EXPERIMENTS WITH AEROPLANES USED BY THE MEDICAL SERVICES IN WAR AND IN PEACE TIME.

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With the advance of knowledge in the science of medicine and surgery the importance of affording treatment at the earliest possible moment becomes increasingly more manifest. In many cases, e.g., acute appendicitis, perforated ulcers of the stomach or intestines, serious bladder inflammations, certain abdominal conditions, serious wounds with much haemorrhage only immediate surgical treatment can save the patient's life.

The importance of rapid transport from house to hospital has been realized. For a long time in our country we have had motor transport, and in latter years the Central Committee of the Swedish Red Cross, on the initiative of Prince Charles, President of the Society, has assisted in the provision of cars. In a speech made by Prince Charles in December, 1924, to the Swedish Medical Society, the Prince spoke of the great difficulties in the transport of wounded in various regions, especially in the northern parts of the country, the suffering thereby entailed, and the impossibility in certain cases, after transport by water and road, of getting the patient to hospital in sufficient time to save his life.

This led to the introduction of aerial transport in the region of Norbotten.

So much for peace; in time of war the necessities are greater.

1 Translated and abridged from the Revue Internationale de la Croix-Rouge, June, 1928, by Major A. D. Stirling, D.S.O., R.A.M.C.
The experience in the Great War has shown the great importance of affording effective treatment with the least possible delay.

During the Great War many improvements were introduced in the organization of transport, especially in the employment of motor transport in the front line area, by which means many lives were saved. On account of frequent interruptions owing to transport of troops, rations, munitions, the wounded had often to endure great suffering on bad roads swept by shell fire. This led to consideration of transport by aeroplane.

There has been a long interval between the first suggestion of transport by air, and the realization of the idea. In 1910, the Chief of the Dutch Medical Service, M. de Mooy, "the Jules Verne of ambulance aeroplane service," conceived the idea of transporting patients on a huge stretcher raised by a captive balloon, the whole drawn by a horseman. This plan was never tried, and it was not till 1917 that the first case was evacuated from the front by aeroplane.

The idea of transporting wounded by aeroplane had been put forward by Senator Raymond, doctor and aviator, who obtained authority to carry out his project during the great French manœuvres in 1912. At the beginning of the war, M. Raymond was killed during an air reconnaissance.

Amongst others who drew attention to the great advantage of aerial transport must be mentioned the French Military Medical Officer, M. Gautier, who declared in October, 1913 "we shall revolutionize war surgery if the aeroplane can be adapted as a means of transport for the wounded."

During the Serbian Army retreat on the Albanian mountains at the beginning of the Great War, two French aviators carried twelve wounded men from Priznend to Scutari, a distance of fifty miles.

It was Chassaing, a French military surgeon, and a member of the Chamber of Deputies—"the father of ambulance aeroplanes," who got the idea of transport by aeroplane taken up in France first, and afterwards throughout the whole world.

With much difficulty he got an old fighting aeroplane, a Dorant A.R. II, which he adapted to carry two patients. After several trials with this at Villacoublay, he was authorized to fly in the Soissons sector. He carried two wounded from front to rear, making a flight of six kilometres in twenty-five minutes. Subsequently six aeroplanes of the same type were placed at his disposal. In April, 1918, two of these were in operation for the evacuation of Flanders, but owing to the intensity of the fighting, the French higher authorities withdrew their sanction. The D.G.A.M.S. of the British Forces declared at that time that the use of aeroplanes for transport of wounded was not suitable for the British Army in the field.

Chassaing was not discouraged, and at the end of 1918 he went on a mission to Morocco, after which he was allotted sixty Bréguet aeroplanes for conversion to ambulance work. These were ready in 1921, some were sent to Morocco, others to Syria.
The following incident is noteworthy: One of the best-known Generals in Morocco was severely wounded on January 19, 1919, during a march near Meski; it was essential to get him to surgical aid. By stretcher he was taken to the landing ground at Ksar es Souk. Thence he was taken to hospital at Bou-Denib, a distance of sixty-three miles, where he was operated on by a surgeon who had flown over the Atlas mountains from Meknès. The General recovered.

In October, 1921, six aeroplanes carried from a sub-division of Meknès eighteen seriously wounded, a distance of fifty miles in thirty-five minutes. By ordinary means of transport this would have taken three days.

In 1923 over 700 wounded were evacuated by aeroplane to hospitals in Meknès, Fez, Casablanca, the distances varying from 50 to 350 miles. Regular ambulance aeroplane convoys were established.

In 1925, some 928 sick and wounded were carried by aeroplane in Morocco.

In Syria things moved more slowly owing to lack of aeroplanes. During operations on the Euphrates, in less than two hours 150 wounded were taken from Der-el-Zor to Aleppo, a distance of 156 miles.

By the end of 1925 nearly 3,000 cases had been evacuated without accident by aeroplane in Morocco and Syria.

M. Cheutin, who commanded the air forces in Morocco, gives as the result of his four years' experience the following essentials:—

(1) Close and friendly collaboration between the air and medical services.

(2) Confidence of the medical service and aviators in aerial transport.

(3) Existence of a large number of landing grounds, capable of serving both ambulance and commercial aeroplanes. The establishment of these is all-important.

(4) The choice of suitable aeroplanes so that landing may be made on difficult ground. It is especially advisable in the colonies to have the ambulance aeroplane of the same type as the ordinary one, to facilitate handling and the supply of spares. This does not exclude special aeroplanes to carry large numbers which might be used for troops or wounded.

(5) The pilot chosen for an ambulance aeroplane should be the best of all. M. Cheutin was a little sceptical about getting a keen fighter to take on the work, but after explanation of its importance all went well. He had the support of the Commander-in-Chief, who put photographic, bombing and ambulance aeroplanes on the same footing.

Experience in Morocco and in the Levant proved the value of the aeroplane which is not more dangerous nor more costly than other means of modern transport. It has in addition the great advantage of time-saving which is of the greatest service to transport columns, and it has the all-important advantage of producing a great effect on morale. It saves precious lives and reduces suffering.

During the last years of the war in Morocco, further developments took
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place, thanks to the acquisition of a new type of aeroplane, the Henriot, H.D. 14. This is a small aeroplane, with an eighty horse-power motor, an average speed of seventy-eight miles per hour, and capable of landing on an area fifty yards square, whereas a Bréguet requires an area of 650 yards square. It is light and cheap.

With these small machines, of which many were used at the end of the war, wounded were carried after preliminary dressing to points about twenty miles behind the line, and thence by Bréguet aeroplane to the base hospitals. This arrangement was found very suitable.

As the result of the French experience, the British began the transport of sick and wounded in Iraq. The first trials with Vickers Vermont did not give very good results, and it was not until March, 1924, that things were satisfactory. A Vickers-Vermont machine, after a trial flight of 438 miles, carried four patients from Kirkuk to Baghdad, a distance of 185 miles. By the end of the year arrangements were made to transport cases from Iraq to Egypt across the desert, a distance of 625 miles. This could be done in a day, from sunrise to sunset, although generally an intermediate halt was made at Ziza, thirty miles from the Dead Sea, allowing two days for the journey.

On account of the necessity of carrying sufficient petrol, aeroplanes which for short distances can easily take ten patients, could only carry four across the desert.

The advantages are most evident, the journey which formerly took three to four weeks can now be done in one day.

A new type is the Avro-Andover for two lying and two sitting. Another more recent type is the Vermont Victoria, carrying twenty-four sitting or fourteen lying. This aeroplane of a standard type is now in general use.

On account of the lack of special ambulance aeroplanes in Iraq in 1923, sick were being transported by ordinary aeroplanes, and in April, 1924, 200 soldiers suffering from dysentery were carried from the area of operations to Baghdad. Evacuation began near Serkhuma; weather was bad, and the wind strong, and the aeroplanes were obliged to fly at over 5,000 feet, to get over the crest of Adghir Dagh. Unfortunately, a Vickers-Vermont aeroplane carrying sick, made a forced descent from a height of nearly 3,000 feet, and was destroyed. Happily there was no serious injury to the occupants. The place was isolated and did not permit of the landing of a large aeroplane. However, a fighting aeroplane with a medical officer managed to alight; one of the patients was removed by aeroplane, and the remainder on horseback or by camels.

The successful evacuation by aeroplane of 198 sick, first over a short distance to Kirkuk was carried out, and later to Baghdad, a distance of 1,000 miles. The worst cases were evacuated in the morning or late at night, to avoid air sickness, which is always worst in the daytime. In the fifteen months following, 161 sick were evacuated to Baghdad from different stations.
There is therefore no doubt that in certain areas the ambulance aeroplane has a great part to play. The question arises as to whether aeroplanes can be equally well used in war over a large area, as during the Great War. Difficulties arise, and the inclusion of a new element necessitates the protection of personnel and material, and also that military secrets are not revealed to the enemy.

As a result of representation by the French, the question was considered at an International Conference of the Red Cross at Geneva in 1923. The Conference delegated the question to the International Committee of the Red Cross, who appointed an expert Commission to study the matter. This Commission met at Lyons, in September, 1925, in conjunction with an International Law Congress. The results of their labours were submitted to the International Conference of the Red Cross at Geneva, in 1925.

At this Conference, a supplement to the Geneva Convention of 1906, and to the Hague Convention of 1907 was prepared dealing with the application of the principles of the Convention to aerial warfare. This will doubtless be submitted to a diplomatic conference.

The principal recommendations are as follows:—

Medical units of the Air Force should be attached to the Medical Services. They will be, like them, respected and protected by belligerents on condition that they are used exclusively for the transport of sick and wounded (whether accompanied or not by a medical officer and orderly), or for the transport of personnel and medical stores, and that they are not provided with signalling or recording apparatus such as rockets, photographic outfits and wireless installations.

The Governments agree not to use these for any purely military purpose. Flying over, and even approach to the lines within a limit to be determined in accord with the various Governments, are strictly forbidden, except under express and special license.

A landing ground some way behind the line is necessary, where the patients after examination and treatment can be transferred to hospital by aeroplane.

Ambulance aeroplanes especially and solely constructed for the transport of patients, the names and numbers of which have been communicated to belligerents at the opening of or during the course of hostilities, shall be respected and cannot be captured during hostilities. Belligerents will have the right of control and inspection of any ambulance aeroplane.

Ambulance aeroplanes should be painted white, and should carry on their wings above and below, as well as on the sides of the body, red crosses clearly visible to land, air and maritime forces.

In France it is proposed to allot to each Army Corps a certain number of ambulance aeroplanes, with centres at Paris, Tours, Lyons, Bordeaux, Marseilles and Nancy. These aeroplanes will also be used in peace time.
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In Italy a similar arrangement is being organized. So far as Sweden is concerned it is obvious that in a large part of the country, the transport of sick in time of war could not be carried out by land or water satisfactorily, and aerial transport will have to be considered. Steps must therefore be taken in peace time.

I will now pass to the question of using aeroplanes for medical requirements in peace. The experience in war serves as a basis for the study of this subject.

Brief references will be made firstly to experiences in other countries and lastly to Sweden.

Siam.—Particulars furnished by the Secretary General, Siamese Red Cross. Superficial area, 503,000 square kilometres. Inhabitants live in small detached groups. Country mainly occupied by forests and rice fields. Railway communications are limited.

There are therefore vast areas not served by rail where the only communication is by rather poor roads, which during the rains are impassable and at other times too dusty to use.

For nearly three years aerial transport has been in progress from four stations. A distance of 188 miles which formerly took fifteen days by ordinary transport is now covered in three hours. The Siamese Red Cross took the initiative and as a result of the prompt transport of doctors and medicines, epidemics are less frequent and less dangerous. Many persons bitten by mad dogs profit by this method of transport.

The aeroplanes used are Renault, 300 horse-power, arranged for two lying and four sitting.

For New Guinea, a hydroplane was built in England for the transport of sick, and as a result patients who formerly took seventeen days by boat are now taken to their destination in two hours.

In the United States the ordinary aeroplane is being used for ambulance work, although special aeroplanes are being built. In the Navy, ambulance hydroplanes have been used for a long time. The American Red Cross is authorized to use State aeroplanes when epidemics arise.

Finally, let me say a few words on the Swedish Air Service.

In 1923 the Swedish Government, on a proposal from the Swedish Red Cross and assisted by them financially, purchased a Bréguet aeroplane with a Renault motor of 300 horse power, with a special cabin for two lying and one sitting patient. It was provided with wheels and also with floats; later the wheels were replaced by skis, as it was to be employed chiefly in country snow bound during a large part of the year. The Government provided aviators and mechanics, whilst other expenses were borne by the Swedish Red Cross. The aeroplane was stationed at Boden and journeys were made to different parts of Upper Norrland. Transport of patients by aeroplane is only carried out when the medical superintendent of the hospital where the aeroplane is stationed is satisfied as to the nature of the case and also of the location.
In all sixty-two flights had been made up to the end of 1926. The cases transferred were those whose life depended on immediate operation, e.g., perforated gastric ulcer, those suffering from serious illness such as typhoid fever, who were spared the suffering entailed by ordinary means of transport. No accident has occurred during the transport of cases.

The experience of Upper Norrland has caused other parts of Sweden to be interested in this method of transport. In the summer of 1926 several cases were transferred from the archipelago round Stockholm to hospitals in the capital.

Let me mention finally and briefly the conditions necessary for the transport of patients by aeroplane.

It is very desirable that in the construction of an aeroplane the possibility of its use for patients should be considered. Different types of aeroplanes are necessary according to the area in which they are to be used. For the north there should be room for the pilot, mechanic, and one lying case on a stretcher in a covered part capable of being heated. The stretchers must be put in position without difficulty. It is desirable also to have room for an orderly. The aeroplane should have floats and skis, and have a radius of action of 375 miles.

Aeroplanes for the other regions of Sweden should have floats and wheels for landing, their radius of action could be limited to about 220 miles. Room for a mechanic is unnecessary. For these parts the Henriot type of aeroplane used by the French in Morocco is the most suitable. This plane can take one lying case on a stretcher loaded from the side. It is cheap, easy to repair and requires few spares. It can be manufactured in Sweden and working expenses are low.

For the northern regions, circumstances demand a much better machine. The Junker F. 13 complies with requirements. There is room for three or four patients, including one lying case, the stretcher is easily placed in position, the aeroplane is closed in and can be heated. The cabin resembles a coupé in a motor car, with four seats. The back of one of the front seats can be lowered to allow a stretcher to be placed on the seats.

This machine has a radius of action of 375 miles, has a motor of 185 horse power and a speed of 106 miles per hour. It is made of duraluminium which allows it to remain in water until the latter freezes. The lake water in Norrland being fresh does not attack aluminium. The cost, however, is very high, some 75,000 Swedish crowns, over £4,000.

However the Swedish Government proposed to locate one of these at Frösön, which will form the centre of the southern part of Norrland. The requirements for war in the case of Sweden cannot at present be estimated. These will depend on the results of the efforts in peace time.

For some time attempts have been made to get an aeroplane to rise and to alight in as straight a line as possible, and when this is achieved, it will be a most important factor in the development of the use of the aeroplane for the transport of patients.