

The outstanding aeroplane of the year was Mr. Sopwith's American-built Wright biplane fitted with a 40 h.p. A.B.C. piloted by Mr. Hawker. This biplane won nearly all the weekly Brookland's handicaps. Each time it won the gear ratio to the propellers was reduced, speeding up the engine and increasing the speed. I don't remember the exact figures, but it was probably worked up to 55 m.p.h.

The first Marconi wireless messages were transmitted and received by Mr. Bangay, on my monoplane. This was the first instance of receiving in the air in Europe, and the first of transmitting from an aeroplane in England (April and May).

The military trials were the great feature of the year. The weather was uniformly bad; it rained all day and every day, our tents leaked and blew down. No one was satisfied with either the trials or the result, yet I think the rules were fairly good, but they were too severe for an impoverished collection of experimenters who then represented British Aviation. It showed that aviation was not to be developed by brains and hard work, the chief test being money. These trials mark the end of the early days of aviation; there were no more days of the old good-fellowship.

Aviation became a trade. Those who had worked for the love of the science, asking only the poorest food and lodging, were either dead or bankrupt, and so finished days which can never be repeated in the growth of a science. This example of a group of men sacrificing everything for the work has been seen in steam, electricity, motor-cars, etc., but never in quite the form shown in aviation, because the earlier engineering sciences did not necessitate living in communities, as did aviation. It is improbable that anything of the sort will arise again, because money has apparently become definitely the key to all progress. The next openings in science will probably be too elaborate for the needy worker.

However, those few years in every country produced a similar condition, and it would be interesting to hear accounts from other aerodromes.

Aviation in its present form has been built up by the failures and successes of those early pioneers.

DISCUSSION.

MR. MOLESWORTH (Chairman): Mr. Howard-Flanders has given us a most interesting account of the early days.

I myself started making an aeroplane early in 1908. I did not arrive at Brooklands until June, 1910, and left some time in 1911. Although,

luckily, I was not entirely ruined financially, I felt bound to cease experiments after having spent about £1,000.

I notice that Mr. Howard-Flanders has hardly touched upon the many amusing things that used to occur. I have seen Mr. A. V. Roe dub out a propeller with an adze out of a bit of 6 by 4 ordinary fir building scantling, and Mr. Billing flying about on a biplane with two fire-bars tied on the front stays of his machine to keep it in balance. Then England went up one day and descended, as one generally had to do, somewhere, and came down into the sewage farm with dire results. He was not hurt in the least, but was very ill.

One day Grahame-White took a lady up. He rose about 30 or 40 feet and managed to come down so as just to miss the river. So ended that flight.

The funny things that used to occur were very frequent, and it is amusing to look back upon them now from these days of progress.

CAPTAIN SAYERS: I do not think that I ought to be regarded as one of the early pioneers, because I did not reach Brooklands until 1911, when people were really flying, but I had seen a little of Brooklands before that date, and there were quite a number of amusing things happening at Brooklands after I got there.

Mr. Molesworth's recollection as to the machine with the fire-bars on it is correct as to its being a Billing's. It was Eardley Billing's machine flown by Percival, and I remember quite well the occasion on which that machine pulled off the tail of Mr. Molesworth's machine. To my knowledge, that particular machine of Mr. Billing's had its fuselage shifted at least six times, and it was not until after the sixth time that it was near enough in balance for it to land in any other condition but a spin. It was certainly one of the most extraordinary things, but at Brooklands between 1911 and 1912 I saw at least six cases of machines stalling, and in some instances spinning and going straight into the ground, under conditions which in any modern aeroplane would have meant death or very serious damage to all the occupants of the machine.

I remember one case where a gentleman who afterwards became a Brigadier-General spun a machine from about 150 feet into the sewage farm. The passenger's ankle was sprained by going through the radiator.

It is rather interesting to realise that the real reason for the comparative immunity from serious injury was that we were working on a wing-loading roughly of the order of a modern light aeroplane. This tends to reassure us as to the safety of the modern light machine.

I also remember the Walton and Edwards "Collossoplane" crash, which was certainly the loudest and longest crash I ever heard. As far as I remember, I started to run from Mr. Howard-Flanders' shed to a place where the crash could be seen—about 100 yards—and the noise went on all the time and continued after we got there.

Another instance may serve to show the great difference between the early and the modern machines; that was the 35 Green Avro biplane. I

was in charge of the Avro school for six months in 1912, and naturally we had a certain number of machines. There was one strut—the forward skid strut on the port side—which developed very curious mechanical properties. It was of hickory, and after it had been cut out it developed a very severe kink; so we steamed it and straightened it out. After that it was impossible to break it, although its two ends were doubled up on several occasions. We just steamed it and used it again.

I am glad Mr. Manning mentioned Mr. Howard-Flanders' monoplane. During the time in which that machine was completed I was working for him, and it was surprising how extraordinarily advanced ideas were in those days. It was an extremely clean monoplane, with very good aerodynamic qualities. If that machine were built now with a few minor modifications, one would say that it was the latest type of machine. The only reason that it failed in the early days was because we had no proper engines, and not the knowledge of materials or stresses that we have now. Apart from these differences it would have been a very up-to-date machine.

I am sorry that Mr. Howard-Flanders takes a pessimistic view regarding future experiments. It is natural that everybody who tackles a pioneer job in his young days after a time feels it is time to get something out of it. At any rate, the possession of money appears to be an insuperable bar to doing any pioneer work, and if Mr. Flanders is right there will be no pioneer work in the future.

MR. MANNING: One has to search one's memory for recollections, but the first machine I ever saw fly was at the Buc aerodrome in France.

In those days there were three sheds containing two machines. One was a R.E.P. No. 2. I have forgotten the name of the other, but it was a tandem monoplane with an ordinary tail fitted with a R.E.P. engine.

The R.E.P. monoplane with R.E.P. engine had a very peculiar under-carriage—a single wheel in the middle and a bicycle wheel on each wing tip. It had wires to the underneath side of the plane but no wires to the top, so that the planes drooped when the machine was on the ground. The chassis was satisfactory. It was flown by a pilot named Chateau. The machine got off quite well and flew round the aerodrome at about 20 or 30 feet.

The first English aerodrome I remember was at Farnbridge, and was started by Mr. Pemberton-Billing somewhere about 1908. The surface of the aerodrome was not very good, but it would have been very much better if the ground had not been full of water ditches.

There was one shed which contained a Weiss monoplane with a small motor-cycle engine. That was before the Weiss got to Brooklands. It was started in the same way as the Wright machines, with a rail, a heavy weight and a pylon, and I saw this operation carried out once or twice without success. I believe it was the opinion of the people who looked after it that the pressure on the grass at the end of the rail was less than it afterwards became, so that gave them a little encouragement as they

considered it was lifting some of its weight. I helped them pull up the weight one day, but just as we got it up to the top of pylon the catch broke. It took them about three days to get it out of the ground, as the latter was very soft and the weight went some distance into the ground.

Regarding Brooklands, the first Avro machine I saw was a triplane with a 4-cylinder Jap engine. I don't remember ever having seen that machine fly, but the planes were made in the same way as described by Mr. Flanders. A later Avro of the same type had a triangular fuselage covered with veneer, and looked a very nice machine. I believe the engine was a 35 Green. I only saw it out once, when it left the ground for about 100 yards and crashed on landing. The pilot leapt from his seat, stepped on the middle of the upper centre section, and jumped clean over the propeller. He received no injury. The machine had one peculiarity in being round. It had the word "Mercury" painted prominently on its side.

I think Mr. Molesworth must be mistaken regarding the machine with the fire-bars. I have forgotten who the constructor was, but do not think it was Mr. Pemberton-Billing.

I remember that the sewage farm got quite a lot of machines one time and another. Mr. Sopwith had a Wright machine fitted with a 50 Gnome, and I had a very low flight with him over the sewage farm in this. We were flying about 3 feet up with the engine missing badly.

Mr. Howard-Flanders does not mention his own machines. He built a monoplane about 1909-1910 with a 60 Green engine, and it was one of the most successful of the early types. A later type with a 70 Renault was made for the Government. Six were supplied, but for some unknown reason they were never used, but they were certainly among the best machines of their day.

I think we should all feel indebted to Mr. Howard-Flanders for his reminiscences of the early days.

DR. THURSTON: I have greatly enjoyed Mr. Flanders' lecture, bringing back very many happy memories. The spirit of those days appears to have passed for ever, and that of calculatists and economists succeeded, but the achievements of the pioneers will live always, and it is refreshing to bring to light again the spirit of those days.

I am not quite sure what was the reason causing the celebrated pioneer Mr. A. V. Roe to abandon his flying experiments on the Hackney Marshes, where he had his machine housed in a railway arch near the River Lea, but he told me at the time with a twinkle in his eye that the authorities forced him to abandon his experiments because he disturbed the tramps who wished to sleep on the marshes during the day. The authorities, however, could not keep A. V. Roe from continuing his experiments until he achieved a world-wide reputation.

I have often tried to fathom the spirit which animated those pioneers, but it is something which can never be expressed in concrete terms. I had a glimpse of it one day in 1903, when working with Mr. Hiram Maxim.

We were making experiments with aeroplanes in the grounds of Thurloe Park at Norwood, when the strains of Chopin's "Funeral March" were heard as a public funeral proceeded to the cemetery. The sun was shining and it was a beautiful day. Maxim, turning to us, said: "Ah, boys some day when I am over there you will remember me working like hell fire and damnation for an impossible ideal which will revolutionise the world."

Cody was also animated with this intangible and ennobling spirit of the pioneers, which is willing to sacrifice all on the altar of knowledge. He was once asked if he did not fear a crash in his old "cathedral," perched out, as he was, in front of the planes. "Well," said he, "when you have picked up the pieces you can write on my tombstone: 'Here lies the body of S. F. Cody, but his heart's in the highlands.'"

These three little anecdotes reveal to me more of the spirit of the pioneers than mountains of published data and achievement, and I hope they are worthy of record in the discussion on such an interesting lecture. You have the spirit of the pioneers enshrined in the words of America's battle hymn:—

"John Brown's body lies mouldering in the ground,
But his soul goes marching on."

MR. TILGHMAN-RICHARDS: I have listened with great pleasure to Mr. Howard-Flanders' reminiscences, even though corollary thoughts of old-time friends have raised a huskiness in the throat. Reminiscences of old days, gone, I fear, for ever.

Conditions change and we with them, and as soon as a pursuit becomes commercialised there remains little scope for the original pioneers to continue their work; they must fall into line or drop out.

To me, the old names of those whom the Reaper claimed in the early experimental days stir deeper emotions than even those who died in the glorious game of war. The latter had the incentives of duty and patriotism to support them when they went out to meet the enemy and death. But the two hundred odd old pioneers who died had no such encouragement. It takes pluck of the highest order to go out and face death in the early morning, often after weeks of hard toil and a few hours' broken rest on a makeshift bed in the hangar, with no glory to be achieved—no applause; just a cold grey dawn and a handful of tired mechanics, a more or less impossible aeroplane, control and stability of the sketchiest order, and the inner knowledge that, apart from the handful who read his epitaph, in the thought of the great world and often of his own people he would only be "another harum scarum young devil killed."

Were the old pilots an irresponsible lot? On the surface, perhaps, yes. Underneath, emphatically No!

I am reminded of a Gordon Bell story which I believe has not been previously told. G. B., flying one glorious sunrise, met on landing a man whom he particularly disliked, principally because of his atheistic and sardonic outlook. Asked how he had got on, G. B. said: "We had a top-hole time up there together." "Who was your passenger?" asked the

bête noir. "No one," said G. B., "I was solo." "Then what do you mean by 'we,'" asked the other. "Oh, just God and I," retorted G. B., to the discomfiture of his enemy.

Looking back, one is forced to ask one's self what use we have made of the heritage bequeathed to us by the pioneers. Have we gone forward holding high the torch, exploring unknown regions, or have we been content with the slow atrophy of our souls by sticking to the straight and narrow way of conventional thought and research.

Have we striven for aerodynamic efficiency or have we been content to accept greater and greater engine powers instead of more and more aerodynamic research, substituting K_x and K_y with B_f and B_l ?

I, myself, am not satisfied with my share of progress, but then I am a rebel. You, gentlemen, each know your own answer to my question.

Discussing the design of aircraft with a celebrated engineer who has studied the subject as a hobby, he pronounced the following dictum: "Aircraft should be conceived psychologically, designed engineeringly and detailed commercially." "But," I objected, "where does aerodynamics come in?" "My boy," he said, "the present unreliability of aero-engines, good as they are, precludes any extended use of aerodynamics."

A very hearty vote of thanks to Mr. Howard-Flanders brought the meeting to a close.

CAMBRIDGE UNIVERSITY—BUSK STUDENTSHIP.

In memory of Edward Teshmaker Busk, who in 1914 made a fatal flight with the first stable aeroplane, a Studentship in Aeronautics to the value of £150 per annum has been established at Cambridge University. Professor B. M. Jones, Engineering Laboratory, Cambridge, will supply full details and application forms.

CORRECTION.

Attention is drawn to an error which occurred in printing the advertisement of Messrs. D. Napier and Son., Ltd., in Minutes of Proceedings No. 8. In paragraph 4 the flying miles were shown as 100,000 and the flying hours as 1,000. A corrected version of the same advertisement appears in this issue.