# LESSONS OF 1924.

**Paper read by Captain W. H. Sayers (Honours Member) before the Institution, at the Engineers' Club, Coventry Street, W.1, on 8th May, 1925. Mr. S. T. G. Andrews in the Chair.**

CAPTAIN SAYERS said:

The year 1924 was one of steady if perhaps relatively uneventful progress in the development of aviation. It has, however, been marked by a number of notable performances. Amongst them the first flight round the world, which was successfully completed by a team of American Army pilots on September 28th, deserves first mention. During the course of this journey 27,500 miles was covered in 351 hours' flying time at an average speed of 76 m.p.h. The machines employed were specially prepared for the journey by the Douglas Co. of Santa Monica, but were to all intents and purposes a standard bombing and torpedo carrying machine with special equipment. The engines were the well-known 400 h.p. Liberty type, which gave the most satisfactory service under very severe conditions. The whole performance of machines, engines and crew was of a very high order and speaks volumes for the efficiency of the American Military Flying Service, and for the thoroughness with which the trip was organised.

The British attempt by Sq. Leader McLaren to make a flight round the world in the opposite direction to that taken by the American team came to grief, it will be remembered, in a dense fog off the Kurile Islands. Undertaken as this flight was as a single-handed venture on a machine which at times had to carry an excessive overload, its untimely ending in no way detracts from the credit which is due to Sq. Ldr. McLaren, his pilot, Flt. Lieut. Plenderleith, and to Sergeant Andrews, his mechanic, for an extremely fine navigating and flying performance.

Three other flights were of special interest during this year. First may be mentioned the flight round the coast of Australia by Wing Cdr. Goble and Flt. Lt. McIntyre of the Royal Australian Air Force. This flight was of a purely service nature, the object being a preliminary survey of possible sea-plane bases for the defence of Australia.

Much of the coastline is entirely unexplored and uninhabitated, and entirely devoid of any facilities for handling or overhauling aircraft. The flight, therefore, was entirely dependent for its success on the ability of the machine

and its crew to act as an independent unit carrying out all their own repairs, maintenance and so forth. The machine used was a standard Fairy III.D. seaplane, which had been in service for over three years, fitted with a Rolls-Royce Eagle engine series VIII.

The total distance covered was 8,570 miles in 90 flying hours, and this was accomplished with no untoward incident of any kind and no trouble with either machine or engine—a fact which speaks highly for the qualities of British aircraft and engines.

Yet another noteworthy flight was a second circuit of Australia, this time made inland from the coast by Col. H. C. Brismead, Controller of Civil Aviation in Australia, in August. The machine was a de Havilland 50, with a Siddeley Puma engine, piloted by Capt. Jones, Superintendent of Flying Operations, accompanied by Mr. Buchanan, Inspector of Civil Aircraft. The aim of this flight was the exploration of potential air routes, combined with propaganda effect. The flight occupied 25 days, average flying time four hours per day, and the distance covered was approximately 8,000 miles. Here again no trouble or untoward incident marked the trip.

It has to be remembered in connection with both these round Australia flights that the climate of Australia ranges from the temperate to the tropical, and that the machines used in these cases were subject to as rapid and extreme variations of temperature and of humidity as are likely to be encountered in any service.

Another great flight, again accomplished with a British engine, was that from Amsterdam to Batavia by Mr. Van der Hoep, accompanied by Lt. Van Weerden Poelman, of the Dutch Army Air Service, and Mr. Van den Broeke, on a Fokker F.VII. monoplane of the type so well known at Croydon, fitted with a Rolls-Royce Eagle IX. engine. This journey was interrupted at Phillipopolis by a forced landing on bad ground caused by fog, which led to some damage to both machine and engine. The flight was resumed after repairing the machine and fitting a new engine, and was completed without further incident.

The machine was unaltered from the standard type used for passenger carrying in Europe, except for the fitting of an extra fuel tank and of a tropical radiator, and the pilot is one of the staff of the K.L.M.

Yet another great flight of special interest in this country was that undertaken by Air Vice-Marshal Sir Sefton Brancker to India and back on a D.H.50, piloted by Mr. Alan Cobham. This flight was commenced in 1924, and its completion was so recent that it will be well within everyone's recollection. Its special interest lies in the fact that there was nothing of the " stunt " about it. It was determined upon by Sir Sefton Brancker as affording the only possible method by which he could carry out certain desirable duties in a reasonable space of time. Here, again, the flight was made in a standard commercial machine by a regular commercial pilot. A total distance of 17,000 miles was covered in this trip.

These flights of 1924 should serve to demonstrate to all the great improvement in the reliability and the dependability of the aeroplane as a means of transport in recent years, and its capacity to operate safely over practically

any part of the earth's surface, provided that the machine employed is suitable for the particular purpose for which it is used, and that it is handled by competent personnel. A recent paper by Mr. Hinkler on flying in Australia gave some account of the remarkable results which have been achieved by certain Australian airways which go far to confirm the lessons of the perhaps more spectacular flights which I have briefly mentioned, and it seems fairly evident that the aeroplane has now reached a state when it can be regarded as a tried and proved method by which rapid commercial transport can be given over routes where traffic is as yet insufficiently dense to justify the building of railway lines and the operation of high-speed expessr trains.

As against the year's demonstration of the growing dependability of aircraft for transport purpose there is unfortunately to be set the lamentable accident to the D.H. 34 at Croydon on Christmas Eve. It may be said that one such accident as this proves more as to the still existing dangers of flying than all the great flights of the past few years can prove to the contrary. So far as the moral effect on the potential passenger on a route such as London-Paris is concerned this might be true—though fortunately this particular accident seems to have had very much less effect on the traffic of Imperial Airways than might have been expected from previous experience.

On the other hand, such accidents as this may properly be regarded as having little bearing on the real progress which is occurring in regard to the safety of aircraft. The aeroplane to which it occurred was of a type designed in 1921, and represented one of the earliest attempts to produce an aeroplane for high speed heavy traffic over a short route already well served by other forms of transport. It was heavily loaded, and landed fast, and although no satisfactory explanation for the original cause of the accident has been found, the conditions at the time were extremely unfavourable.

The final cause of the accident was a stall followed by a dive too close to the ground to allow of recovery. Although it is difficult to see how accidents caused by involuntary stalls are ever to be avoided completely, yet there is no doubt that much can be done to minimise both the risk of accidental stalling and the degree of danger involved. With a more modern type of machine, a stall in the same circumstances might not have produced any serious results, and one may safely say that accidents of this nature will become increasingly rarer.

Apart altogether from such considerations, however, it has to be remembered that danger is to be considered relatively to all the conditions involved. In the case of the London-Paris and other cross-Channel services conditions are singularly unfavourable to aerial transport. In the first place, the air service has to compete with a comfortable, rapid and regular train and boat service. This calls for high speed and regularity on the part of the aeroplane, and forbids postponement of a trip for considerations of weather and the like except in the most extreme conditions. The route lies in a district afflicted by a most unfavourable climate, and owing to the densely populated nature of that district really satisfactory terminal aerodrome positions are out of the question on the score of expense. Add the fact that the fares charged by the competing rail service are low, and consequently low charges must rule on the

air service, and that as a result the air lines must carry the maximum possible pay-load on their machines in order to reduce costs. This has led to the use of machines with a much more limited reserve of power than is desirable on grounds of safety alone. Thus it may be said that the general conditions obtaining on this route are unusually unfavourable from the point of view of security; but that they have to compete with a surface system which has a remarkably high reputation for safety and reliability.

It may be further remarked that the London-Paris air service is regarded authoritatively as a safer method of transport for parcels and goods than the competing rail and boat service—as it is found in practice that owing to the absence of any transhipments en route there are fewer opportuuities for pilfering and for articles going astray, and that this much more than compensates for such losses as might result from accidents to the aircraft. This is an excellent illustration of the fact that safety has to be judged in relation to the nature of the traffic and the route, and is not merely a question of ton or passenger miles per accident.

If instead of a route such as the London-Paris one a journey covering a route of considerably greater distance and devoid of such highly developed and direct surface transport system is considered, air transport assumes a relatively much higher degree of safety and reliability.

On a long route—such, for instance, as that traversed by Sir Sefton Brancker—or on one where railways and roads do not exist, as in the case of the Australian Airways, the time saved by air transport is so great that a delay of some hours to await favourable weather becomes negligible, and one of a couple of days may be quite tolerable. Thus dangers due to bad atmospheric conditions can often be avoided. Secondly, because great savings of time are possible high rates per mile can be charged, particularly in cases where the alternative transport systems involve hardship and fatigue, as is often the case. This makes possible the use of less heavily loaded machines with an ample power reserve.

Suitable aerodromes of ample area surrounded by clear country can be used in such cases. Aerodromes two hours out of the city are useless for a route on which the aeroplane can save only an hour or two on the train, but would be quite admissible for a journey on which air transport can save days.

And finally, the standard of safety and reliability set by competing systems is usually lower as these facilities are less developed.

With the limited data as yet available, statistics as to the average passenger mileage per fatality on air services are of very limited value. Nevertheless, in certain quarters, these statistics for the British air lines have been compared with those of British railways. It may be pointed ou that this comparison is not only of little value, owing to the limited data on which the air line figures are based, but it is also unfair. The air lines compete with services jointly operated by British and Continental railways. If the accident statistics for French railways are taken instead of those for the British lines, the airway figures will make a much less unfavourable showing. If American railways are taken, and all casualties—not merely those to passengers—are counted, British air lines show a degree of safety comparable to railway travel.

When one comes to consider air services in sparsely populated countries—as, for example, Australia—it is obvious that the safety of an air service will not be judged by the prospective user in comparison with that of a non-existent railway service of British safety and reliability. If—as may be the case—the alternative to a few hours in an aeroplane is a week's foot-slogging through uninhabited bush or desert, a degree of safety quite insufficient for the London-Paris service will be a great advance on that of the alternative.

An extreme instance of the relativity of safety is afforded by the recently instituted seaplane service between the plantations of a Balata company in British Guiana and Georgetown, the capital of that country. The distance is approximately 200 miles, and the route follows that of the river, which affords a chain of emergency alighting grounds. The river is, however, broken up by innumerable rapids, and runs through country of an extremely inhospitable and almost impenetrable nature. Having regard to these facts, travel by air on this route should be much more dangerous than travel on the British air lines.

But the alternative route is by river, and this, owing to frequent porterages at the rapids, takes about a fortnight. As a result the journey means certain death to patients suffering severely from disease or serious injuries. For such cases the seaplane offers a rapid and extremely safe method of removal to a well-equipped hospital in healthy surroundings.

If I have stressed this aspect of the safety of flying it is because I regard it as extremely important that a correct attitude should be taken in regard to aeroplane accidents. There are certain dangers inherent in flying, and it cannot reasonably be expected that flying shall become as safe in the absolute sense as a well-run line of railway is to-day for some considerable period. If the aeroplane is to be regarded only as a competitor with main line railways on two to three-hundred mile routes, it will not achieve commercial success until it does achieve a comparable degree of safety and reliability.

But it is essential for man to travel over routes which cannot possibly for many years to come be served by such rail services. If the aeroplane can give on such routes a quicker, cheaper, safer and more reliable service than is otherwise possible, the fact that it is not as safe as or as cheap as a railway somewhere else has no valid significance.

And on these grounds I feel that it may be held that the various great flights to which I have alluded—together with many others of earlier years—are evidence that the aeroplane has by now developed qualities which render it sufficiently safe, and sufficiently economical for commercial development on a very considerable scale.

The operations of the British air lines in the past few years have, I believe, done a great deal of harm to the cause of Civil Aviation because by their choice of route they have inevitably invited the British Public to compare their record of safety and regularity during the stages of initial development of this type of transport with the records of the British railway system—which is unapproached in those particular matters by any great transport service in the world.

Had the same degree of reliability and regularity been achieved in direct

competition with some of the more primitive services on which our remoter Dominions have to depend, the British public would probably have gained an impression—which I think would have been nearer the truth—that air transport in practice is amazingly safe and reliable. And if that impression can but be established in this country commercial aviation will rapidly become an important branch of the world's greatest industry.

Turning from long distance flights of a more or less touring nature, 1924 was a relatively uneventful year in the sporting side. Practically all the great speed races of the year were more or less unexciting. In France the Beaumont Cup, which was to replace the Deutsche Cup (won outright by Sadi-Lecointe) as the great European speed event, was a walk-over for M. Lecointe on a new type Nieuport. No foreign competitors entered for the race, and the two other French competitors entered were not in a position to start.

The American Pulitzer Trophy race attracted no European competitors, and no new American machines were produced for the event. The race itself was marred by the collapse in the air of one of the record-breaking Curtiss Navy racers, and was won by its sister ship at a speed lower than that attained in the previous year.

No foreign competitors were ready to take part in the race for the Schneider Cup, the British entry having to be scratched owing to an accident to the machine during test. The Americans very sportingly washed out the race instead of flying over the course and so securing two out of the three consecutive victories which would give them the Cup permanently.

Our own Aerial Derby, the only important speed race held in this country, was cancelled from lack of entries. So that so far as speed racing was concerned the year was barren. It is not, however, to be concluded that the development of pure speed machines for racing and record breaking is at an end. Quite the contrary is the case.

What happened was that the Americans, with the financial assistance of the Army and Navy, had during the previous year or two devoted much work and a very large total sum to exploring the possibilities of increasing aeroplane speeds. The result was to raise the speed record to 266 m.p.h. in 1923—nearly 30 m.p.h. in excess of that attained in any other country. This result was not altogether due to aeroplane design, but rested on the development of engines of abnormal qualities and on such items as wing radiators and air screws giving a high efficiency at abnormal top speeds.

Any attempt in Europe or elsewhere to equal the American performances therefore called for more than just a cleaning up of existing racers or a further boosting up of their engines. An ultra-high speed racing machine is not to be built and brought up to its best performance in two or three months, and lacking the experience which the American designers and pilots have accumulated in the past few years European designers not unnaturally encountered a number of serious difficulties in their attempts to equal the American speeds. As a result none of the new European racers were ready to perform during 1924 with the single exception of the Bernard (French racer), which in November put the French speed record up to 244 m.p.h. and in the middle of December regained the world's speed record for France by reaching 278 m.p.h.

This machine was actually entered for the Beaumont Cup race already mentioned, but also had trouble during trials which prevented it from starting.

There is every reason to believe that during 1925 there will again be International Competition in speed races, and that still higher speeds than those already attained may be reached in the course of such contests.

In some quarters there is a tendency to regard this racing as an unnecessary waste of money and risk of life. Undoubtedly a machine capable of 250 or more m.p.h. is of no direct use for any other purpose than that of racing, and is appallingly expensive both to build and to fly. It is also extremely dangerous to fly. But racing has indirect results which may be of the greatest value. I am fairy convinced that all sporting competitions, for aircraft at any rate, should be governed by rules which encourage what is usually known as " freak " design, for the reason that when one is designing for useful service one is forced to compromise between incompatible qualities. As long as one never does anything but compromise one cannot be certain how much your compromise really costs, and it is therefore good occasionally to throw compromise overboard and go all out for one particular quality, sacrificing so far as is possible every other consideration to the quality. By doing so one can learn something of what one is sacrificing in the more usual case.

When the factest racing machines in the world had a top speed of 100 m.p.h. a single seat scout of 75 m.p.h. which could safely be entrusted to a good military pilot was rightly considered a remarkable machine. With a speed record at 180 to 200 m.p.h., 150 m.p.h. for a single-seat fighter with equipment was as much as one could reasonably expect to achieve. Now that the speed record is over 250 m.p.h. the fighter figure has actually reached 175 or more m.p.h.

I think that it is unfortunate, however, that speed racing is the only form of competitive flying in which an exaggeration of one specific quality to the neglect of all others is encouraged. Of course, the Lympne light aeroplane trials of 1923 encouraged freak economy to the practical exclusion of other features, and the success of that meeting is some indication of the wisdom of contests for freaks, particularly when the result of the 1924 light aeroplane competitions held at the same place, under complicated rules designed to produce useful machines, is considered.

I do not suggest that the 1924 Lympne meeting was a total failure, or anything like it, but it did in fact fail to produce the machine suitable for training purposes, which was its ostensible object. It is true that to a large extent that failure was caused by a muddled policy on the part of the Air Ministry, which led to great delay in the production of engines, but it may generally be said that competitions under complicated rules designed to produce machines for specific useful purposes will fail of the desired effect, for the very good reason that the designer works to defeat the rules and not to produce what the rule-makers want. As the designer generally knows rather more accurately what he can do than the rule-maker, the designer wins practically every time.

What may well prove to be the most important event of 1924 was the flight from Friedrikshafen to Lakehurst, New Jersey, of Z.R. III., the airship

built for the U.S. Government by the Zeppelin Co. The importance of this event lies not so much in the achievement of the flight itself, though that is noteworthy, as in the fact that it may definitely be regarded as marking the reopening of the development of the airship on a large scale. It is more or less a coincidence that the Z.R. III.'s delivery to America should have coincided with the decision of Great Britain to embark on a scheme of airship development, but there is a fairly definite connection between the voyage, the formation by the Goodyear Rubber Co. of Akron, Ohio, of the Goodyear-Zeppelin Corporation, and of their intention to proceed with the design of a new type of airship even larger than the British 5,000,000 cub. ft. ships.

I do not think that there is any room for doubt as to the ultimate future of the airship as a method of bridging long distances. But it is very obvious that before the would-be traveller to America embarks on an airship for that journey as readily as he now embarks on a liner, a very much larger experience of both the building and the operating of these craft will have to be acquired. The type of parsimony which has led to the past three years of inactivity in regard to airships in this country may have saved some few hundreds of thousands of pounds in the present, but it is probable that the ultimate cost of gaining the knowledge which could have been acquired in that time by keeping the existing airships in commission will prove to be far greater than the sum which has been saved.

I cannot pretend that I have touched upon all the events of 1924 which deserve notice. To do so in the time at my disposal would have involved compiling merely a catalogue of events. It has seemed therefore better to select some few of the events which seem to me to deserve a discussion of their bearings on the progress of aviation and to air my own views on that bearing. Those views are of course by no means the only ones which can be supported by the events of the year, and it is to be hoped that those who disagree with them will do so in the course of the discussion.

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