



# ADF Serials Telegraph News

News for those interested in Australian Military Aircraft History and Serials

Volume 6: Issue 5: Spring 2016 *Editor and contributing Author: Gordon R Birkett,*

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**Message Traffic Selections:** Please address any questions to: [question@adf-serials.com.au](mailto:question@adf-serials.com.au)

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## News Briefs

- **18th-28th July 2016:** The first Vertical Replenishment (VERTREP) by a HMAS Canberra MRH-90 helicopter (808Sqn 's A40-006) to a United States Navy warship was carried out off the coast of Hawaii as part of Task Group 176.1 in Exercise Rim of the Pacific (RIMPAC) . The VERTREP consisting of 28 pallets to amphibious transport dock USS San Diego was also the largest ever by the ADF's maritime support helicopter. During the VERTREP, HMAS Canberra also received two US Army UH-60 Blackhawk helicopters while USS America, less than a mile away, launched her embarked CH-53E Super Stallion helicopters, the largest in the United States Marine Corps inventory. Also HMAS Canberra has successfully received a United States Navy Landing Craft, Air Cushion (LCAC) within its internal well dock, marking a world-first for the class of ship. The docking is the first for Spanish designed Navantia Juan Carlos I-class multi-purpose amphibious ships and the Royal Australian Navy. The US Navy LCAC is a high speed, "over the beach" fully amphibious landing craft (or hovercraft) capable of carrying up to 75 tonnes of cargo, and/or a M1A1 Tank, fully loaded out with fuel and ammo, at speeds of over 40 knots. HMAS Canberra has also successfully embarked four United States Marine Corps (USMC) Amphibious Assault Vehicles (AAV) off the coast of Hawaii marking another milestone. HMAS Canberra has successfully landed a United States Marine Corps (USMC) MV-22 Osprey tilt-rotor aircraft (19th July 2016) and a CH-53E (25th July 2016) on its flight deck for the very first time during this period.
- **21st July 2016:** The first of 49 PC-21 aircraft destined for the Australian Defence Force, has successfully completed its initial production test flight at the factory in Stans, Switzerland. The flight took place only seven months after contract signature. This first PC-21, registered as A54-001, will be handed over to the Royal Australian Air Force at East Sale in June 2017 after completion of testing and verification work in both Switzerland and Australia



- **28th July 2016:** Lockheed Martin has delivered the 24th, and final, MH-60R Seahawk helicopter to the U.S. Navy in support of the Navy's Foreign Military Sales (FMS) program with the Royal Australian Navy (RAN). The milestone delivery took place during the 27th July 2016 ceremony at Lockheed Martin's Owego, New York facility. The event marked the official transfer of ownership of the final MH-60R Seahawk destined for the RAN from Lockheed Martin to the U.S. Navy. The ceremony was attended by officials from the Naval Air Systems Command (NAVAIR), the RAN and the Australian Embassy, as well as representatives from the Defence Contracting Management Agency, Sikorsky and Lockheed Martin.



- **29th July 2016: A MRTT Order loss,...**India has withdrawn the tender for a much-awaited contract for the purchase of six multi-role tanker transport (MRTT) KC-30A aircraft with Airbus Defence and Space, worth more than \$1 billion, on grounds of the planes' high operational cost. **Meanwhile a Order win,...** A deal to equip NATO with a fleet of A330 MRTT air-to-air refueling aircraft has been signed by Airbus and OCCAR, the European organization that manages cooperative weapons programs. Two of the multi-role aircraft have been purchased by the Netherlands and Luxembourg in what is hoped will become a pooling and sharing arrangement, with options for up to six A330 MRTT s more if other nations join the Multinational MRTT Fleet (MMF) program, which could also include Belgium, Germany, Norway and Poland.
- **4th August 2016:** The F-35A Lightning II fifth generation fighter aircraft was declared 'combat ready' today by Gen. Hawk Carlisle, the commander of Air Combat Command, USAF. The 34th Fighter Squadron of the 388th Fighter Wing, based at Hill Air Force Base, Utah, is the service's first operational F-35A squadron, having met all the established criteria for Initial Operational Capability including a successful June deployment to Mountain Home AFB, Idaho and a series of eight-aircraft sorties held in mid-July 2016. the unit is equipped with fifteen F-35As at this stage. Twelve jets have received the modifications necessary for IOC, 21 combat-mission-ready pilots are available, and the maintenance infrastructure is ready to support the Squadron . Meanwhile, The US Marine Corps has issued a statement confirming that Marine Fighter Attack 121 (VMFA-121), the 'Green Knights' is the first squadron to become operational with the F-35B variant of the Lightning II with Block 2 Software. But, like the US Air Force with the current Block 3I standard that can handle up to 7G loadings , it will have to wait until software blocks 3F and 4 are available in 2018 and 2021, respectively , to lead to its declared Full Operational Capability (FOC) with all current operated/ planned weapons and be capable of 9G loading. Specifically, Block 3F will include upgrades such as a larger synthetic aperture radar map and will be delivered to the fleet in 2017. The Block 4 modernisation will deliver 80 new capabilities and 17 weapons that were not part of the programme's original go-to-war plan for the F-35A back in 2001. Block 4.1 capabilities will include electronic warfare improvements, cockpit navigation upgrades and a maritime identification capability for the radar, the programme office says. AIM-9X missile integration is also planned for Block 4.1, as is the Small Diameter Bomb II, which has faced delays and has not yet achieved IOC. Block 4.2 will enhance interoperability with Link 16 data link and an advanced electro-optical targeting system. Sources: [www.flightglobal.com/news](http://www.flightglobal.com/news).
- **August 2016: US Navy is stretched waiting for their F-35B/Cs.** Until F-35B/C aircraft are available in required numbers, the US Navy plans to mitigate the inventory challenge with service life extension of legacy F/A-18 A-D airframes to 8,000-10,000 hours (over original design of 6,000 hours). Extension of legacy Hornet life requires additional inspections and deep maintenance that were not originally envisioned for the aircraft. Average repair time has significantly increased because of required engineering of unanticipated repairs, material lead times, and increased corrosion of airframes. Out service date for US Navy F/A-18A/C's is 2030. In contrast, our deployed RAAF HUG Hornets are performing magnifically in Coalition War against ISIS with availability rates in the mid to late ninety percentile, thanks to engineering enhancements, selective re-barrelling of some airframes, and avionics upgrades from the late nineties and early 2000's and the support staff. *Careful RAAF fleet planning will see that their out of service date of 2023, some seven years before the US Navy, with still adequate airframe hours spared in any unplanned F-35A delivery contingencies .*

# THE KANGAROO ROUNDEL THAT WE LOVE

Written and researched by John Bennett 2016

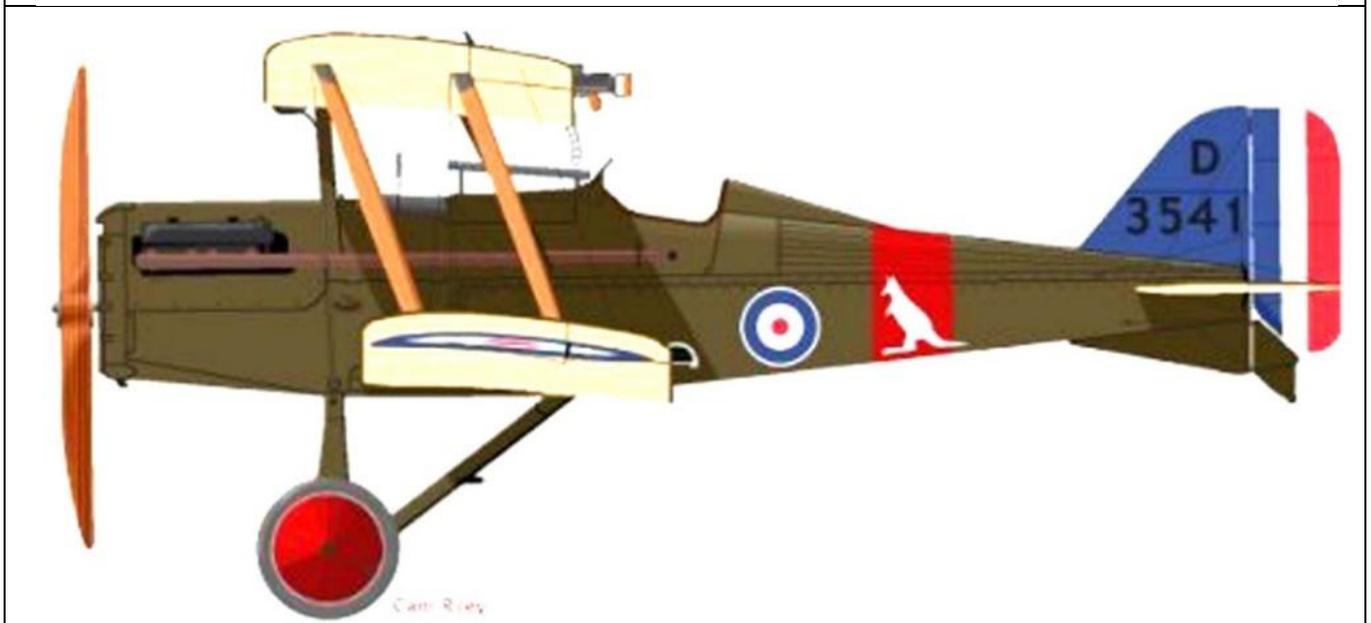
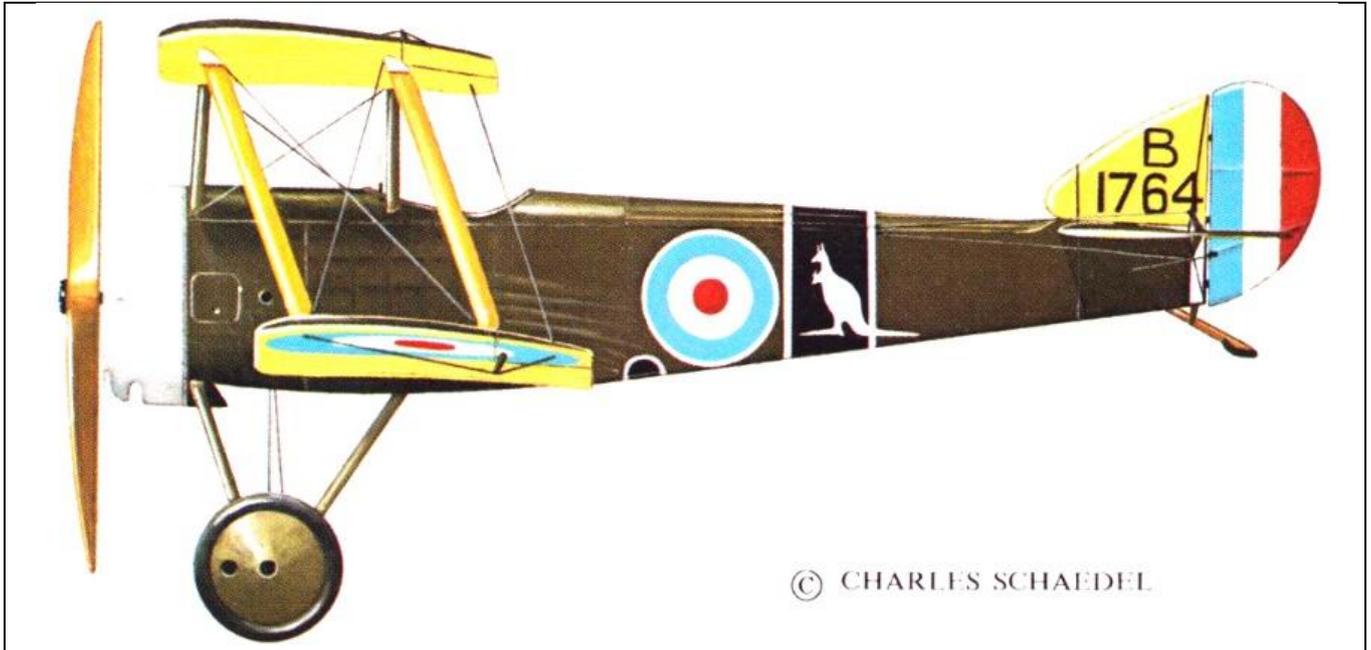
Most of us know that the kangaroo roundel for Australian military aircraft was adopted as our national marking in the “1950s or 1960s”. Well both of these responses are correct, but there is a lot of background which led to these decisions. In 1956 the leaping kangaroo replaced the RAF “target” style roundel on the fuselage of Australian military aircraft – and on the mainplanes too of RAN aircraft – and then in 1965 the RAAF also introduced the kangaroo roundel to the wings. Looking at the Australian history associated with kangaroo markings on our aircraft, that is relevant to this decision, is a detailed story and warrants a full retrospective look. In addition to this story, the documentation that led to our national marking becoming the “kangaroo in motion” has been referenced.

## First World War – Kangaroos on Aeroplanes

A pioneer Australian aviator was Oswald Watt, who was the first commander of 2 Squadron Australian Flying Corps (AFC). He had joined the French military aviation service in 1914, where he would earn the *Legion d’Honneur* and *Croix de Guerre*. He had his MF Shorthorn adorned with a standing kangaroo and named “Advance Australia” over 1914-15.<sup>1</sup> In 1916 he was appointed as a Major to command the newly formed 2 Squadron AFC, who he took to France in 1917, and then at the beginning of 1918 became the commander of the new 1st Australian (Training) Wing in Gloucestershire.



Oswald Watt with his kangaroo “Advance Australia” Shorthorn marking



© Norman Clifford



The top illustration of a 5AFC Sopwith Pup (taken from black and white orthochromatic film on the following page) should probably have a red fuselage band. Artwork by Charles Schaedel, Cameron Riley and Norman Clifford.



An black and white orthochromatic film example of a 5AFC SE5a, this one being #B129 "A"

The Australian training squadrons were forming from late 1917, and Watt organised his 1st (Training) Wing along the following lines. There were two airfields some 8 miles apart, Minchinhampton and Leighterton.

No 1 Station **Minchinhampton** was home to 5 and 6 (Training) Squadrons, which had as the 1 Station marking a standing white kangaroo (similar to Watt's Shorthorn "Advance Australia" kangaroo) on a red band. 5AFC flew Scouts and Camels in support of 4AFC; 6AFC flew Avro 504s and SE5As in support of 2AFC.

No 2 Station **Leighterton** was home to 7 and 8 (Training) Squadrons which had a white emu on a red band. 7AFC flew Avros and RE8s in support of 3AFC; 8AFC flew Avros, Scouts and Camels in support of 4AFC.<sup>ii</sup>

These markings survived into 1919, and some aircraft of these training units also sported white boomerang markings, which had been adopted in France during 1918 by the operational AFC squadrons.

The Minchinhampton kangaroo is interesting. 6AFC's fighting instructor Les Holden flew an all-over red painted SE5A (numbered B129), with the white Minchinhampton standing kangaroo superimposed on an individual letter "A".

Many year later, this standing kangaroo marking was temporarily adopted by 6 Squadron RAAF, for its 90th Anniversary in 2007 – the white standing kangaroo on an F-111C's red rudder. Furthermore it was the design of this "standing" Minchinhampton kangaroo that was considered in 1955 for the new RAAF kangaroo roundel.



The 6 Sqn Minchinhampton kangaroo marked on a 6 Sqn 111C A8-125 in 2007, little worn but under cover

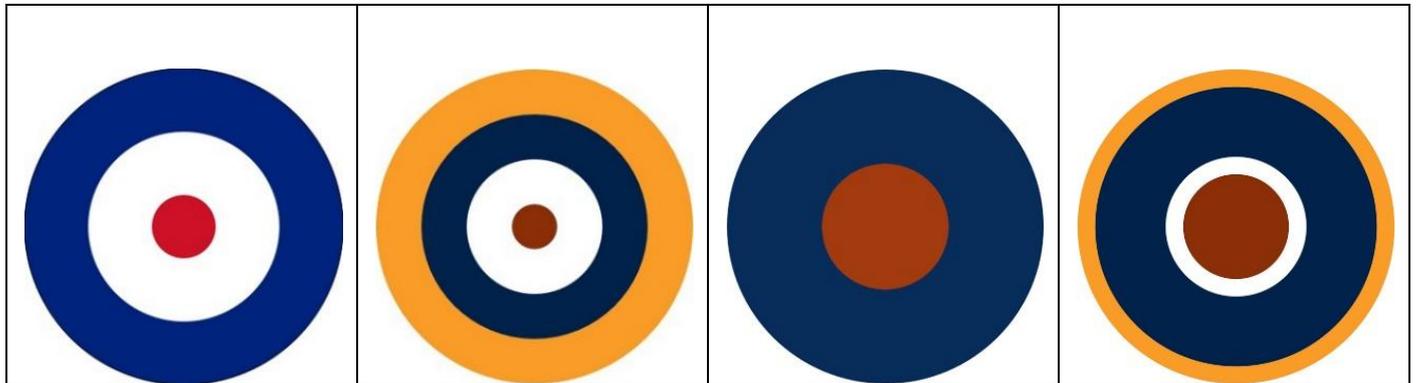


A8-125 in 2007 again, pre-dating first picture and out in the open with newer fresher truer colours

## Second World War - the RAF Roundel

The RAAF followed the policy in changes to the RAF roundel, or cockade, in the late 1930s, which included changes at the time of the Munich crisis in 1938, the entry into War in 1939, and resultant changes with operational circumstances. Furthermore Japan's entry into War in 1941 led to even more sweeping changes.

Initially like the RAF, the RAAF had used the red/white/blue fuselage "A"-type roundels (often with yellow outer rings as "A1" roundels), and "B"-type red/blue roundels on the upper surfaces. With war, we followed the RAF with "B"-type roundels on the upper wings and fuselage too, with "A"-type on the lower wings.<sup>iii</sup>



Type A

Type A1

Type B

Type C1

The proportion of the sizes of these roundels is always provided in relation to their diameter as follows:

- **"A"-type** is 5:3:1 ratio, where 5 represents the outer diameter of the blue ring, 3 is the diameter of the white ring, and 1 is the diameter of the red centre.
- **"A1"-type** is 7:5:3:1 ratio, where 7 represents the outer diameter of the yellow ring, 5 is the diameter of the blue ring, 3 is the diameter of the white, and 1 is the diameter of the red centre.
- **"B"-type** is 5:2 ratio, where 5 represents the outer diameter of the blue ring, 2 is the diameter of the red centre.
- **"C"-type** is 8:4:3 ratio, where 8 represents the outer diameter of the blue ring, 4 is the diameter of the narrow white ring, and 3 is the diameter of the red centre. Therefore, the white is quite thin, and there was a matching "C1"-type roundel with a thin yellow outer ring.

The designators A/B/C came from British author Bruce Robertson from his writings on camouflage and markings of over 60 years ago, and these have remained as the definitive descriptors for these markings. Typical sizes for a "A1" on a fuselage could be 49" (inches):35":21":7", or 35":25":15":5" – that is the 7:5:3:1 proportions. Type "A" underwings could be for example 45":27":9", or 40":24":8" – that is 5:3:1 – and fin striping colours were in equal proportions, size changing with aircraft types. Type "B" wing roundels again varied with aircraft type, and could be 63":25", 54":21.5", 49":19.5", or 40":16", that is in the proportion 5:2.<sup>iv</sup> (Later in the War the RAF introduced the "C"-type roundel, as to not compromise the camouflage by too much white in the national markings – both with roundels and fin striping.)

But soon into 1940, the RAAF fuselage roundel was reverted from "B"-type back to "A/A1" roundels. What is not generally known is the RAAF officially identified these roundels in 1940 (bearing in mind this was a decade before the Robertson designators were developed and widely accepted) as "M.1", "M.2" and M.3" roundels. "M" stood for Marking (i.e. national marking), and the Technical Order AGI No.C.11 Issue 3 defined these roundels,<sup>v</sup> and the comparable RAF roundels are listed below:

- **"M.1"** was what we have come to refer to as the "B"-type roundel;
- **"M.2"** was the "A"-type roundel; and
- **"M.3"** was the "A1"-type roundel.
- Marking **"M.4"** was the red/white/blue fin striping.

These M markings were adopted several years before the “C”-type roundel was introduced to the RAF, and subsequently it was never intended to use this roundel on RAAF aircraft in the Pacific. Furthermore, post-war an RAF “D”-type roundel was introduced to both the RAF and RAAF – and this is later significant to our story.

### The Unique RAAF Pacific Roundel

During the Pacific War, in 1942 the RAAF had deleted the red circle of the RAF-style “bullseye” roundel for fear of confusion with the round red *Hinomaru* “meatball” marking of Japan. Indeed, this had happened in June 1942 when a US Navy Wildcat fighter had mistakenly attacked a RAAF PBY-5 Catalina.<sup>vi</sup> This was an understandable mistake, and very fortunately it was not a fatal case of friendly fire. From Australia’s entry into the Second World War in 1939, the RAAF had adhered strictly to RAF camouflage patterns – that meant red/white/blue fuselage “A”-type roundels (often with yellow outer rings as “A1” roundels), and “B”-type red/blue roundels on the upper surfaces. Our early PBYs had a bluish-green camouflage, so as the blue outer ring of the upper roundel faded, the red disc became more prominent. Added to this the above view of a PBY is quite a squat shape, not like its familiar sweeping lines in side view. Perhaps this unfamiliar view of a fat flying boat – with red disc markings – would explain, if not excuse, the US Navy’s error.

Although immediate, this was not a simple and quick transition...

- Initially in July 1942, immediately following the above incident, the red in the “B”-type roundels was over-painted with white on the upper wings in the proportion 5:2, but on the fuselage “A”-type red, white and blue roundels would be retained as 5:3:1.<sup>vii</sup>
- This somewhat confusing directive was cancelled two months later in September with an instruction given to obliterate red in national markings altogether: “The colour red is no longer to be used and the standard cockade will be a white roundel surrounded by a blue ring. Diameter of the cockade is not to exceed 4 feet [48”]. Diameter of white centre is to be 3/5 of cockade diameter.”<sup>viii</sup> So this proportion of 5:3 was basically a “A”-type roundel with no red centre.

The result was that the removal of the red disc from the RAAF’s roundel over the second half of 1942 produced a unique national marking – the WWII RAAF Pacific roundel. By deleting the red, the proportion of the blue/white in practice would later change, depending on the original type of RAF roundel that was altered. The blue might be narrow (by just white painting out the “A”-type red centre), or it might be broader. The trouble was of course, a large white disc compromised camouflage – a delicate balance between camouflage to conceal, and displaying national identity. Eventually the white centre was reduced, and over late 1943 and 1944 a standard 5:2 roundel was in wide use.<sup>ix</sup> But there was some variance, for example Vengeances, Kittyhawks and Wirraways had roundels at 32”:12” – the white centre was slightly smaller than 5:2.<sup>x</sup> In 1945 the white centre even further shrank with the 3:1 roundel.<sup>xi</sup> The fin stripes had also changed to make a blue/white stripes of equal widths, but of varying height according to aircraft type.



RAAF WWII Pacific 5:3 and 5:2 roundels, and marked on never to be delivered A-25 Shrike A69-29 in USA

## Second World War – 456 Squadron the Definitive Kangaroo Roundel

In 1943, 456 Squadron – the RAAF’s only night fighter unit and serving in UK – adopted the leaping or “penny” kangaroo (as shown on the “tails” side of the copper penny coin) as its unit badge, in an “A”-type roundel.

This roundel had evolved from the Unit’s ground crew sailing from Australia to the UK in mid-1941, but it was not until 1 July 1943 as 456 re-equipped with the Mosquito, that the kangaroo roundel matured and was marked on aircraft.<sup>xii</sup> Aircraftman Ron Vidler recalled:

“On our way over, we made templates of the kangaroo from the penny. Most of the chaps around us on the ship emptied their blue kit bags and painted the ‘roo on them. The Squadron went to the Isle of Anglesea...it is here you will see me standing with my back to the camera and the roo on my overalls. We put the roo in the middle of the roundel when we got the Mossies. On my return to Australia I wrote to Air Force Headquarters and said it would be a good idea to have it on RAAF aircraft – didn’t get a reply, time went by and it appeared on RAAF aircraft.<sup>xiii</sup>

Below is 456 pilot Warrant Officer “Gate” Gatenby with the 456 kangaroo roundel that was displayed on a door leading in from the Squadron hangar. Also a 1944 picture shows 456 Squadron radar operator Andy Kellett and his pilot Fred Stevens in front of their Mosquito crew entrance door



Leaping kangaroo on 456 Sqn hangar

Leaping kangaroo on 456 Sqn Mosquito

Indeed, in 1956, the RAAF did adopt the kangaroo roundel, and the above photo of the Mosquito crew entrance door shows, today’s RAAF roundel is exactly the same as that designed by 456 Squadron in 1943.

## Post-war RAAF Markings

The RAF decided to re-introduce pre-war red/white/blue national markings in May 1947 with the roundels in 5:3:1 proportions.<sup>xiv</sup> These became generally known as “D”-type roundels. In RAAF parlance the “D”-type roundel was referred to as “National Marking I”, and the fin flash as “National Marking II”.<sup>xv</sup>

Three months later the RAAF prevaricated stating that “red in roundels is not a requirement”.<sup>xvi</sup> However this was soon reconsidered, and red was to be introduced with wartime matt colours,<sup>xvii</sup> and the Instruction was issued in January 1948 directing the introduction of 5:3:1 roundels in gloss colours.<sup>xviii</sup>

Most aircraft were re-marked over 1948-49, but there were some variations. For instance, when the red inner circle was added to the RAAF P-51 Mustangs of 81 Wing in Japan, the red disc was too small for the roundel, and is more of an “A”-type roundel than a “D”-type roundel.

<b>Standard</b>	<b>British Standard BS 381C</b>	<b>1947 RAAF Designator K3</b>	<b>Remarks</b>	<b>Dulux Identifier</b>	<b>1948 RAAF Designator K3</b>
Red	BS 381C-37 <i>Signal Red</i>	K3/235		<i>Bright Red</i> 388-5302	K3/346
White	no standard	K3/236		<i>White</i> 388-026	K3/242
Blue	BS 381C-4 <i>Azure Blue no.4</i>	K3/232	adding a “dash” of K3/231 <i>Black</i> produced <i>Royal Blue no.6</i>	<i>Royal Blue</i> 388-041	K3/343

This was peculiar to the British Commonwealth occupation air forces (BCAIR) and these unique roundels were at variance with all the other air forces’ domestic markings, or what they used in other theatres. When the Meteors arrived however, they did have the standard “D”-type roundel, from factory deliveries or diverted from the RAF.



77 Sqn P-51D Mustang A68-708 with “A”-type roundel

But these – irrespective of whether “A” or “D” roundels – were still more associated with the RAF, and a true Australian character was required for our national marking.

We did have ongoing overseas commitments such as 77 Sqn in Korea, 78 Wing in Malta, and 1 Sqn in Singapore. So in search of something truly Australian, we turned back to previous wars...

### Search for a Kangaroo – ‘standing’ WWI Minchinhampton or ‘leaping’ WWII 456

Consideration for a kangaroo as the national marking had come from several quarters, and in March 1955 the RAAF Air Board formalised the proposal. Most credibility was towards a leaping or a standing “erect” kangaroo, over other ideas of a southern cross and a boomerang, and the marking should retain the traditional red, white and blue. The Air Board recommended on 3 June that new roundels should undergo service trials on two Sabre aircraft, and a standing kangaroo on one Sabre was shown in Melbourne’s *The Age* on 13 September 1955.<sup>xix</sup> This has perhaps been misinterpreted as two Sabres having the erect kangaroo – it is probable that one of the Sabres had a leaping kangaroo. As part of the trial, on 13 October approval was also given to mark a Beaver bound for Macquarie Island with a new kangaroo-style roundel.<sup>xx</sup>



Sabre 31 A94-927 with standing kangaroo in 1955



ANARE Beaver A95-201 with standing kangaroo 1955-56

In April 1956 a vote was taken of serving RAAF personnel, with the ballot form shown below. The choices were to retain the present roundel ("D"-type), retain the present roundel, or to adopt a new roundel with either a kangaroo "in motion" or "erect" design.

It has been suggested that the roundel on R.A.A.F. aircraft should be adapted to a more distinctive national design.

Accordingly, the existing roundel and two alternatives (illustrated below) are being submitted for the vote of all members of the R.A.A.F. Please register your vote for the design you prefer by placing a cross in the square opposite that design.

1. Existing roundel		<input type="checkbox"/>
2. "Kangaroo in Motion" roundel		<input type="checkbox"/>
3. "Erect Kangaroo" roundel		<input type="checkbox"/>

If you have voted for the existing roundel (No. 1), do you think an additional symbol should be placed ~~adjacent to it.~~ *on aircraft.*

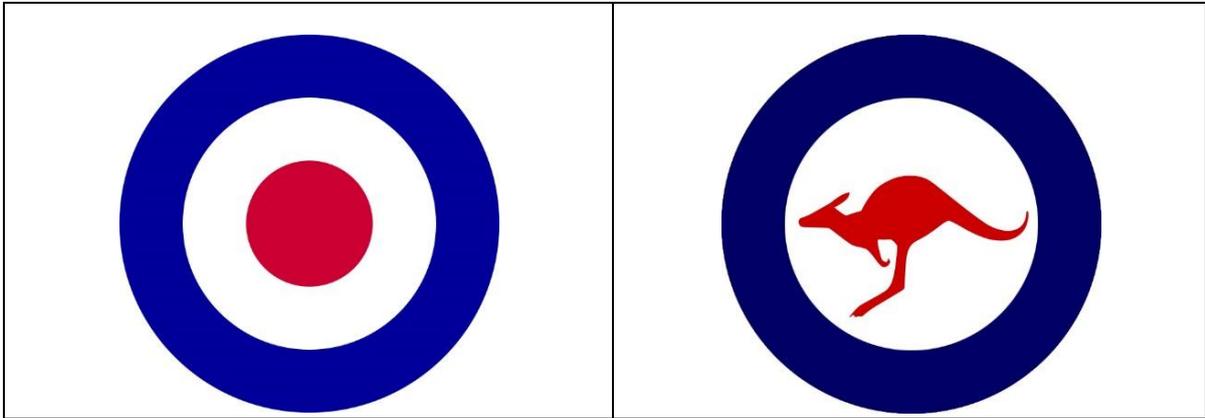
If so, illustrate your suggested symbol in the space below, and include a brief description of it.

The 1956 voting form

The erect kangaroo of course had its origins with Oswald Watt in 1914 and his introduction of the marking at Minchinhampton in 1918. The leaping kangaroo was 456 Squadron "penny" kangaroo and had been carried on that Squadron's Mosquito over 1943-45.

9442 RAAF personnel voted, and 81% voted for the "kangaroo in motion". On 8 Jun 1956, the Air Board proposed to adopt the new roundel and approval was given by the Minister for Air on 2 July 1956.<sup>xxi</sup> The kangaroo was adopted for the fuselage only – the wings would follow some nine years later. But the RAN did decide to use the leaping kangaroo in all roundel positions, with the main plane kangaroos facing forward (*forward*) and legs pointing inboard (*amidships*).

The selection of the "kangaroo in motion" led to the over painting of the RAF "D"-type roundels red centre with the leaping kangaroo. Below shows the difference in the roundels, with the kangaroo roundel, which has unofficially been referred to in the book *Southern Cross Mustangs* as a "KD"-type roundel.<sup>xxii</sup> "D"-type roundels



"D"-type roundel

Kangaroo roundel base on the "D" roundel



Sabre in 1958 and Mirage in 1962, with kangaroo fuselage roundels and "D"-type wing roundels

Some early kangaroo users



Auster III A11-1 c 1960



Point Cook Wirraways c 1959



Meteor T.7 A77-705 c 1962



Auster 6 A11-201 off the vessel Kista Dan



Vampire A79-202 21 Sqn



Lincoln B.30 A73-41 1 Sqn



Beaufighter Mk.21 A8-357 1956-57



Freighter Mk.21E A81-4 1962



Sikorsky S.51 A80-374



Sycamore A91-2 1962

### **...and, Formally, onto the Wings**

The Air Board in September 1965 finally recommended the RAAF adopt the leaping kangaroo in all roundel positions. The Air Board Agendum made some interesting observations. It made the point that in 1956 the Air Board had decided that in view of the difficulties of positioning the kangaroo on the main planes to the best advantage, the kangaroo would appear only on the fuselage.

“The practice of retaining the RAF roundels on the wings in lieu of the kangaroo has caused much conjecture, particularly overseas, as it is most unusual and inconsistent to have two different insignia on the one aircraft.”<sup>xxiii</sup>

“Since our commitments to South-East Asia have increased, there have been reports that many Asian as well as American nationals assume that where the kangaroo appears on the sides of the fuselage, only, then the aircraft is of British (RAF) origin, but being flown by an Australian crew.

This is not in the best interests of the Service or the Nation.”

These observations were of course quite valid, and they had not been contemplated back in 1956. The 1965 Air Board Agendum recommended “that the ‘kangaroo in motion’ roundel be approved for positioning on the main planes as well as the fuselage of all RAAF aircraft and that the kangaroo be so placed as...head forward, feet inboard in each case”. This was followed up two months later by a directive to units to replace the wing roundels in accordance with this Air Board recommendation.<sup>xxiv</sup>

On a more technical side, in November 1965 units were advised in more detail by RAAF Support Command of marking the kangaroo in all positions.

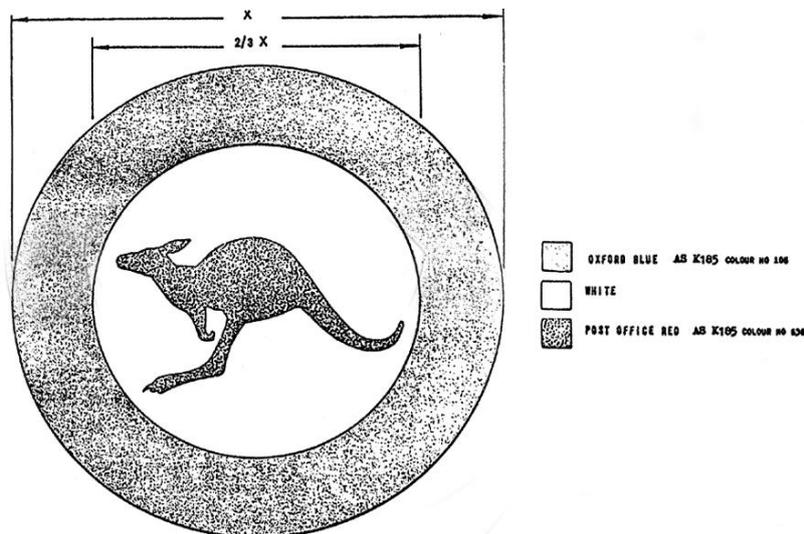
“Kangaroo silhouette is to be placed with head forward and feet inboard on all wing roundels and head forward feet port on underside fuselage rotary wing aircraft. Units having templates of correct size and design or drawings of kangaroo silhouette appropriate to aircraft held are to proceed with remarking as above using lacquer Red 8010-018-5120 and White 8010-018-5119 as required.”<sup>xxv</sup>

The roundel colours were further enunciated in the RAAF “Aircraft Finishing Schemes” publication, under the International designators ‘Red’ BS 381C-538 (Australian designator K185/538), ‘Blue’ BS 381C-105 (K185/105) and ‘White’ FS 595a-17875.<sup>xxvi</sup> It was prior to this that RAAF paint stores identifiers were changed from K3/ to K185/ as an Australian Standard (AS).

The Australian Defence Standard DEF (AUST) 572 of March 1975 established these criteria across all the Services and further detailed the roundel colours under the Australian designators as “Post Office Red” K185/538 (or FS 595a-11136) and “Oxford Blue” K185/105. To simplify this numeric minefield of colour charts, I have developed the table below for gloss colours.

Also the kangaroo silhouette attached to this Standard is shown below.<sup>xxvii</sup>

<b>Standard</b>	<b>US FS 595a</b>	<b>British Standard (BS) BS 381C</b>	<b>Australian Standard (AS) K185</b>	<b>Lacquer Identifier</b>
Red	FS595a-11136 <i>Insignia Red</i>	BS 381C-538 <i>Post Office Red</i>	K185/538 <i>Post Office Red</i>	8010-018-5120
White	FS595a-17875 <i>Insignia White</i>	no standard	<i>White</i>	8010-018-5119
Blue	FS595a-15044 <i>Insignia Blue</i>	BS 381C-105 <i>Oxford Blue</i>	K185/105 <i>Oxford Blue</i>	not known



Kangaroo silhouette with 3:2 roundel and specified AS K185 colours

Later some hues of these colours were changed. By 2011, we had adopted a change to the Australian Standard (AS) colours, and the standard current roundel colours are provided below.<sup>xxviii</sup>

<b>Standard</b>	<b>US FS 595a</b>	<b>British Standard BS 381C</b>	<b>Australian Standard</b>
Red	FS595a-11136 <i>Insignia Red</i>	BS 381C-538 <i>Cherry Red</i>	AS R15 <i>Crimson</i>
White	FS595a-17875 <i>Insignia White</i>	no assigned BS number <i>White</i>	no assigned AS number <i>White</i>
Blue	FS595a-15048 <i>Post Office Blue/ Insignia Blue</i>	BS 381C-105 <i>Oxford Blue</i>	AS B13 <i>Navy Blue</i>

Finally in 1982, the kangaroo was adopted also for the RAAF Ensign. Although efforts to make the transition during the RAAF’s Golden Jubilee in 1971 had failed, moves during the Diamond Jubilee in 1981 had won through.<sup>xxix</sup>

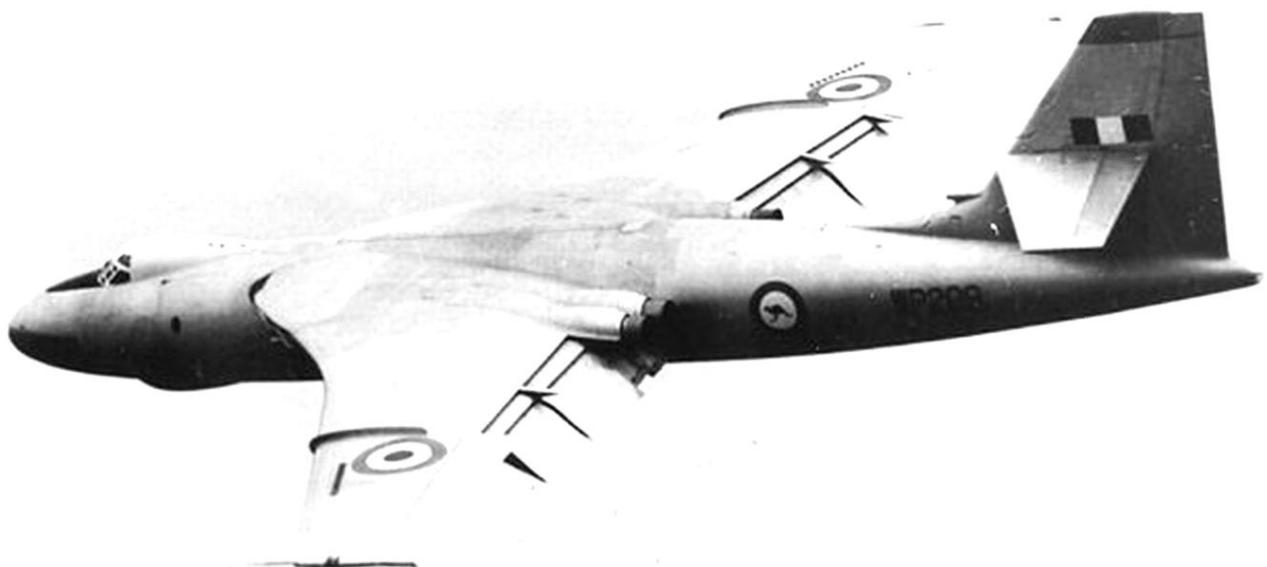
## Kangaroo Oddities

Of relevance are some individual oddities that did occur with the introduction of the “kangaroo in motion” roundel.

- “Jumping the gun”. In June 1959, 24 Sqn CA-18 Mustang A68-141 had kangaroo roundels applied on wings inadvertently: they should of course have been the standard wing “D”-type roundels.



- “A real roundel, or an elaborate zap?” Valiant WR902 serving with ATU for Woomera trials.



- “I just stuck it on the wrong side, Sir”. Below, CA-25 Winjeel A85-405 with a reversed kangaroo roundel.



#### Low Visibility National “Toned-Down” Markings

And finally, well almost, that is the story of the RAAF kangaroo roundel, adopted in 1956 and added to the wings in 1965. But more recently these have in some cases been superseded by low visibility (“low-viz”), “toned-down” kangaroo markings.

To blend better with camouflage, which depends on the area of operation, low visibility renditions of national markings have occurred over the past decades. Probably the first was with Army light aircraft operated in Vietnam in the late 1960s, when the roundel was discarded and replaced by a leaping kangaroo in green or black.

The RAAF and Navy have generally preferred a toned-down roundel with the increased operational tempo in the Middle East over the past 25 years. The RAAF Instruction of June 1990, *“Aircraft Identification Markings and Paint Schemes”*, stipulated: “The Australian roundel or version in tone-down colours must be placed on all RAAF aircraft.”<sup>xxx</sup>

These “low-viz” markings have also led to the deletion of aircraft fin flashes, with the June 1990 Instruction being amplified (by exception) as: “Fin flashes are to be applied to those aircraft bearing the red white and blue roundels.”<sup>xxxi</sup>

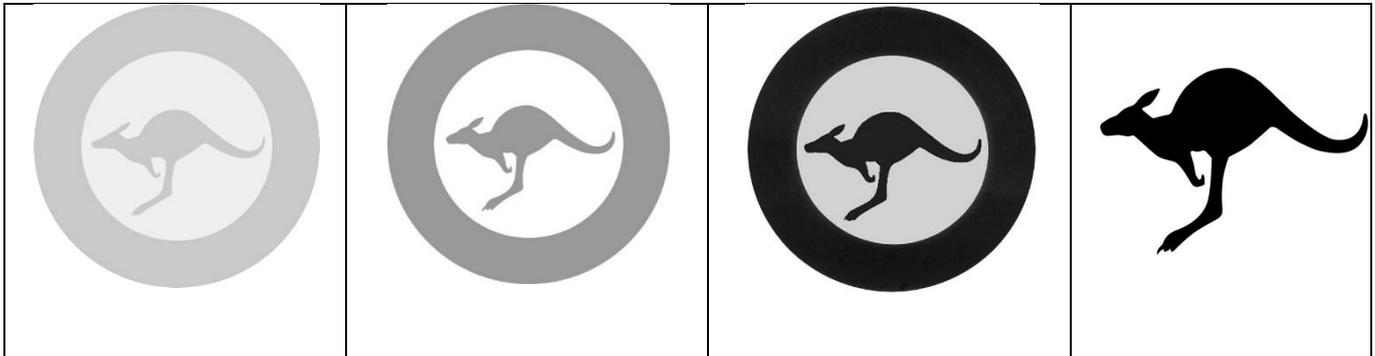
The current 2001 Instruction DI(AF) OPS 4-3, *“Aircraft Identification Markings and Paint Schemes”*, repeats this directive on roundels – but there is no reference to the need for the fin flash, but does discuss a “unit distinguishing tail flash”, i.e. a squadron marking.<sup>xxxii</sup>

The 2011 Australian Air Publication 7021.004-1, *“Aircraft Finishing Schemes, Materials and Processes”*, provides the details for “low-viz” roundels and kangaroos under National Markings:

Variations to the standard roundel for aircraft with tactical or camouflage schemes is permitted. For tactical colour schemes the red kangaroo and the blue outer circle can be replaced by a single contrasting shade of grey (or black). The inner white circle shall be replaced with the general background surface colour of the aircraft paint finish. For camouflage aircraft the colours of the kangaroo and outer circle may be in a single

contrasting colour to the background colour or, the standard red, white and blue roundel may be used at a reduced size. Where approval has been granted, a black kangaroo silhouette without the circumscribed ring may be used on camouflage aircraft.<sup>xxxiii</sup>

Shown below are the toned-down roundels on our modern aircraft, typically in black or grey to better match the platform. Also shown are how kangaroo silhouettes have been employed, typically favoured by Army. However, these were also used on the RAAF Caribou with the kangaroo colour altering in trials with different camouflaged surfaces.



“Low-viz” kangaroos



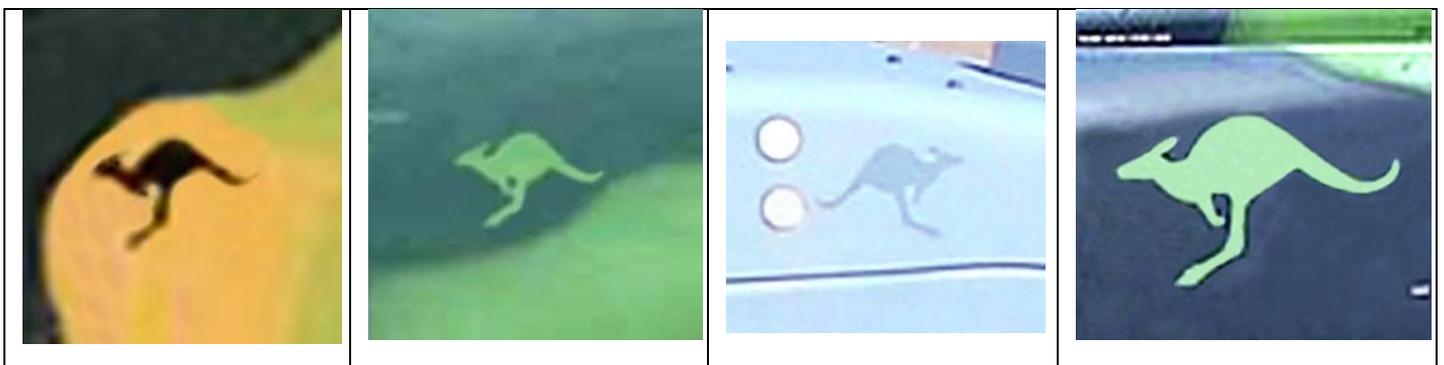
C-130J A97-468

C-17A A41-206

Bell 429 N49-047

A109E N42-510

“Low-viz” roundels on aircraft



Caribou A4-228

Caribou A4-275

RQ-7 Shadow A43-543

MRH90 Taipan N40-008

“Low-viz” kangaroo silhouettes on aircraft

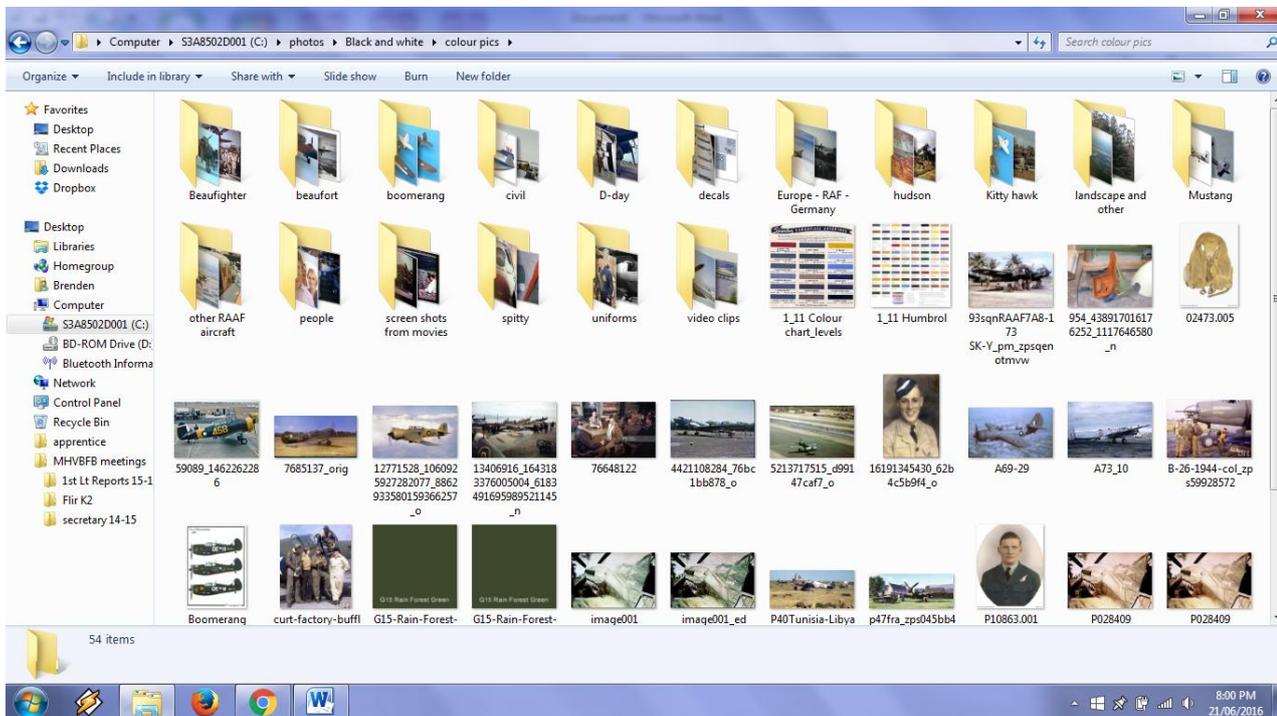
***Editor's Comment: John's End Notes are at end of this issue***

# Photoshopping and Colourisation of old Black and White Aircraft Pictures; Part 2.

As discussed by Brendon Scott @ 2016.

Continuing on from Brendon's first article in the Winter 2016 Edition,.....

This article is a follow on from my black and white images to colour. A huge amount of research goes into each image; including finding and downloading plenty of period photographs and also research people have done with colour plates. Below is a screen shot from one of my folders of information before I put it into a separate folder for ease of use.



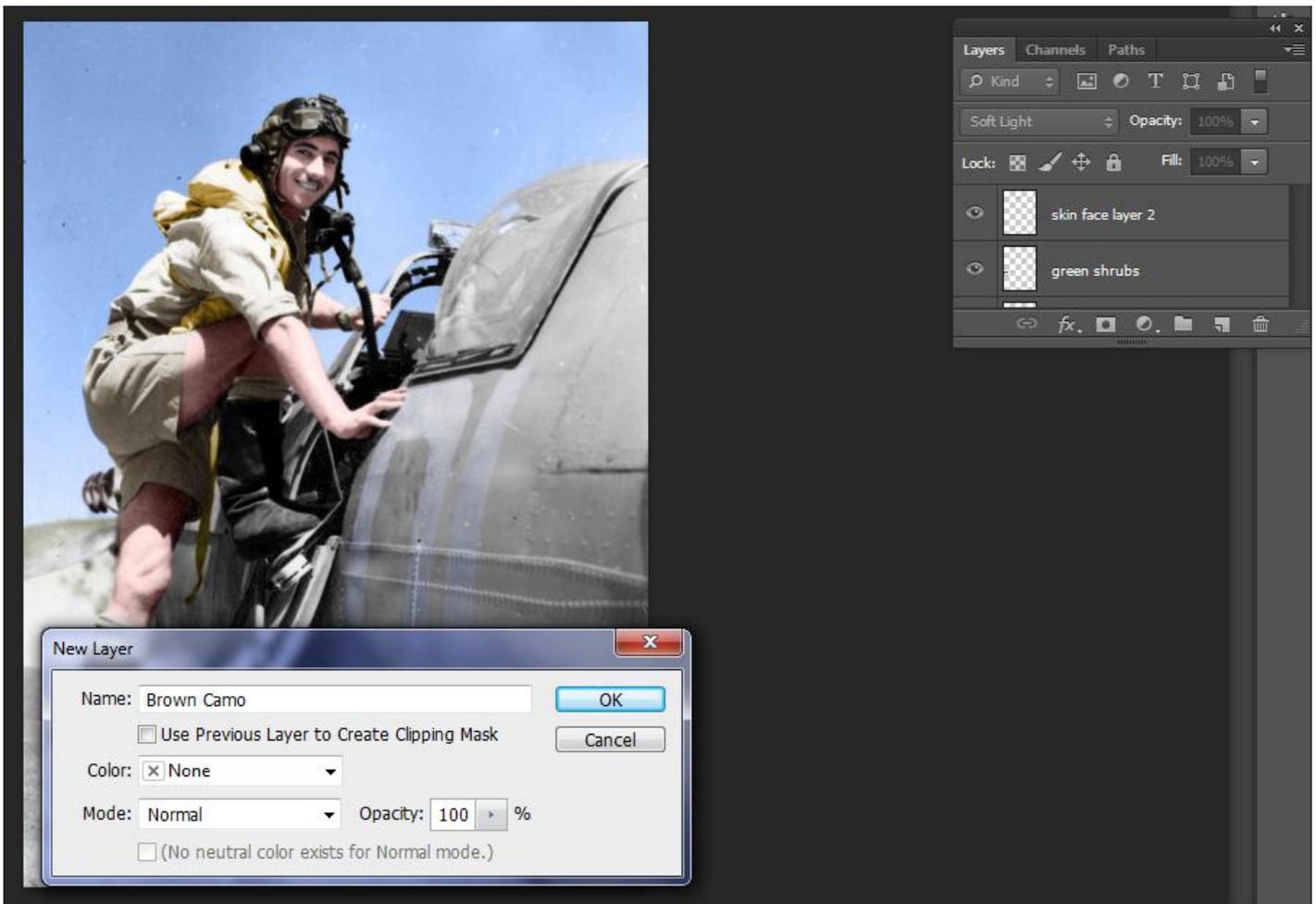
I use Photoshop CS6 for the editing, however there is another program which I can't recall what it is. Below is an image of a Spitfire which I downloaded from the State Library of Victoria and I have partly edited. ( M. C. Hughes (R.A.F.) climbing down from his plane). As the images are over 50 years old there is no copyright with them. This is where legally you can modify the image etc, however I do credit the photographer or source where I can (or remember).



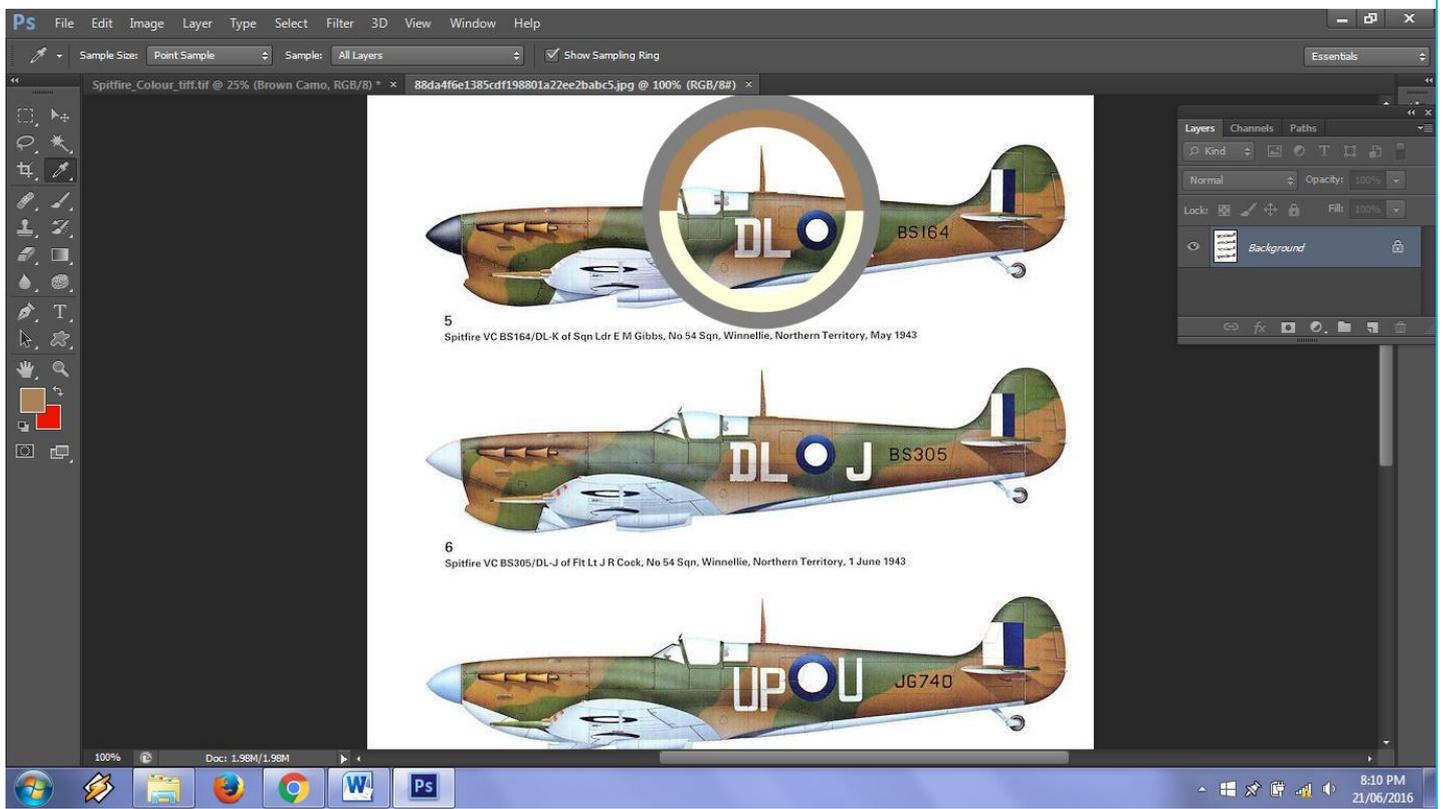
*P/O M C Hughes RAF Serv# 49239 served in 54 Sqn RAF during 1943: Flew Spitfire MkVC's AR619\*, BR536, BR545 DL-E "Ivy" \*/\*\*, BR570, BS188 in his 1943 Tour and was promoted to F/O in May 1943. (\* Regular) Three other pilots lighting cigarettes from the one match in the same period, l. to r.: G. Horkin D. M. Wheeler and s. C. J. Laundry, **No superstition there!!** Editor*



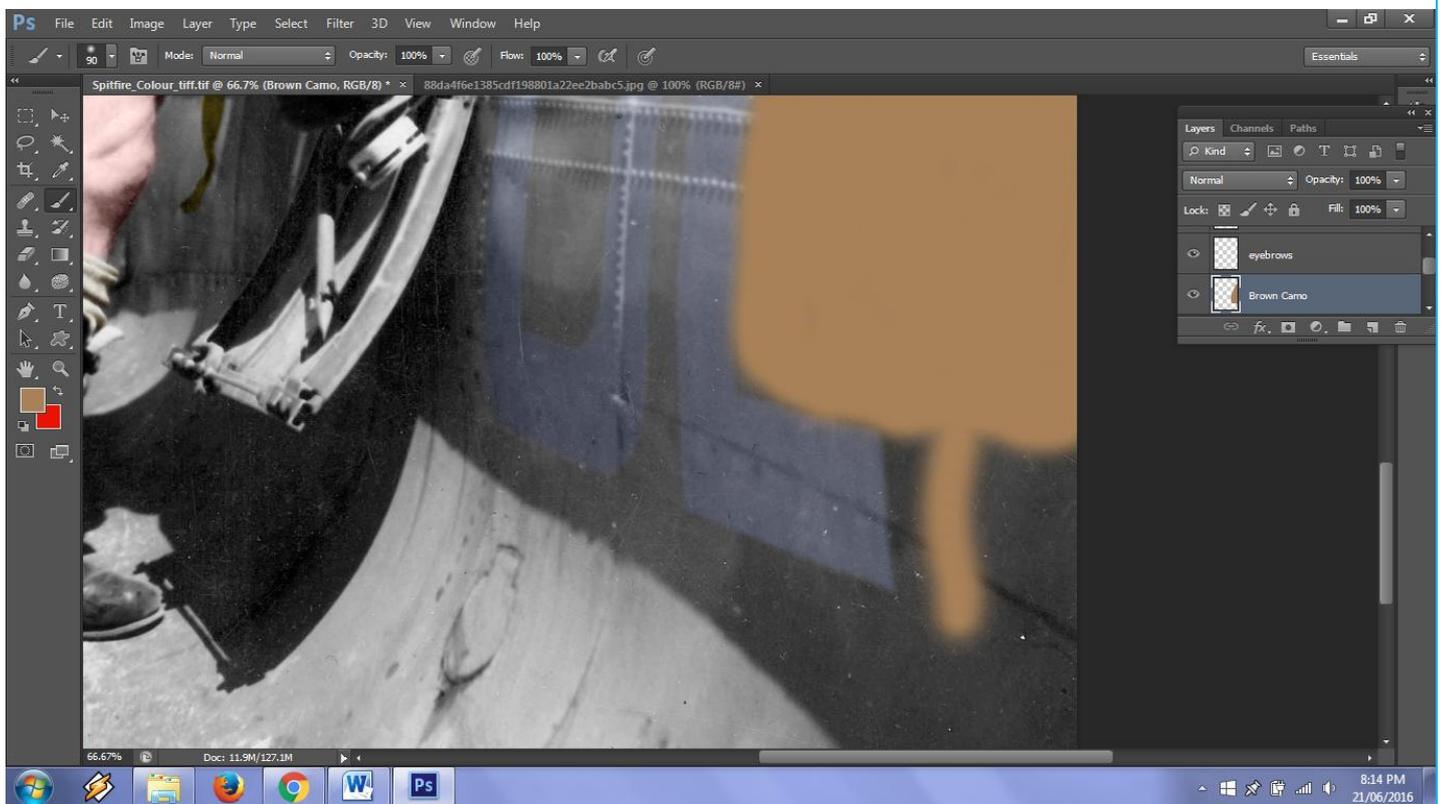
I need to make a new layer in Photoshop as shown below and I generally name it to what I am colouring in. This one is Brown Camo as generally seen on the Mk V Spitfire.



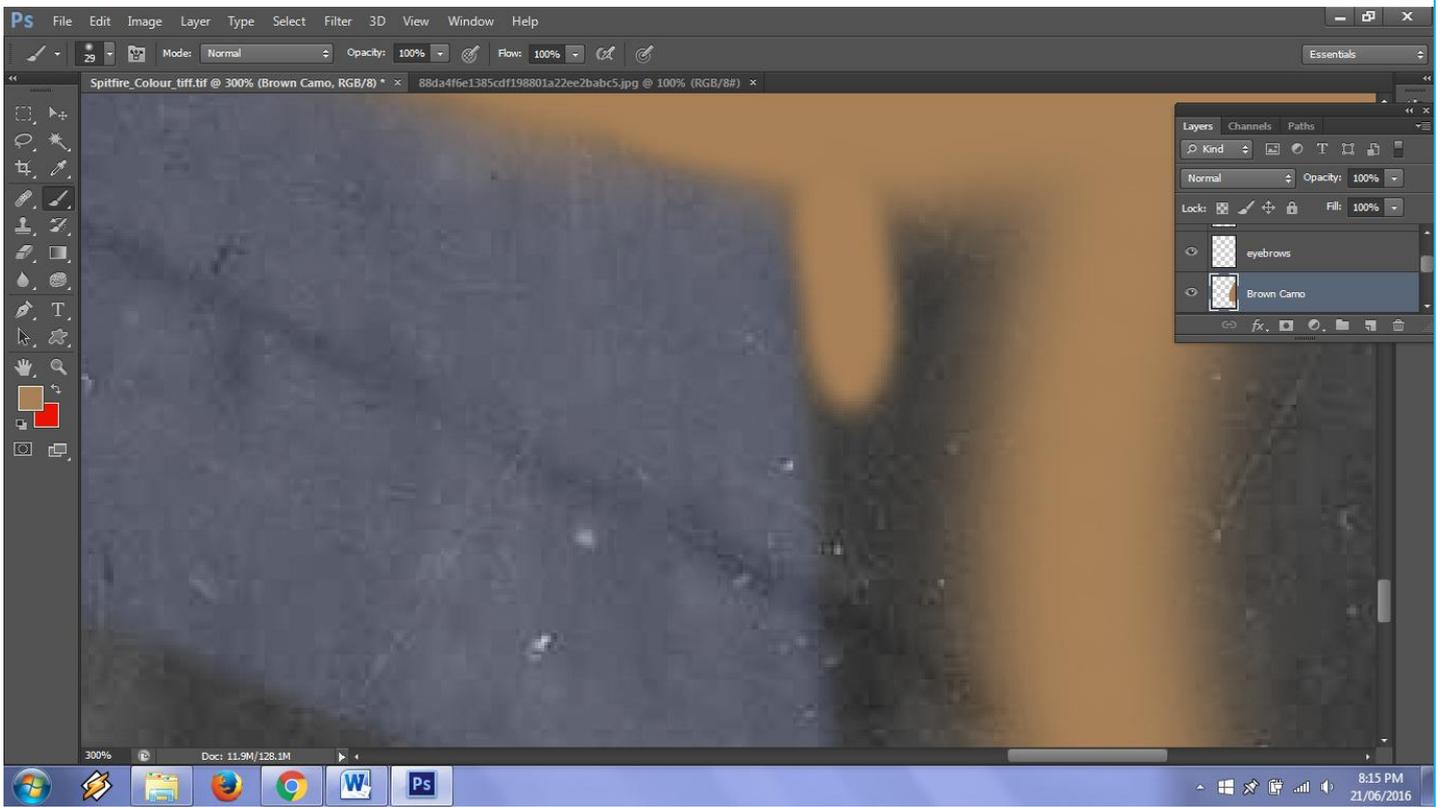
I then use the Eyedropper tool to pick up my colour that I am going to use. I use this as a base and then adjust as required in the colour pallet



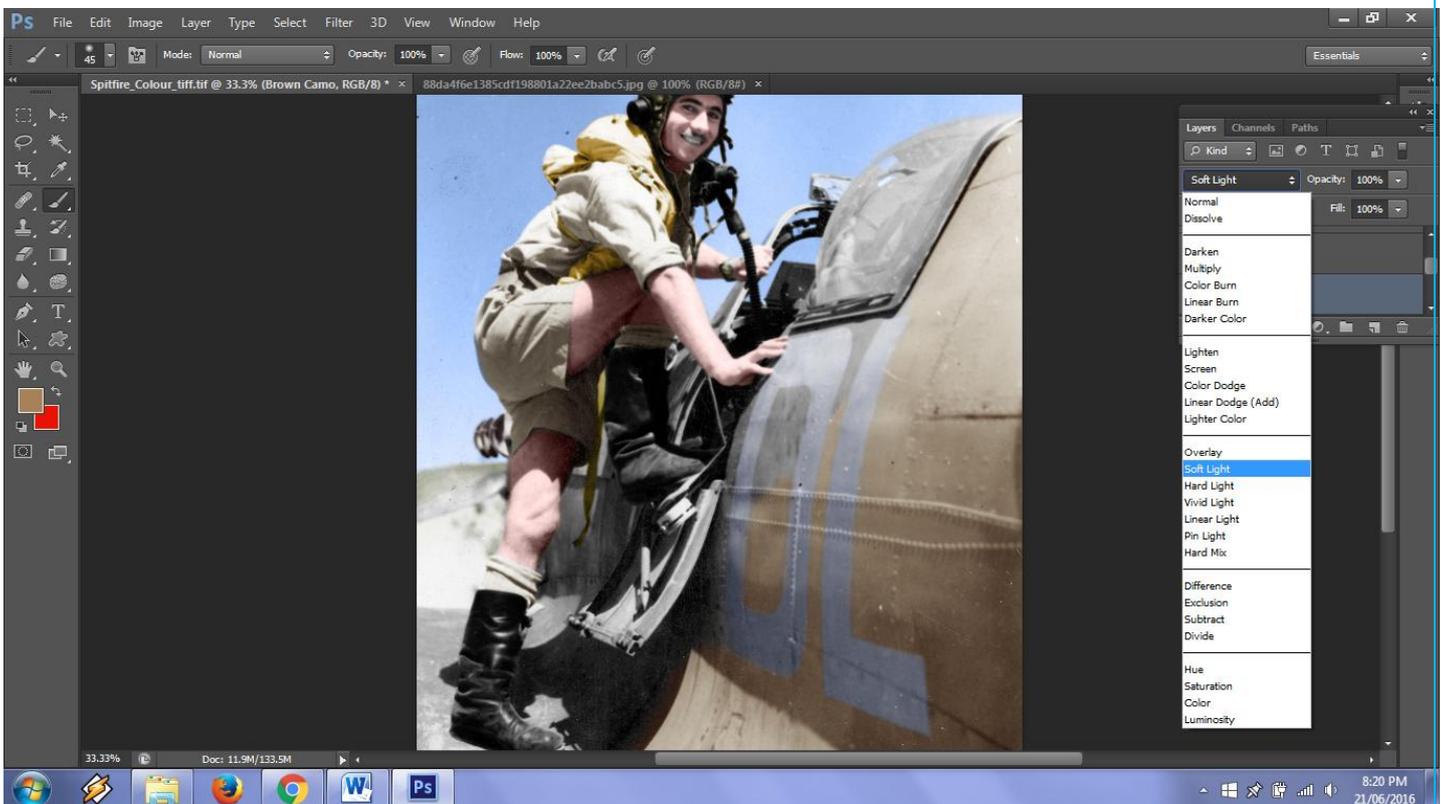
I then pick up my paint tool and start painting essentially.



Even getting right down to the pixels



Once I have covered the area I then click how I want the layer to interact with the image. On this one I have picked Soft light. Depending on the image and how it mixes with the original image (different films, filters etc) will depend on what I use. A general rule of Thumb is Overlay, Soft light and Colour. I then use the Opacity and Fill bars for the layer if I wish to reduce the intensity even more.

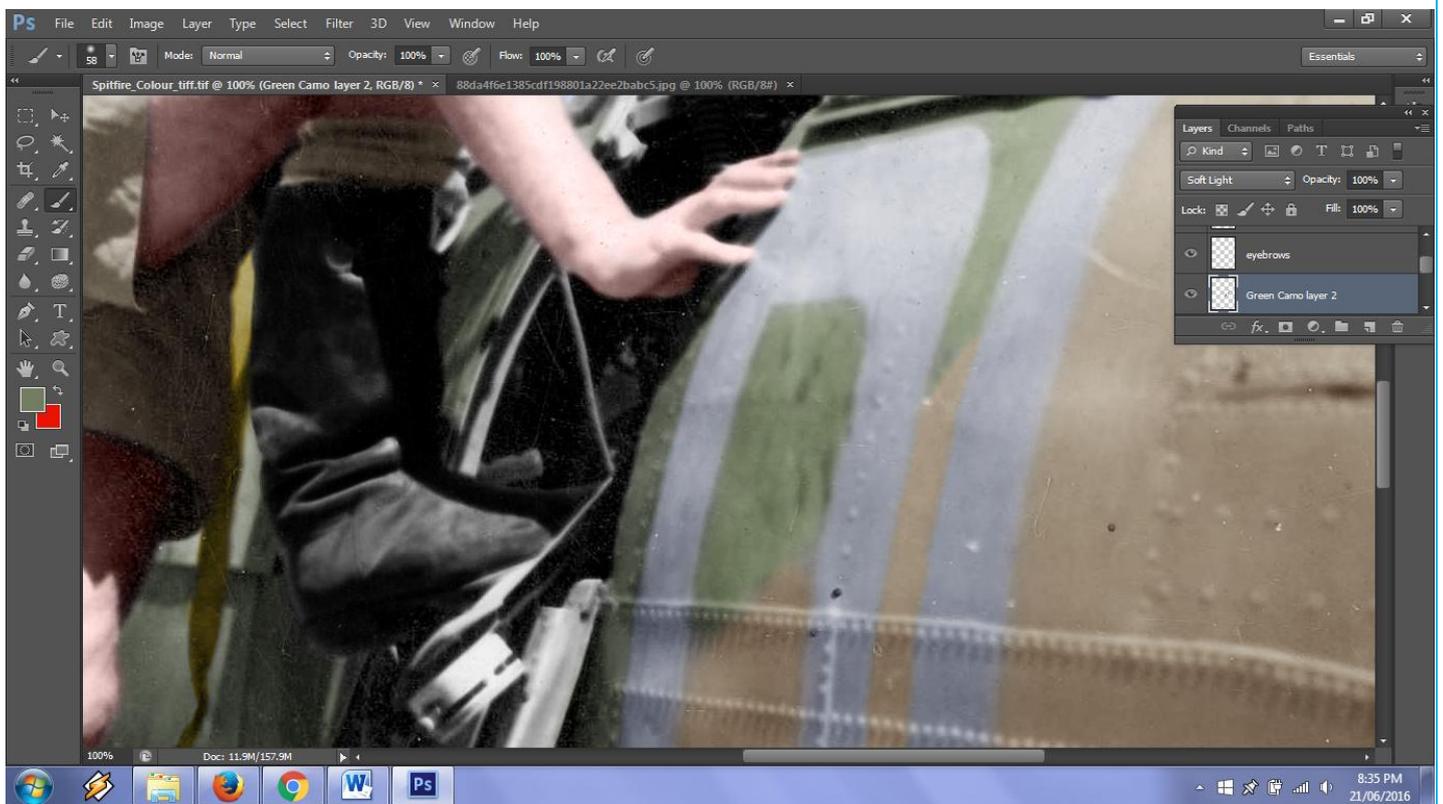


Here I added in the Foliage/Forrest Green



Here is a close up where I added another green layer to make it a tad darker.

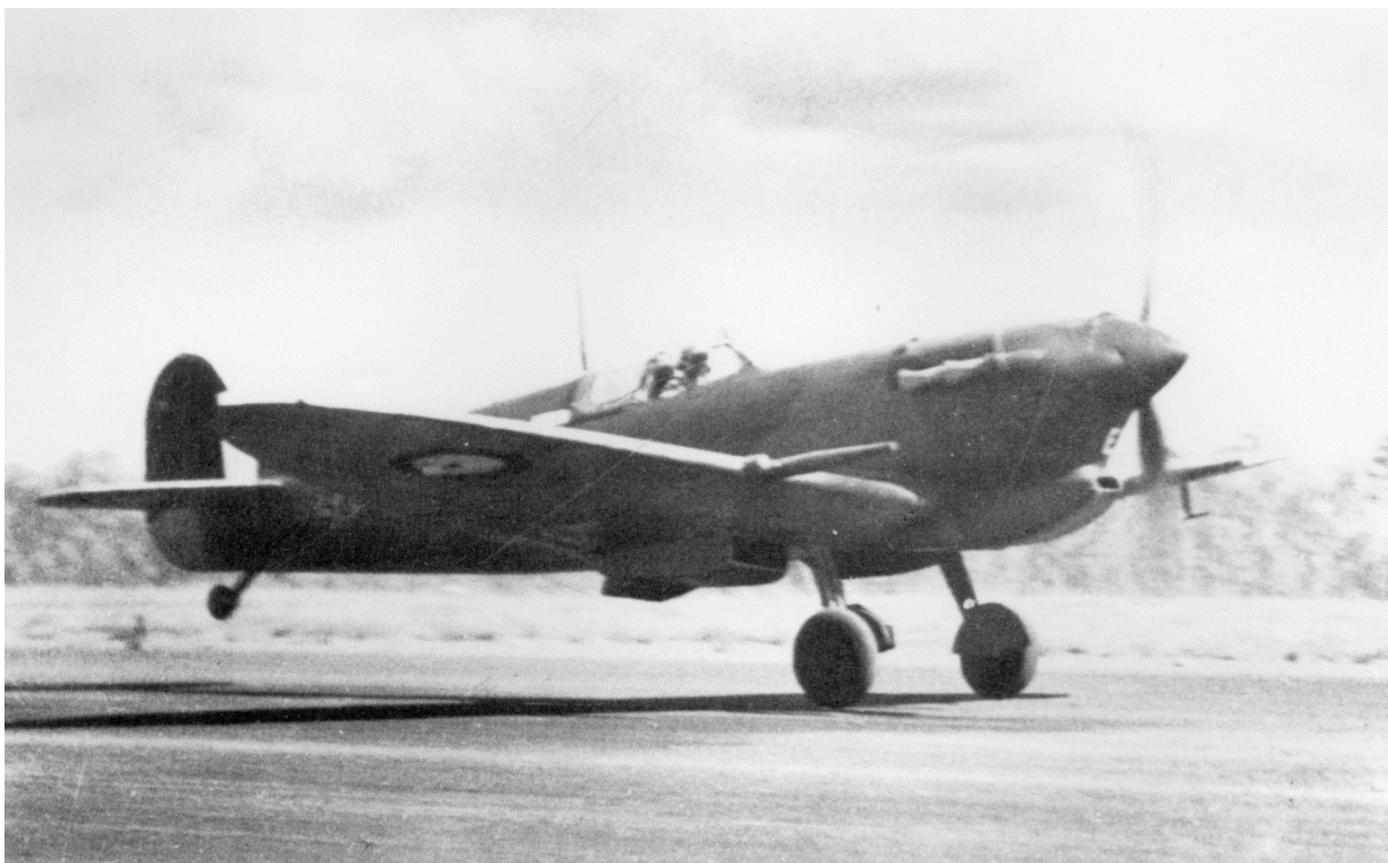
From here I use the opacity layer to reduce the strength overall. You can see in the D that I have added in some more colour.



So as you can see as much as I quickly used a computerised image I use this diagram below. Along with some research on each aircraft, time in service for the correct colour scheme etc.



If you just have a stab, you can see where I have changed the Brown to medium sea grey and clearly the image will tell you that you have selected the wrong colour. I hope that this has inspired a few people to give it a crack. I just wish to thank Mike M, Peter M, and Gordy for always pointing out my errors and giving me pointers and assistance when required.



**\*\* The Subject aircraft: BR545 , A58-51, DL-E "Ivy" as flown by F/O M C Hughes in mid 1943. GRB Collection. ED**

## C-17A. The beginnings of the Ten year Australian Love affair. Gordon R Birkett@2016

### The concept and need

Just over thirty-six years ago, in February 1980, the United States' Department of Defence issued a Request for Proposals (RFP) for a new Strategic transport.

The USAF realised that in view of the increased Soviet assertiveness in foreign policy and the resultant possible need to reinforce of the American presence in theatres situated all over the world, from Europe, Middle East and the Pacific, that additional aircraft was required.

Already at the start of the eighties, the USAF had already initiated enhancements for its then current and future fleet of transports. Re-winging of the C-5A Fleets, the C-141 fuselage stretch remanufacturing program and the procurement of new KC10 multi-role tankers. *(Prior urgency to boost these requirement needs led, under President Ronald Reagan's presidency, to a further order for fifty Lockheed C-5Bs in the mid eighties, with deliveries completed by July 1985.)*

In addition, the strength of the US Civil Reserve Air Fleet was authorised to rise to a total of Four Hundred Aircraft( American Owned and Registered Airline Fleets that could be used for both trooping, cargo and/or combo- cargo and troops carriage: aircraft like Boeing 747's, Lockheed Tristars, and Douglas DC-10s)

Demand was growing, which was realised primarily from the annual *Reforger* Exercises ( **Reinforcement for Germany**)through-out the following eighties to flesh out the assigned forward deployed US Army Divisions for NATO where their whole stored equipment stock was based in Germany, so as to assist those divisions already based there, to fight the invading Soviet Warsaw Pact as their armoured forces cascade through the Fulda Gap into West Germany. The Slow Sealift reinforcements that followed on, some weeks later after sailing, would need support in theatre to move rapidly forward to reinforce the first two deployed forces.

Thus approved under President Jimmy Carter's presidency, the new CX (Cargo-Experimental) Program would be used to provide the rapid development and introduction into service, a new aircraft that would be designed to carry outsized cargo on a strategic basis with the ability to operate from un-prepared airfields that were within close proximately of the forward line. In effect, used in the initial stage of strategic delivery from the United States to Europe, then it would be used for inter-theatre support as the Sea Lift Component arrived, again to operate from un-prepared or by then, battle damaged airfields.

Despite all of this urgency, the CX Program winner was not announced until the 29th August 1981.

Following initial work on the program, the USAF finally awarded MDC a fixed-price contract for design and development of three prototypes (only one flying) on the 31st December 1985. Value was then \$3.387 Billion Dollars. The USAF had a eventual planned requirement of some 210 Airframes to replace the C-141 Fleet which by that time was suffering from numerous issues of fatigue and high utilisation.



The McDonnell YC-15 lineage of the C-17A can be seen in this side shot

Leveraging the YC-15 Aircraft technologies and design, borne out of a past program initiated in the mid Seventies for a Advanced Medium Short-take-off and landing Transport (AMST) Program to replace the ubiquitous C-130 Hercules, Douglas Aircraft Company Division of McDonnell Douglas (MDC) was selected, with their C-17 Design Proposal.

### **The Aircraft**

The C-17A Globemaster III carries the name of two previous piston-engine military cargo aircraft, the Douglas C-74 Globemaster and the Douglas C-124 Globemaster II.



*The Douglas C-124 Globemaster II*

The MDC Specification was to build a four engine long range manoeuvrable fly by wire (FBW) aircraft with a internal cargo dimension of 5.48 metres wide, a length of 26.82 metres long and a height, under the wing box, of 3.76 metres (Highest fuselage point being 4.11 metres). Maximum take-off weight of 263083Kgs, and a empty weight of 122016 Kgs. Two outboard wing fuel tanks of 21,210 litres (5,603 US gallons or 4,665 Imp gallons) each, two inboard wing fuel tanks of 30,056 litres (7,940 US gallons or 6,611 Imp gallons) each, to a total capacity of 102,532 litres (27,086 US gallons or 22,554 Imp gallons). In-flight refuelling is installed.

The original specification from McDonnell Douglas defined a service life of 30,000 hours.

The strong longitudinal floor planks would withstand loads of up to 60 tons, whilst absorbing landings with a sink rate of 4.6 metres per second on Menasco (Canada) single axial double nose wheel and on the mains, side by side Cleveland Pneumatics two double and two triple wheel truck bogies that must rotate 90 degrees to retract.

The 25 degree swept Wing, with double slotted Flower trailing edge flaps had a span of 50.29 metres wide at the tip of the 2.4 metre high winglets and the fuselage a length of 53.39 metres.

The small wing length was part of the specification of the aircraft being able to manoeuvre within the standard apron measurement of 90 x 122 metre area on most European airbases. The 19.81 metre span T-Tail, standing at 16.79 metres high, was swept at 40 degrees.

Normal flight crew of pilot and co-pilot sit side by side and there are two observer positions on the flight deck, plus a loadmaster station at the forward end of the main floor.

As in the eighties timeline, the initial C-17 design incorporated the latest off the shelf equipments that led to a two crew cockpit with Head up displays (HUD), fighter like electronic flight control system stick (replacing the normal heavy aircraft control yoke), Quadruple redundant General Electrical all digital Fly by Wire System, Teledyne control warning and caution system, Multi-function displays (MFDs), four main computer systems (made up of some 56 digital Line Replacement Units), coupled with a Mil Standard 1553 data bus linked through almost 200 kilometres of wiring, a AN/APS-133(V) weather/mapping radar (later replaced on later Blocks and retrofitted to earlier Blocks, by the AN/APS-150 Weather Radar from Honeywell), AN/AAR-47 Defensive System and the AN/ALE-47 Countermeasures dispensing system and GPS.

Later C-17As produced new or are being upgraded in the future, with the Large Aircraft Infrared Countermeasures (LAIRCM) system from Northrop Grumman and with the AN/AAR-54 MWR and a laser transmitter assembly (SLTA or GLTA) include our RAAF C-17A's.



At its time, the C-17 was considered to be the most computerized, software-intensive aircraft ever built, relying on 19 different embedded computers incorporating more than 80 microprocessors and about 1.3 million lines of code" . *The current record per codes is the F-35A/B/C with some 18 million lines of code,...currently.*

The secret of the wing size was that the four Pratt & Whitney F117-PW-100 Turbofan engine driven exhausts( The engines are a military version of the PW2037 that powered the Boeing 757) would blow over and through flaps and lower wing surfaces, as used in the design of the previous YC-15 "blown Wing", which would provide exceptional additional lift in slow speeds and on take-off. To provide short field landings and self reversing on the ground, were fitted with directed-flow hydraulic-activated thrust reverses.

Passenger accommodation is for 102 personnel in 27 storable tie-up seats along each aircraft hold side along with additional 48 seats that can be erected in the centre section of the hold. Alternatively, 48 Litters or 6 intensive care beds with support surgical recovery gear. Seats stored, some 220 tie-down rings and bi-rollers, rails and seat fitting covers cover the main floor.

The aircraft was originally configured for single-row airdrop, but a dual-row capability operationally was certified in 1998 and became a standard feature of 51st and subsequent C-17s, as well as being retrofitted to earlier aircraft.

*The current Block 18 standard, as on RAAF C-17A's, is installation of the A22 High Velocity Container Delivery System.*

Additionally, further tie-down rings and bi-rollers and rails are fitted to the rear ramp floor for cargo placement of up to 18143Kgs(almost the maximum load of a C-130H almost!)when retracted up on closing, and is used for LAPes (Low Attitude-Parachute Extraction System) tow release mechanism in flight, either singular or in twin extraction trains out the rear ramp.



*This engine/wing concept itself was a further development of a early seventies NASA Buffalo aircraft STOL Program that first tested this idea when it first flew with a redesign and installed four engine exhaust blown wing.*

Lastly, with a "in theatre "ability to carry a then US Army standard 60 tonne M1A1 Abrams Main Battle tank.

*In RAAF service our maximum Loads include: 102 passengers, 36 personnel on stretchers, an M1A1 SA Abrams tank, three Eurocopter Tiger ARH helicopters or five Bushmaster Protected Mobility Vehicles and 18 standard 463-L pallets.*

### **The cutting of metal for flight**

The C-17 Program passed Milestone II in February 1985. However in 1987, McDonnell Douglas missed delivery of the first test aircraft, so the Department of Defence reduced funding during budget reductions and moved delivery schedule for the first test aircraft three years to July, 1990.

In addition to this reduction, in January 1988, the US Congress deducted \$20 million from the C-17 during its budget review, but invited Department of Defence to ask for reprogramming of funds (SAF/AQ, 1989).

Department of Defence declined the invitation.

In 1987 the Sperry Corporation (the flight-control subcontractor) told McDonnell Douglas that the mechanical flight control system could not prevent pilots from putting the airplane into an irreversible stall.

So after confirming that the aircraft configuration and the mechanical flight control system could allow the aircraft to enter an uncontrollable stall during certain tactical manoeuvres, Douglas directed Sperry to change the mechanical flight control to a fly-by-wire system. During this same period Honeywell, Incorporated, purchased the Sperry Corporation.

The awarding of a \$603 million production contract came on the 21st January 1988 for two aircraft production aircraft( P1 FY88-0265 and P2 FY88-0266) for the then USAF Military Airlift Command.

The first aircraft, T1, the C-17 Prototype FY87-0025 authorised in 1987, was beginning to take shape by 1989, but developmental and design problems with the FBW were already causing a four month delay in its construction.

*A significant event happened in 1990, the fall and fragmentation of the Soviet Union and its Warsaw Pact members, the cold War thawed. All of a sudden, a new paraphrase came in being, "Peace Dividend".*

US Defence Secretary, Dick Cheney advised that the C-17 program was to be restructured following the OSD Major Aircraft Review in mid 1990 to reduced the USAF commitment to buy from 210 airframes to 120 C-17s to be ordered.



*Prototype McDonnell Douglas C-17 T1, in Euro Lizard Scheme, with candy nose probe fitted, early in its life.*

Roll out of the T1 prototype was made in December 1990 for ground tests, followed, and after a year of tests and changes, by the first C-17 flight on Sunday, 15th December 1991 for flight of two hours and twenty-four minutes.

After take-off from Long Beach, California, under command of MDC Test Pilot William Casey and Lt Col George London USAF, the needle nosed European Lizard camouflage aircraft was flown to its new destination, the 6510th Test Wing based at Edwards Air Force Base. There it would undergo exhaustive handling trials, in flight engine shutdowns and restarts, aerodynamic tests and refuelling trials.

The first production aircraft, C-17 P1 FY88-0265, made its initial first flight on the 18th May 1992. With the moving times, it was the first C-17 to be painted with the finish of Poly-Coat Air Mobility Command standard "Battle Grey", finish that is still current to this day. The instrumented aircraft was flown direct to Edwards AFB to undertake structural loads and testing. Soon after, the second production aircraft, C-17 P2 FY88-0266, with the program increasing its pace, flew on the 21st June 1992. Its role included demonstrated range, qualifying avionics and software upgrade testing.

By the 7th September 1992, the fourth instrumented C-17(P3 FY89-1189) had landed and joined the flight development program at Edwards AFB. By this date some aggregated 500 hours in total had been flown by all four aircraft and had flown up to 949KPM and as high as 12200 metres, achieved in flight refuelling and maximum loaded take-offs within 367metre lengths.

During these early tests, some problems were experienced with wing tank sealant leaking, unexpected hot temperature readings and damage with composite flaps and slat skins, requiring the addition of titanium skin covering of those materials in the flaps. Faulty wing riveting was also highlighted. Later, the leading edges of the main plane were also covered to protect them from pitting and from reverse thrust on the ground.



*Movie Star TI, during parachute Door tests, now with radar dome fitted.*

Further to this, during simulated ground testing, of the two static test airframes (S-1 and D-1), one experienced some wing cracking during load tests at 130% of maximum load in a simulated 32000 feet altitude and at a weight of 585000lbs.

The first exciting year of flight ended with the fourth production aircraft, C-17 P4 FY89-1190, being delivered to Edwards on the 9th December 1992. This was the first production standard C-17 delivered to the USAF, initially for crew training. *That would be the forerunner of the next two decades, although in the early various Budget year changes almost resulting in a cap buy to just 40 aircraft instead of the 120 aircraft then required.*

### **More problems**

It was found the first 39 of the Air Force's 56 C-17s that had been delivered were carrying a undetected design flaw, that led to premature failures of the trunnion collar, a part of the main landing gear that guides gear rotation up and down. The collar attaches the main landing gear post to the fuselage. Durability testing failure in February 1997 showed the original collar design would not last the full 30-year service life of the C-17.

A direct impact of the decision to temporarily cap the program at 40 was to greatly inflate the cost of each C-17. During the Congressional reporting cycle in December of 1993, the total program cost (research, development, production, and maintenance) divided by 40 worked out to well over \$500 million per aircraft. The acquisition community could hardly endure these headlines and expect a 41st aircraft [by the summer of 1995 cost savings brought down the cost of the C-17 to \$172 million in "flyaway cost" per aircraft in constant 1995 dollars].

Design of the C-17 landing-gear posts and trunnions had not been sufficiently stabilized to enable the C-17 System Program Office to fully project life-cycle management cost of landing-gear support. If the contractor is unable to extend the life of those parts, through redesign, past the 1.5 lifetimes of durability testing warranted in the contract, and those parts are declared life-limited, the Government costs for C-17 landing-gear support over the life of the C-

17 fleet could increase \$133.2 million for landing-gear posts and \$5.2 million for trunnion collars. In addition, because of a much higher usage rate than anticipated in the original specifications, support costs could increase as much as \$813.5 million for brakes and about \$29 million for tires over the life of the C-17 fleet.

Milestones per fixes and redesign were met and the full buy of 120 aircraft authorised



*"Are we there yet?" US Paratroops of the 82nd Airborne Division flesh out a USAF C-17A*

With effect from the 71st C-17, the first Lot 12 aircraft, an extended-range fuel tank containment system (ERFCS) was adopted whereupon the wing dry bay is turned into an additional fuel tank containing approximately 36,339 litres of fuel, thus increasing the range with 18,144 kg (40,000 lb) payload by 900 nautical miles (1,667 km or 1,036 miles). In December 2001 Pentagon officials approved a plan to acquire 60 more Boeing C-17 jets -- bringing the total buy to 180 Aircraft under a multiyear contract running from 2003 and extending through 2007.

In April 2001 Boeing proposed a follow-on multiyear procurement under which 60 C-17s would be bought at a rate of 15 per year and \$152 million per plane per FY '99 dollars.

The then current average price was about \$198 million. The additional aircraft would have extended range fuel tanks and a maximum gross takeoff weight of 615,000 pounds, compared to the original 585,000 pounds on original C-17 aircraft.

Early in 2002 US Transportation Command had identified a requirement for a further 42 C-17s above the original 180 Aircraft program. The contract for the additional 42 aircraft would be worth about \$5 billion and extend production through 2011, resulting in a total buy of 222 aircraft. Eventually another single airframe was added, #223, to replace a single aircraft loss in Alaska<sup>1</sup>.

## First export and our C-17As more of them

On the 4th September 2000, the United Kingdom Government finalised a contract to lease four C-17 aircraft to fulfil the RAF Short Term Strategic Airlift requirement. All four aircraft were delivered for service with the Royal Air Force by September 2001. Boeing by 2015 had delivered some 279 C-17As over twenty years, including the 223 to the U.S. Air Force ( 3 Prototypes T1, S1 and D1 are in addition), and a total of 53 Export C-17As; Australia (8), Canada (5), India (10), Qatar (8), Kuwait (2) the United Arab Emirates (8), the United Kingdom (8) and the 12-member Strategic Airlift Capability initiative of NATO and Partnership for Peace nations (3). (Technically, one of the latter is USAF, by funding). **But I seem to have lost or misplaced a C-17A somewhere, specifically 14-0003 ala N272D (See next page)**

Boeing finished production of the final C-17 Globemaster III aircraft, the 279th airframe, on 29th November 2015, destined for Qatar. Boeing will continue after-delivery support of the worldwide C-17 fleet as part of the C-17 Globemaster III Integrated Sustainment Program (GISP) Performance-Based Logistics agreement.

**Note 1** On 28th July 2010, a U.S. Air Force C-17 A FY00-0173 – "Spirit of the Aleutians" crashed at Elmendorf Air Force Base, Alaska, while practicing for the 2010 Arctic Thunder Air Show, killing all four crew aboard



Not what you think, it's the 500th C-17A Airframe to go through Warner Robins Air Logistics Centre last year. Earlier Blocks have gone through some 2-3 times by then.



Partnership between the USAF and the RAAF has depth and history, as shown by the first RAAFKC-30A refuelling of a USAF C-17A in 2015. This led to the first RAAF C-17A and KC-30A in April 2016.

## Missing a new C-17A out of the last 10? Yes,... C-17A FY14-0003 N272ZD

When doing the numbers I had a problem with the whereabouts of one C-17A out of these 10 White Tails. Assumed it went to Qatar Emiri Air Force as did everyone else,...**but** they just don't add up. *Bottom Line: News Sources and Web Sites had,...Qatari Emiri Air Force – 4 C-17As in use and 4 on order: Source: <http://boeing.mediaroom.com/2015-06-15-Boeing-Qatar-Confirm-Purchase-of-Four-C-17s> Expands airlift fleet to eight aircraft*

One is still registered on the US of A "N" Register,.....**C-17A FY14-0003** and is still assigned as **N272ZD** on the **FAA N Registration** and is still registered to Boeing as of today(12/08/16). Apparently it went to Kelly AFB in July 2015, where apparently, it is still there.

N Registry Details per Website: [http://registry.faa.gov/aircraftinquiry/NNum\\_Results.aspx?omni=Home-N-Number&nNumberTxt=N272ZD](http://registry.faa.gov/aircraftinquiry/NNum_Results.aspx?omni=Home-N-Number&nNumberTxt=N272ZD)

Serial Number	14-0003	Status	Valid
Manufacturer Name	BOEING	Certificate Issue Date	06/20/2014
Model	C17A	Expiration Date	06/30/2017
Type Aircraft	Fixed Wing Multi-Engine	Type Engine	Turbo-fan
Pending Number Change	None	Dealer	No
Date Change Authorized	None	Mode S Code (base 8 / oct)	50530055
MFR Year	2015	Mode S Code (base 16 / hex)	A2B02D
Type Registration	Corporation	Fractional Owner	NO

The "was" Accepted breakdown: QATAR has bought 8 or was it now 9???? I read 8, so one has not been sold? Rare Jets Site has errors per N Regos; **with my "N" Rego corrections in last column of the Official FAA Site**

After checking the US FAA Rego System

C-17A c/n Line FY#	Wrong N Rego	End U#	Ownership	Correct N Reg
50271/F270/AUS7/14-0001	N271ZD	A41-212	Australian AF	N270ZD
50272/F271/AUS8/14-0002	N272ZD	A41-213	Australian AF	N271ZD
<b>50273/F272/14-0003</b>	<b>N274ZD</b>	<b>Not Del</b>	<b>White Tail Boeing Owned 2016</b>	<b>N272ZD</b>
50274/F273/14-0004/CA05	N273ZD	177705	Canadian Forces	N273ZD
50275/F274/14-0005/QA5	N275ZD	A7-MAM	<b>Qatar Emiri Air Force</b>	<b>N274ZD</b>
50276/F275/14-0006/QA6	N276ZD	A7-MAN	<b>Qatar Emiri Air Force</b>	<b>N275ZD</b>
50277/F276/UE7/14-0007	N277ZD	1229	United Arab Emirates Air Force	<b>N276ZD</b>
50278/F277/UE8/14-0008	N278ZD	1230	United Arab Emirates Air Force	<b>N277ZD</b>
50279/F278/14-0009/QA7	N279ZD	A7-MAO	<b>Qatar Emiri Air Force</b>	<b>N278ZD</b>
50280/F279/14-0010/QA8	N280ZD	A7-MAP	<b>Qatar Emiri Air Force</b>	<b>N279ZD</b>

N280ZD is Not Assigned/Reserved  
ever to Boeing

Everyone else have the correct Regos including:

- <http://www.abcdlist.nl/bl.html>
- <https://www.planespotters.net/operators/Boeing/C-17> confirms that its Boeing Owned

So,..they snuck one way?????? Secret Prototype AC-17G Gunship or MC-17K Spec Ops, MC-17R for Air Launched ICBM Carrier?

**I haven't an answer,..do you? But,..there's still wiggle room it seems to get RAAF C-17A #9 after all!!!**

Sources:

Air International 1993

[www.globalsecurity.org/military/systems](http://www.globalsecurity.org/military/systems)

<http://www.globalsecurity.org/military/systems/aircraft/c-17-block.htm>

Boeing

Warner Robins ALC

## The RAAF four tranches of C-17As, 10 years on. A History and Update.



A lovely shot of A41-211 on approach, and all dirty and down. *Source Australian Aviation Steve Allsopp*

The RAAF received its first four C-17A(ER)s between late 2006 and early 2008.

The initial aircraft, which was allocated the serial number A41-206, was completed in October 2006 and arrived in Australia on 4th December that year. A welcome ceremony attended by Prime Minister John Howard, Defence Minister Brendan Nelson and other dignitaries was held at Defence Establishment Fairbairn in Canberra.

The second aircraft, A41-207, was delivered on 11th May 2007. A41-208 was handed over to the RAAF on 18th December 2007, and A41-209 was accepted on 18th January 2008.

The first two aircraft were delivered in accordance with the expected schedule, and the third and fourth were each delivered two months early. The RAAF also acquired a C-17 flight simulator, which entered service in January 2010.

In the 2012–13 edition of its annual Major Projects Report, the Australian National Audit Office judged that a lesson for the Australian Government from the successful procurement of the first four Globemaster Aircraft was that purchasing major equipment on an "off-the-shelf" basis allows "considerable acceleration of the standard acquisition cycle".

Similarly, Australian Strategic Policy Institute analyst Mark Thomson wrote in 2008 that "the breakneck speed with which the C-17 acquisition was executed (and the good outcomes of the acquisition) provides an example of what can be achieved" through off-the-shelf purchasing, and that such projects generally deliver better outcomes for the ADF than attempts to develop equipment tailored to Australia's needs.

In February 2011 Minister for Defence Stephen Smith announced that an additional C-17 would be purchased for a cost of \$A130 million. This aircraft was ordered to prevent a shortfall of airlift capacity while the original four C-17s underwent scheduled heavy maintenance. The decision to purchase this aircraft also supplanted an earlier plan to acquire an additional two C-130Js. As the deadline for A41-206 to be temporarily taken out of service for maintenance was rapidly approaching, the USAF agreed to transfer a C-17 airframe that was nearing completion to the RAAF. This aircraft, A41-210, was delivered on 14th September 2011, and arrived in Australia nine days later.

At the ceremony held to welcome A41-210, Smith announced that the government intended to order yet another C-17. The \$A160 million contract for this aircraft, A41-211, was signed in March 2012, and it was delivered to the RAAF on 1st November that year. Funding for these two aircraft was obtained through a combination of supplements to the Defence budget and reallocating unspent funds from ADF projects running behind schedule.

Owing to budget constraints and the scheduled closure of Boeing's Globemaster production line in 2015, it was considered unlikely in 2012 that the RAAF would acquire additional Globemaster Aircraft .



*Though the seventh delivered, A41-213 is the penultimate RAAF C-17A purchased. Source Australian Aviation Steve Allsopp*

However, in August 2014 Minister for Defence David Johnston stated that the Government was likely to purchase a further one or two C-17s. The Government announced that it would purchase two additional Globemaster Aircraft in October 2014, and requested information on the pricing and availability for a further pair of aircraft. In November 2014 Australia lodged a formal request with the United States Defence Security Cooperation Agency for four C-17s and associated equipment, for a total cost of \$A1.85 billion.

An order for the RAAF's seventh and eighth Globemaster Aircraft was formally announced by Prime Minister Tony Abbott on 10th April 2015. The first of the new C-17s, A41-213, arrived in Australia on 29th July 2015, and the second, A41-212, on 4th November that year. These two aircraft were among the last 10 White tail C-17As to have been built before the production line was closed at Airframe #279, and thus it is not expected that the RAAF will acquire any further additional Globemaster Aircraft, unless they are second hand USAF C-17As.

*Note: The USAF has reduced their C-17A Primary Aircraft Fleet by withdrawing and placing in their back up reserve inventory, by retiring several airframes from their active fleet from recently de-establishing some Airlift Squadrons. This is to extend the life of the fleet, due to the excessive use in the past decade of the fleet during the war on*

terrorism. There may be a few airframes that could be bought or transferred as excess defence articles for any future attrition or for increasing the size of the RAAF Fleet.

On the 2nd June 2015, RAAF flew its first Boeing built C-17A Globemaster III equipped with a new advanced satellite communication (SATCOM) and imagery display system, providing the flight crew and passengers with unprecedented situational awareness. Boeing installed the high-speed SATCOM system to support the RAAF's 'Plan Jericho,' an initiative to transform the Australian military into an integrated, networked force able to deliver air power in all operating environments. Boeing has been executing and supporting programs to network Australian defence forces for many years.



**Production Block enhancements applied to RAAF Airframe, and since updated during Local Servicing cycles at Amberley or Depot maintenance in USA.**

Our RAAF C-17As were produced under the following blocks, but are all being brought up to the latest Block Standard by 2020 in line with USAF Aircraft Upgrade Slots at Boeing's San Antonio facility or at the USAF Warner Robins Air Logistics Complex<sup>2</sup> in Georgia State USA. *The USAF will finish these Block upgrades for all of their own 222 Aircraft fleet in 2020.*

**Block 16 starting at USAF C-17A 06-6154**

- First flight September 2005, Block 16 upgrades include:
- New Honeywell AN/APS-150 weather radar with 320 nm range for weather systems. *In fact, 562nd Aircraft Maintenance Squadron at Warner Robins ALC, have completed last retro fit of the new AN/APS-150 weather radar modernization package, referred to as BLOCK 16, with the final Legacy Block 1-15 standard C-17A Globemaster in mid 2015.*
- An improved Onboard Inert Gas-Generating System (OBIGGS II). This system quickly and efficiently inert gases in fuel tanks, preventing them from exploding if hit by enemy fire.
- Next Generation Communication Navigation Surveillance/Air Traffic Management (CNS/ATM).

- An improved stabilizer strut system
- A suite of modernized avionic boxes.
- The 1st Block 16 was delivered August 9, 2005 and was the 138th C-17 delivered.

**Block 17 starting at USAF C-17A 07-7169**

As of the beginning of 2008, C-17 Block 17 aircraft was the current standard for new production and upgrades. The newest variant included following improvements:

- Formation Flight System (FFS),
- Required Navigational Performance-Improved (RNP-I) and High Frequency Data Link (HFDL),
- Combat Lighting giving the aircrew more IR lighting options

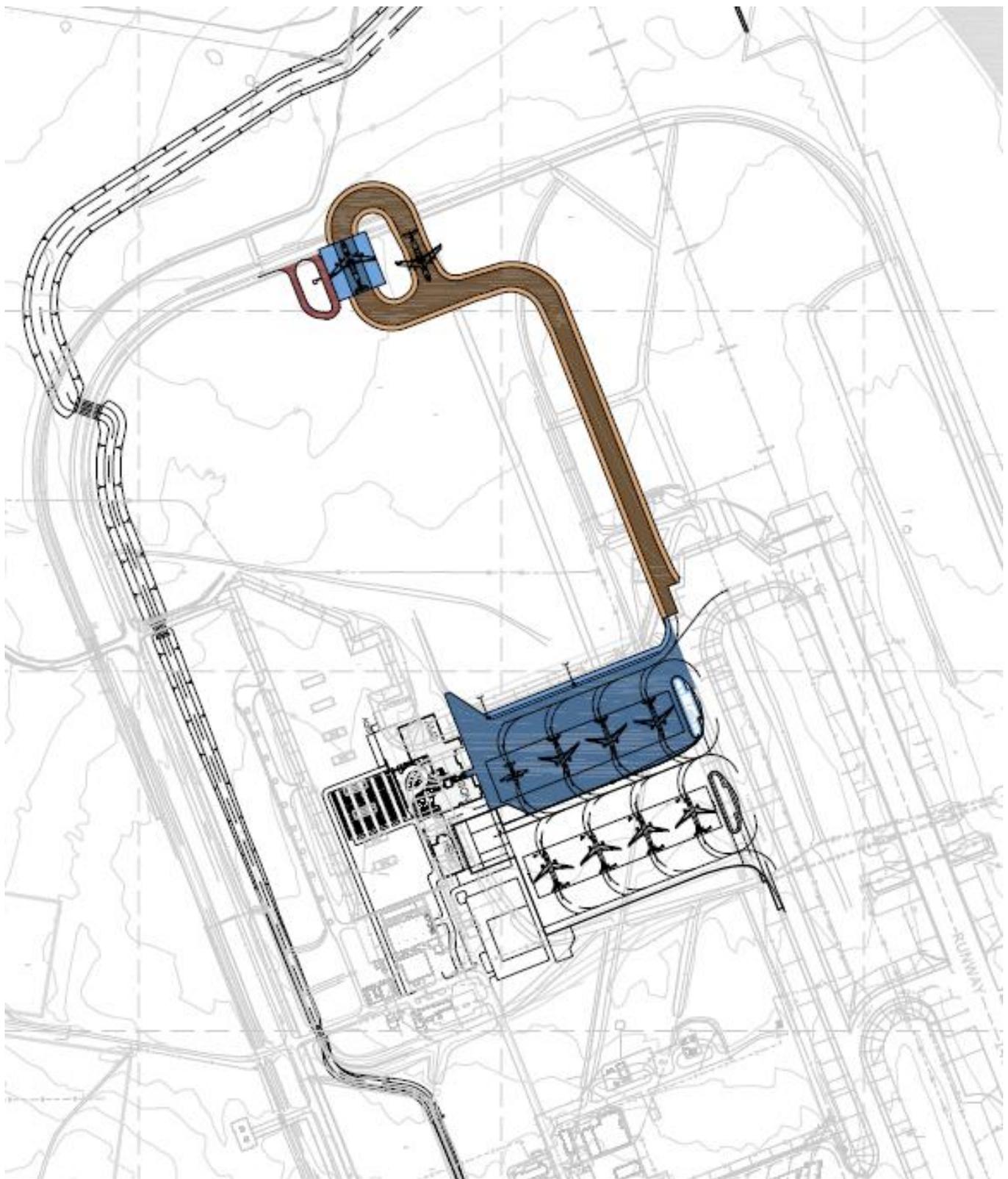
**Block 18 starting at C-17A USAF 08-8181**

In December 2006, the United States Air Force places a follow-on contract for 10 Block 18 C-17A Globemaster III aircraft (c/n P-181/190). The contract was valued at \$2 billion with deliveries to complete October 2009. Our last two aircraft, A41-212 and 213 were of this Block.

- A22 High Velocity Container Delivery System is installed.
- Large Aircraft Infrared Countermeasures (LAIRCM) system from Northrop Grumman and with the AN/AAR-54 MWR and a laser transmitter assembly (SLTA or GLTA). LAIRCM is based on Northrop Grumman's AN/AAQ-24(V) Directional Infrared Countermeasure (DIRCM) system.
- ILS Identification and Flight Control Computer Updates (Capability Improvement)
- Fixed Installation Satellite Antenna (FISA 2) (Capability Improvement) and Advanced satellite communication (SATCOM) and imagery display system. *Due to synergies with loading software and depot downtime, USAF installations of the following capabilities from the C-17 Communication/Navigation & Capability Mandate (CN/CM) Program (Automatic Dependent Surveillance - Broadcast (ADS-B) Out and a communications upgrade) are included as part of the CIP & Mode 5 Plus upgrade packages starting in FY17. The project includes procuring Government Furnished Equipment of IFF Transponders, Precision Landing System Receiver (PLSR) Software Upgrades, ARC-210 Gen 5, and Radio Control Units.*



*A41-206 on the line early 2006.*



RAAF BASE AMBERLEY  
C-17 FACILITIES

0 200 400m  
SCALE 1:10000 AT A4

EOA & C17 PARKING APRON  
SITE PLAN

There was on the rare occasion from 2013, that there was little spare room on the aprons at Amberley when all of the aircraft of 33 and 36 Sqn's were all home. With eight C-17As and five KC-30As in service,(two more KC-30As are on order), it was apparent that more apron area is needed, and is being built now to correct this shortage of parking. ADF.

**With ten years of service behind already, the eight current RAAF C-17As will continue to fly in our service for another thirty years , even perhaps up even up to 2050 at the very least.**

*By then, you will need a new Editor to write the full history of the RAAF C-17A, as this fellow will long be in his own boneyard by then.*



*Now 10 years on, and getting a well earned service in the Hanger at Amberley a few years ago: ADF-Serials*

**Happy Birthday A41-206!!!** 

**Congratulations and well done, to the 36Sqn RAAF Staff and to Boeing**



**Note 2:** Warner Robins Air Force Base is home to the C-17 System Program Office, which is responsible for the sustainment, modernization, modification, maintenance and overall service of the world wide C-17A fleet.

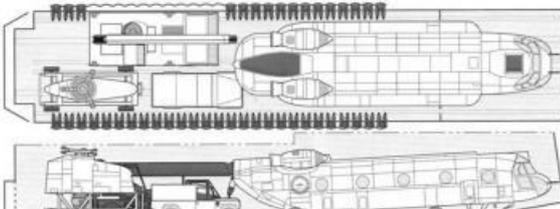
# RAAF Loads sometimes carried by the C-17A



## CH-47



**CH-47D Chinook Helicopter  
plus Landrover, 15T Crane, and Personnel**  
1/125 scale



- 1 CH-47D Chinook helicopter (Forward and aft rotors, hubs, gear boxes, and pylons removed, with all rotor blades plus forward pylon/gear box stowed inside helicopter)
- 1 Perentie Landrover 110 light truck (4x4)
- 1 15T truck mounted crane (to reassemble Chinook)
- 43 Personnel

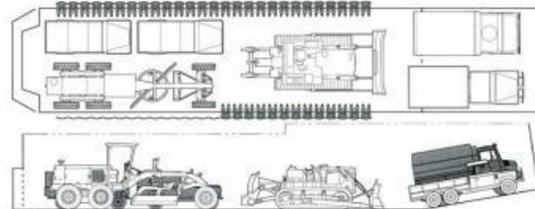
Payload 87,240 lb (39,655 kg)



## Disaster Relief



**Construction Equipment  
plus Support Vehicle, Cargo Pallets, and Personnel**  
1/125 scale



- 1 Roadgrader
- 1 Bulldozer
- 1 Perentie Landrover 110 (6x6)
- 2 Perentie Landrover 110 (4x4)
- 1 Unimog 2.5-ton truck (4x4)
- 40 Personnel

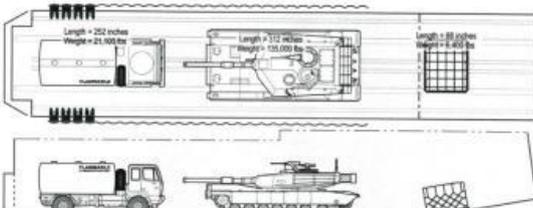
Payload 138,990 lb (63,180 Kg)



## Abrams



**Abrams Main Battle Tank  
plus Support Vehicle, Ammo Pallet, and Personnel**  
1/125 scale



- 1 M1A2 Abrams MBT (no ammo aboard, min fuel, 135,000lb gross vehicle wt)
- 1 LMTV 4x4 truck (fuel tanker)
- 1 ammo pallet
- 8 Personnel (vehicle crews) (240 lbs each)

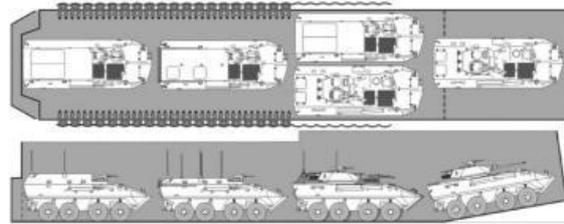
Payload 164,420 lb (74,740 kg)



## ASLAV



**5 ASLAV Light Armoured Vehicles, and Personnel**  
1/125 scale



- 2 ASLAV-PC, 6x8 Armoured Personnel Carrier
- 1 ASLAV-C, 6x8 Command & Control
- 2 ASLAV-25, 8x8 APC w/25mm turret
- 38 Personnel

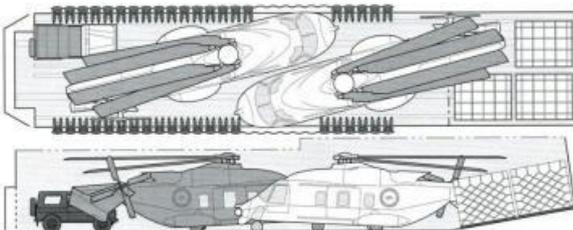
Payload 140,490 lb (63,800 Kg)



## MRH-90



**Two NH-90 Helicopters  
plus Support Vehicle, Cargo Pallets, and Personnel**  
1/125 scale



- 2 NH-90 TTH Helicopter (main rotors and tail section folded)
- 1 Perentie Landrover 110 light truck (4x4)
- 3 463L cargo pallet
- 42 Personnel

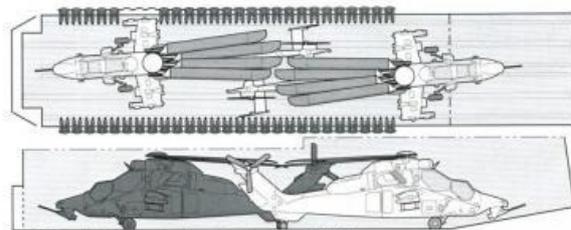
Payload 53,425 lb (24,273 kg)



## ARH Tactical



**Tiger Helicopters in Tactical Configuration**  
1/125 scale



- 2 Tiger HAP Helicopters (four main rotor blades folded)
- 51 Personnel

Payload 26,212 lb (11,905 kg)

### Sources:

Air International 1993

[www.globalsecurity.org/military/systems](http://www.globalsecurity.org/military/systems)

Boeing

[https://en.wikipedia.org/wiki/Boeing\\_C-17\\_Globemaster\\_III\\_in\\_Australian\\_service](https://en.wikipedia.org/wiki/Boeing_C-17_Globemaster_III_in_Australian_service)

<http://www.globalsecurity.org/military/systems/aircraft/c-17-block.htm>

RAAF Public Relations 2006 "C-17A"



## Curtiss Corner: P-40N-25 A29-819



Ordered by the USAAF on Contract W535-AC34423 Project#41444, the aircraft, USAAF FY43-24305 a P-40N-25, (Build in a Production Standard as a Block 87 standard, stamped on Cockpit Frame with CW Line Number 3554, and plated with Construction Number 32244).

It was then allotted as part of RAAF Kittyhawk allocation on their Lend Lease Request for single engine fighters under RAAF Supply Indent 2270, via a bid (Case 500 Indent 2270, per RAAF Code "Joggle") on RAF RFDA-322A allocation for Kittyhawk Mark IVs, under Supply Diversion 779A-A, Batch 40 (Aus 40) for supply of 20 RAAF Aircraft for March 1944. Its Australian Allotment number was Aus 40#1 of 10.

It was marked, per Munitions Armament Commission (Air) in the United States at Buffalo, with the RAAF A29 Serial of A29-1295, in sequence from the first RAAF P-40N-1, A29-1000, thus being the 296th P-40N issued by the USAAF to Australia. *NB: Not all would wear RAAF Roundels eventually).*

It was shipped to Vancouver, Canada, after crating ex Factory and arrived there after its long trans Canada rail trip on the 26th February 1944. Destination Port ZZB (Melbourne, Australia), it left there on Cargo Vessel, coded #260, on the 10th March 1944. After its sea voyage, it was unloaded at Geelong and then transported nearby to No 1 Aircraft Park for assembly on the 11th May 1944.

After assembly, it was renumbered A29-819: a practice per RAAAF HQ instruction to ensure that the Japanese, if examining it on capture or investigation of the wreck, would have trouble in reconciling the actual number of P-40Ns in RAAF service.

It was delivered to No 1 Aircraft Depot, at nearby Laverton, on the 8th June 1944 for further modifications and slow timing of its Allison V1710-99.

On the 25th June 1944, it was received by No 77 Fighter Squadron and coded as **AM-N**.

After a period, it was named "**Cutie Pants**" in white outline red letters, with a motif of a pair of lady's white under draws .



On the 23rd December 1944 it suffered operational damage by AAA in the tail area, during a dive bombing and strafing run on barge hideouts near Goeroea Bay after staging through Morotai, along with A29-911. The pilot, P/O D H Helsham Serv#439418, was not injured.

It was received by Number 22 Repair and Salvage Unit for repairs and its 240 Hourly and returned to No 77 Squadron the following month, on the 8th January 1945. Its service life came to an end on the 21st April 1945.

After the completion of patrol over Convoy ""M"" 0505N/12545E, along with three other P-40Ns (A29-807/917/928 led by F/Lt Taylor), they were headed back to base when the pilot of A29-819, W/O Les Hanson Serv#25485, noticed that his aircraft was using fuel at a fast rate.

At 1355Hrs, the aircraft ran out of fuel, with Les leaving his aircraft at 5000 feet.

With the successful opening of his parachute, he drifted down and landed into the sea.

The remaining three Squadron aircraft provided cover until an attempt was made for pickup by a RAAF Air Sea Rescue Catalina. However the sea was too rough. The Catalina stayed overnight covering the pilot, but at dawn on the 22/09/45, he was not sighted again. He was classified by the Squadron for all intended reasons as missing, presumed lost. One of a number of recent losses suffered by the squadron that were killed or missing presumed dead over the previous few weeks.

However, Les was alive and uninjured. He had remained in his dingy from 2114Hrs until 2309Hrs that night on the 21st April 1945, when he was actually picked up by a patrolling US Navy PT Boat.

To the joy of the Squadron, He arrived back at the Squadron 1500hrs two days later on the 23/09/45. Les and his Wife Margaret would survive into the 2000's in retirement. A29-819 Coded AM-N "named "Cutie Pants", was his aircraft, as borne out by the official Interrogation Reports and A50/A51 Sheets, and Newsreel Film viewed by myself, and further, by a Family Friend of Les's, named Michael via Gordon Clarke, off his Log Book, and photo collection.

As for A29-819 "Cutie Pants"? her last entry was: AMSE Approval to Write-off per File#9/16/2557 14/05/45 with the loss of V1710-99 Engine#43680.

**Cutie's last known position:** 0530North/12620East, where nearby somewhere after 71 years of drift, she remains on the sea floor to this day, as perhaps best summed up, with "**her draws now in Davy Jones Locker! "Ed.**

## Odd Shots: Martin Baltimore Bomber (Named after the US town where the Martin Factory was located)



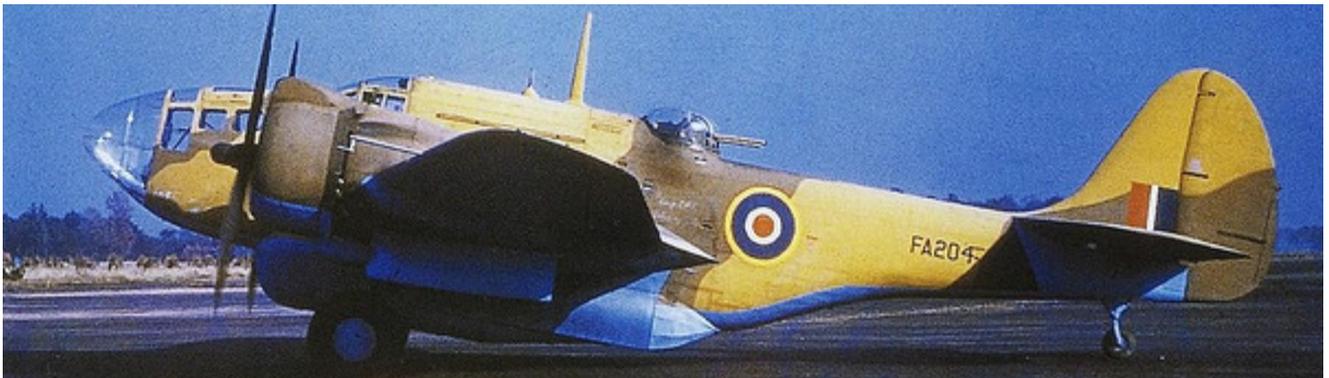
An early MkIII of 21 Sqn (SAF) in the Desert 1942



Somewhat miss identified as being delivered to the RAF, this Martin Baltimore MKIIIA , FA105, Group#53 actually stayed in the US of A with the USAAF and was used by NACA in tests, as pictured here on 31st July 1943.



Nice line up of Desert Camouflaged Martin Baltimore MKIIIAs in a snow covered US of A Airfield late 1942.



Martin Baltimore MKIII, FA204, still in the US of A 1942.



Getting to North Africa, was to fly from the US of A via Brazil, as pictured here in 1942.



Halfway, Martin Baltimore FA504 at Accession Island(UK), with hatch up, after crossing midway during its lower Atlantic Ferry route to Africa. Note large ventral ferry tank snugly fitted with Bomb Bay Doors open.

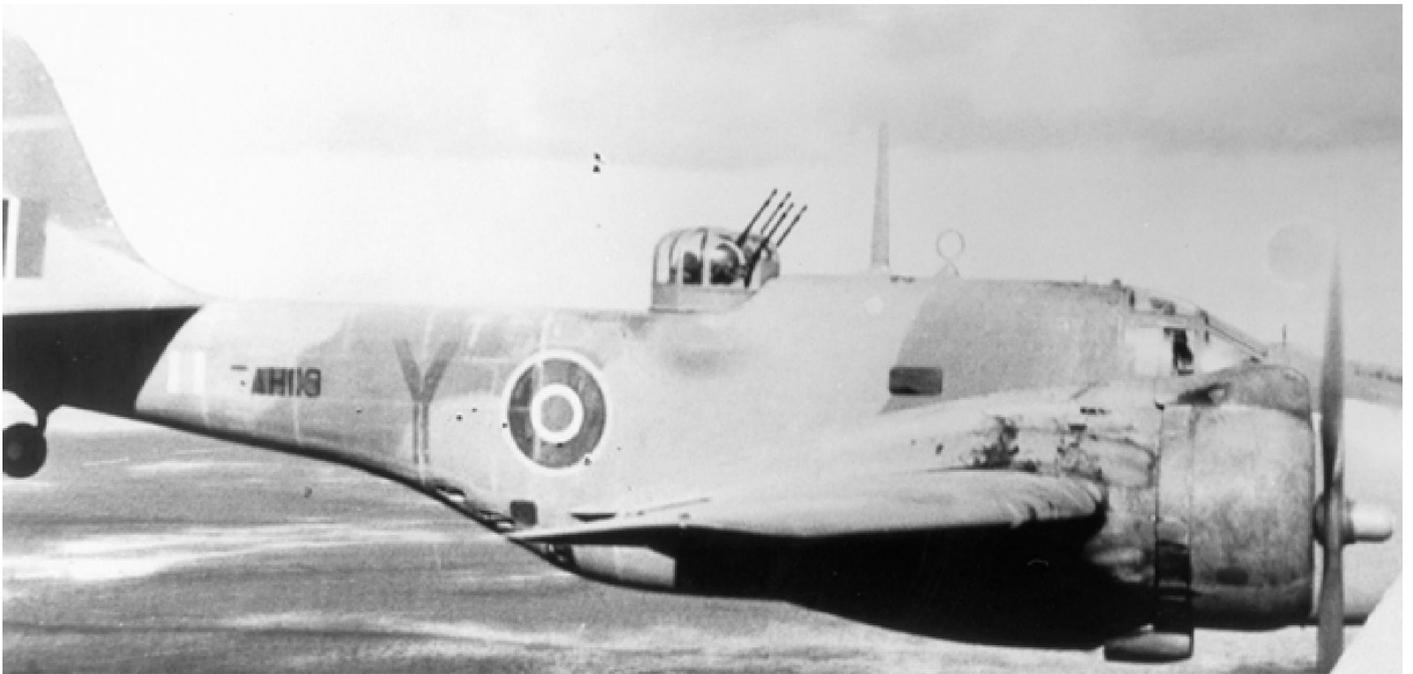
Sometimes the next stop could be the end after checking that rough running port engine after that ocean crossing!



To burn only on landing in Nigeria or Accra Gold Coast, as in this case, December 1942. Note Ferry Tank and the crouching "tiger" Fireman in attendance in top pic with asbestos suit. Below pic shows it got away from him.



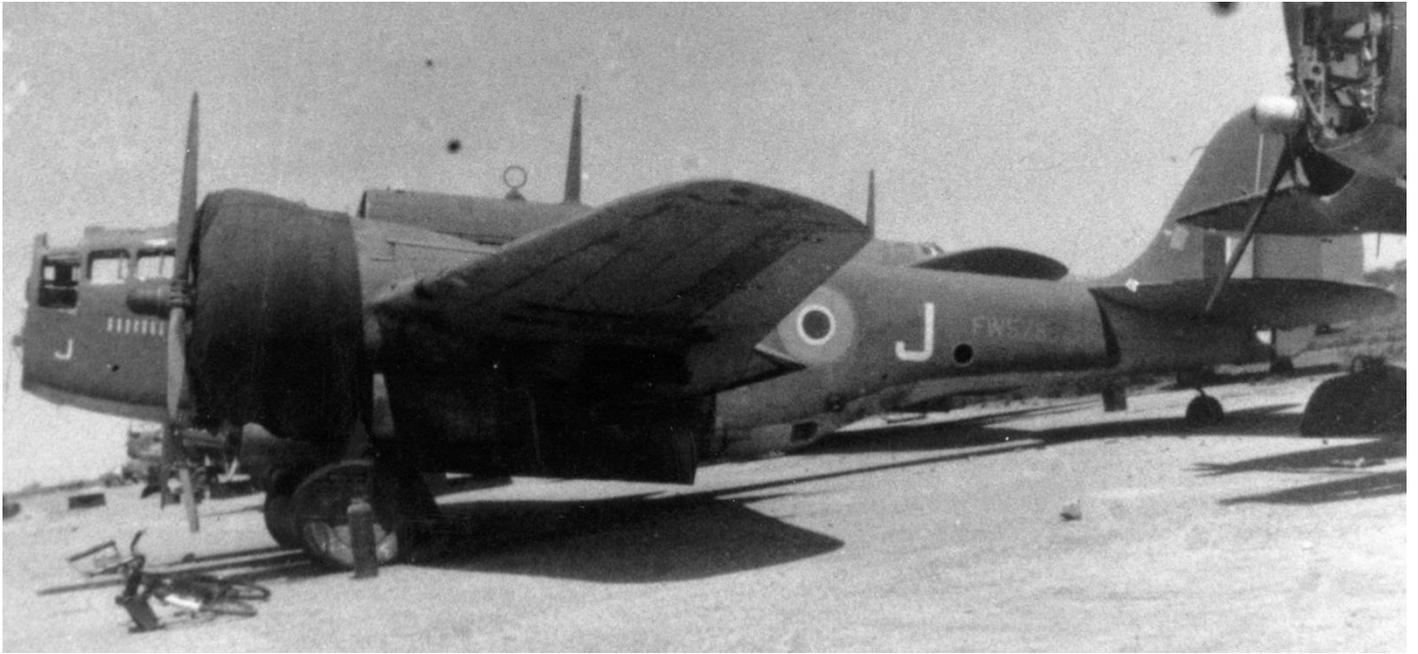
Originally the earlier mark did not have a turret on this earlier type pic, dated pre July 1942 by Roundel pic



But on the later MkIII, somewhat gunned up to four .303cal MGs in a power turret.



Martin Baltimore MKV FW609, now repainted in RAF Temperate Scheme, served in 454 Squadron (RAAF) in 1945



Martin Baltimore Mk V FW528 "J" of 459 Squadron (RAAF) in 1945 resprayed Temperate Scheme



Nice shot of Martin Baltimore MKV FW605 in DAF Colours, which would later serve with 454Sqn RAAF

## Editor's Notes:

Special thanks to John and Brendon on their inclusion of articles: Many Thanks

Contributors are most welcome to provide written articles or even topics to be covered by others.

In future editions of the *Newsletter* John will look at a wider spectrum of post-war aircraft colours, markings and camouflage, together with changes to the national fin stripes – and whether these were still necessary as we entered the modern era. Also this will delve into other general markings on aircraft, squadron markings, aerobatic teams, aircraft badges, and nose art.

### John's end notes to his article: "THE KANGAROO ROUNDEL THAT WE LOVE"

- <sup>i</sup> John Bennett, *Highest Traditions – 2 Squadron RAAF*, p.12, AGPS, Canberra, 1995.
- <sup>ii</sup> A H Cobby DSO DFC\*\*, *High Adventure*, pp.96-102, Kookaburra, Melbourne, 1981; Charles Schaedel, *Men & Machines of the Australian Flying Corps 1914-19*, pp.46-56, Kookaburra, Melbourne, 1972.
- <sup>iii</sup> RAAF Technical Order AGI No.C.11, para.2, 22 Sep 1939.
- <sup>iv</sup> Goulding & Jones, *Camouflage & Markings 1936-1945*, Doubleday, New York, 1971.
- <sup>v</sup> File C.12260/40, RAAF Technical Order AGI No.C.11 Issue 3, 3 Oct 1940.
- <sup>vi</sup> Ian K Baker, *Aviation History Colouring Book*, number 5, p.3, Melbourne 1993.
- <sup>vii</sup> RAAF Technical Order AGI No.C.11 Issue 4, Part II, para.1, 31 Jul 1942.
- <sup>viii</sup> File 0947/19/30A, RAAF Signal 4223, T520 19 Sep 1942.
- <sup>ix</sup> RAAF DTS Diagram A5524, Sheet 1, Issue 2, 9 May 1944.
- <sup>x</sup> File 1/501/329 13552, 8 Jul 1943; RAAFHQ Signal T72, 4 May 1944.
- <sup>xi</sup> David Muir, *Southern Cross Mustangs*, p.77, Red Roo, Melbourne, 2009.
- <sup>xii</sup> David Vincent, *Mosquito Monograph*, p.240 1982.
- <sup>xiii</sup> Ron Vidler, letter to author 6 Dec 1994. John Bennett, *Fighter Nights – 456 Squadron RAAF*, p.69, Banner Books, Canberra, 1995.
- <sup>xiv</sup> RAF directive A.413, p.4, 15 May 1947.
- <sup>xv</sup> RAAF DTS Diagram A5524, Sheet 1, Issue 3, 8 Oct 1946; and Issue 4, 19 Jan 1951.
- <sup>xvi</sup> RAAF DTS file 9/1/1595 para.2 (k), 4 Aug 1947.
- <sup>xvii</sup> RAAF Support Cd (HQSUPCOM) Minute 1/501/329, 56, 20 Nov 1947; and RAAF HQ Signal TS.1831, File 1/501/329, 24 Nov 1947. Dulux identifiers from DAP Parafield "Insignia Painting", File 1/501/329, c Aug 1947.
- <sup>xviii</sup> RAAF HQ DTS Special Instruction Gen/96, TS.1840, File 9/1/1595, para.D(8a), 14 Jan 1948.
- <sup>xix</sup> *The Age* Melbourne, p.15, 13 Sep 1955, quoted in AHSA Newsletter, Vol 4, No 2, 1988.
- <sup>xx</sup> RAAF HQ File 470/1/11 para.4, 1956, incorporating Air Board Agenda 12486, 25 Mar 1955.
- <sup>xxi</sup> RAAF HQ File 470/1/11 para.6, 1956.
- <sup>xxii</sup> Muir, pp.75-94.
- <sup>xxiii</sup> RAAF HQ File 470/1/11, incorporating Air Board Agenda 13128, 16 Sep 1965.
- <sup>xxiv</sup> RAAF HQ File 410/1/261, Signal TEF 950, 4 Nov 1965.
- <sup>xxv</sup> RAAF HQSUPCOM Signal T917, 9 Nov 1965.
- <sup>xxvi</sup> RAAF AAP 7021.004-1 Aircraft Finishing Schemes, paras.11-12 "Roundels", 17 Nov 1971.
- <sup>xxvii</sup> Standard DEF (AUST) 972, figure 1, March 1975.
- <sup>xxviii</sup> RAAF AAP 7021.004-1, Aircraft Finishes, Sect 2, Chap 1, Ann G, diagram 1G1, 4 Jul 2011.
- <sup>xxix</sup> "Our kangaroo wins out" in *Aircraft magazine*, Melbourne, pp.9-10, January 1982.
- <sup>xxx</sup> Defence Instruction DI(AF) OPS 4-21, Issue No.3/90, para.2b, 1 Jun 1990.
- <sup>xxxi</sup> DI(AF) OPS 4-3, Aircraft Identification Markings and Paint Schemes, para.6, 7 Jun 2001.
- <sup>xxxii</sup> RAAF AAP 7021.004-1, Sect 2, Chap 1, para.40, 4 Jul 2011.