THE FOUNDATIONS OF VICTORY:
THE PACIFIC WAR
1943-1944

LOGISTICS IN THE SOUTH-WEST PACIFIC

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'I have gone at some length into this question of supply', wrote Lieutenant-General Sir EF Herring in a letter to Dudley McCarthy, author of the official series volume dealing with the South-West Pacific Area, 'because I think it was something the historian should know about'.[1] Herring was not the only wartime general of this opinion. In August 1943, Major-General LE Beavis, Director of Ordnance Services AIF in the Middle East from 1940 to 1942 and Master General of Ordnance from 1942 to 1947, had written to the Australian War Memorial to press for 'a volume specifically on administration and maintenance' to be included in the Army series.[2] This volume was authorised by the government but never written. Reviewing Official Historian Gavin Long's *Final Campaigns* when it appeared in 1964, Beavis took issue with Long's decision not to cover administration:

> perhaps if there had been a history of the administration by British and Australian authorities of the First AIF at the outset of the 1939-45 war we would not have been without the organisation to provide the material requirements of a force in the field based on Australia. Such a history might have helped the military authorities between the wars in their failure to train in peacetime an organisation which could have been expanded when war came. As it was, the organisation to look after the arms, ammunition and equipment of the field force had to be created at the same time it was required to function, and it was largely a case of the 'blind leading the blind' until with experience and training an efficient organisation came into being.[3]

The Australian Army was indeed woefully unprepared to fight in New Guinea in 1942. Accustomed to having logistical needs met by the British Army, it was thrown entirely onto its own resources for the first time in the South-West Pacific Area (SWPA). Although Lend-Lease aid from the United States was an important source of equipment and munitions, the US Army in Australia was able to provide little in the way of direct logistical support because it had different doctrine and equipment. Moreover, in the first year of war its logistical situation was no better. After a brief moment in the spotlight in early 1942, SWPA, in the words of the US naval historian, 'led the list of "have nots" and "won't gets"'.[4] Shortages of logistical units forced the Americans to rely on the Australian Army for basic services such as the provision of rations and fuel in 1942 and early 1943, which were supplied free of charge under Reciprocal Lend-Lease. In no other theatre of war was local procurement of supplies by US forces as extensive or important as in the South and South-West Pacific, for Australian reciprocal lend-lease went straight to the most important bottom line of all: shipping. Every shipping ton procured in Australia saved two in the Atlantic. During 1943 the US Army gradually reduced its dependence on the Australian Army at the urging of the Australian Government and was fully aware that it would need its own logistical system when it got to the Philippines.[5]

That the Allies had organisational difficulties is not to say that New Guinea did not pose daunting logistical challenges in its own right. The terrain and climate were formidable and the country almost devoid of the infrastructure needed to conduct modern warfare. In much of the country there were no roads, no buildings, no wharves, and no skilled labour. In 1942, bases had been carved out of the jungle at Port Moresby, Milne Bay, Buna, Wau and Merauke, but in early 1943 they were still far from what was required to support the upcoming campaigns. The role of the bases was not so much as to support the operational units as the other way around, for it was the bases that were important to the prosecution of the war against Japan, allowing air and naval units to move ever closer to choking off Japan's imports. The function of the operational units was to capture and defend those bases.

The major logistical feature of jungle warfare in New Guinea was the absence of wheeled transport. The road network was restricted to what had been constructed in the base areas. Under these conditions, the most useful vehicle was the ubiquitous quarter-ton jeep but even it was restricted to whatever vehicle tracks could be constructed. Resort was therefore made to older modes of transport. The 3rd Pack Transport Company employed horses and mules to deliver supplies in the Wau-Bulolo area but difficulties in providing forage for the animals resulted in this mode of transportation being phased out. Papuan civilian carriers—the famous 'Fuzzy Wuzzy Angels'—had been a vital means of transportation during the Papuan campaign, especially in forward areas, but while still important, they could not be relied upon so heavily in 1943, for the campaign would be taking place in sparsely populated areas and there would be competition for labour from base construction activities. Allocation of local labour resources among competing demands remained the responsibility of the Australian New Guinea Administrative Unit (ANGAU).

Water transport seemed the logical alternative to land transport. No amphibious operations had been carried out in SWPA in 1942 although small craft had carried troops between Milne Bay and Buna. There were several reasons for this: the waters surrounding New Guinea were poorly charted; the Japanese air forces were alert and effective; and there was a shortage of landing craft. Transported across the Pacific deck-loaded on freighters, these had arrived in pitifully small numbers. Then in early 1943, the US Army began shipping some 600 disassembled 36-foot (11.0 m) LCVPs (Landing Craft, Vehicles, Personnel) for its 2nd Engineer Amphibian Brigade. This formation had been created for a 1942 English Channel operation but its cancellation had the US Army's amphibian engineers looking elsewhere. Shipping the landing craft disassembled allowed them to be carried in the holds of Liberty ships, the standard wartime bulk cargo carrier. Equipped with these landing craft and a few of their larger 50-foot (15.2m) cousins, the LCM (Landing Craft, Mechanised), the 2nd Engineer Amphibian Brigade was assigned to General Sir Thomas Blamey's New Guinea Force for the upcoming operation, codenamed POSTERN. How big a part it could play depended on how quickly its landing craft could be reassembled at a plant the US Army built and operated at Cairns.[6]

The Australian Army had been no less impressed with the potential of water transport than its American counterpart. In 1941 a Tug and Lighter Company of about 60 men had been formed in the Middle East. It had served at Tobruk for about four months from November 1941 before returning to Australia in July 1942. It became the first water transport unit in New Guinea in August, equipping itself with whatever craft it could lay its hands on, including the wreck *Macdhui* from the harbour. Australian Army landing craft, along with other small craft and barges, operated on the lines of communications along the coasts of Papua and New Guinea. By April 1943, the Australian Army was operating some 348 small craft, of which 272 were with the 1st Water Transport Group in Papua, which had absorbed the Tug and Lighter Company. This fleet of small craft included only 20 landing craft, mostly of American make but four of them were Australian made. Working with the Ford Motor Company the Australian Army had designed and developed its own landing craft, known as ALCV and ALCM, which were manufactured by Ford at its plants in Brisbane and Geelong. As diesel engines were unobtainable, they were powered by Ford V8 Mercury petrol engines imported from the United States under Lend-Lease. The design was deliberately kept simple because they had to be fabricated by firms inexperienced in boat building.[7]

In 1943 the RAN converted its three merchant cruisers into fast amphibious transports, HMAS *Manoora*, *Kanimbla* and *Westralia*. Each of the three ships carried American landing craft, some 20 to 22 LCVPs and two or three LCMs. These three ships became the beginning of the VII Amphibious Force. The Australian Army was approached by the RAN to provide experienced hands to work the ships' gear, handle all the landing craft and tactically load assault equipment.[8] The Guadalcanal and North African landings of 1942 had been carried out with such transports carrying the troops to the landing area and then landing them on the beaches in the ships' landing craft but in 1943 the introduction of new types of landing ships radically altered amphibious doctrine.

The LCT (Landing Craft, Tank) was a 120-foot (36 m) vessel with a bow ramp that could carry three medium tanks. The first of these was completed in October 1942 and three had been shipped to Australia by the end of the year, deck loaded in three sections on freighters. The LCI (Landing Craft, Infantry) was a 158-foot (48 m) ocean going vessel, the first of which were built in December 1942. It had no ramp as it was designed to carry infantry only, disembarking them by means of gangways on either side of the bow. It had a cruising radius of 8,000 miles at 12 knots and could carry 188 troops but it lacked quarters and mess facilities to carry them for more than about 48 hours, being designed for commando raids in Europe. Larger still and most important of all was the Landing Ship, Tank (LST), an ocean-going 1,490-ton, 328-foot (100 m) vessel with a bow ramp and a 50-foot (15 m) beam. Capable of carrying 2,100 tons deadweight, they could hold 20 medium tanks and had accommodation for 160 men. The design ingeniously managed to reconcile sufficient draught for seaworthiness with a shallow draught for landings by using ballast tanks like submarines. If the beach grade was just right they could beach and discharge tanks or trucks into shoal water.[9]

The US Joint Chiefs of Staff had ordered these landing ships as part of a crash program for an invasion of France in early 1943. Their priority was so high that the keel of an aircraft carrier was removed to enable LSTs to be built in her place.[10] The cancellation of operations in Europe provided a windfall for the South-West Pacific Area of 72 LSTs, 36 LCIs and 72 LCTs but the actual strength of the VII Amphibious Force on 1 April 1943 consisted of the HMAS *Manoora*, the barely serviceable USS *Henry T Allen*, and just five LCTs. The rest would arrive during 1943 as they were completed and made the trip across the Pacific.

Because the 2nd Engineer Special Brigade had only sufficient assembled landing craft to support one brigade, the original 1943 campaign concept called for an overland advance on Lae combined with a secondary coastal movement. Amphibious doctrine at the time called for landings to be made outside the range of enemy artillery. As a landing to the south of Lae would require a crossing of the Markham River, a beach east of Lae was the logical alternative. In a single night, the 2nd Engineer Special Brigade could only sail about 60 miles, so a base that close was considered to be required. Buna and even Morobe were too far away, so Nassau Bay, about 35 miles from Lae, was chosen and was captured in a preliminary operation. Ironically, the 2nd Engineer Special Brigade would demonstrate in this operation that it could operate over 150 miles. General Blamey subsequently decided to land two brigades of the 9th Division east of Lae. To accomplish this he requested additional support from the VII Amphibious Force to the tune of seventeen LCIs and three LSTs. Once the VII Amphibious Force was on board it was a short step to carrying out a 'ship-to-shore' operation from Milne Bay.

To support the 7th Division's movement to the front around Wau and subsequent advance on Lae from that side, General Blamey relied on the construction of a road from Bulldog to Wau capable of carrying motor traffic. Continuation of a land supply line over the Markham River looked at first like it would require a bridge, which was estimated to require a field company of engineers and about 12 weeks to construct.[11] Always receptive to new technologies, Blamey proposed instead to use DUKWs, newly developed 2 1/2 ton amphibious trucks, to carry supplies across the river. Some 100 DUKWs were due to arrive in SWPA in June or the first half of July and another 150 between mid July and mid August so SWPA General Headquarters (GHQ) in Brisbane was able to offer Blamey 50 for the Markham River crossing and another 36 for the amphibious operation.[12]

If the Bulldog Road was not available in time, Blamey intended to rely on air supply. Considerable improvement had been made in this area since 1942. Most of the aircraft of various types that had originally been pressed into service as transports had been replaced by new C-47s, a military cargo version of the Douglas DC-3. A second group of 52 C-47s had been rushed to SWPA in December 1942 in response to an urgent request from General MacArthur and in March 1943 the Pacific Military Conference allocated another 2 1/2 groups to the theatre, which were scheduled to arrive by the end of September.[13] Some 78 C-47s were shipped to the RAAF under Lend-Lease and were used to form six squadrons but the RAAF withdrew its transport planes from the control of the Allied Air Forces in May 1943.[14]

The Australian Army rose to the challenge of making more efficient use of the available air transport resources. Three air maintenance companies were formed for the 1943 campaign, one each for Port Moresby, Dobodura and Nadzab. Each consisted of a headquarters, a supply depot platoon, a transport platoon, an aircrew platoon, an air packing platoon and a workshop section and was capable of operating an aerial supply head. Methods for handling rapidly changing priorities were implemented, procedures for efficient loading aircraft were worked out and special packaging for supplies delivered by air was developed. The 7th Division was treated to a 12 minute training film, 'Loading the Douglas C-47'.[15]

The Bulldog Road has been described as 'one of the most ambitious engineering projects ever undertaken by the Australian Army'.[16] The idea was to create a line of communications that ran up the Lakekamu River to Bulldog and thence over the Owen Stanley Range to Wau. In 1942 the 1st Independent Company had trekked along the route to reinforce Wau and from then on it was in use by carriers to bring up supplies. On 12 January 1943, General Blamey put Lieutenant-Colonel WJ Reinhold in charge of construction with orders to push road construction through as rapidly as possible. A consulting engineer in civilian life, Colonel Reinhold had considerable experience in road construction in Northern Queensland. During the First World War he had served with the 1st AIF on exchange with the British Army on the Western Front, winning the Military Cross and serving in the Tank Corps. He was the driving force behind the project. Initially a jeep track was to be built. This was then to be upgraded to a full road capable of handling trucks. Speed was of the essence if the road was to be completed in time to play a part in the upcoming campaign. Initially, the gradient was set at 5% and the minimum curve radius at 80 feet. To save time, this requirement was reduced to a gradient of 10% and a minimum curvature of 50 feet. Perishable materials such as softwood timber were freely used.

Work proceeded from both ends, supported by the 41st Water Transport Group from the south and air supply from Wau in the north. Survey began in February but the final route of the road was not determined until April, by which time construction was underway. A tramline was begun at Grimm Point, south of Bulldog, in order to cut out a particularly snag-ridden and fluctuating section of the river but was later abandoned. The de-snagging and marking of the river was carried out concurrently with the construction of the road.

At the height of the project in July 1943 there were 1,038 soldiers and 2,349 Papuan civilians working on the road. Work was carried out largely, and on some stretches entirely, with hand tools. In mid-July 1943, the 2/55th Light Aid Detachment stripped down three 1,730-pound compressors and each was carried forward down the track by 51 men to difficult sections where heavy rocks had been holding up progress, the engine blocks alone requiring eight carriers. Before this, drilling on the rock sections had to be done by hand. At this time the Royal Australian Engineers (RAE) were not well-endowed with mechanical plant and there were some who were doubtful of its value. The experience in New Guinea would change this and quantities of plant were ordered from America under Lend-Lease. A platoon of the 2/1st Mechanical Equipment Company detached to work on the Bulldog Road became the first Australian specialist plant unit to serve in New Guinea outside the Port Moresby Base Sub Area.

The route ran for 68 miles over rugged and densely forested terrain above 9,000 feet (2,700 m). Such mountainous terrain could be bitterly cold even in tropical New Guinea. Some sections were unexplored, unmapped and practically unknown even to the nomadic Kukukuku people. The Australian and Papuan road builders worked under severe conditions, living under canvas at high altitudes, often on reduced rations, and sometimes in clothing that was insufficient to withstand the cold and constant rain. Despite the hardship, only four men died on the road: one was killed by a falling tree, one by a landslide and two through careless use of explosives. One serious but non-fatal injury resulted from each of these three causes. The major medical problem affecting the troops was malaria, while the Papuans, unused to the heights, suffered from pneumonia and bronchitis.

The road was pushed ahead relentlessly. On the morning of 23 August 1943, two jeeps left Edie Creek for Bulldog, returning the next day with a convoy of 14 trailer-hauling jeeps. That day Colonel Reinhold received a special signal from General Blamey:

Congratulations on first passage. The road is now named the Reinhold Highway.

It remained to widen the road to take three-ton trucks, which first traversed the road on 23 September 1943.[17] By this time Lae had fallen and the strategic value of the road began to decline. It never carried the volume of supplies that had been envisaged but in return for the manpower, equipment and supplies invested it yielded a benefit beyond price: tactical flexibility which guaranteed victory under any circumstances. No more could be asked of any military engineering project.

By the time the 7th Division arrived in New Guinea in July problems with the Lakekamu River silting up, with the availability of watercraft, with finding the shipping to move the required motor transport to Bulldog and delays in road construction made it clear that the 7th Division operation would be, at least initially, an airborne one. Development of a forward airbase therefore became a priority. Gliders were brought up from Australia to carry heavy equipment and first a battalion and then an entire regiment of paratroops was allocated to seize the Nadzab area. A one month delay was imposed to allow for the arrival of more transport aircraft.

GHQ wanted a full order of battle submitted by 1 July 1943 to enable it to allocate shipping and transport aircraft. This was handed in two days late and contained a number of units that did not yet exist. While some units could be created from New Guinea Foree's limited resources, the majority would have to be raised in Australia. Given the short time available, the only way that this could be done was by disbanding operational units. The 30th Infantry and 1st Motor Brigades were disbanded in order to bring the 6th and 7th Divisions up to strength.

To control administrative units supporting the upcoming campaign, the Moresby Base Area was created on 15 March 1943 and placed under the command of New Guinea Force.[18] On 5 June. New Guinea Force created five subordinate Base Sub Areas, one each for Moresby, Milne Bay, Buna, Bulldog and Morobe. Command of all Line of Communications units passed from New Guinea Force to the Moresby Base Area on 14 June 1943. The Bulldog Base Sub Area was especially notable because it was a wholly Australian responsibility, the first of its kind, involving up to 10,000 troops.[19]

The immediate task of the Moresby Base Area was to get the Base Sub Areas up and running. War Establishments for the Base Sub Areas were not approved until 22 July 1943 but New Guinea Force was authorised to proceed with raising them anyway.[20] Some 330 additional personnel were required to staff the new Sub Area headquarters, more than was readily available in New Guinea, and a call for personnel went out to the New South Wales, Victorian and South Australian Line of Communications Areas. Such personnel had to be fit for tropical service but could be medically Class B, that is, fit for base service only.[21]

The Moresby Base Area was instructed to prepare three transit areas for brigade groups at Milne Bay, Buna and Bulldog and hutting for additional stores. By D minus 30, New Guinea Force hoped to have 30 days' supplies for 15,000 troops at Morobe, 30 days' for 25,000 at Buna, 60 days' for 40,000 at Moresby, 10 days' for 20,000 at Bulldog and 20 days' for 20,000 at Wau.[22] This was not accomplished. DEXTERITY, the American campaign to capture Woodlark and Kiriwina, absorbed shipping and port space and, by pulling fighters off to provide air cover for the fleet, even prevented the transports from flying in to Wau for a time. This caused the stockpile at Milne Bay to be reduced. GHQ thought that Morobe was too far forward and therefore subject to Japanese attack to hold so many stocks, so more was held at Buna and less at Morobe. Finally, the move away from using the Bulldog Road caused stocks there to be run down.

For the campaigns of 1943, GHQ took over direct control of shipping to Milne Bay and points north. This represented an important change, for shipping for the maintenance of the Australian Army in New Guinea had hitherto been the responsibility of Allied Land Forces Headquarters (LHQ) in Melbourne.[23] This led to friction over the allocation of shipping between Advance LHQ and GHQ. The Australians felt that they were being shut out of Milne Bay and the needs of POSTERN were not being met at Buna. The issue went all the way to General MacArthur.

Initially the Australians intended to use Oro Bay, near Buna, as their main supply base but this small port was also needed to support the Allied Air Forces and the upcoming invasion of New Britain. General Blamey therefore decided to use Buna as the principal Australian port instead. This avoided some hassles, for Oro Bay soon became badly congested with American shipping, but Buna harbour was little more than a roadstead formed by coral reefs. It was exposed to the north and east and could be reached only by means of a tortuous channel between the coral heads.[24] The US Navy did not believe that it would be possible for Liberty ships to berth in Buna as their charts indicated a depth of only 12 feet and a fully laden Liberty drew around 26 feet. The US Army was equally adamant that the required tonnages could not be shipped in shallow draught vessels and that Liberty ships would have to be used. Anything less would be like 'dumping a bucket out with a teaspoon'.[25] It was found that some parts of the harbour were indeed deeper than 12 feet but they had to be surveyed and marked before vessels drawing more could use the harbour. This task fell to the Port Director, Lieutenant-Commander JM Band, RANR. Considerable improvisation was necessary. The steaming and side lights of the SS *Anshun*, sunk in Milne Bay in September 1942, were salvaged and used to light the buoys at Buna so the port could be entered at night and operated around the clock.[26] The Buna Base Sub Area constructed new depots and a new wharf for Liberty ships. As built by the Australian engineers, there was 22 feet of water at the wharf and the first Liberty ship was discharged on 22 July by unloading top cargo into LCMs and LCTs until the ship's draught was reduced sufficiently to unload at the wharf. Efforts were made to increase the port capacity by rounding up additional docks personnel in Port Moresby, using operational troops as labourers and securing some additional landing craft.

The work was done so well that it became possible for transport aircraft to start flying out of Dobodura on 4 August 1943, allowing them to avoid overflying the Owen Stanley Range. Although only slightly shorter than the flight from Port Moresby, weather conditions, visibility and landmarks were all more favourable. In August the 2nd Air Maintenance Company became operational at Dobodura to support the 3rd Division in the Wau area, and later the 7th Division in the Markham Valley.

Lieutenant-General Herring's I Corps also moved to Dobodura, which was close to the headquarters of the 1st Air Task Force and in telephone contact with the US 5th Air Force and New Guinea Force in Port Moresby. The high Owen Stanley Range made radio traffic between Port Moresby and points north of the range difficult but Herring could control his corps by radio from Dobodura. The linesmen were already at work stringing a line from Dobodura to Lae. In late 1943, Army ripped up one of the old underwater cables that ran across the Bass Straight to Tasmania and relaid it across the Torres Strait by the cable ship SS *Mernoo*, connecting Australia and New Guinea by wire. By this time the 19th Line of Communications Signal Unit had completed a line from Morobe to Lae via Salamaua.[27]

To the consternation of GHQ, planning was delegated to the 7th and 9th Divisions and the Moresby Base Area, as was Australian doctrine at the time, although it was contrary to the manner in which operations were carried out on the Western Front in 1918. GHQ doubted that effective cooperation could be arranged at the division level. The decentralised approach had its advantages but generally did not work out well. The 9th Division altered its loading plans without notifying I Corps, and when ships were sunk or damaged their contents were not known. Ordnance stores were left at various points along the coast and I Corps, unaware of where they were, could not make up deficiencies quickly.

The movement of the personnel of the 7th and 9th Divisions from their training areas on the Atherton Tableland to New Guinea was completed on 19 and 24 August, although each still needed a couple of Liberties to lift remaining vehicles. Priority shifted to the administrative and independent units, some 13,000 strong with 2,500 vehicles, including 67 Matilda tanks of the 1st Tank Battalion, requiring 18 Liberty voyages. Following them were around 3,000 personnel earmarked for the new Lae Base Sub Area, requiring another three ships.[28] The movement of the base units was running well behind schedule but there was still hope that everything would be available when it was needed, for Lae was not expected to fall until three weeks after operations began.

A case in point was the headquarters of the new Lae Base Sub Area itself. Lieutenant-General Herring recommended that it be raised in Australia for service at Lae with the same establishment and duties as the Buna Base Sub Area and urged that it be moved to New Guinea by air as soon as possible in order to study the local conditions and prepare for the development of the new base.[29] LHQ was unable to assemble even the nucleus of the new headquarters in Brisbane by 30 June as promised. Lieutenant-Colonel OA Kessels assumed command on 23 August 1943 and the other officers commenced duty during September, by which time it was far too late for study and preparation.[30]

The 7th and 9th Divisions were both supposed to have been re-equipped in Australia but somehow arrived in New Guinea without certain items of equipment, necessitating a comb out of the depots in New Guinea. Some items were found to be in disrepair, including eight brand new short 25-pounders straight from the factory in Australia, which were found to have defects such as filings in the recuperators. Only two could be made ready in time for the operation.[31] It was discovered that the 1st Tank Battalion had arrived without ammunition. To assemble the required motor transport, LHQ established a pool at Enoggera, Brisbane, and ordered units on the mainland to contribute to it. The result was that a large number of vehicles that had been used in the Middle East were shipped to New Guinea and many were found unroadworthy on arrival. Some 200 trucks loaned to the 9th Division by the US Army Services of Supply (USASOS) for the amphibious phase were described as 'unserviceable' and 'junk' when returned a month later.[32]

At Lae the Australian Army was confronted with the logistics of an amphibious operation for the first time since Gallipoli. The beaches became confused and the need for a beach master with overall authority became apparent. A special Beach Group was also required; the Shore Battalion of the 532nd Engineer Boat and Shore Regiment was insufficient for the task. The biggest problem was that LSTs and LCTs arrived after 2300 and the Navy required them to depart before dawn. Unloading a combat loaded LST in four hours of darkness proved difficult, if not impossible and many left partially unloaded. In the rush to unload, stores and equipment were piled up unconcealed on the beach and exits were blocked. There was no possibility of properly segregating supplies and in some instances fuel and ammunition dumps were just 20 metres apart. Inevitably, a Japanese air raid hit an ammunition dump, which set a fuel dump on fire and 100 tons of supplies were lost.[33]

Shortly after the 503rd Parachute Infantry had seized the Nadzab area on 5 September 1943, the 2/6th Field Company, the 2/2nd Pioneer Battalion and some 800 civilian labourers arrived, having crossed the Markham River using rubber boats and a folding boat bridge. Work began on the airstrip the very next day with hand tools. Trees were felled, potholes filled in and a windsock erected. It had been arranged that engineering equipment would be flown in by glider but owing to a breakdown in communications, the gliders were not called forward from Dobodura. Lacking mowers, the Kunai grass was removed by burning.[34] The US 871st Aviation Engineer Battalion began arriving on 7 September with its tiny air-portable bulldozers and graders. By the end of October there were four airstrips at Nadzab, one of which was 6,000 feet long and sealed with bitumen. All the while, transport operations proceeded uninterrupted by work on the airstrips, flying in troops, equipment and stores of the 7th Division, with up to 27 aircraft taking off and landing every 45 minutes.[35]

As the fall of Lae had made Salamaua superfluous as the site of a base, the Area Commandant Headquarters that had originally been raised for Salamaua was sent to Nadzab. Nadzab had not been intended as a major supply point and there was no supply depot platoon to take over dumps from the 7th Division. As the campaign proceeded down the Ramu Valley, the 3rd Air Maintenance Company, intended to receive supplies at Nadzab, found that it had to dispatch them to Dumpu as well, and so needed to be twice as large. The 2nd Air Maintenance Company from Dobodura pitched in to help. Air shipments had accompanying conductors who accompanied the supplies to the intended destination and obtained receipts on delivery.

Daily maintenance of the 7th Division was flown from Dobodura while troop movements were made from Port Moresby. Some 36 aircraft were available from Nadzab daily and 54 daily from Port Moresby. This was estimated to yield 54 loads per day from Dobodura and 49 from

Port Moresby. It was estimated that lifting the whole division would require 1,816 planeloads. The daily maintenance requirement was estimated at 24 aircraft loads; six for Australian rations, one for Native rations, 15 for ammunition and two for POL. This still left 30 discretionary loads per day, which were used to build up reserves. Because there was less fighting in the Markham Valley than expected, ammunition and medical stores began to pile up and eventually they were deleted from the daily maintenance run and sent forward only on demand.

All letters posted to the troops went by air from Australia to Port Moresby. A daily run, weather permitting, brought them up to the 7th Division at Nadzab. Men in the Ramu Valley could read letters posted in Sydney just three days before. Letters bound for the 9th Division were flown to Dobodura but then travelled forward in barges or small ships so there was a delay of several days. By contrast, parcels and newspapers went by surface and mailbags piled up by the thousand at Buna for want of priority to move them forward. In this case, the situation was reversed and it was the 9th Division that got their mail earlier. When it came to sending mail home, soldiers in the field had no access to stamps and no cash to buy them, so they simply marked their letters home 'On Active Service' and the Army paid the postage.

Rations were supplied in bulk, although there were experiments with American 10-in-1 packs. The 7th Division received fresh fruit, meat, butter, eggs and vegetables whenever they were available in Buna and fresh bread was flown from Dobodura to Nadzab daily. There were no refrigeration units in Buna until October, so reefers were discharged as required. A small ship, the *St John*, with about 12 1/2 tons of refrigeration spaces made two runs to Lae with fresh meat, butter, fruit and vegetables. The 7th Division prepared a schedule whereby each aircraft carrying rations carried a balanced load of 900 rations. This meant 36 different commodities on each aircraft and involved considerable handling. After a few weeks of this, I Corps switched to 'bulk' loading the aircraft. Each aircraft carried only six different commodities but 5,400 balanced rations were carried for every six aircraft, the same as before. Apart from considerably reducing the effort to load the plane, pilfering was reduced by concentrating the attractive items and placing a conductor on the plane, who obtained a receipt upon delivery.[36]

Lae was in an appalling state when it was captured on 16 September. Rotting food and decomposing enemy dead had attracted swarms of flies. The enemy had used shallow trench latrines, one of which was poised over a creek and the medical authorities feared an outbreak of dysentery unless things were cleaned up quickly. The 2/3rd Anti Malaria Control Unit arrived on 21 September and found large numbers of anophelene mosquitoes breeding in bomb and shell craters and in the swamps. Bodies and rotting food were heaped into dugouts, covered with oil and burned, and then the dugouts filled in. The trench latrines were treated with chloride of lime, covered with oil-soaked hessian to prevent hatching flies from reaching the surface and filled in. The 9th and 14th Anti Malaria Control Units arrived on 1 and 14 October and set to work filling in the bomb craters and draining the swamp. The l06th Casualty Clearing Station opened a 500 bed hospital on 22 October and was treating 500 patients by the end of the month.

The headquarters of the Lae Base Sub Area arrived at Lae on 30 September. Some 5,000 administrative troops were nominally assigned to it but shipping priorities and the unexpectedly early fall of Lae did not permit them to be in place in time and the administrative plan was consequently disrupted. The Lae Base Sub Area was subordinated to the Lae Fortress, which was created from the headquarters of the 5th Division on 22 September. The Lae Fortress was under the command of Major-General EJ Milford until 3 November, when Brigadier GV Moriarty succeeded him. All Australian troops in the area except those assigned to the 7th and 9th Divisions came under its control. In addition, the Lae Fortress had operational control of the American base, the port, and the airfield. Lae Fortress could not directly take control of the Allied Air or Naval Forces or the USASOS unless Lae came under attack, but the principle of cooperation between all services was firmly established.

The Lae Fortress troops were confronted by three interdependent tasks: the construction of the Markham Valley Road to Nadzab; the development of the port of Lae; and the construction of the base in Lae. The Americans were given responsibility for the port, the airdrome and the US base while the Australians worked on the roads and the Australian base.

Work on the port proceeded fastest. A floating dock was brought up from Oro Bay and assembled in three days, allowing a ship to discharge on 20 October 1943, just 34 days after the capture of Lae. A permanent 336 foot Liberty ship dock was completed on 23 November, allowing two Liberties to dock simultaneously. Other ships were offloaded into barges and DUKWs.

The large scale development of airdromes in the Nadzab area required heavy construction equipment which could only be brought in by sea to Lae and then overland. Development of the road connecting Lae and Nadzab was therefore given the highest priority. Completed on 4 October, it was washed away by heavy rains three days later. After considerable effort by the US Army and RAAF engineers, the road was finally opened on 15 December.[37] Paralleling the road for much of its length was 30 miles of four-inch pipeline constructed to supply a fuel tank farm at Nadzab. Three pumping stations were established at 10 mile intervals. A six-inch Victaulic pipeline was constructed from the fuel jetty at Lae to supply the needs of the Lae airdrome and road transport. Petrol, Oil and Lubricants (POL) for all forces was the responsibility of the Australian Army. Bulk storage tanks had been established at Port Moresby and Milne Hay from which tankers could discharge. POL could be also carried in Liberty ships, which had two deep tanks capable of carrying 29,000 and 55,000 US gallons (110,000 and 208,000 litres). Fuels were then supplied to the air forces via pipelines. Supplies to the forward areas were in four or 44 gallon drums which were manufactured in Australia by Rheem. During the Papuan Campaign increased production and a reclamation program had overcome a critical shortage of 44 gallon drums. At first it was thought that the problem was solved but as the Allies moved forward, the number of drums required increased and a drum shortage recurred in early 1944.

It was not intended that Lae should become a major airbase as it was further from Rabaul than Woodlark and Kiriwina and further from Madang and Wewak than Nadzab and the ground was not nearly so suitable for airfields as that in the Markham and Ramu Valleys. From the Allied Air Forces' point of view, the primary function of Lae was to supply Nadzab through the port. Nonetheless, the Lae airdrome was repaired within two days after the town was captured and was soon the centre of considerable activity as, pending completion of the Lae-Nadzab Road, it was used to supply Nadzab with POL. LCTs and LSTs landed fuel in 44 gallon drums which were trucked to the Lae airdrome, loaded on C-47s and flown out to Nadzab. At one point there was a takeoff or landing every 26 seconds. This took its toll and maintenance was continuous.[38]

The development of the Australian base was dependent on the construction of some 20 miles of roads. This was complicated by the same unseasonably heavy rains in October that had stymied the construction of the Lae-Nadzab road and also by the lack of mechanical plant until a platoon of the 2/1st Mechanical Equipment Company arrived in late November. The Bitibum Road was opened on 21 November. Due to a shortage of roofing materials, hut frames were erected and left pending the arrival of roofing. The Australians initially opened up a number of wells as water supply points. Later the Americans set up a water pipeline and pumping station. A water supply system was constructed in order to provide over 1,000,000 gallons of water, with a peak demand of 2,000 gallons per minute, using the Bitibum and Busu Rivers as sources. Pipes were laid to carry water to kitchens and showers. Later the Americans constructed a 500,000 gallon reservoir. Electric power was established to provide lighting for the docks and the base area, initially with a salvaged 41 kW set, and later with two plants totalling 200 kW. Shortly after the capture of Lae, the 2/78th Light Aid Detachment managed to get the town iceworks back into operations. This supplied ice to both Australians and Americans until refrigeration plant began to arrive, starting with 5,000 cubic feet on 15 November, although it took almost a month to install owing to shortages of parts. Some 30,000 cubic feet of refrigeration space was installed in the Australian area over the next two months.

The allocation of local labour was controlled by the Lae Fortress, which received heavy demands from the 7th and 9th Divisions, engaged in operations in the Markham and Ramu Valleys and around Finschhafen, from the US 5th Air Force, and of course from the base. By mid November, the 9th Division had exhausted its local supplies of labour and some 1,000 labourers were transferred from the Markham and Ramu Valleys. Some 1,500 local labourers worked for the Lae Base Sub Area.[39]

By early 1944, the base at Lae, along with those at Finschhafen, Nadzab and Dumpu, was ready to play its part in the upcoming campaigns. For the Australian Army, it had been an enormous learning experience, and a satisfying one. Enormous challenges had been faced and overcome. In February 1944, General MacArthur declared that 'the great problem of warfare in the Pacific is to move forces into contact and maintain them. Victory is dependent upon solution to the logistic problem'.[40] In this, the Allies had been eminently successful.

Endnotes

1. Letter, Sir EF Herring to Dudley McCarthy, 15 May 1957, Herring Papers, State Library of Victoria, MS 11355 Box 11.
2. MGO to LGA 4 August 1943, National Archives of Australia (hereafter NAA) (ACT): A2653/1 M258/1943.
3. LE Beavis, 'Review Article: *The Final Campaigns*', *Stand To* (January-February 1964), 22.
4. SE Morison, *History of United States Naval Operations in World War II*, Volume VI: *Breaking the Bismarcks Barrier, 22 July 1942—1 May 1944* (Boston: Little, Brown and Co, 1950), 32.
5. AP Stauffer, *The Quartermaster Corps: Operations in the War Against Japan* (Washington, DC Office of the Chief of Military History, Department of the Army, 1956), 98-133.
6. JH Casey, *Engineers of the Southwest Pacific 1941-1945*, Volume IV: *Amphibian Engineer Operations* (Washington, DC: Government Printing Office, 1959), 30-45, 703-10.
7. RR McNicoll, *The Royal Australian Engineers 1919 to 1945: Teeth and Tail* (Canberra: Corps Committee of the Royal Australian Engineers, 1982), 299-311.
8. OC 3 Landing Ship Detachment, 'Report on the Formation of Aust Landing Ships Dets RAE', 20 September 1944, A[ustralian]W[ar]M[emorial] 54 963/21/7.
9. Norman Friedman, *US Amphibious Ships and Craft: An Illustrated Design History* (Annapolis, MD: Naval Institute Press, 2002), 115-20, 131-4, 140-3.
10. SE Morison, *History of United States Naval Operations in World War II*, Volume II: *Operations in North African Waters, October 1942-June 1943* (Boston: Little, Brown and Co, 1947), 268.
11. Minutes, Planning Conference, Adv LHQ, l0 June 1943, AWM54 213/3/20.
12. BGS (Ops), 'Discussion between DCGS and Gen Chamberlin G3 GHQ 31 May 1943', 1 June 1943, AWM54 213/3/20.
13. Minutes of Pacific Military Conference, 18 March 1943, NACP RG 218 CCS381.
14. Letter, CinC SWPA to Prime Minister Curtin, 9 June 1943, NAA(ACT): A2684/3.
15. *7 Aust Division Training Instruction No 7*, 7 August 1943, War Diary, 7th Division, 1943 Part 2 (Appendices), AWM52 1/5/14.
16. Dudley McCarthy, *South West Pacific Area—First Year* (Canberra: Australian War Memorial, 1959), 578.
17. WJ Reinhold, 'The Bulldog-Wau Road: The John Thompson Memorial Lecture at the University of Queensland, 1945', Reinhold Papers, Fryer Library, University of Queensland, Special Collection Box 62.
18. DA&QMG New Guinea Force, *New Guinea Force Administrative Instruction No 80*, HO, 12 March 1943, War Diary, New Guinea Force G Branch, AWM52 1/5/51.
19. GOC New Guinea Force to LGA, 'Formation of Sub Areas: New Guinea', 21 April 1943, NAA (ACT): A2653/1 M56/1943.
20. GOC New Guinea Force, 'Administrative Organisation—New Guinea', l0 November 1943, AWM54 9/5/9.
21. AG to NSW LOCA, Vic LOCA, SA LOCA, 9 June 1943, NAA (ACT): A2653/1 M56/1943.
22. DA&QMG New Guinea Force, *New Guinea Force Administrative Instruction No 105*, 7 June 1943, War Diary, DA&QMG New Guinea Force, June 1943, AWM52 1/5/53.
23. LGA, 'Allied Land Forces in South West Pacific Area Administrative Instruction No 2—Overwater Supply', l9 August 1942, NAA (ACT) A2653/1 M140/1945.
24. HJ Casey, *Engineers of the Southwest Pacific, 1941-1945*, Volume VI: Airfield and Base Development (Washingion, DC: Government Printing Office, 1951), 128.
25. Minutes, Conference at GHQ, 8 June 1943, AWM54 213/3/20.
26. G Hermon Gill, *Royal Australian Navy 1942-1945* (Canberra: Australian War Memorial, 1968), 172, 327.
27. CGS to Secretary, Department of the Army, 6 November 1943, NAA(Vic): MP742/1 94/13/571.
28. DA&OG, 'Decisions Affecting Planning', 13 August 1943, War Diary, DA&QMG LHQ, August 1943, AWM52 1/2/6.
29. GOC New Guinea Force, 'Proposed BINOCULAR Advanced Base', 29 July 1943, War Diary, Adv LHQ DA&QMG Branch, AWM52 1/2/6.
30. OC Lae Base Sub Area, 'Officers posted to HQ Lae Base Sub Area', 18 November 1943, War Diary, Lae Base Sub Area, August-December 1943, AWM52 1/8/15.
31. OC 2/51 LAD, 'Defects in 25 pdr Light Guns', 3 September 1943, NAA(Vic): MP742/1 94/1/450.
32. WF Craven and JL Cate (eds), *The Army Air Forces in World War II*, Volume IV: *The Pacific: Guadalcanal to Saipan* (Chicago: University of Chicago Press, 1950), 192.
33. Casey, Amphibian Engineer Operations, 103-4.
34. GOC 7th Division, 'Report on Operation Outlook', 27 November 1943, War Diary, 7th Division, 1943 Part 4 (Appendices), AWM52 1/5/14.
35. Casey, *Airfield and Base Development*, 168.
36. *Report of I Aust Corps on the Operations in New Guinea from 22 Jan 43 to 8 Oct 43*, AWM54 519/6/32.

37. Craven and Cate, *Guadalcanal to Saipan*, 192.
38. Casey, *Airfield and Base Development*, 170-9.
39. Sgt EE Smith,'The Account of the Development of Lae as an Allied Base', 30 November 1943, AWM54 589/3/1.
40. M Matloff, *Strategic Planning for Coalition Warfare 1943-1944* (Washington, DC: Department of the Army, 1952), 461.