CASUALTY EVACUATION BY HELICOPTER IN MALAYA

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A signal recently received from R.A.F. Headquarters Far East stated: "Helicopters have been doing excellent work and surpassed all expectations. Although sent out mainly for operational trials, have met 90% of calls for casualty evacuation."

FIG. 1.—Westland S.51. (Reproduced by courtesy of *The Aeroplane*.)

The first request for helicopters to evacuate casualties was made by Far East Headquarters in 1949, as Army patrols receiving casualties were unable to continue operations and had to hand-carry their wounded to the nearest road, a journey which often involved several days. At that time the only helicopter in production that had passed its service trials and which was suitable for the task of evacuating casualties was the Westland S.51, or "Dragonfly" (Fig. 1). This type of helicopter normally carries a crew of two and two passengers, has a cruising speed of 70 knots and, with full payload, has a range of 200–250 miles (322–402 km.). It was decided to get three of these aircraft and adapt them for the movement of casualties. As the cabin was not large enough to accommodate a patient on a general service stretcher, it was decided to fit two special containers or "pods" outside the cabin, one on each side of the aircraft. These pods, which were rather coffin-like in appearance, were fitted with windows and controllable air vents. Means of intercommunication with the cabin was also installed.

While these modifications were being carried out the opportunity was taken to visit Malaya and get a first-hand picture of the problems involved.

Nature of the Terrain

Most of Malaya is low-lying, with the exception of some high ground which runs up through the western central side of the peninsula. It is largely covered

with primary jungle, where the average height of the trees is 100 ft. (30 m.), and viewed from the air has the appearance of a large cauliflower patch (Fig. 2). There is little undergrowth in this type of jungle, the ground surface is poor, and there is little light; patrols can rarely see the sky. The remainder of the country is covered by secondary jungle or cleared primary jungle which has been allowed to grow again. The undergrowth is very thick and there is a constant struggle for air and light. Rivers and tracks wind among the jungle and are difficult to see until one is directly above them. There are occasional clearings which seem to be good alighting areas when seen from above, but closer inspection reveals waterlogged paddy fields.

The weather is tropical. Frequent early morning mists prevail in the centre of the country; these lift and break into low-layer cloud by mid-morning, becoming strato-cumulus and cumulus by midday, and usually dispersing in the evening. Scattered storms, producing a heavy rainfall, occur during the latter part of the day. Winds are unpredictable at heights at which helicopters operate, usually about 2,000 ft. (610 m.). Violent turbulence is experienced in the bowls at the end of passes through high ground.

While in the Far East it was learnt that calls for helicopter evacuation would occur on an average about once a week, and that, in addition to the task of rescuing Army casualties from jungle clearings, the helicopters would also be useful for taking medical assistance to crashed aircraft and rescuing injured members of the crew. On return to England it was therefore recommended that each helicopter should be fitted with a winch with a form of boatswain's chair attached to the end of the cable.

The aircraft were completed and despatched by sea to Singapore in the spring of 1950. As this type of aircraft had not been operated in tropical climates, the Army authorities were warned not to expect 100% reliability immediately, as the aircraft would have to be tested under the new conditions and the pilots would have to gain experience in flying over and landing in jungle country.

FIG. 2.—Typical Malayan jungle as seen from the air. It is not uncommon for these trees to reach a height of 200 ft. (61 m.). The trees in many cases are festooned with creepers.

Early Difficulties

An R.A.F. casualty air evacuation flight, consisting of experienced helicopter pilots, ground mechanics who received a special course of training in helicopter servicing, and three air-ambulance orderlies, was formed in the United Kingdom and proceeded to Singapore, where active training began. Soon afterwards the first successful evacuation of a casualty was carried out.

One of the earliest lessons learnt was that the "pods" interfered with the performance of the aircraft when operating in the Tropics. These were removed and a wickerwork "cradle," which was made locally, was attached to a metal rack fitted inside the cabin of the aircraft. As a result, owing to the narrow width of the cabin, the foot end of the cradle projected through the door. However, the patient was well protected by coverings and experienced no unpleasant effects. A new method to overcome this has now been devised. This is known as the "top hat" modification, and consists of two bulges in the fuselage to contain the head and foot of the cradle.

On active operations the pilots have found difficulty in navigation and landing procedure, especially in tropical rain. It was therefore decided to replace the air-ambulance orderly by a second pilot who had received a full course of first-aid training. Winching trials have been undertaken, using Neil Robertson's and general service stretchers, but these tend to swing when within 20 ft. (6 m.) of the aircraft. Lowering of a medical officer by means of the winch has been done successfully, and further trials are being carried out.

Landing

It is not easy to find landing grounds prepared by patrols. The usual practice is for an Army Auster plane to reconnoitre the site first and guide the patrol to an appropriate clearing and give it instructions in the preparation of the landing area. The Auster then returns to a strip where the helicopter is waiting, and the pilot is briefed; if necessary the Auster is used to guide the helicopter to the landing area, and constant communication between Auster pilot, helicopter pilot, and ground patrol is maintained by means of radio telephones. Should heavy rain occur the helicopter pilot has to fly around it, or reduce speed to 25 knots and fly low along the line of communication, or land at a strip and wait for the storm to pass, which it usually does in about 30 minutes.

The following are the requirements for a landing ground: (a) where possible, level ground should be used; (b) an area 30 yards (27.6 m.) in diameter has to be cleared to ground level; (c) a further 10 yards (9 m.) outside this circle must be cleared to within 2 ft. (60 cm.) of the ground and there must be no overhanging branches in this area which might foul the tail rotor; (d) a 30 degrees approach corridor must be prepared; (e) the centre of the clearing must be marked with towels or other suitable material to form the letter "H"; (f) areas of bad ground must be clearly defined so far as is possible; and (g) the patrols should use smoke to guide the aircraft to the clearing.

If there is a hospital within range the helicopter flies the patient direct there. When more than one patient has to be evacuated the helicopter ferries the cases to the nearest airstrip, and then Auster aircraft fly them on to hospital.

A Typical Sortie

To illustrate a typical evacuation sortie an extract is quoted from a report by the commander of the R.A.F. Casualty Air Evacuation Flight.

"The unit was informed that there were four British soldiers requiring helicopter evacuation from a position marked X on the Johore grid map. Taking off at 06.40 hours the helicopter landed at S— at 08.50 hours. The flight was direct and uneventful apart from large patches of mist and broken low cloud. On arrival it was learnt that there were two stretcher and two sitting cases. The first stretcher patient had a bullet wound through his left groin, the second a bullet wound of his left ankle. The sitting cases were a Bren gunner who had a nasty palm wound which had nearly severed his left thumb, and a man with a flesh wound of the chest where a bullet had ricocheted off the bone near the heart. A casualty party consisting of a second lieutenant, a sergeant, and 30 men had left the main company and was proceeding to a clearing near the river at position X on the Johore grid, some 15 miles from S— and about 24 hours' (plus) march away from transport facilities.

"Captain W. in an Auster took off at about 09.00 hours and after an hour's flying returned without finding the patrol. At 13.30 hours he took off again on another search and with no assistance from the ground patrol eventually located them in a small clearing at the river side. This was very fine work, as the patrol did not put up smoke or open up on the radio; in fact, Captain W. flew over the clearing once and assumed the men were tree stumps. The patrol actually arrived at this clearing at 13.20 hours. They stated that they had seen the Auster several times but did not put up smoke as it would slow their march. In the clearing they had thrown one smoke grenade but it failed to go off. Before sending the helicopter in to start the evacuation a further reconnaissance was made with a helicopter pilot in the Auster, Captain W. having reported that the clearing was perhaps too small. However, the clearing was considered to be of just the minimum requirements and the patrol were given instructions over the R.T. how to prepare the landing ground. The Auster then returned to S—.

"Take-off of the helicopter was delayed for 20 minutes because of a heavy rain-storm. It finally departed for the clearing at 15.15 hours, arriving at 15.30 hours. The clearing was in the middle of primary jungle surrounded by trees reaching up to 150 ft. (46 m.). The approach was slightly curved, but it was a good natural one owing to the height of the trees diminishing near the river. The centre of the landing ground was marked with towels. The first case to be evacuated was the patient with the bullet wound of the left groin. One pilot was left in the clearing to marshal the helicopter in 'turning on the spot' so that it could take off over the line of best approach and at the same time he could help to speed up loading. The helicopter then returned and picked up the second stretcher case. The patient with the nearly severed thumb was evacuated next. These three sorties between the clearing and the airstrip at S— were accomplished in 75 minutes. The helicopter was then refuelled and returned for the last casualty. The operation was finally concluded after 105 minutes from the first take-off.

"The patient with the groin wound was the only one in pain, but the R.M.O. said the hand was the worst case. The Casualty Air Evacuation Flight offered to fly any of the patients to hospital at K—, but the R.M.O. declined. All the men left by road ambulance, after initial treatment, at approximately 17.30 hours. It can therefore be assumed that as K— is only 35 miles away from S— all patients were in hospital by 19.00 hours. All the casualties were national service men, and their patience and uncomplaining cheerful attitude were a credit to their regiment. During the flights from the clearing to S— each patient's personal equipment was carried, and medical stores and mail were taken on the return trip. As it was too late to return to

base that night the aircraft was "D.I.'ed" (routine daily inspection) and the crew remained for the night at S—. In the morning the helicopter returned to base, refuelling at K—, as there were only 32 gallons (145 litres) of 100 octane remaining at S—."

Conclusion

There have been many similar sorties carried out in which the helicopter has undoubtedly saved life and limb. As further experience is gained the R.A.F. Casualty Air Evacuation Flight will no doubt be able to answer all the calls for casualty evacuation.

The helicopter is invaluable from the medical point of view and has again proved its worth in Korea, where the American Air Force has been picking up casualties from the front line. As these aircraft operate usually below 2,000 ft. (610 m.) there are no clinical contraindications to flight. Any patient fit for movement by surface means can safely be evacuated. Designers in this country are now fully aware of the medical requirements in design in order that the aircraft may be used to the best effect for loading and carrying casualties. Even hooks in the cabin roof from which blood bottles may be hung have not been forgotten.

I wish to express my thanks to those officers of the Far East Air Force who have provided me with information and to the Director-General of Medical Services of the Royal Air Force for permission to publish this article.

NEWS FROM THE BRITISH ASSOCIATION MEETING

The one hundred and thirteenth annual meeting of the British Association was held in Edinburgh from August 8 to 15. It was a special occasion in several respects. Being held in the Festival year, it was in part a centenary meeting, the centenary of the Great Exhibition. On that account there was more of stocktaking than usual and, as an extension from that, of extrapolation into the future. Secondly, the Association had the Duke of Edinburgh as its president, as in 1859 was Prince Albert, whose suggestion had led to the Great Exhibition. And finally the meeting was three weeks earlier than usual on account of the Edinburgh Festival.

The president's address was on "The British Contribution to Science and Technology in the Past Hundred Years." Among his examples were the birth of modern surgery in Scotland with Simpson's discovery of the use of chloroform as an anaesthetic and Lister's antiseptic technique; the work of Manson as the father of tropical medicine; and the leading part taken by the British Commonwealth in the promotion of public and personal health services. He spoke also of some omissions: the screw micrometer, invented in Britain but produced earlier in Germany and the United States; the silicone* group of materials developed in Russia and the United States from basic work by Professor F. S. Kipping, of Nottingham; and, from Navy experience, of "apparatus . . . used operationally exactly as the inventor put it together, with all the resulting disadvantages in maintenance and efficient operation." He drew the conclusion that where scientific principles are known by all nations the advantages lie in the good design of equipment for practical use.

Among those who looked to the future, Sir CLAUDE GIBB, president of the Section of Engineering, felt little doubt that within the next fifty years the gas-turbine motor-car would be used to the exclusion of all others. The remaining problem was the efficient recovery of heat from the exhaust gases. He suggested also that large-scale railway electrification might

*Organosilicon compounds with a wide variety of properties, the combination of heat-resistance and high electrical insulation being two of the most useful. See, for example, Hardy, D. V. N., *Endeavour*, 1947, 6, 29.

well be hastened by the application of atomic energy, since to justify the high initial cost generation of electricity would need to be substantial. In the use of materials, Dr. F. D. RICHARDSON (Imperial College, London) said that metals hitherto regarded only as alloying elements were becoming of interest as possible bases for new systems of alloys. An example was the relatively light metal titanium. It had a specific gravity of 4.5, excellent resistance to corrosion by chloride solutions, and a tensile strength greater than that of mild steel. Large quantities of titanium ores were available, and, if large-scale extraction could be improved, a new and important industry would almost certainly grow up and would help to relieve other shortages.

Chemistry and Medicine

Sir CYRIL HINSHLWOOD (Oxford), in his presidential address to the Section of Chemistry, referred to the present dimly appearing discernment of chemical processes in the cell, with chemotherapy dependent on their selective influencing, and the possibility of deep-seated chemical intervention into processes which were now normally inviolate. What was dimly appearing included the mutually aided auto-synthesis of protein and nucleic acid, changes in the proportions of enzymatic material in response to the changed reaction velocities imposed by various environments, and discontinuous modifications in the molecular pattern caused by radiations or the accidents of abnormal cell division. The division of the cell itself was imposed by a physico-chemical influence known as the scale-effect, and occurred without doubt in response to a physico-chemical stimulus. The growth of chemotherapy must be long and difficult, because as yet the rational chemical basis for much that was known was incomplete. Chemically induced mutations of cells were already known in a crude fashion, the influence of drugs on personality already exercised medicine and the law, and the day might well come when a conscious moulding of individuals and even of races would present problems of fearful fascination.

Recent work on the adrenocortical hormones was reviewed, with special reference to cortisone, by Professor G. F. MARRIAN (Edinburgh). As an addition to published information,† he stated that an announcement of the total synthesis of cortisone on the laboratory scale would soon be made. This was the opening contribution to a symposium on "Organic Chemistry in the Service of Medicine." The following speakers were Dr. F. L. ROSE (I.C.I., Ltd.) on antimalarials, and Dr. R. V. PITT-RIVERS (National Institute for Medical Research) on recent work on the thyroid gland.

Underdeveloped Areas

A full day was devoted by the Section of Geography to the types of surveys needed in underdeveloped areas, particularly in the Tropics. Professor L. DUDLEY STAMP (London) suggested that the examples of the groundnuts scheme in East Africa and the abortive poultry scheme in the Gambia showed that, apart from possible mismanagement, there was inadequate knowledge on which to base development schemes. A first step must be to record the existing use of land and to try to discover the reasons for its use or non-use. The World Land-Use Survey was a recently established voluntary organization under the auspices of the International Geographical Union. It was carrying out pilot surveys in parts of Nyasaland, the Gold Coast, Nigeria, Libya, Kenya, and Somaliland, including experiments on the use of material from surveys undertaken for other purposes—air photographs in particular. Dr. A. S. THOMAS (Nature Conservancy) enlarged on the types of preliminary surveys needed. Attention must be paid not only to soils, animals, and plants, but to existing farming practices. In many parts of Africa the best soils were on the tops of hills, not in the bottoms of valleys—hill-top villages, enforced by mosquitoes, having led to soil-enrichment by plant-ashes and food residues. The low fertility of many equatorial soils was now becoming more generally recognized; and, in

†*British Medical Journal*, 1951, 2, 406.