Revised – December 2025

Mapping photography South-West Pacific Area 1942-1945

Peter Jensen[1]

Prologue

In July 1943 a high-priority mapping photography mission by a lone unescorted B-17E Flying Fortress (US Army Air Forces – USAAF) from Port Moresby to Japanese held Bougainville ended with the crew being awarded two Medals of Honour[2] (one posthumously) and seven Distinguished Service Crosses[3] for completing the mapping mission while under determined and continuous attack by eight Japanese fighters for a period of 40 minutes. One member of the nine crew was killed and all but four were wounded. The pilot was seriously wounded having all of his flight instruments shot away by cannon and machine gun fire early in the attack. The crew is the only one ever to be awarded two Medals of Honour in the one action and with all of the individual decorations considered together it is, and remains, the most highly decorated aircrew in US history. The details of that mission are later in this story.

At least 77 men of the US air photography units of the Allied Air Force operating from Australia and New Guinea to the Philippines lost their lives on combat missions 1942-1945. This does not include fighter pilots of other units lost while escorting photographic aircraft on combat missions.

Introduction

How many map users, indeed map makers, have thought of the stories behind the marginal information printed on maps, especially those produced with the purpose of contributing to defeating the enemy during wartime? For most of the military maps of New Guinea[4] produced by Australian and United States forces in the Second World War, the source of the aerial photography used to produce the maps is noted on those maps as '*AIR PHOTOGRAPHY 8th Photo Squadron, 5th Air Force' (USAAF).* Much of that photography was flown on combat missions by single pilots in lone, unarmed and unescorted aircraft over enemy held territory and exposed to enemy activity.

Major-General Hugh Casey, US Army, Chief Engineer, General Headquarters South West Pacific Area (GHQ SWPA) was responsible for coordinating the mapping and charting by Australian and US forces in SWPA from 1942 to 1945. He later reported '*much of the ultimate success of the mapping program was due to the individual efforts of the men who flew the photographic planes'*.

[1] Lieutenant-Colonel (Retd) RA Svy/RAE B App Sc (Distinction) (Surveying & Mapping) WAIT, M Sc (Geodetic Sc) The Ohio State Univ

[2] The highest US award for valour in combat is equivalent to the Victoria Cross for Australia

[3] The second highest US award for valour in combat after the Medal of Honour

[4] Here New Guinea is the collective name for all of the north-east part of the South-West Pacific Area of the Pacific Theatre

In Brigadier Lawrence Fitzgerald's (Director of Survey Land Headquarters from July 1942-1945) book Lebanon to Labuan (p60) he writes – *'The Squadron (8th Photographic Reconnaissance Squadron) bore the burden of photography over New Guinea and it deserves recognition for a gallant attack on an impossible commitment and for its splendid performance against insuperable odds.'*

The popular shortened name for the unit at the time was '8th Photo' and is the name used in this story. For 1942 and 1943, 8th Photo was the 'eyes' of the US 5th Air Force (SWPA) providing aerial photography for intelligence, mapping for planning and conduct of land combat operations, mapping of broader areas for other than operations, for terrain model making and for the many and various studies of the SWPA by the GHQ Allied Geographical Section.

As the war moved west towards Japan in the island hopping campaigns from the north-coast of New Guinea in 1944-1945, more photographic units were added to the order of battle. From the meagre four aircraft in 8th Photo in early-1942, the USAAF aerial photographic capability grew to 44 aircraft in four squadrons by mid-1944, 68 aircraft in six squadrons by end-1944 and twelve USAAF squadrons and two US Navy land based squadrons plus carrier based aircraft of US Pacific Fleet by 1 July 1945. This does not include Royal Australian Air Force (RAAF), Royal New Zealand Air Force (RNZAF) and USAAF units in Australia or remaining in the New Guinea areas to support the on-going and final campaigns there (Bougainville, New Britain, Aitape-Wewak).

This is not a history, but a story which attempts to add some of the character, background and detail of this not very often thought of part of map making of enemy held territory during the war. The emphasis of the story is on 8th Photo, mainly because of its lone heroic efforts in New Guinea in 1942-1943 in the darkest two years of the war for Australia. But also included is the effort for mapping photography across the huge area from New Guinea to the Philippines and Japan in the last 20 months of the war, January1944 -August 1945.

Two books are the main source of information. Firstly, *Engineers of the South-West Pacific 1941-1945 Vol III, Engineer Intelligence, Report of Operations United States Army Forces in the Far East, South-West Pacific Area, Army Forces, Pacific, by the Office of the Chief Engineer, General Headquarters, Army Forces, Pacific, Major-General Hugh J Casey, Chief Engineer, 1948*. Secondly, *The Eight Ballers: Eyes of the 5th Air Force, The 8th Photographic Reconnaissance Squadron in World War II, Stanaway and Rocker, 1999*. This second book is based on an informal, light-hearted, at times comical and serious when it should be reporting a missing colleague, daily diary kept by the well informed unit Intelligence Section. A page example of the diary is Figure 18.

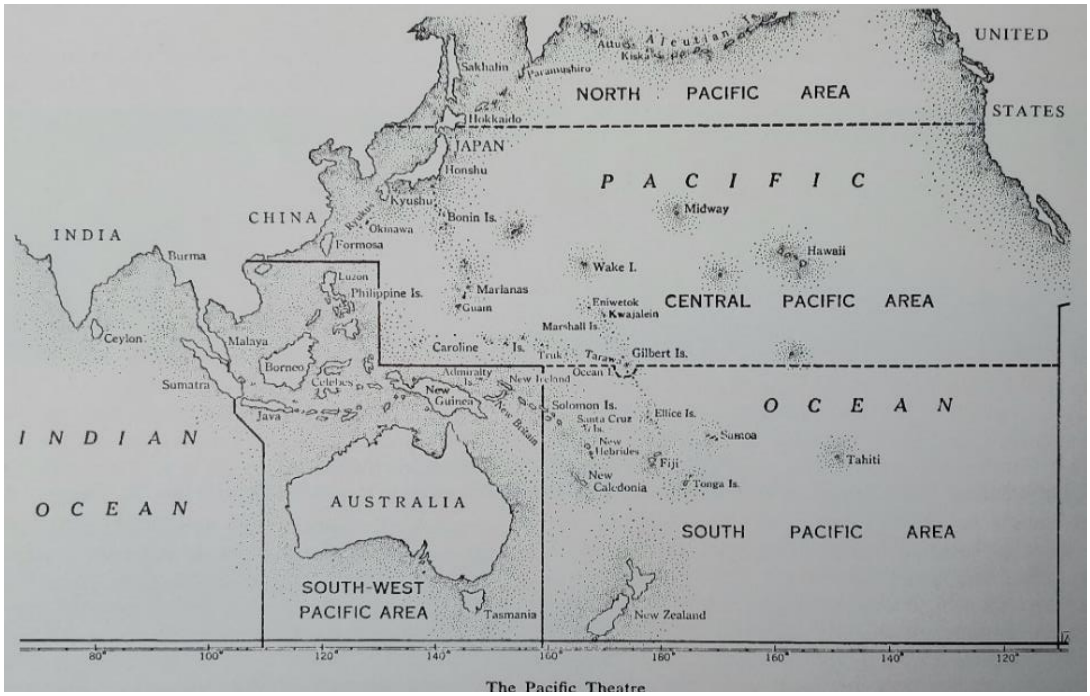


Figure 1 – The Pacific Theatre

8th Photo's SWPA area of operations for 1942 – 1943 included Bougainville, Shortland Islands, Buka Island, Green Islands but after US forces held Guadalcanal in the Solomon Islands in early-1943, 17th Photo Sqn, 13th Air Force, of the South Pacific Area took primary responsibility for those island groups from mid-1943. 8th Photo and 17th Photo photography was used for mapping for the US Marines invasion of Bougainville at Torokina in November 1943 and the follow-on US Army force and later II Aust Corps from November 1944. This story does not include operations of 17th Photo Sqn or the relief units of the Royal New Zealand Air Force Wing (Corsairs) for strike and photographic reconnaissance and No.5 Squadron (Boomerang) RAAF, which used smaller format reconnaissance cameras to provide supplementary photography updates of the 17th Photo Sqn trimetrogon photography after that unit departed Bougainville.

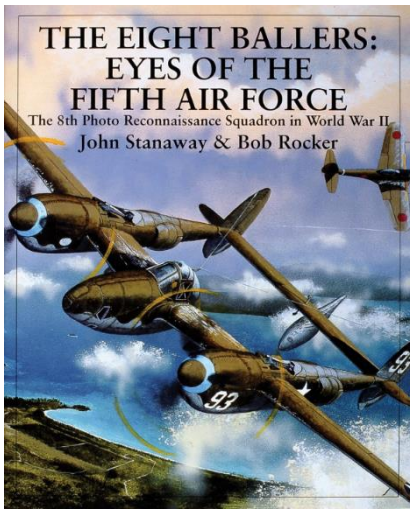


Figure 2. Those who served in 8th Field Survey Squadron RA Svy (Moem Barracks Wewak 1975-1980) may recognise the coastline in this illustration on the book dust cover. It is Boram (now Wewak airport) on the coast road between Moem Barracks on Cape Moem to the bottom right of the picture and Wewak township further left past Boram Point on the left. Here the F-4 Lightning has just jettisoned a drop fuel tank to evade the Zero fighter. This was quite typical of photo missions to Wewak.

Background

Six weeks after the fall of Rabaul (New Britain), to the main Japanese force in the South Pacific and three weeks after the first Japanese air raid on Darwin on 19 February 1942, the Australian and US military mapping authorities met in Melbourne on 10 March 1942 to address how to provide the mapping materials needed for operational planning and sea, land and air operations in the Australian region to stop and defeat the rapid advances of the Japanese forces. One outcome of that meeting was to requisition a USAAF photographic reconnaissance squadron, a US Army Corps of Engineers topographic battalion (Army troops) less its survey company and a deployable US Army Corps of Engineers topographic company (Corps troops).

By May 1942 the Japanese had seized the Netherlands East Indies except for the southern part of Dutch New Guinea and the Australian Territory of Papua and occupied coastal towns, airfields and ports Rabaul (New Britain), Kavieng (New Ireland), Lae and Salamaua (New Guinea), Buin and Buka (Bougainville) and Tulagi (Solomon Islands). The major prize not seized was Port Moresby, the administrative centre of the Territory of Papua, and the key port town needed to be held to mount major offensive operations, supported by land based aircraft, against continental Australia.

There were few roads and no railways between the Japanese held towns, airfields and ports. Their occupied and defended coastal airfields, normally near ports, meant that they could rapidly move and resupply air units with relative ease. There was little known about the geography and its effect on manoeuvre and logistics needed to plan and conduct intensive land combat operations against a well prepared, trained and experienced Japanese enemy. There was very little aerial photography, topographic mapping of military utility and survey control for mapping from photography. Mining exploration in small areas had prompted some photography and mapping. As for the mapping, other wars and campaigns often involved derivation or update of existing civilian mapping. There were more maps available for the planning and landings at Gallipoli in 1915 than there was in New Guinea in early-1942.

On 22 December 1941, two weeks after Japanese naval air forces attacked the US at Pearl Harbour bringing the US into the Second World War, the first US forces (4,600 troops) arrived in Brisbane having been diverted enroute from the US to the Philippines. This force became the skeleton of US Army Forces in Australia (USAFIA) which transitioned from supporting US forces in the Philippines to the defence of Australia. In March 1942, General Douglas MacArthur was ordered by the US President Roosevelt to withdraw from the Philippines to Melbourne where he was appointed Supreme Commander of all Allied Forces (absorbing USAFIA) in the South-West Pacific Area (SWPA) of the larger Pacific Theatre of operations. The mainly US Navy's successes in the Battle of the Coral Sea (early-May 1942) and the Battle of Midway (early-June 1942) were the strategic turn-around points in the Japanese strategy of cutting the Australia to US lines of communication. The Japanese then attempted to capture Port Moresby overland through Buna-Kokoda, Milne Bay and Solomon Islands ports and airfields to cover the eastern approaches to Port Moresby and to conduct

bombing raids on northern Australian towns, military installations and occasional invasion threats which went on for the next eighteen months.

The units

Two weeks after the Japanese attacked Pearl Harbour, formation of the 8th Photographic Squadron, USAAF, was authorised. On 1 February 1942 the unit was raised in California with a nucleus of three officers and twenty-eight other ranks mainly from the 4th Mapping Squadron. By 7 March 1942 'A' Flight had grown to nine officers and forty other-ranks with four F-4 (photographic) P-38 Lightning aircraft.

On 18 March 1942, 8th Photo was the first photo reconnaissance unit to leave the US when 'A' Flight embarked at San Francisco on SS President Coolidge with its four F-4 disassembled for deck cargo, to arrive in Melbourne 7 April where the aircraft were reassembled at the Commonwealth Aircraft Corporation.

The first Commanding Officer 8th Photo, 1st Lieutenant Karl Polifka was one of the first two pilots with experience on the F-4 Lightning and photography, flying many of the early combat missions familiarising himself with the challenges of New Guinea flying to meet the demanding tasking especially over enemy held territory, enemy activity, poorly mapped high mountain terrain and extremely unpredictable and fast changing weather conditions. He went on to be a legend of photo reconnaissance, being posted to England and the Mediterranean influencing much of the photographic capability development. In New Guinea he was credited with the first Zero kill in an unarmed F-4 – in a hot pursuit a Zero flew into the sea. As a Colonel and Commander of the 90th Photographic Wing he was killed-in-action in Korea in 1951.

Figure 3 – A 8th Photo Squadron F-4 P-38 Lightning as deck cargo on SS President Coolidge arriving Port of Melbourne, 7 April 1942

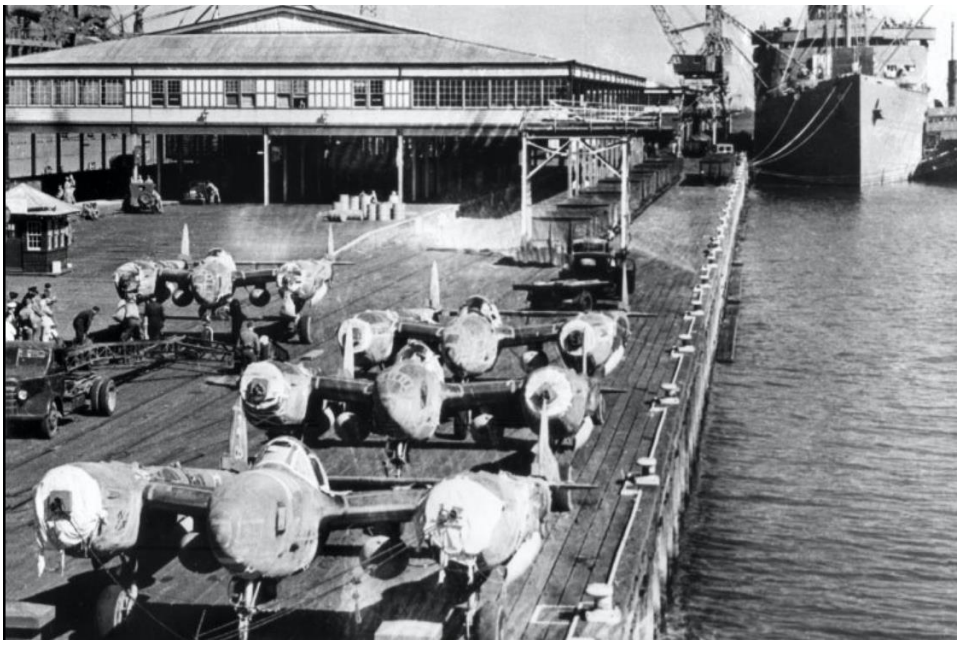


Figure 4 - The first four 8th Photo Squadron F-4 P-38 Lightnings, with wing tanks, on Station Pier, Port of Melbourne, 7 April 1942. SS President Coolidge in the background.

The unit moved to Brisbane 24 April then to Townsville 2 May. From Townsville combat missions were possible over much of New Guinea after staging through Port Moresby. The informal diary does mention that the unit did provide critical reconnaissance in the Battle of the Coral Sea but there is no detail of that action.

On 9 June 1942 the unit was redesignated 8th Photographic Reconnaissance Squadron. On 19 July the unit came under administrative command of 19th Bombardment Group, 5th Bomber Command, absorbing 435th Bombardment Squadron, bringing the personnel establishment to 32 officers and 230 other ranks. The Bombardment Group returned to the US early-1943 then leaving 8th Photo again under direct command of 5th Bomber Command until late 1943 and leaving behind three B-17 Flying Fortress bombers which would be available to 8th Photo for longer-range missions.

8th Photo was the pioneer unit for photo reconnaissance establishing practices for mapping and reconnaissance photography which became ‘standing operating procedures’ for other units to later serve in SWPA. It was the unit requisitioned for the purpose of mapping photography but once in the Theatre the majority of missions included general photo reconnaissance and tactical photo reconnaissance before and after air strikes for battle damage assessment. For this huge responsibility it was a much under-resourced unit in terms of reliable aircraft, other equipment and at times trained photo pilots. Their mapping photography achievements in 1942-1943 were against the odds, although largely described as adequate rather than to strict standards. It was much better than nothing. Despite aircraft needing more maintenance than usual, some of the worst weather conditions for flying and air photography in the world and increasing hostile enemy activity, somehow they managed to provide adequate mapping photography through skill, daring, courage, perseverance and initiative.

But for the advance to the Philippines in SWPA in 1944, and then Japan in 1945, it was clear that a much augmented aerial photography capability was needed to match the huge demand. Late 1943, 6th Photographic Group, 5th Air Force, was formed with squadrons assigned to the group being the existing 8th Photo with F-4/F-5 aircraft, two other light (F-5) units the 25th Photo Reconnaissance Sqn and 26th Photo Reconnaissance Sqn and 20th Combat Mapping Sqn (heavy long-range) with F-7 B-24 Liberator (known as flying dumbos). 20th Squadron was the first USAAF 'long-range' photographic unit to be deployed in the Pacific Theatre. Some of the new units were not operational until April 1944. Initially they all operated from Nadzab (New Guinea), near Lae, along with the Group and Wing Headquarters. The F-7s were intended for the missions assigned to mapping photography for the 'late next' and 'after next' land and amphibious operations towards Japan. F-7 crew included an air photographer cross trained as an air gunner. Initially 20th Combat Mapping Squadron suffered many problems relating to equipment serviceability and crew training with suitable mapping photography not achieved in the first few months.

In June 1942 1st Photographic Reconnaissance Unit (1 PRU) RAAF was formed, after the RAAF Survey Flight was disbanded, equipped with four F-4 Lightnings and based at Coomalie NT near Batchelor south of Darwin (photography mission identification prefix COO). 1 PRU and USAAF 380th Bombardment Group (B-24 Liberator) attached to the RAAF based at Fenton NT and Darwin (photography mission identification prefix FEN) flew combat mapping photography in 1943-1944 for mapping the Japanese held islands nearest to Australia and Dutch New Guinea (Timor, Tanimbar, Kai and Aru). Non-combat missions were over coastal areas of Northern Australia.

No.4 Squadron RAAF (Army-Cooperation) (Wirraway and Boomerang) deployed to New Guinea November 1942 and did provide reconnaissance photography to supplement the 8th Photo mapping photography for compiling 1:25,000 maps of Port Moresby area and Popondetta-Buna area in 1942-1943.

From November 1943, 8th Photo was assisted by the US Navy Fleet Photographic Squadron One (VD-1) which operated seven specially equipped PB4Y-1 B-24 Liberators for maritime and land photographic missions especially in support of amphibious operations. The unit then based at Guadalcanal was a Fleet asset but assigned to the South Pacific Area of the Pacific Theatre. A senior US Navy commander said 'we don't do anything without knowing what is in front of us. We rely on the B-24 photo aircraft to tell us that'.

In June 1944 Far East Air Force was formed combining 5th Air Force (SWPA) and 13th Air Force (South Pacific Area). This added 17th Photo Sqn which had been operating from Guadalcanal over Bougainville, New Britain, New Ireland and two heavy F-7 B-24 Liberator units, the 2nd Photographic Charting Sqn and 4th Photographic Charting Sqn. These two heavy units operated from Hollandia (Dutch New Guinea) (20 October 1944), Morotai (Moluccas) (13 December 1944) and Palawan (Philippines) (5 May 1945) being in position to fly mapping photography for the last major land offensives of the war, the amphibious landings by the Australian 7th and 9th Divisions at Tarakan (May 1945), Brunei Bay/Labuan (June 1945) and Balikpapan (July 1945) in Borneo.

Being unarmed, except for a Colt 45 side-arm, F-4/F-5 pilots avoided, when they could, getting into 'dog-fights' with Japanese fighters which were more agile, but the F-4/F-5 could outrun, out climb and out dive them and had a higher service ceiling. Testing of a captured Zero showed that they became unstable in high speed dives. On mapping photography missions above 30,000 feet the F-4/F-5 were relatively safe from fighters and anti-aircraft fire but did have to fly straight and level for long strips. By late 1943 Japanese anti-aircraft fire to 33,000 feet was effective. Mapping missions meant that the pilots were on oxygen for up to six hours. Problems with the oxygen systems sometimes caused hypoxia in pilots with behaviours such as flying upside down unknowingly with proofs in the trimetrogon horizon-to-horizon photos of sky and a little bit of land or ocean each side. Long lone stressful missions took their toll on F-4/F-5 pilots. One pilot had a habit of landing at the wrong airfield from following another friendly to save navigating after a long mission, with his mates hoping that he would not land at Japanese occupied Lae, as he was very familiar with it from 20,000 feet. And another buzzed Wewak at low altitude after a good photo run knowing that he would be long gone before any Zero tried to catch him. One pilot was concentrating on his photo flying to find that a Japanese plane was flying in close formation with him. No shots were fired and he thought it was a photo plane like him. He quickly headed for home. The 8th Photo diarist recorded 1 April 1943 – '*Lt Sykes went to Wewak today and returned with the illuminating report, "You know the bastards are trying to kill us!" Sometimes war seems to mean more here than just corn willy and gas rationing.'* Corn-willy is bully-beef.

Cameras and photography

Figure 5 – Fairchild K-17 aerial camera with probably a 12-inch lens cone

The main mapping camera system for the entire war was the US Fairchild K-17 trimetrogon camera so named after the 90-degree wide angle 'metrogon' lens manufactured by Bausch and Lomb in the US. The trimetrogon was three 'metrogon' cameras, one vertical and two high oblique mounted 60 degrees off vertical (one each side of the vertical camera) at right angles to the line of flight to capture overlapping horizon-to-horizon coverage for each exposure epoch. Camera lenses were interchangeable with focal lengths 6-inch (f 6.5), 12-inch (f 5) and 24-inch (f 6). The film roll was 9 ½ x 9 ½ inch wide with 9 x 9 inch negative exposure and 200 frames on the roll.

Directives from GHQ SWPA were very specific as to; required by dates, areal coverages, flight lines, time of day, type of photography, cameras and lenses and film types, flying heights, photo overlaps.

The 12 June and 13 July 1942 Directives set the standards for K-17 vertical photography (mentioned earlier) and distribution of negatives and prints. These standards came from discussion at the GHQ meeting of 18 May 1942 when it was agreed that the standard

mapping photography camera and focal-length would be the K-17 and 6-inch respectively. This was to match the Multiplex[5] optical photogrammetric map compilation equipment which would be used by the US topographic battalion when it arrived. Vertical photography would support plotting of 50 foot contour intervals accurate to half the interval. Direct liaison between the Photo Officer Allied Air Forces and Mapping Officer GHQ SWPA was authorised.

Standard trimetrogon photography (6-inch focal length), nominal photo scale for the vertical photography was 1:40,000 (flying height 20,000 feet above mean terrain), 60 percent forward overlap and 30 percent side overlap, height difference along the flight line not more than 500 feet, unless weather and enemy activity meant otherwise. Vertical photography was required for tactical mapping (scale 1:63,360 and larger) but oblique trimetrogon was adequate for aeronautic charts and broad area coverage (scale 1:253,440 ie 4 miles-to-the inch) of other areas of operational interest where no other photography existed and where fewer strips flying straight and level and at the same altitude reduced the risk to the pilot and aircraft from enemy activity. Australian mapping units never had Multiplex but were able to use the photography for mapping using graphical, optical and mechanical means. There was technical development throughout the war, but never to the stage of routinely using oblique trimetrogon photos for scale 1:63,360 maps and larger. Flight lines for long coastline photography were to be parallel to the coast with the vertical camera 'principal points' to be over land and flight lines far enough inland such that the coastline was in the foreground of the seaward looking oblique camera (about two miles inland from 20,000 feet). Standard 6-inch trimetrogon coverage from 20,000 feet above mean terrain was a swathe about 16 miles wide. If more than one trimetrogon run was needed, flight lines separation was not to exceed four times the flying height above terrain. These standards were was not easy for F-4/F-5 pilots to navigate especially over areas of enemy occupation where they may be intercepted by Japanese fighters or subjected to anti-aircraft fire while flying straight and level.

The Fairchild K-18 24-inch focal length was the main reconnaissance camera and for detailed mapping and photo interpretation of Japanese installations and where intensive land combat or amphibious landings were planned. With the K-18 camera on at the same time as the K-17 at 20,000 feet the nominal photo scale was 1:10,000. Like the K-17 the film roll was also 9½ inch wide but 9 x 18 inch negative format. Black-and-white film was the main film with colour film and black and white infra-red introduced in 1943 mainly for oblique photography of planned amphibious landing beaches especially to detect camouflaged heavy weapons and fortifications. K-18 was both spot and overlapping strip and block mosaic photography (60 percent forward and 25-35 percent side overlap) for photomaps and slotted templets (Figure 6) to establish minor control for mapping and control for targeting. K-18 24-inch focal length photography aided photo interpretation of the K-17 photography for large scale mapping.

[5] See page 19

Figure 6 – At US 648th Engr Topo Bn BMP Melbourne, K-18 24-inch focal length vertical camera large format photographs (9x18-inch) here being used for a slotted templet assembly to establish photo control for mapping likely areas of intensive land combat operations and for targeting.

Aircraft

The obsolescent F-4 Lightning was a factory modified variant of the single seat, twin engine, Lockheed P-38E Lightning fighter. The fighter's armament of four 0.5-inch machine guns and one 20-mm cannon in the nose was removed to install a four camera system for reconnaissance and mapping being operated remotely by the pilot from the cockpit. The P-38 Lightning was the premium long-range (when fitted with drop tanks) fighter with a top speed of 410 mph and service ceiling of 40,000 feet. In 1943 the F-4 was replaced with the F-5 with more powerful and reliable engines, better performance, longer range and a five camera system. The squadron was different to others in that it had from time to time a mix of photographic aircraft types, light and heavy, some allocated and some borrowed. Other aircraft were scrounged, mainly heavy and medium armed bombers modified for air photography with more cameras and of different types to help them meet the ever increasing demanding tasking directives. These were bombers modified for photography of more distant targets, longer loiter time, being armed for self-protection and with air photographers to operate the cameras. Borrowed aircraft types were: B-17E Flying Fortress, F-7 B-24 Liberator, B-25 Mitchell, and B-26 Marauder. Some of these came with crew, others the unit pilots had to convert to. Air photographers on the bomber crews cross-trained as air gunners. The B-17Es were not the F-9 which were the factory photographic variant of the B-17F and later models.

B-17E Flying Fortress and B-24 Liberator crew on high altitude missions had to wear clothing to protect themselves against the air temperatures of colder than -20 deg C at 25,000 feet. This included layers of wool, silk, heavy sheepskin leather jackets and trousers, wool lined leather helmets and electrically heated woollen flying suits, gloves and boots. These suits were improved over time becoming more reliable, more effective and less bulky later being worn under outer woollen wind-proof sheepskin jackets. Each crew station had a power outlet for the suit. Oxygen was used above 10,000 feet and crew had to carry a portable bottle as they moved about the aircraft and for use in the event that the aircraft

oxygen system was destroyed or otherwise went unserviceable or they could not get to a crew station.

The 8th *Figure 7 - 1942 - An 8th Photo F-4 P-38 Lightning at '14-mile' Schwimmer Airfield complex near Port Moresby. The two vertical camera ports (K-18 24-inch forward and K-17 6-inch closer to the nose wheel) and the port side K-17 oblique camera port next to '23'. In November 1942 this F-4 crashed on take-off killing the pilot.*

Photo B-17s were also used for Army commanders to conduct visual reconnaissance and for transport flights to Australia to collect new equipments and supplies, to carry personnel for leave and for training, for air camera training and for pilot liaison and mapping familiarisation visits to the US Army 648th Engineer Topographic Battalion Base Mapping Plant in Melbourne. It was not uncommon for the B-17s needing an engine change for an overnight or two in Brisbane, Sydney or Melbourne.

Figure 8 - An 8th Photo Sqn F-4 P-38 Lightning Limping Lizzie – the nose camera bay showing the starboard K-17 6-inch high oblique (60 degrees off vertical) camera part of the trimetrogon system just in front of the line of the nose wheel and what appears to be a K-17 24-inch vertical camera forward of that. This was one of two F-4 Lightnings loaned to 75SQN RAAF at Milne Bay, August-December 1943 (Lockheed files)

Figure 9 - An 8th Photo Sqn F-4 P-38 Lightning – a K-18 24-inch (9x18 inch film) reconnaissance camera is standing in the back of the ute (Lockheed files)

In mid-1942 B-17s were in short supply in the SWPA as the war in Europe was attracting most of those coming off the production lines in the US. Three older B-17s destined for 8th Photo were reallocated (returned later) at the last minute to a bomber unit on orders of the new Commanding General US 5th Air Force Lieutenant-General Kenney. On assuming command in July 1942 and telling General MacArthur that he wasn't impressed with the Air Corps/Force organisation in the theatre, General Kenney said that he would reorganise and go on the offensive immediately. He was a firm believer that air forces power and superiority covering land and naval operations would win the war. His strategy was simply to destroy the airfields and associated infrastructure held by the Japanese to deny them their use. A few days later a scraped together bomber attack force of twenty B-17s from Townsville and Charters Towers staged through Port Moresby to successfully attack the airfields at the Japanese main base Rabaul. Kenney had visited New Guinea and north Queensland finding that some combat squadrons were led by Captains and Lieutenants. He directed that Majors were to be squadron Commanding Officers and that headquarters staff officers in the comforts of Brisbane and other rear areas were not to be promoted before the front-line combat pilots. Also that attack forces were to be led by group commanders Lieutenant-Colonels and Colonels.

The aircraft were often adorned with larger than life 'nose art', some a little risqué with young women in various states of dress and poses. On one trip south, the unit's B-17 was parked at Archerfield in Brisbane and a story has it that the Base Commander ordered that the young lady artwork be given some knickers as the US First Lady Elanor Roosevelt was due to visit.

The F-4 had four cameras, the K-17 6-inch trimetrogon system and another K-17 or a K-18 vertical camera mounted in front of that. The K-18 was mounted across the aircraft so that film overlap was on the 18-inch film edge. The F-5 accommodated another vertical K-18 camera mount.

The unit was equipped with a photo processing 'laboratory' but had to learn to adapt to use of film and chemicals in tropical conditions. A refrigerator was purchased on a Brisbane trip to control storage of these supplies. They found that colour film could only be processed in the low humidity hours after mid-night. They did have mapping equipment of vertical and oblique 'sketchmasters' and oblique 'angulators' for plotting planimetry from the photography but traded those off with 648th Battalion for better power generators.

On the F-4/F-5, the camera ports plexiglass covers were removed when it was found that they caused unacceptable distortions. In the upgraded F-5 Lightning, at 30,000 feet the aircraft nose dipped down 3-5 degrees from the horizontal. The effect on the cameras was corrected by tilting the camera mounting frame up by 4 degrees. Under normal flying conditions on two engines, there was sometimes a vibration caused image blur if the two propellers were out of synchronisation. A pilot found that this didn't happen on one engine as he returned to Port Moresby that way a few times with the cameras rolling. Later, F-5s were not painted so not adding weight which could go to higher speed.

The B-17s and other bombers all had the K-17 6-inch trimetrogon mapping system, a K-18 24-inch vertical camera and a mix of up to four other cameras including K-17 (various lens cones) and K-18 oblique. 8th Photo claimed that they had the fastest Fortress in New Guinea not being laden with heavy bomb loads. When B-17s were to be withdrawn for bombing duties it was suggested that the photography missions could carry bombs to be used on opportunity targets but it is uncertain that this was done. Later a photographic F-7 B-24 Liberator reported that not finding any areas open for photography they flew on to Rabaul to drop bombs there.

Figure 10. This 8th Photo's B-17E Flying Fortress 'RFD Tojo' 41-2627 crashed 26 December 1943 taking off from Port Moresby in early morning thick fog. The mission was to observe the US 1st Marine Division landings at Cape Gloucester, New Britain. Of the 16 on board (12 crew and four passengers) two were killed in the crash, two died the following day and all suffered burns. Passengers included four news correspondents – one American (United Press), two Australians (Brisbane Telegraph and ABC) and one Briton (London Times). The American and the Brisbane Telegraph correspondent died the day after the crash. The aircraft was destroyed.

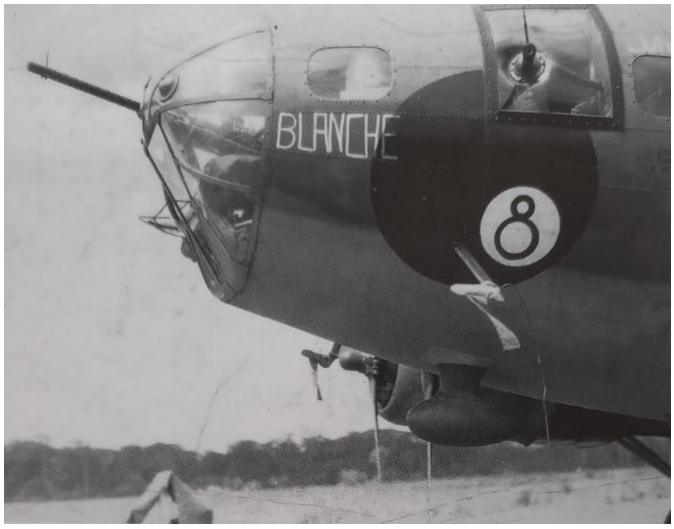


Figure 11. The 8-ball logo nose art on 8th Photo photo B-17E Flying Fortress RFD Tojo 41-2627.

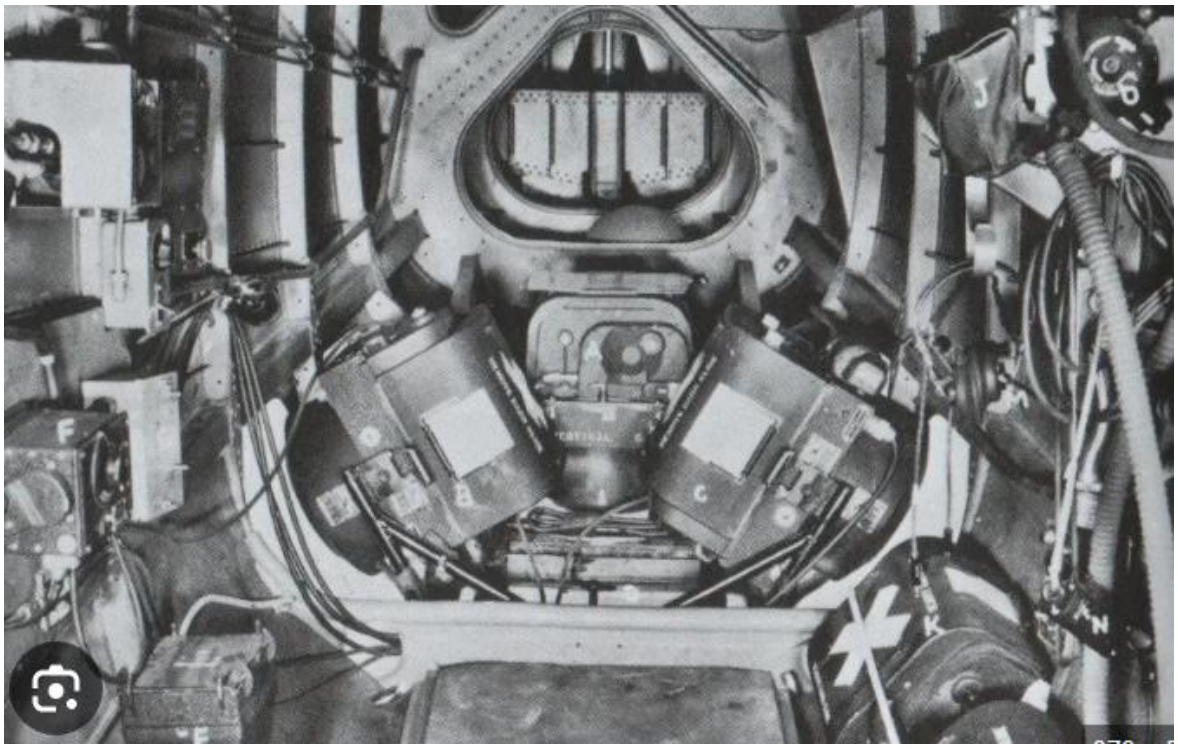


Figure 12. A K-17 trimetrogon camera system of a vertical and two high oblique K-17 cameras mounted in the bomb bay of a B-17E Flying Fortress (looking along the fuselage to the rear)

Figure 13. A F-7A B-24 Liberator photographic plane of 20th Combat Mapping Squadron, 6th Photographic Group, 5th Air Force in SWPA 1944-1945. This F-7A had three cameras in the nose (K-17 trimetrogon and K-18) and three cameras in the rear bomb bay. Long-range fuel tanks were installed in the forward bomb bay. The F-7B with six cameras in the bomb bay did replace the F-7A in this squadron in late-1944. The small graphics below the cockpit window are 'air cameras' depicting the number of mapping missions by the aircraft. This F-7A went on to fly 32 missions over New Guinea, Dutch New Guinea and Netherlands East Indies.

1942 operations

Each day whatever photographic aircraft were serviceable were despatched on missions all over New Guinea either on regular reconnaissance trips to the Japanese held airfields looking out for enemy shipping on the way or mapping tasks or a mixture of both. The weather and aircraft problems enroute often frustrated the pilots getting to the target areas.

At the 4th May 1942 conference General Casey advised that the air photographic unit soon to arrive would be available solely for aerial photography for mapping. That was not to be as it was the only combat capable photography unit in the theatre and also needed for urgent tactical reconnaissance missions. These were competing demands and the urgent requests for reconnaissance photography won over mapping photography at that time.

The GHQ SWPA Mapping Conference of 12th October 1942 reviewed the action items of the two previous conferences on 4th and 18th May 1942 including 'aerial photographic mapping missions'. There it was agreed that '*requests from the various Forces for aerial mapping missions be referred to GHQ where they would be allocated a priority by G-2 (Intelligence) based on consideration of operational requirements as indicated by G-3 (Operations) and on the affect of existing mapping missions as indicated by Chief Engineer GHQ' (Figure 14).* Priorities were articulated in Mapping and Photography Directives in three classes: Class I providing for immediate operational photography, Class II photography for secondary areas for revision of existing maps, Class III photography to be used for revisions of maps of continental Australia. But specifics were never enumerated in such detail as to eliminate the need for wide and speculative photo coverage.

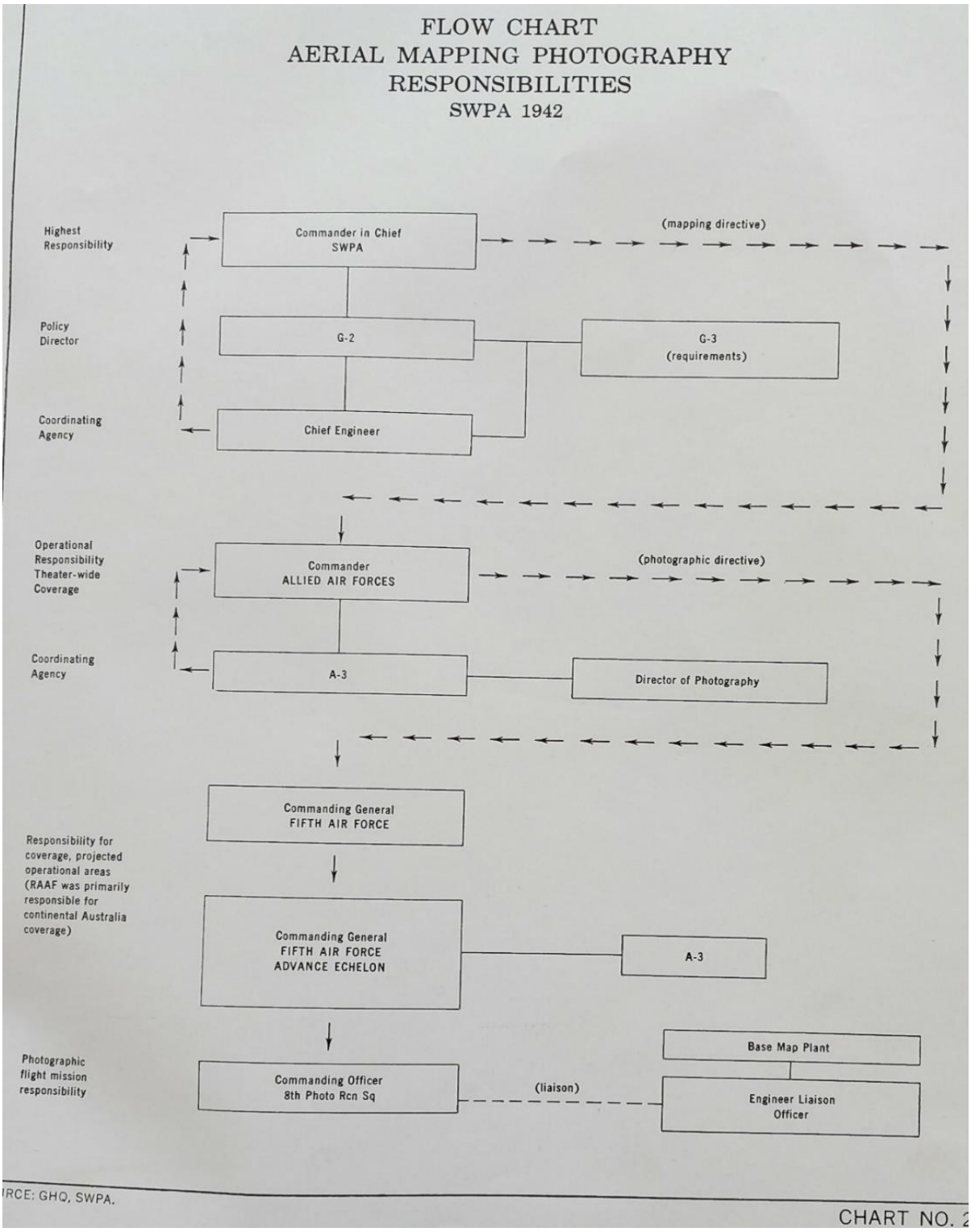


Figure 14 – Commander Allied Air Forces was the operational commander responsible for all mapping photography in SWPA

Ideally for detailed planning and terrain analysis of planned combat areas, maps were needed by the combat units D-30 (day) meaning that accounting for map distribution taking 30 days, mapping production taking 60 days, photography was required D-120 meaning photo tasking

directives were ideally needed D-180 (six months before the planned operations). It was rare that this ideal timeline happened especially as the operational decisions changed and operational tempo increased significantly from the end of 1943. The photography phase of 60 days was extremely optimistic noting that pre-war reports from the Fairchild Company which had a commercial contract for aerial photography for mining exploration in New Guinea showed that in some areas only 15 minutes per day was normal for standard aerial mapping photography. For one pre-war task an aircraft was in position for 105 days for one flight line flown.

8th Photo's first combat photo reconnaissance mission over New Guinea was 16 April 1942, from Townsville staging through Port Moresby. This was the first P-38 Lightning in combat in any theatre in the Second World War. For May and June the missions were photographic reconnaissance along the eastern coast of New Guinea, Lae and Rabaul which were the two major Japanese bases. The first 8th Photo casualty was a pilot killed-in-action on a F-4 mission to Lae on 2 May 1942. The first mapping missions were non-combat along the coast Townsville to Brisbane when a 600 mile K-17 6-inch trimetrogon strip was flown showing the advantages of the trimetrogon system.

On F-4 Lightning mapping photography missions the single pilot had to navigate in the notorious weather conditions of New Guinea, navigate the flight lines and calculate adjustments if the planned lines could not be flown because of the weather or enemy activity, operate the cameras remotely, fly straight and level on the photo runs and keep an eye out for enemy fighters. The pilot had to ensure that photo 'principal-points' were on land and not water. All too often missions were hindered by faulty engines, faulty navigation equipment where it appeared that the main compass was affected by electric motors in the plane or the cameras and camera failures.

The first Mapping and Photography Directive was issued on 12 June 1942 by MacArthur's GHQ SWPA. This included aerial photographic missions to cover the following areas of New Guinea for which aerial photographs are not now available:

(1) From Latitude 9deg 10min S, Longitude 146deg 50min E around the coast as far east and north as enemy activity will permit. (ie east from 40 miles north-west of Port Moresby)
(2) From Latitude 9deg 10min S Longitude 141deg E, to Latitude 7deg 50min S. Longitude 145deg 15min E (ie east from south coast Papua border with Dutch New Guinea to northern coast of Gulf of Papua)

Mapping missions from Townsville staging through Port Moresby commenced as soon as operationally possible after the 12 June directive. First areas were eastern coastal areas of New Guinea. In the Survey Corps history Coulthard-Clark noted (p92) – *'Fortunately, during August (1942) the section (2 Fd Svy Sect) finally received air photos taken by 8th Photographic Reconnaissance Squadron, US Army Air Force, of the country between Kokoda and the Buna-Gona area, although these were tri-metrogon prints – a type of which the Australians were not then familiar, but managed to devise a satisfactory method of using them.* The Moresby Defence Area (codename Maple) was also covered.

Mapping Directive of 13 July 1942 (eight days before Japanese landings at Buna) included photography needed by 15 September: Rabaul, Cape Gloucester and Gasmata in New Britain; Guadalcanal in Solomon Islands; Buna, Lae, Salamaua, Milne Bay, Wewak, Madang in Papua and New Guinea; Kavieng in New Ireland; Bougainville. In November, priority additions were: Morobe, Markham Valley and Finschafen in New Guinea; Talasea in New Britain. The operational planners were then planning offensives beyond defeating the Japanese in the Buna area which was not complete until January 1943. It was to be a year before some of this photography was achieved.

The 648th Engineer Topographic Battalion (Army troops) arrived in Melbourne 5 July 42 to establish the GHQ SWPA Base Map Plant (BMP) until the unit moved to the Philippines in early-1945. The BMP, located in the Myer Emporium, was the Theatre level US map compilation, drafting, photographic and lithographic unit. At that stage the Battalion's survey company was in Alaska. The model of the Battalion size fixed base unit was that of the American Expeditionary Force in the First World War where a fixed mapping base was established at Langres in France. The BMP was the sister unit of the Aust LHQ Cartographic Company at Bendigo.

648th Battalion was the first US Corps of Engineers unit trained and equipped to use the trimetrogon photography initially using the vertical and oblique photography sketchmasters and the oblique photography angulator as optical and mechanical devices for plotting planimetry. Contours and form lines were plotted using Fairchild stereo-comparagraphs. Limitations included sparse ground control and often unknown accuracy and photo blocks which by accident, equipment malfunctions or operational necessity were often far from being complete, with holes, changing flight line direction and changing flying heights. By using the oblique trimetrogon photography and odd bits of survey control far from the vertical coverages, they were able to provide a rough but basic framework of photo control for disconnected vertical photography. By 1943 the Battalion BMP was using Multiplex for optical stereographic photogrammetric map compilation from vertical 6-inch trimetrogon photography.

Multiplex is a whole story in itself but warrants brief mention here. Developed in Germany in the early-1930s it was introduced in the US in 1934 being used by the Geological Survey. General Douglas MacArthur, a topographic engineer, was then Chief of the Corps of Engineers, and recognised the potential of Multiplex for topographic mapping from aerial photography, ordering that it be acquired by the Corps' topographic battalions[6]. But it wasn't until 1938 when Multiplex was manufactured in the US by Bausch and Lomb in Rochester, New York, that it was available to military units[7]. Multiplex was designed for a wide angle 6-inch focal-length lens of which the K-17 Bausch and Lomb metrogon lens was one. A design and manufacture challenge was the production of the glass diapositives which were

[6] Gruner H, Bausch and Lomb, Inc, The History of the Multiplex, Photogrammetric Engineering 1962, p480
[7] Manual of Photogrammetry, 4th Edition, American Society of Photogrammetry, 1980

reduced from the 9 x 9 inch film format to 2 ¼ x 2 ¼ inch and then the projectors to enlarge to the plotting scale such that original film detail was not lost.

In 1938, Major Thomas Vance, then Officer Commanding Australian Survey Corps, visited the US and Canada to assess how the Australian military survey organisation compared with north-American counterparts. He did see Multiplex in Canada and the US reporting[8]:

> *'Air Survey Plotting Machine. It has been proved by the results obtained in the US and Canada that the Multiplex Projector system is suitable for plotting for small and medium scale maps and requires less ground control than the radial line method (used by Aust Survey Corps). It is especially useful to bridge areas where the radial line method is difficult to apply. Before deciding on the purchase of this type of machine two important factors must be considered: firstly the machine can only be used satisfactorily in conjunction with cameras fitted with a similar type of lens. The photographs taken by the RAAF may therefore not be suitable. This difficulty may be overcome by the purchase of special cameras to be used for all photos taken for the Aust Survey Corps. Secondly, owing to the International situation the question arises as to whether it would be wise to purchase a German instrument for which it may be difficult to obtain spare parts additions when required.'*

Colonel Fitzgerald mentioned to his British counterpart Brigadier Hotine in May 1945[9] that the US had no spare Multiplex equipments available for Australia. It was not until 1952 that Multiplex (the UK Williamson and Ross version) was acquired by RA Svy and used by AHQ Survey Regiment, Command Field Survey Sections and School of Military Survey.

On 16 July 1942, B-17E Flying Fortress 41-2458, modified for photography, was the first B-17 to be re-assigned to 8th Photo for more distant targets. The B-17, fitted with six cameras did mean that the cameras were manned and that in flight camera problems that the F-4 experienced were fixed in flight by air photographers. One recurring F-4 problem was that the K-17 film advance pins sheared, something which the pilots couldn't do anything about in flight. Pilots had to convert onto the heavy bombers flying the first B-17 mapping mission to Darwin, 13-16 August 1942, when a mapping photo mosaic was flown. On this mission two pilots who were later shot down in F-5s over New Britain and rescued months later were Captain Post (B-17 duty as navigator) and 1st Lieutenant Hargesheimer (B-17 duty as bombardier). Air Commodore Hewitt RAAF, Director of Intelligence, Allied Air Force, was a passenger on that mission.

Colonel Fitzgerald noted that the B-17 was the 'superior' mapping aircraft being disappointed when they were withdrawn for bombing duties.

8th Photo 'B' and 'C' flights arrived at Townsville on 27 July with another four F-4 Lightnings after a sea voyage from the US to Melbourne on SS Matsonia. On 2 September, the unit moved from Townsville to '14-mile' Schwimmer Airfield complex at Port Moresby where they remained until early-1944. The unit then had eight F-4s although the daily on-line

[8] Vance TA, Major, OC Aust Survey Corps, Report of Overseas Visit, 1938
[9] Demi-Official letter Colonel Fitzgerald to Brigadier Hotine 15 May 1945

average was three or four as they required excessive maintenance to keep them in the air. Average availability in late-1942 was 10 missions per plane per month. Some moves involved the air echelon going forward to recently captured airfields with the rear echelon following when suitable facilities were established. Mission identification for 8th Photo 1942-1943 was prefixed with 'SCH' being the first three letters of where they were based – Schwimmer, Port Moresby.

The extended Kokoda Trail – Port Moresby to Buna - was high priority early-September but as the 8th Photo diarist noted '*photographs are getting pretty vital and yet we can't get the weather to fly it'*. On one such mapping mission the photo pilot spotted two Japanese Zeros flying towards Buna so he followed them to find 30 aircraft at Buna airfield. He photographed the airfield which led to an air attack group the next day which destroyed 17 of them on the ground and another 12 the following day.

A 12 October conference decided that the fixed base Central Photographic Library maintained by Allied Air Forces would be located in Brisbane with GHQ SWPA.

The longest trip to 25 October from the Port Moresby base was to Wewak and Madang with trimetrogon mapping photography along all of the coast between the two coastal port towns.

A major reason for success of 8th Photo was embedding an Engineer Officer (Lieutenant Fairbank) from 648th Engr Topo Bn BMP in the unit from November 1942. His task was to '*live, work and fly'* with the pilots to make the most of what they had to satisfy the Photo and Mapping Directives. He briefed the pilots before the missions, debriefed the pilots after examining the film negatives, conducted pilot photo training, organised pilot's visits to the BMP in Melbourne to understand the mapping processes and why the need for photo flying specifications and wrote detailed weekly and monthly reports to BMP and superior headquarters alerting them to matters needing attention. He flew on B-17 combat photo missions often as navigator and gunner. His was a busy and essential job.

For eleven days 11-22 November 1942 nothing was done due to bad weather but then three F-4s all flew good missions 25-26 November. This was followed by a period of a few frustrating days when only one or two aircraft were serviceable.

For ten days in early-December 1942, while the Gona-Sanananda-Buna land battles were in progress, five strips of vertical K-17 6-inch with trimetrogon (Figure 16) was achieved over the battlefields along with three strips of K-18 24-inch of the Buna coast and adjacent reefs. At the same time six K-17 6-inch trimetrogon strips near Myola Lakes (east of Kokoda Trail) was completed. Competing demands for photography over the clouded New Guinea mountains, jungles, coastal areas and seas often meant that reconnaissance took precedence over mapping. But mapping directives had to be met, especially for planned combat operations in a few months time. In the absence of prior timely information about conditions over targets, the odds of a successful mapping mission was 20:1.

8th Photo had radios installed in the aircraft then had to scrounge around for a base radio. This was a game changer allowing early morning 'weather' reconnaissance flights to report weather and areas open for photography. Another method of success was flying single F-4

four hour missions looking for cloud gap areas not previously covered with follow-up overlap missions two hours apart. Large photo mosaic areas were covered in this manner although often they were patchworks with gaps and clouds and then being difficult to use for mapping. On 21 December a new aircraft was received '*a F-4 with the same undependable quality'*!

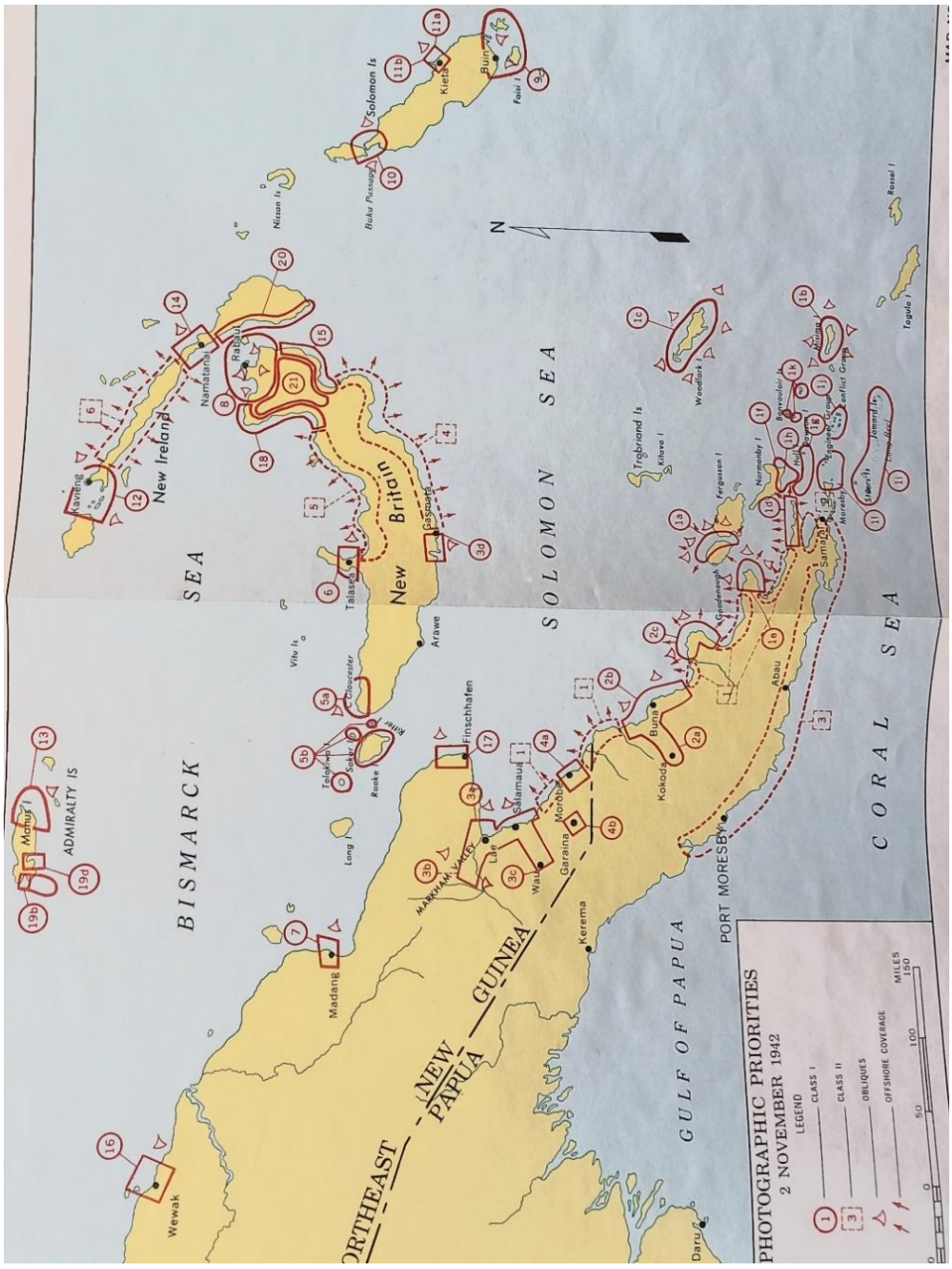


Figure 15 - GHQ SWPA photographic priorities 2 November 1942 before the Japanese were defeated at Gona-Sanananda-Buna in January 1943. Coastal photography was to cover up to 20 miles inland.

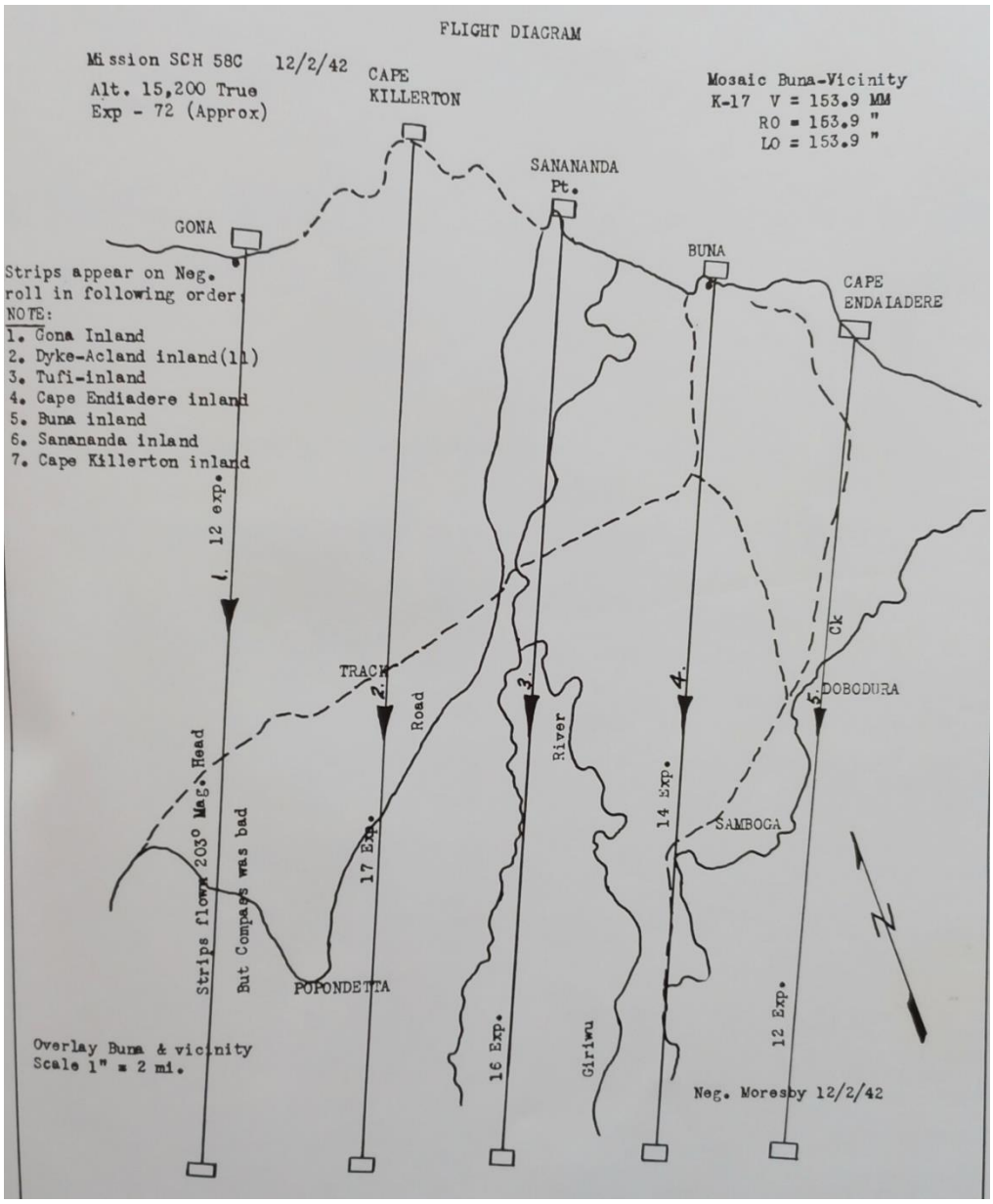


Figure 16 - On 2 December 1942, five strips of K-17 trimetrogon vertical mapping photography (flight lines about 3 miles apart for vertical side overlap 30 percent) of the Gona-Buna area was flown while the land battle was in progress. The Japanese defensive perimeters around coastal villages Gona, Sanananda and Buna were about one mile behind the beaches. Here the pilot had to calculate the flight lines as he couldn't get to the standard height of 20,000 feet because of cloud, and compute and set the intervalometer for forward overlap. All of this while keeping an eye out for enemy air activity as he was not escorted and also anti-aircraft fire.

In December 1942, the unit achieved 65 mapping missions and 2,200 flight line miles. This was the only recorded mapping photography achievement for the year as the record was commenced by the 648th Engr Topo Bn officer posted to 8th Photo in November.

At the close of the year 8th Photo called 1942 the '*year of preparation'* looking forward to 1943 as the '*year of progress'*.

1943 operations

In mid-January 1943, B-17E Flying Fortress 41-2627 '*RFD Tojo'* (Figure 10) was assigned to 8th Photo on a permanent basis.

Missions to Wewak (occupied by the Japanese in December 1942) were flown as much as possible in February 1943 with aircraft on high altitude (27,000 feet) mapping runs being attacked by as many as six Zeros. One F-4 was damaged. Anti-aircraft fire was heavy at lower altitudes.

In February, March and April 1943, 8th Photo B-17 mapping missions to Manus Island, Bougainville and New Ireland (Kavieng) were successful.

After Gona-Sanananda-Buna was secured in January 1943 and the US built large airfield complex at Dobodura behind Buna was operational, 8th Photo sometimes flew across the Owen Stanley Range in fine weather to stage through there or wait for weather to clear over other areas. To be assured that they were on-line for pre-strike and post-strike tactical reconnaissance tasking for major strikes on the northern side of the Owen Stanley Range 8th Photo detachments of planes, pilots, mechanics and camera mechanics spent a few days at a time at Dobodura.

On 11 April, B-17E 41-2666 '*Old 666*' flight over Kavieng was attacked at 13,000 feet by ten Zeros. The lower gun turret was put out of action so the pilot dived the plane to about 200 feet above the sea so that the Zeros could not get under him. For twenty minutes the Zeros made twenty passes from all directions. The unit scored its first confirmed kills with two Zeros shot down by Private La Rosh. Most of the crew, including the pilots, '*entertained themselves*' with a go on the various gun stations. No one was wounded and the plane had only minor damage including loss of hydraulics.

In the first half of 1943 8th Photo started to get the much improved F-5 Lightning to replace the unreliable F-4s.

In April 1943 mapping strips were flown of New Britain and early-May a 8th Photo B-17 flew a thirty-three strip mosaic of the Trobriand Islands with no gaps. Lieutenant Fairbanks (the 648th Battalion topographic engineer officer) flew this mission as navigator and assistant photographer.

In April, Lieutenant-General Kenney, Commanding General Allied Air Forces, visited the unit to present personal medals and awards. He added that '*8th Photo is doing a bang-up job'* regretting that witnesses to deeds were necessary as he knew that many 8th Photo men deserved medals for their work across the Theatre. He reiterated that the work was not going unobserved adding assurance that additional units would be assigned by the end of the year.

March-June 1943 was not a good period for the F-4/F-5 pilots with five lost on the almost daily '*milk run'* to Rabaul and the coastal New Britain circuit over known Japanese airfields and looking for new airfields. From July a two-plane then four-plane P-38 fighter escort from fighter squadrons was assigned to Rabaul missions although that wasn't all that successful as fighter pilots sometimes lost the photo plane as they didn't understand the photo

mission. On one occasion the escort picked up another P-38 to look after, so the F-4 went off without an escort. At one point 8th Photo flew two F-4s together for mutual support. In September the unit was equipped with six new P-38 fighters and so became the first photo squadron in any Theatre to fly its own fighter escorts. Unit photo pilots were trained as fighter pilots at Charters Towers, QLD, fighter pilots were posted-in and local fighter unit pilots kept the 8th Photo pilots up with the latest on enemy tactics and how to evade them.

In August 1943, 8th Photo trained fighter squadron 75SQN RAAF (then at Milne Bay) pilots on flying F-4 and photography and loaned that unit two of their aircraft from August to December 1943.

In their courageous endeavours to provide aerial photography, 8th Photo lost 23 pilots in SWPA with most on combat missions over enemy held territory. These men were initially posted 'missing-in-action' not knowing if they have been shot down, forced landing somewhere, mechanical failure or weather or terrain related accidents. The unit always searched for their own, at known emergency landing grounds, at open areas, at designated 'rescue' sites and transiting to and from tasking. Two who 'bailed out' evaded capture for up to eight months in Japanese held New Britain being assisted by friendly natives. They were joined up with other downed US and Australian aircrew as arranged by Australian Coastwatchers and rescued by US Navy submarines months later. After the war one of those pilots, Lieutenant Fred Hargesheimer repaid the life-saving help given to him by the natives by establishing schools in their villages and visiting many times as a teacher. In 2006 his aircraft was found by locals. At age 90 years, he was flown in nearby by helicopter and then carried by locals on a chair to the site of the wreckage where there was still unexposed film in the cameras. For his service on that mission he was awarded the Distinguished Flying Cross. This is part of his story:

> On June 5, 1943 at 1:00pm 1st Lt. Frederic G. "Fred" Hargesheimer took off in a F-5 from a Dobudura Airfield (near Buna and Popondetta) on a photographic reconnaissance mission over West New Britain in search of Japanese barge traffic. At 2:00pm over Arawe (south-coast New Britain), he made a position and weather report via radio but his unit was unable to decipher his message because Hargesheimer was given the wrong code card before taking off, but was able to track his position by map coordinates. Next, he passed over the south-eastern tip of Rooke (Umboi) Island twice and found nothing, then circled Cape Gloucester airfield and photographed runway areas from 6,000' and observed no activity, then flew around Lolobau Island. Flying east over the north coast of New Britain, he descended to 3,000' to avoid bad weather near the Talasea Peninsula and when he reached Garua the sky cleared. He observed what appeared to be a new runway at Ubili airfield and circled it gaining altitude and afterwards proceeded southwards toward Gasmata, to confuse the Japanese, then turned northward to orbit Ubili airfield again. By this time, the weather had cleared and Hargesheimer searched for enemy barges reported in the area and made a photographic run over Ulamona sawmill and again circled Lolobau Island near Open Bay. After departing Lolabau, his aircraft was attacked from behind by a single Ki-45 Nick.

"I spotted what looked like the construction of a new airfield. I levelled off and circled the area for a better look. The least I could do was shoot a set of pictures and let the photo interpreters back at the base decide if this was an important field. I carefully lined up for a low-altitude pass over what looked like a runway and set the camera intervalometer for a series of overlapping pictures. The cameras were rolling when I was startled by a series of sharp staccato sounds. Eager Beaver quivered a bit as I made a hurried check of the engine instruments. Everything seemed normal. Suddenly a long jagged tear appeared in the port engine cowling. An instant later a puff of black smoke shot out from the hole, followed by a burst of flame. Instinctively I sent Eager Beaver into a screaming dive with throttles wide open; only then did I dare sneak a glance at the rear view mirror. I was afraid to look - but afraid not to. Turning my head, I stared straight into the flaming snout of a twin-engine enemy fighter."

The port-side engine temperature gauge went into the red and he feathered the propeller and was unable to release his drop tanks. Damaged, he attempted to reach a cloud bank but the right engine was also hit and failed. Opening the canopy to bail out at roughly 1,500 feet, the hatch did not completely release and while attempting to push it away Hargesheimer was sucked clear of the plane and opened his parachute and drifted down near the Pandi River and Nakunai Mountains. His aircraft crashed below him and he landed in the same vicinity and burst into flames instantly as the wing tanks were still full. As he descended, the enemy fighter fired at him but missed before landing in trees. Hiding his parachute, the fighter strafed where he landed but again missed. Wandering in the jungle for 31 days alone until he found villagers from Nantabu village who hid him for six months. Later, he was taken to the camp of Australian Coastwatchers who arranged his rescue, along with other American and Australian aviators, from behind enemy lines. After eight months, on 5 February1944, the USS Gato (SS-212) surfaced in Open Bay near Maitanakunai and transported them to Finschafen. From there, he was sent back to the United States.

The other rescued downed (20 June 1943 – two weeks after Hargesheimer) pilot Captain Arthur Post, the unit Commanding Officer, was awarded the Distinguished Service Cross for his courage on that reconnaissance mission being unarmed and unescorted over Rabaul which was the well defended Japanese headquarters of all forces in the South-West Pacific. He was rescued three months later on 28 September by submarine USS Grouper (SS-214). Major Post, Commanding Officer 6th Photo Group, was killed 25 August 1944 test flying a F-5 Lightning at Biak Is (Dutch New Guinea). Also killed in that crash was an aircraft mechanic sitting behind the pilot in a temporary seat.

When possible pilots were rested with leave trips to Brisbane, Sydney and Melbourne. After 90 combat missions they had completed their duty and returned to the US for rest and reassignment. On occasion all of the 8th Photo pilots had completed more than 45 of their combat missions with the unit then needing reinforcements which always meant an intensive training program to get them to operational standards.

On 16 June 1943 the crew of B-17E 41-2666 '*Old 666*' then with 65th Bombardment Squadron but still assigned to mapping photo missions and partly manned with crew from 8th Photo became the most highly decorated US air crew ever while on a lone unescorted mapping photography mission from Port Moresby to Bougainville and Buka, a round trip of about 1,200 miles not including the photography flight line miles. Photo missions by solitary unescorted aircraft to Bougainville by 8th Photo were not unusual but mapping tasks were often thwarted by bad weather and equipment malfunction as what happened the day before with a 8th Photo B-17 mission.

Pilot Captain Jay Zeamer had '*Old 666*' refurbished especially for this type of photographic mission a long way into enemy territory and beyond the reach of fighter escort for a long period. He added three extra 0.5-inch machine guns to the normal thirteen and extra armour. '*Old 666*' was then known to be the most heavily armed bomber in the South-West Pacific. The loss of a B-17 and all on-board over Rabaul on a bombing mission, including Brigadier-General Walker, Commander 5th Bomber Command, on 5 January 1943, may have prompted additional armaments especially for lone unescorted missions.

The mission was to acquire mapping photography of the west coast of Bougainville from the north coast, south past Torokina to Empress Augusta Bay and Point Motupena. Unbeknown to the crew, this was where a US Marine force was to land around Torokina in the invasion of Bougainville in November 1943. Zeamer[10] was requested to fly a reconnaissance run over the Japanese fighter airfield on Buka Island just north of Bougainville before the mapping work, but refused it on the grounds that it would alert the Japanese to their presence there for the high priority mapping mission.

B-17 '*Old 666'* departed Port Moresby arriving over Bougainville to find the weather good but they were 30 minutes early to start the mapping photography such that the sun's elevation meant that valleys were not in shadow from the high mountains in the east. Zeamer asked the crew should they fly around over the horizon for that time or do the Buka task. Unanimously the nine of them agreed to do Buka then the mapping mission. They did of course alert the Buka base and quite by accident photographed (K-18 24-inch) up to 22 fighters taxiing for take-off. What they did not know then was that the Japanese group taking-off had staged from Rabaul through Buka, arriving late the day before, being part of a 94 plane force of dive-bombers and fighters to attack Guadalcanal shipping on 16 June[11]. The B-17 then headed off for the mapping work with a section of those 22 fighters catching up to them when they were still flying straight and level at 25,000 feet taking K-17 6-inch trimetrogon mapping photographs. There are various accounts of what happened but what is true is that they were attacked by at least eight Zeros. The apparent accepted story of the action from crew accounts and a Japanese war diary is:

[10] Zeamer was known to do the unexpected. On an earlier B-17 photo mission to Rabaul he finished his photo run at 20,000 feet then returned to surprise the residents flying at 500 feet across the harbour to strafe the searchlights as bombers were conducting night attacks.

[11] 25 of the Japanese strike force was destroyed at Guadalcanal

The ensuing head-on attack by the first Japanese Zero mortally wounded bombardier 2nd Lieutenant Jon Sarnoski, who struggled back to his machine gun to drive off a second Zero after being blown back from his position by a 20 mm cannon shell from the first Zero. A total of four 20 mm shells destroyed the pilot's side of the instrument panel and broke Zeamer's left leg above and below the knee, leaving a large hole in his left thigh. He was also hit by shrapnel in both arms and his right leg, with a gash in his right wrist. Three others were also wounded, including the navigator and top turret gunner, who responded to an oxygen fire by putting it out with rags and their bare hands.

Due to the loss of oxygen and to escape their attackers, Zeamer dived the B-17 violently from 25,000 feet to approximately 10,000 feet, estimating the altitude by an increase in engine manifold pressure. The Japanese followed them down and commenced a 40 minute series of frontal attack passes as that was the least defended part of the B-17. Despite his wounds, Zeamer avoided any further extensive damage to the plane by repeatedly turning sharply into the oncoming fighters, just inside the trajectory of their fixed fire, a technique he learned while in the 22nd Bombardment Group. By doing so, the Zeros would continue rolling into the bomber without hitting it, but exposing themselves to the B-17's rear machine guns. Eventually, all of the Zeros broke off the attack due either to damage, lack of ammunition, or lack of fuel.

The oxygen and hydraulic systems were destroyed, as well as all of the pilot's flight instruments. The magnetic compass and engine instruments on the co-pilot's side were undamaged, as were all four engines. Too wounded to move and unwilling to give up command of his aircraft, Zeamer instructed the top turret gunner who took over co-piloting[12] duties, allowing the unwounded co-pilot to attend to the wounded. The lack of oxygen, in addition to Zeamer's and the navigator's injuries which needed expert treatment quickly, meant a return to Port Moresby over the Owen Stanley Range was impossible. They headed home with 500 miles to go for an emergency landing at the nearest friendly airfield at the Dobodura complex about 10 miles behind Buna on the north-coast of Papua opposite Port Moresby. Without operable brakes or flaps because of the destroyed hydraulic system, the co-pilot landed then ground-looped the B-17 (spinning it around 180 degrees at the end of the landing) to a stop, without additional damage. The casualties were one killed (Lieutenant Sarnoski) and four wounded. Captain Zeamer was initially thought dead from loss of blood, but he was treated with the other injured aircrew members by the Australian 10th Field Ambulance before being evacuated to Port Moresby the next day.

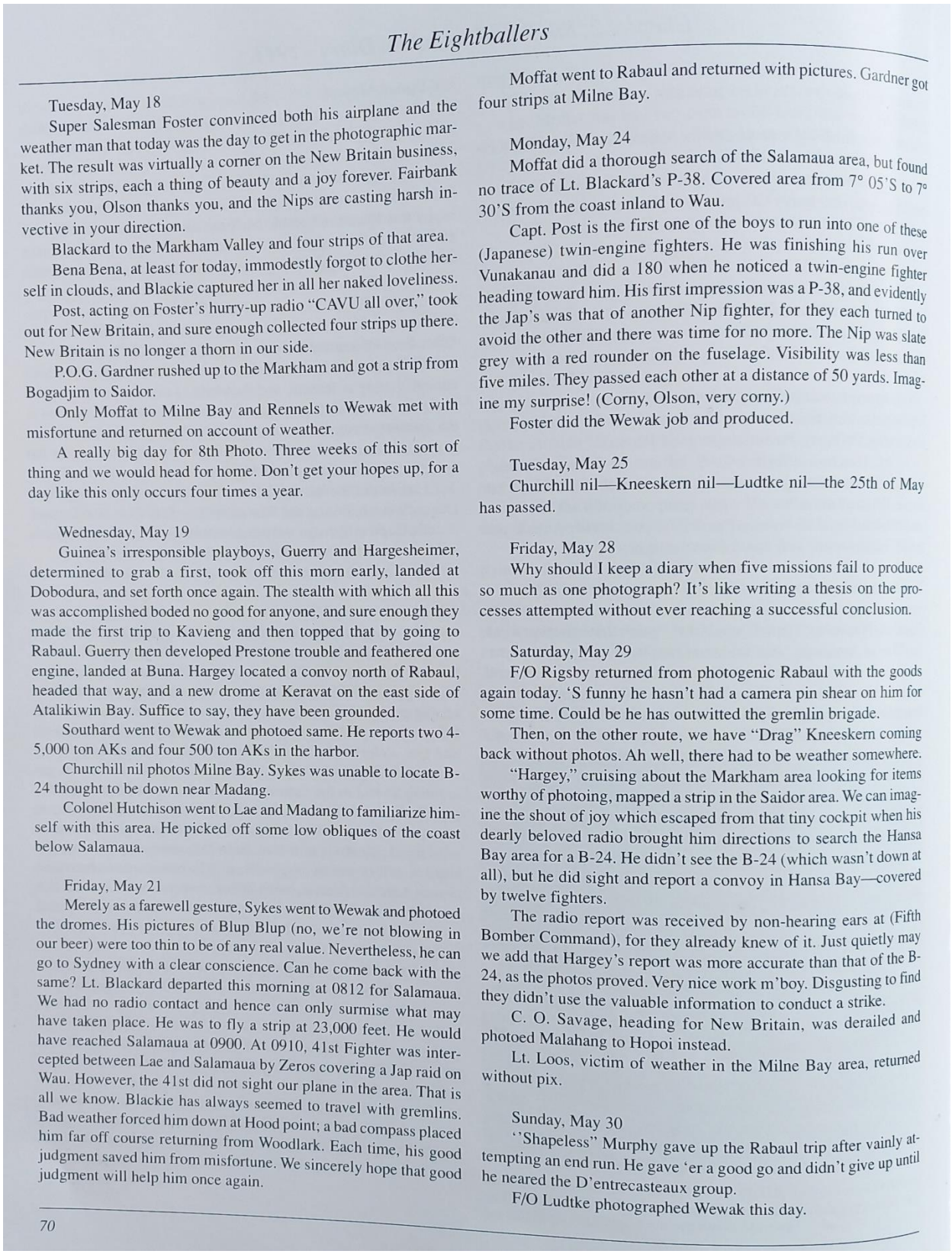
Pilot Captain Zeamer and bombardier Lieutenant Sarnoski were awarded the Medal of Honour (Sarnoski posthumously) and all of the other crew the Distinguished Service Cross.

[12] A report noted that the air gunner acting as co-pilot had failed flight school

'Old 666' had suffered five 20mm cannon hits causing large holes in the nose area and 187 bullet holes.

Figure 17 – the most highly decorated crew in USAAF history from the B-17 mapping photography mission 16 June 1943 over western Bougainville

The original "Eager Beavers". Front (l to r): Sgt. William Vaughan, Sgt. George Kendrick, Sgt. Johnnie Able, Sgt. Herbert Pugh. Back (l to r): Bud Thues, Capt. Jay Zeamer, Hank Dyminski, 2nd Lt. Joe Sarnoski. Just prior to the 16 June 1943 mission, Tech. Sgt. Forrest Dillman was added to the crew, and Lt. John Britton and Lt. Ruby Johnston replaced Dyminski and Thues, who had contracted malaria.



The Eightballers

Tuesday, May 18

Super Salesman Foster convinced both his airplane and the weather man that today was the day to get in the photographic market. The result was virtually a corner on the New Britain business, with six strips, each a thing of beauty and a joy forever. Fairbank thanks you, Olson thanks you, and the Nips are casting harsh invective in your direction.

Blackard to the Markham Valley and four strips of that area.

Bena Bena, at least for today, immodestly forgot to clothe herself in clouds, and Blackie captured her in all her naked loveliness.

Post, acting on Foster's hurry-up radio "CAVU all over," took out for New Britain, and sure enough collected four strips up there. New Britain is no longer a thorn in our side.

P.O.G. Gardner rushed up to the Markham and got a strip from Bogadjim to Saidor.

Only Moffat to Milne Bay and Rennels to Wewak met with misfortune and returned on account of weather.

A really big day for 8th Photo. Three weeks of this sort of thing and we would head for home. Don't get your hopes up, for a day like this only occurs four times a year.

Wednesday, May 19

Guinea's irresponsible playboys, Guerry and Hargesheimer, determined to grab a first, took off this morn early, landed at Dobodura, and set forth once again. The stealth with which all this was accomplished boded no good for anyone, and sure enough they made the first trip to Kavieng and then topped that by going to Rabaul. Guerry then developed Prestone trouble and feathered one engine, landed at Buna. Hargey located a convoy north of Rabaul, headed that way, and a new drome at Keravat on the east side of Atalikiwin Bay. Suffice to say, they have been grounded.

Southard went to Wewak and photoed same. He reports two 4-5,000 ton AKs and four 500 ton AKs in the harbor.

Churchill nil photos Milne Bay. Sykes was unable to locate B-24 thought to be down near Madang.

Colonel Hutchison went to Lae and Madang to familiarize himself with this area. He picked off some low obliques of the coast below Salamaua.

Friday, May 21

Merely as a farewell gesture, Sykes went to Wewak and photoed the dromes. His pictures of Blup Blup (no, we're not blowing in our beer) were too thin to be of any real value. Nevertheless, he can go to Sydney with a clear conscience. Can he come back with the same? Lt. Blackard departed this morning at 0812 for Salamaua. We had no radio contact and hence can only surmise what may have taken place. He was to fly a strip at 23,000 feet. He would have reached Salamaua at 0900. At 0910, 41st Fighter was intercepted between Lae and Salamaua by Zeros covering a Jap raid on Wau. However, the 41st did not sight our plane in the area. That is all we know. Blackie has always seemed to travel with gremlins. Bad weather forced him down at Hood point; a bad compass placed him far off course returning from Woodlark. Each time, his good judgment saved him from misfortune. We sincerely hope that good judgment will help him once again.

Moffat went to Rabaul and returned with pictures. Gardner got four strips at Milne Bay.

Monday, May 24

Moffat did a thorough search of the Salamaua area, but found no trace of Lt. Blackard's P-38. Covered area from 7° 05'S to 7° 30'S from the coast inland to Wau.

Capt. Post is the first one of the boys to run into one of these (Japanese) twin-engine fighters. He was finishing his run over Vunakanau and did a 180 when he noticed a twin-engine fighter heading toward him. His first impression was a P-38, and evidently the Jap's was that of another Nip fighter, for they each turned to avoid the other and there was time for no more. The Nip was slate grey with a red rounder on the fuselage. Visibility was less than five miles. They passed each other at a distance of 50 yards. Imagine my surprise! (Corny, Olson, very corny.)

Foster did the Wewak job and produced.

Tuesday, May 25

Churchill nil—Kneeskern nil—Ludtke nil—the 25th of May has passed.

Friday, May 28

Why should I keep a diary when five missions fail to produce so much as one photograph? It's like writing a thesis on the processes attempted without ever reaching a successful conclusion.

Saturday, May 29

F/O Rigsby returned from photogenic Rabaul with the goods again today. 'S funny he hasn't had a camera pin shear on him for some time. Could be he has outwitted the gremlin brigade.

Then, on the other route, we have "Drag" Kneeskern coming back without photos. Ah well, there had to be weather somewhere.

"Hargey," cruising about the Markham area looking for items worthy of photoing, mapped a strip in the Saidor area. We can imagine the shout of joy which escaped from that tiny cockpit when his dearly beloved radio brought him directions to search the Hansa Bay area for a B-24. He didn't see the B-24 (which wasn't down at all), but he did sight and report a convoy in Hansa Bay—covered by twelve fighters.

The radio report was received by non-hearing ears at (Fifth Bomber Command), for they already knew of it. Just quietly may we add that Hargey's report was more accurate than that of the B-24, as the photos proved. Very nice work m'boy. Disgusting to find they didn't use the valuable information to conduct a strike.

C. O. Savage, heading for New Britain, was derailed and photoed Malahang to Hopoi instead.

Lt. Loos, victim of weather in the Milne Bay area, returned without pix.

Sunday, May 30

''Shapeless" Murphy gave up the Rabaul trip after vainly attempting an end run. He gave 'er a good go and didn't give up until he neared the D'entrecasteaux group.

F/O Ludtke photographed Wewak this day.

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Figure 18 – A page from the 8th Photo Sqn informal diary 1943 – based in Port Moresby at the time

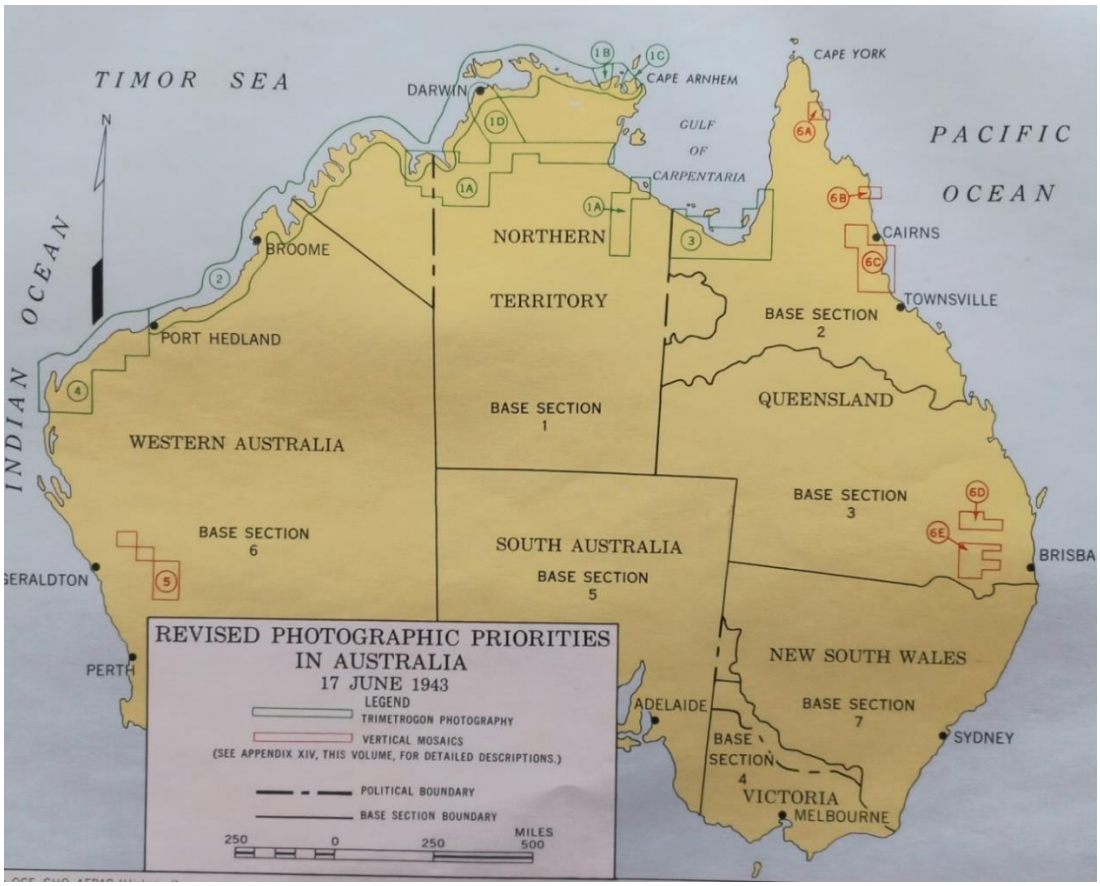

Figure 19 – Continental Australia priorities 17 June 1943 accounting for what had been done in the last year and the Japanese threat at that time

Continental Australian photography For continental Australia, photography fell upon the RAAF to organise. Early in the Pacific war priority photography of continental Australia was flown by the RAAF Survey Flight which was disbanded early-1942. A commercial contract for 20,000 sq miles of vertical mapping photography over two years was then awarded to the company Adastra. Coverage was mainly of SE Queensland, eastern NSW and eastern Victoria. Two civilian aircraft fitted with Eagle IV cameras were used for the contract which terminated early-1944. The northern coastline was the highest priority and much of this mapping photography was flown in 1943 by 18 (Netherlands East Indies) Squadron RAAF equipped with B-25[13] Mitchell bombers fitted with Fairchild K-17 trimetrogon cameras. In 1943, 1 PRU RAAF flew limited K-17 trimetrogon photography of Arnhem Land coastline. 8th Photo flew K-17 trimetrogon mapping photography in Australia from 1942 where otherwise the GHQ directives would not be met and for training on F-4 Lightning and B-17E Flying Fortress.

13 Believed to be the standard bomber B-25C and B-25D and not the F-10/B-25D photographic variant of which 50 were manufactured 1942-1943

Figure 20. After the Allied capture of Gona-Sanananda-Buna in January 1943 the June 1943 highest priorities for mapping photography were still the Papua and New Guinea northern coastline where Japanese forces were concentrated and areas of planned land combat operations in Markham and Ramu Valleys and Salamaua-Wau-Bululo which would be from September 1943.

Photo and Mapping Directives of 17 and 18 June authorised direct liaison between field survey parties, mapping units and photographic units. Variations in scale/flying-height were allowed whenever occasioned by bad weather or enemy activity.

On 7 August 1943 a 8th Photo B-17 flew a mapping mission north up the Markham Valley from Lae. This was to prepare for the Australian offensive to capture Lae. On board was Major-General Vasey, General Officer Commanding 7th Aust Division, Brigadier Eather Commander 25th Aust Infantry Brigade, Colonel Hutchinson Assistant Chief of Staff 5th Air Force and Lieutenant-Colonel Robertson AIF. The mission including low oblique photography of Nadzab aerodrome attracted 'substantial' fighter cover. Then on 5 September, General Vasey flew again with the 8th Photo B-17 to observe US paratroops and Australian artillery troops and guns air dropped into Nadzab before the 25th Aust Infantry Brigade, 7th Aust Division was landed there by US C-47 transports commencing the next day as part of the capture of Lae along with the amphibious landing and assault by the 9th Aust Division from the east.

On 15 August 1943, 75SQN RAAF (Milne Bay) pilots completed training with 8th Photo then accepted two loan F-4 Lightnings, for photo reconnaissance, until December1943.

Having secured Nadzab the photo missions from 15 September from Port Moresby were able to stage through Nadzab to reach to Hollandia in Dutch New Guinea.

On 21 September 1943 a record eight 8th Photo aircraft were in the air on photography missions. Regular 8th Photo F-5 and B-17 photo missions were then to Hollandia, Wewak, Markham Valley, Kavieng and Rabaul although reconnaissance was the majority of tasking.

On 10 October 1943 the longest trip to date in the Theatre by pursuit type aircraft (a single F-5) was 600 miles from Nadzab to Wakde Island (Dutch New Guinea) the next major Japanese held airfield on the north coast 150 miles west of Hollandia.

A week later on 19 October, 8th Photo's own P-38 fighters escorting a F-5 over Rabaul engaged nine Japanese fighters for the first time, with one probable Zero victim. This two plane escort showed that four were needed to ensure protection for the photo plane. For the first time this mission experienced effective anti-aircraft fire at 33,000 feet.

Figure 21. The late-October 1943 photography plan for the mapping program to cover possible operations to July 1944 moving from New Guinea westwards. At that stage strategic options were to advance to the Philippines across the north coast islands or the islands in the Arafura Sea north of Australia west to Java then turn north to Borneo and the Philippines

By early November 1943, New Ireland was still largely photo-unmapped.

On 2 November 1943 an Urgent Directive to 8th Photo originated from US Navy Amphibious Force Seventh Fleet for photography support prior to the US 1st Marine Division landings at

Cape Gloucester, West New Britain area including islands in the Dampier Strait and New Guinea coast opposite. Required was: K-18 24-inch scale 1:10,000 with each photo half-land and half-water; landing beaches no higher than 1,000 feet altitude for K-18 obliques to aid ship-to-shore approaches and K-17 trimetrogon mapping photography at 25,000 ft. Some photography was needed in one week with all to be complete for invasion date 26 December. This essential project required a one month loan from the South Pacific Area units of long-range heavy bombers modified for photography: one B-17 Flying Fortress and three US Navy PB4Y-1 B-24 Liberators (next paragraph). On 7 December, using a borrowed B-26 Marauder, 8th Photo flew low oblique (K-18 24-inch) photography of Cape Gloucester Japanese airfield and planned landing beaches.

From November 1943, 8th Photo was assisted by the US Navy Fleet Air Photographic Squadron One (VD-1) (PB4Y-1 B-24 Liberators) based at Guadalcanal in the South Pacific Area of the Pacific Theatre. A detachment to First Army Air Task Force at Dobodura (New Guinea) flew large-scale vertical mapping photography for the US Navy and US Army invasion of the Admiralty Islands in February 1944. The US Base Map Plant produced the 1:20,000 combat topographic maps and photomaps in December 1943. The standard Navy mapping camera was the Fairchild metrogon K-17. For some areas of Admiralty Islands, 8th Photo trimetrogon was also used.

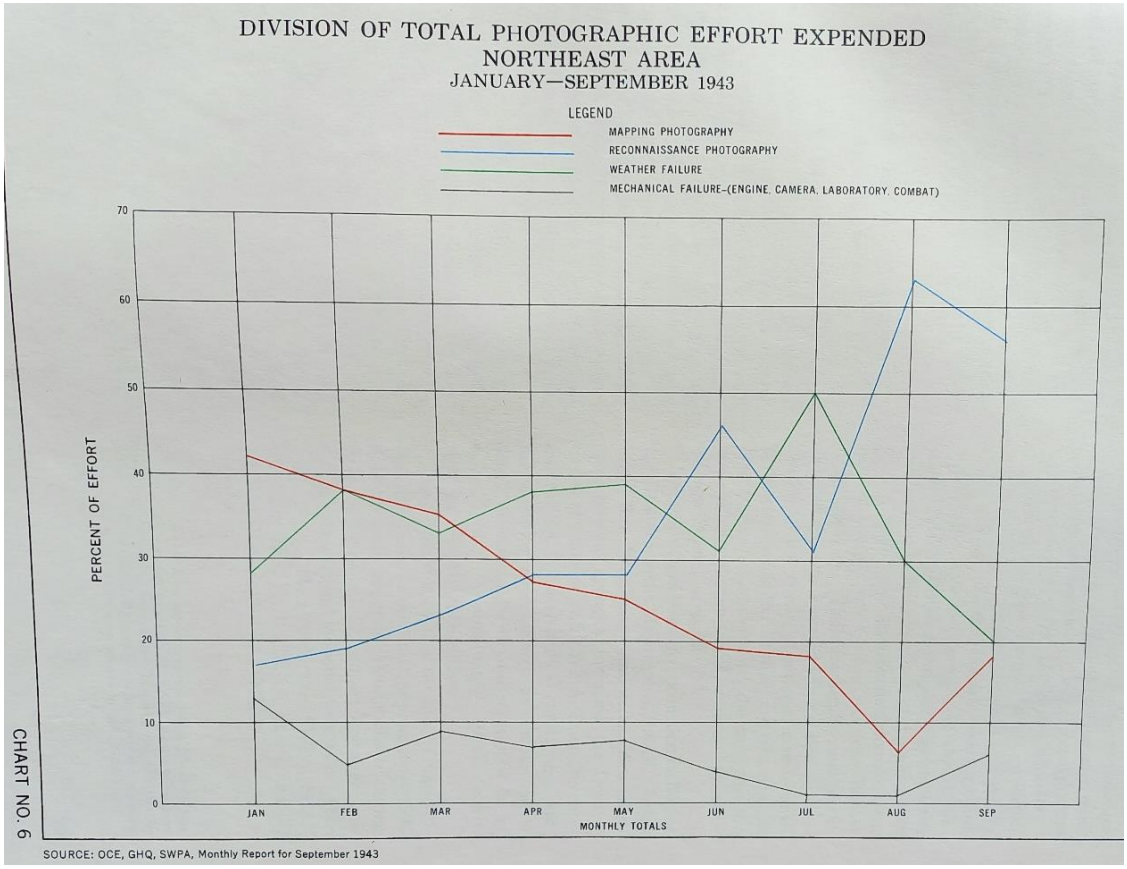

Figure 22. Weather and mechanical failures hindered all photo missions

The US Navy B-24 Liberators also photographed Bougainville for ground forces there. Late November 1943 a unit forward echelon at the Torokina fighter airstrip included a film processor so that the exposed film could be air dropped for film developing and paper prints

to be with the forward troops quickly. If the airspace was uncontested a successful method for the Navy was one aircraft flying vertical photography at 20,000 feet and a second aircraft flying oblique photography at 7,000 feet at the same time as the high altitude verticals.

On 26 December 1943, 8th Photo's B-17E Flying Fortress '*RFD Tojo'* 41-2627 of 8th Photo, piloted by the Colonel Group Commander crashed taking off in thick fog from Port Moresby to observe the US 1st Marine Division landings at Cape Gloucester, New Britain. Two died in the crash, two died the following day and all other 12 on board suffered burns from fire which destroyed the plane (see Figure 10).

For 1942-1943, 8th Photo was 'the eyes' of the 5th Air Force covering New Guinea. This changed on 5 December when the unit came under command of the new 6th Photographic Group promised by Commander Allied Air Forces six months before. Two light squadrons (25th and 26th Photo Reconnaissance, both F-5) and the 20th Combat Mapping Squadron (F-7 B-24 Liberator) would increase the force to 44 US photography aircraft in the SWPA theatre compared with only four, 20 months earlier. But it was not until April 1944 that all of the new units were in SWPA and operational. The F-7 B-24 Liberator was heavily armed like its B-17 predecessor with 13 0.5inch machine guns.

Total trimetrogon mapping photography for 1943 'the year of progress' for 8th Photo was: 513 missions flown for 22,000 flight line miles. A huge and very significant achievement for a small unit barely able to keep three aircraft in the air each day. This photography was adequate for the mapping program to April 1944 (Figure 23).

Figure 23. Total acceptable K-17 trimetrogon mapping photography for 1943

1944

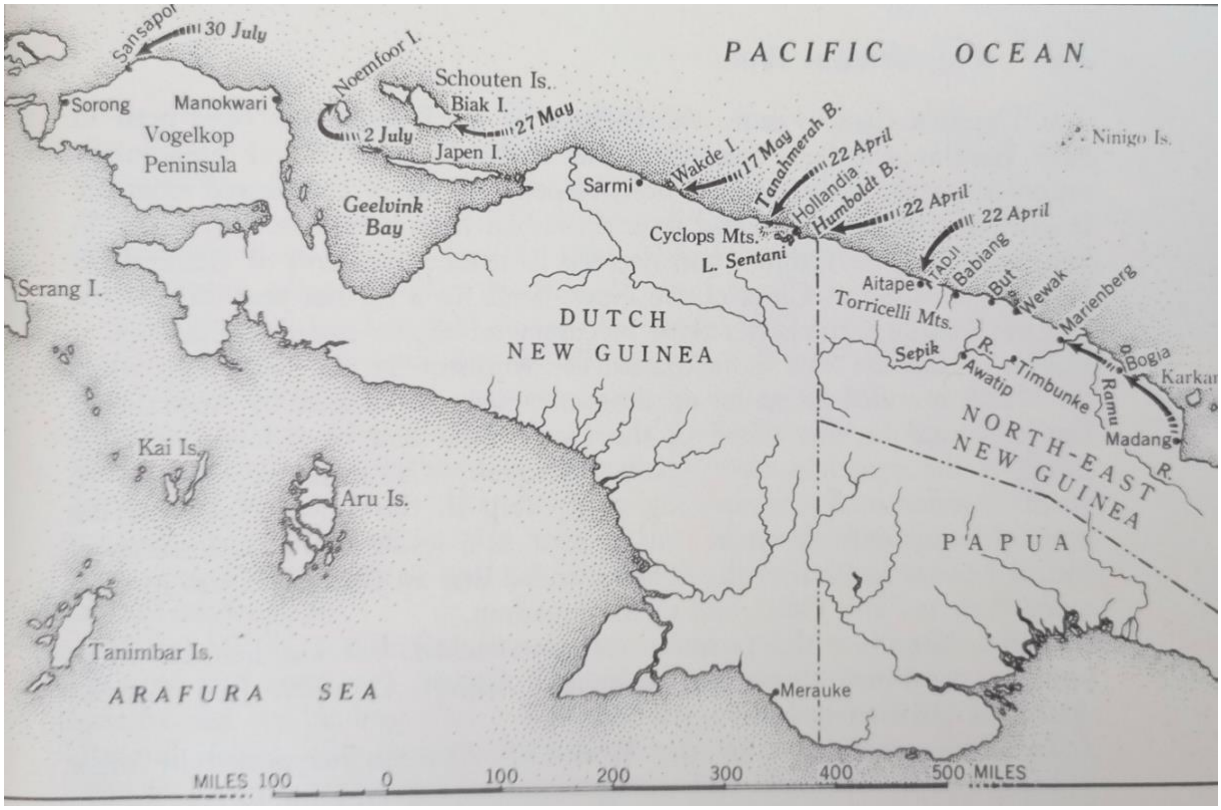

Figure 24. 1944 advances by Australian forces from Madang to Wewak and US landings at Aitape, Hollandia, Wakde Is, Biak Is, Noemfoor Is, Sansapor

The changes in photographic priorities of 18 January 1944 (Figure 25), 11 April (Figure 27) and 31 May (Figure 28) show the rapid changes in operational planning and tempo. With the Hollandia invasion to take place on 22 April, the changed photo priorities reflect the US Joint Chiefs of Staff decision to advance on the Philippines by a northern island hopping campaign rather than the southern route through Java then north through Borneo. On 12 April the US Joint Chiefs of Staff directed that mapping materials were to be prepared to cover Japan and its approaches. This Directive (JCS 756/2) included tasking in addition to the photo and mapping needs for each operation to capture the Japanese airfields along the way.

8th Photo remained in Port Moresby through late-1943 advancing to Nadzab 16 March 1944, to Biak (Dutch New Guinea) from 11 August 1944 to be able to reach as far as Morotai (Netherlands East Indies) which was half-way between Biak and the Philippines and to Dulag, Leyte (Philippines) to be operational there 26 November 1944.

A Directive of 28 April 1944, originating from the US War Department, required that the mapping Engineer Liaison Officers with the photo units in the Theatre were to choose the film original negatives for mapping which were to be 'safe-handed' to be at the 648th Engr Topo Bn BMP within 48 hours for Multiplex diapositive printing for map compilation there or to be despatched to the Army Map Service, Washington DC. Duplicate negatives and prints were to be made before despatch from the photo unit without delaying the despatch.

In seven weeks January-March 1944, 25th Photo Sqn (F-5B) lost three aircraft and pilots on missions from Nadzab to Tadji near Aitape (New Guinea). A year later on 29 May 1945, F-5E 44-24953 aircraft and pilot were lost on a mission from Leyte (Philippines) to French Indo-China (Vietnam).

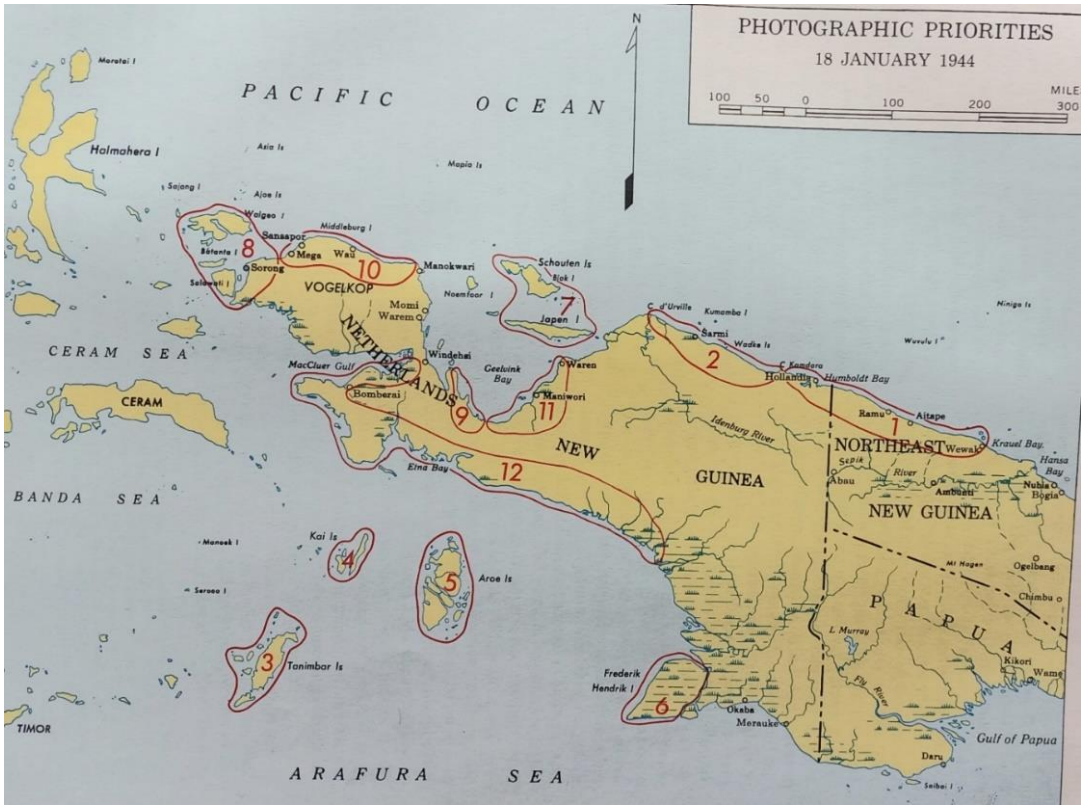

Figure 25. 18 January 1944 - Priority 1 and 2 areas were to cover planned landings at Aitape and Hollandia (22 April) and Wakde Is (17 May). At that stage the strategic axis of advance to the Philippines had not been decided

Mapping photo missions (K-17 trimetrogon and K-18) for 18 January 1944 Priority Areas 3, 4, 5, 6 (Figure 25) were commenced by 1 PRU RAAF (F-4 Lightning) and US 380th Bombardment Group (F-7 B-24 Liberator) from the Northern Territory in July 1943. In September, 1 PRU was redesignated 87 Squadron (Photo Reconnaissance) and equipped with Mosquito aircraft. Reconnaissance missions were over Java, Balikpapan (Borneo), Biak, Halmaheras and the Philippines. In June 1945 a detachment was briefly based on Cocos Islands where it tried unsuccessfully to photograph targets in Singapore, being hampered by bad weather and the loss of an aircraft.

On 22 May 1944, F-7A 42-73052 '*Under Exposed'* of 20th Combat Mapping Squadron departed Nadzab at 0400hrs as part of a three F-7 flight to fly mapping photography of the small islands south-east off the coast of Biak. This was only five days before the US amphibious landings on Biak Island at Bosnek Beach east of Mokmer Airfield. The Liberator was seen circling to gain altitude before heading north-west and then crashed near the peak of Mt Wilhelm (the highest mountain in Papua and New Guinea) about 135 miles north-west of Nadzab. All 11 crew were killed in the crash. The two other F-7 had not heard from *Under*

Exposed and a unit search found the wreckage. The unit Intelligence Officer led a walk into the crash site to recover the bodies. The unit moved to Biak, Mokmer Airfield, 7 August – 3 September 1944 to be able to reach as far as the Philippines.

Figure 26. The 20th Combat Mapping Squadron military funeral service at Nadzab for the 11 men killed when F-7A 42-73052 *'Under Exposed' crashed on 22 May 1944 near the peak of Mt Wilhelm*

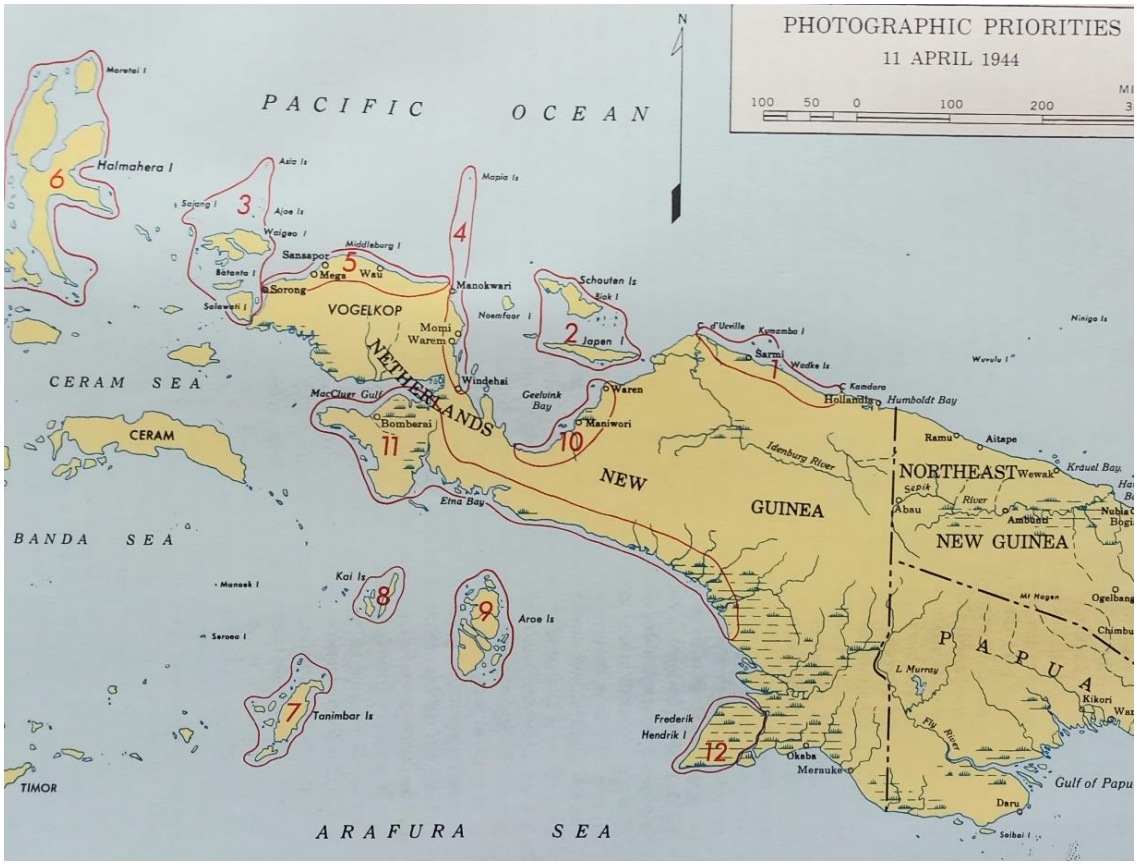

Figure 27. Photo priorities 11 days prior to the successful landings at Hollandia on 22 April. The decision to advance to the Philippines via the northern islands had been made.

Figure 28. Photographic priorities after the US landings on Biak Is (near the 'N' in 'OCEAN') on 27 May

The additional photographic aircraft and units available in early-1944 did not necessarily mean that the rate of flying suitable mapping photography, more than what 8th Photo had done by themselves in 1942-1943, was available to support all planned operations. Much of the mapping photography required in the directives did not meet standards when it was flown, was late or was not acquired at all. Adverse weather was always a big factor but the importance of mapping photography for operational planning and for intensive combat operations, especially as operational tempo was increasing in the advance on Japan from SWPA and the Pacific Ocean Area. The amount of mapping photography acquired in May 1944 was significantly less than that in May 1943 (May 1943 – 9 aircraft, 38 missions, 3300 flight line miles; May 1944 – 44 aircraft, 25 missions, 2300 flight line miles). This was obviously unsatisfactory.

General MacArthur's GHQ Chief of Staff Lieutenant-General RK Sutherland US Army brought this personally to the attention of Lieutenant-General GC Kenney US Army, Commander Allied Air Forces (SWPA), in a long "*Memorandum on Adequacy of Mapping Photography on 1 June 1944*", with examples of technical deficiencies which were common across the new units. The key concerns raised were: camera and intervalometer maintenance, malfunctioning navigation equipment, planned flight lines not followed although not troubled by weather or enemy action, flight lines were often not straight, cameras were sometimes

switched off before the end of the lines, at times there were excessive flying height differences on the lines, cameras and mounting frames not installed correctly, first time trimetrogon coverage not always flown if weather was clear – all film was to be exposed, photographic pilot visits to BMP in Melbourne were high value and were to be programmed allowing pilots to discuss with the map makers the relationships between the mapping photography and the mapping processes. The memorandum signed by General Sutherland himself ends:

> *"A new directive is being issued. I suggest that you lend some of your own drive toward the accomplishment of the program."*

Such was the critical nature of mapping photography to the success of the campaigns in the South-West Pacific. This memorandum did have the immediate effect of improved quality and quantity of mapping photography. In June there were 30 mapping missions and 4,125 flight line miles with 80 percent of photography useable. Much improvement came from experience. In addition, a senior officer with long experience in photography and mapping was appointed as Inspector within the 6th Photo Group to address and maintain all of the matters raised by Chief of Staff GHQ SWPA.

August 1944 saw for the first time mapping missions exceeding reconnaissance missions with 88 mapping missions capturing 8,945 flight line miles (Figure 34).

By the end of August 1944 practically all of the operational areas of New Guinea had been photographed for mapping. But photography was needed to update mapping in support of operations in Aitape-Wewak, New Britain, Bougainville.

Maps produced from K-17 trimetrogon and K-18 photography for US amphibious forces to land at Morotai (Moluccas) on 15 September 1944 were in the Theatre for issue by 5 September (19 x 1:20,000 maps and 1:20,000 photomaps and 7 x 1:63,360 maps). Morotai was first mentioned in photo priorities in the Directive of 11 April 1944 and within reach of the long-range F-7s late-April with the capture of Hollandia. K-17 trimetrogon and K-18 vertical was flown in July and August. This demonstrated that map production and distribution could be compacted to a few weeks. The Terrain Handbook 30 (essential for operational planning) published 19 August 1944 by Allied Geographic Section, GHQ, SWPA used photography as late as 8 August 1944.

A raid by a Pacific naval force around Leyte, Philippines in early-September 1944 led to a conclusion of hitherto unsuspected enemy weakness in the Leyte area. The US Joint Chiefs of Staff then decided to change the strategy from invading Mindanao first, to be Leyte first, and to be brought forward from 20 December to 20 October. This placed an unprecedented burden on photography and mapping organisations. The date for issue of maps to the combat force was then 5 October with a compacted photography, map production and distribution pipeline of only 40 days. Weather was bad for photography and the US Navy asked photographic aircraft to stay out of the way as Pacific force carrier based aircraft strikes were starting to soften up the Leyte areas. The first pictures of Leyte were by US Navy carrier aircraft on 12 September but were not mapping quality. There was insufficient time to produce new maps and so existing US Coast and Geodetic Survey maps at scale 1:200,000

and 1:25,000 were used with updates from photography where possible. *'But somehow the troops had maps when they landed although being best described as barely adequate'.*

On 30 September 1944, F-7B B-24 Liberator 44-40422 of 20th Combat Mapping Squadron departed Biak (Mokmer airfield), for a mapping photography mission to Leyte, Philippines. Returning to Biak from Leyte the plane had to avoid severe bad weather and disappeared without trace after being airborne for 11 hours. There were 11 crew members. The official record is that it was lost over the sea. Investigations as recent as 2015, and believed to be ongoing by family of crew members, lend probable evidence that it crashed near Sarmi on the Dutch New Guinea mainland near Wakde Island and that at least three of the crew were captured by the Japanese and executed for which one officer was tried by US Forces for war crimes and executed in Manila in 1947.

Mapping for the Leyte campaign was the largest program for the year. At the same time the JCS 756/2 required complete K-17 trimetrogon coverage of the entire Philippines.

As the year ended, maps from photography were ready for US 6th Army as it prepared for landings at Lingayen Gulf, Luzon, Philippines on 9 January 1945.

Station	6th HQ	8th	20th	25th	26th	36th
Melbourne, Aus		4/42				
Sydney, Aus	10/43		10/43 G	11/43	11/43	
Brisbane, Aus	11/43	4/42	11/43 G	11/43	11/43	
Townsville, Aus		5/42				
Dobodura, NG					1/44	
Pt. Moresby, NG	12/43	9/42	12/43 G		2/44 D	
Lae, NG				2/44		
Finschhafen, NG					2/44	
Nadzab, NG	2/44	3/44	2/44 G 3/44 A	2/44	3/44	
Hollandia, NG					6/44 A 7/44	12/44
Biak Island	8/44	10/44	8/44	7/44	8/44	12/44
Dulag, Leyte	11/44	11/44	11/44 G	11/44 *		
Tacloban, Leyte			1/45 A1			
San Jose, Mindoro			2/45 A2	1/45		
Lingayen, Luzon					1/45	
Clark Field, Luzon	5/45	5/45 A	5/45	6/45 A	7/45 A	4/45 **
Okinawa	7/45	7/45	8/45	7/45	8/45	8/45

A = Air echelon
A1 = Air echelon, primary location
A2 = Air echelon, secondary location
D = Detachment
G = Ground echelon
* = Detachment remained until 2/45
** = Air echelon remained until 9/45

Figure 29. Units of 6th Photographic Group, 5th Air Force, from Jan 1944 – arrival dates (mm/yy) at bases

Not included in the table (Figure 29) are the photo units not a part of 6th Photographic Group: 2nd Photographic Charting Sqn (F-7), 4th Photographic Charting Sqn (F-7), 17th Photographic

Reconnaissance Sqn (F-5), 3rd Photographic Squadron (F-13 B-29 Superfortress) (Twentieth Air Force)

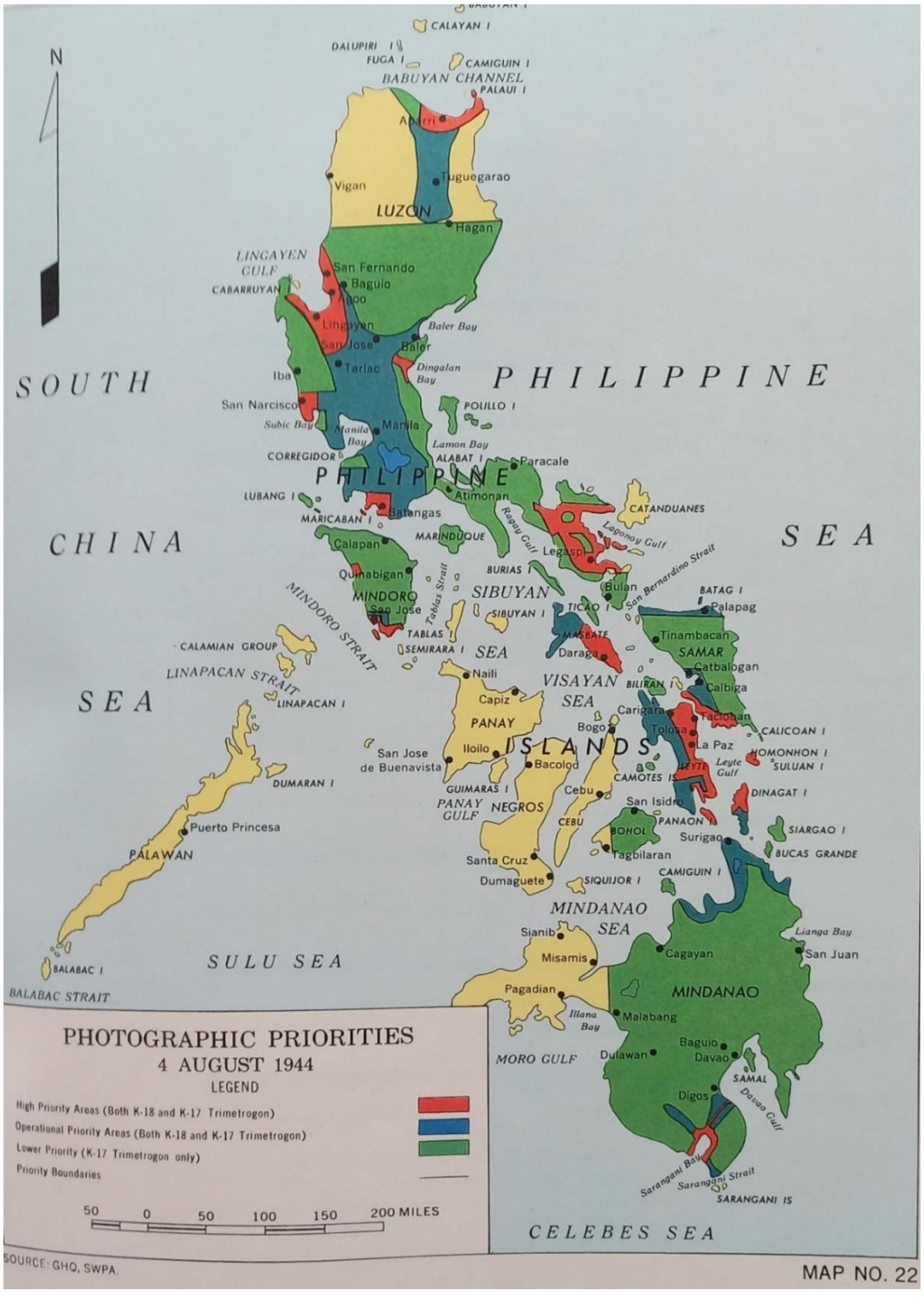

Figure 30. Photo priorities for the Philippines invasions plans before the mid-September decision to change the first attack from Mindanao Is in the south to Leyte Is in the middle with D-Day brought forward two months to 20 October

On 14 August 1944 the 20th Combat Mapping Squadron F-7A B-24 Liberator 42-64047 "*Patched Up Piece*" was returning to Biak from a mapping mission to Morotai when two

engines failed. The navigator found on the latest air chart that a fighter airfield on Middleburg Island, off Sansapor (US landings 31 July 1944) on the north-west corner of Dutch New Guinea mainland was under construction. They arrived overhead to find airfield construction equipment on the runway. After firing a red flare the ground equipment was moved and the pilot landed 15 feet from the end of the airfield and stopped safely in the 1,800 feet so far completed. There the 20 year old 2nd Lieutenant pilot found that they had 'upstarted' a General who was meant to land the first plane there when the airfield was finished. A fighter had landed to test the airfield before a fighter squadron was to start arriving the next day. The Liberator's engines were fixed but had to wait three days for more airfield work to be completed before they could take off safely but couldn't get out quick enough before the General arrived.

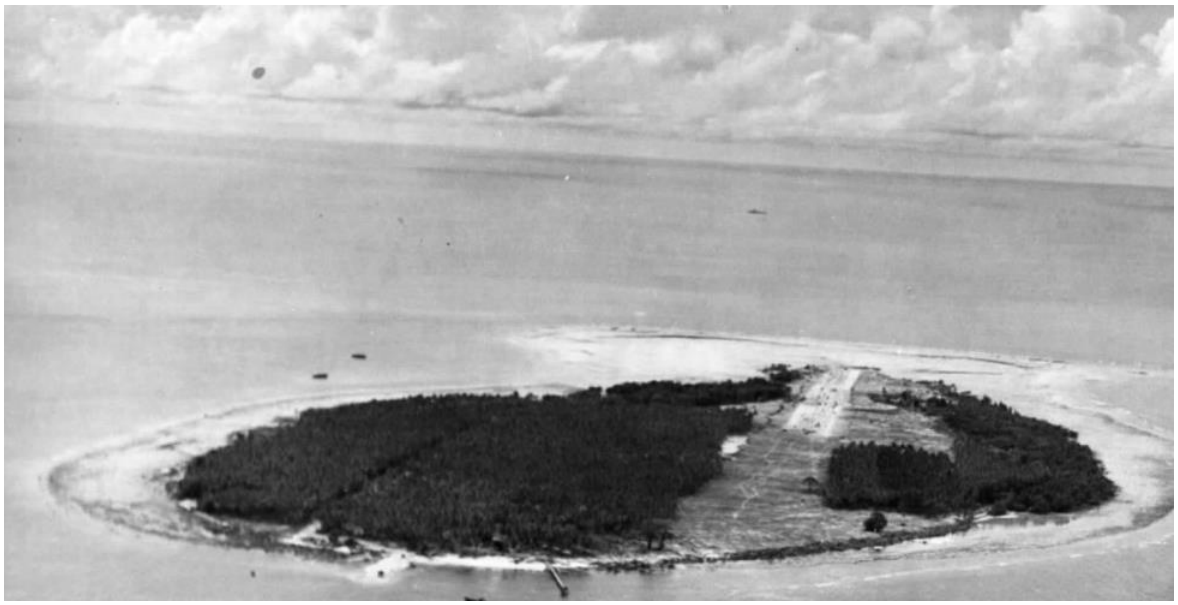

Figure 31. Middleburg Island, off Sansapor, Dutch New Guinea, August 1944, at the time of the emergency landing of the 20th Combat Mapping Sqn F-7A B-24 Liberator. This oblique photo may have been taken by the Liberator before it landed.

Figure 32. The unexpected emergency arrival of the 20th Combat Mapping Sqn Liberator at Middleburg Island fighter airfield drew a large crowd.

Figure 33. Photo priorities of 13 October 1944 noting that photos and maps for the invasion of Leyte Is on 20 October were complete

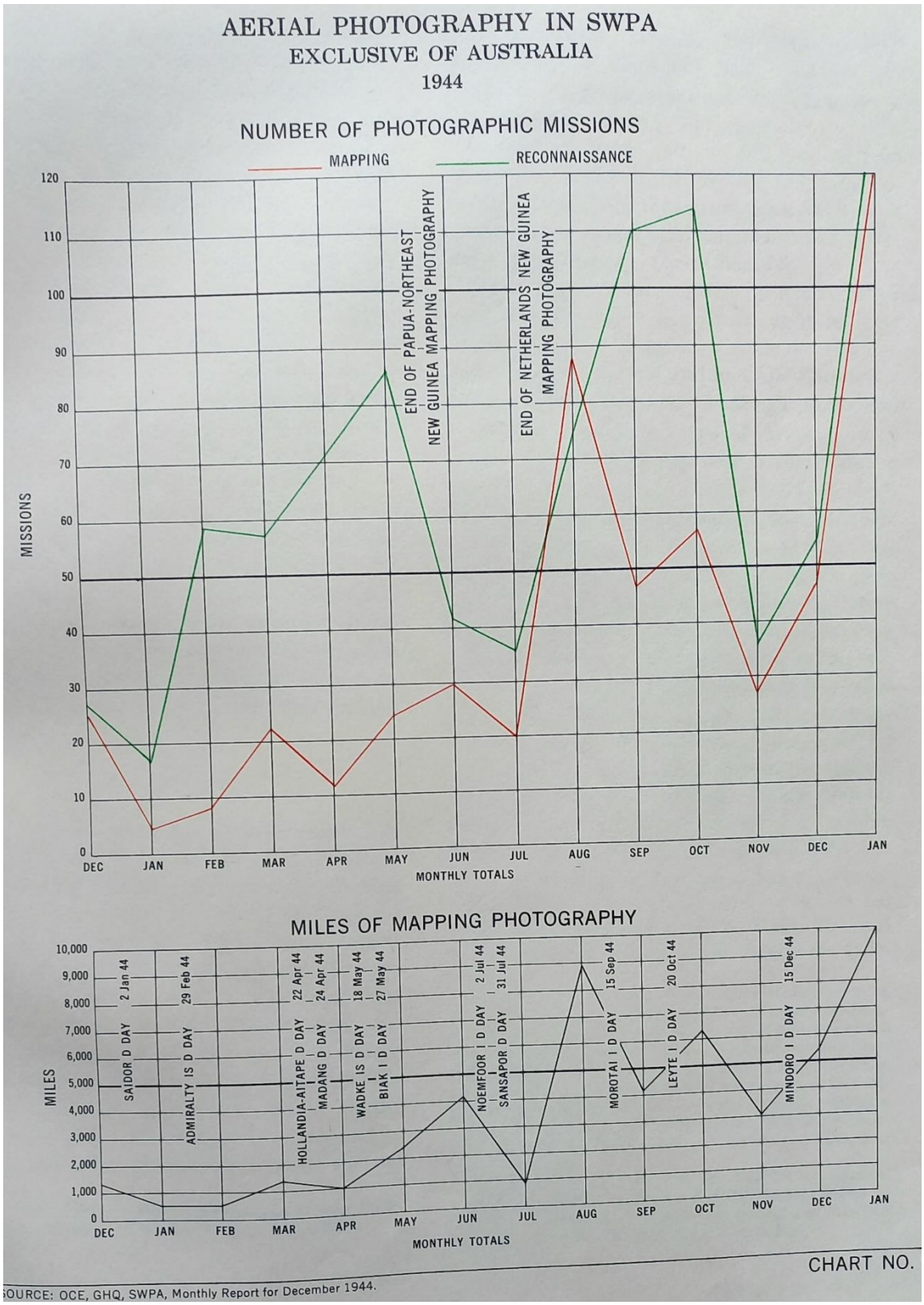

Figure 34. 1944 mapping photography achievements much improved from July

The total mapping photography for 1944 was 388 missions for 38,000 flight line miles. More than 70,000 mapping negatives and 350,000 prints of all types were delivered to mapping units.

1945

As the Allied offensive might drew closer to Japan the demand for aerial photography grew significantly. In SWPA, tasking covered parts of the entire area except continental Australia. Early in the year the focus was on the Philippines but photo squadrons were widespread based at Darwin (Det 4th Photo Charting Sqn – Long Range), Nadzab, Hollandia, Biak, Sansapor and Morotai.

On 11 January 1945, F-7B 44-40961 of 20th Combat Mapping Squadron was lost without trace on a mission from Morotai to Luzon, Philippines. There were 11 crew members lost.

By early-January there were six squadrons of photo aircraft either based in the Philippines or capable of reaching over the entire country. On 14 January, a detachment of 8th Photo established itself on Mindoro Island south of Manila (Philippines) to extend range to China, Indo-China (Vietnam) and Formosa (Taiwan). Mapping photography missions covered the landings on Luzon Island (Philippines). By May they were based at Clark Field, Luzon with an operational range including Borneo in the south to the southernmost parts of Japan itself. 8th Photo moved to Okinawa on 15 July after the horrendous victory there to photograph the main islands Honshu, Kyushu and Shukuku, Japan. A month after the end of the war they moved to Chofu, Japan where they remained as part of the Occupation Force. During the Korean War 8th Photo operated from Japan and Korea extending its record of service into an entirely new era.

In January 1945 there were 120 mapping missions with 10,000 flight line miles. By the end of February, 90 percent of K-17 photography covered Luzon, Visayas and Palawan. Borneo photo priorities being future combat areas, were photographed with oblique and vertical cameras in February but there was more to be done.

The mapping photography priorities in the directive of 8 February 1945 (Figure 34) brought together a picture of the combined detailed mapping photo requirements of the SWPA and the Pacific Ocean Area (POA) including the invasion of homeland Japan. At that stage, most of the SWPA photo squadrons were based at Leyte, Philippines.

In March, 4th Photographic Mapping and Charting Sqn (F-7B B-24 Liberator) moved to Mindanao, Philippines, to contribute to the planned priority operational areas in Borneo. April 1945 had 125 mapping missions producing 13,500 flight line miles with 98 percent of the Philippines requirements complete. Effort improved in May to produce 148 mapping missions achieving 14,500 flight line miles with K-17 trimetrogon coverage of Netherlands East Indies then virtually complete.

The last major land offensives (Operations OBOE) of the war were in Borneo at Tarakan (May-June), Brunei Bay (Labuan) (June-July) and Balikpapan (July) all amphibious operations landing the 7th and 9th Australian Divisions of the 1st Australian Army, 1st Australian Corps with US and Australian naval and air forces. The mapping materials were prepared by Australian Survey Corps units under direction of Director of Survey LHQ and Assistant Director (AD) Survey HQ 1st Aust Corps who later reported that the Corps General Staff believed that all of the mapping for those three successful operations '*were the best operational maps produced by the Aust Svy Corps during the war'*. Underlying the currency, detail and intelligence of the map information was the photography from 14 missions from

October 1944 to May 1945 by 2nd Photo Charting Sqn, 4th Photo Charting Sqn, 17th Photo Reconnaissance Sqn, 25th Photo Reconnaissance Sqn and 24th Bomber Squadron. AD Survey 1st Aust Corps (Major BP Lambert) noted '*In general, extensive last minute large scale photo coverage was provided for interpretation by GS Int. The finer detail for the 1:25,000 maps was obtained from these photos. When further large scale photography was required coverage of particular areas was requested through G Air and promptly supplied*.'

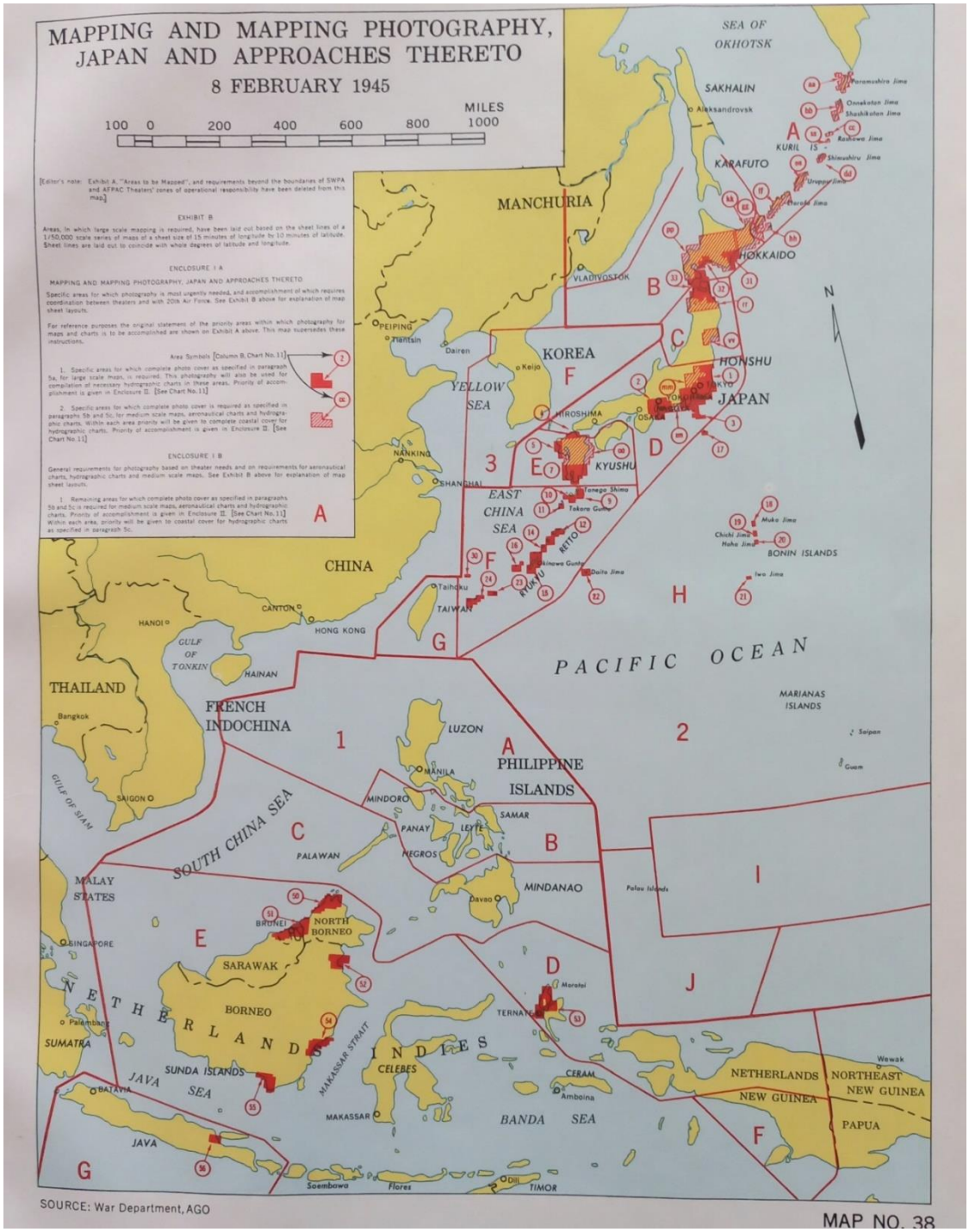

Figure 35. SWPA priorities (area 1 bounded by the thicker red line) and Pacific Ocean Area priorities (area 2)

As General MacArthur's SWPA and Admiral Nimitz's POA forces converged on Japan, the combined Army Forces in the Pacific (AFPAC) was formed in April 1945 and General MacArthur appointed the Commander-in-Chief. The combined photographic force was fourteen squadrons, including the F-13 B-29 Superfortresses of 20th Air Force which was not part of AFPAC:

- Four USAAF squadrons of F-7 B-24 Liberator (long range)
- Seven USAAF squadrons of F-5 P-38 Lightning
- One USAAF squadron of F-13 B-29 Superfortress (very long range) (20th Air Force)
- Two US Navy squadrons of F-7F B-24 Liberator equivalents (US Pacific Fleet)
- US Navy carrier based aircraft (US Pacific Fleet)

This does not include 87 Squadron (Photo Reconnaissance) RAAF (redesignated 1 PRU) or B-24 Liberator bomber units capable of air photography.

Poor coordination and overlap of responsibility between all of the photography and mapping organisations was soon evident and a new Air Section was created in the Office of Chief Engineer, GHQ, AFPAC to coordinate everything. This responsibility fell on Major-General Casey who had coordinated photography and mapping in SWPA.

By the end of May 1945 outstanding photographic coverages of required areas included:

- All operational requirements in the Philippines
- Trimetrogon of the Moluccas, Celebes, and Lesser Sundas with some verticals
- Trimetrogon of Dutch New Guinea
- Trimetrogon of Borneo
- Extensive vertical of actual and planned operations of Borneo
- Partial trimetrogon with supporting 24-inch and 10-inch vertical of Java
- Ongoing and lower priority of Formosa, Hainan, near coast of China and French Indo-China
- Ongoing Japan and Korea

On 6 September 1945, four days after the Japanese unconditional surrender, two 20th Combat Mapping Mission F-7B B-24 Liberators based on Okinawa were over Honshu, Japan engaged on a photo mission. Their mission included photo reconnaissance of a fighter base where there were about 60 war-weary aircraft. One of the F-7Bs developed an engine problem which required it to be shut down and soon after a second engine failure followed the first. A 900-mile trip home on two engines was judged more than risky so the pilot elected to return to his photo target and land. Beyond alarming the inhabitants, the landing was uneventful until the craft turned onto a taxiway and its right main wheel went through the concrete (Figure 36). They were unable to move it. The second F-7B landed safely but stayed on the runway.

The intruders were met by the Japanese base commander who offered his sword in a gesture of surrender, having anticipated a full scale invasion. The war was over, but no occupation troops had yet landed in the area. Some uneasy first moments passed, communication was established, and things settled down. Having assured the safety of the

crew, and after removal of a few sensitive devices including the Norden bombsight, the second F-7B departed for Okinawa.

The Japanese brought the crew food, chairs, a wind-up phonograph, and Bing Crosby records to entertain themselves.

Figure 36. A Japanese airman guarding the 20th Combat Mapping Squadron F-7B after an emergency landing at a fighter base on Honshu Island, Japan, 6 September 1945 – four days after the unconditional surrender.

Figure 37. The stranded F-7B on Honshu Is Japan destroyed by fire after being deliberately strafed by P-38 Lightning fighters. The crew approach the Catalina with souvenirs from their Japanese hosts.

A few days later a Catalina arrived to pick-up the crew, escorted by eight P-38 Lightning fighters which destroyed the F-7B in-situ (Figure 37).

At the end of the war 710 mapping missions covering 80,000 flight line miles had been flown by all units in 1945. This was in addition to 1,300 reconnaissance missions.

At war's end

So ended a period of just over three years of a tremendous mapping photography endeavour for topographic mapping, engineer intelligence and geographic reports for ground combat operations in the most challenging wartime conditions of a determined and aggressive enemy, high mountainous jungle covered terrain much of it unmapped or portrayed only on rudimentary maps and sketches of the day, some of the worst and most unpredictable weather in the world for flying and photography and maintenance of equipment in difficult tropical conditions.

As the war ended, one of the largest air photography armadas ever gathered was ready for the next phase of photography missions for mapping for Operation Downfall being the invasion of homeland Japan planned to commence 1 November 1945 (Operation Olympic – Kyushu) and about March 1946 (Operation Coronet – Honshu near Tokyo). Some of those photography missions had already happened when Japan unconditionally surrendered on 2 September.

In all, more than 1,676 mapping missions flying 162,000 flight line miles had been flown by the air photo squadrons in SWPA from April 1942 to September 1945.

But there was still air photography needed for post-war tasks in SWPA such as monitoring Japanese forces in areas not yet controlled by the Allies, civil reconstruction and preparing to hand occupied areas back to civil administration.

This story is about the air photography in General MacArthur's South-West Pacific Area of the Pacific Theatre so it is now time to finish as the war to Japan was not part of SWPA.

After the war

A month after the end of the war, the US War Department published the Post Hostilities Mapping Plan covering Japan, with work to be undertaken by the Occupation Force. As the period of that Force was unknown it was assumed that the program should be complete within three years and the prerequisite air photography complete within two years. With all of the post-war unit deactivation and personnel demobilisation this new program would not be able to start for another six months. General MacArthur's Commander Far East Air Forces was made responsible for aerial photography over the entire Far East Area amounting to 3.8 million square miles of trimetrogon photography for aeronautical charts, 2.4 million square miles of vertical photography for larger scale mapping of population centres, essential national infrastructures, key lines of communications, areas of economic development etc and ground control for all of that mapping. By comparison Australia is 2.97 million square miles in area.

As military capabilities continued to evolve, especially to very long-distance missile system and national and international policies and strategies developed, the US moved to a state of 'measuring and mapping the world'. US Air Force established the 1370th Photographic Mapping Wing in 1954 with sole responsibility for the Air Force's global precision photo-

mapping and aerial electronic surveying for the next 20 years, until the Defense Mapping Agency was formed in 1973.

The 1370th Wing conducted the South-West Pacific Survey Project AF 60-13 HIRAN (High frequency Ranging and Navigation) trilateration geodetic survey (1962-1965) connecting the Australian Geodetic Survey including through Territory of Papua and New Guinea to the world geodetic system in the mid-Pacific. The US Navy also had global air photography requirements conducting a series of South-West Pacific operations (SOUTHPAW) 1962-1973, sometimes based in Townsville.

Conclusion

The challenges and frustrations of flying mapping photography, over enemy held territory and exposed to hostile enemy activity, of jungle covered mountainous terrain in some of the most unpredictable and difficult weather in the world were overcome by the photographic units of the Allied Air Forces of the South-West Pacific Area to do what Major-General Casey, US Army, Chief Engineer, GHQ SWPA, said at the end of the war '*it was the aerial photographers who truly made a vast contribution to the combat effectiveness of Allied forces'*. Special mention is the pioneer service of all who served in 8th Photographic Reconnaissance Squadron, USAAF, who set the standards for this most difficult task especially given meagre resources to start with.

The roll of honour of the sacrifice of more than 77 men who lost their lives in this essential endeavour must be commemorated – LEST WE FORGET.

Epilogue

The practices pioneered by 8th Photographic Reconnaissance Squadron for flying mapping photography in New Guinea 1942-1943 were very similar to those adopted by the Royal Australian Survey Corps (RA Svy) and No. 2 Squadron (Canberra) RAAF on Operations Skai Piksa (Papua New Guinea) 1973-1975 and Operation Cenderawasih (Irian Jaya) 1976-1981. The 8th Photo F-4 Lightning and the Canberra operations were similar with the exception that the Canberras did not have to worry about an enemy intent on destroying them: weather and cloud cover a major impediment, fast to transit quickly, capable of high altitude photography, long-range, no external navigation aids and small crew. RA Svy detachments for photo quality control worked with the No. 2 Squadron RAAF detachments of normally two aircraft. The book *Highest Traditions – The History of No. 2 Squadron RAAF, Chapter 27 – Bird of Paradise* notes that *'Patience is still the main virtue required of our survey teams anywhere, but an extra-large serving is required in Irian Jaya'*.