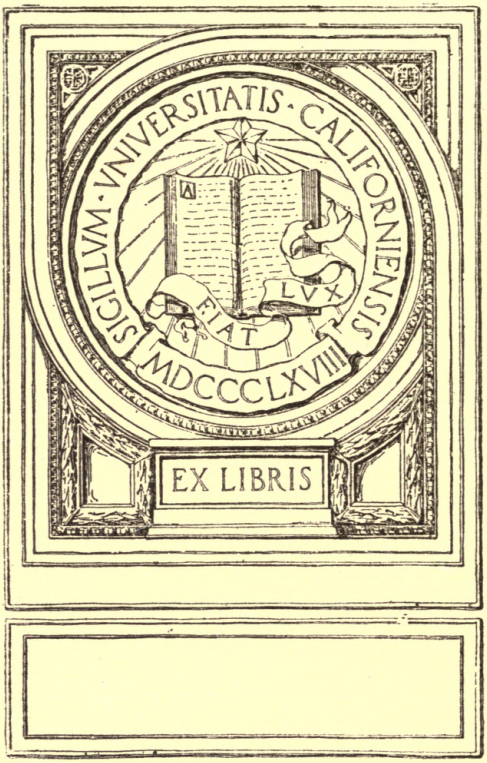
THE AIRMAN

CAPTAIN C. MELLOR, R.E.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THE AIRMAN

Photo. by Rameau, Etampes

PILOT AND PUPIL READY TO START

THE AIRMAN

EXPERIENCES WHILE OBTAINING A BREVET IN FRANCE BY CAPTAIN C. MELLOR, R.E. WITH AN INTRODUCTION BY MAURICE FARMAN AND EIGHT ILLUSTRATIONS

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NOTE

THE original title of this book was "THE AIR PILOT." It was, however, found that this title had already been taken in America. It was therefore changed at the last moment to "THE AIRMAN."

WILLIAM CLOWES AND SONS, LIMITED, LONDON AND BECCLES

INTRODUCTION

By Maurice Farman.

Paris, *le* 23 *mars*, 1913.

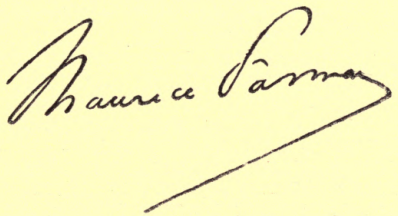
Cher Monsieur Mellor,

Je viens de lire votre ouvrage sur l'art de devenir aviateur et je ne saurais vous dire combien il m'a interessé.

Les lecteurs y trouveront relaté d'une façon claire et précise ce qu'il faut faire pour commencer à savoir voler, et aussi, ce qui peut être plus important encore, "tout ce qu'il ne faut pas faire."

Ils y trouveront aussi décrits d'une façon tout à fait pittoresque les amusants à côtés de la vie de l'élève aviateur qui sont reservés aux amateurs de ce nouveau sport.

Je suis sûr que par sa lecture un grand nombre de jeunes gens seront convaincus et voudront goûter de cette merveilleuse locomotion à travers les airs, et par là vous aurez rendu un très réel service à l'aviation.



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THE AIRMAN

THE AIR PILOT

CHAPTER I

THE WOULD-BE PILOT

I WANT to fly. The question is how and where. I have just returned from abroad with a limited amount of leave of absence, and I want to do the trick as quickly as possible. If I am unable within three months to report to the War Office that I have obtained my certificate, I shall have to rejoin my station abroad. I also want to do it as cheaply as possible, for I have had to pay my passage home, and shall also have to pay for that of my successor out. The advertisements of the various aerodromes in the aeronautical journals seem to offer all that one can reasonably demand. The general quotation seems to be for £75, which includes

risks to machine and third party. I inquire the cost of insuring myself against accident and death, and receive a quotation of £15 per cent. This is not good enough, so I decide to risk it.

I had written while abroad to some of the best-known schools for particulars, and I found the answers awaiting me at home. Some of these were business-like, with printed forms of agreement, others of the chatty description. On inquiry at the War Office I was told that no advice was given as to what school I should go, or on what machine I should learn, except that the biplane at present was preferred to the monoplane. I had simply to get my certificate in any way I liked, and the War Office would refund me £75.

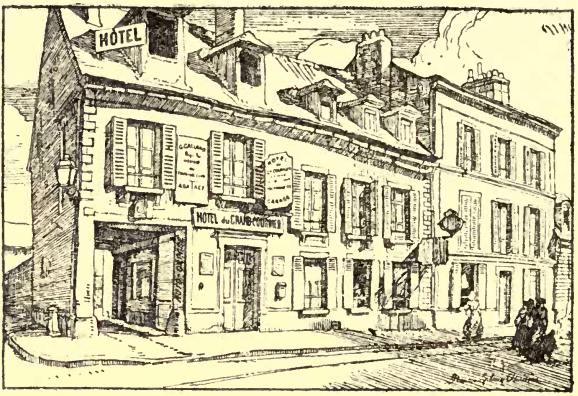
I happened to have a friend who had been flying now for a couple of years, and had a pretty thorough acquaintance with the flying business both in England and France. He advised me to go straight to the latter country, telling me I should save time, get better experience, and that the prestige of the

French certificate was higher than the English one. I decided to act on this advice, and have no cause to regret that I did so. At the same time, I cannot say I should not have done as well had I stayed in England, nor would my present very limited experience justify a critical comparison on my part between the schools generally of the two countries.

Within a week of arriving home I left for Paris. I went to what was described to me as a comfortable little hotel, and which I hoped would be inexpensive. I found myself in a palace, the very atmosphere of which smelt expensive, and proved to be so. Next morning I braced myself for a struggle with the Paris telephone system, and after a series of desperate bouts I got through to the Maison Farman at Billancourt, and arranged for an interview with one of the brothers Farman in the afternoon. A long ride in the still-existing, absurdly antiquated-looking steam tram took me from the Place de la Concorde to Billancourt, and I took a seat outside the Farman Office

about 3 p.m. Some time after 4 Mr. Dick Farman arrived, and I arranged in a few minutes for taking my brevet for £75. Even in that short time we were interrupted by the arrival of several visitors on pressing business. One of them was the Minister for one of the Balkan States, and desired to expedite an order for aeroplanes for the seat of war. I was then kindly taken round the very fine new workshops by Mr. Farman, who explained some of the interesting processes in the construction of the Henry and Maurice Farman biplanes. It was interesting to see how these two brothers continued to develop their particular creations on their own lines in the same shops. The shops were humming with activity, and gave one the impression of immense human bee-hives. About one aeroplane a day was being turned out, which was insufficient to keep pace with the demands. I tried to find out which of the two types of machine was in greater demand, and gathered it was about the same for both. I had to choose which type of machine I would learn on, and the difference

between the two is considerable. During the last French manœuvres *escadrilles* of both kinds had been employed. I knew that machines of both types had been supplied to the home Government, but I believed that the majority were Maurice Farmans, and I knew also that a company had been started in England for the building of the Maurice machines. I decided to learn on the Maurice, which has the attractive reputation of being the easiest and safest for the beginner. Mr. Farman told me there was a school at Buc and another at Étampes, to either of which I could go, and that there was little to choose between them. For the school at Buc one would live at Versailles which was handy for Paris, while Étampes was an hour away by rail. It struck me at once that the proximity of the Boulevards to Buc might prove a fatal attraction, so I elected for Étampes, which was said to be a better ground if anything. There was, moreover, an English officer at the latter school.



CHAPTER II

ARRIVAL AT THE SCHOOL

1*st day*.—I arrived next day at Étampes at the Hôtel du Grand Courrier, where Lieut. X, the English officer referred to above, was staying, and obtained an excellent room at 4 francs a day. The charges for meals were *petit déjeuner*, 75 c.; *déjeuner*, 3 fr.; *dîner*, 3 fr. 50 c. The *cuisine* was always excellent.

After *déjeuner* the school car started for the flying ground, which is about four miles out of the town. The *camion* would

take about a dozen passengers, and on this occasion there were about half that number. Two French officers in uniform were of the party. They had obtained the ordinary certificate, or *brevet civil*, some time before, and were now training for the "*brevet militaire*," which is a very superior affair. Lieut. X was ready to take his certificate at the first suitable opportunity. He could have done so before, but was advised to hold on for a time in order to obtain further practice in the *vol plané* and flying generally. At this school, he told me, one is not hurried, nor pressed to attempt the necessary flights for one's certificate before one feels confident.

The school consists of a dozen large hangars, containing Henry and Maurice Farman biplanes. The ground is bordered on one side by the main route to Orleans, on the other by a narrow belt of trees about five hundred yards long and five hundred yards away. For the rest, the surrounding country is open and undulating, grass and stubble alternating with ploughed land, save for the relief of a number of small woods

sparsely scattered. The square half mile or so of flying ground proper consists of good turf, but one can fly over the adjoining country, which is destitute of hedges or fences of any description. The narrow belt of trees mentioned above is used as the long axis of the oval followed in making a circuit, which is always carried out left-handed. The reason for always going left-handed is no doubt because some machines with rotary engines turn to the left more easily than to the right. It is an offence to make a right-handed circuit, unless there is no possibility of any other machine being about with which one might collide.

There was a certain amount of wind, and the Manager and Chief Pilot (in this case the only pilot-instructor) proceeded to take out a Maurice and Henry machine respectively, and try the air. *Remous*, or eddies were reported, unsuited to the training of the young idea, so there was nothing to be done but watch the flights of the "old birds." One could not but be struck by the confident ease with which the old birds

take to flight. A comprehensive *coup d'œil* and they climb into their seats and give the word to start up. A mechanic depresses the needle of the carburettor, places the two-bladed walnut wood propeller in a horizontal position, gives it one swing down and darts back and then out to the side clear of the tail. Two other blue-clad mechanics meanwhile hold the machine while the pilot listens intently to the tell-tale hum of the engine and tries the engine control. The pilot raises his hand and the mechanics stand clear. The machine moves off, slowly at first, and then with rapidly increasing speed, rolling easily on its pneumatic-tyred wheels over the smooth ground. The tail rises clear of the ground with the blast from the propeller, the machine gradually, gets more and more on tip-toe, and leaves the earth with a very gradual rise. A few circuits are made, each buffet of wind seems to be counteracted, and any tendency to tip to one side nipped in the bud. The landings are so beautifully made that it is hard to see when contact is really

made. The pilots are indeed admirable, but I returned with the reflection that in their more humble way, the mechanics upon whom the engines depend may be equally worthy of admiration.

CHAPTER III

A FIRST FLIGHT

2nd day.—This was a Sunday, on which day the school was generally closed; owing, however, to the fact that Lieut. X wished to fly off his trials, the school was opened in the afternoon, and a "*commissaire*," an official of the Areo Club de France, was in attendance to witness the trials. Maurice and Henry Farman machines were taken out for trial spins by the manager and the pilot, who reported the presence of *remous* in some numbers. The decision was against Lieut. X flying for his certificate that day, but otherwise the normal work of the school was to proceed. The French officers and non-commissioned officers in waiting for the *brevet militaire* took out their Henry Farmans, and I was told to take my seat behind the pilot in the Maurice. I turned my cap

round so that the peak was over the nape of my neck, and climbed up into my place.

The Maurice is provided with a double control, which permits the pupil to grasp a pair of handles on the control bar by putting his arms under those of the pilot from behind. There is also a second pair of footrests working the rudders. I am not permitted on this occasion, however, to touch the controls. I am merely to watch the pilot and see what it feels like. Well, off we go—straight into the wind. We run more and more smoothly, and I am uncertain as to when we leave the ground. We skim along near the ground, rising very gently. Suddenly we shoot up a steep hill in the air. I wonder if it is all right—we seem to be climbing so rapidly. Then we flatten out and go horizontally for a hundred yards or so; then another shoot up, and another later on, which makes one's heart jump into one's mouth at first. The rush and press of air are terrific. My chest seems to be getting stoved in and my ribs feel inclined to give way. I have difficulty

in exhaling. The smallest opening of the nasal valve seems to give too much air. My blood rapidly becomes super-oxygenated, and I experience a feeling of exhilaration. I should like to shout, or at least say, ha! ha! but the pressure of the wind is too great for me to say anything, and I feel it best to keep my mouth shut. My left pedal has sunk—the pilot must have pressed down his. I look over his left shoulder and see that it is so. We ought to be going round to the left. I look over the edge of the fuselage and see we are going round rapidly. What a distance we have come in those few moments! We seem to be about a mile beyond the end of the wood which we are encircling. But as I look we are getting quite close to it. Coming along with the wind we do not travel nearly so steadily. The control is working most of the time. We tip sometimes to one side and sometimes to the other, with now and then a sudden drop or rise, but none of them alarming. The drops give one a particularly pleasant sensation of the switch-back order,

but more delightful because they are so springy. The pilot motions me to look over the edge and look about generally over the ground. He evidently wishes to see if I can stand looking down at the ground which is rushing wildly past below us, and whether I am at my ease. I nod and smile to him and manage to convey the desired impression, hiding my bursting chest in my bosom. To the quondam balloonist the conditions do not seem so strange. But now we are going down. We take a dive which felt steep at first, but then we flattened out. Now we are diving again, and it seems as if nothing could prevent the machine burying her nose in the earth. An almost imperceptible movement of the front stabilisator causes us to run parallel with the surface. Are we on the ground or are we not? I crane over the edge, but cannot quite see the wheels. Anyhow, we are slowing up rapidly, and the engine has been cut off. We are certainly on the ground and standing still—all safe. I thank the pilot (in Dutch), and scramble down, rather breathless but happy.

CHAPTER IV

I AM ALLOWED TO TOUCH

3rd day.—We started at 6.30 a.m. in the school motor from the corner of the street, the *rendez-vous* for all who required to be taken up to the school. The drive of seven kilometres was desperately cold at that early hour—just after dawn. The pilots tried the air and decided that it was not for us. I felt rather disappointed, but found consolation in my goloshes, which afforded one some comfort while standing about on the damp clayey ground. The Britishers, I found, invariably wore goloshes, while the Frenchmen seemed content to paddle about in thin pointed boots of the consistency of paper. There was nothing to do but hang about and gaze at the sky, and then turn round and glare at the flag flying stiffly on the roof of one of the

hangars. The longer one looked at the anemometer on the roof of the office, the faster it seemed to buzz round and round. Occasionally one went into a sort of waiting room provided for the pupils, and warmed oneself at the stove. The attendance this morning was not in full force—a look out of the bedroom window at 6 o'clock had evidently been enough for some. Time went on slowly till about ten or half-past, when we motored back.

At the afternoon attendance things were more hopeful, and flying started towards evening. The pupils were taken out in strict rotation, according to the order in which they joined the school. I got up in my turn and sat behind the pilot as before. The pilot pointed to my cap, which I had forgotten to turn round. The danger of one's cap flying off is a very serious one. It is almost certain to be struck by a propeller blade as it flies backward. A piece is broken out of the propeller blade which then becomes unbalanced. After that the propeller either breaks up altogether—practically explodes—

Photo. by Rameau, Étampes

PUPIL SEATED BEHIND PILOT, AND HOLDING THE SECONDARY PAIR OF

or continues to whirl round, as long as the engine is running, in a lop-sided manner, bringing a frightful strain on the seating of the engine in the fuselage, eventually tearing the engine out of its place, and causing a catastrophe. I shamefacedly put my cap to rights and pulled it well down.

This time I was to hold the control bar by the second pair of handles provided for the pupil, and plant my feet on the secondary pair of pedals. We were off in a few moments. I found that I did not feel the rush of air nearly so much, nor have I subsequently felt any distress from it — at least, not in a biplane.

As soon as we were fairly going, I experienced a pleasing sense of security as though borne on a cushion of air, as if all the air between me and the earth were in the nature of a spring mattress.

We made a circuit, and landed without the suspicion of a bump. Opening the throttle while still running along the ground, we soon left the earth again for a second round. We had been flying low up to now, and desirous

of not letting the pilot feel that I wished to hug the earth, I pulled the control ever so slightly back. I thought that the pilot would scarcely notice it, but I was wrong. He warned me afterwards that if I pulled the control back we should go up, lose speed, and drop sideways or on our tail. I certainly had not meant to do all that at once, but I said nothing, and decided to put no pressure on the control in any way next time.

My turn soon came round again, and I went for another couple of circuits, keeping a satisfactory contact on the controls.

Lieut. X tried a circuit and figure of eight to see if he would take the opportunity of going for his *brevet.* He flew successfully and landed nicely, but considered that there was a trifle more wind than he cared about for examination purposes, and decided to wait. He had been declared fit to take his *brevet* a week before, but wished to profit by a little more practice before leaving the school. He now wished to finish with it, but was not taking any unnecessary chances —wise man.

We were finished for the day. The normal dose, I gathered, was a couple of lessons morning and evening of two or three circuits each.

CHAPTER V

BLANK DAYS

4th, 5th, and 6th days.—For the next three days there was absolutely nothing to be done —literally nothing. This is excessively trying at first, especially when one is particularly anxious to get on with the job ; but in learning to fly one at the same time learns patience. If I ever asked a perfect loafer, engaged in the pursuit of his trade, what he was doing, and he answered "learning to fly," I should consider there was a good deal of truth in it.

The trouble commenced with a south wind, bringing the rain. In the intervals when the rain ceased the wind usually blew harder. Most of us went religiously up to the School twice a day, and passed the painful hours kicking our heels in the waiting-room. My efforts to make up a four at bridge met with

a lamentable want of success. It was considered quite an English game which they could not be expected to know. I thanked my stars I could speak French, which was the common medium of the polyglot group assembled round the stove. This was the first time in my life I had really found it useful. Even here it was not really necessary in order to learn to drive an aeroplane under the instruction of a French pilot. This may sound strange at first, but the movements of control are learnt by holding the secondary handles of the control bar, while during flight the greatest linguist in the world would be inaudible in the roar of the engine. It was, of course, of assistance to clearly understand any instructions given by the pilot before the commencement of a flight, and his criticisms or explanations afterwards.

The military element in the party consisted of two French officers, two non-commissioned officers, two ex-non-commissioned officers (who wished to re-enter the army as officer-aviators), and two British officers.

The civilian element consisted of a Frenchman, a Dutchman, a Swiss, and a German. The Swiss was afflicted with a stiff leg which necessitated his sitting up on a sack of shavings to enable him to get his right foot on the controlling pedal. Later on when this unfortunate individual tried to settle himself in the front seat of the aeroplane, he found he could not manage it at all. Nothing daunted he went successively to the Blériot and the Deperdussin schools and tried to wedge himself into their respective machines, but had finally to give it up as a bad job. It was astonishing at first to note the intimate terms on which French officers and N.C.O.s are with each other—the same handshakings and salutations, an equal place in the social circle and in the general conversation. The possibility for this must be looked for in a high general level of education and good breeding throughout the country. In the afternoon the officers sometimes brought their ladies to join the party. The fund of small talk on these occasions seemed absolutely inexhaustible, though occasionally one nearly had

a back somersault at the turn taken by the conversation, a turn which an Englishman would studiously avoid in the society of ladies. The only people flying the Henry Farmans were those in training for the *brevet militaire*, while all the new pupils during the whole time I was at the School came to learn on the Maurice Farman. The school was originally a Henry Farman school, and had only recently become a combined one. By the time I left popular favour seemed to have swung round to the Maurice machine. Several of the older fliers in the party considered that the Henry was perhaps the most difficult machine of all to learn. It certainly was a matter of several months' training between the time that the Henry pilots took their *brevet civil*, and the time of their carrying out the tests for their *brevet militaire*. There is, of course, a very considerable difference in the value of the two *brevets*. Until one has obtained one's own *brevet*, it is difficult to realize how little the ordinary one means, and how much remains to be done before one is even a reasonably

safe pilot for an ordinary cross-country journey.

It may be interesting to compare the tests for the two *brevets* as at present laid down, for they have been changed in the past, and probably will be changed from time to time in the future, always in the direction of making them more exacting.

The ordinary certificate is that laid down by the Fédération Aéronautique Internationale, and the Aero Clubs of different countries belonging to this association appoint officials to see that the tests are strictly carried out. The tests consist of two flights of at least 5 kilometres each, and an altitude flight of at least 50 metres. The course to be taken for each of the distance flights consists of a series of "figures of eight" round two posts not more than 500 metres apart. The exact shape of the figures of eight is a matter of taste or luck. Some of the figures of eight I have seen taken round these posts partook more of the nature of cross-country flights over the surrounding country, especially in a strong wind. The

altitude flight can be combined with one of the distance flights, and this is usually done to save time. Landings must be "normal" —not of the "pancake" order—and after each distance flight the machine must be brought to rest within 50 metres of a previously indicated point, the engine being cut off not later than the moment of first touching the ground. The above tests have been carried out by a few brilliant individuals after some three days' instruction, but the average time may be put down as six weeks for those who wish to get a reasonable amount of practice in addition to passing the bare tests. It will be seen, therefore, that the ordinary *brevet* amounts to little more than a certificate to the effect that the holder is in a position to commence his more serious training as a pilot.

The *brevet militaire* is that of a fully qualified pilot, and the following are the tests which usually require four or five months' training in the French army. A cross-country flight of about 150 kilometers without landing, and a return in like

manner either on the same or a subsequent day. Secondly, a triangular cross-country flight of at least 200 kilometres, with landings under supervision at each corner of the triangle. Thirdly, an altitude test of not less than 800 metres for at least three-quarters of an hour. Fourthly, an oral examination on aero-motors and internal combustion engines generally; construction of air-craft; theory of flight; map-reading and meteorology.

The special certificate of the Royal Aero Club of the United Kingdom is of a similar order but less searching.

All the French military pilots have obtained their *brevet militaire*. Only two English officers at present hold a special certificate. It is devoutly to be hoped that English officers will be given the opportunity of attaining the high standard possessed by their French *confrères*.

CHAPTER VI

I TAKE CHARGE

7th day.—There was a touch of north in the westerly wind, and flying conditions were favourable. I took my turn behind the pilot, and as we followed our usual circuit it seemed to me that I had personally more effect on the control than before. In fact I seemed to have gradually and unconsciously taken charge. I looked over the pilot's shoulder and saw that as a matter of fact he had taken his hands off the control, and was holding them out in front of him. This was extremely gratifying, and I braced myself to do my best. I moved the control in accordance with the movements indicated by the pilot's hands, which he continued to hold out in front of him. After rounding the wood he took my left hand off the

control and put it on the throttle lever. We depressed the elevator and commenced to descend, and then partly throttled down. When at a few metres from the ground we closed the throttle by pushing the lever forward to its full extent, and the noise of the engine instantly ceased. By drawing the control slightly back the elevator was brought to a horizontal position, and we glided along about a couple of feet from the ground, as near as I could judge. We lost weigh, and sank gradually, taking the earth without shock, and came to a stop about 20 yards further on, thus effecting a successful *atterrissage*. The business was over for the morning. In the afternoon I was given the front seat in which one has more control, especially over the steering pedals. I felt somewhat elated and nearly forgot to turn my cap round.

This point about the cap is certainly a great danger, and in order to obviate it I decided I had better get a helmet such as is *de rigueur* with French military men when flying. This would in any case be

"Flight" Copyright Photo.

A LEFT-HANDED TURN WITH PLENTY OF BANK

a reasonable measure of precaution, as safety helmets have already saved several lives.

On the word "*contact*" given by the pilot the mechanic launched the Chauvière "*Intégrale*" propeller, and the trusty Renault engine started at the first swing. I pushed the throttle lever down so as to retard the engine; the propeller speed under these circumstances is insufficient to move the aeroplane and the mechanic can get out of the way of the tail by passing under the tail booms. I put up my hand as a sign to all and sundry to stand clear, and opened up full. We left the earth after a run of about 60 yards and moved along a few feet above the earth. I drew the control slightly towards me, and we rose rapidly. I then moved horizontally again to ensure not losing speed. One more step up like this and we were at a height of about 80 feet, which was sufficient for the time being. We swung round left-handed and the machine "banked" up to the right. This was corrected by depressing the control to the right, which sends the right-hand ailerons

up and the left ones down, and brings the machine to an even keel. It was better, I understood, to let the machine bank to some extent on the turns, as it thus turns more rapidly. Sometimes the machine fails to bank itself naturally when turning ; one can then help it by giving it an artificial bank by depressing the control to whichever side one is turning. The working of the control for lateral stability is a perfectly "natural" one, *i.e.* one cannot help doing the right thing instinctively. It is just as if one had the two wings of the machine under one's two hands ; if the right wing comes up too much, one just pushes it firmly down again with one's right hand, and similarly for the left wing.

The flight was uneventful, as the pilot took charge to effect the landing on the conclusion at the first circuit, and again when finally landing after the second circuit. I judged therefore that the landing was a more delicate affair than the other matters, and this indeed I found to be the case later on, in fact more so than all the rest put together.

Lieut. X then took the machine, and after a trial circuit went out for his *brevet.* He circled around the two posts alternately, making up the necessary number of figures of eight (*i.e.* five in this case, the posts being 500 metres apart), and then had to make his descent. Two men with flags stood about 100 yards from the point near which he had to stop, and about 100 yards apart. If the aeroplane was steered midway between the two men, and the engine cut off at the same time, the landing would probably be successful. Lieut. X. seemed to me to hold on rather long both as regards coming down and cutting off his engine. At last he was coming down, but did not seem to be following a line at right angles to the one given by the guides. He pulled up safely, but alas! outside the circle described with a length of 50 metres as radius and the given point as centre. His machine had cut the circle; its direction, however, was not that of a diameter of the circle, but a chord to it. A puff of wind catching the tail, when the machine was

slowing up on the ground, had made matters worse than they would otherwise have been, by slewing the tail in an unfortunate direction. The attempt was therefore held to have failed by the *commissaire*, the official of the Aéro Club de France, who had come to witness the tests. This result was naturally disappointing to Lieut. X, but instructive to inexperienced onlookers.

CHAPTER VII

A VISIT TO THE SALON

8th day.—Every one at all interested in aviation, and who could possibly manage to do so, naturally went to the Salon to see the "Fourth Annual Exhibition of Aerial Locomotion." It was marvellous value for a franc. There one could see examples of all the more or less famous types of aeroplanes, aeromotors, and accessories. One was struck by the comparative absence of everything appertaining to balloons and dirigibles. The machines holding the various records could all be examined, and those with any successes to boast of presented a conspicuous list of them. The army and navy had both entered with a will into this exhibition, and among other exhibits the army showed the complete

transport and accessories of a military *escadrille*. The *escadrille* is the French aviation unit, and its personnel and material are designed with the object of keeping six aeroplanes permanently in the field. The transport besides carrying the personnel is designed to carry a generous proportion of spare parts, the field hangars, complete aeroplanes dismounted, and workshops. All vehicles are motor driven except the two wheeled *prolonges* for carrying aeroplanes, which are attached as trailers by a limber attachment to motor vehicles. The complete transport, set forth in military array as for an inspection, consisted of three motor cars and two motor bicycles (for intercommunication purposes), six heavy cars each drawing a two-wheeled *prolonge*, and two travelling workshops. One of the latter was shown at work with drills, lathe, etc., worked by motors obtaining their power from a dynamo worked by the engine driving the vehicle. An enormous amount of money and labour must have been expended in the production of this excellent organisation, which stood

the test of the last manœuvres so well. Four *escadrilles* were employed on each side in the manœuvres with some spare aeroplanes in reserve; in all about sixty machines were in the field. Reconnaissances were carried out daily at the hours scheduled on a programme, regardless of weather, and both generals were kept accurately informed of the movements of the enemy's troops. No serious accident was sustained by any of the pilots, although several machines were damaged more or less seriously. The active aeroplanes all assembled at the places of concentration, prior to the commencement of the manœuvres, coming from their various centres by way of the air, and afterwards returned home in a similar manner. This is indeed a wonderful record, and one might imagine that the French would be satisfied for the time being with their present organisation and rate of progress. This is by no means the case. Throughout the country a great campaign is being carried on by individuals and societies for increasing the rate of progress in aviation, improving

the material and organisation, increasing the trained personnel by passing young men through the aviation schools prior to their doing their military service, and providing landing-places with hangars all over the country, particularly in the neighbourhood of Paris and of the eastern frontier.

The balconies of the Grand Palais presented the wonderful spectacle of a number of aeroplanes bought by various provinces, societies, commercial houses, theatres, etc., and by private individuals, and presented by them to the Government as a voluntary contribution in token of their sense of the importance of French aerial supremacy. This grand national effort could only be made by a nation, the whole manhood of which had passed through the ranks, and which had the enlightenment to understand the importance of this new development in warfare, to take a personal interest in it, and tax itself not only publicly but privately to attain its ends. It makes one's heart sink to think what a comparatively feeble interest is taken in aviation in England,

and how much the public has to learn as to the necessity for the development of military and naval aviation.

The only British exhibits I found were the Bristol aeroplanes and a British Bréguet. The former were specially well commented on in the French papers. The French technical journals gave one very little idea, however, as to the comparative merits of various aeroplanes and engines; as each machine was described, a note was added to the effect that it was in the first rank of such machines, if not actually superior to all others.

The Maison Roold gave a useful exhibition of the clothing and equipment designed for the comfort and safety of aviators. The Roold helmet is worn a great deal in France, being compulsory for military aviators. I invested in one, which I found quite comfortable, but I have not otherwise tested its merits. Monsieur Roold showed me a letter from a French officer whose life had been saved by his helmet; he had been hit on the head by a cylinder, which had flown off

a rotary engine. A length of silk woven material, known as a *passemontagne*, and looking suspiciously like the top of a lady's stocking, is recommended for wear under the helmet. It is pulled over the head balaklava-capwise, and is certainly very warm for its small size and weight. Among the exhibits were a variety of vestments made of a kind of Japanese paper, or *papier Kami*, which is waterproof, warm, untearable, and very light. I have tried a coat and found it very good, also a pair of gloves which are worn inside the usual fur-lined ones. Paper socks to put over one's ordinary socks are also sold, but any piece of paper—tissue paper is the best—does for this. The question of keeping warm in the air is a very important and rather difficult one, especially as regards one's hands. It is very dangerous if one's hands become so cold that they have not a proper feel on the control, and accidents have occurred from this. Most French pilots wear a neat black-leather suit, lined with camel's hair fleece, consisting of coat and trousers, worn over their ordinary kit.

This is a very practical kit, and does not show the dirt. It can be got for eighty francs in France, but is much more expensive in England. It is a very good tip, if one thinks one will be cold, to put a newspaper under one's waistcoat. One of the models dressed up on the stand looked like a travesty of a man in armour, with his helmet, breast plate, thigh guards, and shin guards. The mannequin was sitting on an aeroplane seat, which also defended him from shocks from that quarter, being constructed on the same principles as the helmet, etc.

The machine with the most fighting aspect was a Henry Farman hydroplane, with a Hotchkiss mounted in the bow of the fuselage. The machine was floating in a miniature pond in which some innocent goldfish were swimming.

All aeroplane constructors are aiming at building machines to meet the wants of the armies and navies of the world, as these at present are the only important customers. A time will come when aeroplanes will be constructed for a variety of civilian uses,

but at present ninety-nine per cent. of the output is destined directly or indirectly for military uses. It is the absolute necessity for the aeroplane in war, which is tiding the industry over this present semi-experimental stage which must precede the full development. The way in which Government orders are placed may make or mar the industry. In France the difficulty has for the time being been solved by forming homogeneous *escadrilles* of the various types of proved merit.

CHAPTER VIII

HOW NOT TO DO IT

9th day.—On the Monday morning following my week-end visit to the Salon I paid a visit to Buc to view the flying-ground there, which seemed to me to be inferior to that at Étampes. The Blériot School has, however, just removed from Étampes to Buc, presumably in order to be nearer Paris. Approaching the Buc ground the R.E.P. machines and hangars were in evidence. M. Robert Esnault Pelterie has recently retired from aviation. This step was forced on him by lack of Government support, in spite of a record showing many brilliant achievements in practical flights, which in his case perhaps more than in any other were the outcome of close scientific application.

Then came a long line of Farman hangars

which I visited. As I had to get back to Étampes I did not stay long. Only chance taxis are to be picked up at Versailles, and I had had to take a "growler" at 10 francs to go to Buc and back. Travelling back in the train to Étampes from the Gare Quai d'Orsay, one passes the Juvisy flying-ground on the left, which looks very restricted. Arriving again at the Étampes ground it seemed to be an ideal place. The journey from Étampes to Orleans is a very favourite cross-country flight, as one can come down almost anywhere if the engine fails.

Proceeding to take my lesson, I tried the system of rising very gently for a considerable way, including a turn. This was extremely inadvisable, so the pilot impressed on me afterwards, as a turn takes off so much weigh that it is asking too much of the engine to rise at the same time.

Between my turns I saw the first effort of one of the fledglings at managing the machine alone. After making an uneventful circuit he evidently proposed to descend, and began to come down all right. He then

cut off his engine, and at the same time the machine took a heavy list to starboard. This was corrected in time, before the wing touched the ground. The aeroplane then continued to sail along with what weigh it had left at about 20 feet above the ground, when to our horror we saw that the machine was slowly rising instead of descending, besides wobbling from side to side. When the machine had almost come to a standstill prior to a rapid descent on to its tail, the pilot mercifully opened up the throttle, and the trusty engine, picking up immediately, saved the situation by getting flying weigh on, thus automatically raising the tail and enabling the control to act. After going round once more a safe descent was made, but instead of running straight, the machine ran round in a small circle, which looked rather dangerous and must have brought a considerable strain on the chassis. No damage was done, however. The explanation of the first attempt to land was that, having taken his left hand off the control to cut off the engine, the pilot unconsciously

bore down with his right hand, thus working the ailerons, and causing the machine to drop down on the right. While correcting this mistake, the pilot pulled the control slightly towards him, instead of pushing it forward as he should have done, on throttling down ; for even when the elevator is held perfectly horizontal, the tail will drop if speed be lost. The engine would have started sooner, but that the pilot pushed the throttle lever further forward instead of drawing it back when he first realized that he must regain his flying speed. When he finally landed an unconscious pressure of the left foot on the pedal must have caused the machine to " circle left."

Thus were a whole series of errors clearly demonstrated ; in fact, a very useful exposition of " how not to do it."

Lieut. X brought off his tests with flying colours, and departed for England the same day.

Just at dusk a monoplane circled down from above, and landed near the hangars. It was Gilbert in a Sommer machine. (M. Roger

Sommer is another who has lately had to retire from the field of aviation through lack of support, in spite of obtaining a considerable measure of success with his machines; he has returned to his former pursuit of felt-making.) Gilbert got out, a somewhat uncouth figure, looking rather like a Michelin man in his padded overalls, and looked at his engine. The engine was quite cool and in good order. "Look at that engine," he said, "forty-one hours it has gone without having to have the slightest thing done to it—not even a sparking plug!" The engine was a "Rhône," a rotary one, similar to the "Gnôme" in general appearance. It has given remarkable results with Gilbert in his almost daily flights about the country. On this occasion he had come from Tours in an hour and 40 minutes. "Pretty cold up there," he said, pointing to the sky. We pushed his machine into one of the hangars and brought him back to the town with us in the school-car.

I read in the evening paper that Lieut. Sylvestre, whom I had seen starting out on

a Blériot monoplane for his station at Belfort, near the Eastern frontier, had arrived safely the same day. The journey had taken him from 7.30 a.m. to 4.30 p.m. He had had to make two descents on the way, owing to violent storms of rain and hail. This journey was carried out in the ordinary course of duty, and such fine feats are so frequent in France that they seldom call for remark.

CHAPTER IX

FIRST FLIGHT IN A MONOPLANE

10*th day*.—It seemed particularly cold at the school that morning. It was, in fact, freezing. I repented after my first round of having only a thin pair of gloves on, and hurried off to the vicinity of the stove. My eyes also felt the cold, so on my next round I borrowed a pair of fur gloves and tried a pair of celluloid goggles which I had bought at the low price of eighty centimes. I eventually found that, although good enough for passenger work, the curved portions of the goggles slightly distort one's vision, and this may constitute a real danger when one has to bring the machine to land oneself. Several good pilots have told me that, after trying everything, they have eventually returned to plain glass as the best and safest,

although the use of glass has, of course, one obvious drawback. M. Pierre Verrier, an artist on the M. F. biplane, always puts even his glass goggles up on his forehead before making one of his impeccable landings. Proceedings were varied by the arrival of M. Perreyon, a noted pilot, in a Blériot, from the school over the way. He and our instructor gave each other turns in their respective machines, which was a first experience for each of them on the machine of the other. We saw that Perreyon in the passenger's seat had taken control by the end of the first circuit, for the pilot proper was holding his arms out in front of him.

M. Perreyon then kindly gave each of us a turn in his speedy monoplane. The Gnôme engine was very troublesome about starting. The propeller had to be swung in one case about thirty times before the engine consented to fire. Meanwhile the pistons were from time to time liberally douched with petrol, a steady flow of which also ran from the carburettor, causing a circular patch of frost where it evaporated

on the ground. The Gnôme is all right once it gets going, but requires taking down after every fifteen hours or so of running to keep it in perfect order. It can he taken down, cleaned, and mounted again very quickly, and those who use Gnôme engines which are well cared for, swear by them.

A party of three or four of us hung on to the tail each time the monoplane was ready to start. This ensured the engine getting up to full speed before a start was made, so that the tail when released lifted at once, thus saving the tail skid from unnecessary rolling work, and enabling the machine to leave the ground more quickly. The job of holding the tail is rather unpleasant, owing to the blast, which has a very strong smell of burnt and unburnt castor oil.

It came to my turn, and I struggled up into my seat alongside the pilot through a hole in the bottom of the fuselage, which is closed by a trap-door. The draught from the tractor screw was terrible, and I

hastened to adjust my goggles and get my gloves on. We left the ground in about 20 yards. The machine seemed very small and bird-like compared to the biplane. It flew wonderfully steadily. There was no machine like it, Perreyon told me after, for "holding the wind," and he said it could go out in a wind which forbade the use of other monoplanes. This may be true, but most pilots can prove to you that their machines are superior to any other. The propeller draught was very trying at first. In fact, I could hardly breathe. I tried to breathe out, but only felt like "expiring." The experience was similar to my first ride in the biplane. Raising my hand on the way round, it was suddenly blown back on to the helmet like a piece of string, through getting into the full blast of the propeller. The fine spray of vapourised castor oil was not particularly nice. I was distinctly relieved at the end of the circuit, as I had begun to feel like blowing up, through distress in not being able to breathe. I do not suppose I should have experienced

this distress on my next journey, or at any rate nearly so much, judging by what I had felt on the biplane. Well—a very jolly experience when it was all over. I cannot imagine that a machine that goes at the pace this one did can be as safe as a slower one with more wing surface; take, for instance, the question of having to land in our restricted English fields at the greater pace. At the same time the fastest machines possible are required for strategic reconnaissance, and the present ban of the War Office on monoplanes will require reconsideration. The number of monoplanes built to-day is greatly in excess of the biplanes; both are developing equally strongly, and both will probably be required for military aviation.

It rained all the afternoon, so I stayed comfortably in my room at the hotel, and brought my diary up to date, instead of spending a gloomy afternoon in the waiting-room of the school.

CHAPTER X

I FLY BY MYSELF

11*th day*.—A thick mist, which the November sun took a couple of hours to lighten, covered the ground. After the fog had lifted I went for two very wide circuits with the pilot behind me, and I was then told I could try a small circuit or two by myself if I liked. Feeling sufficiently confident I replied that I would. With the engine throttled down, I tried the controls once more before starting: forward and backward to depress or raise the elevator; right and left for the *gauchissement* of the ailerons; right and left pedals for working rudder to right or left; backward and forward the small lever (lying close to my left hand) for opening or closing the throttle. A wire controlling the petrol supply had been duly unhooked, and was all right, and another wire controlling

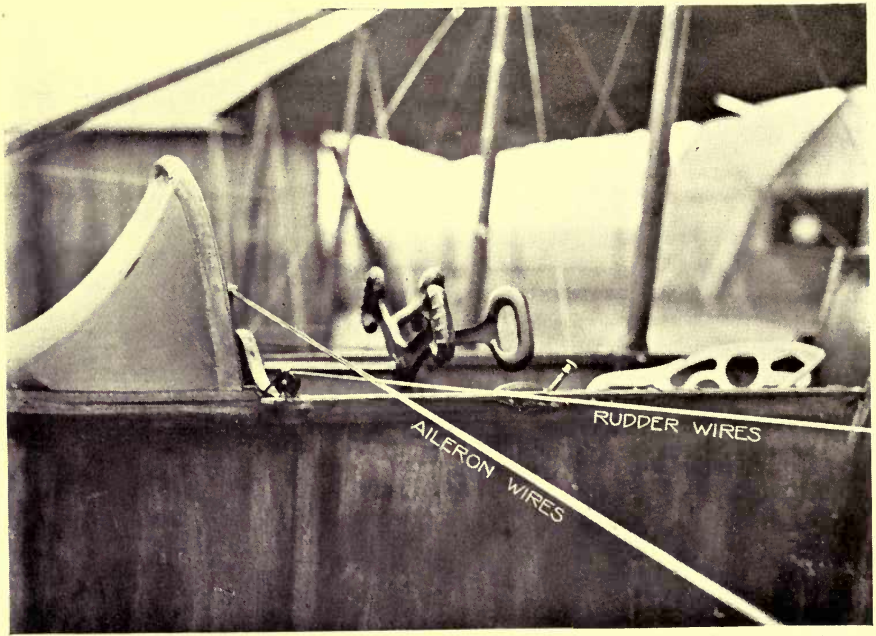


Photo. by Rameau, Etampes

THE DOUBLE-HANDED CONTROL BAR USED ON A SCHOOL MACHINE

the supply of air to the mixture could be left as it was. There was nothing more to do, then, before starting. The pilot told me to be careful not to go too high, and not to mount while turning.

I opened up the throttle to fairly full, and soon started moving off. I turned the machine gradually while starting, so as to head it for a straight run on the circuit (I had been warned before not to turn the machine too quickly on the ground, for fear of straining the chassis). I kept the elevator horizontal until I saw that the machine had left the ground of its own accord, and then, with a thrill of exultation, headed her for the blue ! After a decent rise, I went horizontally again, and then took another rise, after which I began turning to the left. I kept the elevator as horizontal as I could, but I seemed to be getting up to a good height all the same. I shot a glance to the left, and saw that the wood which I was supposed to be going round was still there. I was still at the stage when I felt as if my eyes were glued to the elevator, and that I

could not afford to take them off for looking round. There was a certain amount of wind, and I had to work the control backward and forward, right and left, a good deal. The working of the pedals had not yet become automatic with me, as I often found myself trying to work the handles round as one would the handles of a bicycle instead of working the pedals. Anyhow, I got round all right in time, as there was all space to turn in. I saw the starting-point, and the group assembled there looked small, and far below me. One turn was completed, and on I went with my second. The air below me seemed thick and friendly; it gave me the impression it would not willingly let me down. I passed through an eddy from time to time, and the incipient dive or rear up of the machine answered readily to the control, which I worked with a firm, decided movement, without jerks. The air seemed to say, "You have only to hold the handles in a reasonable way and I won't hurt you. These little movements of mine are only to add interest to the proceedings."

The side slaps of the wind were less sudden. I felt rocked in the cradle of the air. The lateral controls rapidly damped out these rockings, in which the air seemed to say, "You see, I can blow from all directions, but if you only keep calm and do the right thing, I'll stand by you." It was now time to think of coming down. I depressed and put my left hand on the throttle, and as I descended, gradually throttled down. When a few yards from the ground, I cut off and flattened out. At least, I imagined I was going to fly horizontally for a short distance before actually alighting. Much to my horror, I perceived I was rising instead of moving horizontally. This would not do. I opened up full at once and got good weigh on again and depressed once more. When within a few feet of the ground I cut off again and flattened out just as I was touching. I made a very fast landing, but without shock I was glad to note, and then let the machine run on to a standstill.

Well, that was a good thing over. I had run a long way from the starting-point, and

it took a long time for the others to walk up. I was anxious to hear what there was to be said about my flight. The pilot congratulated me, but with several restrictions. I had gone up too high in the first place. This was accounted for to a great extent by my having mounted on the turns after all. This type of machine tends to mount when turning to the left, and requires to be repressed to keep it horizontal. This I had not grasped before. Then the switch-back landing was not all it might have been. I cut off while still too high the first time, the almost invariable mistake of beginners, who see the ground coming at them at a fearsome pace, and consider—prematurely—that something must be done. The second time I cut off too low. However—well out.

The feeling of responsibility on this first flight alone was the greatest tax on the nerves I have yet felt in flying, and I felt greatly relieved when it was over. I felt the absence of the pilot behind me much more than I should have expected, although latterly he had been doing little or nothing.

In the evening I had a couple of flights with the pilot behind me, and the feeling of confidence which this imparted seemed to make me do the right thing automatically.

Note.—I have talked about "cutting off" the engine by pushing the lever of the throttle valve right down; with a Renault properly adjusted, however, this does not cut the engine right off, but leaves it running just sufficiently to keep the propeller turning slowly. This is a point of the greatest value, as by throttling right down one cuts off the propeller blast, which is always obtainable, however, in a couple of seconds by opening up.

With a Gnôme engine—the most widely used aero-motor of the present day—which will only run at practically full speed, one has to switch the engine right off, and if one wants to keep the engine running (as, for instance, during a long *vol plané*) one has to switch on at intervals to keep the propeller turning. If one leaves it too long and the propeller stops, or is turning too slowly, the engine will not

start or pick up on switching on again—Danger !

A new carburettor has been brought out by the Gnôme Company, which will permit of the engine running at a low number of revolutions, but I have not yet seen this in use. The usual form of carburettor on Gnôme engines, such as are used on the Henry Farman machines at the Étampes School, consists of a simple pipe and jet ; during its passage through the pipe the stream of petrol sucked in is vapourised and mixed with air. The amount of suction required to work this simple arrangement is only obtained when the engine is running practically at full speed.

CHAPTER XI

I AM PUT BACK

12*th day*.—This was a particularly fine morning for the sport, in spite of the prognostications of all the old birds the evening before, when the sun had gone down in a red setting, and even on the ground one could feel the wind getting up, while higher up the little clouds had arranged a handicap according to altitude.

I took a turn with the pilot behind me, and we finished with a figure of eight in order to land against the wind. One should always land against the wind, when there is any to speak of, both because one is steadier and because one brings up in a shorter distance owing to more rapid loss of weigh. A side wind is particularly dangerous to land in, as with diminished weigh the machine is

very easily tilted on to one wing by a puff, and the effect of working the ailerons is greatly reduced—in any case, they have practically no time or space in which to act before a wing is smashed; a more or less dangerous side-strain on the chassis is also involved. I was told I could take a turn if I liked by myself, and follow the same course, which I proceeded to do. The circuit went fairly well, and I then had to make my figure of eight. The latter was an enormous sprawling affair, covering kilometres of air-land, and not always at the same altitude, which is one of the many desiderata to be aimed at. I made a nice straight flight home for the hangars at a height of about 20 metres. The critical business of descent had now to be undertaken, with left hand on throttle valve and right hand on the control. I tried to descend gently while gradually cutting off at the same time. I came to the end of my tether in both senses more quickly than I reckoned on. I didn't like the look of it. I did not want to land at that speed, and I instinctively did not

want to rise again without the engine on; so I opened up again for a slight rise, and descended again, cutting off the engine. I landed safely enough, but fast and beyond where I wanted to stop, and ran some way beyond that again—another unsatisfactory descent of the switchback order.

The pilot said this would not do—I must descend more gradually and cut off more slowly. I felt rather sick about it, but tried to comfort myself with the thought that it might have been worse. One of the four thick rubber rings, by which each axle with its pair of wheels is slung to the chassis, had gone, and I mournfully watched the interesting operation of inserting a new one. I again tried to comfort myself with the reflection that repairs were included in the sum I had paid down.

I was fairly restored to equanimity by the time I went for another tour, this time *behind* my pilot, in which position one has a very modified command over the controls. We followed the Orléans road, travelling about 100 metres high. The usual delightful

avenue of trees bordered the road. I liked the look of them less in plan than from any other point of view. We circled several times above some farm buildings where the pilot had some friends, who kept his dog for him. They all came out and waved, attracted by the insistent call of the engine. We waved back to them. The farm buildings were picturesque enough, but lost most of their picturesqueness in plan, like the trees. Give me the soft plough beneath or the green fields, and I am with you in your appreciation of the beauties of the landscape.

We moved off at length from the vicinity of bricks and mortar, and flew across some small woods. These might have been pretty too, but their deep shadows seemed to glower at one. We were soon over these, though, and headed for home. Very slowly we descended and gently throttled down, skimmed along the surface and imperceptibly took the ground.

The afternoon was still good for flying, and the pupils had three lessons apiece. There were several moments of interest

during the afternoon. At one time half a dozen machines were in the air at different heights—three Blériots from the establishment over the way, and three of our Farmans. Gilbert turned up, and took out the Sommer monoplane which he had left in our hangars. Rapidly mounting to about 500 metres, he made for Paris—for the Issy-les-Moulineaux ground. A new Henry Farman was brought out of its shed, and tried by Fischer. This was of the latest type, without front elevating plane. It had a specially large tank, to hold 390 litres of petrol. At a rate of consumption of 27 litres an hour, this would be sufficient for 14½ hours. The duration record at time of writing is held by Fourny on a Maurice Farman—13 hours and some minutes. It was hoped that this Henry Farman with Fischer up, would beat the above record. Being a faster machine (85 kilometres to the hour, fully loaded), it was also to be expected that it would beat existing records for distance in a given time for the longer periods. Thus is the house of Farman divided against itself. The new

Farman was provided with a "Rhône" motor, now on its trial in the aeronautical world, from which great things were hoped. The long supremacy of the Gnôme as the aeroplane motor *par excellence* was challenged. This new rotary engine would be mistaken by the uninitiated for a Gnôme. Its chief difference consists in having the inlet valves controlled mechanically instead of automatically. A possible drawback lies in its having exterior induction pipes for the supply of the mixture to the cylinders, and this arrangement might cause trouble in very cold weather.

CHAPTER XII

I AM PROMOTED AGAIN

13*th day*.—This was another absolutely perfect morning for aviation. The worst one could say of it was that it was rather cold. As there seemed no sign of the wind getting up, we all tacitly held on for a time, just to let things warm up generally. One of the French officers started off on a trial for his military *brevet*, on a cross-country journey to Tours. He was disqualified on his last attempt for exceeding the time-limit allowed to cover the given distance. This was due to villainous weather and engine troubles, the latter including a broken cylinder, which resulted in a damaged propeller.

We started going out in turn about 9 a.m. After a turn behind the pilot I was told to take the front seat again, and all went well.

As regards control I was told that although my movements were correct, they should be carried out sooner.

I have often noticed, when sitting behind a good pilot, that he seemed to have an uncanny knowledge of what the wind was going to do, and started making the necessary correction almost before the actual arrival of the wind buffet. In explanation of this I have frequently experienced that a strong puff of wind is heralded by a much slighter one, a sort of advanced guard, and that if one exercises a good touch on the controls checking these light winds, one is doing the right thing when the real puff comes, and that one has simply to accentuate the movement one has already commenced. To obtain the best "feel," one's touch on the control should be neither too light nor too hard, much the same as in driving a car.

I was also told again that my landings were not gradual enough. I knew I should descend gently, with engine on, to about two metres above the ground, and then cut

off and flatten out, and gradually take the earth, but I had not yet got the knack.

In the afternoon I had another couple of circuits and landings with the pilot, and was then told to carry on solo. I started off, and overtook a covey of partridges, which I chased and passed over ; got round the wood in no time, and pulled myself together for the landing. I descended gradually on my last turn, saw that I was truly horizontal and in the straight for the starting-point, continued descending, and cut off the engine at two metres. My idea was now to bring off this much-desired gradual contact, but—wump !—that was a nasty bump ! I bounded up a couple of yards, but tickled her down by a series of quick depressions of the elevator, and ran out quietly. I then waited to be told off, and prepared to "take it in the neck." It was not as bad as I expected, however : rather too high a flight ; still an inclination to mount in turning ; and as regards landing I *must* keep the machine going much longer, after I cut off, before touching ground. Noted for next

time, but that was what I was trying to do before. I was not likely to do it worse, I reckoned, and ought to do it better. All the staff came up and shook the chassis and felt the wires. One of the latter had gone, the right one, from the front of the right skid to the boom of the lower plane. It was only a case of "bang went saxpence," and was rapidly renewed.

Meanwhile, the other pupils were taken on the second machine. I was then doctored up with further precautions, and started on another run. Nothing eventful occurred till the landing. Last time I had landed on an upward slope, which I had not sufficiently taken into account. I cut off at the two metres height, and kept the machine up long enough to land with only a slight bump. This was better, but not good enough, and I had landed slightly on the turn, to stop near the sheds. My mental notes were confirmed by the words of the pilot, near whom I had stopped. He told me I should have carried straight on instead of worrying about stopping near the sheds.

So I went off again, and brought off much the same sort of landing, but quite straight. I was a long way from home, so I started off on a fourth round. I took a very wide turn this time, and decided that the only thing left to try to improve matters was to keep the elevator perfectly horizontal after cutting off at two metres. I got on to the line of the straight for home in good time, descended gently, cut off at the right height, and kept her floating at that. This seemed all right—floating along nicely—"must touch soon, I suppose," was what passed through my mind. I kept the elevator just nibbling, as it were, at the horizontal, and found myself running out without having felt the ground. I hooked up the petrol wire and climbed down. I received congratulations from the pilot, who confirmed the idea of keeping the elevator horizontal after cutting off, and thus letting the machine settle down horizontally for the last two metres of height, while it lost weigh. I felt very pleased at having grasped the right idea to work at now in my landings.

One of the pupils who started a day after me, wound up the day with a couple of solo circuits with perfectly satisfactory landings.

Another week, we were told, and we should be practising for the *brevet*. This was extremely cheering.

The officers and N.C.O.s, practising on the Henry Farmans, were gradually working up to greater heights in this good weather combined with longer periods in the air, and practising vols planés of moderate height at first, but gradually increasing.

One of the N.C.O.s showed me—

Les Dix Commandements de l'Aviateur.

1. Ton appareil, examineras
   Avant de partir, soigneusement.
2. Tous les organes, vérifieras
   Bien, l'excellent fonctionnement.
3. Ton moteur, tu t'assureras
   Qu'il est en parfait rendement.
4. De l'atmosphère, étudieras
   L'état si souvent inclément.
5. Ton casque tu n'oublieras,
   Il te garantira sûrement.

6. Le départ enfin tu prendras,
   Avec sang-froid, courageusement.
7. Contre les éléments, lutteras,
   Mais n'oublie pas d'être prudent.
8. Ta mission tu accompliras
   Avec soin et très sérieusement.
9. Nos TROIS COULEURS tu porteras
   Avec joie, partout, triomphalement.
10. Et pour la FRANCE sacrifieras
    Ta vie, s'il le faut, glorieusement.

J. A. B.

CHAPTER XIII

I FLY TEN TIMES OVER

14*th day*.—Decidedly the winter seems to be the flying season par excellence, and November the best month in it in this part of the world. The perfectly still mornings characteristic of early Novembers are perfect for the sport. The slight touch of frost in ground and air this morning added a *joie de vivre*.

After the customary minute examination of the aeroplanes and engines, the manager and pilot tried the air. All being reported well, the fledglings were permitted to try their wings. I made a circuit round the wood, and effected a landing—all right it seemed; so I opened up again, ran on and got off, and effected another circuit, landing again with fair success. There was still an

unprofessional ripple about the final stage of the descent, and I could generally feel when I touched.

The next pupil then carried on. This was his second solo flight. The pupils' flights at this stage are naturally of more than ordinary interest. He went off and got round all right, but the great query is always the landing. He cut off high, and then mounted rather higher. (In taking off one's left hand to cut off, the remaining hand unaided is very apt to make some slight involuntary movement.) He depressed, however, before it was too late, and after a big ripple, landed with a slight bump or two. He evidently thought it all right, though, and was off again on his second round. He made a similar landing, and came running up very pleased. The pilot took him somewhat to task.

Flying was over for the morning, as a slight southerly wind had brought up a dense fog. Going back to the town, I took a lesson in driving the school car, from the very amiable chauffeur.

Conditions were excellent in the afternoon, and I did four circuits with landings in rapid succession.

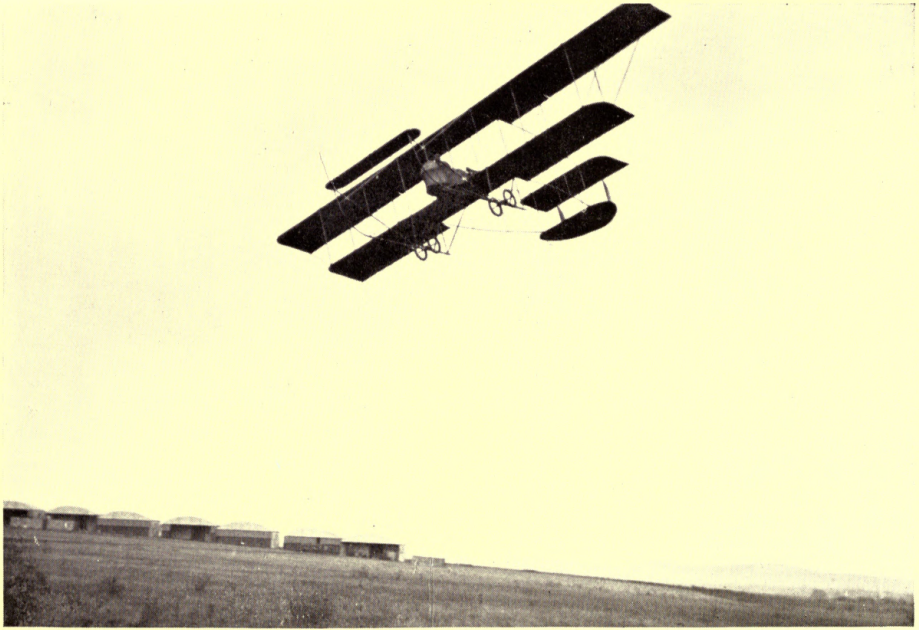
Pupil No 2 had a couple of rounds. In his final landing he positively soared up after cutting off, from which position he had to do a miniature *vol plané* down. He brought it off all right, but the danger was that, having very little weigh on, a treacherous puff might easily upset him sideways. He tried again, and this time again cut off rather too high, and then sailed along without any loss of altitude. The tail began to drop, and one wondered when he would elect to come down. The tail dropped more, but mercifully the whole machine was now settling down. The tail touched first, which immediately brought the chassis to earth with somewhat of a bump, but no apparent harm was done. Pupil No. 2 seemed rather more pleased than the occasion warranted, but he was of an eminently French sanguine temperament.

Pupil No. 3, the one who nearly slid back on his tail the other day, then went

out. I knew he was nervous, as earlier in the afternoon he had said he was not going out any more that day. He seemed to me to smoke too many cigarettes, and had a bella-donna look in the eyes. I swung the propeller for him, usually an easy job on the stationary Renault engine, compared to the business of swinging the propeller for the rotary Gnôme. In the latter case you have to swing engine and all, and it is usually more difficult to get it to fire. This business of swinging the propeller is a frightfully dangerous looking thing at first, as the blades begin to fly round almost before the man's hands have left, and the madly whirling knives seem to be going round precious near his face. It is, in fact, an operation in which due caution has to be employed, the great thing being to avoid slipping at the critical moment, and falling with one's head in the fatal disc. Well —No. 3 got off and disappeared behind the wood, as usual. Suddenly, the hum of his engine ceased, and did not start again. I started running for the end of the wood,

and the rest followed, the school car bringing up the rear. A variety of conjectures passed through one's mind as to what might have happened, and as to what possible gruesome spectacle one might be treated. I guessed, however, allowing for the state of mind with which I credited him, that he had merely surprised himself into landing, by suddenly finding himself too low through inadvertence; that he had cut off and landed instead of rising. We ran on and round the end of the wood. . . .

Well in the open we saw the machine at rest, apparently all right, with No. 3 examining the chassis. This was a great relief. We assured ourselves that both pilot and machine *were* all right, and were then treated to a lengthy explanation, accompanied by much gesticulation: how he had made a large circuit, and was steering in a general direction for home, when suddenly tall, dark, and menacing, the great black wood elevated itself before him. Uncertain of making good his turning round the end of this menacing obstacle, he thought it better to come down,



"Aeroplane" Copyright Photo.

A RIGHT-HANDED TURN WITH A FAIR AMOUNT OF BANK

and had effected a good landing, in spite of a number of large stones strewn about.

This was an interesting and surprising yarn. The fact was that he had completely lost his head. The machine was a good hundred yards from the wood, and the track of the wheels extended nearly another fifty yards back, and in a direction which showed that the descent had been made not towards the wood, at all, but in the correct direction for home. There was sufficient room to have made a complete circle without touching the wood or even going dangerously near it ; the said wood was only a narrow copse of small firs, and a slight draw on the lever must of a certainty have carried him safely over.

The pilot then took up No. 3 as a passenger, just to show him how he *could* turn, and got badly caught in the eddy of his own tail—rather a new experience for the pilot, I fancy.

I made four more circuits, landing each time, and taking a greater height during flight. On one occasion, after landing and

running along on the wheels, I hooked up the petrol wire, with a view to stopping the engine and getting out ; on looking up after this momentary diversion, I found to my horror that I was floating up in the air again ! I had got more weigh on than I realized, and had unwittingly drawn back the control somewhat. I depressed immediately and landed gently. As the propeller was still moving I released the petrol wire, and opened up again just to show I could do better. The final landing really seemed all right, and the pilot complimented me. When coming down from these greater heights, he said, it was certainly best to throttle down a good deal, on account of the added velocity from the descent.

I hoped I had now got hold of the right ideas to aim at in landing. My idea now was to flatten out at two metres high, and then keep the machine—*not necessarily the elevator*—horizontal, until she dropped of her own accord to earth. One then landed on the four wheels, and the tail dropped gently afterwards.

CHAPTER XIV

READY FOR THE *BREVET*

Sunday.—The chance of a last visit to the Salon was not to be missed. I had a good look round from 9 to 11 a.m., after which the place began to get crowded. I paid another visit in the afternoon, and was occasionally carried off my feet by the crowd. The national enthusiasm over aviation was most remarkable, and reached its maximum when the band played "La Marseillaise des Aviateurs." It is the military aspect of aviation, with the hope of the success it will bring them in their next war, which makes the chief appeal to the people, and the success of the show was due in great part to the active co-operation of the fighting services. The number of types of hydro-planes exhibited was another remarkable

feature. This branch of aviation is advancing with giant strides. The absence of Paulhan with his "Triad" was noticeable, due it was said to the impossibility of sparing a single machine of the type even for a fortnight.

15th and 16th days.—Monday and Tuesday.—Wind, rain, fog, etc.—nothing doing. I occasionally got into the seat of a Maurice, and worked the control and my imagination in unison.

17th day.—Wednesday.—Not too bad. The pilot told me to start quick before the wind got up. So I pushed off and did four circuits with landings, all going very well. I was just beginning to make the necessary movements automatically, including the steering with one's feet, which at first seemed unnatural.

The pilot said I could go for my *brevet* when I liked.

A thick fog came up directly I had finished, and closed proceedings for the day. I drove the school car back under instruction, and up and down again in

the afternoon. Fog prevented any further flying.

18*th day.*—*Thursday.*—Nothing doing again. This was very dull. I wandered about in the workshops, and tried to get some instruction about the engines. Some of the school prospectuses in England contain clauses as to instruction being given in the care and repairing of engines, etc., but there is not as a rule much organisation about this part of the teaching ; nor is this difficult to understand, as much attention paid to this portion of the business would prove a costly and unprofitable undertaking. It would in any case be hard to arrange and carry out, as the knowledge of the pupils on the subject varies between such wide limits. While few of them are entirely ignorant, many are experts. In any case there is no examination on aero-motors for the ordinary certificate, such as there is for the French *brevet militaire*, and the expense of instruction in this subject would be a loss to competitive schools catering to pass candidates simply through the tests for the certificate at so

much a head. The minimum that is required to be known is soon picked up, however, together with the leading features and characteristics of the engines with which one has to do.

The two most commonly used engines in the motor world are the Gnôme and Renault, and their chief points may be summarised as under—

Gnôme.—This is a radial engine of the rotary type, with seven cylinders. The types on the market are of 50, 70, 80, 100, 140, and 160 horse-power. The last three consist of two of the corresponding lower powered ones worked together on one shaft, the cylinders of the back unit showing through the spaces between those of the one in front.

The cylinders are of steel, and very thin, and are made with fins to facilitate air-cooling, which is also greatly aided by the revolution of the engine itself. In practice it is a very reliable engine, and is generally regarded as a marvel of skilled design by the engineering world. It requires,

however, much attention and specially trained mechanics to look after it properly. To keep it in perfect order it has to be taken down after about thirty hours' running, cleaned, and re-erected. This takes two skilled mechanics a ten-hour day. The reason for this constant cleaning arises from the free deposit of carbon in the cylinders from the burnt oil.

The propeller is fixed to a boss on either the front or back plate of the crank-case, and thus revolves at the same number of revolutions as the engine, *i.e.* at about 1200 revolutions per minute.

One of the great features of the engine is the ease with which it can be mounted on any machine, which in a great measure accounts for the general manner in which it has been adopted for many different types of machines. There is an objection from a certain number of people to the use of this engine, in common with other rotary engines, on account of its gyroscopic action. The effect of the gyroscopic action may be slightly felt when making a turn to the right.

It is very wasteful both in oil and petrol. The weight of a 50 horse-power engine is only 150 lb., or 3 lb. per horse, and it is this wonderful lightness which is its greatest advantage. When one sees one of these engines starting, and the light frail-looking working parts beginning their mad dance, one imagines that the whole thing must fly to bits with the centrifugal force developed.

The price of a 50 h.p. is £400.

Renault.—This engine is very similar to the well-known car type except that it is air-cooled instead of being water-cooled. A revolving fan in front of the engine drives air past the cylinders, while aluminium shields direct a part of this current upwards between the cylinders. It is a stationary engine of eight or sixteen cylinders, set V-shaped.

The types on the market are of 50, 70, and 100 h.p., of 8, 8, and 16 cylinders respectively.

The cylinders are of cast iron, and likewise the cylinder heads ; both of which, and

the top of the sparking plug, have fins to facilitate the air-cooling.

It is a very reliable engine, and requires comparatively little attention. The accessibility of the working parts leaves much to be desired, but the engine does not often require taking down—say, every 60 hours. The cylinder heads can be removed, and the cylinders cleaned, valves ground, and can all be put back by a mechanic in half a day. If the whole engine has to be taken down, it is a heavy job, and it is awkward to get it out of the nacelle. It would take two good mechanics, with assistance in lifting the engine, three days to take down, clean, and re-erect.

The propeller is fixed to the end of the cam-shaft, and revolves at 900 revolutions to the engine's 1800, the cam-shaft being geared down from the crank-shaft at 2 to 1. A larger measure of efficiency is obtained from the larger propeller travelling at a slower speed, than from a smaller high-speed propeller; the amount of gyroscopic action is negligible.

A 70 h.p. Renault uses 7 gallons of petrol an hour, and $\frac{3}{4}$ of a gallon of oil. It weighs 430 lb., or $6\frac{1}{7}$ lb. per horse.

The price of a 70 h.p. Renault is £480.

From the manager I tried to get some notes as to the administration of such a school as this, and received many polite promises.

From the clerk I obtained a record of my flying time up to date, which was as follows :—

Flying days.	*Minutes.*
1st	41 with pilot.
2nd	11 „ „
3rd	6 „ „
4th	15 „ „
4th	23 alone.
5th	65 „
6th	65 „
7th	50 „
8th	23 „

Total—5 hours all but a minute.

The above times were made up of several short flights, as a rule, and were generous

estimates, I should say, probably to make sure of accounting for all the petrol used.

It was still raining, and feeling very bored I walked back to the hotel. The first five kilometres were fairly pleasant walking, along a decent road ; but the last two kilometres through the town were killing, the paving consisting of very rough stone, about 6-inch cube, very uneven and full of holes. A mile or two over this tires one out, and one arrives at one's destination feeling jarred all over. One hears much of the fine roads of France, but in our small towns the roads are infinitely better than this. The effect of this sort of road, which extends for miles from Paris in some directions, must be nothing less than disastrous to the bolts and springs of cars.

CHAPTER XV

FINAL PRACTICES FOR THE *BREVET*

19*th day*.—The afternoon proving favourable, I was told I could have the machine, and do more or less what I liked with it. So I started off and tried some figures of eight round a couple of imaginary points. I found I was carried about half a mile to leeward while I was on the turn, which made my figures rather shapeless. I had got over the inclination to mount on the turns, and was now rather the other way, which was preferable. The pilot told me I would do better to work at a higher altitude, so as to allow for sinking on the turns.

So the next time I got up to rather over 50 metres, which is the height to be attained in the altitude test for the *brevet*, and passed over the wood while making the "eights,"

instead of going round it each time. This made the figures more stylish. The landing (against the wind) was in each case imperceptible, so I felt pretty confident for the tests, which specify "normal" landings. One of the pupils who was carrying out his tests just before I joined, landed in the middle of the given circle very exactly, but the landing was unfortunately of the pancake variety, and broke up the chassis.

The time-keeper, who swore to his exactitude, had noted the duration of my two flights as 10 and 12 minutes respectively. The latter would be my longest non-stop solo flight to date. I felt I could easily carry on for an hour. This would carry me 85 kilometres, with an expenditure of 30 litres of petrol. I should certainly have liked to fly for an hour, in order to say or rather to feel I had done it. The French officers and N.C.O.s were in fact training until they could do an hour at 500 metres altitude. This done, they would join one of the military aviation centres, and undergo further training for the military *brevet*.

20*th day.*—*Saturday.* Rained all day.

21*st day.*—*Monday* afternoon was perfect for flying—not a breath of wind. The first time I got hold of the machine I did my five "figures of eight" round two imaginary points, at a height of about 50 metres, passing over the wood as required, so as not to spoil the symmetry of the figures. I made an attempt to land in the circle marked on the ground as the usual stopping-place for the trials. I did not, however, see the spot in time, with the consequence that I ran over the circle after landing. But as there would be a flag or something to mark the spot on the day of trial, this failure did not worry me much.

It was some time before I could get hold of the machine again, as there were two other pupils now flying alone.

A bran-new one also turned up, accompanied by his parents. The new-comer was given a passenger flight, "with which he declared himself enchanted," according to the almost invariable formula in the aviation journals the day following a new "baptism

of the air." The new chum's father was also taken for a turn, and was previously overheard to say that he must have a flight to see if his legs got cold, and whether it would be really necessary to get Marcel leather trousers as well as coat. (As he had only a short trip, and it was a warm day, paterfamilias's legs did not get cold, and the son never got his trousers.) Madame, meanwhile, was making inquiries as to whether her boy would find himself in a "*bon milieu*," and looked the rest of us up and down in a very searching manner.

When I got the machine again I noticed there was an aneroid attached to the front of the fuselage, so I determined to have a little altitude trial all to myself. I only needed to get up to 50 metres for the trial, so I opened up full and headed for the blue-grey. On looking at the aneroid for the first time after starting I saw I was already at 75, so I said "Good enough," and rung round the wood, making a gradual descent, and landed, or rather stopped, inside the circle.

I felt I could easily work at a higher altitude if necessary, so I was satisfied for the present.

There was no further time that day to fly off the trials, which would take from half an hour to an hour, but I was told that if it was fine the next day, as seemed probable, I could carry them out. One of the French officers would be willing to act as *commissaire*.

At this stage the inevitable photographer, who took all the pupils as a matter of course, turned up. He was not to be denied, and had his will of me. Four photos are required in any case nowadays to accompany the application for the *brevet*, and the pupils at the French schools do a good deal in the way of exchanging photos in the form of postcards.

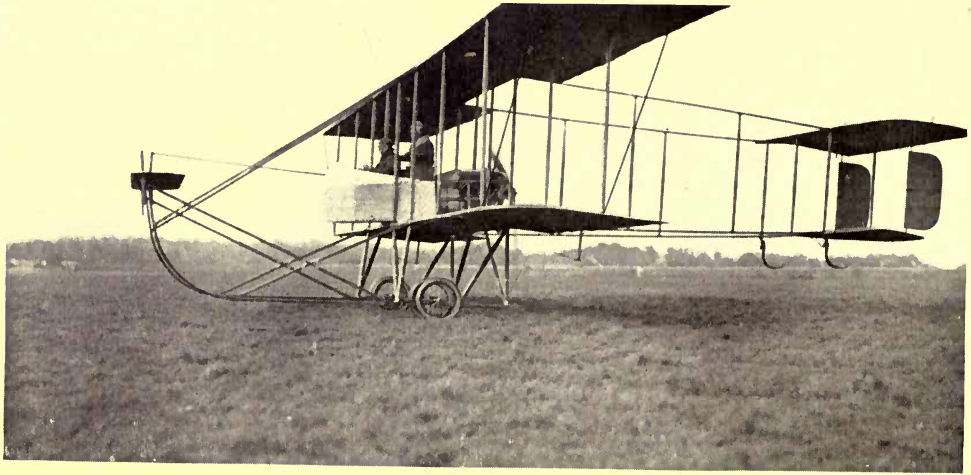


Photo. by Cooke, Wealdstone

THE TAIL SHOULD BE WELL UP AND FLYING SPEED ATTAINED BEFORE THE MACHINE IS PERMITTED TO LEAVE THE GROUND

CHAPTER XVI

THE *BREVET*

22*nd day*.—The morn bid fair, and after turns taken by the pilot and two other pupils, I started off to do the necessary for the *brevet*. The pilot's final injunction was to roll well before rising from the gorund, so as to make sure of having due weigh on, and avoid rising with a drooping tail, which would be thoroughly bad style. I determined to do nothing so amateurish. I was provided with an aneroid slung in front of me, which I could read easily, and a pocket barograph, a very neat little instrument, lent to me by one of the pupils, the Dutchman. I decided to fly at about 100 metres, that being a decent height, and not too high to prevent one easily seeing the flags, about which one had to turn. The

pilot said he would wave a flag when I had done four figures of eight, so that I should then know that I had to make one more figure, and then land.

I went off and got my altitude during the first figure, trying to rise on the straights only and avoid turning on the curves. I seemed to be getting along famously, and quite forgot to look out for the signal on my fourth figure. I saw violent signs being made as I finished my fifth, but as I had rather lost count by this time, I made one more to be quite sure, and then did a circle round the wood, making altogether, as I was told afterwards, six and a half!

Two markers stood about 100 yards from the stopping point, and the thing was to steer midway between them, and at right angles to their line. This I managed to bring off all right, having made a very big sweep round, so as to get a long straight. I came along about six feet above the ground, and cut off as I passed the markers, having already throttled down to a certain extent. I ran over the centre of the circle and stopped

about ten yards beyond. This was satisfactory. The pocket barograph showed a line of dots at the 100 metre level, representing my flight. This was the end of the first test.

I now proposed to go straight on, and combine the other two tests, namely a second series of five figures of eight, and the altitude test of 50 metres. For this purpose I had a sealed barograph slung in a box on my back. I still had the other in my pocket, and the large aneroid in front of me. Off I went again with instructions to look out for waving on my fifth figure, which I was to complete, and then do the altitude test—100 or 200 metres, or whatever I fancied above the 50. I completed the five figures of eight at about 100 metres without incident, having noted the waving, which I was this time on the look out for. I then set out for altitude.

The first thing I concentrated on was to see the aneroid mark 200, without rising appreciably on the curves. I was making large circles round the wood. The 200

was so soon and easily attained, that I thought I had better make sure of good measure by going to 250. I still felt quite master of the situation, so I determined to push on with a third oval and make it 300. I now began to feel rather less sure of myself, as sometimes when I felt sure I was mounting, the aneroid did not seem to show it, and then when I felt I was going horizontally, or even slightly down, the aneroid seemed to be going up quite quickly. The instrument must have had a certain retardation, but this discordance between fact and fancy was disconcerting.

Well—I arrived at 300, and was still going round. At this height movement seemed quite slow. I could easily fancy I was not moving at all—just sitting still in a buzzing chair. Rapidly multiplying 300 by 3, and finding that this fell short of 1000 feet, I determined to make for 350, which would give a decent margin. Long clouds of fog were streaming up from the south, and frequently nearly hid the wood and the ground generally from view. But I could

just see well enough to steer by. Having had my confidence slightly shaken by the unsympathetic behaviour of the aneroid, I went very gently indeed: in fact I seemed to be unable to rise at all. The low fog had obscured the horizon, and I found that the effect was that one soon lost one's sense of the horizontal under these circumstances. Ordinarily, by seeing what the edge of the front elevator is doing with regard to the horizon, one has a sound guide. I was not sure now what I was doing, whether I was going down, horizontally, or up. The awful thought struck me that I might be going up at some impossible angle, dangerously "cabré," and I shot a pained glance at my aneroid, that broken reed, which I considered had failed me in the hour of necessity. It marked something slightly over 300. After all, I thought, I was pretty steady; if the aspiring aviator begins to conjure up bogies, he might as well put up the shutters. It required considerable effort, however, to pull the control now, so as to either feel like rising, or have any effect on

the aneroid. I pulled resolutely, and was certain I was rising. The aneroid started rising soon after. I determined to come down at 350, as I was beginning not to like it. I hung on like grim death, and leaning forward I saw the needle well over the 350 mark, and depressed. The wretched aneroid still continued to rise, which made me depress more, and more than depressed me, as I had not really had a calm moment in which to size up the nature of the beast. When it did begin to drop the aneroid certainly dropped very quickly, much too quickly I considered. I determined to take plenty of time about it from then on.

In about three large ovals I got down to the region of 50 metres, and then rung round the wood, and made an exactly similar landing to the previous one, *i.e.* stopping about 10 yards beyond the centre of the marked circle. I hooked up the petrol wire, undid the belt which fastened me into the seat, and began to climb down. The others called out to stop me, until the *commissaire* came up and removed the sealed barograph.

I then got down and we looked at the records. The pocket barograph showed 400 metres, the official one 365, while the one I was looking at had marked 355 when I began to descend, and I had not noticed to what height it had gone exactly during the early part of my descent. The differences in reading were accounted for by the fact that the aneroid slung in front of me had been adjusted to something below zero before I started, so as to give the official instrument, a noted laggard, time to mark somewhere near the height attained. The pocket instrument was the most delicate of the three, and probably correct.

The deed having been done, all and sundry were most congratulatory. The pilot said I had been too high, but was distinctly pleased. For another he would have had fear, he said, but in this case he trusted to British phlegm.

The fog was now thick, so we dispersed. Having arranged to carry on with further training, I turned up as usual in the afternoon, and got a couple of good flights, not

going much above 100 metres, but going in for steering over fresh country, steering on a distant mark, following a road or railway, etc. I also found out how warp and rudder help each other, so that in practice one gets into the way of seldom using the one without the other.

One of the other pupils flew his tests, but not in good style, as he kept very low, and only did about 70 metres for his altitude.

An instructive accident occurred to a Henry Farman on landing, as I was watching it. The officer flying the machine, who had had considerable experience, was landing gently after a *vol plané*; he had elevated slightly just before landing, so as to clear the plough at the edge of the ground, and had very little weigh on. The ground sloped up to his right, and as he kept his planes horizontal, the right wheel touched first. What happened then was that the two struts immediately above the right pair of wheels snapped in half, and the machine tipped forward, breaking off the ends of both skids. Some other minor damage was done,

but as the machine did not turn over the pilot was unharmed, being luckily strapped to his seat. It seemed to me that the chassis broke rather easily, and I did not think this would have occurred with a Maurice Farman. The Henry machine in question was a 13 metre one, of a newer and lighter pattern than the older 17 metre one, and designed for greater speed. It has a distinctly more fragile appearance.

CHAPTER XVII

SUBSEQUENT PRACTICE

THE time subsequently passed by me at the school I employed for cruising round the environs generally for as long as I was permitted to have the machine; this was never more than half an hour, as there was always some one else waiting for his turn. The pilot had promised to come up with me, and put me in the way of the *vol plané*. He explained that I should certainly have had some little experience of this before going anything like as high as I did when passing the *brevet;* if anything had gone wrong with the engine when in the air, I should have had to plane down. The force of this reasoning was manifest, and I was only too anxious to learn the elements of the *vol plané*, and thereby take a reasonable

measure of precaution against engine mishaps in future flights.

Well, the pilot always seemed to be very busy with new pupils, who were flocking up daily, and as the manager of the school was on leave getting married, the pilot was also acting manager for the time being, and so had less time than ever. I therefore came to the conclusion that if I was going to learn this thing I had better teach myself. I had already started on a very small scale in some previous flights "*en faisant la montagne russe*," i.e. by switchbacking the machine, throttling down the engine while descending, and opening up again for the rise. This is quite an exhilarating form of play at first, especially combined with a rocking of the ailerons, and only advisable for a beginner on a perfectly calm day. It is wonderful how rapidly and easily the machine will rock when the handles are quickly moved up and down. The machine answers at once, without any retardation. It acts so easily, too, that one seems to be rocking the house with one's little finger.

When the machine answers like this to the lateral working of the command, one knows from that alone that the machine has got all due flying speed on—and this is a useful check in climbing, for instance, against rising too rapidly. An occasional waggle of the command should be followed by a corresponding rocking of the machine—then all is well, and you may continue to climb at that. If there is no corresponding rock, or if it is late and feeble—beware! you are losing weigh.

Having decided, then, to fathom the mysteries of the *vol plané*, as soon as I had secured the machine, I proceeded to a height of some 50 metres, and after a preliminary switchback or two, I pushed the throttle lever full down, and proceeded to descend.

Now if there is one thing about a Maurice Farman more than another which is rubbed into one *ad nauseam* in all one's reading of the comparative virtues of various machines, it is its almost uncannily low gliding angle. I said to myself therefore,

"Let us take advantage of our wide and deep reading on these things. Of what use, indeed, is theoretical knowledge unless applied to practice when opportunity offers? We will proceed to glide at $\frac{1}{10}$ or thereabouts." We seemed to be swishing along nicely, and evidently the whole art of vol planing seemed to me must consist in taking the smallest possible gliding angle. I was not, however, quite happy: the swishing seemed to be dying away, but go down steeper I would not. Had not I read the whole matter up, forsooth? Of what use then were books? I could swear I was descending at about the best angle, as shown in the pictures in some of the highest authorities on the subject. All the same, things were going from bad to worse, there could be no doubt of that. The swish had quite died away, an ominous wobble was beginning to make itself felt—this without either wind or working of the *gauchissement* to account for it. I wobbled the lateral command—horrors! there was practically no response. I felt that in another moment

I should be standing still, and then—but no! I felt in a fraction of a second that if I came dropping down on my tail, in a Maurice Farman too, of all machines, I should not only suffer a serious accident, but should also make myself a laughing-stock. I decided to postpone further experiments. I shoved her nose down, I turned on the engine full blast, I got so much weigh on the old bus that I could make her rock by merely thinking of the ailerons. Flattening out to relieve the pressure on my ears, I sailed round to the back of the wood and some distance off for my next experiment. I clung tenaciously to my theory of the weirdly low gliding angle, and the proper way of putting that precious knowledge into practice. Again and again did the machine fail to go down according to my expectations. "I'll go back and think it out," I said to myself, "especially as the other chap's waiting." It also occurred to me that I seemed to have forgotten I was now paying for damages.

I returned and strolled toward the hangars, as if I knew nothing of important experiments which had recently been conducted in the neighbourhood on the subject of aviation. My return was unmarked in any way by the sort of comments I was expecting. I had hardened my face, preparing to be told I had been making an ass of myself. At the same time I was somewhat disappointed at the entire absence of comment, and therefore proceeded to draw one of the *sous-officiers*, an experienced flier, who was standing about. After a general conversation, I casually remarked as I was leaving him that I was commencing the *vol plané*. "Yes," he said, "but you were going too flat." "I thought so," I lied. On my way to my machine I passed the pilot, who was changing pupils on the other machine. "You cut off your engine before beginning to descend just now, didn't you?" he said. "Yes, isn't that right?" I replied. "Get your apparatus engaged at the right angle of descent first and get her going well down before you cut off."

This was enough. Armed with these instructions I got into the machine again, determined to leave fine gliding angles well alone for the present. I went up to 100 metres, put the machine well down to a useful angle of descent, and then cut off. I felt I was going at more than normal flying speed, "*vitesse de régime*," but I avoided all inclination towards a more gradual angle. I felt a strong and constant wind in my face. Keeping the nose of the machine well under, the odd simile of drowning a kitten came to me. Instead of the humming roar of the engine, I heard as we (the machine and I) descended, ever at the same angle, the constant swish of the planes ; it seemed the most beautiful music I had ever heard. Anything more beautiful than the sensation of this flight, I had never experienced. But here was mother earth. Gradually flattening out and opening up the engine, I proceeded to take height again, and went through exactly the same performance. Coming down I worked the lateral command, and the machine rocked in unison.

"Aeroplane" Copyright Photo.

A VOLPLANE AT A SAFE ANGLE OF DESCENT

The pedals swung her easily to right and left. Nearing the end of my tether I turned the engine on, and made a normal landing. Even after this I was subsequently told I had been going rather flat !

On the next occasion I determined to make my landing without the engine. I proceeded as before, and having descended to about 30 feet from the ground, I flattened out gradually in an asymptotic curve, and ran her out nicely to $y = 0$.

This felt really great and glorious, and I did it once more, all going well. The joy of vol-planing really beats anything I have ever experienced.

I was glad I had done this, as I never got the machine again. A whole week of bad weather prevented my doing further flying, and the time had come when I had to leave the school.

CHAPTER XVIII

MISCELLANEOUS NOTES

Average flying time required to secure a certificate. I obtained from the clerk at the School Bureau the number of flying hours taken by all the pupils on the Maurice Farman machine up to date at that school. The results were as follows :—

Number of pupils.		*Hours.*	*Minutes.*
1		8	24
2		8	27
3		10	—
4		6	42
5		7	7
6		7	2
7		4	9
Totals 7		51	51
	Average time	7	24

The average time in flying hours may, therefore, be taken as $7\frac{1}{2}$ hours, of which one half to three quarters of an hour would represent the time taken in flying off the actual trials for the certificate. My own time was 7 hours and 2 minutes, number six in the above list. Number seven took only a short time, but he was inclined to be in too great a hurry to take his certificate, and was not a strong flier at the time of his passing.

As regards the number of flying days, this naturally depends on the weather. The whole business has been done in two or three days, but, as a rule, not more than half an hour's flying per day is given on the average, and more than this is not usually considered advisable at first. A good deal is learnt by being about and watching pilots and other pupils. In my case I flew on thirteen separate days out of a total period of twenty-six days including four Sundays on which the school was not open. I happened to hit a favourable period after the Balkan officers had left for the seat

of war and before a number of new pupils, chiefly English officers, had begun to arrive. The weather was on the whole favourable.

After the trials are over, there is a delay of some three weeks in receiving the actual certificate. In the case of an Englishman or other foreigner getting his certificate in France there is a delay of some seven weeks while the various Aero Clubs communicate with each other.

Cost of subsequent practice.—The cost at which practice may be carried out after finishing with the certificate was quoted to me as 500 francs a week, or, if by flying time, at 200 francs an hour. The cost of remaining on at the school with a view to taking the *brevet militaire* would have been 4000 francs. This latter sum was said to be a special minimum for English officers, and is, like the £75 for the ordinary *brevet*, much less than is paid by the French Government to the various schools on account of military pupils. This is accounted for by the long time sometimes taken by

the military pupils, and the thorough nature of the training for the *brevet militaire*, which comprises several distinct stages, namely—

Vol plané from 500 metres.

Hour's flight above 500 metres.

Cross-country flying.

Examination in aero-motors.

Finally, the tests laid down for the *brevet militaire*.

Precautions.—The wearing of a safety helmet is generally conceded to be a sound precaution.

As regards strapping one's self in, there is some difference of opinion. In some cases people have probably been saved by being thrown clear, but it is much the same problem as the tight or the light-hearted hunting-seat. I fancy, if it could be compiled, that the record would favour the tight seat in an aeroplane, and the strap certainly keeps one in one's place in the event of an extra rude buffet which would otherwise throw one against the control and possibly cause a false movement.

Tips.—I have been told by an English pilot that he generally got £5 from a pupil on the latter passing for his certificate. A similar tip is not so usually made in France, but I gathered that 100 francs was often given ; in any case the *billet* for that amount which I tendered was gracefully accepted. Some French pilots get a sum of say 50 francs from their *Maison* or *patron* for each pupil passed for his certificate.

CONCLUSION

I TRUST that anything I have written in the above diary will be regarded merely as a record of experiences, and not be taken as intended for instruction. If, however, these notes should prove of interest or help to any one about to learn to fly, I should be greatly pleased.

What would give me the greatest satisfaction would be to convey to some, who can only regard aviation as flying in the face of Providence, a more accurate idea of what is actually involved in the way of risks and difficulties, which are considerably less, for instance, than in mountain climbing; to certain others, who might be hesitating whether to take the plunge or not, I should like to give the last needed touch; to certain others, again, who have formed the

impression that the certified aviator necessarily knows all about flying, I should like to say once more that he is only at the beginning of the two or three years of constant training and practice necessary to make the perfect pilot; and lastly, to all who are not already aware of it, I would point out that we are getting left in the race for aerial supremacy, and losing that position which should go by nature to English temperament and character.

Brighton, *January*, 1913.

APPENDIX

THE Rules under which the following certificates are granted are added for reference.

I. AVIATOR CERTIFICATES.
II. ROYAL AERO CLUB SPECIAL CERTIFICATE.
III. FRENCH BREVET MILITAIRE.

I

AVIATOR CERTIFICATES

The Sporting Authority governing aviation in each country represented on the F.A.I. can alone grant Aviator Certificates to candidates, of at least 18 years of age, and coming under its jurisdiction.

1. To natives, *i.e.* candidates of the same nationality as the Club.

2. To foreigners belonging to a country not represented on the F.A.I.

3. To foreigners of a country represented on the F.A.I.; but in this case the certificate can only be delivered with the authorisation of the Sporting Authority of the candidate's country.

The Royal Aero Club of the United Kingdom will grant certificates in accordance with the regulations of the Fédération Aéronautique Internationale to candidates who have complied with the following rules :—

Rules.

1. Candidates must accomplish the three following tests :—

   A. Two distance flights, consisting of at least 5 kilometres (3 miles 185 yards) each in a closed circuit, the distance to be measured as described below.

   B. One altitude flight, consisting of a minimum height of 50 metres (164 feet), which may form part of one of the two flight prescribed above.

2. The course on which the aviator acomplishes tests A. must be marked out by two posts situated not more than 500 metres (547 yards) apart.

3. After each turn round one of the posts the aviator must change the direction when going round the second post, so that the circuit will consist of an uninterrupted series of figures of 8.

4. The distance flown shall be reckoned as if in a straight line from post to post.

5. The method of alighting for each of the flights shall be with the motor stopped at or before the moment of touching the ground, and the aeroplane must come to rest within a distance of 50 metres (164 feet) from a point indicated previously by the

candidate. The landing must be effected under normal conditions, and the officials must report the manner in which it was effected.

6. Each of the flights must be vouched for in writing by officials appointed by the Royal Aero Club. All tests to be under the control of, and in places agreed to by, the Royal Aero Club.

7. All flights must be made between sunrise and sunset, and suitable previous notice must be given to the Secretary of the Royal Aero Club.

8. The Royal Aero Club declines all responsibility for any accidents, or any damage that may occur to the aviators, their machines, or to any third parties during or in connection with the qualifying tests of the candidate.

9. Candidates must make application on a form provided for that purpose. Any expenses incurred must be borne by the candidates.

10. Foreigners belonging to a country represented on the Fédération Aéronautique Internationale can only receive a certificate from the Royal Aero Club after having obtained the consent of their national sporting authority, as approved by the Fédération Aéronautique Internationale. A certificate may be granted to a foreigner whose country is not represented on the Fédération Aéronautique Internationale.

11. The Committee of the Royal Aero Club will decide if the candidate has qualified for a certificate, but reserves the right to refuse the same or withdraw the same at any time without giving reasons.

12. The decision of the Committee of the Royal Aero Club in all matters connected with the tests is final and without appeal.

13. The Committee of the Royal Aero Club may in special cases waive any or all of the above rules, and grant certificates at its discretion.

II

ROYAL AERO CLUB SPECIAL CERTIFICATE

(Under the Rules of the Fédération Aéronautique Internationale.)

The Royal Aero Club of the United Kingdom will grant a Special Certificate to aviators who hold the F.A.I. Aviator Certificate, who are entered on the Competitors' Register of the Royal Aero Club, and fulfil the following requirements :—

(A) An altitude flight of at least 1,000 feet rise, which shall be verified by recording barograph, sealed by the observers prior to the start.

(B) A glide from a height of at least 500 feet above the ground to earth, with engine completely cut off. The landing must be made under normal conditions within 100 yards from the starting point. This glide may, at the candidate's option, be the conclusion of Test A. Tests A. and

B. must be accomplished before Test C. is attempted.

(C) A cross-country flight, out and back round a point situated at least 50 miles from the start. The turning point will be selected by the Royal Aero Club, and will not be indicated to the candidate until one hour before the starting time selected by the candidate. This flight shall be completed within five hours of the selected starting time. No passenger may be carried during this flight.

1. A sealed barograph must be carried in all flights.

2. Each of the flights must be vouched for in writing by observers appointed by the Royal Aero Club. All tests to be under the control of, and in places agreed to by, the Royal Aero Club.

3. All flights must be made between sunrise and one hour after sunset, and suitable previous notice must be given to the Secretary of the Royal Aero Club.

4. Candidates must make application on a form provided for that purpose. Any expenses incurred must be borne by the candidates.

5. The Royal Aero Club will decide if the candidate has qualified for a certificate, but reserves the right to grant, refuse, or withdraw the same at any time without giving reasons.

6. The decision of the Royal Aero Club on all matters connected with the tests is final and without appeal.

7. The Royal Aero Club reserves itself the right to interpret, add to, amend or omit any of these rules, should it think fit.

8. The Royal Aero Club declines all responsibility for any accidents, or any damage that may occur to the aviators, their machines or to any third parties during or in connection with the qualifying tests of the candidate.

III

FRENCH BREVET MILITAIRE

Part I. Practical Tests.

(*a*) A triangular flight of at least 200 kilometres, with the shortest side at least 20 kilometres long and with two landings at predetermined points; to be accomplished within 48 hours.

(*b*) A non-stop flight of 150 kilometres in a straight line to a point indicated beforehand.

(*c*) A similar flight but with one stop *en route*.

In the course of these flights the pilot must make one flight of at least 45 minutes' duration at a minimum height of 800 metres.

Part II. Theoretical Tests.

(*a*) Map reading. Meteorology, its principles. Barometrical pressure, temperature,

hygrometry, clouds, and wind. Reading of meteorological charts. Utilisation of meteorological information. Air resistance, its laws.

(*b*) Laws of the assistance of the air applied to aviation. Construction of aircraft. Tests on their delivery. Tuning up.

(*c*) Motors. Principles and working of motors.