CHAPTER 29

EVACUATION OF CASUALTIES BY AIR

In the war of 1914-18, the British, French and Serbians evacuated small numbers of casualties by air, using military aircraft in standard form or with minor modification only. In Australia, patients were first carried by air in 1922, one of the doctors sponsoring the project being Watson Brown. In 1926 the Australian Flying Doctor Service was established by Dr John Flynn, and with its development an increasing measure of medical security was brought to those living in the outback.

Counsell and Daley during 1928-1933 experimented with techniques to carry stretchers, Neil Robertson and others, inside and outside the fuselage of R.A.A.F. combat aircraft, including the Westland Wapiti and De Haviland types. Colonel R. Fowler (A.A.M.C.) was also impressed with the importance and potential of aircraft for the carrying of Service casualties.

The modern approach to military casualty air evacuation was pioneered by the Germans during the Spanish Civil War of 1936-38. Employing oxygen-equipped Junkers (Ju-52) transport aircraft carrying 6 to 10 litters, they flew their Condor Legion and other casualties home to Germany over the Alps, reaching altitudes of 18,000 feet and travelling on occasions 1,600 miles. On the outward flight to Spain these aircraft had carried troops or materials of war.

Techniques developed in the Spanish campaign were again employed in the invasion of Poland in 1939; men wounded in western Poland were in the operating theatres of base hospitals in Germany within two hours. In the Russo-Finnish war the Russians, adopting German practices, flew their chest-injury patients to a specially equipped hospital, manned by thoracic surgical teams, on the shores of Lake Ladoga. Many men who in previous wars would have died on the battlefield thus reached specialised surgical aid; the recovery rate achieved, approximately 80 per cent, contrasted more than favourably with the 50 per cent survival rate of similar British and French casualties of the 1914-18 War evacuated by surface transport.

At the outbreak of the Second World War, air transport of casualties was accepted in principle by the Allied powers. Implementation, however, met considerable difficulties arising from lack of practical experience of air evacuation techniques and a gross shortage of aircraft of all types. The shortage applied even more seriously to combat and logistic support aircraft than to civil types, and it was partially for this reason that specific air ambulance units using slightly modified civil transport aircraft, and engaged in casualty evacuation work exclusively, were first envisaged. The role of such aircraft in war had already been considered by the Geneva Convention, Article 36 of which “guaranteed” immunity from enemy attack provided that:
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(i) the conventional red cross symbol was displayed on specific surfaces of the aircraft, together with national insignia for identification;
(ii) operations of the aircraft were limited geographically; specific restrictions on flight over forward areas and enemy and neutral territories were laid down;
(iii) such aircraft were not employed for purposes of intelligence or transport of combatants or materials of war (medical supplies excluded).

Protection for aircraft crew, medical personnel and patients, in the event of descent in enemy or neutral territory, was also provided for by the Convention. In practice, however, even with the best of intentions on both sides, immunity from attack was uncertain, the chief reason being that the red cross markings were on occasions not visible to attacking pilots before the attack was launched.

Under these conditions specific air ambulance units were formed in the R.A.F., the South African Air Force and, as No. 1 and No. 2 Air Ambulance Units, in the R.A.A.F.; the Australian units operated in the Middle East, New Guinea and Australia. They rendered excellent service in a limited way, transporting casualties and medical supplies. No. 1 R.A.A.F. Air Ambulance Unit conveyed about 9,000 patients during the Middle East campaigns, in the course of which two of its aircraft were shot up.

Among the disadvantages of specific air ambulance aircraft—and indeed intrinsic in the air ambulance concept under the Geneva Convention—was the limitation of role imposed both by international agreement and by the physical fact that they were, as already mentioned, largely aircraft unsuitable for other military purposes. As they did not fit into the equipment pattern of operational air forces, their maintenance and spares services had to be specially provided. For these reasons they were a militarily uneconomic proposition between engagements.

The New Guinea campaigns of 1942 produced numerous sick and wounded, and the ambulance aircraft available to fly them back over the Owen Stanleys were few and of inadequate capacity. The alternatives to large-scale air evacuation were impracticable, with the sea coast controlled by the enemy and land travel along the Kokoda Trail on the shoulders of native bearers too rigorous. It was against this background that casualty air evacuation of necessity entered a new phase. In areas where hostilities were characterised by rapid advances and withdrawals airstrips were set up or recommissioned and almost immediately military transport aircraft would land on them with reinforcements, ammunition and supplies. Sometimes the airstrips were so far forward that fighting was still continuing on the perimeter as the transport aircraft came in to land. As many casualties occurred near the strips, the practice developed of using transport aircraft to evacuate them, and it sometimes happened that troops would return as battle casualties in the same transport which brought them.

Unfortunately this sudden need to transport large numbers of sick and wounded men by air caught the Australian and American medical services unprepared. They had no organisation or medical personnel available for caring for patients in flight. Air evacuation without specially-
trained medical escorts was attended with many difficulties, yet it was only on rare occasions that a medical officer was present even to superintend loading and to instruct the crew what to do for seriously wounded men in an emergency; one pilot stated that in 200 trips he carried a medical attendant only twice. This meant that in many instances the aircraft crew had to attend to patients in the air. Chest cases, which were carried lying flat, had to be given morphia obtained from the emergency crash kit of the plane. At this early stage no medical kit or oxygen were carried for these cases which were often taken to altitudes of 12,000 to 15,000 feet. On many occasions pilots, even though they were carrying full loads of patients, indulged through ignorance in elaborate "peel offs" when they reached the other side of the range, an unnecessary procedure except as an evasive tactic when under attack.

Patients were often improperly prepared for flight. Some would be taken aboard the aircraft with their clothes, which consisted only of shirt and trousers, soaked from a tropical downpour. With the temperature dropping 2°C. per 1,000 feet of altitude they rapidly froze. Frequently there were only sufficient blankets to allow one to be supplied to each stretcher case and sometimes not even this. At this period military transport aircraft had no cabin heating. In the absence of medical supervision, alarming incidents occurred. There was for instance the case of the psychotic patient who wandered up to the cockpit, grabbed the pilot's loaded revolver, and threatened him with it. Distracted by the cries of a badly wounded man, he forgot the pilot, but attacked the wounded man, with unfortunate results.

Owing to the lack of coordination between transport and movements sections and medical sections, aircraft were often held up on forward strips to wait for patients, where they made easy targets for enemy strafing. Nevertheless, under these conditions 13,000 patients were carried in 70 days.

Soon after the Gona-Buna-Sanananda campaign No. 804 U.S. Medical Air Evacuation Transport Squadron arrived in New Guinea. Squadrons of this type were designed for the mass movement of casualties by military transport aircraft, and orders were given that air evacuation should henceforth be the responsibility of the air forces and under the control of the medical air evacuation transport squadrons. No. 804 Squadron, composed of 5 doctors, 25 sisters and 25 orderlies, together with necessary supporting personnel, was soon in full control of all New Guinea medical evacuation.

With the 7th Australian Division fighting its airborne campaign in the Markham and Ramu Valleys and the 9th Division progressing along the coast from Lae to Finschhafen, the air evacuation of wounded became too big a task for this one squadron. The R.A.A.F. Medical Service was asked to cooperate and an R.A.A.F. medical officer and 12 orderlies were posted to No. 804. Subsequently wounded were evacuated at the rate of approximately 125 a day from each division to the base hospitals at Dobodura and Moresby. The day after the first transport landed on the
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newly prepared strip at Finschhafen 478 patients were flown out to relieve the congested 9th Division hospitals. In one morning 25 aircraft, with medical attendants of the air evacuation squadron travelling on each, moved them to Moresby. In those days fighter escort was provided.

After working for two months with the Americans the R.A.A.F. decided to form its own medical air evacuation transport unit. Thus No. 1 M.A.E.T.U., which was half the size of the American unit, came into existence in March 1944. The sisters and orderlies were put through a comprehensive training course in Melbourne and the unit became operational in July 1944, working in conjunction with the American squadron at Nadzab. It was commanded by Squadron Leader F. W. Kiel.1

After that time all the Australian evacuations for the First Army, both within forward areas and from operational areas to the Australian mainland, were carried out by this unit. In late 1944 No. 804 Squadron moved on with the American Army to the Philippines, and No. 1 M.A.E.T.U. then became responsible for both Australian and American evacuations in New Guinea. On one occasion when the American Air Transport Command air evacuation unit was short of personnel for its trans-Pacific evacuation to America four of its C-54 transports were medically staffed by members of the Australian unit. In the course of its existence No. 1 M.A.E.T.U. carried more than 14,000 cases without a single loss in flight.

When a second M.A.E.T.U., No. 2, was formed it was based at Morotai. No. 2 M.A.E.T.U., commanded by Flight Lieutenant G. F. Salter and later Flight Lieutenant V. W. Potter, handled all air evacuations for I Corps, as well as all R.A.A.F. and R.A.N. evacuations. The personnel of Nos. 1 and 2 M.A.E.T.U’s did not operate any farther south than Townsville, where a third medical air evacuation unit, No. 3, was based. The flight teams were changed there, personnel of No. 3 M.A.E.T.U. taking over and escorting patients to Brisbane and other points south.

In air evacuation of casualties transport aircraft of many types were eventually used. Flying-boats such as Sunderlands, Catalinas and Mariners carried out evacuation from newly-taken islands where the old strips had not been repaired or new ones built. Four-engined Douglas C-54’s were used by the Americans for trans-Pacific flights, but the aircraft most frequently used was the two-engined Douglas C-47—or Dakota—which did more than 90 per cent of the Australian medical evacuation work in the S.W.P.A. This aircraft was at first fitted out with metal litter brackets and could take 18 stretcher cases. Webbing suspensions developed later enabled 24 cases to be carried in American litters; or 19 in British or Australian litters.

In the European theatre of war, where evacuations were only a matter of a few hours or even minutes, W.A.A.F. nursing aids accompanied the patients; in the Pacific, with rugged flying conditions and the long dis-

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1 Much of the material for this chapter has been taken from the article "Air Evacuation of Casualties" by Squadron Leader Kiel in Medical Journal of Australia, pp. 97-104, 25 Jan 1947.
tances to be covered, where a flight might be equivalent to a day or more
of hospitalisation, sisters and well-trained senior medical orderlies were
considered necessary. The practice was for aircraft of the regular transport
squadrons flying troops, munitions or other supplies to the forward areas
to take one sister and one medical orderly of the M.A.E.T.U. This team
would then care for the patients back-loaded on the aircraft from the
forward area.

The medical air evacuation unit classified the air evacuees, superintended
the loading of patients, provided medical care during flight and super-
intended the unloading. The Services requiring evacuation were respon-
sible for collecting their cases and for providing shelter and medical
treatment at the points of emplaning and deplaning. This was done
efficiently at Nadzab where the army built a 200-bed strip-side hospital
purely for staging patients flown in and out of the area by the R.A.A.F.

If the availability of aircraft was good, all cases could be evacuated
without delay, but where this was not so or where more than one hospital
or Service had requested evacuation, the allocation of priorities as between
all patients requiring evacuation fell to the lot of the M.A.E.T.U. medical
officer.

The M.A.E.T.U's had on detachment at headquarters in all the main
fighting areas sergeants who went in at landings just before the strip be-
came serviceable, for the purpose of liaison with the army medical services.
At the appropriate time they signalled to their parent units the number and
classification of cases awaiting evacuation and other relevant information.
The orderly rooms at the parent units then arranged with the transport
squadrons what aircraft would be allotted to the task and signalled this
information to the sergeant on detachment.

When an aircraft flying in an M.A.E.T.U. team was one hour distant
from its destination, its estimated time of arrival was radioed forward.
Thus the despatching medical unit could arrange for patients to be avail-
able for loading at the strip with a minimum of waiting in ambulances
under hot or humid conditions.

The nominal rolls, X-rays and medical documents of the psychiatric
cases were handed over to the sister; other patients had their field medical
cards attached to their shirts. Medical documents were never given to
psychiatric patients as they invariably tried to read them, to their own
disadvantage. With the nominal rolls as a guide the sister checked all
patients in the ambulances, noting their condition, the restraint necessary
for psychotic cases, and ensuring that all pre-sedations were marked on
the medical cards. Meanwhile the medical orderly had fitted up the plane
ready to receive the litters. The sister then superintended loading of the
patients in the most advantageous positions.

Stretcher cases were if possible loaded head foremost towards the front,
the rationale being that near the aerodynamic centre of the aircraft the
effects of air turbulence were less disturbing than was the case towards
the tail. The heating system was also more efficient in the front. Those
cases which were likely to need most nursing attention were placed in
the lower positions so as to be more readily accessible and to allow a greater "head" of fluid under gravity above the recipient if intravenous therapy had to be given.

All stretcher cases were given three blankets and walking cases at least one, as it was sometimes necessary to fly at 18,000 feet, where the aircraft heating system failed to be effective and the cold was intense. It was interesting to note that patients said their extremities became warmer when oxygen was given, probably because it increased metabolism.

Customarily, chest cases were loaded right forward in the lowest litter position so that pillows stacked against the forward cabin bulkhead could be used to maintain a semi-Fowler's position. The litter position second from the bottom could be left unfilled to make room. Some medical officers, however, preferred loading chest cases at the tail of the aircraft for reasons connected with cabin air movement in flight. With fractures it was often more comfortable for the patient to have the injured limb suspended from the litter above.

After the litter cases were loaded their kit was stowed under the seats, 20 to 30 pounds being the maximum allowed to each patient. Walking cases then took their seats.

Before take-off a check had to be made to ensure that:

(a) all wounds and fractures were adequately supported and all wounds recently dressed;
(b) T.B. chest cases were wearing a gauze mask, and psychotic cases had been properly sedated and restrained;
(c) all cases had recently voided and if possible emptied their bowels, and those needing catheterisation had been attended to; and
(d) a light meal with adequate fluids had been taken.

The importance of thoroughly checking all patients before departure was demonstrated by the case of a patient who had been diagnosed as suffering from skull injury with brain prolapse. The forward clearing hospital had missed the fact that he also had five bullet holes through his abdomen. Another listed as "skin" was found to have had an appendicectomy the day before.

On take-off the sister and orderly reassured those patients who had not previously flown, and kept a watch to ensure that litters did not slip. The sister would then make out her flight forms from the nominal roll, recording on one of them details of pre-sedation, the reactions of patients during flight, any in-flight treatment, and other relevant points. The pulse and respiration rate of all patients were taken, and the body temperature where indicated.

Early morning flying was by far the smoothest, so stretcher cases liable to be upset by bumpy weather were dispatched on early aircraft. Walking cases could be sent out later in the day. Flight near the ground in the tropics was usually bumpy because of thermal effects, and a high flight was usually a smooth one. The sister always indicated to the pilot whether the trip should be a high smooth one, as desirable for cases such as recent fractures and renal calculus with colic, or a low, if
rougher, one for chest cases, severe anaemias, cardinals and cerebral injury cases. When several aircraft loads had to be evacuated from one place the dispatching medical officer compiled his loads so that cases expected to travel better at a low altitude were not mixed with those for whom higher-altitude travel was indicated. Patients suffering from otitis media travelled quite well provided the ascent and the descent were gradual. If a sister thought the flight altitude was becoming too great for her patients, she would advise the pilot to this effect. In an emergency such as the sudden collapse of a patient she would have a signal sent to the nearest landing strip with medical facilities predicting arrival and requesting the presence of a medical officer. It was the sister's duty to keep a check on the altitude at all times, and to chart it on the flight form.

A comprehensive medical kit was carried by flight teams. A plasma infusion set was essential. On the few occasions this was used in the air it proved a life saver. Hypodermic syringes, 10 ccm and 2 ccm, used in the administration of intramuscular penicillin and intravenous sodium amytal, and numerous other items such as rectal tubes, pans, urinals, thermos and catheters were always carried. Portable oxygen equipment was an essential piece of apparatus and saved lives on numerous occasions. The system most favoured was a low pressure 1,150 litre bottle at 500 p.s.i. pressure with a pressure/contents gauge and a flowmeter indicating in litres per minute up to 6. The face mask used was a B.L.B. type with a rebreathing bag.

When an evacuation aircraft was within about half an hour of its deplaning point, the base was advised by radio of its imminent arrival and of the number of ambulances required. The aircraft was unloaded under the supervision of the medical orderly and sister. The receiving medical officer discussed the cases and their treatment with the sister after perusing the flight forms, which finally passed to a clerk for statistical purposes.

The possibility of a crash-landing was not overlooked. In forward areas each member of the crew wore full tropical equipment and carried a full water-bottle, flying rations, survival kit, steel helmet and revolver, while on flights over water “Mae Wests” were also carried. Every fortnight flight crews were briefed by an army liaison officer on the tactical situation, forward enemy positions and escape routes. The instructions of the sister and medical orderly in the event of an impending crash-landing were to behave in a calm, reassuring manner and to give their orders clearly. All loose gear, baggage and medical kit were to be thrown overboard, with the exception of some selected drugs which were to be saved if time permitted; this was feasible in view of the presence of a comprehensive medical kit in the rubber dinghy. If over land, the double doors of a Dakota could be jettisoned in preparation for rapid exit. Over the sea, however, the doors had to be retained, since if touch-down were made in the desirable tail-down attitude the aircraft would otherwise rapidly flood.

If there were time, all stretcher cases were turned round so that their feet and not their heads faced the direction of flight. Restrains straps were
applied under arms and across the body, and instructions were given to hold on tightly. The sister and the navigator or co-pilot then went into the lavatory compartment and stood with their backs against the bulkheads on either side of the door, which was left open to prevent jamming, and their hands clasped behind their necks for additional support. The captain, remaining at his controls with restraining harness adjusted, jettisoned the escape hatch in the roof of the cockpit and sounded the "bale-out bell"—if the aircraft was so equipped—as a warning to all personnel an estimated 30 seconds before ditching. The wireless operator, having radioed the aircraft's ditching position, took station with the medical orderly in the navigation compartment, their backs braced against the forward bulkhead.

If landing on water, Mae Wests were put on but not immediately inflated as the rubber bladder could burst due to a sudden blow on touchdown, or egress through an escape hatch might be obstructed, if such had to be used for escape. When the aircraft had come to rest the navigator or co-pilot and sister immediately inflated dinghies on the water. The sister superintended the loading of patients, placing the most serious cases in the dinghy to be occupied by herself. Walking cases filed out so as not to block the unloading of the stretcher cases, which was usually carried out by the medical orderly and wireless operator, the captain helping if he were able. Stretchers were left behind unless absolutely necessary.

Of all casualties evacuated by air in New Guinea 15 per cent were psychiatric cases. It became necessary ultimately to define three categories of psychiatric: serious mental litter, mild mental litter, and mild mental walker. In practice, categorisation was based on the diagnosis submitted by the dispatching hospitals on the manifest—this was sometimes faulty, as prolonged study of these cases was not possible in forward areas.

Throughout the records of psychiatrics there were frequent notations by the flight nurses to the effect: "physical condition poor", "marked dehydration" or "state of exhaustion". In the period before admission to hospital mentally disturbed men, labouring under mental conflicts and frustrations, might be over-active, sleep poorly and fail to eat and drink regularly or adequately. In the discomforts and dangers of army life in forward areas their condition would often go unnoticed until it had reached an advanced stage. Thus many of the mentally disturbed men arriving at advanced hospitals were in poor physical condition. Because of the problems involved in their care these hospitals were glad to evacuate them as soon as possible; thus they often arrived at the aircraft unfit to withstand the stress of a long flight.

It was found that patients who had had a course of treatment such as cardiazol travelled infinitely better than those who had not. On occasions flight sisters travelled from forward areas to Lae with serious mental cases who reacted unfavourably to flight, having been poorly prepared by the hospitals concerned. Some weeks later these sisters evacuated the
same cases to the mainland after they had received treatment at Lae. Many commented on how well the patients then travelled.

Illustrative of the dangers involved was the alarming experience recorded by a flight sister who, against her better judgment, accepted for evacuation a psychotic patient who had been inadequately prepared. The patient, who was in an emaciated condition, had been wakened at 1 a.m. and, without being given food or drink, had been brought to the strip for 5 o'clock take-off. He was restrained by rope that had frayed right through his pyjama coat and broken the skin underneath. He smelt of paraldehyde, but on examining his documents, the sister discovered that there was a blank sheet for the last three days of hospitalisation. As he was struggling violently, she surmised that the sedation was insufficient, and gave him sodium amytal gr. 6. However, the hospital sedation had apparently been given late and had been ineffective up to the time of emplaning, with the result that one hour after take-off the patient collapsed and could not be roused. His breathing was shallow and he became cyanotic, with a rapid, thready pulse and clammy skin. The sister immediately applied oxygen, gave intramuscular coramine and requested the pilot to descend to 500 feet. The patient improved somewhat but was in a very unsatisfactory condition on arrival at his destination. The sister had radioed for a medical officer to meet the plane with plasma, which was given to the patient before his removal to a hospital. Such poor preparation of a patient was only too frequent in some of the forward areas.

The sedative drug of choice was sodium amytal. Intravenous administration just before loading the patient on the ambulance was favoured, as this produced sedation more rapidly and was more predictable than the same drug given perorally or other sedative drugs administered by any method. For any further sedation required en route oral sodium amytal or "Nembutal" in small doses was usually employed. For one-third of the psychiatric cases carried it was necessary because of their disturbed condition in flight to give further sedation. When considerable resistance was met further intravenous sodium amytal was the only answer. It was found that in general morphia was unsatisfactory given either prior to or in flight, as in severe cases the dosage required to bring about the desired degree of hypnosis was so suppressive to the respiratory centre as to be dangerous. Paraldehyde was useful as a sedative if given rectally. When given orally the result was deplorable to all concerned if the patient became air sick soon after take-off. Patients who refused sedation in the air could make it impossible to give this drug rectally. Intramuscular injection was not generally favoured, although good results were obtained using this method combined with sodium amytal. Some cases could resist high dosages of sedative drugs. For example, one man awaiting embarkation on the strip was still raving and struggling half an hour after the administration of 28 grs. of sodium amytal; needless to say, he was of extremely strong physique. Evipan sodium was not considered satisfactory.
Loading a stretcher case into a Dakota at Nadzab.

A wounded soldier from Kokoda arrives at Port Moresby by Stinson ambulance aircraft.
Senior Sister B. Bray and a nursing orderly, Sergeant Dawson, attending to patients on board a medical air evacuation aircraft.
Many patients who had been wrongly categorised as “serious mental litters”, were released from restraint by the flight sister and travelled satisfactorily sitting up in a normal manner. The opposite also occurred: walking cases on occasion became violent in the air and had to be restrained. An interesting point was that often a fractious mental patient responded to orders from a fellow psychiatric when all requests for cooperation by the sister and orderly had been unavailing.

It was found that the use of the straight-jacket was inadvisable, as was the use of tight clothing and blankets. These could lead to dehydration, which in this theatre of war had to be avoided at all costs, especially in psychotic cases. Cabin temperatures up to 150°F. were registered in Dakotas which had been standing for an hour on a strip at midday. Because of this it was necessary for patients to be loaded just before take-off, and if there was a break in the journey, to be removed and placed in the shade during the waiting period. Just before take-off copious fluids were given, intravenously if necessary. The best means of restraint for maniacal cases was found to be straps of soft material, such as triangular bandages or towels; the friction generated by a patient in his struggles against restraining webbing or rope could cause severe abrasions. Ordinary cotton bandages, even though of many thicknesses, tended after continual struggling to become rolled and also injure the skin.

Patients with chest conditions travelled remarkably well with the correct management. Oxygen was essential if the aircraft had to ascend to even moderate altitudes. On one flight during which weather conditions made it necessary for a height of 19,000 feet to be maintained for an hour and a half, there were two chest cases from the Borneo fighting aboard, one a post-pneumonic empyema, who with the aid of oxygen stated he felt no ill effects except for a headache, and the other a case of gunshot wound of the chest with fractured ribs, torn diaphragm and lacerated liver, and in addition a through-and-through wound of the right buttock. He was somewhat cyanosed, but not excessively so, and had some chest pain.

On the same flight were two heart cases, both with aortic regurgitation. These became more cyanosed than any other patients on the flight but were not severely distressed. R.A.A.F. experience in evacuation of various types of cardiac cases, including coronary thromboses, supported the contention that the seriousness of the effect was a product of the reduction in ambient pressure, the duration of exposure and the degree of cardiac impairment. The type of lesion was not as important a factor as the cardiac reserve, nor the increased demand on the heart as deleterious as anoxia of the heart muscle.

Asthmatic cases thrived on altitude. The higher they ascended the better they felt, and the less laborious was their breathing.

Air evacuation of patients with severe coryza was found to be inadvisable, except in emergency. When such cases were evacuated, pneumonia sometimes followed, and sometimes otitis media. Air evacuation of acute lobar pneumonia was also contra-indicated. The flight sister escorting a
case of pneumothorax had to remember to advise the pilot that a slow ascent and descent were desired.

Cases of bacterial endocarditis, severe malaria, leukaemia and all types of anaemia travelled well, given adequate supplemental oxygen.

Scrub typhus cases often became unduly anoxic at high altitudes but revived on administration of oxygen and descent to lower levels.

Head injuries had always to be carefully watched as even moderately severe cases did not travel well unless oxygen was given, signs of hypoxia often appearing at altitudes as low as 5,000 feet. Schnedorf and his co-workers demonstrated that cerebral concussion with or without skull fracture caused depressions of arterial blood oxygen concentration ranging from 5 to 44 per cent. Oxygen therapy minimised pyrexias of central origin and restored blood oxygen saturation to normal. Acute head cases evacuated in forward areas often had continuous oxygen for the whole journey. It had to be remembered that release of gases from solution in cerebro-spinal fluid became significant at altitudes of 12,000 feet and above, adding to the high intracranial pressure already manifested in most head injuries.

Recently repaired abdominal wounds involving the gut travelled well, providing an altitude at which reduction of barometric pressure induced undue expansion of bowel gas was not reached. Such expansion could cause severe colicky pain and disruption of sutures.

Patients were not nearly so prone to airsickness as might have been expected. On one occasion when a mixed load of patients and troops was carried not one of the patients was sick and all enjoyed watching the sister ministering to the unhappy troops. Probably the supine position of litter cases had much to do with this. One flight sister who recorded that she had few cases of airsickness over a period attributed this to the fact that she always watched for the first symptoms of agitation and uneasiness and when these appeared immediately commenced treatment, which consisted of loosening all tight clothing and administering glucose and 1½ grs. of luminal. Oxygen relieved many cases of impending airsickness and was used as a routine by some sisters.

Generally speaking, air evacuation proved to be the ideal method of transporting wounded and was economical of time, personnel, transport and material. The shorter time involved—a Dakota travelled approximately 10 times as fast as a hospital ship—reduced medical requirements and complications in transit. It was estimated that the transportation of patients by air required 21 times fewer personnel than were required to transport the same number of patients by sea. This estimate was made on the basis of an aircraft requiring only 30 to 70 patients to make a full load as against 300 for a hospital ship. Because air trips were more frequent, fewer holding hospital beds were required in advanced areas—provided the casualty rate was relatively constant and within the capacity of the evacuation facilities available—and these areas could be cleared of sick and wounded with less delay for the majority of cases.
When mass evacuation of casualties was first planned it was thought that there would be many kinds of medical conditions which would preclude safe movement of the sufferers by air. This was disproved by experience. With a few exceptions, even seriously ill men could be moved safely, given some preparation and adequate in-flight attention by trained medical personnel. Where the forward hospitals were well established and relatively immune from enemy attack by virtue of Allied air superiority, however, there was no need to hurry the evacuation of men who were in a shocked condition or would be improved by a few days' treatment in hospital. Only occasionally, as in the Buna campaign, when the war situation was not predominantly in our favour, were men moved who required plasma or other resuscitative treatment en route. Classes of cases which were evacuated urgently included eye injuries, brain injuries and those requiring plastic surgery; the prognosis of all of these was improved by removal to the specialised care and treatment available in the big base hospitals on the mainland.

Air Evacuation of Recovered Prisoners of War. When the war with Japan ended in August 1945 Australian prisoners of war, numbering about 14,400, were widely scattered in camps on Singapore Island and in Johore, in Thailand, Burma and French Indo-China, on the islands of the Netherlands East Indies—including Java, Sumatra, Ambon, Celebes and Bali, at Kuching in British North Borneo, in Japan, Korea and Manchuria and on Hainan Island. Plans had been made for their repatriation long before the armistice was signed. At the end of 1944 the Pacific commands—the Australian Army, South-West Pacific Area headquarters and South-East Asia Command (S.E.A.C.)—had each been made responsible for recovering Allied prisoners of war in their respective zones and for bringing them to given concentration points. An organisation known as Repatriation of Allied Prisoners of War and Internees (R.A.P.W.I.), was created to look after the prisoners at the concentration points, where they were to be retained for medical treatment and clearance, kitting, interrogation, documentation and pay. The final stage of repatriation, the transportation of the prisoners to their homelands, was the responsibility of the Allied country concerned.

The Australian Army was responsible for recovering prisoners from Rabaul, the Moluccas, Borneo, Timor and Celebes and other islands to the east of Timor, and for transporting them to Morotai, one of the concentration points, where the 1st Australian Prisoner of War and Internee Reception Unit had been established since June. As well as troopships and hospital ships, Australia had aircraft ready for the task, and it was necessary that full use be made of them as many of the prisoners were seriously ill, and might die unless transported quickly to hospital. It was decided that most of the experienced escort personnel from No. 1 M.A.E.T.U. at Lae and the air evacuation unit at Townsville should be sent to No. 2 M.A.E.T.U. at Morotai, and from the pool thus formed the requirements of the various sectors could be met. Squadron Leader F. W. Kiel arrived at Morotai on 9th September to take his part in
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Operations. Meanwhile, No. 2 Air Ambulance Unit was detailed to provide a service of one air ambulance aircraft each week between Brisbane and Morotai, the aircraft to go forward with Red Cross supplies and to return with patients.

At Morotai about 1,000 army patients at the 2/5th and the 2/9th A.G.H.'s were sent to Australia by air, with medical air evacuation escorts where necessary, to make room for the incoming prisoners. These soon arrived, R.A.A.F. transports bringing in about 700 from Kuching. Most of these were taken off by hospital ship. The small number remaining were very sick, and they were evacuated to Labuan by air for hospitalisation.

South-West Pacific Area headquarters was responsible for recovering prisoners from northern Indo-China, China, Manchuria and Japan and for concentrating them at Manila. Here the 3rd Australian Prisoner of War Reception Group under Brigadier H. Wrigley had established a camp for the British. The camp was well run but many of the recovered prisoners were understandably restless because there was a long delay, sometimes as much as four weeks, in finding transport to take them home. In September Kiel had visited Manila, and he arranged for the airlift to Morotai of approximately 50 sick Australians for whom accommodation was not available in hospital ships.

Admiral Mountbatten's South-East Asia Command was responsible for recovering prisoners from Malaya, the western part of the Netherlands East Indies, from Thailand and the southern half of French Indo-China, and for concentrating them at Singapore. A major evacuation problem facing S.E.A.C. was the airlift of 4,670 Australian prisoners from Bangkok to Singapore, where they were to be embarked on ships for Australia by 23rd September. Only about 100 of the men were hospitalised but as it was a six hours' flight over ocean and the majority of them had not flown before, the A.D.M.S. considered that medical air evacuation escorts would be required on all aircraft, and it was agreed that the organisation and administration of the move would be according to the accepted principles of R.A.A.F. air evacuation.

It was at first intended that Australian prisoners in Singapore who required hospitalisation would be sent by air to the 2/4th and 2/6th A.G.H.'s and the 2/1st C.C.S. at Labuan. This became unnecessary when British and Australian hospitals were established in Singapore. The 2/14th A.G.H. arrived in Singapore on 13th September, together with the 2nd Australian P.W. Reception Group under Brigadier J. E. Lloyd. Australian Dakotas allocated for the Singapore-Labuan service then became available for the Bangkok airlift, and Australia was also able to contribute four ambulance aircraft and medical air evacuation escorts to the S.E.A.C. undertaking.

Sumatra: Just as the Bangkok evacuation had got under way it was learned from Australian newspaper correspondents that there were large numbers of Allied prisoners, including Australian army nurses, in camps in Sumatra, and that they were in a very bad condition. The R.A.F. had no aircraft to bring them out, and it was decided that the R.A.A.F.
should divert to their rescue aircraft then employed on the Bangkok undertaking. This was not a difficult decision because, although the prisoners in Bangkok had suffered severely during the building of the Burma-Thailand railway, they were well treated after the Japanese capitulation. There was ample food in the country, and it was given to them freely, some of the prisoners putting on two stone in as many weeks; about 100 of them who were sick were in good hospitals.

The first relief plane for Sumatra left Singapore and landed at Palembang on 15th September. The relief party included Squadron Leader F. W. Madsen, the pilot, Major H. M. J. Windsor, A.A.M.C., Sister B. O. Chandler, R.A.A.F. Nursing Service, and Hayden Leonard of the Australian Broadcasting Commission. Their primary objective was to rescue the Australian nurses, but when they came down they found numbers of Allied prisoners who were in such poor condition that they decided to send some of them back in the aircraft immediately. Those of the relief party who remained began a search for the nurses. The Japanese either could not or would not give any information as to their whereabouts, so they questioned everyone in Palembang who was known to have been in contact with them since their imprisonment. The only person able to provide a clue was the Mother Superior of a hospital. She told them that in the previous year there had been Australian nurses at Lubuklinggau, some 150 miles south-west of Palembang. The rescue party flew to Lahat, which was connected with Lubuklinggau by rail, and persuaded the Japanese to send a train. On this the rescuers travelled to Lubuklinggau, where they found 24 Australian nurses and about 600 British, Australian, Dutch and Eurasian civilians. The nurses with 30 other internees were brought to Lahat by train. Matron Sage and Sister Floyd flew in to welcome them, and in the words of Major Windsor, they "staged an almighty reunion". The nurses were then sent to Singapore by air.

To take care of the internees still at Palembang and Lubuklinggau supplies of all kinds were flown in, and hospitals were set up where they might await evacuation. At Palembang the Japanese converted a large building for the purpose, and at Lahat a hospital was established in the Dutch Convent for the internees from Lubuklinggau.

Meantime, aircrews who had visited Paken Baru reported that conditions in camps there were even more appalling than at Palembang and Lubuklinggau, and it was decided to concentrate rescue efforts on those camps. To allow the maximum number of sorties during the day an "all in" effort was made to service, load and fuel the aircraft during the night, R.A.F. aircrew whose fighter aircraft had been grounded to conserve fuel taking over the job of loading the R.A.A.F. aircraft. Thus, as many as 20 aircraft could be sent daily. Three sorties for each aircraft were planned for the 16th, but on that day R.A.P.W.I. announced that no more prisoners could be accommodated in Singapore, and that sorties were to be cancelled for the rest of the day. As prisoners were dying at the rate of seven each day in the camps any delay in bringing them out was unthinkable, and Brigadier Lloyd of the Australian Reception Group,
accompanying Wing Commander Game, approached Lieut-General Sir Philip Christison, the army commander in Singapore, to suggest that empty houses and hotels should be taken over to accommodate the prisoners. The general agreed and requested his D.D.M.S. to provide 250 emergency beds for the next day, and to make every effort to provide a greater number for the day after. Over 400 men were lifted on the 17th. From then on the daily rate gradually declined but small movements from Sumatra continued until 4th October. The total number evacuated by the R.A.A.F. was 2,289.

Java: It was known that there were Australian prisoners in Java and to obtain first-hand information of their numbers and condition Brigadier Lloyd flew to Batavia on 22nd September accompanied by Wing Commander Game and an R.A.A.F. sister. They found that Major C. W. Maisey, R.A.M.C., a former prisoner, was trying to manage the medical side of the relief, but was hampered by a desperate shortage of suitable food, medical supplies and staff. He told the brigadier that there were about 25,000 Allied prisoners in Batavia and another 24,000 at Semarang and Magelang in Central Java. All the British prisoners, about 1,500, including 339 Australians, were believed to be in Batavia. Arrangements for their rescue were complicated by a number of factors. The Indonesian republican movement under Soekarno had got under way, and many of the male population were carrying weapons; although their hostility was directed against the Dutch, there was always the possibility that the situation would get out of hand. Food was scarce; there was plenty in the country, but the Indonesians would not make it available, and they had driven beyond reach many thousand head of cattle which would have eased the shortage. Medical supplies were also scarce, especially emetine, liver extracts, nicotinic acid, and other vitamin preparations; while aircraft to Batavia could be loaded with these items, the space was limited, as fuel had to be carried in drums for the return journey. The monsoon was due to break within the month, and this would make the prisoners' camps, especially those in the middle of Java, uninhabitable. The water-supply was unreliable and, with the rains dysentery would be a danger. The Dutch were disorganised and could offer little help.

Brigadier Lloyd and his party visited many of the places in and around Batavia where Australians were awaiting evacuation. They found four Australians at the Dutch Hospital, four at the Carolus Hospital, and five medical orderlies at the Mater Dolorosa Hospital, where they were working, but most were in the Bicycle Camp, still confined under Japanese guards because of the political situation. About 185 Australians were there; 180 of them were in a reasonable physical condition, though many of their number would require hospital treatment after rescue; five were in hospital, but all were considered suitable for air evacuation. The Australians were not happy because of what seemed to them a lack of enthusiasm to get them out, although quite a number of their fellows had been evacuated to Balikpapan during the preceding few days in R.A.A.F.
Mitchells and Dutch aircraft, and it had been arranged that more would go the next day.

On the 23rd Brigadier Lloyd and his party left with fourteen sick prisoners, including the four Australians from the Dutch Hospital, who were suffering from tuberculosis, and three from the Bicycle Camp. The British had considered the tubercular patients too sick to move, but Wing Commander Game, believing their repatriation advisable, accepted the medical responsibility for their removal. Within the next few days the R.A.A.F. moved about 317 prisoners, including 152 Australians.

Brigadier Lloyd asked that a contact team be sent to Surabaya to check if any Australians were there, and on 1st October an aircraft left carrying three army men, Senior Sister A. M. Budd of the R.A.A.F., and Wing Commander Game as medical officer. Wing Commander G. H. Purvis was captain of the aircraft. They landed first at Batavia, where they were told that there were no Australians in Surabaya but that eight were believed to be in Bali. However, they decided to check personally, and landed at Surabaya. They were met by the Japanese, who drove them to the Hotel Oranje under a heavy escort. The free Indonesian flag was prominently displayed in the streets, and truckloads of Indonesian youths armed with bamboos with metal blades drove up and down outside the hotel. They then learned that there were five persons to be evacuated, an Australian woman and child, a Dutch woman, and two men, one from the R.A.N. and the other from the R.N.Z.N. The rescue party left early next morning for Bali with an R.N.N. lieut-commander as interpreter, intending to collect the prisoners from Surabaya on the return journey on the same day.

The aircraft reached Bali about 10 a.m. The Japanese commander, summoned to the airfield through the interpreter, said that the prisoners were 60 miles away. The rescuers went to the Hotel Bali in Den Pasar, the capital, to wait until they were brought in. On their way they visited the hospital, and found two Australians who were well enough to be taken along. The other prisoners, all captured in Timor, arrived in the early afternoon. It was decided that all should stay at Bali that night. The Australians felt some apprehension when the Japanese commander announced after dinner that he had been ordered not to fire if there was an uprising. Wing Commander Purvis made him responsible for the safety of the party, but the Japanese had only six men, the rest being up country; four were sent to guard the aircraft, and two remained at the hotel. The night passed uneventfully, fortunately as it happened, for it was discovered next day that the Japanese had no ammunition in their rifles. At dawn the party left with the recovered prisoners.

Flying low over Surabaya, they observed native mobs in the streets and about 2,000 with bamboos on the airfield. There was no sign of Japanese guards, and Wing Commander Purvis decided it was unsafe to land. Even had they done so, they could not have got their intended passengers from the town to the field. They landed at Batavia, and informed the British G.O.C. about the situation in Surabaya. They then
took aboard the remaining British prisoners from Batavia and returned to Singapore.

Rescue operations in Sumatra and Java did not absorb all the R.A.A.F. aircraft contributed to the S.E.A.C. undertaking, and some were sent each day to Bangkok to return the following day with recovered prisoners. Large numbers were moved during the week 21st to 28th September when R.A.A.F. aircraft availability in Singapore was unusually good, and the daily numbers again rose sharply from 1st October because the Sumatra-Java commitment was then almost complete. In all, R.A.A.F. aircraft carried 4,227 from Thailand to Singapore. The rest were moved in R.A.F. aircraft. These figures included a relatively small number of Australians who had been moved from Saigon in French Indo-China to Bangkok by the R.A.F.

The total number of recovered prisoners of all nationalities which passed through the hands of the R.A.A.F. M.A.E.T.U. detachment at Singapore was 7,801. The bulk of the work was completed by 9th October when most of the aircraft and the M.A.E.T.U. detachment returned to Morotai.

Meanwhile, on Morotai the other part of No. 2 M.A.E.T.U. had been working to capacity. As mentioned, over 1,000 patients had been evacuated to Australia during September. This work had progressed smoothly from the middle of the month when R.A.A.F. Liberators and other converted transport aircraft came under the control of the local T. & M.O. On 10th October Advanced Land Headquarters had approximately the following back-log of evacuations: Balikpapan 90, including 8 sick recovered prisoners; Labuan 200, including 140 sick recovered prisoners; Manila 40 sick recovered prisoners and Morotai for evacuation to Australia 200. With the assistance of No. 2 Air Ambulance Unit and special aircraft allotted by the A.T.C. Post, Morotai, these movements were all carried out by the middle of November. With the return of No. 2 M.A.E.T.U. to Australia, some little time later the R.A.A.F's medical air evacuation task in the South-East Asia and South-West Pacific theatres was complete.