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FLYING DUTCHMAN

THE LIFE OF ANTHONY FOKKER

BY ANTHONY H. G. FOKKER
AND BRUCE GOULD

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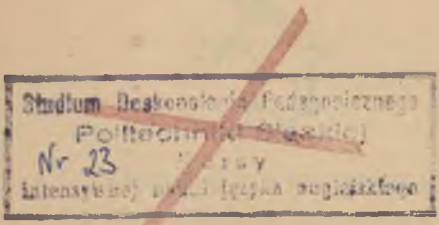

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I

PECK'S BAD BOY

" SCHOOL will make nothing of Tony," my father used to say, sadly shaking his head.

As I grew older, he became more sorrowfully convinced of this. So did I. Classes were boring; teachers stupid; I seemed almost heroically dumb. It was the more disappointing to my father because he had sold his profitable coffee plantation in Java and returned to Holland just to give my sister, Katharina, and me an education.

Like many Dutchmen, he had gone in his youth to Java to clear the Malay jungle and plant coffee. When he got rich he expected to retire to the beloved dikes and tulips of Holland to live out a life of slippered ease. He had settled in Blitar, a tiny settlement near Kediri, almost the island's length from Batavia, the port to which the steamers came to make their contact with the Old World. After ten years of loneliness, he revisited Holland in the late 'eighties, married my mother, Anna Diemont, a descendant of *émigré* French Huguenots, and took her back to Kediri. That remote, primitive village gave me my first glimpse of the world. The faint memory of it came back to me on an afternoon in 1929 when I bade godspeed to one of my passenger air-liners leaving Amsterdam for Batavia on the regular K.N.I.L.M. (Koninklyke Nederlands Indische Luchtvaart Maatschappy) service. I had helped bring Java, which in my youth seemed worlds away from Holland, within ten to twelve days of it. No longer need planters take months out of their lives to make the 8,000-mile trip home.

When I was a wild young boy, enjoying my freedom with the bronze-skinned natives who were my playmates, Blitar seemed the best place in the world to live. The " islands

of the shallow seas" were my paradise. The natives shinned up trees like monkeys, using their toes as effectively as their fingers. My mother let me run barefoot, too, and I imitated the natives until my feet and ankles grew abnormally flexible for a white boy. Without any difficulty I could shin up a tree at almost a running pace, pick up nails with my toes, and simulate flat feet at will. This last accomplishment got me out of compulsory military service in Holland later, but nearly got me into a Dutch military prison. Until I was six my feet did not know the feel of a shoe. I imagined all life was like this primitive, carefree, outdoor existence.

My parents were not as happy about it as I was. I could hear them talking low together in the evening, when I was presumably asleep in bed, gravely discussing some problem. Finally I understood that they were planning to go back to Holland. They felt the need of more civilized surroundings for their growing children. I heard school mentioned. Without knowing exactly what a school was, it sounded depressing. A few weeks later we had packed up our household goods for the long overland trip to Batavia and the interminable weeks at sea. No doubt my father and mother were glad to be returning to their homeland, with a comfortable fortune, but it was leaving home for me.

We settled in Haarlem, a small city in the bulb country on the north coast between Amsterdam and the dunes bordering the North Sea. Most of the residents, like my father, were retired planters or business men living out the final years of their lives sedately. For sport there was sailing on the land-locked waters which formed a continuous string of small lakes near the city.

Our house faced a big park. Instead of an unlimited playground such as we had on the plantation, there was only a small garden in the rear. On both sides of our house stood others so close that the gables overlapped. Bitterly complaining that these quarters were too cramped, I was

given the front half of the attic, a sizeable room on the third floor, for a playroom. This became my real headquarters, changing from a boyhood workshop to an aeronautical laboratory during the years I lived at home. But I soon learned that I had not come back to Holland to sail boats or experiment in an attic, but to go to school, though I considered my workshop infinitely superior to any classroom in the world.

The Dutch elementary schools, like those in England, were supplemented by secondary schools. After attending a secondary school, those boys who could afford it went to a University or to some technical school. No doubt they were as good schools as existed at the time, but since growing up I have decided that there is much that so-called teachers do not know about instructing unruly small boys.

School and I didn't agree at all. Active, high-spirited, full of inventive ideas with a practical turn to them, I found study a boring routine, monotonous in the extreme, something which teachers did little to make more interesting. My teachers complained to my troubled father that I was too playful, and reported all kinds of mischief to which I had to confess—with more pride in my ingenuity than regret for my naughtiness.

One subject did appeal to me, and in it I excelled. That was manual training. Working in wood, I became steadily more proficient, and needed no urging to go on to metals. Father encouraged me hopefully, seeing in my interest an inheritance from him, for he tinkered about the house whenever he got the chance. It perhaps made him a little angry when he missed one of his favourite tools and found it in my own kit—somewhat the worse for wear—but after boxing my ears he seemed not to mind.

Soon I had my own workshop going full blast in the attic. With a boy's lust for accumulation I amassed a vast collection of knick-knacks out of which I made playthings. Gradually my interest narrowed to trains. Before long I

had a railway system, with four long strings of cars operating over an extensive permanent way, covering the entire floor with tracks and switches. I bought the switches from my allowance, but made the straight tracks myself by nailing strips of metal on the floor.

These trains were run by springs, but the switches were thrown by hand. To keep the railroad in operation required many subordinates. It was necessary to enlist the help of neighbouring boys. When they failed to report for duty because of some more urgent business, or went on strike, my railway was practically ruined. I solved the switch problem by rigging up an intricate system of wires by which the whole system responded to levers in a single control tower. That made me independent of labour. Sitting in one corner, I could watch my trains race over the line, banking on the curves, darting through tunnels. I was able, without moving, to stop one train at a station, sidetrack it to let the express dash through on time, and let it race on again.

Every so often, however, it was necessary for me to leap from my post to wind springs. This seemed a nuisance. I decided to build an electric engine, and electrify the whole system. Nowadays, boys can buy elaborate electric toys, but they were unheard of then. My locomotive was made from an old electric motor, and my overhead trolley system was modelled after the one supplying current to the Haarlem trams which ran past our door. It was necessary to renew batteries constantly, however, and this was such a drain on my pocket money that I cast about for a solution. It occurred to me that I might tap the cable in the street, and run a wire from that cable to my window. After making arrangements to do this, I reflected that I should certainly get caught in the act, and so it was hardly worth the effort. That was a lucky thought, for men were killed from electric shocks while repairing that same cable, and I might have met a like end.

I did not know a great deal about electricity, but fully realized how unpleasant it was to have an electric shock. The servants used to come into my room in the evening to sit at the windows while listening to the band concerts in the park. My rails were nailed to the floor and their chairs often bent the metal, throwing my whole system out of gear. I was determined to stop that. And I rigged up a circuit of high-tension coils so that turning the doorknob closed the contact, and released the "juice." The first victim was an inquisitive cousin, who thought she would peek into my funny attic. The family heard her frantic yells and rushed upstairs to find her dancing ecstatically up and down before my door with her hands glued to the knob. That cured everyone of calling on me without an invitation.

In addition to the electric locomotives, I made stationary steam engines, some of which had boilers ten inches in diameter. I used gas for getting up a head of steam. An overload, with the larger boilers, would have meant a terrific explosion. But Fate, apparently, had different things in store for me.

In my opinion, the modern boy, who has all these toys bought for him, is very badly off. The whole fun is in making them. When parents buy elaborate toys for their children, they are spoiling their constructive ability. It would be better to give them scraps of material, and let their ingenuity do the rest.

After these, I turned my hand to miniature gas explosion engines, but in this I was not so successful. I had difficulty in making the sparking plugs small enough. Somehow they always turned out to be as big as the cylinders. Moreover, it was almost impossible to invent a satisfactory carburettor of such small size and so I had to give up the manufacture of gas engines.

For soldering work I used Bunsen burners. Father protested fiercely against the mounting gas bills, and ordered me to cut down this waste of fuel. That presented me with

a serious problem until one day I started to remove a pipe on the floor which was directly in the way of my railroad. I found it came from downstairs and disappeared through my floor into the house of a neighbour. Investigation proved that it was a gas pipe and without more ado I made a T connection, nearly asphyxiating myself in the process, but finally subduing the leak with the aid of rubber tape, soap, and other things. From then on I had a good supply of gas. My neighbour never complained; probably because he had a constantly increasing family and so was accustomed to sudden extra expenses.

Not all my activity took place in the attic workshop. When I reached the age of twelve the desire to own a canoe possessed me. Father refused point blank to buy it for me, but he said nothing about not letting me build one of my own, nor did I tell him that was what I intended to do. A few days later four planks about twenty feet long arrived at our house and disappeared through my attic window. The family was so accustomed to my racket that they paid no attention to the sawing and hammering that was going on. Finally, when I had the canoe built, caulked and ready for inspection, I invited all the family in to see it. It pleased my father immensely. He sent it downtown to be painted. For years I had that canoe, eventually stepping a mast into it and sailing it with outriggers. It began my yachting experience, and my love for boats, whether sailing or flying ones.

All these valuable practical experiments, which really determined the course of my later life, made no better scholar of me. My father took some pride in them, or at least tolerated them, but everyone else regarded them as boyish foolishness. My teachers were determined that I should learn their lessons whether they interested me or not.

History and languages meant nothing to me. Grammar I hated. Geography I remembered. Mathematics I liked, although I have never been able to remember figures, and

even to-day I have to consult a notebook when I want to remember the dimensions of one of my latest aeroplanes. Physics I enjoyed, because of the endless practical experiments. My failure in other subjects distressed my father very much, however, and to keep from being an utter loss I resorted to my inventive mind to devise means of getting me through school.

Recitations were made in front of the class, and I still recall with a shudder the moments I spent, standing like a dunce, before younger children, because boys of my own age had left me behind. Therefore, I devised my own wireless system to remedy the situation. As each question was asked, a boy in the rear chalked the answer on a slate and held it down near the floor. It was as effective as though we got the answer by wireless. The teacher could not see it; the boy reciting could. But when the chalker was late, our suffering was terrific. Our marks began to improve, and we organized the system throughout the school.

Written examinations remained a problem, however. My father scaled my allowance to my bad marks, and these also cut down my hours of liberty. I retreated to my attic to work out a system of overcoming this obstacle. After pondering the problem long enough to do my schoolwork thrice over, I finally evolved a solution.

The teacher noticed me one day carving fantastic devices on the surface of my desk. He was not surprised, perhaps, for I was likely to be caught doing anything, but a warning was issued that at the end of the term I must pay for resurfacing it. I refused to desist. It was part of my scheme. After it was sufficiently scarred, it was difficult to notice that a slot about an inch long and one-sixteenth of an inch wide was cut clear through the desk-top. On the underside, the slot spread out to an inch and a half long and three-quarters of an inch wide. An eye held close to the slot took in a wide range of objects in the desk underneath. On the underside of the desk was attached a revolving

cardboard disk. As the disk was revolved, about two inches of the card passed within sight of my eye as it peered through the slot. A shutter, attached to a piece of wire, which covered the whole space under the slot, was opened or closed by moving my body sideways against the desk. When the slot was not operating, it was plugged with a piece of ink-stained wood. On such a disk it was possible to jot down many facts and figures which my brain could not record. I had my answers in condensed form, and it worked so well that I could pass all examinations.

This facility in passing examinations greatly astonished my teachers, who knew I hadn't the faintest knowledge of the answers. Therefore, during examinations, they stood close by my desk, watching me narrowly. Perhaps they wondered why I screwed my eye so close to the desk, and speculated on the source of my inspiration, but they never discovered my secret. As far as they knew, I wrote the answers by magic. Usually there were ten questions in an examination, eight of which could be systematically recorded. These I answered fairly correctly. The two informal questions, which demanded some study of the subject, I always answered a hundred per cent. wrong. My average was just enough to pass. I enjoyed the whole thing because it seemed a test of skill between me and the teachers. They failed to notice the black shutter operated by a tiny wire which was moved by the quiet motion of my body. I was so proud of my little trick that after I left school I showed the teachers how it worked since they were too lacking in intelligence to find out for themselves.

It was through being kicked out of my classes so frequently that I started work on my first invention. At that time I was eighteen and nearly through secondary school. The teachers looked on me as a nuisance and often told me to go home, which I didn't dare do. Instead, I spent the time in the porter's lodge at the entrance to the school grounds. Here one afternoon I made friends with another

student, Fritz Cremer, son of J. T. Cremer. Like me, young Cremer had been let out. After that we saw a great deal of each other, learning that our fathers were friends as well.

The Cremers had a fine estate in the dunes and owned a motor-car, a rare thing in Haarlem in 1908. Until Fritz gave me a ride in his father's motor-car, I had thought my bicycle a fine vehicle. I persuaded him to teach me to drive. Motor-cars were very temperamental in those days. Engines frequently gasped and died; tyres were for ever being punctured. Pretty soon I got to know the Cremer motor-car inside out, so that I could repair the engine and anything else which went wrong. The tyres annoyed me, however; they were always going flat. I wondered why somebody hadn't thought of inventing a puncture-proof tyre. The more I pondered, the more important such an invention seemed to become. Finally I decided to invent a puncture-proof tyre myself.

II

FIRST INVENTION—A FINANCIAL FLOP

By nature I am an enthusiast. It was not long after starting to develop the puncture-proof tyre that I had definitely decided to put the rubber tyre industry out of business. There were times when I felt pretty sorry about doing this, but I was so absorbed in my invention that I had little time to worry about the ruin of all the widows and orphans whose savings were invested in rubber-tyre works.

At first I told no one of my determination. Secretly I investigated the deformation of pneumatic tyres on different kinds of roads—dirt, macadam, asphalt, cobblestones. It was before the period of concrete. To record the deformation I needed instruments. There were none, and so I had to invent these as well. After a certain amount of trial and error, I devised a crossbar on springs which would record to what extent the tyre flattened out in usage. Each new step increased my enthusiasm. Soon I knew that I was hot on the heels of an astounding new invention.

Neither I nor my family had a motor-car for my experiments, but my bicycle did very well for the early tests. After repeated failures, I constructed a spring wheel in the form of a flat rim of steel, flexible and fastened to a fixed rim by tension members which could expand and contract rapidly throughout the circumference of the wheel. In this way, the steel rim could give way under pressure, and resume its original shape as soon as the pressure was removed. To keep anyone from stealing my invention I made all the tests at night, riding forth on the untravelled streets and seeking out the roughest roads in order to test my invention to the utmost. Finally I reached the end of my resources, and in order to carry on had to appeal to my father for further funds.

Past experience had shown me that my father was in his most mellow mood after he had dined well, smoked a good cigar while reading his paper, and topped this with a little nap in his easy-chair. Since that night I have done lots of selling in disposing of millions of dollars' worth of aeroplanes, but father was my hardest prospect. Nevertheless, I was firmly convinced of the soundness of my invention. With an air of supreme confidence, I strutted into the family parlour and launched forth a description of my scheme. Father listened to me without saying a word, letting me go into the minutest detail as I warmed to my subject. It wasn't until I noticed that he'd let his cigar go out that I knew I had "sold" him. He not only agreed with me; he consented to my taking two weeks' vacation so that I could devote all my time to developing fully my ideas.

Next day I was at school, earlier than I had ever been before, to see the Director. He was an elderly, white-haired gentleman with a great deal of dignity. There was no surprise on his face when he greeted me. I was a familiar sight, having been often sent to him by teachers on far less pleasant errands.

"I want two weeks' vacation," I blurted out.

This was too much. After all the days I had missed, and the time I had wasted in school!

"You want a vacation? You?"

"Yes, sir," I insisted. "I need two weeks to perfect my invention."

I thought it sounded pretty important, and perhaps he did too, for his head started nodding in an amazed sort of way.

"I've been in the same class for two years," I continued. "I've learned all that I can. I don't do the class any good."

His nodding seemed to increase.

"I can't keep my mind on the work, anyhow."

As his head kept nodding mechanically at everything I said, I took it for granted that my leave of absence was

approved, and left hurriedly before he changed his mind. The other teachers could hardly believe I was leaving; it sounded too good to be true. They predicted that I would not return. They were right. I am still on that vacation.

Because I wished to test out my metal tyre on a motor-car, where its future possibilities lay, I broached the subject of a partnership to Fritz. He was as eager as I was to get out of school, which may be why he consented so readily. Our fathers mutually agreed to finance the development, and Mr. Cremer said we could use his car for the preliminary tests. Before they finished they had put up several thousand guilders, and Fritz and I had spent a year of our time.

Half a mile from the starting-point, the first non-puncturable tyre for motor-cars fell apart in the middle of the road. This didn't discourage us. We made another of better materials. This one lasted for several miles of careful driving. On the basis of that experience we made more and still more.

If anything, we redoubled the secrecy which had surrounded my tests with a bicycle, fearing that someone would get wind of our marvellous invention and beat us to the patent office with it. We drove the car out only at night, keeping it carefully locked up in the daytime. At about ten o'clock we would leave Duin er Kruidberg, the Cremers' estate, and drive through the night, returning at the break of dawn to crawl wearily into bed. Each week showed a greater mileage with every successive wheel. At last, we could fairly speed over the old stone pavements which jolted car and occupants unmercifully even with rubber tyres. Fortunately, Mr. Cremer had bought himself a new car in the meantime, because his first car was rapidly heading for the junk pile. After about two months of this gruelling treatment, it tried to give up the ghost.

Fritz and I refused to let it die on our hands, however, and tore it apart to hold an autopsy. In this work we had

the help of a young mechanic of the neighbourhood. New gears were the most imperative necessity, we found out. The car was a Peugeot, and our young helper insisted that it would be necessary for him to go to Paris to get the new parts in a hurry. Taking the old gears along, with all our available funds, he departed, promising to return immediately. We waited days. No word from him. At the end of two weeks he returned—crestfallen, and with the old gears. We had not been old enough to know that you shouldn't send an inexperienced Dutch boy to Paris.

Fortunately, we found a cast-off machine nearby, bought it for junk and transferred the gears to our car. Other needed parts we made, and I acquired valuable experience fitting the engine together again, becoming expert in such things as valve grinding and timing the magneto. In repairing the old Peugeot we threw away the stately looking six-seater body and stripped the chassis down to racing lines, much more to our liking. That way we had room behind the single seat to store a number of spare tyres when we went out at night to set new endurance records for the tyres and speed records for the car.

For testing purposes we selected the straight highway which ran parallel to the sixteen-mile stretch of railroad track between Haarlem and Amsterdam. The Paris train came by just before midnight and we waylaid it for a nightly race. By and by, the sporting engineers came to know us. As they approached our usual meeting-place they blew a whistle and put on more steam while the fireman furiously shovelled coal. Passengers, sensing the excitement and hearing our Peugeot's snorting challenge alongside, stuck heads out of windows, some frowning at our scandalous conduct, others cheering in the excitement of the race. The event got to be known and the Amsterdam papers printed pieces about it.

We could reach forty-five miles an hour with our new-fangled tyres. It was lucky we could go no faster. The

road was very narrow and even at that late hour frequented by horses and traps which carried no lights. I don't know whether it was our guardian angel or our hardly-won skill in dare-devil driving which saved our foolish necks. In any event we came through without a scratch, and the training gave us an alert, lively sense of danger which stood me in good stead in my early years of flying. After the midnight race, when we had turned back at the borders of Amsterdam, we took turns at driving for the endurance tests. One would curl up in the nest of rubber tyres in the rear, sleeping so soundly that not all the noise and danger of these nocturnal expeditions could wake him. Not until the car was driven into the garage did he waken, when the sudden hush of the engine assailed his ears.

Such excellent progress was made in the development of the puncture-proof tyre that my father engaged an eminent patent lawyer to look after our interests. It must have been evident to him, when father and I timidly appeared in his office, that neither of us was versed in the legal difficulties surrounding the taking out of patents. I can imagine him smacking his lips at our innocence, and deciding to give us an expensive lesson in the intricacies of legal shystering. We listened with delight as he assured us that it was his opinion we had a sure claim to a basic patent. He advised us to leave everything in his hands while he scoured the records to protect our interests to the fullest extent.

While we worked night and day on the development of our invention, the lawyer prodded us on with his optimistic reports. Under his guidance we applied for patents in the principal countries in Europe, paying him, without a murmur, the high fees he charged in each case. Acting on his further advice, we hired him to conduct a research into all patents which might possibly supersede ours, in order to be able to contest the claims of any inventor who might be envious of our success. Legal expenses mounted weekly. Finally our parents refused to pay out any more good money

for these extensive researches. They demanded that the puncture-proof tyre be placed on the market.

At the time, motorists experienced so much tyre trouble of every kind, we felt certain a practical substitute which did away with these difficulties would be enthusiastically welcomed by the motor-car industry. Many of the motor-car manufacturers we approached were highly interested. The spring wheel was demonstrated successfully to them over and over again. Mounting a metal tyre on one side and a rubber tyre on the other, we defied riders to tell the difference in comparative comfort. The only certain way to tell the difference was to wait for the rubber tyre to blow out. It appeared that we were on the verge of success.

Then, one day, our perfidious lawyer dropped in to see my father. He wore a long face, and said that his assistants had just discovered a basic French patent which antedated ours. It had been overlooked in previous investigations, and had just turned up.

Our time, money, and work all were gone for nothing. We had been defeated before we started.

III

SPROUTING WINGS

My father was probably even more disappointed than I was. I had proved pretty much of a failure in school, and he had banked on this invention to show his Haarlem friends that I amounted to something. To cap it all, I began clamouring to be allowed to fly. I had gone to a motor show in Brussels and there had seen an exhibition of the Latham aeroplane. On returning home I acquainted my father with my new ambition.

"You can do what you please," he said firmly, "but I will never buy you an aeroplane."

For several years I had been closely following flying activities in Europe. Secretly I had sent off badly scrawled letters to leading manufacturers, begging them to let me work for nothing in exchange for learning to fly. To-day I get thousands of such letters from youngsters all over the world. I do the same thing which the early pioneers did with my letters—throw most of them into the waste-paper basket, unless they contain a return postage stamp. It seems cruel, but it is impossible to do anything else.

When Wilbur Wright came to France I had absorbed every scrap of information about his plane. Working out my own theories, it seemed to me that the main trouble with the Wright biplane was that it had very poor lateral stability. The Wright had just sufficient speed and power to stagger into the air. Once there it could fly in a straight line or in a circle of wide curves, but Mr. Wright, although a good early pilot, had little control over it beyond a certain point. I had also followed the early experiments of Henri Farman and Louis Blériot. With all of them the big problem was stability.

Retiring to my attic I made hundreds of wood and paper models with the idea of analysing their movements in an effort to solve the problem of lateral stability. I hung pendulums from the centre of some of these models, but I found the pendulum merely imparted a systematic swinging motion to the aeroplane, putting it into a series of banks. By endlessly trying wings in every conceivable kind of position, I finally came to the conclusion that a sweepback wing with a pronounced dihedral, combined with a high centre of gravity, would give me an aeroplane of perfect lateral stability. When I actually had found an aeroplane which was inherently stable, I decided that it was not necessary to warp the wings as the Wrights and others had done before Glenn Curtiss invented the ailerons. For that reason my first monoplane was built two years later along my own lines, without ailerons. It had a high centre of gravity and V-shaped sweepback wings, and practically perfect stability.

I received no encouragement from my parents. They viewed flying as most people did at that time, as the shortest way to the cemetery. Determined to get up in the air someway, I decided to build a huge kite, get into it, and with the help of my friends send it into the air as you would an ordinary kite. Then I would cut loose and fly it like a glider as long as it remained aloft. First I designed it and then bought the material, bamboo sticks and cotton cloth. I decided to fly the kite over water; it would be softer if I fell.

To-day I doubt whether I could have built the kite sufficiently safe. It was only chance, I guess, which prevented my breaking my neck. Fortunately the Dutch military authorities, just at that time, decided that I must devote a year to compulsory service in the army, and brought that experiment to a timely end.

A military life took too much time away from my aviation experiments to interest me. I expected my brain to be of

much more value to my country than my rifle. Therefore, when I reported at the Naarden barracks, I claimed exemption because of flat feet. Drilling, I would fall down in the ranks. I seemed to be unable to run. The authorities became suspicious, however, because I always recovered late on Friday, in time for Saturday leave. Finally, I exasperated everyone sufficiently to be sent to the hospital.

Few Dutch boys had feet as limber as Java natives, but still my feet were not odd enough to make out much of a case for real disability. Instead of being exempted, I was put on a rice-and-water diet. A psychiatrist cunningly sought to trap me by naïvely asking what position I had played in the football team in the Haarlem Higher Burgher School. I looked at him in wonder, as if surprised that a doctor didn't realize that a boy with flat feet couldn't play football. They threatened me with prison.

Though I was officially eating rice and water, I was really dining off the fat of the land, for from the underside of my bed hung a veritable grocery store, with wurst, cheese, bread, cake, and sweets in abundance. To keep the rest of the ward from sneaking, I shared my feasts with them. But the inactivity of the hospital life drove me wild, and I schemed to put an end to the idiotic farce.

The first week-end, I went to Amsterdam, and late in the evening boarded the tram. Alighting, I jumped in such a way that my ankle struck the kerb, bruising it. Dropping as if crippled, I lay moaning, until picked up and taken to a hospital. There I told the inspecting doctor it was worth a hundred guilders to him to declare me unfit for military service, and in two or three days I was sent back to Haarlem, with my discharge and forty-nine cents in my pocket I had earned by soldiering.

My father was heartily sick of such an unsatisfactory son. Back in Haarlem I spent as much time with my

boats as I could spare from my attic laboratory. The whole family began concentrating intensely upon my career, except me. I hadn't thought much about it, and resisted their efforts. My mother's ideal was to see me graduated from the University at Delft. My father promised an excellent allowance, 2,400 guilders a year. Eloquent for a moment, I was able to convince him that if I couldn't get through school, I should certainly be ploughed at a university. I again broached the matter of learning how to fly. He thought it was a nonsensical, crack-brained notion. He told me that with my enthusiasm for reckless experiment I should certainly break my neck, demonstrated thoroughly that aviation was a passing fad, and refused heatedly to furnish me with money to go to one of the many flying schools in France, the most advanced country, aeronautically, in Europe.

"Now is the time for you to do something and start to work," my father said, angrily.

"You ought to be thinking now of your diploma," he would say to me, in exasperation, "so that you can make yourself fit for something important in the world."

In my own heart I felt that I knew more than most of my high school class-mates, even though they had passed their examinations with higher marks. My father had enough money so that I shouldn't have to begin life as a clerk or labourer. It seemed to me my experimenting was of more value than excellence in stupid classwork. My father, however, seemed pretty well convinced that I was hopeless. The upshot of several long evening arguments was that he decided to send me to a well-known Technicum in Bingen, on the Rhine. The German engineering schools at that time were more practical than those in Holland. I was not unwilling to study engineering if it could be studied practically instead of theoretically.

He seemed so bent on it, I finally made preparations to

attend the engineering school in Bingen. This saved wasting six years at Delft, though it is probable that I should never have finished my course if I had been sent there. A boyhood friend, for some reason, was to accompany me up the Rhine. Had he not been with me, I think I could not have left home. As it was, my heart was sick. I had never liked school, even in Haarlem. The thought of going away to school frightened me to death. Feeling very much as if I were leaving for the end of the world, I boarded the steamer for the 300-mile trip up the Rhine. I don't remember when I ever was so discouraged. The picturesque Rhine trip past Dusseldorf, Bonn, Cologne, and Coblenz should have been thrilling to my inexperienced eyes. Except for the long journey from Java when I was six I had hardly ventured away from the quiet streets of my home town. Each mile simply made me more dejected. It did not seem possible that at that moment I was fairly launched on an adventurous life which has grown more exciting with the years.

Homesick, downhearted, feeling like taking the next steamer home, we arrived in Bingen. There, before I had registered at the Technicum, I learned that at Zalbach, near Mainz, but twenty miles away, was a special school for motor-car engineers which had just advertised an opening course in aviation. Bingen immediately disappeared from my programme. Hurriedly, I wrote Father of the fine school for motor-car engineers at Zalbach, asserting that it was even more practical than the Bingen Technicum. He knew of my interest in motor-cars, and cheerfully assented to my transfer, for I had discreetly avoided any mention of the aviation course.

There began my actual contact with aviation. It was soon evident that no one at the school knew much more about aeroplanes than I did. An experimental aviation engine had been obtained by the school, but we students were expected to build the aeroplane. As I was handy

in all kinds of woodworking, my help was especially welcome. The school had engaged a so-called aeronautical engineer to supervise the construction of the aeroplane. It was soon evident that I knew more about the theory of aviation than he did. That same man, by the way, ten years later, applied to me for a job in Holland as a draughtsman. I hired him. At that time he didn't amount to anything, but like many such persons pretended that he knew a lot. The Director of the school knew even less about aviation, and his subordinate's faking was not found out.

Finally, I had to write to my father telling him about this aviation course. It cost 500 marks more than the motor-car engineers' course. In addition, each student had to put up a 500 marks deposit to pay for possible breakage of the plane while he was learning to fly. That was 1,000 marks more than I had. I emphasized the engineering features, hardly mentioning the flying end of the course. To my surprise he put up the money. Perhaps he was getting tired of opposing me. Of course, I wrote to him that it was a fine course and that experts were directing it.

There were almost no other students, at first. That was a good thing for me. I got all the experience of helping to build the first training plane. But when the first plane was nearly completed, the Director became alarmed at the lack of students. There was talk of discontinuing the aviation course. Fearful that this might happen, I scurried around and got ten or twelve more students who all joined up. Meanwhile I kept writing letters home to my father enthusiastically praising the school, and telling him what a good foundation in aeronautical science I was getting.

We were to have a flying instructor, Bruno Büchner, who was reputed to be one of the early pilots. We looked up to him as a kind of god when he arrived, but when he saw

our training plane he seemed to lose his enthusiasm for flying. At that time we didn't know that he had smashed several planes. All we knew was that he came from Johannisthal, the German flying centre near Berlin. There were few official pilots then, though licences were issued by the Fédération Aéronautique Internationale. He declared he could get his licence at any time. We were so impressed by anyone who claimed to be a pilot that it seemed presumptuous to ask him whether he could actually fly.

Büchner soon saw that I had my hand in everything, because I was something of a mechanic and had helped build the plane. He took me into his confidence as far as he could. Our first engine was a four-cylinder air-cooled converted motor-car engine. After it ran six or seven minutes the cylinders and valves got hot and warped. There was no question of getting any prolonged power from it. After each running, we would have to take down the whole engine, grind all the parts and line up the valves before it could be started again. It is not surprising that it looked pretty hopeless to him.

Nevertheless, Büchner went ahead as if he really intended to fly. A flying field was leased in Wiesbaden, the famous watering place near Frankfort. It was a large flat field, ideal except that part of it sloped abruptly towards a gully at the end of the runway. We moved from the school to the field, and prepared for the great day when Büchner would take off.

We soon saw that our first plane was too heavy ever to get into the air. It was far too cumbrous; the wings were too short, and the engine was underpowered. All we could do was to roll over the ground in it, and we took turns at that. It wouldn't even roll except down the slope. After reaching the end of the hill, the students pushed it back up for another start. So we called the first plane a grass-cutter, and started work on the second, which we built with greater wingspread.

One of our students was a baker who had both money and enthusiasm. He bought a 50-h.p. Argus engine, one of the first water-cooled engines in Germany. It was heavy, but it had power. The school, nearly bankrupt by this time because it had not got enough money from the students, refused to buy another engine. The baker was wild to get into the air, and agreed to loan his engine to the school. Prospects looked rosy. The news got around about our new engine. More students joined the aviation course, anxious to learn to fly. When our second plane was built, the Argus engine was installed. It was soon evident that our latest aeroplane could at least get into the air for short hops. Under the excuse of testing the plane, Büchner was trying to teach himself to fly by making tentative flights of a few feet, and then landing quickly.

He wasn't anxious to get really into the air, apparently. Sometimes he would take me in the plane with him. He did this, I think, in the hope that the added weight would prevent his rising off the ground, where he felt safe. The plane was a biplane, very heavy, with about 45 feet wing-spread, but it could race over the ground at from thirty to forty miles an hour so that Büchner could hardly keep it out of the air. Everybody was looking forward to the first official flight, and I was writing more enthusiastic letters than ever to my father about my progress.

The day for the big test came. Everything depended on it, for until Büchner flew the plane none of the students was to get any training. The whole school and its Director gathered at the field in the late afternoon, after the wind had died down. Büchner seemed nervous, but he wasted no time. He had made up his mind to get it over, it seems. I had stationed myself away from most of the students, far down the slope of the hill, at a point where I thought the plane would actually take the air.

Suddenly I heard the engine roar into full life. The wobbling biplane gathered momentum downhill. It swept

down the field and got into the air. We who had built it simply swelled with delight. I thought of all the nights we had laboured to puzzle that unwieldy plane together. It was actually flying! Everybody was happy. In my excitement, I could fancy myself in Büchner's place at the controls. Now was his chance to show what a wonderful pilot he was, to make good on the reputation he had brought from Johannisthal.

Half-way down the field he should have throttled down. Apparently he couldn't make up his mind. When he saw the end of the field approaching it was too late. He should have tried to bank and turn round. Instead, I saw with sinking heart that he was going to try setting the plane down in the last few feet of the slope in front of the gully. I tried to yell him instructions, though, of course, he couldn't have heard me. As his plane sank to the ground, my hopes sank with it. I could foresee the end. With a bang it landed, and rushed headlong into the ditch with a thundering crash.

The tail flew up in a cloud of dust. The plane looked like a collapsed tent. I started to run towards the wreck. Through my tears of rage I could dimly see Büchner's astonished form struggling in the midst of the debris. Behind me I heard mingled cries and, turning, saw the whole school trooping towards the crash. When Büchner recovered from his shock, he must have seen them too, for he staggered uncertainly to his feet and limped swiftly away rather than face his disgrace. We never saw him again.

I could imagine my badgered father's feelings when I described to him the sorry end of my "engineering course," which he had paid for.

In a hasty examination I saw that the engine was cracked up as well as the aeroplane. Büchner alone had escaped unhurt.

It flashed through my mind that there was no more money in the school. All further hope of my learning to

fly there was lost. I was sitting on a tangle of wings when the Director, puffing furiously, arrived. All I could say was, " It's terrible," and sniffle.

Perhaps he thought I was weeping because of Büchner, who had made me his closest friend.

I was thinking only of myself, and those letters I had written my father.

IV

FIRST AEROPLANE

FOLLOWING Büchner's crash, my future prospects of building an aeroplane, or even of learning to fly, looked pretty dismal. The aviation school had crashed with Büchner. The temporarily air-minded baker had salvaged the wreck of his engine and turned to another school. The plane itself was a tangled heap of debris. I suspected that my father would rage when he learned the full details of how I had been spending my time and his money solely on aviation, while he blandly supposed I was becoming a motor engineer.

Thus I reasoned, but that wasn't the way I felt. Nature endowed me with a spirit which strengthens miraculously in adversity. Courage at such moments comes to me automatically, as adrenalin pours into the bloodstream at the first whiff of danger. When well-laid plans collapse, I instinctively put my shoulder to the wheel, pushing with all I've got against failure. And so I figuratively dusted the seat of my pants, swallowed my tears, and decided to build a plane of my own.

First I wrote another letter to my father. Optimistic, even blithe, it explained that the crash had really been a lucky break. There were too many students at the Technicum. I had had the benefit of helping to construct two aeroplanes. While working on them I had continued my experiments with models—to the great distress of my landlady, who thought me the messiest lodger she had ever housed. Believing the all-important problem of automatic stability was now solved, I wanted to see what could be done with my own ideas.

A wealthy German Army Oberleutnant, Von Daum, who was a student at the aviation school, was enthusiastic

about my models and had shown a willingness to share the expense of building a real aeroplane. Aviation to him—he was about fifty years old—was merely a plaything, but he was willing to help finance a practical test of my theories. Surely my father could do no less. All the eloquence I had developed in years of thwarting my father's ideas and advancing my own I put into that letter.

Even so, I was far from certain that he could be brought around to my point of view. He might even think this was just the time to forbid my ever having anything to do with an aeroplane again. While anxiously awaiting a reply, I tried to think what I would do if my father turned me down. Casting about in my mind for alternative sources of revenue, I remembered the 500-mark crash deposit. I had not broken anything, possibly because I had not yet flown. That 500 marks would come in very handy on my new venture.

When I appeared at his office, the Director seemed almost to divine my purpose before it was stated. He gave the impression of a startled nesting hen, with my deposit as the nest egg. No effort had been made to return the money. The school was none too well off. Perhaps he had desperately hoped to retain it, by interesting me in some other branch of the Technicum. He tried being suave, but firm. The money was not mine, but my father's.

That made no difference, I replied. I had given it to him.

He made a few pedagogical remarks, slightly tart.

I told him not to beat around the bush; I wanted the money, which I could see he wasn't going to give me without a struggle.

He called me a young whipper-snapper.

I said I wasn't trying to keep other people's money.

While he was trying to think of something to say, I pressed him on that weak spot, hinting that the Board of Education might be interested to know that he had collected

money from students for a course which had no teachers. He was quick to catch my drift, but it made him angry. His face turned red. I pressed my advantage. He saw it would be cheaper to shut me up than have to refund the deposit to all the students.

He lost his head, threatened to write to my father that I was quitting school, predicted a bad end to my career, but finished by forking out the 500 marks, which I clutched hastily and took away while he was still hurling carefully chosen insults at my back.

He did write a nasty letter home, but I had got what I wanted, 500 marks in my pocket. His letter didn't matter. Teachers and I had never agreed, so the Director's attitude didn't strike me as unusual.

To offset his letter, however, I wrote my father again, saying that I was going to build a plane with Lieutenant Von Daum out of the 500 marks, but needed 1,000 or 1,500 marks more to defray my share of the expense. With my own plane it would be easy for me to learn flying by teaching myself, I told him confidently. After that, I could give demonstrations, teach others, and make so much money that I should never be a burden to him. I really meant it. It was not known to me then, and certainly my poor father had no presentiment, that he was going to shell out 183,000 marks before I began to make money, or before he saw a penny of all he was forced to lend me to protect his original investments.

Much to my surprise, father sent me 1,000 marks without protest, probably feeling that I was not to blame. He said nothing derogatory about my quitting school, and returned the Director's fiery letter. At once everything looked rosy. My troubles seemed finally ended. My partner agreed to buy the engine, while I constructed the plane with my brains, hands, and 1,500 marks.

From crude drawings a Frankfort company made steel tube frames for the wings. The wooden beams for the

fuselage and ribs we had built in a neighbouring carpenter shop. Minor metal parts we made in the Technicum. While I was assembling these parts my partner discovered that through his connections we could obtain the use of the currently unoccupied Zeppelin hangar at Baden-Baden where the first passenger flights had been made in the German dirigible. It was in this cradle of commercial airship transportation that my first aeroplane was born. No young man ever went through more difficulties than I, trying to bring my theories to life.

My original aeroplane, as first designed, had neither rudder nor ailerons. These are two of the three necessary steering devices of the modern plane; the elevator is the third. The rudder steers to right and left; the ailerons balance the wings either horizontally, or maintain the proper banking position in a curve; while the elevator points the nose of the machine up or down, or keeps it in normal flying position. Theoretically, however, I was able to do without the rudder and ailerons. It was only by an actual application of my theories that I was to learn it was impracticable.

According to plan, my first aeroplane with its sweepback V-shaped wings and high centre of gravity was steered to right or left by increasing or decreasing the angle of incidence of the wings. I had even, at first, contemplated doing without an elevator—literally having only a flying wing. Elevator action would be gained, I theorized, by warping the trailing edge of both wings simultaneously, but I quickly abandoned this idea because of practical difficulties of control mechanism.

Birds, as everyone knows, have neither rudder nor ailerons. It took some time for us early designers to learn that we couldn't build aeroplanes by copying birds. No one can build as wonderful a machine as a bird. We can construct aeroplanes which fly faster, higher, and even farther. They are not birds, however. Nature is a better

artificer than Man, for her own purpose. We succeed only by duplicating her result rather than her methods. Men have invented machines which talk like human beings, breathe, see light, feel cold, walk, run, and even seem to remember, but no one has built a mechanical man.

The first setbacks, after the aeroplane had built been and the engine installed, occurred on the ground. Whatever might be the theoretical possibilities of using the wings for rudder control in the air, I soon saw that I had no steering device for taxi-ing purposes. When the throttle was opened, the plane would dash and dart about in all directions, under about as much control as a chicken with its head off. It cost me a broken wheel to realize that I must have a rudder to steer right and left on the ground. Previously I had attached an elevator, but my aeroplane was still without ailerons.

Just before Christmas, 1910, was set for the initial try-out. The Wrights had flown seven years before, almost to a day. I had not their sensations of giving to the world an invention which in my opinion is destined to have as revolutionary an effect on human life as the printing press, the steam engine, or the electric motor. But when that aeroplane, built and guided by my hand, left the ground for a hundred feet my happy heart went leaping off on a trajectory which has yet to drop. It was pure elation. My puny little flying machine seemed more graceful than the hawks I used to watch and want to imitate. I felt like Balboa when he sighted the Pacific, or Newton when he suddenly perceived the significance of the fallen apple. It seemed at the moment that my life's ambitions had been wholly realized. I was so excited that I wonder now it was possible to get the plane safely down. I just wanted to keep on hopping around like that for ever.

To start the engine took all my strength. It was done by swinging the propeller through a half-circle. I had to do everything myself, running back to my crude board seat

across the fuselage behind the engine, adjusting the petrol and spark, running back again to the propeller. The engine was sluggish. Before it would start, I worked up a dripping sweat. Once it roared into life, I had to duck quickly under the wing and jump into the seat before the aeroplane got rolling too fast. We hadn't yet thought of putting chocks under the wheels. With the sweat dripping from every pore, I whizzed through the air, chilling myself rapidly. The result was that I caught pneumonia and nearly died. My temperature ran high; it was touch and go.

Dazed with success, light-headed with fever, I had just sense enough left to know that if I remained near that marvellous machine I shouldn't stay in bed but would be out on the flying field, pneumonia or not, until I dropped in my tracks. I wanted to fly it every minute.

Fortunately my mother, worried about her boy spending the holidays in a foreign country, sent me a telegram requesting me to come home for Christmas. It seemed the best thing to do, though I disliked parting with that plane for several days. But some lingering good judgment persuaded me that I could both see my mother and get well. Moreover, I thought that if I sounded successful enough, my father might be induced to give me some more money for further experiments already in my mind.

My absence was apparently just what Von Daum had been waiting for. His sudden consideration for my health, and his firm insistence that I go home, had puzzled me without arousing my suspicions. His guile was all too soon to be revealed. By inventing a hundred new reasons daily why he should not yet fly, I had managed to keep him out of the aeroplane which I cherished as myself. In my jealous possessiveness, I quite forgot it was half owned by him. It seemed to me that no one else should even sit in it. He had been forced to watch me hopping happily about the field, while he stood disconsolately by with his

hands in his pockets. He thought he could fly as well as I. And so, no sooner had he seen me well on the train bound for Haarlem, than he rushed back to the flying field to test out *his* aeroplane.

The first thing which hailed my arrival at home was a wire saying that he was unharmed, but the aeroplane had met with a " slight accident." It was all my parents could do to dissuade me from taking the first train back, though the doctor, called in by my frantic mother, had ordered me to bed.

What had happened I later learned from a Zeppelin mechanic. Apple trees had a terrific attraction for my partner. To an apple tree he was as a nail to a magnet. Some pilots are like that. Once he started taxi-ing, he lost his head, forgot how to direct the plane, started bumping over the rough spots, clutched the struts, and was only able to stop by piling up against the trunk of an apple tree, the sole tree near the whole field. Small boys, first learning to ride bicycles, have the same difficulty when they find themselves suddenly pedalling towards an immovable object. Frozen with fright, they hypnotically steer straight at destruction. My lieutenant must have spoiled many a bicycle when he was a boy.

There was nothing to do on my return but make the best of a bad situation. Repairing the plane gave me an opportunity to install a decent rudder, and for safety's sake a better elevator as well. Control was always the most puzzling problem, but I have never been stubborn about making minor changes in design when my theories prove impractical. To warp the wings for elevator action required twelve wires, running on rollers and centring on the control stick. This was bad mechanics, however good theory it might be. Therefore, I built a new elevator and a rudder in the rear, and made my wings rigid. In addition, I changed the landing-gear slightly, fixing a skid behind the two wheels so that it touched the ground on

landing and cut down the forward roll. Small skids were put under the wing tips as a protection against ground loops. Thereupon, we shifted our headquarters back to Mainz.

Taxi-ing about that field, following these alterations, I found the plane was under much better control. Each time I increased the engine speed we would make a little hop in the air. Ten-foot hops went to twenty, then a hundred, two hundred, three hundred. Finally I made a long hop of six hundred feet, and felt like a bird.

Flying weather in those days was limited. No one dared go aloft in the slightest wind. We used to look at the smoke to see whether it was rising straight up from the chimney tops, or wait until a handkerchief hung perpendicular without a flutter. Early morning or late evening hours were the chosen times of the day, because the wind died during those periods, as a rule. No one knew just what influence a high wind would have on flight, and no one seemed anxious to find out.

Flying morning and evening, in three days I was hopping 1,500 feet, the length of the field. Moreover, the wheels were no longer merely cutting the grass. I was skimming along thirty feet high, at times. In this way, by patiently rising from the ground, climbing slowly, cutting the engine and gliding carefully down to a landing, I taught myself to land and to fly. All this, of course, in a straight line.

Though I was itching with curiosity, I had, as yet, no knowledge of what my plane would do in a curve. Once satisfied that there was no difficulty in straight flying, I had to find out. On May 5th, 1911, I started off on the big trip.

With my partner and a mechanic watching, my own nerves tingling in anticipation of what the next few minutes would bring, I took off the long way of the field. Fifty or sixty feet high, I was nearing the boundary when I ruddered into a shallow left bank, held it tightly, and watched the horizon swing past the corner of my right eye. The ques-

tion was, would it rudder out of the bank, or start swinging like a pendulum? At the end of a half circle, I straightened out again. It answered like a trim yacht. I roared back down the field triumphantly over the heads of the two pigmies below. They were waving like mad.

Three times I circled the field, and on the third trip I felt qualified to fly around the world. While I was still aloft I decided to apply at once for a pilot's licence. When I finally landed I told my partner of my decision, using it as an excuse to keep him from flying the plane.

On May 16th, I took my aerial examination before the president, Lieutenant Von Selasinsky, of the Mainz Aero Club, which had originally been formed to stimulate enthusiasm for ballooning. In order to obtain a licence one had to fly three times in a figure eight between two pylons 1,500 feet apart, and then land within 450 feet of a given point. My number was 88, for licences were only beginning to be issued. August Euler held the first licence to fly, I believe. He started a flying school and an aeroplane factory, and was the first of us to have army students. Gaining the pilot's certificate marked the turning-point of my life, I thought.

Becoming a licensed aviator made me one of the central figures of the neighbourhood. It was not long before I thought nothing of flying at altitudes of 200 and 300 feet, and shortly I dared to leave the field for a flight over the village. That really gave me a thrill. Part of it was the sight of the entire village populace staring up at me in wonder, making me feel, indeed, like the monarch of all I surveyed.

The rich idlers about Wiesbaden formed the habit of dropping out to our hangar. Work was always being done there on the plane, for it was more temperamental than an early motor-car. They would loll about and ask foolish questions. Sometimes they would wait all day in the hope of seeing us fly. Generally, they mistook Lieutenant Von

Daum for the aviator, for he strutted around explaining to everybody who would listen all about our plane. He was too fine to spoil his hands, and what he did try had to be done over again. Dressed in greasy overalls, I looked no different from the mechanic. Often the visitors would ask me where Mr. Fokker was. I explained that Mr. Fokker only came round in the evening to fly. The tips I received for this information I turned over to the mechanic. Then we would watch the expression on the donors' faces in the evening when they saw whom they had tipped. Everyone, then, regarded an aviator as a kind of demi-god, and they felt very sheepish about their mistake.

To protect ourselves from so many people and their idiotic questions, we stretched a copper wire across the hangar entrance. Visitors just leaned on this, however, and shouted. When someone asked too silly a question, we connected a magneto to the copper wire and turned on the juice to divert their minds. It scattered them, but in a few minutes they were back again. Then they would try to steer newcomers up against the wire.

Seeing what a local hero I had become, my partner couldn't wait any longer to learn how to fly. I tried my utmost to dissuade him. Since the apple-tree episode I had no confidence in his aptitude. It had been agreed, however, that after I got a pilot's licence—which I explained I needed in order to impress my father sufficiently to get more money from him—he could have the plane to learn it. My reputation as a flyer, however, had by this time spread to Holland, and the Haarlem townspeople, probably at my father's instigation, had asked me to exhibit my plane. I begged him to wait until I had flown in my home town at least.

My despairing arguments all fell to the ground. He insisted on keeping me to my bargain. In anguish I protested that we couldn't afford another crack-up. He waved my fears aside. I had to give in.

To my surprise his first attempts met with no mishaps. Indeed, he did so well that I began to be afraid he would actually learn and I should have to share the aeroplane. But it was only beginner's luck.

When he was about thirty feet in the air, sailing along gaily, he apparently forgot everything he knew. Nosing the plane down he tried to make a landing. His wheels struck the ground hard, the plane bounced, he pulled back the stick, shot in the air, nosed down, struck again and porpoised into the air. That threw the machine into a stall, of course, and it dropped down like lead.

It looked from where I was standing as if everything was smashed to smithereens, and the lieutenant buried underneath. Since the first time I'd seen him mismanage the controls but miraculously escape the consequences of his ineptitude, I'd been expecting just this. Everybody ran across the field towards the wreck, fearing the worst. Just as we reached the crash, a pile of fabric began to upheave. In an instant, his battered head popped forth. He crawled slowly out, looking more bewildered than hurt.

" You can take your damn aeroplane and fly it to the moon," he said. " I'm through with flying."

I tried to look sorry.

The next morning, finding he had wrenched his back more than he thought, he was even more determined to quit. I did everything possible to fortify his intention, from agreeing that his age was a handicap to sketching the lively possibility of his breaking his neck next time.

It had been heartbreaking to watch his bungling efforts. It seemed entirely wrong to repair my beloved bus just to have him crack it up again. The engine was only slightly damaged, but the plane itself was badly mangled. I offered to take over his part of the wreck for 1,200 marks. He snapped up my offer.

That ended his connection with aviation, and mine with partners.

I sent my father another eloquent letter, explaining that this fortunate accident now left me free to go on by myself, if he would only send me enough money to pay off Von Daum. Alone, I could soon be doing exhibition flying, by which I should earn so much money that he would never have to send me a cent again. Bedazzled by my argument, he sent me the necessary funds.

V

THE BOY MAKES GOOD

As soon as the plane was repaired, I gave more demonstration flights in Mainz, getting bolder as I gained experience until I was able to go up even when it was blowing hard—say, two or three miles an hour. The stability and safety of the aeroplane were remarkable. It had a top speed of forty miles an hour, and took off at about twenty to twenty-five. It was not long before I could even fly with a passenger. Newspapers wrote glowing accounts of the flights and my reputation spread to Berlin, and Johannisthal, now the chief aviation centre of Germany. Some Berlin motor salesmen came down to Mainz, telling me they had heard of a crazy flying Dutchman whose aeroplane neither had ailerons nor warped its wings. They didn't believe it until they saw my machine. Then they thought it was a trick. They had never seen an inherently stable type of plane.

Soon after that a promoter arrived from Berlin, proposing that I tour Germany in my strange-looking aeroplane. He talked expansively. Large sums of money rolled off his tongue. I agreed to fly if he would guarantee me 1,000 marks for each city, 500 marks in advance. With the greatest confidence he went to Hamburg and arranged for the first exhibition flight, printing circulars and tickets, plastering bill-boards with my name, and gaining a great deal of publicity for me. He seemed to be able to do everything but produce the 500 marks. Thousands of people arrived in Hamburg to see the daring flyer. That individual was still waiting cautiously in Mainz for his advance. I did not want to risk cracking up the ship without payment. Another crash might prove more than I could afford. It was shortsighted of me, probably, but

I had no confidence in the promoter, and no experience in large affairs to guide me. Moreover, I could not again risk my Haarlem engagement.

For, after the first accident, a committee from Haarlem had invited me definitely to fly in connection with the local celebration of Queen Wilhelmina's birthday. I immediately wired my acceptance, when they agreed to pay the expense, and shipped the plane to Amsterdam. A cross-country flight in those days was practically out of the question. My plane could only fly about twenty minutes before exhausting its fuel.

When I looked over the flying field the unthinking committee had selected, my heart sank. It was a small patch of meadow near the city, entirely surrounded by ditches. Along one side a high covered grandstand had been built. A continuous line of flag-poles stuck up in the air thirty feet high, ready to pin my plane like a butterfly specimen. The whole field was only about 300 feet long and 100 feet wide. I couldn't have got in there with a shoe-horn. Even to look at it scared me.

When I explained to the committee that I couldn't fly from the field, much less land in it, they got more scared than I was. Immediately, they began telling me how much money they had spent, and how disappointed the crowd would be. During aviation's barnstorming days, numbers of flyers killed themselves just to protect a committee's bad judgment. Sticking to my decision made them more angry. They said they didn't believe I could fly anyway. No one round there had seen me. Newspapers lied. It was an awful way to treat old friends. Then they once more went over a complete statement of the great expense to which I had put them, and explained that my flight was the high spot of the celebration. At last, much against my better judgment, I told them that if they would remove all the poles and fill in the ditches at both ends of the meadow to make the field at least 900 feet long,

I would chance it. Even so, the field seemed pretty small to me. I thought that I should be able to take off all right, but whether I could land would only be found out by trying.

Their suspicions definitely roused, they insisted that I make a test before the big day. The fragile contraption of wood, cotton, and wire set up by the mechanic and me in a few hours inspired them with no confidence. Their faces got even longer.

I was not anxious to try a flight from that field twice. Once was a time too many. What they interpreted as my evasions simply made them more determined. I saw they were going over the whole rigmarole again; their expense accounts were already out. In consideration of my father's difficult position—he was on the committee, of course—I finally consented.

Taxi-ing down to the far border of the field, I opened up the throttle as wide as possible and headed for the opposite end. As the members of the committee saw the wheels still hugging the ground within thirty feet of the ditch, I've no doubt their hearts were in their shoes. If so, theirs were no lower than mine. But at that instant I felt the wings lift. The next second I was in the air.

For five minutes I was happy, circling over part of the city at 300 feet altitude, staving off the moment when I should have to land. I didn't want to come a cropper right in my own town, where I had none too good a reputation anyway. Failure to land properly would mean more than temporary disaster, because I should be ruined in the eyes of everyone who knew me. The committee was even gladder than I was when I just cleared the ditch and rolled into a fair landing. Rolling too far I had to make a quick ground loop to save a collision. The committee thought this a regular procedure and complimented me on my fancy steering.

The next day everyone in the city came out to the

meadow, nearly ten thousand people. It was perfect weather for everything but flying. At four o'clock, the hour the committee had arbitrarily set for the flight, it was still too windy. They had little conception of what a delicate thing a flying machine was. From that field I was going to take no unnecessary chances. It was seven o'clock before the wind failed to stir a handkerchief.

Mine was the first aeroplane ever flown in the city, and when they saw me circling the famous sixteenth-century cathedral of the town, the populace went wild. Next day the newspapers said that cooks let their steaks burn, electric cars stopped, hospital patients hobbled to the windows, everyone wanted to see the unbelievable.

After fifteen minutes I landed safely to the first and biggest ovation of my life. My father and mother were there, and I think my father got his money's worth that day hearing the people cheer his Tony. Somebody handed me a big wreath of flowers—I was glad no one was putting it on my chest—and the Boy Scouts hoisted me to their shoulders and carried me along in front of the grandstand. Everyone crowded close to my aeroplane, wanting to touch it. Whatever my neighbours had thought of me in the past, I was cock of the walk that day.

The success of the flight was so great that I was asked to repeat it next day. I did, although I would have backed out if I could.

This reception I shall always remember as the biggest satisfaction I ever got out of aviation. For me, it remains the high point of my life. The committee, delighted with the way things went off, presented me with an official plaque memorializing the occasion, while my father gave me his fifteen-year-old watch commemorating " the first aeroplane flight in Haarlem." Privately, he again congratulated me and we held our only extended conversation in which I wasn't asking for money.

Out of it all I gained one practical bit of knowledge, as

well. Flying over the city I noticed that oranges on barrows in the streets were the most noticeable things visible from the air. It was remarkable how the colour stood out. In later years this fact was scientifically tested and confirmed. Weather vanes, airport names, and all objects to be seen from the air are now painted a chrome yellow to be easily distinguished.

Much as this ovation delighted me, a little of that sort of thing goes a long way. It was not my intention to hang around Haarlem like a hero. There was too much work to be finished in Mainz. In a few days I had packed up the aeroplane and followed it on the train. Not, however, before I had taken advantage of my father's excessive pride and enthusiasm in his son's achievements to get some more money from him and the promise of additional funds in the future.

Returning to Mainz, I found an agent for the Dixie Engine Company waiting. He, too, had heard of my flying in Johannisthal. He wanted to see what the Fokker aeroplane could really do. After watching it perform, he was most enthusiastic and urged me to come to Berlin where everybody could see it.

" I never saw such flying," he said. Innocently enough, I believed him, though he was trying to sell me an engine at the time.

My thoughts naturally turned towards Berlin, after this. The agent had told me that I was simply burying myself in the country by staying at Mainz. If I came to Johannisthal my flying was so superior, it was bound to attract attention, he had assured me. When it flew, my aeroplane would surprise and astound everybody. Gradually, he made me share his enthusiasm. Probably it wasn't hard to convince me. Before the middle of 1911, I made up my mind to go to Berlin.

The Haarlem exhibition had stimulated an interest in aviation on the part of my school chum, Fritz Cremer.

He suddenly showed up in Mainz and announced that he intended to buy a plane from me and learn how to fly. That pleased me immensely, because it had been with Fritz that I had tried out my non-puncturable tyre. For him to have faith in another venture of mine gave me a great deal of confidence, although I cannot say that I ever particularly lacked that quality. Fritz was the first to buy an aeroplane from me, and became my first pupil. During the war, he joined me as chief instructor of my flying school at Schwerin, after having gone with me to Johannisthal in December 1911. Many years later, after having made a trip around the world, and married, he was again to continue his association with me as my representative in America, where his father was Minister from the Netherlands.

VI

JOHANNISTHAL DAYS

WHEN I came to Johannisthal I changed overnight from being a big frog in a small pool to a very little one in a big pool. Up to that time I hadn't realized what a country boy I was. Not that Berlin overwhelmed me. My innate conceit was too strong for that. But I saw that I still had a long way to go to make my mark in the world. At the first glimpse of my unusual-looking aeroplane a general horse laugh was raised. Older and more experienced pilots, whose reputations were international, regarded my low-wing, aileronless monoplane as a joke. No one around spoke a good word for it. Angered by their jeering, I still didn't want to betray my feelings by blurting out my opinions of them and their planes.

Johannisthal was a thriving little cosmopolis. Aviation was a sport which had attracted daring spirits, ne'er-do-wells, and adventurers from all over the world. There were sober, industrious pilots and designers present, too, but they were in the minority. Many of the amateur pilots were rich men's sons.

Excitement out of the air centred in the gay little café, run by Papa Senftleben, attached to the field. My drink, "Kaffee Fokker," became famous, because it was so different, a tall beaker of warm milk with an inch of coffee. Pilots spent most of the mid-day there, for actual flying lasted only an hour or two after sunrise and before sunset after the wind had died down. It was a hard, dangerous life, but a dashing and reckless one, attractive to youngsters barely out of their teens. There was something of a story-book quality about that heady company of brave men.

Of the crack pilots on the field when I reached Johannisthal, a husky German Jew, Willy Rosenstein, was the ace.

His name was on everyone's lips; his picture everywhere. Flying a Rumpler Taube, one of the most successful of the early German aeroplanes, with his breath-taking banks, twenty to thirty degrees steep, he never failed to thrill the crowd. A favourite in the air and in Senftleben's café, he was cock of the walk. Whatever he said about another pilot or his plane was reverently noted. That was everyone's opinion thereafter.

Striding into our hangar two or three days after we had arrived, he took one withering look at my funny plane where I had set it up, and laughed. It was as good a way to kill yourself as any, he commented, and walked away. The hangers-on trooped out after him laughing, leaving me wanting to throw a wrench at his thick head. They expected me to crash on my first flight.

There was no friend to tell me how gawky and countrified I looked at the time. Just turned twenty-two, I probably appeared as hopeless as my plane to all those smartly dressed people. I had never given a thought to clothes. All my spare time during the day, while the other pilots were sleeping or in the casino, I spent working on my present aeroplane, or drawing up plans for a new type. If possible, I caught a nap after lunch; if not, I went without. Those who remember me in Johannisthal admit that I was anything but prepossessing; that I was usually grimy and tousle-haired, with my nose invariably in a cylinder head and my face and hands smeared with oil. When I flew I wore ordinary workclothes or overalls. The other pilots dressed in dashing flying suits, and carried helmets and goggles with conspicuous carelessness.

No matter how much I disliked Rosenstein for belittling my plane, I don't want to underestimate his skill. I was out at dawn to watch him the first flying day. He could fly. Handling his Rumpler with practised ease, he not only had a knack for airmanship, but he was a showman as well. What I saw, however, made me feel better. I

could make steeper banks and sharper curves than his. Pretty soon I would show him.

I had accepted the hospitality of a hangar from the Dixie Engine Company. This bit of frugality proved a very foolish thing, but I was yet to be initiated into the tricks played on the unsophisticated. On Saturday and Sunday afternoons big crowds trooped out from Berlin to watch the flying at Johannisthal. Having set up the plane and tuned up the engine, I was all ready for my first Saturday.

As every pilot got a proportionate share of the entrance fee, dependent upon the actual time he spent in the air, there was great rivalry to be aloft the longest. Rosenstein usually got the biggest purse for the day. No sympathy was wasted on those pilots whose planes were out of commission. The fewer in the air the more money each one received.

I scented no danger in this. In fact, I confided to the Dixie pilot I was going to try to stay up longer than anyone. He knew I would remain in the air as long as my petrol held out because he had seen me flying in Mainz. And he had been so generous in lending me part of his hangar that I did not suspect his friendliness. He just grinned and told me not to take any wooden pfennigs. I thought he was feebly trying to be funny, and went out for lunch.

At four o'clock, when the wind had died down, I wheeled my plane out in front of the hangar. Methodically, I primed the engine with the aid of a mechanic. Now was the time to show these fellows who was from the country. Smiling in anticipation of their amazement, I spun the propeller. The engine took hold immediately with a quick explosion, and I ducked under the wing to get into my pilot's seat. While I was still scrambling under the wing, the engine coughed and died. I backed out angrily, primed the engine with petrol once more, and

tried again. The same result. I thought the petrol was clogged and tinkered with the carburettor. For nearly a quarter of an hour I kept this up—priming, swinging the propeller, ducking under the wing thinking everything was fine—only to have the engine gurgle and die. A crowd seemed to collect as if by magic. One might have thought they had been told to expect a funny show. They offered jeering comments, suggesting that perhaps I did not really want to fly, that I was afraid. Unable to understand why my engine should start so readily but die almost as speedily, I was boiling with rage.

The rest of the flyers were all in the air making money, while I was wearing out my arm swinging the propeller. There was only a brief time to find out what was the matter because it became dark shortly after five o'clock. The mechanic and I looked over the engine carefully, trying to ignore the jibes we heard plainly enough. Everything seemed in tiptop order. The confounded engine should start when primed, and ought to keep on running.

I had strained the petrol into the tank with my own hands. Surely, it was all right. Still, it was obvious that something mysterious had happened. Might as well look at everything.

Opening up the carburettor, we found inside it a whitish deposit that looked like wax. I didn't know what it was, but I knew that it couldn't have strained through the chamois skin I had used. I looked into the petrol tank, but could see nothing. Nevertheless, we drained it thoroughly, and put in fresh petrol.

The engine started with a bang and purred smoothly.

But by that time it was too late to join my competitors in the air. I could only curse the sabotage which had kept me on the ground.

The next day I learned that it was sugar which had been dropped into my petrol tank. It is a sure trick to keep the engine from running. If there were to be too many aloft,

sugar was put into the tanks of the unsuspecting, so that the others could make more money.

There wasn't a chance of finding out who had pulled off the stunt. No more shared hangars to save money, however ! I moved out that same evening and hired my own hangar. That night I slept under the plane, and henceforth always kept a guard on it. My mechanic brought me sandwiches.

Sunday was as good a flying day for crowds as Saturday. During the afternoon, however, it was windy. Only two pilots got ready to go up, Rosenstein and Wsewolod Abramowitch. The latter, a Russian and a fine pilot, flew a Wright biplane. No one seemed to expect me to fly. They were still laughing over the sugar trick.

There was more wind than I had ever flown in before, probably four or five miles an hour. If the top of the grass barely moved in the wind, it was regarded as " stormy weather." It wasn't an ideal day for a début at all. On the other hand I should make a lot of money. The pilots' share would only be divided three ways. Probably I should make as much as 700 marks. Moreover, it was a chance to gain a reputation at one stroke. If I could go aloft when only Rosenstein and Abramowitch dared hazard the wind, there would be no doubt about the quality of my aeroplane.

A regular pilot made a terrific fuss about flying. In fact there couldn't have been more fuss if he had been departing for a trip around the world. His admirers and assistants acted as if he might never return. A mechanic fidgeted with his flying suit, and put his crash helmet on his head elaborately. While all this was going on before a gaping crowd, more mechanics wheeled the aeroplane out from the hangar with the ceremony usually reserved for a racehorse in the paddock. Shouting to the crowd standing around to get out of the way, they walked the plane out to the flying line. Only then would the pilot get into his seat,

and look about in a grim, grand way. The mechanic started the engine, ran round the wing to shout something unintelligible to the pilot, who waved his arms as if he understood. The carefully staged hocus-pocus worked up a great deal of excitement. The crowd, in a fever of anticipation, was on tiptoe for the take-off

Never accustomed to much personnel, I scorned such romantic foolishness. Starting my engine myself and clambering into the seat, I taxied my plane out from the hangar to the field and was up in the air while the crowd was still walking along towards the sound of an engine from my hangar.

The amazement on the faces of the people as I soared over them nearly a hundred feet high after the first round of the kilometre square field was worth seeing. Everyone had been so perfectly sure that I would crash. No one conceded that an aeroplane could fly without ailerons. When they saw that mine did, they immediately concluded that I was a great pilot, capable of handling a ship in which anyone else would break his neck. The next day newspapers wrote up my flight as if it were an astounding feat.

When I came into Senftleben's café for supper, I got more attention than I wanted. Persons entirely unknown to me begged for my autograph. The sudden change in attitude was something of a nuisance, except that Rosenstein came over to introduce himself, shake my hand, and to congratulate me on my flying and on my plane.

The way I lived was to get up at five o'clock or earlier every morning, roll out my ship and, if conditions were right, fly. After a hop I would go to Senftleben's for breakfast, and perhaps to my combined office and sleeping quarters on the second floor. Most of the other pilots, who had likewise been up early, then went to bed until noon. I went back to the hangar to work. As long as my father was financing me I felt I owed it to him to spend all my time getting ahead. I kept right on sending enthusiastic letters

to him, asking for 4,000 or 5,000 marks more. Soon I would begin paying him back. He maintained faith in me, though protesting more and more about how much money he was pouring into aviation.

My reputation not only as a flyer but as a designer increased at Johannisthal faster than my income. We were still building the plane in which I planned to teach Fritz. Constantly we expected to make ends meet by exhibition flying, yet the end of the month always showed us in debt. Any day we hoped to sell a plane, but so far, purchasers were skittish.

When the first army officials visited my combined hangar and shop, Fokker-Aeroplanbau, I would have offered to build them a plane for the bare expense of manufacture if they would have taken it. They left only " interested."

It was six months later that they came back suggesting a cross-country flight from Johannisthal to the military field at Doberitz, about thirty kilometres away, as a test of my plane for army use. I readily assented.

Although I had kept close to the aerodrome during exhibition flights, the hop to Doberitz was far from difficult for me. Carefully grooming the plane against accident, I made the trip without incident, landing on schedule before a small group of officers assembled for the occasion. They were impressed, but it was not until I returned from Russia that they were " sold." Then two planes were ordered for 10,000 marks, as a result of my increased reputation, and we started their manufacture at once.

A short time later I embarked on a much more ambitious cross-country hop from Berlin to Hamburg, two and a half hours in the air. It necessitated the installation of auxiliary fuel-tanks. Because I was not a good navigator—and never will be—an army officer came along as passenger. As soon as we left Johannisthal and swung towards Hamburg, I turned over the rudder to him. The plane, being automatically stable, required no other attention. He kept

the course, and we made the flight with no trouble, though I spent most of my time wondering what was going to happen.

After that important flight, showing what my plane could do, ti occurred to me that the Dutch Government, which was known to be in the market, might buy from me. I planned to fly from Berlin to The Hague, but dislocated my arm in a flying accident three days before the scheduled departure. A Dutch friend of mine, Bernard De Waal, who had learned flying in another school, persuaded me that the long-distance flight would be a great advertisement. He made the four hundred mile trip with only one stop at Hanover—on May 13th, 1913. I took the train. At The Hague, to explain my arm in a sling, I told them I had slipped on a greasy floor.

We received a fine reception and big writeups in the press. Moving pictures were made and we could go nowhere without being cheered. I believed that my own Government would surely give me an order after all the public fuss made over us. It was a duplication of the enthusiastic Haarlem turnout. But I had the usual difficulty seeing a big general in a small army. When I finally gained entrance to General C. T. Snyders, he promised only that his staff officers would look into the matter. One did come to Johannisthal later, flew and liked our plane, but we got no orders. Instead, the Dutch Government, to my intense disappointment, ordered Farman planes from France.

In later years, General Snyders turned out to be a good friend, but that was after the war, when my plane had proved itself on the German front, and I came back a famous man. The war had turned him into an aviation enthusiast and he was one of the pioneers in organizing the Holland-India flight. No doubt he put too much dependence on his subordinates at that time. Our one-stop flight from Berlin clearly showed that the plane had superior qualities.

Out of the whole trip I gained nothing but expenses. De Waal talked me into letting him fly back to Berlin. I must have had a hunch. I instructed him, in a pinch, to land on

trees to break his fall. They were soft. But when a rocker arm of the 100 h.p. Argus engine broke, he found an even softer spot in a farmyard, plopping down in the squashiest manure pile for miles around. It seemed too fitting an end. The plane was badly damaged and had to be shipped by train to Johannisthal.

It was in 1912 that the aviation world was electrified by the news that the Frenchman, Pégoud, had looped the loop. He was the first flyer in the world to perform that hair-raising stunt. People paid hundreds of pounds to watch him. Lincoln Beachey came out of his retirement to learn the thing he had never dared to do. Finding out how it was done, he returned to flying—and his death in 1915.

One of Pégoud's first demonstrations outside France was at the Johannisthal flying field in 1913, not long after my return from Holland. His Blériot monoplane, with an enlarged elevator, had a reinforced upper structure to stand the strain when it turned over. Pégoud was strapped to his seat to prevent his dropping out when he hung head down at the top of the loop. The day I saw him, along with thousands of other, he made three loops, but most of his flying was only spectacular curves.

My biggest ambition was to match his stunt.

And I was actually the first in Germany to loop.

Pégoud's looping crystallized my idea of abandoning the automatically stable feature of my aeroplane. Pilots were beginning to feel safe in the air. Confident of controlling their planes, they were demanding greater manœuvrability so they could perform stunts. My ship was too stable; it resisted efforts to fly in any but a normal manner. Stability was no longer a dreaded problem; more power had given us the control which we lacked at first. Therefore I abandoned the whole automatic type and went to conventional design, at first warping the wings, however, instead of using ailerons.

In general appearance, the first plane I constructed after

that decision greatly resembled the French monoplane types, but from a detailed engineering standpoint, it was radically different. For the first time I used a rectangular fuselage of welded steel tubes. The wings were wood, covered with fabric, and braced with cables. As soon as I finished and test-flew the new plane I decided to try my first loop.

Nobody had ever told me how; I only knew that I had seen it done. The loop seemed to require the use of great speed. On the other hand, pulling an aeroplane sharply up at terrific speed puts a tremendous strain on the wings. Something is likely to buckle. After I had flown around, testing out my plane gingerly like a man putting his toe in a cold bath, I glided down and yelled to my mechanics to watch me—I was going to try a loop.

When I had gained some altitude, I began to wish I hadn't promised anything. I found that I was thoroughly scared, too frightened to make a start. While trying to get up my nerve, I pretended to be getting more altitude, all the time wishing my engine would stop or something would happen which would permit me to withdraw with honour. Several times I dropped the nose to pick up speed, but each time I nosed up for the loop I levelled out again like a balky horse refusing a fence. I kept wondering whether I had made the plane strong enough to stand the strain, and went over every detail of construction in my mind to assure myself of the stoutness of each part. I felt in a worse position than a pilot who trusts blindly to others. Finally, I saw that the engine wasn't going to quit. The mechanics were stretching their necks to watch ; I was simply in for it. So I set my teeth and thought, " Some day you must die, it might as well be now." With that, I pushed the nose far down, picked up speed until the wind whistled through the guy wires, and pulled up sharply on the elevator.

The aeroplane staggered fearfully, turned over like a flash on its back, and for a moment my feet slipped off the rudder as we hung there, upside down. I prayed for my

straps to hold. Then over we came in a steep dive towards the ground out of which I pulled as rapidly as possible. In a minute the aeroplane was back again in normal flying position.

I had flown my first loop and was still alive !

That was the way I felt, exclamation mark and all.

I had looped at 1,500 feet altitude and come out of it losing only about 200 feet.

The story of my first loop was printed in newspapers all over Germany. Offers for exhibition flights came pouring in. A promoter took hold of the whole matter for me and lined up a German flyer, who had brought an old Blériot, like Pégoud's, and said he would loop, too, although he had never done it before. The promoter closed one contract after another in a whole string of cities. Everybody was anxious to see an aeroplane loop. People hardly believed it could be done, even though they had read about it.

Coblenz was the first city on our schedule. Thousands crowded out to the flying field to see the famous loop-the-loop airman. The first time aloft I confined myself to steep banks and spectacular curves. I found I didn't want to loop. The thought of doing it still scared me to death. If I could possibly get out of it, I didn't intend to loop. I stunted brilliantly instead. When I landed I found the public wildly enthusiastic. They had never seen such an intricate combination of banks and curves. In fact, some banks were so steep that many people thought I had actually looped.

Unfortunately an army flyer on the committee knew better. He complained that I had failed to live up to my contract. We were to receive 10,000 marks for three days, with 500 marks for expenses. A proportionate part of the purse was paid after each flight. There had not been as big a gate as had been expected. People could see the flying outside the field as well as inside. My failure to loop gave the committee a chance to refuse to pay the second instalment.

The promoter, thoroughly frightened at the committee's threat, told me that if I did not loop we would lose most of the money. He persuaded me to go up again, and I flew around wondering whether I had the nerve to loop for that crowd.

I remembered the strain the plane underwent and how it shuddered when I pulled up sharply after the preliminary dive. Probably the wings would simply fold up under the excessive strain. Still, I had done it once. Thinking it over carefully, I decided that this time I would not pull up so sharply. Maybe it would loop a little easier.

Before I could change my mind I dived the plane and pulled it up gently. In two seconds I was on my back without much strain and with less loss of speed than the first time. Then I nosed over easily and pulled up again to normal flying position.

That felt a lot better. I tried it again a little slower this time, making a perfect loop. The plane swung into it with practically no undue strain.

I suddenly discovered I knew how, and from that time on enjoyed the trick, a favourite stunt with airmen once they get the knack. Nowadays, pilots do it for setting-up exercise in the morning.

On landing, everybody except the committee seemed satisfied. They had to dig into their pockets to pay for the thrill of those outside the field.

The tour continued, but the other pilot didn't seem to want to loop. He banked and curved steeply, just as I had done the first day, but he couldn't get up his nerve to go the whole way. In fact he never did loop throughout the whole series of exhibitions, but demanded fifty per cent. of the takings just the same. Understanding how he felt, I didn't have the heart to complain.

At Frankfort we flew on the Zeppelin airport and I got some experience in showmanship which was of advantage to me demonstrating planes in later days. I found it was

possible to thrill the public without really endangering myself. Audiences wanted to believe one was going to break one's neck, and then see one save it spectacularly. The Zeppelin hangar was at the side of the field opposite the public. Taking off in the direction of the hangar I flew low, directly at it. At the crowd's distance it was impossible to judge accurately the narrowing space between me and the building. The spectators held their breath, momentarily expecting me to crash. While they were gasping, I zoomed high over the hangar and disappeared by dropping down behind, playing leapfrog. Everyone waited, tense, for news of the expected crash. Flying below the roof and in line with the building I circled wide, over a forest. Hidden by the trees, I was out of sight for several minutes. Most of the crowd had given me up for lost. While they stood strained, waiting for the electric news of a crash, I suddenly shot up behind them and flew over their heads waving. Landing quickly, I jumped out and the crowd spontaneously ran towards me yelling their heads off, carrying me off on their shoulders and begging me to sign photographs. Hundreds of people offered real money for a passenger flight; invitations to parties poured in. I refused both. I was unwilling to risk other people's lives, and too tired to attend parties. It required all my time to keep the plane in working condition. Looping the loop was now the easiest part of the performance, but it looked the hardest and always was the biggest attraction of the exhibition.

Our first tour ended with a big demonstration in Johannisthal, where I was hailed as the most daring pilot in Germany. Many army officers, who in late 1913 were beginning to take up flying, were present to watch me loop and stunt.

I remembered how, only a year before, I had come to Johannisthal, to be jeered at. It pleased me to know that Rosenstein was among those who were now watching me enviously.

Cities all over Germany, which we had missed on the first swing around the country, were clamouring for our appearance. I continued these exhibition flights right up to the war. The newspapers wrote fabulous stories about my spectacular flying, exaggerating its danger. They alarmed my father, who sent me a postcard urging me to quit.

" Now you are famous," he wrote. " Now is the time to stop. The only thing you can do next is to break your neck."

I am still flying.

VII

DUELS WITH DEATH

To develop air flight, we early inventors who were flyers had not only to struggle with recalcitrant materials and mechanics but also to face death. That seems often to be one of the hurdles in the achievement of important tasks. To their credit, few men balk at it. A tribute is due to the courage as well as to the genius of the Wright brothers, Curtiss, Blériot, Farman, Sikorsky, the De Havillands, the Sopwiths, and the Roes. They never shirked this ultimate test.

Those of us who continue to fly can never quite brush away from consciousness the memory of those early days. Pilots who begin their flying to-day can hardly understand the rarely absent sense of dread which afflicts the veteran airman. It is a dark heritage of the time when almost any flight was potentially a one-way trip to oblivion. Curiously enough, most of the outstanding aviation pioneers survived.

My baptism in flight was the sight of a reputedly qualified pilot, Büchner, crashing on his first real test hop. Happily I was young and unimaginative enough not to be perturbed by the misfortunes of others. Serious accidents happened to other people in my own first plane. As related, my only partner nearly met with disaster twice before hastily turning over the development of aviation to the younger generation. Every flying field I have known is soaked with the blood of my friends and brother pilots. Thirty-three of those fine fellows were killed at Johannisthal alone. My memory is one long obituary list. Relics of the crashes used to adorn the walls of Tolinsky's café, the mechanics' gathering place, near Senftleben's. Indeed, much interest centring on early aviation depended on the lively prospect of a Roman

holiday ending air meets. Attendance always picked up after a particularly messy crash. We pioneer flyers knew this, accepted it, even capitalized it; though I think we were something more than gladiators.

The first time I risked death closely was during early experimental flying in Mainz. I had constructed a new rudder with a stationary triangular fin of fabric just in front of it. The fabric was laced to its triangular steel supports, securely as I thought. But when the wind began vibrating it violently, the cord on the front side of the fabric tore loose and the fin flapped to one side, turning the ship. Barely able to hold it straight, I passed the end of the field.

Unable to turn, and with little petrol for sustained flight, it was touch and go for twelve miles over trees, until I saw a tiny open clearing straight in front of me. Petrol was just about exhausted when I squirmed into this spot and rolled to a stop just short of obstacles. It was several moments before I could believe solid earth was safely under my wheels.

Shortly after that experience, I was asked to fly during some army manœuvres in the Taunus range near Frankfort. As my own plane carried an insufficient supply of petrol for any extensive flight, I accepted the loan of a plane Goedecker had built on the model of the Rumpler Taube. This plane had a spreading tail, like that of a bird, which served as combined stabilizer and elevator. The fabric was laced into this triangular tail. Elevator action was gained by warping the rear of the tail surface.

All went well until I was wheeling over the mountains bordering the Rhine. Suddenly, I felt a throbbing in the tail.

Looking back in alarm, I saw that the laced fabric had already partially torn loose. If it tore completely off, I should be powerless to direct the plane either up or down. Sooner or later I should drop, out of control, to the ground.

The lacings at the front still held, though the fabric threshed wildly about in the propeller's slipstream. I hoped it would hold until I could turn back and land somewhere in the Rhine valley. There seemed nothing but peaks below me at the moment.

Curiously enough, I was worried more about cracking up the aeroplane than about injuring myself, because it was someone's else's ship. In those days it took nearly three months to patch up a badly wrecked plane. I could have landed easily by cracking up, and I might have escaped with only a scratch. But I was eager to save the plane.

While I was standing by to see what would happen, a bare slope suddenly appeared on one of the hills below. By careful manœuvring I landed uphill without damage in a steep short clearing, and remained right side up. A search-party of army mechanics in motor-cars, expecting to find me dead, discovered me eating a hearty dinner at a nearby farmhouse. Next morning, after careful repair, I was able to take off down hill and get safely into the air again. I flew next day in the manœuvres, happy that the aeroplane had survived its first trial.

Hairbreadth escapes always varied in kind, however similar they were in degree of danger. On another occasion while I was demonstrating a special plane to German army officials, a 300-litre petrol-tank burst because of excessive air pressure. Apparently, the relief valve had stuck.

Petrol ran out, streaming down beside an exhaust pipe blazing with hot fumes.

It would be only a matter of seconds, I knew, before the plane burst into flames. Burning is one form of death which appals the hardiest aviator.

I shut my mind to the horror that stared me in the face, spiralled rapidly to earth and slid into a tiny space between a line of trees and a row of buildings and in the greatest speed I had ever made. Cutting off the engine, I jumped to

the ground as the wheels touched; running away as the whole plane caught fire with a terrific explosion !

The blast struck me in the back, bowling me over, but I scrambled to my feet and ran even faster. In a minute I was safe though singed, and trying to remember just how I had escaped in time that blazing inferno.

I ought to have been killed ten times over, for the incidents mentioned here are only a few of the narrow escapes which came to be part of my normal existence. What astounded me was the variety of ways an aeroplane could try to kill its pilot. That I survived can only be ascribed to sheer luck, for at a certain point in every crash one lost control of ensuing events.

One of the times I just squeezed through occurred during the first test of my earliest flying boat. I had built it to win a 100,000-franc prize hung up by the Monaco speedboat race committee in 1913. The whole aviation world was invited to compete. My boat, a sesquiplane type, was built round a twelve-cylinder, 100 h.p., water-cooled Renault. The propeller revolved in the rear of the engine, just above the narrowing tail. A mechanic and I sat tandem in the bow, just in front of the engine.

The boat took off nicely from the river that runs close by the Johannisthal field, and seemed to fly well in the air. But when I started to make the first landing I ran into trouble.

To land, it was necessary to idle the engine and glide slowly down to just above the surface of the water. Then, as the plane lost speed, one pulled back the controls until the hull settled gently on the water.

As soon as I retarded the throttle for landing, the nose of the boat climbed up. No amount of pushing the controls forward for a glide would compensate for its heavy tail which forced the nose up in the air as soon as the engine was idled. The elevator was too small. Quickly I gave it full

gun, and flew round a bit, thinking desperately of some method to get that boat snugly on the water again.

I could see that a crash was inevitable. The question was only one of discovering the way to crash least dangerously.

It was no fun flying round above that river, knowing that pretty soon one had to descend and risk having a twelve-cylinder engine plough its way through one's back. I had plenty of time to run through the whole list of catastrophic things which could happen in the smash-up. Some of them were bound to happen.

Finally, I decided that the only way out was to make a power landing, hitting the water at almost full speed before cutting the gun. The friction of the water might tear the bottom off the hull, but it was a chance I had to take.

I did not want to take it. Three times I thought I had summoned up enough nerve, but each time I climbed again just before the boat touched the water. At the fourth time, my nerve held.

After the step of the hull hit, I was hardly aware of what happened next. Apparently the bow sheered clean off at our cockpit, and my mechanic went hurtling through the bottom. I was thrown forward, clear of the wreck, and I bobbed up about forty feet away, swimming and unhurt. My mechanic was nowhere in sight. He might have been killed instantly, or worse, badly injured, and pinioned under the wreck to be drowned.

The tail was sticking straight up. Parallel to the water and about a foot above it, the propeller was still revolving.

At the moment I noticed this, I saw the mechanic's head rise slowly under the still spinning propeller. I could picture him guillotined the next instant. I couldn't reach him.

With all my might I yelled.

In another instant I gave him my hand.

For aviation's sake, I had told the press and others in The Hague, curious about my arm in a sling, that I dislocated it by slipping on a greasy floor. The real story was somewhat different.

Early aviation mechanics, unlike modern ones, were not so conscious of their grave responsibilities. Workmen to-day realize that other people's lives depend upon the integrity of their work, and are satisfied with nothing less than perfection.

This was not so in the early days. While building planes in Johannisthal, I employed about twenty men. No one really knew anything about aeroplanes. I had to depend upon my helpers following explicit instructions.

One mechanic was assigned to make up the axle for the landing gear of a new plane. Two wheels revolved on this axle and these were made of two tubes closely fitting into each other. The workman made a mess of the job and then tried to hide his mistake. The inner tube should have been slipped clear inside the outer tube. In inserting it he got stuck half-way, cut off the end, and inserted the remainder from the other side, so that at a glance the axle looked intact. However it was weakened in the very middle. I inspected the plane when it was finally assembled, saw nothing wrong with it, and took it out for a test flight.

As soon as the machine gathered speed and hit a bump the fake axle collapsed, the ship nosed over, and I was thrown out, head over heels. That was before aviators had thought of safety belts. I landed forty or fifty feet ahead of the ship. Picking myself up, I felt a terrific pain in my shoulder. My left arm was dislocated at the shoulder. The plane was badly wrecked because of its high speed when the axle crumpled. But for sheer luck, I might have broken my neck.

The doctor had a difficult time getting my arm back into place. He twisted and jerked it unsuccessfully, protesting his fear of hurting me, which he did, abominably. Finally,

he said he couldn't set it without an anæsthetic. I was pretty angry by this time.

" What difference does it make to you," I asked him, " whether I have an anæsthetic or not ? "

He didn't know any answer for that, and so I told him to try again. Laying me on a couch, he wrestled with my arm so violently that the couch skidded clear across the room. My arm was still dislocated.

" Let's try my helping you a little," I said.

I placed my right hand on my left shoulder and pressed it down. The doctor twisted my arm. There was a click, and the arm was back in place—but still painful for several weeks.

That was how I slipped on a greasy floor.

The most serious crash—the one I count as the worst experience in my life—happened early in my Johannisthal days during the annual flying week in the autumn. For seven terrifying minutes I waited for death, as my crippled plane came slowly down from 2,400 feet.

Tens of thousands of people were present from ro ınd Berlin to witness my crash, for the autumn flying festival was the biggest aviation attraction of the year. Permanent grandstands had been built to accommodate a part of the crowd.

Though what we considered a stiff wind was blowing, I was aloft. By that time I had become known as a " storm pilot." Abramowitch was the only other aviator in the air. Several lesser pilots had tried to take the air, but the wrecks of their planes were mute evidence of their failure.

People were fighting to take a ride with me. Its hitherto unblemished record had built up a feeling of confidence in my automatically stable plane. As we were paid for carrying passengers, I was not unwilling to take them along.

After flying for twenty minutes, I came down for petrol and one of the two army officers whom I had promised to give a ride. As it happened, the first officer was not around. Impatient to get up in the air again, I took the second one, Lieutenant Schlichting.

With the 100 h.p. Argus engine tuning up nicely, we rose swiftly to about 2,400 feet. The first 300 feet were decidedly bumpy. The air rocked us sharply, shaking us up, putting a severe strain on the plane, and keeping me busily alert with the controls in order to maintain equilibrium. Once or twice, as we tossed about, the officer looked back at me quizzically, as if mutely questioning whether we were all right. I smiled comfortingly back at him, and he seemed satisfied. At 2,400 feet I cut down the engine to cruise slowly around the field. Every minute I remained in the air meant just so much more cash.

Passengers in those days had to have a blind confidence in their pilot, for a glance at the aeroplane was hardly inspiring. The fragile wings of my skeletonized monoplane were supported by eight wires, four above and four below, running on each side of the open-work fuselage. With the wires, the plane had a safety factor of about five; without them the wing spar could barely support itself in the air. But at that time I was as proud of my plane as I was of my piloting skill. For the moment we had the sky to ourselves. I couldn't help thinking my plane was the best at Johannisthal. Looking down on the ground, I could see the wrecks of four crashes. That would mean big business next Sunday. Fatalities one week-end invariably brought out a larger crowd the next—*just in case.* I comforted myself smugly that other pilots might crash, but I bore a charmed life.

Suddenly—Bang !

That is the way things happened—unexpected and terrifying. For an instant I couldn't tell what had occurred, as my eyes raced all over the aeroplane at once. Then I

noticed that the right forward top wire was slack. A swift glance through the open fuselage told the whole tale. The flying wire on the underside of the wing—which had supported the first bay in flight—had snapped, and was hanging useless from the landing-gear.

Punishment for my excessive pride had come swifter than usual.

My heart sank. I expected every second that the wing would crumple. A two-thousand-foot fall, it would soon be over !

The crash seemed inevitable.

We relied for safety on that wire—which was twenty times stronger than it need be—rather than on the steel wing spar which was not built to support two bays without a brace. It was already bending under the strain.

But though I expected to die, I hadn't given up hope. The spar hadn't broken yet. Miracles sometimes happened. Our lives were hanging by a thread, but for a moment that thread was of steel.

Hastily surveying the ground below, I saw we were above a small forest bordering the field. It would be safer to fall into trees than on the hard ground. I spiralled down—cautiously. The wing sparwas giving us a chance. It wouldn't break right away.

I resolved to make use of my passenger. If I could only persuade him to crawl out and stay on the spar, his weight, pressing it back into place, might keep it from breaking.

Frantically I made motions. He looked at me surprised, then seemed to understand. I yelled instructions, not very good ones, perhaps. I pointed at the spar. He clambered heavily out on the wing, balancing himself uncertainly in the stiff wind, tottered, recovered himself, plunged his foot through the wing fabric.

I sat frozen with fear lest he grab the front landing-wire to pull himself up. We were gone if he did.

Instead he pawed at the fuselage, untangled his foot, and looked at me wistfully.

I saw it was hopeless. He was game, but he wasn't a mechanic. There was too much to explain. He might grab that landing-wire if his foot slipped again. He couldn't know that his weight, properly placed, would have tipped the scales in our favour. I motioned him back to his seat.

Even though I didn't expect to get out alive—too many pilots had been killed in front of my eyes—I couldn't help seizing every straw. If the wing crumpled at a thousand feet I knew we were dead. Nevertheless, I kept circling over the trees to break our fall. I didn't want to die, not so much because I had any fear of death—I was too young for that—but because I had so much I yet hoped to do; my head teemed with plans for new aeroplanes. I was afraid if I died they would never get built. I felt sorry for my brave mother and father, that all their worry and trouble in my behalf should end like this.

To ease the strain on the crippled wing I was gliding down slowly. After we had reached about 500 feet I gained a little courage. It seemed that the spar might hold, though it weaved now more than it had. All this took only a few seconds, but things seem to happen slowly in the air, swift though they look from the ground. I had much more time than I wanted, to think. We had glided down another 150 feet. I decided that perhaps I could land after all, and so I guided the plane over the trees bordering the forest, with the idea that at the last minute I still could direct the plane over the field. We came down lower and lower, the wing still holding, and so I decided to go in for the landing.

We hit the bumpy layer of air just off the ground. That brought a greater strain on the wing, as the frail plane pitched and tossed. I saw the spar bend dangerously. Desperately I tried to swing the plane once more over the

trees. There was a rending; the rip of canvas. Instinctively I braced my legs and arms for a crash.

When it came, I didn't feel it. The shock knocked me unconscious.

Some minutes later I came to. A crowd had gathered. I was not quite sane yet. For a moment I ran aimlessly around with only two thoughts: one for my passenger, the other to discover why that wire had broken. My passenger, they said, was all right. It was only next day I found that he was dead.

Hysterically I dug into the wreckage for that broken wire. My friends arrived, insisting that I get into my car. I refused to let anyone else drive, but as I slipped in behind the wheel I felt suddenly faint. Someone else drove.

Once at home, I collapsed and remained unconscious for several hours. It seemed that several of my ribs were broken, and I was bleeding inside.

I couldn't stay in bed more than three days, although the doctor protested. My breastbone was pushed in a trifle.

At the field I learned that an official investigation had been held, but it was more or less of a formality. Examining the wire myself, I couldn't discover that the material was faulty. We had to lay the blame to a weak spot in the high-tempered steel wire. After that we used cables.

I was afraid that the crash, with the army officer killed, would ruin my whole reputation. The newspapers carried long accounts of it, and I felt it was the end of everything. My competitors did their best to use the accident to my hurt, asserting that my plane was not any good. At moments I wished I had died with Lieutenant Schlichting, and ended my endless troubles.

Some years later, at the front, I met the officer who had

been scheduled to make the first flight. He introduced himself, by saying:

"I was the fellow who escaped, when you crashed with Oberleutnant Schlichting."

We were often that close to death. It was something we pioneers had to face and still go on.

VIII

MY RUSSIAN EXCURSION

For a while I feared that my whole business would be ruined by that fatal accident blackening the reputation of my aeroplane. But I plunged ahead, built another plane, and even optimistically continued the flying school with the large total of three students. I was still flying my first old plane, and had built a second one of improved type. One of my students was a Russian, named Grünberg, who cherished vague Slavic ambitions of buying a plane and becoming my agent in Russia. Shortly after he joined me, in August, 1912, he heard of an important competition for military planes which was to be held in Russia.

The French were to be well represented, according to report. In all there were to be thirteen or fourteen competitors, some of them important, others not so very good. Competitors were to receive 2,000 marks expenses for the transportation of their planes and equipment. Abramowitch, I learned, was going to St. Petersburg, with his Wright biplane. Igor Sikorsky, now successful in America, was demonstrating a large twin-engined biplane. Both of them, being Russian, might be presumed to have the inside track. But as I had so far been unable to sell my planes in Germany, I decided that I might as well try Russia as a market.

Although constant travel and association with representatives of every nationality have now put me at ease wherever I go, my visit to Russia was an eye-opener. Germany I had accustomed myself to, because the language was similar enough to Dutch so that I could get along from the start. But Russia was like nothing I had seen. The luxuriant beards, the meaningless jargon, the happy inefficiency of everyone, the Slavic-oriental architecture, the unaccount-

able mixture of magnificence and filth, struck me as a nightmare. Nowhere did one find the accustomed reaction either to thought or deed. It left me confused, and despite my customary optimism, I soon became convinced that Russia and I would never agree.

We were met at the military post by a great gathering of extremely polite Russian officers, who said we must fulfil certain requirements of starting, landing, and rate of climb, 3,000 feet in twelve minutes. Thinking that expedition would impress our hosts, I was among the first to fulfil these conditions. Abramowitch was next with his old Wright. He was actually my most dangerous competitor when it came to demonstrating the tricks of flying. He was clever, and a very good pilot. After he watched my demonstration, and noticed that it had evidently delighted the judges, he set out to put my performance in the shade. I felt that I had to show him up. Pretty soon we found ourselves competing with our lives at stake.

I still cannot understand why we were not both killed, because we were doing dangerous stunts rather than demonstration flying. Curving through the air at terrific speed, I could bank at steeper angles than Abramowitch because of the automatic stability of my plane. Determined to show me up in some manner, he suddenly dived from several hundred feet almost to the ground and slid between two hangars, so close together that his wing-tips fairly scraped the paint off the sides. I watched him with a mingling of respect and horror and decided that this was the moment to stop competing with him. I had too much respect for my skin. Half a year later he was killed in a dare-devil flight on that same field, when his plane collapsed in mid air. He had been touring the country risking his neck to thrill the crowd. No one could help admiring the daring of such dauntless fellows as Abramowitch, but though I was only twenty-two, my Dutch caution forbade my imitating him. Planes were neither very strong nor

very quick to answer controls in those days. Death had already paid me enough calls to show he had more than a passing interest in my existence.

Soon I learned what was meant by Russian efficiency. No definite closing date had been set for the competition. For weeks after Abramowitch and I had qualified, the Russians let the exhibition drag along, waiting for the other fellows to catch up. They encouraged us to fly, and applauded our skill, but that was all. The Russian whom I had taught to fly in Johannisthal claimed to have splendid connections, but I soon discovered that doing business with the Czar's Government was an art not to be learned in a day. It was so subtly compounded of subterfuge, conspiracy, and influence, the whole gilded with smiling evasions.

Before you could see an official in his office, it was necessary to send in your visiting card wrapped in a ten-rouble note, otherwise your card got no further than the porter. After running this gauntlet, the secretary of the department expected not only a letter of introduction but a larger banknote to rouse him from lethargy. Then, if you wanted to talk to the General himself, you had to see the executive officer with a really important bribe, and finally the General would only sign a contract if there were enough banknotes folded in it. Unfortunately I was armed with very little cash, and I certainly couldn't ask my father to finance bribing the whole Czarist Government. As a matter of fact the big expense of entering the competition had stripped me to my last farthing, and I couldn't imagine risking a lot of bribe money without knowing whether I was going to get the business or not.

It seemed pretty evident that I had nothing further to gain by remaining in Russia. I got only evasions in answer to my inquiries. Finally I left my plane there in the charge of my business agent. A week after I departed a number of other competitors suddenly fulfilled all the requirements.

Abramowitch's plane was judged the best, the Sikorsky second, and my plane third. The net result was that the prize order for six planes went to someone else. I didn't sell a single plane to the Russian Government. The one thing gained was the knowledge of how to sell to them, if I wanted their business—which came too high.

IX

HIGH FINANCE

PROBABLY I have been as shrewd about developing business as many people, but making money has never been an end in life with me. Money to me has never been anything more than a necessary evil. Once I have enough money to live comfortably and protect my business against sudden bad times it is thereafter nothing more than any other raw material. For that reason I have never fully realized how greedy many people are. When I first came in contact with important financiers at twenty-three years of age, I believed their promises meant an equal performance. It was years, in fact, before I learned that ordinarily honest people can be tempted when the sums become large enough, and I am still learning. Whenever possible, I have had someone else attend to the financial part of my affairs. The result of this has taught me that it is easier to make money than it is to keep it. While there are, fortunately, exceptions, few people are honest enough to be trusted indefinitely without any supervision. Money one handles begins to seem too much like one's own, and the next step is to act as if it really were. After some experiences, I discovered that there is a moral obligation upon one not to subject people to unnecessary temptations. One should assist them to remain honest by constantly supervising their handling of financial affairs. That way everyone is happy. These lessons took longer to learn than a day, however, and my serious education began at Johannisthal, just after my return from the futile Russian expedition.

By that time I had become as reluctant to write my father for money as he was to supply it. The expense of a hangar, the upkeep of my shop, and the salary of my twenty or twenty-five employees had to be paid out of what I earned

by exhibition flying. Not that I minded risking my neck if only the week's results would equal my pay-roll, but they never did. I was in the limelight as a pilot, and my planes were considered among the best. Without knowing it, I was on the edge of success, but that didn't pay the bills, and things looked no more rosy than before.

The army had become interested in aviation to the extent of sending a few officers to the different flying schools at Johannisthal, and I began to get my share of army patronage. But all that did not bring in much cash. I was still where I had always been, each day expecting that my opportunity would come, but it never did. Every so often I would have to write an enthusiastic letter to my father asking for another 3,000 or 5,000 marks, telling him that success was just over the horizon.

Several of the more important aviation companies, among them the Albatros and Rumpler firms, had tried to get me to join them as a designer. Like other independent pilot-designers, I was living a hand-to-mouth existence. The fact was an open secret. When I turned their offers down, they bided their time, expecting me to go broke shortly. Most poverty-ridden designers were eventually hired by capitalists. They earned a salary, but had no opportunity to develop any of their more original ideas. I wished to keep my independence as long as possible, but there were times when the easiest way of selling my talents for a certain living seemed most desirable.

It was during one of those hopeless periods that a suave, faultlessly groomed promoter from Berlin motored out to Johannisthal and spread before me what looked like a golden opportunity. I had just returned from my vain trip to Russia. Representing himself as the emissary of such important capitalists as Graf Oppersdorf—who was known to be closely connected with Kaiser Wilhelm, Bethmann-Hollweg, always influential in political circles and finally Chancellor, and certain of the large Berlin banks—he

painted a picture of my future—if properly financed—which left me swooning.

In something like a daze, I got into his luxurious motor-car, and was whisked along Unter den Linden to one of the largest banks in Berlin. A doorman, with more gold on his chest than I ever expected to possess, opened the door for us, and my new-found angel with all the certainty of St. Peter escorted me through this financial heaven. Seated in a comfortably upholstered chair, surrounded by an atmosphere of limitless wealth, I lost my native scepticism and was lulled to a false sense of security by the siren songs sung by this practised promoter.

I learned that certain high army officials were interested in a project to build a huge aviation company around me as designer. These officers, together with the financiers, believed that aeroplanes were shortly going to become a military necessity. The army and navy must soon let out big contracts. They would be in a position to ensure them to the best designer. In preparation for this, they would finance me to the extent of several hundred thousand marks. At the beginning I should receive 12,000 marks a year, an excellent salary, I thought. With my new resources, I could buy engines, quantities of the best material, hire skilful mechanics and competent engineers, and set about to produce the finest aeroplane it was in me to design.

It seemed to me these were remarkably far-sighted persons. I was delighted with the prospect they spread before my dazzled eyes. It seemed to mean the end of the dreadful financial uncertainty which had soured my life up to then. They took such a fatherly interest in me, a young man of twenty-three, I couldn't help but be grateful. It then required more than a little courage and faith to believe that aviation would ever be more than a sport. Military planes were as yet undeveloped. Only a few persons thought aircraft would be used in war.

I could hardly wait to sign the contract. Having had almost no experience with lawyers, promoters, or complicated business deals, and much bemused by these sophisticated financiers, I cheerfully left the drawing of the contract entirely to them, and signed on the dotted line.

While my backers were dickering in Berlin, I was luxuriating in my supposed release from financial worry. On the strength of the elaborate promises by my bankers, I ordered engines and materials on a big scale. My innocent belief was that with the contract signed, the company would be good for all legitimate bills. Telling the promoter we needed 2,000 or 3,000 marks for this and that, I would go ahead when he nodded. But all I got was promises and I signed all the bills myself. Wages for my employees and myself were doled out.

Too late I realized that I had been made a fool of. The contract did not actually hook me up with the important financiers at all. Only if army contracts were forthcoming, would the contemplated big company with the real men behind it be brought into the scheme. Therefore, instead of several hundred thousand marks, only 20,000 were to be immediately available. The only part of the agreement which was hard and fast was that part which related to me. I had signed away my shirt, my patents, present experience, and future knowledge for a lifetime. In exchange I got a scrap of paper, and the privilege of working for them. It was a case of heads I lose, tails you win.

My disillusionment came fast. The army was interested, yes, but not giving any orders so easily, as they had blithely figured. Considerable sums of money would be consumed by experiments before proper types could be developed.

Pressed by me for expense money the financial gentlemen got cold feet, confessed that they were not able to produce the necessary capital, not even working capital for the

smaller company, and finally said they wanted to cancel the entire agreement. I was asked, however, to pay back all money advanced and even defray the expenses of the negotiations they had made.

I didn't realize then my miraculous luck in getting rid of them. I simply thought my bubble had burst. For I had saddled myself with greater debts than I felt competent to discharge. My promoters proposed that I pay them 4,000 marks and they would cancel the contract. Looking over my contract at last, I perceived how I had been gulled. I was so angry that I agreed to the cancellation. Fortunately, I had just enough cash on hand, if I did not pay for the motor-car I had just bought.

That was my first contact with high-pressure bankers, but not my last, unfortunately.

The termination of the agreement placed me in a very difficult position. Pilots at Johannisthal—living as they did from day to day—were notoriously badly paid. Engine manufacturers never did business with them on any but a cash basis. I was the first to get credit. My reputation was good, and it was thought I had lots of money behind me. On the basis of my presumed prosperity I had ordered a badly needed motor-car. Now everyone was clamouring to be paid. In my first enthusiasm, after listening to these promoters, I had written an optimistic letter or two to my father, about the end of our financial troubles. Soon I would pay him all back, and then I would be on Easy Street. Perhaps I had strutted a little in those letters. Now, everything had blown up, and I had to eat humble pie.

Writing letter after letter home, I appealed despairingly to my father for more money, pointing out that he had already put in about 100,000 marks and should protect his investment. Unless he footed these bills, my business would be bankrupt.

When I heard from my father at last, it was to the effect

that he had sunk as much money as he could afford in my ventures. He was through. Although I could not honestly blame him, I did, and used all arguments to make him change his mind. It was no use. He said he had spent all the money that he intended spending upon getting me started in life.

" Now I have had enough," he wrote. " I am going to stop. You have never shown me any books. You have never shown me any real statements. I am not going to believe any more promises. I am going to quit."

At first I did not know where to turn. I had been relying on my father to pull me out of financial holes for so long that when he deserted me I felt completely lost.

Casting about in my mind for some way to save myself, I thought of my fine old uncle, Edouard Fokker. He had shown on several occasions a more than avuncular interest in my activities. Once, being in Berlin, he had motored out to Johannisthal just to look at my factory and hangar, and his comments had made me feel very good. I was at the point of pawning my motor-car to pay off my employees. Even that would leave many bills unpaid. On a long chance I telephoned my uncle, explaining my difficulties, and followed the call up with one of my most eloquent letters in downright earnest, stressing the point that I couldn't fall down on my promises, that I must keep my credit good, that the name of Fokker must not be discredited. I explained that up to the present time I had been successful, and it would be a shame to stop at this moment, when everything looked brightest. I think I have always been eloquent on my own behalf.

My uncle was convinced and sent me 20,000 marks, which temporarily saved my finances. I have always appreciated his kindness and am happy that he is now, although over eighty years old, president and chairman of the board of my Dutch company. Though my uncle's generous action tided me over the immediate crisis, my financial difficulties

were far from over. All my early years of struggle seemed merely a succession of periods when I thought I was out of trouble, only to find myself plunged into a deeper mire of financial difficulties. Then I had to call loudly for help or sink out of sight for ever, as so many of my struggling contemporaries did. It wasn't long after my uncle had come to my rescue, that I again had to have money. Cudgelling my brains for a new way to approach my father, I thought of an ingenious proposal—that he give me the money he would have spent on me had I gone through a secondary school and a university in Holland. Such a course of study would have been quite expensive. He had once promised me 2,400 guilders a year for at least five years, the allowance of a rich man's son. Living on his income, doing no work, he would be no poorer if he turned over to me the capital from which he would have derived the 2,400 guilders a year, I informed him. If he did that, he would never be bothered again for money by me.

The idea did not at first appeal to him, and so I wrote a stronger letter.

If he turned me down, I said, I would struggle along in Germany as best I could. But between the lines he could read my thoughts, that the money would automatically come to me, and I would receive it with mixed emotions.

It was perhaps a very selfish letter to send him, but he never mentioned it afterwards. I was desperately in need of money to continue the work which was vitally important to me, for which I was giving everything I had. Perhaps he didn't think it was selfish—only that my heart and soul must be bound up in what I was doing if I could so boldly write my feelings.

He arranged for me to get the money, but in his letter said that it would be the last.

"I am not going to undress myself completely," he wrote, "before going to bed."

Before my father died, in 1925, after having enjoyed the success of his son, I had returned all the money he ever loaned me, and I took no part of my patrimony, turning over my share of his estate to my sister. I thought then, and I still think, a father should help his son to his feet during his early struggles, if the son shows a clear disposition to work out his destiny. He knew I was not a waster, as many rich men's sons in Haarlem were. What I had asked from him was less than my inheritance, and would not interfere with his pleasantly leisured life in Haarlem. Had it placed any hardship on him I would not, of course, have asked him for a halfpenny.

Even though it was true that my father received none too businesslike statements about my affairs—I would make an inventory on a scrap of paper—I knew that I had never spent anything he lent me on gambling, or in any of the ways young men are supposed to waste their substance.

My whole ambition was centred in aeroplanes. I was completely obsessed by it, desiring nothing but to build aeroplanes and fly. What were temptations to others were no temptations to me at all.

My father put a limit on his help when he set aside 50,000 guilders, which looked like a fortune to me just then. I thought it would surely be enough. But expenses always grew with the business and exceeded income no matter how hard I worked, and the money was eaten up in no time. I did not know then what I know now, that the better a business is the more money one must put into it—that is the law of working capital. Nor was my father sufficiently a business man to sense this. He probably thought he was pouring money into a bottomless well, and it is true the aviation industry sometimes looked like that in the early days. He had been a successful coffee planter, but really knew little about industrial affairs, as I later realized.

For the time being I was able to struggle along by watch-

ing every penny, hoping that things would brighten up soon, but the question of finance was to give me grey hairs time and again, before I finally came out in the clear. Of all the troubles I have had, all the dangers I have run, I think the question of financing myself has caused me the most grief.

X

ARMY ORDERS

THE aviation corps in the German army was originally part of the signal corps, just as it was in the United States. For a long time—well into the war, in fact—the old-line army generals were not convinced that aviation would be anything more than an extension of their communication system. Many of the oldest flyers in the air corps now are former signal corps and cavalry officers, who first looked at the aeroplane merely as a reconnaissance machine. Armies are the same the world over, slow, conservative, difficult to prod into action. To stir up the moss-backed staff required enthusiasm and often the sacrifice of certain far-sighted officers, in Germany as in other countries. That rôle in the German staff was played by Captain Geertz, who devoted himself from about 1912 on to obtaining a separate aviation force.

Captain Geertz's plan was to ring the German border with a chain of airports and hangars, like the forts with which the frontier bristled. He was soon in a death struggle with the older staff officers, who characterized such a project as sheer folly. Geertz was, indeed, rather too enthusiastic. The industry was not developed to carry out his ambitious schemes. He failed in his major purpose. But he was responsible for the gradual building up of military aviation, and directly responsible for my contact with the German army.

In the meantime I was having my first contact with army pupils, and this was of vital importance to me since their attitude towards my plane would help determine future orders. Two officers had been assigned to my flying school at Johannisthal. They were Lieutenants Muhlig-Hoffmann and Reinicker. With the score or more army officers

at other schools, the regular pilots and designers like myself, and various amateurs as well, there were between sixty and seventy pilots who flew regularly about the aerodrome, crowding the air with planes and causing numerous collisions, some of which were fatal. On one such occasion I barely escaped landing on top of another pilot, who came in under me and failed to set his plane down as quickly as had been expected.

At the flying school we had only a single plane for advanced pilots and demonstration purposes, so that my pupils and the two officers were constantly warring with each other for its use. Much of the time it was being repaired and conditioned, which made the competition keener. Lieutenants Muhlig-Hoffmann and Reinicker were accustomed, like true Prussian officers, to believe in their natural right of precedence. The greatest amount of diplomacy was required to smooth out difficult situations constantly arising. Lieutenant Muhlig-Hoffmann, from the first, proved to be a born pilot. He boosted my plane with the army and was of great service to me, but Lieutenant Reinicker was so stupid that every time he got in the plane I was fearful that he would crack it up, and perhaps kill himself. It was beyond my power to dismiss him with the statement that he was unfit. Moreover, all planes were then so untested that the army would simply contend that my plane was unsatisfactory for military work. Eventually, however, Lieutenant Muhlig-Hoffmann was convinced by his own progress and the manner in which other pilots flew, that his brother officer rather than my plane was at fault.

The climax came while he was watching Lieutenant Reinicker attempt his first solo hop. The first thing Reinicker did, after narrowly escaping nosing it over at the take-off, was nearly to stall the ship in the air. Somehow he managed not to crash and staggered drunkenly once around the aerodrome before attempting to land. Forgetting to shut off the engine, he hit the ground with his

wheels, bounced in the air, but contrived to wobble into straight flight again. By that time I could have killed him if the plane didn't. When he came in for a second landing he banged and bounced but refused to stop. Other pilots were gathered round, staring in amazement. My anguish was pitiful, because he had my whole reputation in his clumsy hands. Each time his wheels bounced on the ground he landed on my heart. Refusing to shut off the engine and quit, he careened three times around the aerodrome. Finally, apparently even he got nervous and started to oscillate the rudder. If my plane had not been so automatically stable he would have killed himself a dozen times, but his guardian angel was with him, even though she obviously kept her hand off the controls. Nobody knew how he brought it down. It was sheer luck that brought him safely to a stop at last.

We traded Lieutenant Reinicker for another officer. The first of two experimental military planes was delivered to the army, and Lieutenant Muhlig-Hoffmann's flying helped to build up a good reputation for it.

During an interim, I was approached by a German naval officer, Captain Felix Schultz, a spy for the German Government, he disclosed to me, and like so many of his kind a spy for the English Government as well. He was one of the students I had taught to fly.

An adventurer, daredevil, opportunist, he was ready for anything. He proposed to sell my patents to the English Government, explaining that he was well acquainted with the War Office. He was going to England shortly, to look over the English seaplanes as part of his under-cover work for the German navy.

My so-called financial backers had already sounded out Italian and English military attachés in Berlin regarding my planes, with no success. Italy was concentrating on the development of her own designers, just as England was developing her domestic types.

But I was in desperate need of money and there seemed nothing to lose. I gladly appointed Captain Schultz my agent in England. He enrolled in the Avro flying school near Southampton as a sportsman interested in aviation. Entering as a new student he created a sensation by learning to fly immediately. He did his best to influence navy officials towards my plane, according to his report. But they did not believe in my theories of automatic stability, and declared themselves well satisfied with their own machines. Schultz sent me drawings of one of the early seaplanes then just tested and considered a valuable military secret.

As a matter of fact my work was at that time well known in England. About the time of the first aeronautical show at Olympia in London in 1912 my first ship had been extensively described in British aviation magazines. There is no doubt that the War Office had all the information it wanted about my designs. When these negotiations fell through I made no further attempt to sell to the English. After the war I was greatly amused to learn that a question had been put in Parliament as to why England had not bought my planes, since I was a Dutchman and could have sold to them as readily as to the Germans. But in 1913 the English weren't buying, nor apparently the Germans either.

Captain Schultz returned to Johannisthal and became interested in an aeroplane which looked much like mine, even to the extent of having no ailerons. But with my wide experience I knew that the proportions were wrong and the centre of gravity too low. Consequently, I could foresee what would happen to it in the air, because I had learned all that from my wooden model experiments. I warned him against flying it, repeatedly and urgently, but he would not listen. Just before he started the engine, I again walked up to his plane and warned him. He laughed at me and took off. The plane flew until he tried to bank. It then rocked

back and forth, with a sideways pendulum motion, higher and higher on each side. He became desperate, tried to come down quickly, and dived too steeply, gaining more and more speed. Half-way down, the wings collapsed. The impact killed him instantly.

Just at this time came an opportunity which looked hopeful to me—a chance to get an army order not by long-drawn-out diplomatic dickering but by actually showing what my plane and I could do.

At that time the best army opinion held that an aeroplane could be operated only for a very short distance from its airport and that it would have to be transported to the Front and from field to field like a piece of heavy ordnance, even if the airports were only twenty or thirty miles apart. Staff officers had the idea that the plane would have to be trucked, much like a captive balloon. For that reason the army wished to have hangars and aeroplanes developed as units travelling on the ground. To stimulate the building of such units a competition was arranged.

Manufacturers were ordered to build an aeroplane with necessary spare parts, all the spare parts for the engine, a transportable hangar and other supplies, the whole to be packed on one truck, to travel as one complete unit, carrying the needful petrol and oil.

As a test of mobility, each competitor had to start from Johannisthal, truck to Doberitz, assemble his plane, make flights, disassemble, and truck under various weather conditions through a 250-mile tour which included mountain territory, country roads, and cities. In each large city the plane must be assembled and flown. The whole competition was to be decided on a basis of points, so much for mobility, so much for the flights, and so much for ease of assembly.

An order for ten units at 45,000 marks each was the alluring bait offered as first prize. Naturally every large manufacturer entered with the will to win. It was one of

the first things that looked like big business in the aviation world.

The competition excited me intensely. All the other designers made their planes with detachable wings, using a truck and trailers for the different loads. I determined that the most practical device was to place the aeroplane itself in the truck, detaching its wings and fastening them to the sides, using the landing wheels and tail skid as shock absorbers for the fuselage in the truck. Spare parts and other supplies were distributed wherever there was room. For the competition the Mercedes-Daimler factory built me a special two-ton truck.

This achieved a compact, mobile unit, with the further advantage of being very small. In addition, the plane was extremely simple and practical in assembly. One big turn-buckle connected the top wires holding up the wings, while the lower wires were assembled together merely by hooking them into the landing-gear. In other words, by disconnecting two turn-buckles, all the wires slackened, whereupon four wires were unhooked and the wings came off. The whole operation of assembly or break-down took only about five minutes, and needed no additional adjustments.

The trial began—and our small unit raced ahead of all competitors. We out-distanced them on steep hills, over cross-country roads, and through narrow, winding village streets which held up longer units interminably. In many cases we came into junction points four and five hours in the lead. Moreover, we won all points on assembly t me. Almost from the start there was no question as to who would win.

It was my first marked success and a heady victory. Besides the prize order of ten planes, my ship gained great prestige. And since the first two experimental planes I had already delivered to the army acquitted themselves well, further orders for this type were given us as well. At last I was ready to start manufacturing planes on a real industrial

scale. This plan happened to coincide exactly with German army projects.

Johannisthal was overcrowded. It was decided to establish separate fields for teaching military students. Captain Geertz, working from both ends, suggested first to the various manufacturers that each move out of Berlin, and in the meantime went to various cities and induced them to make a deal with aeroplane manufacturers. Further, to stimulate this move. the army contracted with me to teach thirty of its students annually, and to maintain its interest by keeping me occupied with manufacturing orders.

Schwerin, Mecklenburg, about 220 miles north of Berlin near the coast of the Baltic Sea, one of the important cities selected as a site by the board of strategy, approached me with a favourable proposition. A flying field corporation was organized and a large tract of land purchased for an airport. Here a hangar was built, together with living-quarters and a casino for the army students. The field was rented to me for a long term, with an option to buy. From my point of view the municipality was more than generous.

This all took place half a year after my return from Russia, towards the end of 1913, interspersing my loop-the-loop tours. It was my first definite contact with the German army, made in such a way that my fortunes were thereafter linked with the fortunes of German arms. The fact that I was training officer students influenced the apportionment of further orders, of course, and brought me in closer touch with the military masters of the German Empire.

Among my first students was a Graf von Bismarck, a grandson of the old Bismarck, who had done so much to build Germany up into a modern state strong enough to challenge, even if not to whip, the rest of the civilized world. Bismarck later ordered a plane for his own private use, to fly for sport. Others among my students bought them for commercial and demonstrating purposes. A captain in the

German army was in command of the students, all of whom were lieutenants. French and English flyers were often not above the grade of sergeants, but the Germans, like the Americans, believed that only officers had intelligence enough to fly.

Our school was successfully launched in Schwerin, and it was time to consider establishing a factory. Negotiations with the city resulted in its building me a factory which it likewise rented on a ten per cent. basis, with a buying option as in the case of the field. A one-storey building, fifty by one hundred and twenty feet with a lean-to for offices and my sixty employees, it was my first real factory.

But just when I seemed on the threshold of something like moderate success, my old money troubles came up again. Equipment for the flying school and opening a factory, with the transfer of effects from Johannisthal to Schwerin, required a large and immediate outlay of money. On the other hand, a definite income for at least three years from the flying school seemed assured, while orders received from the army for planes and others from pilots wishing to cash in on the loop-the-loop craze, promised the foundation of a permanent business.

Therefore, despite my promise to my father never to ask him for money again, I went to Holland for conference with him, my uncle, some of his friends, and Mr. Cremer. My uncle proved to be on my side. Having made his money in various financial transactions, he was more familiar with the details of organizing an industry than my father. With his help a company was formed, capitalized at 300,000 marks, in which my father, my uncle, and Mr. Cremer and a few friends of my uncle participated according to the amounts they invested. I assured them that they would make big profits, now that the business was finally on a solid basis, and they were not unwilling to believe me.

It was not six months later, however, before I again was forced to appeal to the stockholders for additional funds,

using the old recipe that unless they came to my rescue everything already invested would be lost. If they loaned me just 100,000 marks more, I assured them it would be the last money they would be required to put into the business.

This time, my long-deferred prophecy proved to be definitely true. The army, in the routine of expansion, had ordered an additional dozen planes. The army practically financed construction, once it gave an order, because it paid one-third in advance, one-third when the work was half done, and the final payment on delivery. The navy, jealous of the other service, had made tentative enquiries about seaplanes, such as the English were developing for their sea arm. Orders for private planes for sport use continued to trickle in, so that my force of employees had increased to 150 and the business showed real indications of being more than self-sustaining. The profit would be about 40,000 marks for the year. My unabashed optimism was finally rewarded.

When my business was on a paying basis, the World War broke—out of a clear sky.

XI

WAR

In the peaceful summer of 1914, when the world was publicly congratulating itself that the sword had been sheathed by civilized nations, the World War exploded in its face. This immense irony took me completely by surprise. For more than a year I had been working closely with the German army staff, but no hint had been given me that plans were afoot for the great drive against France which began on August 4th, 1914. As far as I was concerned, hostilities opened overnight. However clearly historians in the future may show that the World War was inevitable, my ear was turned away from Destiny and I did not hear the rumbling of the gun caissons until they were rolling towards the French border.

Then, suddenly, the air was electric with preparation. Peace-loving men knocked the ashes from their fireside pipes to seize rifles and don uniforms which had grown a little snug around the belt. Women heard the bands playing, found their hearts strangely thrilled, and paid no attention to the fateful tears which sprang to the eye at the same moment. Boys cast aside their story-books for their first essay into disillusion. War was abroad in the land.

With the war, my whole life changed. From a struggling outsider who had just barely launched himself, I suddenly found myself a man of the hour. After years of clutching and clawing at the bottom rungs of the ladder, I suddenly felt a boost from the shoulder of a nation. Almost before I knew it, I was scrambling up the ladder faster than my feet could carry me. Somehow I managed to keep my feet, and, though my eyes were dazzled, seized every opportunity as it presented itself. It is a tremendous and heady sensation for a rising young man. Already I could sense the

touch and feel of success, and every move brought me nearer to the tangible reality. My heart was buoyant; whatever I did prospered. For the first time in life I worked in a state of happiness and appreciated achievement.

As I have moved about the world I have heard some criticism levelled at me because I threw my lot in with the Germans. Certain Allied spokesmen have said that I should have joined with them. Such critics disregarded the fact that my own country had seen fit to prefer French planes to my own; England and Italy had scarcely acknowledged my advances; Russia had proved too corrupt a soil for me to take root, while Germany alone had welcomed me, if not with open arms, at least warmly enough.

From my earliest connection with the German Government I had found it the soul of fairness. That this would not continue, I could not foresee. Until competition became keener and I more successful in Germany, the same fairness was manifested by rival aeroplane manufacturers. And the trend of German politics concerned me, a youth of twenty-four, but little in those days. I was a Hollander with a lively sense of my own nationality; so much so that, as will be shown, I later placed myself and my property in jeopardy rather than discard my Dutch citizenship. My own country remained neutral throughout the entire course of the great conflict, and in a definite sense, so did I.

As must be clear by this time, my heart and soul were bound up in the growth of aviation. I became an aeroplane designer long before I became a political philosopher. Struggling desperately to get ahead I had gladly furnished the German army with aeroplanes, although I could have conjectured that some day these same aeroplanes might be used by Germany even against my own country. Similarly, all the leading aircraft manufacturers in capitalist countries to-day, exporting planes to any country which will purchase them, may be arming the future enemy, just as our industrialists selling machinery to Russia are strengthening

the sinews of the Soviet though most capitalists consider Bolshevism a menace. Preparedness presupposes warfare.

But when the World War descended on us like a thunderclap at bright noon and the Government simply commandeered every plane we had besides overwhelming us with an avalanche of future orders, I could only think that for me the millennium had come at last. Suddenly, with my new-found independence of my father, I felt grown-up at twenty-four.

The very first day that war was officially declared, an army telegram reached me confiscating all planes for its use. The next day, an excited navy commander, frothing at the mouth because the army had the jump on him, dashed up to Schwerin from Berlin in his high-powered motor-car and ordered that all my planes must be turned over to the navy. Price was no object. The point was that the navy must have them. It seemed to make no difference whether the aeroplanes would be of any use to the navy once they got them. The war had gone to his head as to everyone else's.

My mood was to say yes to everyone, and sell to the first buyer who planked down his money on the barrel head.

Army and navy officials visited my plant daily, warring with each other, until I thought that Schwerin itself would be turned into a battleground. Competition became so fierce that they took anything which looked like an aeroplane or engine. Engines which would have been junked a month before were now picked up as though they were Rolls-Royces. Finally, things reached such a point that higher officers stepped in and suggested a conference to prevent the rival services running the prices up to infinity. After a stormy session behind closed doors they came to an agreement on the spoils, but they still paid excessive prices for anything delivered at once. I simply stripped my factory to supply their needs. All sporting planes, even the one just delivered to young Bismarck, were confiscated.

No one in Germany expected the war to last more than

three months, which partially explains why the army and navy were willing to pay any price for goods which could be delivered within twenty-four hours. Already the German army was plodding surely towards Paris, and the popular bet was that it would be taken by Christmas. Like everyone else, I had no thought that the war would last. While the dance was on someone else was paying the piper, and all of us were stepping to the tune. I felt that, at last, my chance had come.

As the war opened, planes were strictly flying machines, not fighting machines. For many months they were as offenceless as captive balloons. They permitted a trained observer to gain an idea of the terrain and position of the enemy. For this reason, the first aeroplanes used could hardly be called, in the modern sense, military types at all. They were nothing more than converted sport-type single-seaters. The pilot flew along looking over the side, jotting down mental notes, and returning to his base when the petrol, which lasted little more than an hour, neared exhaustion. The original pilots had no more chance to be pugnacious than army clerks.

Thirty officers arrived a few days after war was declared, swelling the ranks of the regular students in the flying school. Morning, noon, and night, planes were in the air, trying to get these men in shape for practical usefulness with the army before the war ended. The army and navy, respecting this need, had left us a few training planes, but not enough to take care, fully, of our increased student body, who fretted and flew every daylight hour.

I hired more workmen daily, and my staff leaped to their tasks. Our first order was for twenty-four single-seater sport planes for the signal corps. A kind of fever swept over the factory and workmen produced twice as much as in a normal day. Everyone felt the impulse to do.

Now was the time to pay back my father and the other stockholders. They had been actuated by a desire to help

me rather than to invest in a business proposition, I knew. I quickly wrote them that if they wanted to get out of this precarious business, now was the time. The war would be over in three months, when manufacturing would slump back to its old level. But while the excitement was on, I could get a banker to put up the money for current needs. I suggested that I could pay them back the principal with ten per cent. interest for the first year and five per cent. for the second year. Some of them had written-off their loans to me as losses, expecting neither the principal nor the interest back.

They accepted with alacrity. They, no more than I, could foresee that their 300,000-mark investment, if left with me, would have returned a 30,000,000-mark profit. Instead they thought I was being more than fair. All of them were wealthy, so the money actually meant little. I was delighted to pay them back. I had made so many explanations for repeated failures. Independence was all I asked. None of them ever complained later that I had been unfair. From then on I owned my business completely. It marked the second time I had gained financial independence, this time, with no strings at all.

As a free man for the first time in my life, I could turn my energies to making the best aeroplanes I could conceive, and producing them as fast as possible. Mine was a single-track mind, and that seemed like paradise to me. I gave no thought about whether I was doing this for the Germans, for whom I had no special affection as a race. I felt that at last I was on my own, working for myself with greater prospects of success than I had ever foreseen, and I wanted with all my heart to make the most of this opportunity.

Fighting in the air sprang up months after the first appearance of the observation aeroplanes on the front. The French Caudron, a twin-engined bomber, carried a machine-gun, but it was largely a show-piece from a practical standpoint. The first observation pilots on both

sides carried no armament except a service revolver, useless in the air. No one expected them to fight. The aeroplane was exclusively a reconnaissance weapon, having early shown its superiority to the cavalry in this branch of field operations. It was because the cavalry was washed out shortly after this war opened that Baron Manfred von Richthofen, later to be the German ace of aces, took up the aeroplane. One of the first German military pilots attached to the general staff had made such remarkable surveys from his plane, as the army progressed through Belgium and France, that a large number of such planes had been immediately ordered.

Gradually, as the hate which was spreading like a poison on the ground drifted up into the air, reconnaissance pilots began to carry rifles aloft more to satisfy their choler than because there was any chance of doing damage to an enemy airman. The next move was to carry machine-guns in the cockpits, but it was not until I had invented the synchronized machine-gun shooting through the propeller, that war in the air became the deadly combat which developed the race of heroic airmen the world knows and honours.

XII

I INVENT THE SYNCHRONIZED MACHINE-GUN

THE synchronized machine-gun, with which weapon Richthofen, Boelcke, Immelmann, Udet, Fonck, Guynemer, Nungesser, Bishop, McCudden, Ball, Lufberry, Rickenbacker, and Landis became such glamorous figures during the World War, was an inevitable device. Necessity is the mother of invention, and the necessity for the synchronized machine-gun became increasingly imperative. It may seem a sad commentary on human nature that man had barely become accustomed to the new element of the air before he began using it as a battleground. Yet that fighting brought out some of the finest qualities of the human spirit, a courage that was dauntless, and a skill little short of miraculous. It appealed to the young, quick with an indomitable eagerness for life, which somehow, paradoxically enough, goes hand in hand with a strange fortitude in facing death. They fought in the high blue sky like knightly champions of the muddy armies locked in deadly combat far below. It was only when death called, levelling them to the common fate, that these heroic youths came hurtling down, each plane a bloody, flaming pennon, bent for destruction. That was not a pretty sight to watch, and it is even sadder to contemplate when all the trumped-up fervour has gone out of the spectacle.

The first air fighting in the war opened up in 1915. French pilots in the pusher-type Farman observation planes (with propeller in the rear), mounted machine-guns in the front cockpit. The pilots were able to fire ahead in almost a half-circle, but of course they could not shoot back through the propeller. Pilots in tractor planes, whose propeller was in front, were similarly restricted in their firing. They could shoot out each side and up.

Such devices were inadequate for any real combat work, and the best minds of all the air forces were bent on improving this situation in order to gain ascendancy in the air.

Observation planes quickly became the eyes of the artillery and the general staff, and the only hope of clearing them from the sky was by attack from other planes. Infantrymen shot at aeroplanes, particularly when pilots swept low to strafe them with their newly installed machine-guns or bombs, but their success depended more on luck than aim. Anti-aircraft fire was only a little more successful. Its chief result was to force observation planes to fly several thousand feet high, but " Archies " rarely scored a direct hit. If it were possible to develop a speedy aeroplane, from which a machine-gun could shoot easily, the whole problem of supremacy would be more or less solved.

Suddenly a deadly French single-seater appeared in the air. German pilots, watching this plane fly towards them with its propeller spinning like a solid disk in front, confidently flew on, feeling safe from attack. To their astonishment the nose of the ship began spurting a stream of lead. Several of the German planes were downed. No one knew the secret, although spies were instructed to discover, if possible, the trick and the identity of the flyer.

As luck would have it, a faulty engine brought the plane down within the German lines. Pilots landing in enemy territory were instructed to burn their machines, but before this one was fully consumed it was captured. The airman proved to the famous Roland Garros, one of France's greatest stunting pilots before the war. Then his secret was out.

Garros had ingeniously attached a machine-gun in front of his cockpit so that its bullets shot straight ahead. To prevent the propeller, which was of special shape, being shot to splinters, he had fitted the near side of each blade

with a triangular steel wedge to deflect striking bullets. It was a dangerous device for the pilot. Despite the deflecting wedges, the impact of a bullet might break the propeller, and the ricocheting bullets might even strike his own plane. Nevertheless, crude though it was, it had worked. Garros had shot down a number of unsuspecting German pilots before he was captured.

The air corps had no thought but to imitate Garros' device, and called me into Berlin where the remnant of his plane had been shipped, to take over the job of adapting it to German use. Until Garros' gun was given to me I had never had a machine-gun in my hand. I had only a vague idea how it shot, and of its practical workings I was entirely ignorant. The German Parabellum machine-gun was turned over to me about five o'clock of a Tuesday evening. I caught the next train to Schwerin with it under my arm. The following Friday I returned to the air corps headquarters with the actual synchronized machine-gun used in all subsequent aerial warfare. For my gun was copied by the Allies immediately after one of the German planes equipped with it had been captured. The invention and development had all been complete in forty-eight hours of day and night work, after I had hit upon the essential idea.

For the purpose I had adapted the Parabellum gun, the first air-cooled infantry gun, shooting continuous bands of 100 bullets. It had just been developed. Taking the gun apart, I first learned how it worked, shooting it until I had thoroughly familiarized myself with its action. Then I put the problem in technical form, so that it could be considered logically.

The technical problem was to shoot between the propeller blades, which passed a given point 2,400 times a minute, because the two-bladed propeller revolved 1,200 times a minute. This meant that the pilot must not pull the trigger or fire the gun as long as one of the blades was

directly in front of the muzzle. Once the problem was stated, its solution came to me in a flash.

The obvious thing to do was to make the propeller fire the gun, instead of trying to shoot the bullets through the propeller. Inasmuch as the machine-gun would shoot only about 600 times a minute this required some practical working out, but the principle had been found, which was the important thing.

For a temporary device, I attached a small knob to the propeller which struck a cam as it revolved, This cam was hooked up with the hammer of the machine-gun, which automatically loaded itself. Thus as I slowly revolved the propeller, I found that the machine-gun shot between the blades.

During the night I found out the basic operation, and began next morning to perfect the device. One blade was enough to strike the cam, because the gun could shoot only 600 times a minute while the blades passed a given point 2,400 times a minute. To the cam was fastened a simple knee lever, which operated a rod, held back by a spring. In order that the pilot could control the shooting, a piece of the rod which struck the hammer was hinged to hit or miss as the operator desired. That was the entire device.

Further experimenting disclosed that it worked far from perfectly. The gun insisted on shooting more than one shot at a time. It reloaded so fast that two shots were caused when the cam was struck but once. Therefore, it had to be adjusted to operate faster. Another day's hard work brought it to a point where it would shoot through the propeller without hitting it.

To check up where the bullets were actually going in relation to the propeller, I fastened a wooden disk to the hub. The bullets passed through the disk within a short distance of each other, well out of line of either blade. The bullet pattern also showed how much time there was

between the striking of the cam and the actual firing of the bullet.

It gave me an immense feeling of pride to invent something which I knew would have a fundamental effect on strategy in the air, once it was adopted for combat work. In order to demonstrate it myself, because I felt so elated over conquering the problem, I installed the synchronized gun in a little monoplane we had at Schwerin, lashed the tailskid of the monoplane to my 80 h.p. Peugeot touring car, and set out Thursday night for Berlin, 220 miles away, arriving there Friday morning. At the military field I told everyone I was going to demonstrate the synchronized gun that morning.

No one believed that it would operate successfully because of the short time I had been working on the problem. Most of the important staff officers were present. They saw that the propeller had none of the steel wedges that Garros had employed, and could not conceive how I expected to miss it. Nevertheless, everyone desired to witness the try-out. I was confident that their doubts would soon be changed into complete belief.

In my confidence, I had not figured on the conservative military mind, which not only has to be shown, but then wishes to be shown all over again, after which it desires a little time to think the whole matter over once more.

First I demonstrated the machine-gun from the ground, starting the engine and shooting through the propeller towards the rifle butts. Pulling the trigger, I shot three bursts of ten shots each before stopping the engine.

Gravely they examined the propeller, found no flaw in it, but suspected that there was some trick in the fact that I had shot only bursts of ten. They were not sure the gun would shoot a whole band of bullets. They thought I had slipped something over on them. This was absurd, but the easiest way of proving it absurd was to shoot a

band of 100 bullets. That was just as simple as shooting bursts of ten.

Satisfied that the gun would operate while the plane was on the ground, the military men doubted that it would be successful if shot from the air.

I decided to teach them a lesson which would make them think twice before being sceptical again. Directing that some old wings be placed on the field, I took the air while they crowded fairly near the wings to watch the bullets strike. From about 900 feet I nosed over, pointed the plane towards the wings and began firing. They had not foreseen that the bullets striking the stone underneath the wings would ricochet in every direction. I had. When they took to their heels, running like mad for the safety of the hangars, I decided they would never forget that the gun shot from the air as well as it shot from the ground. Timidly they crept out, after I had landed, and viewed the bullet-riddled wings.

Still they were not satisfied, contending that the only certain test of the gun was to shoot an aeroplane down. The suggestion was made that I, a foreigner and a civilian, go to the front, find a French or British flyer, and demonstrate by actually bringing down an enemy plane that my gun was practical.

My protests were useless. The official mind was made up. Without being given a choice, I found myself bundled to the front, and introduced to the liaison headquarters of General von Heeringen, one of the army corps heads near Laon.

The day after I arrived at von Heeringen's headquarters another demonstration of the gun was made, first from the ground. It became evident that, like the Berlin group, these officers couldn't believe what they saw, and so I showed how it worked from the air. This convinced them sufficiently to suggest that it be displayed before the Crown Prince, whose headquarters were only a short

distance away at Stenaiy, about eighteen kilometres from Verdun.

The Crown Prince, known in Germany as a young sportsman, proved to be very charming and natural, at once greatly interested in the synchronized machine-gun because of his partiality for aviators. The flying field was quite close to the chateau in which he was living at the time. After all the officers were assembled the Crown Prince arrived in a high-powered motor-car with a chauffeur and guard. Everyone saluted, while the commander of the field, Captain Blume, received him and brought him directly over to where I was standing beside my plane.

"Kaiserliche Hoheit," he said, "this is Herr Fokker, inventor of the fighting aeroplane."

I took off the little sporting cap I was wearing, and shook hands. He was dressed in a smart Hussar uniform, white blouse, slim breeches, highly polished boots. I had on checkered black and white breeches, wrap puttees, tweed coat, with a little woollen flying helmet and goggles sticking out of one pocket. He proved to be friendly, informal, putting everyone at ease immediately. There was nothing about him of that stiff-necked dignity which characterized the Kaiser in all his dealings.

Quite surprised to find me such a young man, he asked me if my father had invented the gun. I replied that my father was in Holland, and that I had just started to build aeroplanes in the last three or four years. The Crown Prince then went to the plane and asked me to explain the mechanism.

First I showed him the controls of the plane itself, indicating how the machine-gun was solidly fixed to the plane, pointing in line with its nose. The gun was aimed by aiming the aeroplane, an idea which I afterwards learned had been patented by Euler in 1910. As the plane was a single-seater, I could not take him in the air with me while I demonstrated the gun's operation.

The manœuvre of the small fighting plane always created a sensation, because I made the most of my experience in displaying its best features. So when I went aloft, I performed a few aerobatics, then, at 1,500 feet, nosed the plane down, diving at a forty-five-degree angle, and firing into a little stream bordering the field, about two or three hundred feet away from the Crown Prince. As soon as the trigger was pressed, the " tuck-a-tuck-tuck " of the gun started, the bullets sending up a chain of geysers as they hit the stream. Sixty or seventy feet from the ground, I pulled up into a steep climb, swung back over their heads and repeated the dive, shooting as I came in. Landing quickly, I taxied up close to the Crown Prince, shut off the engine, and jumped out with a big smile, because I saw from the faces and gestures of the flying officers how much they were impressed.

Almost before I had alighted, the Crown Prince was beside me, and I had to explain all over again exactly how the gun worked, and just how it synchronized with the revolutions of the propeller. I explained that the bullets could safely fire through the space between the revolving propeller blades because of the relatively greater speed of the bullets compared to the blades. An analogy was that of a man crossing between tramcars, 600 feet apart, which were travelling three miles an hour. Or better, of a boy casually throwing stones between the blades of a Dutch windmill revolving about ten times a minute. He wanted to know where the spent cartridges went—at first we let them fly out of the plane—and commented vigorously on everything, congratulating me several times. While I had been in the air he had said, according to my mechanic:

" He seems to be a real flying Dutchman."

When I finished with the description, he remarked dryly that he would rather sit behind the gun than be in front of it.

After the demonstration was over, he asked me to drive

back home with him. The motor-car was a deep-lunged grey Mercedes, and we bowled along at a terrific pace.

It pleased me to have the Crown Prince so interested in my plane and machine-gun. It was my pleasure later often to meet the Crown Prince in Holland, where he was in exile, and I once took him for a trip on my yacht. I also became quite well acquainted with Prince Hendrik of Holland, who joined the annual cruise of the Royal Dutch Yacht Club. With Prince Hendrik I once spent hours walking bare-legged in knee-deep water to reach a bird preserve in the northern part of the Zuider Zee. It seemed to me that kings, like other folk, prefer their companions to be natural and at ease with them.

We had lunch at the Crown Prince's headquarters ; cold ham is all I remember of it except that I declined what he assured me was very good sherry, because I don't like alcoholic drinks. His headquarters were in a beautiful little French chateau, surrounded by a trim park, at the edge of the village. Everything was immaculate ; nothing indicated that a war was in progress, except some tables with maps and telephones strewn over them, for as commander of the Fifth Army he was constantly in close touch with the activities of the front. He revealed more intelligence than might have been expected, showing a quick grasp of every subject touched upon. Recently he has informed me that the synchronized gun was a revelation which not only revolutionized aerial fighting, but stimulated the German army as well. After lunch he sent me back in his motor-car to the flying field, with orders that every courtesy be shown me.

As a civilian and foreigner flying from the German lines, I should be killed if captured. The Germans thought this was too risky, even though they still insisted that the machine-gun be tested by actual flights over the front line. After conferring on the matter, it was decided that I should be tricked out in the uniform of a lieutenant in the German air corps. An aviator's insignia was hung over my left breast,

and an identification card signifying that I was Lieutenant Anthony Herman Gerard Fokker of the German air force, born April 6th, 1890, was tucked in the pocket of my field-grey tunic. In this garb I flew over the German lines searching for an Allied plane two or three hours daily for several days.

One evening in the canteen I met the chief of a near-by battery. He was interested in finding out what could be seen of his position from the air.

"We have camouflaged our observation pits," he told me, "and I should like to know whether you can locate them from the air."

Agreeing to do this scouting, the next morning I headed in the approximate direction of his batteries at about 2,400 feet to see if they could be spied out, despite the camouflage. Through a hole in the bottom of the fuselage I kept a sharp watch for his batteries. Otherwise, I paid little attention to where I was going. As a result I was soon flying low in a straight line, very close to the French artillery. They must have seen the iron crosses on the wings of my plane. Suddenly there was a terrific bang right in my ear. My head came popping out of the cockpit in record time. I looked around expecting to see that the wings had come off.

The wings were intact, but as I glanced back for a sight of the tail unit, I noticed a whole string of little white dots. The exploding shells were trailing me in the air and coming closer every second. Banking hastily, I zigzagged rapidly, climbed higher, and headed for the German lines. At the time the French gunners sighted me, I don't believe I was more than half a mile away from their position, and paying no attention until they reminded me that there was a war on.

Nevertheless, I was able to tell the battery commander next day that, while it was difficult to see his actual pits, the paths leading to them were extremely visible from the

air. Apparently the area was unoccupied where the pits were, but tell-tale paths gave the lie to this. The pits were so close to the French lines at the time, that from their slight eminence one could see the French soldiers moving back and forth in their trenches.

Another day, rather late in the evening, I saw the French lay down a terrific barrage in preparation for an attack. The shells dropped on the ground like flaming raindrops spattering on a black pavement. From the air it looked like a bright forest fire in a ruined wood, though there was much smoke. As I had petrol for only an hour and a half, and it was getting dark, it was impossible for me to remain aloft to watch the actual attack, which I should have been glad to see, although I felt a great deal of pity for the poor devils down there on the ground, fighting like madmen.

The next morning I decided to see the war from the battery commander's observation pits. Another pilot from the squadron came along. For several miles we were able to drive easily by motor-car over deserted roads to a point more than midway between the heavy artillery and the front-line trenches. From there on, the roads were nearly impassable because of shell craters and enormous ruts. We left the motor-car about two kilometres behind the actual front lines, and walked by a circuitous route through the trench area. This section was regularly under fire, I was told, about eleven o'clock in the morning, and so it was suggested that I return before that hour. The last stretch was through muddy trenches. They were lined with telephone wires fastened to any sort of a stick. We had to duck along as best we could, slipping in the mud and banging against unexpected obstructions.

Under the observation pits, which we reached about nine o'clock, were the officers' quarters, burrows in the earth, timbered over, probably eight or nine feet underground. Four or five men would live in each cavity, along with a colony of rats, who, however, seemed no more at home in

their quarters than the men. Candles lit up the gloom somewhat, enough to show how filthy it all was.

On top of the little hill was the observation post, quite roomy. It was a loosely constructed wooden affair, topped with chicken wire on which had been spread a layer of leaves and shrubs. From the post, one could see a trench connecting the French and German lines. About half-way between were cross-sections of sandbags where both sides had stopped. Between the two barricades was No Man's Land. The French were easily visible from the post, not more than 1,500 feet away. I found the situation so interesting that time slipped by quickly. It was 10.30 before anyone realized it. The commander urged me to go at once, saying he would send a soldier back as far as the motor-car, which had been left on the far side of a demolished village. On the way through the trenches we were delayed, partly because of my curiosity. Just before reaching the abandoned village the expected artillery fire opened up.

The screaming of the shells as they approached; the bursting roar as they hit; the blasting of earth, bricks, and trees, simply frightened me to death. I began dodging with every detonation, even though my mind told me that once the explosion was heard, it was too late to dodge. With one accord we started running, catching our feet on stray bits of wire, falling down in the mud and getting up even more scared. My arms were covered with filth clear up to my shoulders where I had plunged headlong into the muck. In a few minutes we were dripping. Exhausted with running, we dropped into an abandoned dug-out to catch our breath. As soon as we had stopped panting, we saw that the shelter was little protection, for only a few timbers formed the roof, and shells were dropping on all sides of us.

The soldier who had brought us out of the trenches was paying not the slightest attention to all the firing, and was

as near to laughing at us as a German soldier could come to mocking a superior officer. It made me feel pretty small, but none the less afraid.

Wherever I have gone, since I was a boy, I have always taken pictures, for photography has been a hobby with me, and so I thought I might as well get a picture of this place. My companion agreed to wait until a shell hit near enough to get a snapshot. As soon as I had taken the photo, however, all further interest in sitting there vanished, and we ran for it again. Stumbling and scrambling along, we raced through the scarified streets of the village, noisome with the stink of dead men and horses rotting on the ground. Finally, we reached the car and drove it all out away from that inferno, bumping over shell-holes which sometimes threw us out of the seat, but did not jar the driver's foot from the accelerator.

Later, we were told that what we had gone through was just a light fire, but it was heavy enough for me. It recalled the barrage I had watched a few evenings before, and I wondered that men had the courage to dash not only through that, but through machine-gun fire as well. I had never had any ambition to be in the army, and I could not blame anybody else who felt likewise. I can quite easily imagine how soldiers got shell-shocked under that terrific strain. It is amazing to me that it was possible to keep men year after year in the trenches, undergoing such experiences daily, and I take my hat off to those who went through it and didn't quit. That morning's adventure made me appreciate how pleasantly situated were the aviators, eighteen kilometres behind the front lines. They could have a bath, good food, clean living quarters, a drink and a song any time they wanted it. No wonder the infantrymen often looked up with envy at the airmen in the sky.

Even in the first two years of the war there was not much aerial combat, so that a berth in the air corps was by com-

parison with the life of an infantryman in the trenches a form of life insurance. The principal risk in the first two years was that the engine would give out, forcing a landing in enemy territory. It was not until the final two years of the war that combat in the air became really active.

Not finding any French planes in the sky where I had been flying, I moved up to Douai, where more of the Allied airmen were reported. I had been out on five consecutive mornings and evenings without seeing an Allied plane, and had taken an evening off to join the German pilots who were enjoying a birthday dinner for their field commander. That was, of course, the evening five Farman bombers chose to visit the flying field at about seven o'clock. They came flying in low, about 1,800 feet high, to drop their bombs, unhampered by anyone. At the first sound of their engines we rushed out of the dining-room. Helplessly, we saw the damage they were doing. One bomb hit a hangar tent, destroying a plane; another tore a hole in the field. Fortunately, my plane was not the one destroyed. I rushed to my hangar to pursue them, but before I could warm up the engine the squadron had "laid their eggs' and disappeared into the night.

But two days later, while I was flying around about 6,000 feet high, a Farman two-seater biplane, similar to the ones which had bombed me, appeared out of a cloud 2,000 or 3,000 feet below. That was my opportunity to show what the gun would do, and I dived rapidly towards it. The plane, an observation type with propeller in the rear, was flying leisurely along. It may even have been that the Frenchmen didn't see me. It takes long practice and constant vigilance to guard against surprise air attack, for the enemy can assail one from any point in the sphere.

Even though they had seen me, they would have had no reason to fear bullets through my propeller. While approaching, I thought of what a deadly accurate stream of lead I could send into the plane. It would be just like

shooting a sitting rabbit, because the pilot couldn't shoot back through his pusher propeller at me.

As the distance between us narrowed the plane grew larger in my sights. My imagination could vision my shots puncturing the petrol-tanks in front of the engine. The tank would catch fire. Even if my bullets failed to kill the pilot and observer, the ship would fall down in flames. I had my finger on the trigger. What I imagined recalled my own narrow escapes; the time the petrol-tank burst; the breaking of the wing at Johannisthal when my passenger was killed. I had no personal animosity towards the French. I was flying merely to prove that a certain mechanism I had invented would work. By this time I was near enough to open fire, and the French pilots were watching me curiously, wondering, no doubt, why I was flying up behind them. In another instant, it would be all over for them.

Suddenly, I decided that the whole job could go to hell. It was too much like " cold meat " to suit me. I had no stomach for the whole business, nor any wish to kill Frenchmen for Germans. Let them do their own killing !

Returning quickly to the Douai flying field, I informed the commander of the field that I was through flying over the front. After a brief argument, it was agreed that a regular German pilot should take up the plane. Lieutenant Oswald Boelcke, later to be the first German ace, was assigned to the job. The next morning I showed him how to manipulate the machine-gun while flying the plane, watched him take off for the front, and left for Berlin.

The first news which greeted my arrival there was a report from the front that Boelcke, on his third flight, had brought down an Allied plane. Boelcke's success, so soon after he had obtained the machine, convinced the entire air corps overnight of the efficiency of my synchronized machine-gun. From its early scepticism, headquarters shifted to the wildest enthusiasm for the new weapon.

Orders were issued that as many planes as possible be equipped with my gun. Captain Wilhelm Wagenführ, of the aviation inspection service (Idefliег), and Engineer Frank, a civilian expert in the Berlin Idefliег headquarters, congratulated me on having vindicated their confidence in my ability. Some tests were made of Garros' deflectors, but the vibration caused by the ricocheting bullets proved to be too heavy a strain on the propeller for practical use. It was ordered that my factory be supplied ahead of all others with engines and other materials to expedite production.

Lieutenant Max Immelmann was the second pilot to receive the new combat plane. He duplicated Boelcke's success from the start. Within three or four weeks, half a dozen more were flying at the front, with devastating effect on the Allied air forces.

Neither the English nor the French could understand why their air losses mounted so rapidly. For four or five months the Germans managed to keep the mechanism of the synchronized gun a complete secret. Their air forces continued to triumph until a German plane, lost in a fog, landed directly on a French airport. It had been against orders to fly over the French lines, just to prevent a capture. The delight of the French when they found that the terrible havoc-wrecking gun which had wrought such destruction was affixed to the captured ship knew no bounds, according to a report by a French captain made prisoner soon after. The ship, which was undamaged, was flown immediately to French headquarters, we were told, the gun examined and full details of its operation published in various magazines. Some of the French papers printed detailed drawings, more correct in fact than the drawings in my own factory, because I was constantly making changes in the mechanism.

It was following the capture of this plane with the synchronized gun that a question was put in Parliament why the Germans had such efficient planes and a fighting equipment against which the English could not successfully com-

pete. Indeed, English airmen frankly called themselves "Fokker fodder." When it was learned that I was the inventor, the War Office was further embarrassed by being asked why no effort had been made to obtain the patents of my planes, inasmuch as I was a Hollander. For a time, at least, there were no planes which could give the Germans an equal fight.

XIII

I BECOME AN INDUSTRY

FROM the very outbreak of hostilities, everyone kept expecting the war to end in the next few months. The commonly held belief, which one automatically accepted, was that the Germans would be in Paris by Christmas of 1914. After the first flush of excitement, few people want war to continue, and the wish was probably father to the thought. When the first German drive was blocked, people spoke of the war ending with the spring campaign. Thereafter, peace was never more than three or six months off, in their minds. We constantly expected to drop our tools and return to a normal production basis. To prevent being caught with an elaborate plant and heavy inventories, we expanded like a fungus, ready to collapse without complete ruin when the inevitable termination of wartime prosperity came.

The original factory at Schwerin, which remained the principal plant, was too limited almost from the first, but we were reluctant to invest much money in a larger factory. All we cared for was floor space. That was needed for the manufacture of the thousand and one small, hand-made parts which go into aeroplane construction. The initial addition was a couple of one-storey prison barracks, 300 feet long and 36 feet wide, made in quantity for the prison camps and readily available for 18,000 marks. From then on, as business increased, we hastily threw up similar structures. Growing overnight, we complied with no kind of regulations. Our factory was a gigantic fire hazard from beginning to end. The one thought was production. The ultimate picture of the old Schwerin plant where 1,800 men were working at the end of the war was merely an accumulation of small, wooden buildings, in which all

equipment, lighting fixtures, heating arrangements, and other provisions were temporary. From this maze of buildings finally streamed an endless belt of eight planes a day, including Sunday. My own factory built about 4,300 planes during the war; altogether 7,600 Fokkers were built.

The only modern large building and the last addition was a former piano factory, four storeys high, in which an additional 400 men were employed. The piano industry was dead. A lease was easily obtainable, and all pianos were moved to the top floor. The other three floors were used for assembling wings. Workmen, accustomed to high-grade woodworking, speedily adapted themselves to the fine craftsmanship necessary in wing-making.

On completion, the wings were transported by special truck to the flying field about four miles away, where the aeroplanes were put together, test flown, and turned over to the armament department, which installed the machine-guns. After the guns were checked for accuracy on the range, several hundred rounds fired through whirling propellers, the planes were broken down and loaded on flat cars. They were shipped by trainloads to the front, 400 miles away. Planes were never flown to the front as they often were in France and England.

Army acceptance officers remained on the field day and night, together with a small army of inspectors throughout the factory. For a time the flying school kept increasing in size, with officers, men, flight surgeons, and others arriving daily. During the first year and a half, my working force grew from 160 to 1,500 people.

My business began as a one-man proposition and throughout the war practically remained so, despite its fantastic mushroom growth. I had to do everything, from designing the smallest part to negotiating for the largest contracts. Never have I worked so hard. What with

making frequent trips down to Berlin and the front, supervising the training of army pilots, designing new aeroplanes, refining the operation of the machine-gun, scheming to outwit my competitors, and a hundred other things as well, I was busy from morning until late at night. Practically the only things I didn't do or supervise were the book-keeping and the purchase of materials.

In the first two years, types of aircraft were changed frequently. Orders were so small that each plane had to be built practically as a special job. Personnel was hard to get, and every workman had to be a specialist. With larger orders came an opportunity to systematize, and I hired experts from the Schwartzkopff torpedo factory to organize production and buying, while I concentrated on experimental work. These men, knowing nothing about aeroplanes, were content to produce planes according to specifications, without trying to better them. It was a great relief.

My work, thereafter, was divided into two parts: first, designing and test flying new types, maintaining contacts with pilots and mechanics at the front, and developing the synchronized machine-gun. Second, negotiating the contracts, meeting important commissions, attending conferences of the industry's leaders, playing the necessary politics in Berlin, and co-operating with orders in the industry in the everlastingly difficult problem of getting materials. As the years passed, this part of the work took up more and more of my time. To take care of our constantly increasing business, I organized a central office under the capable management of Wilhelm Horter as general executive. My experimental department was headed by Reinold Platz, who, as a welder in 1912 at Johannisthal, made my first steel-tube fuselage. Because of his organizing ability and leadership he was ultimately put in charge of my Dutch factory. Heinrich Luebbe, entering my employ as a pilot, proved to be a capable

engineer and organizer, and took over entire charge of my armament factory. Wilhelm Seekatz, with me from early Johannisthal days, was responsible for organizing my Austrian factory, and is now with the export department of my Dutch company. Bernard De Waal took over all testing of planes besides supervising flying school activities. Without the wholehearted co-operation of these and many other employees, to whom I am still grateful, I realize my German enterprise could never have been fully developed.

Although I was only twenty-four, my workmen called me "The Old Man," and the quick whisper, "der Alte kommt," was the signal for furious activity whenever I entered the factory. No one ever got used to my extreme youth, however. An Austrian Commission, splendid with decorations, visiting my factory with a view to recommending Governmental orders, politely permitted me to show them about, fly the latest Fokker, and explain everything in detail, before suggesting firmly that they desired to talk, either to the director, or to Herr Fokker, senior. They thought that the real Herr Fokker must be a bald-headed man with a wide stomach, not the bareheaded stripling who had been opening doors for them and answering all their foolish questions politely. When I told them they could talk business with me, they asked indignantly who was the director.

"I am myself," I informed them, grinning.

But when they came to talk business they found that I was old enough to know all their dodges and tricks.

I lived in a comfortable boarding house run by a marvellous old lady, Mrs. Frieda Grabitz. There I ate and slept only, with De Waal, whom I had put in charge of the flying school. Too busy for sports or recreation of any kind, I needed no more luxurious quarters. It amused me to think how much better off many of my employees were,

as far as comfort in life was concerned, despite the millions of marks which came pouring in.

Much of my entertainment came from my constant companion, a black, long-haired dachshund, Zeiten, and a virulently experimentative ape, Cuckoo, which De Waal had annexed. Every morning about eleven I made a thorough inspection, putting my nose into every nook and cranny of the rambling factory. Zeiten tagged at my heels, looking critical when I stopped to examine anything, and trotting along on his splayed legs contentedly when I seemed pleased. He was the most intelligent dog I've ever seen. When I was away at Berlin he used to make these inspection trips alone, sticking his long snout into every accustomed spot. It was an unlucky workman who tried to prevent his making a thorough job of inspection. He peeked importantly into everything with his sharp, shiny eyes, before giving his approval and toddling along.

An inveterate motorist, Zeiten became the radiator ornament of my Peugeot racer. As we sped along, his wide ears fanned out like wings, spreading out from his long, low body which ended in a pointed tail. Sticking his snout proudly forward he would bank on curves like a real aviator. Seldom did he tumble from his perch, expertly matching his skill against my attempts to dislodge him.

He did enough mischief every day to do for a dozen dogs. Too busy to spank him for individual naughtiness, every morning I gave him a spanking on account. Accustomed to this, he felt uncomfortable and guilty if I forgot his punishment.

Wise in his mischief, he occasionally overdid it. There was, for instance, a sofa on which he was forbidden to lie. Before I came into the room he would skip quickly off his guilty snoozing place, but be so pleasant and amiable that I knew something was amiss. While I was running my

hand over the sofa in search of the warm spot, he would disappear suddenly.

De Waal's ape was obviously destined for a short life because of his irresistible impulse to steal and eat everything. From his normal perch on top of the dining-room stove, Cuckoo would suddenly jump to the table, seize a bottle of unopened beer, leap back, snap off the cap and guzzle it before you would wink. Any kind of beer would do; he had no preferences.

All day his naked, pink posterior flitted through the house as he searched for things to eat, drink, or destroy. Once he captured a huge bottle of ink as a great prize. Chattering with excitement, he squeezed the syringe, squirting a splatter of ink over the walls, drank the remaining contents and, with a roar of disgust at this frightful new drink, hurled the emptied bottle away.

He died tragically. Some plumbers were teasing him in his cage with a blue pencil. He seized it, tore it to bits, and ate it before they could stop him. Within an hour or two he was dead from poison.

While these pets lived they did much to divert me in the general hysteria of that mad world wherein I moved faster and faster as new and harder tasks faced me at every turn. As often as I laid down one thing another cried for attention, and it didn't suffice that capable men were hired to supervise every department.

Despite the press of other work I was often out at sunrise on the flying field with De Waal keeping contact with the students' progress. My own criticism of the instructors was that they flew too much and talked too little. I could teach a man how to fly over the dinner table better than many of them could on the flying field, and I permitted no student to be finally rejected without personally investigating his alleged unfitness.

Many started out badly, but eventually became excellent pilots. Among the backward ones, for instance, was

Richthofen, though he had the advantage of starting as an observer. The ordinary air manœuvres are now among the common knowledge of the man in the street, so that it is difficult, perhaps, to understand how ignorant many of the students then were of the art they were willing to risk their lives to master.

After the air corps expanded on a large scale, it was decided that all training could be better done under army discipline and direction. A large field was established next to ours, which we retained for testing purposes. During our training operations we had few accidents, only four students were killed—but the army washed out the twenty-two planes we turned over to them in less than a year. After the army took over training there were actually more pilots killed behind than at the front. Quantity production of pilots was responsible.

Reluctant as I was personally to give up the flying school, it had absorbed a disproportionate amount of my too limited time. The transfer left me free to devote myself to the more serious matters of designing combat ships, and shaping my industry along lines for the future expansion which I could already foresee.

While my fighting planes were momentarily superior to anything on the front, I turned my attention to the big opportunities I visioned in seaplane manufacture. My fighters were already being used for Belgian coast defence, but I realized that the navy must have a seaplane. Buying an existing seaplane factory at Travemünde where a school for navy pilots had already been established, I planned to build planes of my own design there, and after the war develop it as a commercial base.

In late 1915 I was asked by the army to co-operate with Hugo Junkers, father of the thick wing and all-metal plane, in developing an all-metal single-seater monoplane. Professor Junkers is one of the pioneers in aeroplane construction. His theories have frequently been in advance of his

time, but he has not always been able to adapt his laboratory experiments to the practical ends of the moment. His single-seater, tricky and unmanageable, was a highly dangerous flying machine until certain alterations in its design were made under my direction. At first Junkers welcomed my co-operation and the 3,000,000 marks I put up to buy a fifty per cent. interest in his plant. I persuaded him to construct many part of his planes of steel-tubing, and urged him to permit the rudder, elevator, and ailerons to be fabric-covered to facilitate manufacture. He refused to give up his all-metal construction for the sake of wartime expediency. Eventually, he built a ground-attack and observation armoured plane which was successfully flown, but I had found it necessary to withdraw from a partnership which cost me 1,500,000 marks and many periods of fruitless argument. Junkers was too theoretical, in my opinion, at a time when practice was so much more important than theory.

Pursuing my intention of building up a strong, well-rounded industrial unit, I acquired an engine factory when I discovered that I was handicapped in getting engines by not controlling the output of some plant. The Mercedes and the B.M.W. motor works both started their own aeroplane factories during the war. This meant that, after the war, both might refuse to supply competitors. Therefore, I bought a controlling interest in the Oberursel firm, then building Gnome and Le Rhone rotary engines. Engineers of the factory were developing an engine in 1917 somewhat similar to the Hispano-Suiza. After having invested 4,000,000 marks in the plant I guided its destinies until the war ended.

In this way I was prepared to deliver to the world a complete fighting or commercial plane, produced in factories under my control, and had laid plans for the further development of this production unit when the war ended and commercial aviation would become

more important than military aviation. But it was a plan doomed to disappointment for reasons beyond my control. The Allies clipped the wings of the Germans with the Armistice and they temporarily clipped mine as well. Entirely destroyed was the industrial edifice I had erected.

XIV

FOKKER FIGHTERS

From the front came the constant cry for more power.

More power meant greater speed and faster climb, and the man on top was the man who won in the air. Combat rose higher and higher in the sky as airmen sought to mount like eagles above each other for the fatal pounce and burst of fire into the enemy's plane. The flyer who rode the highest aeroplane could cruise in the sun until opportunity for a surprise attack was ripe, and then dive.

But more power meant better engines, and better engines were not built overnight. Engines which worked splendidly on paper sometimes fizzled out disastrously on the testing block. We demanded an engine which would purr as smoothly on its back, or on its side diving or climbing, as right side up. Manufacturers worked day and night to answer that demand, but it was not until early in 1916 that a really splendid engine was adapted in Germany to combat-flying.

That was the 160 h.p. water-cooled Mercedes, which remained the outstanding aviation engine, with the later developed 185 B.M.W., during the final period of the war. It was, in my opinion, superior at high altitude to the English Rolls-Royce, the model of automotive perfection, or to the Spanish Hispano-Suiza, which the Allies quickly appropriated. Without such engines not even the finest aeroplane could display its real performance, and so the adaptation of the Mercedes precipitated an internal war among the competing aeroplane manufacturers which was marked, on a smaller scale, by as much intrigue, treachery, wire-pulling, and political manipulation as distinguished the greater war outside.

But while waiting for those engines we had to content ourselves with the various types of air-cooled rotaries. The original Fokker fighting plane, carrying one pilot and mounting one synchronized machine-gun, was powered by the 80 Gnome. Tricky, unreliable, difficult to operate, the Gnome consumed an enormous amount of petrol and oil for the small power supplied. Much of its power exhausted itself in the mere rotation of its parts. If the ignition was shut off without throttling down, petrol flooded the engine. Then, it wouldn't pick up quickly again, but might catch fire. Every engine was different, so that a pilot had to learn the crotchets of each one he flew with. Engine trouble accounted for many of the captures and disasters in the early months at the front.

These planes actually flew only 70 miles an hour. They had a ceiling of 6,000 feet, and a flying duration of two hours. At 2,400 feet an aeroplane was comparatively safe from infantry and artillery fire. The Fokker single-seater, even at this low speed, was faster than other German planes, which were mostly of the observation type, holding two persons and carrying petrol for three hours of flight. These planes were still too structurally weak to permit of prolonged power dives, such as are customary with modern combat planes. Beyond a certain speed, the wings would simply have torn away from the fuselage.

Slow and unreliable though the first Fokker fighters were, they darted about the front like wasps by comparison with the relatively clumsy Farmans. With the double advantage of speed and the deadly synchronized machine-gun, they swept the skies almost clean of Allied planes for several months. The Farmans had no rear protection. Even the speedier Morane-Solniers, two-seater tractors with a machine-gun in the rear cockpit, were not much more difficult to bag. The English observation planes, BC2E's, too slow to run away, were almost entirely defenceless when attacked under the tail. Dropping out of the sun,

a Fokker pilot would dive, pull up underneath the enemy plane and simply sew the opposing airman in a shroud of bullets. The courage of the French and English in facing such disheartening odds seemed almost superhuman to me.

It was not until a Fokker fighter was captured and the Allies developed the Constantinesco synchronizing machine-gun gear by copying the principle of the Fokker gear that air combat took on a semblance of equality. Then, superior courage, greater shooting skill, and cannier flying frequently offset the advantage of superior aeroplanes. The Constantinesco gear, though based on my principle, operated hydraulically, instead of mechanically, like motor-car brakes.

Under the driving stimulus of the war, the lash of domestic competition, the unceasing demands of combat pilots, planes were constantly improved. From the first I made it my business to lend a ready ear to what pilots said of every plane they flew or fought against. I had the liveliest sense of the inhuman dangers they daily faced. By heeding their complaints and requests I often knew what the next improvement must be two or three months before the urge took official form. Then I laid my plans accordingly, for whatever talent I possessed was not stinted in an unremitting effort to give them the best fighting plane my brain could devise. As fast as one side appeared at the front with a superior plane, efforts were redoubled on the other to equal or better it. During the war I designed two or three dozen types perhaps, concentrating, however, only on the few which completely satisfied me. Thus the temporary advantage drifted back and forth across the lines, with the manufacturers almost as deeply embroiled in the fighting as the combat pilots themselves.

The French had perfected a 110 h.p. Le Rhone Nieuport to fight our 80 Gnome, giving them greater speed. Discovering at the front that my first deadly Fokker had now

been outmoded by the speedier French plane, I hastily returned to Schwerin with the specific intention of designing an aeroplane which would top the French one.

Greater power was for the moment unavailable. It was up to me to make a compromise with reality, retaining only the absolute essentials of a fighting ship. My theory was that the ultimate test of victory occurred in five or ten minutes when German " circus " and Allied squadron met in a dog-fight. Therefore, I sacrificed speed for climb and manœuvrability, and the Fokker triplane was the result.

It proved to be one of the most remarkable ships that had ever been built. When the Allies saw its triple bank of planes, glittering red at the head of the Richthofen circus, and saw it fairly float in the air, it threw something of a panic into their men. They never had an opportunity to realize how slow the triplane was because of the way it climbed, flipped, and stunted in a fight. In the turmoil of combat, with its extraordinary climb and manœuvrability, it proved almost invincible under able piloting. Sometimes even German airmen were unaware of its limitations, the triplane responded so immediately to the demands of the fight when those demands became imperative.

Richthofen flew it with consummate skill, as did some of his brother pilots. In his red messenger of death he became famous as head of his dazzling circus. Some pilots came to rely on it so thoroughly that they even preferred it to later types which I considered superior. Voss, a leader of one of Richthofen's *staffels*, won twenty-two victories in three weeks in his triplane.

Had the Allied airmen only realized it, they could have outwaited the triplane, which carried less petrol than other types, and then, with their greater speed, run them down. The Spads of the French were faster, and could dive away from any of the German planes like a streamlined brick.

But they were not as fast on turns or as speedy in climb. The English Sopwith Camels were similarly faster than the Fokker triplanes, but not as agile in a scrap.

On their own part, German pilots, to compensate for certain disadvantages, were constantly perfecting the technique of air fighting. Boelcke invented the " circus " tactics which Richthofen later shaped to even more adroit purpose. Immelmann, who was the second German ace to fly one of the early Fokker fighters, devised the manœuvre which still bears his name. It is a quick back-track on the path of flight, gained through a half-loop and flip-over while on the back. By this means, the flyer doubles on himself instantly, gaining altitude as he comes out headed in the opposite direction.

Because of Immelmann's great success, I built a special monoplane, powered with a 160 Le Rhone and equipped with three machine-guns shooting 1,800 bullets a minute, for him. A terrorizing hail of lead spurted from its nose. Just when it was ready, we received a hurry call from air headquarters to dispatch by train every available machine to Essen. Spies reported a French plan to bomb the vast Krupp works there. We loaded the Immelmann plane, along with a dozen others, aboard the special train, and I went along. We found a concentration of flyers at Essen to repel the rumoured French attack.

Flyers were particularly interested in the Immelmann plane, not only because of its heavy armament, but for the reason that Immelmann, then at the height of his brief, meteoric career, was to fly it. They crowded around, discussing its fine points with each other, and finally asked me to demonstrate it.

Aloft, stunting through all the intricate manœuvres at my command, I made a tremendous racket with the battery of machine-guns. Everyone was watching closely, but they never knew why I suddenly landed at the far end of the field and taxied quickly inside the hangar, before the crowd

of officers swept over to take another look at this powerful air weapon. Nor would I grant anyone so much as a further peek at my suddenly shy machine.

While I had been up in the air tying myself in knots, the mechanism of one of the guns had jammed. Shooting unsynchronized, it had nearly shot off the propeller before I felt the sudden vibration of the crippled prop. I landed immediately lest it should split to pieces or shake the engine out of its bed. Sixteen bullets had riddled the propeller. One blade was ready to fall off. Despite puzzled protests I kept the plane away from observation until a new propeller had been slipped on. Nobody ever realized what a close shave I had had.

Some time later the repaired machine was turned over to Immelmann. It was an unlucky machine, though he gained two victories in it. He nearly lost his life when a rocker arm of the Gnome rotary engine broke in flight. Flailing through the air like a revolving knife, it cut through the steel supports attaching the engine to the nose of the fuselage. The loosened engine rocked and shook itself entirely loose from its bed, but was stopped before it tore completely away. With his engine hanging only by a single twisted tube Immelmann skilfully brought the plane to safety. His time had not yet come. His was the only fighting plane built during the war mounting three machine-guns. No attempt was made to duplicate the ship. Owing to the limited number of machine-guns available and on account of weight and space, the three-gun battery was later abandoned, and two guns made standard equipment.

The better the fighting pilot the fewer bullets he needed to win victory. Successful flyers frequently emerged from a dog-fight having fired only fifteen or twenty-five shots. They waited until they had a bead on their opponent and could wear his landing wheels for earrings before they opened fire. Then their shots were decisive. Immelmann

once returned from victory with only thirteen bullets gone, and I have heard that Richthofen brought two planes down with only twenty-eight shots.

When the long-awaited Mercedes 160 was finally adopted for pursuit ships by the army air corps, which completely supervised the distribution of engines, the pent-up enmity between rival aeroplane manufacturers burst out into the open. For some time, the number of planes each manufacturer could build had been dependent on the number of engines available. At no time had the engine manufacturers kept pace with aeroplane production, so that antagonism had developed and intrigue flourished. In the beginning of the war, there was no reason for jealousy. Every manufacturer had his hands full, unable to expand as rapidly as his orders increased from an army and navy which snapped up every plane built, regardless of quality or price.

But as these boom times ceased and my success increased, the German manufacturers began to resent my competition, not so much because I was a foreigner as because I was a successful foreigner. A howl went up that I was sending money out of the country as fast as I made it—which was pretty fast just then. This, I am sorry to say, was not true. My biggest mistake was in not forwarding all the profits of the first two years to Holland for investment, while it was still legal to send money out of Germany. Once I did send several hundred thousand marks to my bank in Holland. They were invested by a broker friend in Royal Dutch Shell without my knowledge. When I returned to Holland after the war I found that my unknown investment had increased five-fold. Had I only done the same thing with the rest of the early profits I should have become a very rich man indeed. Unfortunately, financial considerations took up little or no part of my time, which I spent entirely on developing my plane and machine-gun.

Because of my close relations with the combat pilots, who felt that their lives were intimately bound up with the success of Fokker planes, the rival manufacturers could not get any support from the front in their fight to oust me from my position of supremacy. They could, however, pull strings in Berlin, invent plausible lies, initiate intrigues, and in general burden my existence. And when the Mercedes 160, so superior to every other engine, was approved for fighting planes, they seized on this as a weapon to do me in.

By exerting the utmost pressure in Berlin headquarters with high authorities, and for secret reasons which I will later reveal, the Albatros factory obtained the complete output of the Mercedes 160 engine. Every effort of mine to get even a small quota was baffled by red tape and headquarters politics.

The adaptation of the water-cooled engine for use in fighting planes by air headquarters came about through my efforts. This knowledge made the discrimination against me harder to bear. Not sharing the general opinion that air-cooled engines alone were suitable for use in pursuit planes, I conducted experiments with a six-cylinder, in-line, water-cooled Mercedes of 120 h.p. Finally, I evolved the D-1, about the middle of 1916. This biplane was the first German fighter to use a water-cooled engine, which had been used solely in observation and bombing planes prior to my experiments. In its official tests the D-1 proved to be the fastest and most efficient fighter available.

When it was proved that a water-cooled engine, despite its increased weight, could be used in a fighter, the Albatros brought out a pursuit plane powered with a 160 h.p. Mercedes, the D-II. They had been using this engine in their observation planes. With its additional 40 h.p., the D-II proved a faster and seemingly better ship than my D-1. Rapidly developing this type through a series of models, they finally evolved the D-V. Certain structural

weaknesses, which an official investigation later proved had been criminally overlooked, resulted in the death of many pilots when the wings of the D-V tore off in flight. Boelcke met his death when the wing of his Albatros was torn off during a dog-fight. But for nearly a year the Albatros was more widely flown by German airmen than the Fokker, although the triplane continued to remain a favourite with Richthofen and some of the other aces.

It did me no good to point out that with an additional 40 h.p. my D-1 would prove a finer fighting ship than the Albatros, D-II. On all sides I met with a steady, definite opposition of a kind which I was least able to contest, for it was evasive, shadowy, never open. There was nothing to do but abandon the D-1. Undeniably I began to lose ground. Unable to obtain any of the Mercedes 160's, I was being cunningly jockeyed into the ruck of mediocre manufacturers, after making a flying start by supplying the Germans with their first fighting aeroplane.

To add to my difficulties, the German War Department now requested me to become a German citizen. Because I was a neutral foreigner, I had a certain protection from arbitrary army jurisdiction which irked the higher military authorities. At first I paid no attention to this request, but concentrated on considering the difficult position I was in.

Checkmated, unable to see for the time being where I could successfully make the next move, I was to have insult heaped on injury. For army officials, not wanting to lose the manufacturing capacity of my plants, and perhaps to keep me so busy in routine production that I could not trouble the other manufacturers by designing a better ship, now gave me a contract to build 400 elementary training planes. It was the biggest production order my factory had yet received. It would keep us busier than ever. But it definitely proposed to relegate me to the background. As if that were not enough, the training planes I was

asked to manufacture were not even my own but some developed by the A.E.G., the General Electric Company of Germany.

The large order made it possible to put my factory on a quantity production basis, with highly profitable results, but that did not lessen the sting of the insult. I decided not to bother with the matter myself, but to hire the head of a large motor-car plant and let him supervise production, which was a mere problem of organization.

Relieved in this way, for the first time since the war opened, from the necessity of attending closely to factory details, I concentrated on designing an altogether new and advanced pursuit plane which would combine the best fighting qualities in one ship. Perfection was my sole consideration. Soon I had developed a biplane of radical appearance, with cantilever construction which entirely eliminated all struts or guy wires. The wings were small, wooden wings with large cantilever. The fuselage, no less than the wings, had a clean, streamlined appearance. Altogether, its appearance was strikingly similar to the most modern racing plane of to-day.

More modern than any plane produced during the war by either side, it looked good, an almost sure test of a fine aeroplane. The top wing sat closely over the fuselage like a parasol; the bottom wing was narrower and of lesser span. The wooden wings of my present-day commercial ships are built along identical lines, indicating how far ahead of its time the biplane was. The round fuselage, which was of fabric over a wood frame built around the welded steel fuselage, promised to complicate production and run up the cost, but that was a fault which could be excused on the score of its additional efficiency.

Taking it up in the air, I found the biplane so fast, sensitive, and altogether satisfactory that I felt certain of having designed a plane which would be immediately accepted and rushed to the front. It had both speed and

climb, and went through all the combat manœuvres like greased lightning. With a feeling of elation such as one seldom receives from the turmoil of creative designing, I telephoned a request to army officials in Berlin to come up to Schwerin at once for a look at the best ship I had yet built.

They arrived, expectant, rather excited by my evident enthusiasm and confidence, on a fine clear day, with a high ceiling which would give me the best kind of a chance to show off the plane to perfection. I met them at the station and rushed them at once to the flying field in a brand new motor-car I had bought for no other reason than a woman buys a new hat. We piled out and I led them up to the flying line where my shiny new biplane was poised in all its power and glory. My beauty stood out among a half-dozen nondescript types, yet I waved my hands towards the biplane with a gesture of ill-concealed pride of craftsmanship.

" Gentlemen, have a look."

They were struck by a chilling silence. Staring coldly at my biplane, they walked around it as if it would bite. Someone wondered idiotically what was going to keep the wings on, as if I were an elementary designer yet to learn the alphabet of mechanics. They felt the wings as if doubting they were real; wiggled them tentatively as if expecting them to drop off at a touch, and thumped the fuselage as though it wouldn't surprise them to find it turn into a pumpkin. By a common instinct they began to shake their heads with comic dubiety like a Gilbert and Sullivan chorus of judges.

No amount of argument altered their view. They listened politely as if suspecting me of having gone the way of all inventors—run wild on theory. I showed them cross-sections of the cantilever construction. They admitted it was all right for bridges, but no one had ever used it in aeroplanes. They wanted something visible supporting

the wings. That was the sort of thing to which they were accustomed. They could understand that. Most of them knew so little about aeroplanes that they dared not venture beyond their certain knowledge, for mistakes were so catastrophic in the air.

Desperately, I flew the biplane as it had never been flown before, practically turning it inside out in the skies, submitting it to every stress and strain of combat flying. Their minds had crystallized in opposition. They seemed a little disappointed that the wings had not fallen off in the air to support their views, and practically accused me of holding them on by sheer will power. Even the so-called scientific members of the group could not bring themselves to recommend it for military use. They asserted that the pilots would have no confidence in it, while professing an academic interest in my odd theories.

It may be that I was unduly impatient with the conservatism, for my biplane was certainly unlike anything else these men had seen. Without sympathizing with it, I could understand their attitude. But I thought they should have more confidence in me. Their rejection dampened my enthusiasm, but left me firm in the belief, which later practice verified, that I was right.

After an entire day of futile argument and demonstration, I drove them back to the station, forced to admit that, right or not, the ship was simply too far in advance of its time.

In the dark as to why the army should suddenly lose all interest in my initiative, yet insist more and more firmly on my becoming a naturalized citizen, I was completely puzzled, and scarcely knew what to do next. It was not until some time after the war that I found out the secret reason why the Government's attitude had changed in favour of my competitors. For a long time spies had been opening my personal mail. Letters reached me a day later than ordinary mail reached my German friends from

the same towns. To prevent any suspicion arising, I had broken off practically all correspondence or connection with anyone outside of Germany—even almost ceasing to write to my father and mother—though I was, to a certain extent, a free agent because of my Dutch nationality. But this had not kept other people from trying to get in touch with me, apparently. I was informed, after the war, that the English Intelligence Service in Holland had tried to forward me an offer of £2,000,000 if I would come out of Germany, back to Holland. This offer never reached me, but it did come to the knowledge of the German Army Intelligence. It made them wonder whether I was trying to sell out, I suppose. So, ironically enough, does time change one from a liability to one's parents to an asset to a nation.

The German War Department now became more insistent than ever that I become a German citizen. Otherwise, it was stated, no further contracts would be given to me. Loyal Germans objected to so much business going to a foreigner. If I became a German citizen, my status would be the same as theirs.

The prospect of becoming a German citizen didn't interest me. I was fully satisfied with my Dutch citizenship. Difficulties with rival manufacturers, the fact that there was no thrill in producing planes in a routine way, the disappointment over the rejection of my biplane, made me anything but desirous of linking my future with Germany. I replied that after working off the present batch of orders, I would sell my factory and return to Holland.

Perhaps they hadn't been expecting this rejoinder. Or it may have confirmed their suspicions that I was secretly negotiating with the English, and wished to get back to my native country. In any case, it upset the authorities. I was immediately told in peremptory fashion that, Dutch citizen or not, I should not be permitted to return to

Holland because of my wide knowledge of military secrets —by reason of my visits to the front and intimacy with headquarters operations—which might be available to the Allies once I got home. It was intimated that Holland was powerless to bring pressure to bear in case I was held prisoner in Germany. My native country was having a difficult time walking the tight-rope of neutrality and could carry no extra burden.

Despite the unpleasing possibility of being imprisoned, I held my ground. It seemed to me there was little to lose by my attitude, and everything to gain. Looking at the matter calmly, I couldn't blame the German manufacturers for being angry or the War Department for wanting its own way, but I had not been born with Dutch obstinacy for nothing. The War Office saw that I was making no move towards naturalization, and thought they would take matters in their own hands, because they did not want such an important factory to stand idle.

Therefore, the War Office sent me a polite but firm letter informing me that my naturalization had been expedited by military order and that I was now registered as a reserve (Landsturm ohne Waffe) in the German army, subject to its military jurisdiction and discipline. It was intimated that I could be called to active duty at any time. The whole procedure was highly illegal, of course, but military officials are accustomed to taking short-cuts to the end they have in mind. If that means riding down private rights, so much the worse for the obdurate individual. I found myself, will-nilly, assigned to an army corps, but relieved from actual front duty as long as I held my place in industry. In other words, I was tacitly informed that if I quit now, I should be put in the front-line trenches as a German soldier, instead of being permitted to take the next train for Holland and home.

My helplessness to protest against such an autocratic assumption of authority need hardly be stressed. Only a

Don Quixote would have chosen to charge the windmills of Prussian officialdom the moment when the whole world was vainly attempting to bend Germany to its will. In no way did I acknowledge the validity of the imposed citizenship, but I could do no more. However, the War Office did not inform the Dutch Government of my changed legal status. In spite of this, after the war, I found myself coldly regarded as an alien, solely because of what had been printed in newspapers.

My position in Germany was that of a man on a treadmill, forced to constant action by external authority more powerful than my own, yet unable to move forward or backward by reason of the obstacles which barred me in every direction. There seemed to be no breaking the grip which the Albatros firm had on the Mercedes output; the army acceptance board was either inimical or hopelessly obtuse to the advantages of my designs; yet I was under compulsion to continue manufacturing or bear German arms. Experience had taught me, however, that the advantages in situations are constantly shifting; that no predicament is so desperate but that a way may be found out of it, if one struggles hard enough. And so I cast about in my mind for some means to restore my former prestige, in a manner which would brook no frustration by hostile competitors.

My own preference has always been for open competitions, in which each man's best is adjudged with sole reference to its excellence. Thinking along those lines, it suddenly occurred to me that the front pilots, whose necks were involved in obtaining the best plane possible, might help me devise a scheme.

They had suffered repeatedly from the planes sent to them by the arbitrary engineering officers of air headquarters who knew more about the qualities of a plane on the ground than in the air, where its real test came. Many of the planes these officers had chosen had poor fighting

qualities. Through Richthofen's use of my triplane, I had become closely acquainted with Lieutenant Kreft, the head of Richthofen's technical staff. He had visited my factory several times and was familiar with my potentialities. Getting into communication with him, I told him all my troubles. He eagerly fell in with my project to bring the manufacturers' struggle out into the open. Together, we concocted a scheme to permit the fighting pilots to select their own planes, instead of being the goat of headquarters intrigues. Lieutenant Kreft and I got in touch with other pilots at the front, who welcomed the plan because they realized at once how they would benefit from an open competition.

It was agreed that a committee of aces make this suggestion to air corps headquarters—that a delegation of crack pilots pick out their own planes from a competition to be held at Johannisthal, now the military flying centre. In this way, the possibility that influence could be employed to foist inferior planes on the fighting pilots would be reduced to a minimum. The plan went through, as suggested. A definite date was set to prevent the competition being dragged out like the Russian affair.

The competition date arrived several days sooner than I found desirable. I was working night and day on the plane which was ultimately known on the front as the D-7, but in order to be represented at all I had hurriedly to finish off a model considerably short of what I had in mind. It was a biplane like my rejected ship with cantilever wings —but in deference to conservatism, the two wings were connected at the tips with a single strut. I removed the round fairing from the fuselage, leaving it square to facilitate manufacture. I retained the tiny wing which streamlined the landing-gear axle, for the sake of speed. The whole plane was built round the coveted Mercedes 160, for it was part of the competition rules that every entrant should use this engine, the only one available in quantity.

With just enough time to make a sketchy test hop at Schwerin to determine that my plane could fly at all, we loaded it on a truck and raced to Johannisthal.

Even the hasty trial had showed me the plane had excellent all-round performance, but it was very sensitive, with tricky habits. Its tendency to spin under the slightest provocation particularly worried me. It was much too responsive to controls, especially on turns.

Rules of the competition permitted manufacturers to demonstrate their entries either personally or by an official test pilot. I took advantage of this on the first few days to make—myself—a thorough investigation of the faults of my ship. On the following days, all manufacturers were to be barred from the field, and the planes turned over to the front pilots, for comparison of their fighting qualities. This was in order that no engineering influence could nullify the ultimate performance tests. The judges were the pick of fighting pilots with the most pertinent of reasons for selecting the best plane. I was the sole manufacturer to fly his own entry.

I flew each day, learning as much about the ship as possible, and showing off by direct comparison that it would out-perform any other plane in the sky. Keeping it well in hand, watching its tricks, I played with the other pilots, diving on them, circling them, swooping in under their tails, looping around them, driving their planes to earth, and in general enjoying myself to the utmost while displaying my ship to best advantage. The manœuvrability of my plane in short, sharp turns at low altitudes was particularly impressive.

At the same time, I began to realize that if one of the front pilots took the ship up in its present shape and tried to duplicate my performance, he would probably kill himself and the pilot he was playing with. Finally, I concluded that the fuselage lacked sufficient rear-side area, had too much front-side area, and that the rudder fin was too small.

Something had to be done, for on Monday the planes were to be turned over to the front pilots. But while I was making up my mind to all this, and wondering whether I should dare enter the plane at all, I let no hint of worry express itself in my outward manner, cavorting in the air and chatting about my ship on the ground, as if I were entirely carefree.

But that Saturday I telephoned to Schwerin for two of my best welders to come at once. As soon as night came, we locked ourselves in the dim hangar to reconstruct the ship. In its cavernous depths we laboured like gnomes under the violet glare of acetylene torches, cutting through the fuselage to weld in another bay of two feet, and enlarging the fin in equal ratio. It was a long, exhausting job all through the night and lasting until Sunday noon. In the end, the fabric was patched so smoothly that nothing appeared to have been done. Wearied though I was, I had yet to take my ship up once more to determine whether the alterations had remedied its faults.

In the main they had. The ship was no longer dangerous, though it still swung around corners at a fast clip. Properly used, this was an asset. The spinning tendency had disappeared. The extra bay of fuselage and expansion of the rudder fin offered just enough resistance to bring the whole plane nicely into control. In the hands of a competent pilot, aware of its weakness, that aliveness to controls became its strength. With a lighter heart I landed and next day turned my plane over to the contest committee.

Before leaving the field for good, however, I sauntered over to a group of pilots who were waiting to test out the various planes. After chatting with them all for a minute, I pulled Oberleutnant Bruno Loerzer, chief of a front squadron, aside.

" You'll notice a special feature in my ship, Lieutenant," I said, " it's quickness on turns. Let the others in on it, so they can show it off to the best advantage."

Then I left, having put them on guard without their realizing it, presumably to seek some much-needed sleep.

With that little tip, they demonstrated the plane as well or better than I could have done myself.

At high altitude where the air is less dense the plane's performance was particularly excellent because of the thick wing—the first time the well-known Fokker thick wing was used. It was at high altitude that combat ships fought, or started fighting, so this factor was important.

I couldn't resist the impulse to watch these tests which meant everything to my future. I feared that certain pilots, unduly influenced by other manufacturers, might try some funny business in the clouds. Therefore, unnoticed, I slipped into the far end of the field where the commercial planes were hangared, and took off quietly in an old experimental plane I had planted there. Climbing to 15,000 feet, where all the really vital tests were held, I closely watched the competing planes in combat manœuvres, and was delighted with the manner in which the Fokker was showing up the others.

None of my chief competitors, the Rumpler, L.F.G., Albatros, or Pfalz, was in the running. The pilots, following Loerzer's tip-off, played with the other ships as I had done the first day, outmanœuvring them all the way down from 15,000 to 1,000 feet, displaying in every way the unmistakable superiority of the Fokker plane. The Rumpler was much faster and had a nice climb, but rather high wing loading. It was my most dangerous competitor. The arrangement of radiators on the sides of the fuselage, however, disturbed the airflow around the control surfaces so that it handled badly in tight moments. Otherwise, it was a clean ship and gave a good account of itself.

Before the contest ended, the front pilots had familiarized themselves with all of the competing ships and turned them inside out in the air. Engaging in sham fights, nose diving,

climbing perpendicularly, stalling, looping, flipping around, spinning, zooming, they tried in all known ways to get on each other's tail for the fatal burst of fire. It was in the sham fights that the Fokker shone. At high altitudes, the Rumpler slipped off on turns, losing height rapidly, while the Fokker buzzed around as though on a rail. No one realized that twenty-four hours before, the same plane had been the chief worry of its designer's life.

The Albatros D-VI was almost a duplicate of the D-V, no improvement. The Pfalz was obviously too weak for combat flying, while the L.F.G. had no visibility. The A.E.G. was an out-and-out flop.

The fourth day of the competition, after every plane had been flown over and over again by the combat pilots, the manufacturers were invited to a conference at headquarters. Captain Falkenhein, son of the famous army commander, in charge of aviation at staff headquarters and adjutant to General von Höppner, chief of the air service, who saw me chatting with some pilots on the field, waved me over, and walked to his closed motor-car. He wasted no words in preliminary or congratulation, assuming, apparently, that I knew which ship had won.

"How many planes can you build at once, Herr Fokker?" he said.

I answered rather irritably:

"My factory is clogged with those damn A.E.G. training ships."

He waved a deprecating hand.

"Let us not waste time quarrelling. What would be your price for four hundred planes of this new type?"

The number staggered me. Except for the routine training planes, which had been about as exciting to build as bird cages, the largest order I had ever received for fighting ships up to that time was sixty.

"Twenty-five thousand marks apiece. Ten million marks in all, Captain."

"All right. Another thing. We want the Albatros factory to build your plane on a royalty basis."

Momentarily I was stunned. Though all my efforts had been laid to stage a come-back, the thoroughness of it rather took me off my feet for an instant.

After nearly a whole year of being the front favourite, the Albatros plane was scrapped. The defeat would have left their factory, one of the largest in Germany, idle at a time when Germany needed every unit of production. And so the army forced Albatros to build my plane on a five per cent. royalty basis.

In this way, our positions had been reversed, and I took pleasure in the fact that the reversal had occurred as a result of an open competition, instead of through political juggling. Not long after this, when the so-called Hindenburg programme went into effect, calling for an enormous expansion of the air service, the A.E.G., also, was ordered to build my D-7, both factories receiving orders even larger than mine.

After strenuous objection the Albatros firm permitted Fokker engineers to enter their factory to teach the workmen how to build my planes, with their welded steel instead of wooden fuselages. Once started, they discovered Fokkers more profitable to manufacture than their own ships, despite the fact that they received 6,000 marks less for each plane than my contract called for, and had to pay me five per cent. of the 19,000 marks. With all three factories humming at top speed, Fokkers again began to swarm in the air at the front, during the final days of 1917 and early 1918.

Money was pouring into my treasury from all sides, but winning the open competition, regaining my old position of leading designer, and forcing the hostile manufacturers to build my plane, gave me more pleasure than all the money which accrued to me. The D-7 proved to be such a satisfactory type that for a time I thought little of im-

proving it. Soon, however, it became evident that the Albatros firm still held its favoured position at court. The Mercedes factory, though stimulated to increased activity, found itself unable to keep pace with the concentrated production of D-7's. There were not enough engines, essential to the D-7, to go around. Engines began to be rationed more or less with respect to the influence each factory had at headquarters. My protests that our quota was constantly diminishing were little heeded. I was reminded that I received a royalty on all D-7's built, anyhow. Nothing was said about the fact that my contract called for a higher price—which it had been decided was fair, in view of experimental and engineering costs. Moreover, the army board suggested politely that it was desirable to free me from manufacturing to develop new types.

I was asked to design a two-seater observation type, which other factories could build along with the D-7 on a royalty basis. It had been speedily discovered that the use of so many D-7's at the front greatly simplified the supply programme. Sizable economics, the release of soldiers and mechanics, followed. Therefore, a Fokker two-seater, having similar controls and many like parts to the D-7, would simplify supply even further. The observation plane, though developed and built, never did reach the front. In France and England I have been credited with building all kinds of planes for the Germans, even bombers. Actually I only built pursuit planes for front flying.

Once more it was up to me to outwit unfavourable circumstances. It became quite apparent that the Mercedes engines were being definitely shunted to the Albatros and A.E.G. factories, and without the Mercedes they were not Fokkers. When certain Mercedes designers broke away from that firm to develop the 185 h.p. B.M.W., I had no better luck getting a fair quota of those engines. The Pfalz firm, close to headquarters, got these engines diverted

to them. In the final year and a half of the war, some of the pilots, forced to fly the Pfalz planes powered with the B.M.W., deliberately cracked them up in order to salvage the engine to instal in a Fokker D-7, I was told. Six new Pfalz were cracked up in two weeks by one squadron. It became increasingly evident that unless immediate measures were taken to correct the situation, I should be again squeezed out of the manufacture of combat planes, even though I designed them. Looking over the engines available, I discovered that a large surplus of 110 Le Rhone rotaries, which had been diverted for training planes, had accumulated because no manufacturer had produced a satisfactory plane for this horse-power. I decided to build a cantilever wooden wing monoplane around the Le Rhone 110, despite the fact that my first ship along those lines had been rejected a year and a half before.

The D-8 monoplane, of the parasol type, had exactly the same shape and wing for which I had been ridiculed. But in the period since my original failure to convince army experts, the cantilever wing with its box spars had proven its reliability at the front in the D-7. The wings were almost invulnerable under the hottest fire. Bullets shooting away struts and guy wires left ordinary wings in a state of collapse, but they scarcely damaged box spars.

And so when the D-8 entered the second competition at Johannisthal, the front pilots were as enthusiastic about it as they had previously been about the D-7, and voted for it over all competing types.

Once more I encountered the opposition of the conservative army mind, however. During the years of the war, the air corps had developed a scientific testing organization with complicated analyses and methods by which it proved the stresses and strains that a plane could stand. It became more and more difficult to satisfy these " pure " scientists. Red tape so entangled a plane that it could never work loose.

When the first D-8 was submitted to the engineering division to be sandload tested, the wings proved to be sufficiently strong, but the regulations called for a proportionate strength in the rear spar compared to the front spar. These regulations were for the ordinary brace-winged type. Since no regulations existed for cantilever wings, these rules stood for all. The plane had gone through all its flying tests, diving and stunting in every conceivable manner without showing any signs of weakness or trouble. But regulations were regulations.

Complying with the Government's edict, we strengthened the rear spar and started to produce in quantity and the the first six planes were rushed to the front. They were not in service more than a few days before we received news that one of the best pilots, whom I greatly admired, had been killed during an air fight when his wing collapsed. At first, it was assumed that the pilot had simply overstrained the ship in an unknown manner. But when a second crash of the same nature occurred, it no longer looked like an isolated accident. Even so, the plane was not immediately grounded, because the D-8 had received such unanimous approval from the fighting pilots. But when the third machine crumpled in the air, the disaster assumed major proportions.

The whole air corps was now fully alarmed. Almost every pilot of importance had asked for a D-8. The whole Richthofen " circus " was to be outfitted as soon as we had produced thirty planes. About fifty or sixty of the type were in work, and a number of others on trains moving towards the front. Since the aces were to receive them first, there was a possibility that the flower of the German air corps would be wiped out.

Because the first test ships had given no trouble, the army engineering department asserted that poor workmanship or poor material was at fault. An investigation was started at once. The results were fruitless. There was no

accounting for the wing's collapse. All spars had been fully up to dimensions, and the workmanship was the usual high standard. The controversy between the army engineering department and our procurement department grew more and more heated as each tried to pin the responsibility on the other. A demand was made that all wings be replaced and reinforced. This seemed pointless and would mean an enormous loss to the factory.

My attitude was that I would accept responsibility only if it could be proved that the wings were under strength, as the test wings had lived up to the army engineering department's own requirements—which weren't mine. To settle this point, it was decided to bring back the wings from the front for a sandload test. In this test, the ship is turned on its back, while bags of sand, to give the equivalent of air pressure, are loaded on the inverted wing until it breaks. The D-8 wing supported more than six times the weight of the entire plane, its required safety factor. Not satisfied, the engineering department tested half a dozen more wings, before reluctantly admitting that we were not to blame for the weakness. Their tests left the whole matter as much of a mystery as ever, and all production was held up, pending a solution.

Because of the fact that aeronautical science was still a relatively unexplored region, and seemingly inexplicable accidents happened to aeroplanes, many fine pilots sacrificed their lives while designers were groping in the dark towards ultimate safety. Sandload tests, on which the army technical bureau placed so much reliance, merely indicated the ability of the wings to support a certain dead weight. The required safety factor was six. What such tests failed to reveal were the more subtle weaknesses of designing. Designers depended as much on practical experience as on engineering knowledge, and engineers without practical experience were lost.

One of the most dangerous planes had proved to be the

early series of the Albatros, D-V, which for almost a year in 1917 had supplanted the Fokker fighter. It was a biplane with a large top wing and smaller lower wing, the latter constructed around a single spar. It had succeeded the D-III, but had failed to be an improvement. The lone spar, unable to absorb the tremendous torsions put upon it during air combat, splintered, the wing collapsed, and the doomed pilot crashed to his death. As far as could be ascertained, more than eighteen pilots were killed in this way in Albatros D-V's. Allied aviators soon learned that the German airman in an Albatros dared not dive too swiftly, and they frequently escaped from a tight corner by the simple expedient of diving away three or four thousand feet. Because, for a time, practically all the fighting equipment at the front was limited to the D-V, these planes could not be withdrawn. Air headquarters was placed in a tight position, however, and a delayed investigation was finally made. It was discovered that the D-V had not even been submitted to the customary sandload test, in such haste had orders been given for their quantity production. For this reason, when the Fokker D-8 showed signs of wing collapse, the memory of the Albatros D-V was recalled.

These terrifying accidents with the Albatros were not entirely in vain, however. They pointed to the great need of a practical parachute adapted to aeroplane use. As far as the Germans were concerned, it was not until the middle of 1917 that the chute was adopted. The English among the Allies had the best and strongest parachute for aviators during the war, and German airmen felt lucky to capture one. Many flyers, however, died unnecessarily for lack of a parachute. The German parachute was the Heinecke attached type. A string from the chute, packed in a bag strapped to the pilot's back, was fastened to the aeroplane. When the pilot jumped, the string pulled the parachute out of the pack. It opened, and the pilot's weight broke the attaching string. Under normal conditions the Hein-

ecke parachute worked satisfactorily, but if the pilot jumped during a spin or other complicated manœuvre the string or chute tangled, as a rule. Nevertheless, these parachutes were furnished to pilots as fast as they could be made, and saved many lives.

When the army admitted it was at a loss to explain the collapse of the D-8 wing in the air, it seemed up to me to discover the cause or cease production on that type. Therefore, I took a new wing out of production and treated it to a sandload test in our own factory. As it was progressively loaded, the deflections of the wing were carefully measured from tip to tip. I discovered that with the increasing load, the angle of incidence at the wing-tips increased perceptibly. I did not remember having observed this action in the case of the original wings, as first designed by me. It suddenly dawned on me that this increasing angle of incidence was the cause of the wing's collapse, as logically the load resulting from the air pressure in a steep dive would increase faster at the wing-tips than in the middle, owing to the increased angle of incidence.

It was the strengthening of the rear spar—ordered by the army's technical bureau—which had caused an uneven deflection along the wing under load. The tip of the wing was taking more load than the middle part. The resultant torsion caused the wing to collapse under the strain of combat manœuvres.

At first the army technical bureau wouldn't give in, further than to permit the front spar to be reinforced to bring back the original ratio of strength between the front and rear spars. Eventually, it was agreed that the old specifications were correct.

Production again got under way on the D-8. No further trouble was experienced, but the delay was such that this final pursuit type hardly figured in front combat, for just when the factory began to renew production the war ended.

Some forty D-7's and a few D-8's, either captured or delivered after the armistice, were brought back to McCook Field, at Dayton, by the United States Army Air Corps. They were flown for experimental purposes there, and gained a solid reputation for me among army aeronautical engineers.

XV

MY OWN MACHINE-GUN WAR

COINCIDENT with designing the successive Fokker fighters, I was altering the original design of the machine-gun synchronized gear and fighting a continuous war on that front, too, as self-appointed competitors sought to cut in on my profitable monopoly. The first order for the original, simple gear was for thirty guns, delivered over a two months' period. As these proved successful, orders increased with avalanche momentum.

A small department in the Schwerin factory managed to keep pace with the demand for gun gears for a time. While the machine-guns were used solely on Fokker fighters, this was a satisfactory arrangement. But the army soon ordered the synchronizing sets installed on competitors' observation planes as well. This necessitated our sending mechanics and engineers into other plants to supervise installation, and a certain amount of antagonism arose. My competitors either tried to imitate the gears, or to prove that mine were unfit for use on other than Fokker planes. In the beginning, different gears were made for every type of engine and propeller, and types of both were constantly changing in small, intricate ways. Naturally, I contended that the business was properly mine, not only by right of invention, but for the reason that I could adapt the gears more readily to shifting conditions than anyone else.

If it seems that mine was a dog-in-the-manger attitude, I wonder if there is not more than a plausible excuse for it. One invents a device which anyone else had an equal opportunity to discover for himself. Then, after considerable effort and nerve-racking flights at the front, one manages to capitalize the invention. It is not until this moment that others "muscle in," not because they have a contribution

—which might give them real rights in the original invention—but simply because one's prosperity has made their mouths water. It is a condition which all inventors, along with artists and all creative persons, have to face. It seems to me that we are all justified in resenting the activities of poachers, if our claims to priority of invention are genuine.

Facing the matter realistically, however, I perceived that this business would soon be lost to me unless I kept a jump or two ahead of my competitors by constantly refining the gun gear. And so I devised a better method of operation. Instead of employing a system of cams, push rods, and levers stimulated by the propeller, I decided it would be more practical to transmit the engine's motion to the gun by means of a flexible shaft operating from the camshaft which runs, of course, at half the speed of the crankshaft. A clutch threw the synchronizing gear in and out, to protect it against wear when the gun was not shooting.

This change permitted partial standardization of the engine attachment. To adapt the gear to any aeroplane, it was now only necessary to determine the type of engine and the length of the flexible shaft connecting engine and gun. Despite this great simplification, however, there were still so many types of engines in use and so many different machine-guns employed that it was necessary to build a whole series of gears. One set would fit the Mercedes and be driven from the camshaft, but entirely different sets were required for rotary-engine use. Moreover, each flexible shaft, dependent on its length, had a different ratio of play, so that the whole process of manufacture remained irritatingly complicated.

In addition, all machine-guns destined for aeroplanes had to be sent to Schwerin for alteration. Originally we had used the Parabellum air-cooled guns, which had been designed for light infantry work, but were later entirely diverted to aeroplane use as being more valuable for the air force. The demand soon out-distanced the supply. Run-

ning short, we had to convert the heavy, water-cooled infantry gun. Stripping away the water jacket and other unnecessary parts, we finally obtained a gun about fifty per cent. heavier than the Parabellum. The quantities were unlimited. After our demand grew heavy enough, the gun factory co-operated with us more closely in this conversion work, remodelling certain parts which had to be changed for aeroplane use.

The number of guns the corps used, while large, was so much smaller than the immense production for the army that the factories had at first declined to produce a special aeroplane type. It was simpler to have us adapt them. This meant that we, after converting the guns and equipping them with new trigger boxes, had to reship them to the various aeroplane manufacturers along with the proper gear boxes and lengths of flexible shaft. As the alterations and adaptations mounted in volume, the army demanded that we move the armament section to Berlin, where the machine-guns were being produced, at Spandau. The order was complied with, and the separate company was called the German Aeroplane Armament Company. At the time the factory was moved to the Berlin suburb, Reinickendorf, the factory was producing 3,000 gears a month.

The machine-guns which we were adapting did not entirely satisfy me. They were far from perfect. They frequently jammed, due to some mechanical trouble which could be cleared up quickly enough on the ground, but was more difficult to adjust in the air when seconds sometimes meant the difference between life and death. It seemed to me that we had to devise some method of compensating for the greater difficulty of shooting in the air. On observation planes, it was almost impossible to attach the machine-gun directly in front of the pilot where he could reach it readily. As a rule, the gun was secured alongside the engine. To help the pilot remedy a jam, we devised a

long-distance operating lever by which he could reload the gun mechanically when it jammed. We also made special sights, to compensate instantly for the great speed of the target and the unusual positions from which it approached. Counters were made to indicate the number of shots fired so that a pilot in his excitement would not enter fight unarmed.

Pilots could be as temperamental as prima donnas, particularly about their machine-guns. Many changes were made in accord with their suggestions, for their opinions about ease of firing carried a great deal of weight. Richthofen, who was a great hunter of animals as well as of men, demanded that the trigger be changed. The first triggers, which threw in the gear clutch permitting the engine to fire the gun, were located in the middle of a circular grip topping the control stick. The pilot fired both guns by pushing down on the buttons with his thumb. Richthofen asked that the trigger operate like that on a rifle. His trigger finger was more alive to nerve impulses than his thumb. It seemed to him the more natural way to shoot, and every effort was made to make instruments work along instinctive lines, for in air combat the pilot was past thinking out his actions. His reactions had to be instantaneous and accurate. Richthofen's word was practically law, and so a new trigger was created with his aid. In this particular instance, I didn't think the change was so important, but to give him pleasure and because it meant a lot of extra business for us, I was perfectly willing to follow his suggestion. Several thousand of the new grips and triggers had to be made immediately for old planes, and we put them out because we held a complete monopoly in this branch of armament work. Types and machine-guns were changing so rapidly under the pressure of front demand that no one else had a chance to break in, as yet. With the headstart we had, the business was too complicated for successful competition.

By this time there were sixty different sets of gear-boxes which had to be kept in supply. Each aeroplane factory was producing four or five different kinds of planes and using as many different engines, so that it became all but impossible to keep the separate gears in stock. This procedure seemed ridiculous to me, for I have always disliked complicated methods when simpler ones will suffice. To eliminate this duplication, I approached the head of the army engine department with a proposal that the motor drives of all engines be standardized; in short, to have the same drive shaft, the same number of revolutions, the same flange on which to attach our gear-boxes on every engine, regardless of type. By one stroke this would cut the type of gear-box to one, simplify the coupling, and in general eliminate trouble not only in the factory, but what was more important, at the front. At the same time, we succeeded in standardizing the machine-gun types down to two. The necessary co-operation was granted, to my great relief, for I now visioned smooth sailing ahead. We should be able to enter on real quantity production of the single gear and spare parts, and reduce the mechanics of the whole operation to such an extent that gunnery sergeants would no longer be driven wild trying to keep in touch with its latest tricks. Our economies would be great, both in time, effort, and money, but the armament section would be even more greatly benefited.

In performing this service for the army, I performed a disservice to myself. Standardization made it possible for anyone to produce the gear-box and the large orders made it extremely profitable to do so. At one stroke my monopoly had seemingly been destroyed. Other manufacturers, who had been sniffing at this rich field for months, decided the time was ripe for their entrance. Hitherto, the ramifications of the business had effectually kept them out.

Close friends of certain army officials in charge of the purchase department of the armament section of the air

corps formed a company for the manufacture of the gears. Every effort was made to keep their plans secret, but it was not long before I was in possession of the entire scheme. Had the company been openly formed and a proper approach made to me so that I could have prepared for the competition, their tactics would not have seemed offensive, as they did under the actual circumstances. For at the time we were delivering 6,000 synchronizing gears monthly and I had bought improved machinery at wartime prices to speed up production, and ordered enormous quantities of raw material. Without previous official warning, I was informed that a large gramophone factory near Berlin, where time gears for torpedoes and mines were being manufactured, was to be equipped for intensive production of my gears. A letter from the army armament section revealed that our monthly order would be reduced by eighty per cent., because the gramophone factory would commence manufacturing from a certain date.

Without so much as a by-your-leave, the gramophone factory had been supplied with samples of our synchronized gears, and certain of the better army inspectors transferred from our factory to assist in bringing their manufacturing process up to standard. All this was possible because the former manager of the gramophone factory had been in charge of the purchasing department of the army armament section. It became increasingly evident that certain armament officers had more than a finger in the pie they anticipated cutting. The gramophone factory had the best equipment, and it was thought that through up-to-date producing methods the gears could be made better and for less money than we were receiving. From their point of view, it looked as though I was to lose a fine business and they were to inherit it.

The whole underhand scheme aroused my fighting spirit. Despite their influence, their new factory, and various other obvious advantages, I decided not to let them get away

with it. The army had thanked me for inventing the synchronized machine-gun gear. Praise had been showered on me when my standardization saved the army millions of marks. The pilots were grateful for my increasing the efficiency of their fighting planes, and decreasing the work needed to maintain the guns. It seemed to me that thanks were not enough. But to get more it would be necessary to defeat this virtual conspiracy among a closely knit group of officials. They seemed bent on taking advantage of their positions to profit themselves. The fact that I was to suffer great losses by reason of the heavy investments made to enlarge the plant deterred them not a bit. And so I laid my plans to catch them on the hip.

Anticipating that the new factory would have greater trouble getting under way than seemed likely on paper, the first thing I did was to inform the army that I would only deliver the present order. To produce a small quantity of the gears for a time, only to be pushed out of the business entirely, was a prospect which didn't interest me, I said. For that reason I would quit at once, leaving my competitors a clear field. From that day forth I refused further orders.

The army could be very unpleasant if a manufacturer failed to fill orders which had been accepted. Fortunately, however, there was no law or regulation forcing me to accept additional orders. Particularly was this true when the army had signified an intention of manufacturing the article itself, or through other channels.

Doubtless, the officers were surprised that I accepted defeat so easily. Had they given the matter thought, they would have known this was unlike me. But my acquiescence lulled them to a false sense of security. I had capitulated more quickly than they calculated, but their plans had been laid so well they probably had no other thought than of eventful victory. Perhaps they were already cutting their profits.

For a month we played the game. My last shipment was made. The army turned for its supply to the gramophone factory. Things had been happening there, not according to schedule, but as they always happen when new projects are started, with delays because of irritating oversights. Production time came and passed. Still the army didn't get its consignment of gears. It became obvious that six weeks, possibly more than two months, would elapse before production could be speeded up sufficiently to supply the demand. The war was going on, gears were needed, what was the delay now that Fokker had standardized them and stimulated production? The front became insistent. The army officers became alarmed.

In the offing, approaching nearer every day, was the inevitable moment when aeroplanes now in production would be ready for shipment to the front. There would be no gears or guns on hand to convert them into fighting ships. Headquarters would investigate, not delicately, but with exasperated, military brusqueness. The responsibility would be traced directly back to the armament section. An inquiry would be instituted, and the whole conspiracy exposed. The close relation officials themselves held with the gramophone factory would come to light. Court-martials, swift justice would follow. Those responsible might not even get off alive—the term traitor covered a multitude of sins.

When they came to me, they came running. Badly frightened, they were ready to promise anything. In trying to make themselves independent of me, they had made themselves more dependent than ever. There was no way out for them, except through me. Even had my terms been harsh, they would have had to accept them. Revenge didn't interest me, however. All that I wished was to protect myself. I was perfectly willing to go ahead with production but not on a weekly or monthly basis. If they wished to change their monthly ratio of supply,

they must give me at least three months' notice. In addition, they must give me a six months' uncancellable order at no change in the old price.

Thoroughly confident that this would be the outcome of the struggle, I had not stopped my production but only cut it down by half. It was a simple matter to speed up sufficiently to fill the shortage.

Nevertheless, it was obvious that the gramophone factory, once fairly started, would be a serious competitor. It had already received an order equivalent to six months' production. Certain guarantees had been made in its contract, which I had never been able to demand. Soon I would lose my business, despite this coup. There was no real guarantee that the antagonized army officials would live up to their contract. It was in writing, but the military mind had violated more important scraps of paper. Any excuse would serve for rejecting my gears as unfit, if I insisted on the letter of the bond. Similar incidents often happened during the war. All law was martial. I conferred with Heinrich F. Luebbe, my chief engineer in the armament developing work.

I believed with Ulysses that the gods help those who help themselves. To protect ourselves in this case we improved the clutch by enclosing all parts and making it practically foolproof, and devised a method of timing the gear so that any mechanic could adjust it by turning a single screw. Special armament mechanics would no longer be needed, a consideration which would weigh heavily with headquarters. Men were daily more precious.

In the greatest secrecy, I manufactured 6,000 of this improved type of gear without an order. Meanwhile I organized the whole factory to produce the new model on a large monthly schedule. The risk I ran was that the armament section would reject our refinements, but I could depend on my boys at the front.

Just when my big competitor was finally ready to flood

the market with his copy of my old gear, I demonstrated my new one. Fitting it on a number of planes at the front, I let the pilots and mechanics fight my campaign for me. They all insisted through headquarters on the simplified type. I had won.

The armament section was left sitting high and dry with about two million marks' worth of useless gears, while the gramophone factory found its carefully planned production programme completely wrecked. My factory, receiving all the orders, was running at full capacity. This situation kept up until the end of the war, about eight months later.

In defence of the German army and its regular officers, it should be said that it was not until civilians began donning the uniform that corruption set in. These rather vociferous patriots obtained positions in the various supply departments, and, lacking all traditions of honour such as were nurtured among the regular officer corps, were not unwilling to use their high positions for their own gain.

With this latest development, the synchronized gun was perfected as far as possible, it seemed to me. But it was always my habit to look ahead, and the next step was the completely engine-driven gun. During the eight months before the Armistice, therefore, I kept experimenting, until I had worked out an entirely new type of machine-gun, capable of shooting 7,200 rounds a minute.

The gun was driven by the engine, so that both the shooting and loading would be synchronous. Jams were most frequently caused by the automatic reloading dependent on recoil. Nor were 600 or 800 shots a minute enough. Aeroplanes flew at such tremendous speeds that it was often impossible to fire at an enemy for more than a second or two—time for a burst of only ten or fifteen shots.

Therefore, we designed a machine-gun with twelve barrels mounted on a revolving unit. Half of the explosion chamber of each barrel was cut away to be closed by another revolving unit underneath. The bullets were discharged at

the time when the two parts of the barrel came together. The belt containing the bullets was run between these drums so there was no question of pulling the bullets out of a belt, sticking them into a chamber, and extracting them after the bullets were fired—the operations which usually caused jamming. It was an extremely simple gun, and would have been a terrific weapon in the air. The final experiments were just being commenced, when the demand ceased. Theoretically, we should have turned this gun over to the Allies, but I didn't. I have it still, at home.

XVI

ACES

THE contempt of the German flyers for death was only equalled by their love of life while they still had that precious possession. So complete was their disregard for the hazard of aerial combat, I sometimes thought they were hardly aware of its terrible dangers. Yet that could not be possible, for on every day they went hunting in the skies some members of the *Jagdstaffel* failed to return. When I met them in their headquarters at the front they jested and sported as though the angel of death were not the permanent leader of their circus, and when they came to Berlin on a fortnight's holiday, they lived as riotously as though they hadn't a care in the world. That is, with a few exceptions, among them Richthofen. He was calm, cold, ambitious; a born leader of men and Germany's greatest ace.

Richthofen, Boelcke, and Immelmann, Germany's trio of aces, I knew intimately; as intimately at least as one knows men who, having stared at death so often, have learned to wear a mask lest an occasional human weakness betray their almost hypnotic gallantry. They were as different as men of the same breed can be. One by one I saw them die as I knew they must die, for they were in a contest not with a human opponent but with Time, the cruellest foe in the world. Judging their bravery by my own, I reckoned them supreme. Knowing the accuracy of the machine-gun and the aeroplane in the hands of a skilled pilot, calculating the remote chance of surviving any prolonged campaign in the air, I should never have had the courage to face the enemy. Every man who went aloft was marked for death, sooner or later, once his wheels left the ground.

Max Immelmann, with Boelcke, was the first German

pilot to win the *Pour le Mérite*, the Empire's highest decoration for military bravery. This medal, originated by Frederick the Great, was colloquially called " the blue Max," from its colour and Frederick's name. Its French title was due to the fact that the founder of the German Empire would only speak French. Immelmann was a serious, modest youngster intensely interested in the technical details of flying. He was popular, and originally better known than Boelcke. He came to Berlin after his fourth or fifth victory and I took him to Schwerin for a tour of my factory. We talked little of abstract matters, but always of machine-guns—he was an excellent shot—of aerial manœuvres, of the relative merits of one pursuit plane over another. He had eyes like a bird of prey, and a short, athletic body capable of standing the bombardment of nerves from which every flier suffers when alone with his imagination. At no time did he drop a hint that he considered air fighting dangerous. As far as I might have known, he had not the slightest care in the world. He gained fifteen victories before he was killed June 18th, 1916.

Almost as much mystery surrounds the manner of Immelmann's death as Guynemer's, which was never adequately explained. Immelmann's plane suddenly fell to the ground as he was flying near the German front lines. It was first given out that his Fokker fighter had failed in mid-air. This explanation naturally did not satisfy me, and I insisted on examining the remains of the wreck, and establishing the facts of his death. What I saw convinced me and others that the fuselage had been shot in two by shrapnel fire. The control wires were cut as by shrapnel, the severed ends bent in, not stretched as they would have been in an ordinary crash. The tail of the fuselage was found a considerable distance from the plane itself. As he was flying over the German lines there was a strong opinion in the air force that his comparatively still unknown monoplane type—which somewhat resembled a Morane-Solnier

—had been mistaken for a French plane. I was finally able to convince air headquarters sufficiently so that, while it was not stated that he had been shot down by German artillery—which would have horrified his millions of admirers—neither was the disaster blamed on the weakness of his Fokker plane. The air corps exonerated the Fokker plane unofficially, although as far as the public was concerned the whole episode was hushed up. Because of this investigation, however, silhouettes of all German types were sent to all artillery commanders to prevent a repetition of the Immelmann catastrophe.

Boelcke, the son of a Saxon schoolmaster, was of quite a different type, although like Immelmann intensely interested in the technical details of flying and aerial combat. In a desperate effort to save him from inevitable death, the High Command restricted his flying after his sixteenth victory in 1916, and sent him to Austria, Bulgaria, and Turkey to instruct others in airmanship. But he became so wearied of the relentless adulation showered on him that he begged leave to return to the front. Until Lieutenant Boehme, of his *staffel*, collided with his plane in mid-air, causing his wing to drop off, his victories mounted, reaching a total of forty before he died. Lieutenant Boehme, who was barely restrained from suicide in his grief, was later shot down in a dog-fight.

Choosing the flying corps because an asthmatic affliction kept him from harder labour, Boelcke left the signal corps shortly before the war to enter the Halberstadt flying school. After seven weeks' training he became a pilot and September 1st, 1914, saw him flying over the Western Front as an observer. It was in June 1915 that he obtained his first Fokker single-seater in company with Immelmann and began his career as an ace. Boelcke had charm, and a kindness of heart which extended itself even to the enemies he brought down. He spent much of his leisure motoring to hospitals to cheer up his wounded opponents, leaving

some gift of cigarettes or other trifle as he departed. Richthofen, who worshipped Boelcke and learned many of his flying tricks from him, records the fact that "it is a strange thing that everybody who met Boelcke imagined that he alone was his true friend. I have met about forty men, each of whom imagined that he alone had Boelcke's affection. Men whose names were unknown to Boelcke believed that he was particularly fond of them. Boelcke had not a personal enemy." Yet no one had a better record of bravery. He died October 28th, 1916.

Richthofen, with whom I became very friendly, was an entirely different sort of flier from the other two. Without the subconscious art which Boelcke and Immelmann possessed, he was slow to learn to fly, crashing on his first solo flight and only mastering the plane at last by sheer force of superior will. Time and again he escaped death by a miracle before he managed to conquer the unruly plane which later became his willing slave. A Prussian, son of a Junker family, Richthofen was imbued with the usual ideas of a young nobleman. He flew spectacularly in his series of all-red planes which became famous over the Western Front. Flaunting himself in the face of his enemies, he built up a reputation which perhaps somewhat daunted his opponents before the fight began.

Ultimately, Richthofen became an excellent flier and a fine shot, having always done a lot of big-game hunting. But whereas many pilots flew with a kind of innocent courage which had its special kind of magnificence, Richthofen flew with his brains, and made his ability serve him. Analysing every problem of aerial combat, he reduced chance to the minimum. In the beginning his victories were easy. Picking out an observation plane, he dived on it from the unprotected rear, opened up with a burst and completed the job almost before the enemy pilots were aware of trouble. It was something of this machine-like perfection which accounts for his near death in 1917 after

his fifty-seventh victory. Richthofen himself has described the experience:

" On a very fine day, July 6th, 1917, I was scouting with my gentlemen. We had flown for quite a while between Ypres and Armentières without getting into contact with the enemy.

" Then I saw a formation on the other side and thought immediately, these fellows want to fly over. . . . We had an unfavourable wind—that is, it came from the east. I watched them fly some distance behind our lines. Then I cut off their retreat. They were again my dear friends, the Big Vickers. . . . The observer sits in front. . . .

" My opponent turned and accepted the fight, but at such a distance that one could hardly call it a real air fight. I had not even prepared my gun for firing, for there was lots of time before I could begin to fight. Then I saw the enemy's observer, probably from sheer excitement, open fire. I let him shoot, for, at a distance of 300 yards or more, the best marksmanship is helpless. One does not hit one's target at such a distance.

" Now he flies toward me, and I hope that I shall succeed in getting behind him and opening fire.

" Suddenly, something strikes me in the head. For a moment, my whole body is paralysed. My arms hang down limply beside me; my legs flop loosely beyond my control. The worst was that a nerve leading to my eyes had been paralysed and I was completely blind.

" I feel my machine tumbling down—falling. At the moment, the idea strikes me, ' This is how it feels when one is shot down to his death.' Any moment I wait for my wings to break off. I am alone in my bus. I don't lose my senses for a moment.

" Soon I regain power over my arms and legs, so that I grip the wheel. Mechanically, I cut off the engine, but what good does that do ? One can't fly without sight. I forced my eyes open—tore off my goggles—but even then I could

not see the sun. I was completely blind. The seconds seemed like eternities. I noticed I was still falling.

" From time to time, my machine had caught itself, but only to slip off again. At the beginning, I had been at a height of 4,000 yards, and now I must have fallen at least 2,000 or 3,000 yards. I concentrated all my energy and said to myself, ' I must see—I must—I must see.'

" Whether my energy helped me in this case, I do not know. At any rate, suddenly I could discern black and white spots, and more and more I regained my eyesight. I looked into the sun—could stare straight into it without having the least pains. It seemed as though I was looking through thick black goggles.

" Again I caught the machine and brought it into a normal position and continued gliding down. Nothing but shell-holes below me. A big block of forest came before my vision and I recognized that I was within our lines.

" If the Englishman had followed me, he could have brought me down without difficulty, but, thanks to God, my comrades protected me. At the beginning, they couldn't understand my fall.

" I wanted to land immediately, for I didn't know how long I could keep up consciousness. . . .

" I noticed that my strength was leaving me and that everything was turning black before my eyes. Now it was high time.

" I landed my machine without any particular difficulties, tore down a few telephone wires, which I didn't mind at the moment. . . . I tumbled out of the machine and could not rise again. . . .

" I had quite a good-sized hole—a wound of about ten centimetres in length. At one spot, as big as a dollar, the bare white skull bone lay exposed. My thick Richthofen skull had proved itself bullet proof."

The news of his fall was kept from the German public, which superstitiously regarded him as a superman, beyond

death. It was less than a month before he was back in the air again, but never as his old self. Something had gone out of him. " Manfred was changed after he received his wounds," his mother is reported to have said. Now he knew that death could reach him as well as the others, and that is no knowledge for an airman to live with, day and night.

The Richthofen " circus," as the Allies called it, was known in Germany as the *Jagdgeschwader*, composed of four *staffels* of five planes each. Towards the end of the war, there were three of these, and their size increased to forty-eight planes. They moved back and forth along the lines from July, 1917, on, wherever the fighting was thickest. It was with *Jagdstaffel* II, Boelcke's old group to whose command Richthofen succeeded, that the greatest German ace gained his long list of victories before the formation of the " circus." The Allied planes were camouflaged in colours, but as if in direct challenge, Richthofen's circus was brighter than the sun in colour. His own plane was red from propeller to tail, and the planes of his particular *staffel* were red in kind, with little distinguishing marks, such as a blue tail, white rudder, black aileron, to set them apart from the Red Knight.

For three weeks I lived with the Richthofen *Jagdstaffel*, located at the time on the Ypres front. Ten or twelve officers were living together in a pretty little Belgian country place. This was only a short time before Richthofen was killed, when he commanded the circus and had a great deal of executive work to attend to as well as his daily fighting. Secretaries raced about, and orderlies came and went all day.

Artillery sites were only about fifteen kilometres behind the front lines, and so, when the circus was scheduled to go aloft, I would start an hour or so ahead of time for the artillery camp, and follow the air fights through their powerful range fingers. As a rule the fights were not

more than nine or ten miles off, and two or three miles in the sky.

Spending hours at the artillery range, I saw battle after battle in the air. *Staffel* after *staffel* would leave its airport, circle for height, proceed to the appointed rendezvous in the sky, and form the "circus" before cruising along the front in search of Allied squadrons. Richthofen would be flying out in front, the lowest plane in an echelon of V's, like a flock of immobile geese, fantastically coloured and flashing like mirrors in the sun.

Out of the western skies would come a tinier V of Allied planes, then another and another, until the whole line of them closed with the "circus" and the blue sky was etched with streaking flight. Round and round, diving, zooming, looping, with engines roaring full out, these lethal wasps spat flaming death through the glittering propeller's disk. Comet-like projectiles missed each other by inches in the whirlpool of sound and fury. Suddenly, out of nowhere, two planes in 125-mile-an-hour flight rushed at each other too late to loop, dive, swerve. Crash! They merged, tanging wings, clasping each other like friends long separated, before gravity pulled them reluctantly apart and they began a crazy descent to bury themselves eight feet in earth miles below. Perhaps I alone noticed them. The taut pilots in the dog-fights were taking in sensations with express-train speed—flying—fighting—automatons at the highest pitch of skill and nerve in a frenzy of killing.

Richthofen gained the tail of an enemy. The tracer bullets were spelling out death, when the enemy's engine stopped, the plane went into a quick spin, and only levelled out for a landing quite close to where we were watching the whole battle. We quickly motored over. Richthofen had already gone back to the front, after landing first and shaking hands with the officer he had brought down. A bullet had pierced the officer's pocket, ruined a packet of cigarettes, travelled on down through his sleeve, punctured

his Sam Browne belt and gone on without injury. We looked over his coat, that might so easily have been his shroud.

Asking him to ride along with us, we took him back to the flying field, where we picked up Richthofen and together went to the Casino for a good breakfast and friendly chat. I took moving pictures of the officer and Richthofen. Later I acquired a patch of the fabric from Richthofen's sixtieth victory. After a pleasant breakfast, we turned the prisoner over to headquarters, since it was against regulations to keep him for any length of time.

For several days we followed Richthofen's fights. Many of his victories were easy, especially when he attacked the clumsy two-seaters. His usual technique was to dive in their rear, zoom under the tail, and shoot them from very close range. By this time he had become a first-class pilot and handled his plane with utmost skill. Seldom did he use more than a quarter of his ammunition on an enemy. Four hundred rounds were carried for each of the two guns. When pilots went from one combat to another, they usually fought until their ammunition was exhausted before returning home.

I think one of the reasons Richthofen survived so long was his ability to keep guarding himself while he attacked. Many other aces were shot down during a fight unexpectedly, as they were training their guns on an enemy pilot. Richthofen would fight very close to his wing men, and not until it was a real dog-fight, with the whole air in confusion, would he release his formation to permit every pilot to shift for himself. He was an excellent teacher, and young pilots who showed exceptional skill and courage were sent to his *staffel* to get experience. At first they were taken along to observe the fighting from a distance, and forbidden to engage in combat at all during the first three flights. For it was found that many of the new pilots were killed in their

first fight, before they had learned to be all eyes in every direction.

Immediately after each battle, Richthofen would gather his officers for conference and a discussion of the tactics. Occasionally he would censure pilots too aggressive, or too willing to pull away before the battle was over. He was perhaps not so much liked as admired, but the respect other pilots had for him was unbounded.

Proud though he was, the réclame of his feats gave him no particular pleasure. He was not interested in publicity, and though he received letters by the ton from all sorts of people, he cared little for fan mail. When he was around, parties were never wild, for the other pilots felt constrained in the presence of their chief.

Richthofen knew little or nothing about the technical details of aeroplanes. Unlike Boelcke and Immelmann, he was not even interested, except as it was necessary for him to know for his own safety and development.

Richthofen met his death in action, about noon of April 21st, 1918, at the hand of Captain Roy Brown of the Royal Air Force. Brown flew a Sopwith Camel; Richthofen a Fokker triplane. Richthofen, all eyes on another Camel he was about to bring down, never knew what hit him. When his plane rolled to a stop near the Allied trenches just outside the ruined village of Bailly-le-Sec, in the Somme valley, he was dead from a single bullet which traversed his breast from the right to the left side. Allied aviators dropped a note on Richthofen's old field. The next day Richthofen was buried with full military honours, and Allied aviators flew over with a picture of the grave, which I now have. In November, 1925, his body was brought back to Germany for State burial, in Berlin, with an entire nation paying him its highest honours. Behind Richthofen's mother, President von Hindenburg led the thousands of mourners.

Three other aces, fortunately still living, commanded the

three *Jagdgeschwaders* which patrolled the front at the close of the war. They were Captain Ernst Udet, with sixty-three victories; Captain Bruno Loerzer, with forty-two, and Captain R. Goehring with twenty-six, who succeeded to Richthofen's command. Goehring, who began his flying career as Loerzer's observer, was not as excellent a flier as either of the other two, but his knowledge of tactics was extensive. After the war he became an influential politician in the National Socialist party, and is now Hitler's right-hand man. Loerzer, a natural pilot and soldier, loved a good time when he was not directly in the grim business of combat flying and still is well known along Unter den Linden as a good fellow. He has retained his interest in aviation, helping to organize and advance the sport-flying movement. Udet, a spectacular, acrobatic pilot and excellent shot, burst into fame while very young and still is Germany's best known stunt pilot. Comical, full of pranks, his caricatures of café life tickled the fancy of his brother pilots and the girls he was constantly giving a good time. He was among the few German pilots to fly the D-8, which because of its thin monoplane wing and great speed was known to his English opponents as " the flying razor."

While they were alive, we did our best to give the fliers a gay time. It was an open secret that all aeroplane manufacturers entertained lavishly while the pilots were on leave, and when the aces came to Berlin for the periodical competitions. Because of the popularity of the Fokker plane at the front, many of the pilots on furlough preferred to make their headquarters with us at the Hotel Bristol. I had a deep admiration for them, and counted many as close friends. Some were so young, I felt almost paternal towards them, although I was only twenty-eight when the war ended.

It was a pleasure to keep open house for the pilots. Naturally it served our interest to hear them talk, discuss one plane and another, the latest tactics of the Allied air-

men, sketch their ideal of a combat ship. But what they wanted most, and what we tried to give them, was gaiety, charm, diversion, the society of pretty girls, the kind of a good time they had been dreaming about during their nightmare stay at the front. Berlin was full of girls eager to provide this companionship, for aviators in Germany as in every other country were the heroes of the hour, and the spirit was in the air to make these men happy before they returned to face death alone.

XVII

ERSATZ

Ersatz is a German word for substitute. After two years of the war it was a word heard more and more commonly. By the time the war ended, it was practically impossible to obtain real food, real money, real men, real anything in Germany.

Because of the location of our factory, distant from Berlin, we obtained food more easily than the people nearer the capital. In the midst of the farmland, supplies were available, legally or illegally. When food became scarce in the markets, the workmen spent Saturdays and Sundays scouring the country. They bought direct from farmer friends regardless of food distribution cards, for it was impossible to check up on the source of supply. Bootlegging of foods became a widespread industry. The prices of eggs, meat, ham, butter, sugar, and other staples became as fixed as the price of bootleg liquors in the United States. Towards the last, and particularly in the final year, even money couldn't buy food except for the immensely wealthy, and people were reduced to trading in kind.

Bread was the first article to be distributed, each family being limited to so many ounces in proportion to its size. Butter was next. Graft began to show at once, with families obtaining tickets for absent members. People who could buy through illegitimate channels would not use up their food cards, but would sell them to less fortunate neighbours, the old law of supply and demand dictating the prices. Fairness and even common decency were forgotten in the struggle to get all the food one could lay one's hands on, for the first law of life was operating more relentlessly than in ordinary times of surplus.

Workmen in armament factories were particularly

favoured in the distribution of foods, so that we were able to buy large quantities of every available kind for our employees. Soon we were purchasing truck-loads of potatoes, rice, buckwheat, canned goods, and occasionally meat. By the end of the war, we had in operation complete grocery stores where the wives and workmen could buy supplies at prices lower than the outside market. For a time this practically solved the problem as far as our employees were concerned, but in 1918 food was rationed on little better than a starvation basis. A week's wages hardly sufficed to keep the larder even moderately filled. And the food obtainable barely satisfied the stomach.

Coffee was burned nuts or roasted corn. Sausages were made out of fish instead of meat. Butter was not to be had, but every kind of fat was used instead, and ways of cooking without grease were invented. Sugar was so expensive that no one but the wealthiest could afford it. Saccharine was used instead. Wherever I travelled, I carried with me a little silver box of saccharine tablets. In addition, if it could be bought, I carried with me a dozen lumps of sugar, because of my fondness for it. Even the best hotels supplied but one lump and frequently none.

I have always used sugar the way other people use alcohol, which I do not take at all. It happens that I don't like the smell of liquor, although I have no objection to other people drinking it. But on the other hand my system seems to demand sugar, basically the same as alcohol. I missed sugar during the war as some Americans missed liquor during prohibition. And so I carried sugar about with me and had a sugar supply in my safe. Whenever I drink coffee, tea, or milk I like a lot of sugar in it, and even to-day I carry in my pockets a supply of Hopjes, a Dutch coffee-and-sugar candy, which I sometimes eat instead of breakfast.

The shortage of food gave rise to what we called " butter and egg " flights among our test pilots. They started out

on what was ostensibly an altitude test of new planes. Once above the clouds, they disappeared, perhaps merely for the night, sometimes for a day or two. As food became scarcer in Schwerin these " butter and egg " flights became commoner. The pilots always reported that after flying around for quite a while, they were forced to land, but it seemed that they always landed near a homey-looking farmhouse where there was a good chance of their being treated hospitably. They would stay as long as their welcome held out, then change a spark plug or two, and fly back to Schwerin with a fresh supply of food in their cockpit.

This stunt reached a climax when one pilot was lost for three days. We were just preparing to send out search parties, fearing that he had flown out over the Baltic Sea, only forty miles north, when he returned Because of his long absence, his arrival brought everyone to the flying field, and a general rush was made for his plane to find out what had been the trouble. Our attention spoiled the principal object of his trip, which was to smuggle back a live pig, besides some other delicacies. The pig was so heavy that he had been forced to wait days for a strong head wind, in order to take off with the extra weight.

It did him no good. The firm immediately confiscated the pig in exchange for the worry he had caused everyone. That same day a group of important army officials had come up from Berlin to visit the plant. Among our products we displayed the live pig and made them a present of it to take back to Berlin. They were delighted, but the gift proved a disastrous one for us. Thereafter, every army delegation reached Schwerin with the highest expectations. No matter how virtuous people were otherwise, they would do anything for food.

It was out of this situation that the custom grew of aeroplane companies sending so-called love gifts (*Liebesgaben*) with every consignment of planes to the front. The practice developed to such an extent that it became an actual

burden on our company. As the competition became keener, the amounts of sugar, chocolate, ham and eggs, cigarettes, and other delicacies grew larger. It was of course an indirect form of graft, by whatever name it was called.

Things came to such a pass that I had an ice-box built to look like a gramophone case. In it I used to carry all my supplies of ham, sausage, eggs, and butter when I went to Berlin from Schwerin. These things were almost impossible to obtain in an hotel, even at unreasonable prices. Ordinary food I would carry in a handbag, just as one carries one's clothes. Everyone who could afford it did the same thing, because one could never be certain that there would be food where one arrived.

There is no doubt that many old people and children actually died from sheer undernourishment in those days. Under my instruction, my landlady daily cooked for at least ten or twelve, so that people who were in need could be fed. As far as I was personally concerned, there was never any difficulty about getting food, because I could always pay for it, and was willing to do so. When people in the army and navy found this out, I became a popular host. On the slightest provocation, important officials came to Schwerin for a conference, which usually included at least mid-day dinner, if not supper.

In addition to the problem of foods, which was naturally the most important, there was substitution in many other lines. It was difficult to obtain clothes: linen and cotton cloth became almost prohibitive in price, and paper was used as a substitute wherever possible. Towels, light uniforms, shoes, cords, bandages, anything which could be, was made of paper, and an enormous industry in such substitutes sprang up. For a time we could not get linen for aeroplane fabric, so we bought quantities of silk, which was not so scarce.

Silk was not as satisfactory as linen or cotton because

it was not as strong, nor would it take " dope " as well as the other fabrics. Under hard use it cracked readily, but lacking anything else we used hundreds of thousands of yards of it. Of course it was stolen from the factory by workmen because it was the finest quality available and made excellent dresses. Whenever any party was held in Schwerin, sixty per cent. of the women present were gowned in Fokker silk. We found it impossible to stop the leak, even when an entire dressmaking shop was discovered using nothing but our material. Some of it was dyed in checks for camouflage purposes in such a way that, even though re-dyed, the original colours would show up under artificial light, and this was one way of telling the guilty women at the evening parties.

When the war ended, I found tens of thousands of yards of silk still on hand. The price dropped precipitately, of course, and I kept many bolts for myself, and still have shirts which were made of it. For a long time when I went calling on a girl I didn't take a box of candy but several yards of silk for a dress, instead.

Metals of every sort became rarer as the war lasted, until there finally came a time when silver and nickel coins were worth more than the counter itself. Suddenly all small change simply went out of circulation, melted down for more valuable uses. In addition, the Government took up these metal coins, printing in their stead units of paper money as a medium for small trading. All the cities followed the Government's lead, printing small bills, but the printing presses found it difficult to keep pace with the concurrent depreciation of paper money. It became valueless, as far as practical purposes were concerned, and in order that workmen could be accommodated, the Government granted permission for various industries to print their own money.

To do this, it was necessary for us to deposit with the bank an amount of cash equal to the paper money printed,

so that our money was guaranteed by actual funds in hand. It was not long before our money, like that of other sound industrial concerns, was more valuable than either the Government's or the city's, and would be accepted everywhere in preference to theirs. We printed mark, half-mark, 25 pfennig, and 10 pfennig bills. With this the men could trade readily at our various grocery stores, and soon merchants in Schwerin took our money in preference to anything but gold. In all we printed several hundred thousand bills, some of which I retained as curiosities.

As the value of money fell, wages of course rose, so that a workman might be getting 500 marks one week, 1,500 marks three weeks later, and still be making no more money. It became a commonplace to have several million marks in paper in one's pocket before I finally left Germany. Tips were of several hundred thousand marks, and before 1924, the end of inflation, ran into millions. One had to pay several million marks for a bowl of soup, and even a glass of water ran into money. If one were making an unusually large payment it was necessary to go to the bank with a suitcase, instead of a pocket-book full of bills.

Farmers, who had the only really valuable commodity, food, hung on to their gold, and would sell for nothing else. If gold was not available, they bartered food for tools, furniture, other things they needed, but not paper money. They paid their bills in ounces of butter or in pounds of other foods.

As the Government became more and more impoverished, it shifted its liabilities on to business. The financing of the war had to be done by means of *Reichsanleihe*, corresponding to War Loans here. Ultimately the only people who could, or would, furnish money to the Government were the various industries manufacturing under war contracts. Therefore, in a contract for millions which guaranteed a big profit, it was tacitly understood that a substantial amount of this profit should be turned back in loans.

The Government maintained a bluff that these subscriptions were voluntary, but actually part of the negotiations for big contracts included dickering as to how much of the profits should be returned to the Government in the form of *Reichsanleihe*. These, of course, proved a total loss with the end of the war and the collapse of the Government. Many German patriots, who had a small capital and had signed up for the state loans, found themselves beggared at the Armistice.

The women had been asked to give up their gold necklaces and brooches, and the men their gold watch chains to the Government. It gave them, in return, chains of iron. They wore these as if they were iron crosses. But in the end they found that their fortunes were paper, their jewels iron. Small wonder that many old people committed suicide.

XVIII

WAR ENDS

THE war ended less suddenly than it began. For nearly a year before the Armistice a whole people gnawed its own hunger, tightening its belt for lack of food. Slowly the revolt against autocratic militarism was rising; slowly, but as inevitably as the groundswell of the sea. The glamour of fighting had worn off after the first two years, and Germany seemed to be hemmed in tighter and tighter by the press of her enemies. Nothing happened again like that first thrilling, seemingly resistless march on Paris. As the wounded and maimed drifted back from the front with their gaunt stories of horror, though they were hidden from sight and forbidden to appear on the streets, the grim reality began to show through the gaudy trappings of romantic patriotism. The martial bands still played and flags waved as usual, but there was a hollow something in the cheering. The cry was no longer from the heart. In four years, Germany had become an old man trumped up in a faded uniform; a deluded old man strutting about like a drum major, destined at any moment to collapse from excessive effort.

Around the corner waited the revolutionary supers, ready the moment the conventional heroes left the stage to put on their direful act. The country was ripe for their appearance. The strong men had thrown themselves on the national funeral pyre. Only the cripples and the superannuated were left, to preserve the discipline of a once ordered state. Disgusted with the old regime, the weary people were ready to turn their backs on it, and face whatever the future might bring in exchange.

For four years the Germans had been gulled by the belief that they were to conquer the world. Nations have held

that belief before—and will again. Occasionally, they win the tremendous and alluring odds, but such ungodly takings never remain in the pocket for long. In the last year, as the Germans watched their dwindling stakes fade rapidly away they foresaw the inevitable. The clearer their fate became, the more desperately rose the hope that a final throw might recoup all their losses. The last mark was swept up. In its recoil, the country hurled itself into an orgy of self-destruction—a kind of suicide of ideals—until the reaction from such excesses inevitably set in. The revolution, the delirium tremens of the whole Martian debauch, lasted for several weeks in full fury before calmer leaders regained control of the situation.

This is all clearer in retrospect. The nation had faced war so long that, in 1918, war seemed almost more normal than peace. So much information was hidden from the people by cunning propagandists that they were overlong in discovering the truth.

All of us in industry could have seen the end coming on. Workmen began to complain more and more loudly of the lack of food. They drifted vainly from one factory to another in search of better conditions. That was permitted, if they arranged for another job before quitting the one they had. Otherwise the army picked them up. All forms of industry were full of men on the pay-roll who did no work, but paid to get there in order to escape army service. Some manufacturers, in order to get rid of undesirables whom they didn't dare dismiss, would arrange with the military authorities to have their exemptions terminated. This helped the manufacturers, but injected Bolshevistic workmen into the military forces and greatly stimulated the eventual collapse of the army and navy.

One could not blame workmen or soldiers for complaining about conditions. People were fast losing their humanity. They were tired of war to the marrow of their bones. Confidence in everything had disappeared. Only

the long powerlessness of the common people had staved off the revolution so far. But the groundwork was prepared. When the end came it came with a rush. The straining mass emotion, too long unreleased, broke its dam with a force which carried all before it. Not even the people themselves could stem its flood. The military authorities were swept out of the way like driftwood. Had only this pent-up despair found an earlier escape, Germany would have been spared some of the madness of revolutionary years.

Like the rest, I was not clearly aware of the significance of what was happening under my nose. Because I was a Dutchman—however closely identified in my manufacturing with the army and navy—many things were kept from me which were perhaps known to patriotic German industrialists. Right up to the armistice I kept on developing my aeroplanes and the machine-gun.

When the armistice was signed, the grinding of gears as industry slowed to a stop was audible throughout Germany. Future contracts for all kinds of armament were abruptly cancelled, but to prevent the throwing of hundreds of thousands of workmen into the street, industry was given a certain period in which to finish part of current work. Orders were issued that all factories should begin the production of peace-time products as soon as possible.

At that time, I had my greatly augmented aeroplane factory in Schwerin, with 1,800 workmen, my armament factory in Reinickendorf, a small seaplane factory in Travemünde, on the Baltic Sea, and owned the controlling interest in the Oberursel Motor Works near Frankfort, altogether employing about 6,000 workmen. My combined plant was one of the largest and most complete companies in the aeroplane industry in Germany. In order to run it, I maintained central headquarters in Berlin, where my general manager, Horter, stayed. I kept my right-hand man in the aeroplane experimental department,

Reinhold Platz, who first came to Johannisthal with me as a welder, in Schwerin; my right-hand man in the machine-gun factory, Luebbe, in Reinickendorf.

Then came the crushing blow from the Allies—the order embodied in the armistice terms that Germany should have her wings clipped for the future, and all her present military aeroplanes and engines destroyed. I came in for the doubtful honour of being the sole manufacturer to have his aeroplane specifically mentioned. Article IV, detailing things which must be turned over by Germany to the Allies, said:

> "In erster Linie alle Apparate D.VII . . ."
> (Especially, all machines of the D-7 type.)

This was wonderful advertising of the worth of my plane, but the cost ran too high. It meant the entire liquidation of my companies, the destruction of five years of day and night work. It meant the loss of a huge investment, practically all located in Germany, where I had expected to continue in commercial aeroplane operation. Further, I was faced with the problem of finding some sort of work for my own 6,000 employees if that could possibly be done, after I had been crippled by the Allied order. The blow was almost a knock-out. Its thoroughness stunned me for a few days; then I tried to find a way to circumvent such disaster.

Perhaps it was the specific mention of Fokker aeroplanes in the Armistice terms which roused me to opposition. It was too obvious a challenge to ignore. In any case my Dutch pugnacity forced me to accept the challenge, and dare the Allies to put their order into effect if they had the cunning as well as the power.

I determined to save as many aeroplanes from destruction as possible. It was reported that an Allied Commission would visit our factories and supervise the systematic destroying of every machine and engine. All Fokker

planes in flying condition were ordered delivered by air to designated flying fields. Many veteran army pilots, sentimentally attached to their ships, flatly disobeyed orders during those tumultuous, rebellious days. Some flew the planes back to Schwerin; others hid them in country places, far from the prying eye of the Allied Commission. This practice became so general, in fact, that a special order was issued warning pilots of the heavy penalties which would follow such disobedience. The celebrated Prussian discipline had lost most of its force by that time and the order had little effect.

I scoured the town and countryside for out-of-the-way barns and unused cellars, and other secret hiding-places where I could store engines and aeroplanes. In a short time we had hidden more than 220 aeroplanes and over 400 engines. When the Commission arrived at my factory, there were still a large number of the planes and engines which the Government had purchased and left to be destroyed, besides the great quantity of aeroplane material on hand. The Government planes and engines were either destroyed on the spot or taken away, but the Commission left our factory completely unaware of the greater number of planes and engines which had been hidden away.

In order to prevent Germany from quickly rebuilding a large air force, all hangars of large size were either destroyed, or made unsuitable for use by cutting through the roof girders and placing supporting posts in the middle of the floor and doors. Hangars and machine shops on the army fields were completely obliterated. It looked as if Germany —to-day one of the most important flying countries in Europe—would never fly again.

To keep my workmen busy, we had tried several schemes, all of which lost money. Boat manufacture seemed feasible, and so we began building all kinds of yachts, motorboats, and canoes. Altogether I think we made 1,500 canoes on the Canadian model. Our chief mistake was in

not concentrating on a few saleable types, but in building every kind and size of boat. In addition, other factories which had copied our aeroplane moves followed our lead again, so the market was soon flooded. Canoes we had built to sell for a thousand marks we couldn't get rid of at five hundred.

Our next move was to build commercial scales. We made a dismal failure in this. The original scale manufacturers were as far ahead of us as we should have been of them if they had turned their shops into aeroplane factories. We just kept on losing money. By that time there was no choice about going on. The revolution, which had broken out on November 9th, two days before the Armistice, was full upon us, and we existed solely at the mercy of irresponsible dictators. For a time, we could not dismiss workmen without the consent of local authorities. Each section of the factory was run by a soviet of workmen. Finally, they were convinced that industry was rapidly going to rack and ruin by that uneconomic method of operation. Nevertheless, things went from bad to worse. We feared that we should not escape with our lives. Revolutionary guards circulated through our factories.

They looted the banks and stole all current funds. Several manufacturers in Schwerin were killed outright when they showed opposition. Telegraph, telephone, and mail service was destroyed. No one knew what was happening throughout Germany. There was no police protection of any kind. I was called before the council of workers, holding forth in an arsenal, and told that I must produce more money or be shot.

Explaining that my money was in Berlin, I convinced them that to shoot me would get them nowhere. On the other hand, if they freed me, I would send to Berlin for funds to run the factory. Reluctantly, they permitted me to return home. Two guards were placed over me, for they didn't trust me any more than I trusted them.

That night, dressed in the uniform of my landlady's son, with thousand-mark bills stuffed in my boots, I slipped out of the house past the two guards, and hurried three blocks down the street where De Waal waited in the shadows with a motor-cycle. In an instant I was in the saddle and roaring out of Schwerin, headed for a village thirty miles away on the main railway line. Through the night, afraid to show a light, I raced at forty miles an hour, fearful that at any moment I should hit something and break my neck, or run into a revolutionary patrol.

Arriving at the village, I hid the motor-cycle in a deserted garden and quietly made my way to the railway station. Not daring to enter the station itself, for fear of being recognized and seized, I waited on the other side of the tracks until a freight pulled in. Quickly, I scrambled aboard. After it had left the station behind, I walked back over the roofs to the van.

Berlin, I knew, was likewise in a state of siege. Fearing that the revolutionists in Schwerin would request their comrades in Berlin to seize me if I went to the Hotel Bristol immediately, I lay low for the first days in the house of a friend. There was continual firing in the streets. I crouched for protection one day in the friendly recesses of the Prussian State Library when the bullets suddenly started whistling up Unter den Linden. People feared that any day the revolutionists would begin looting the houses of the rich, and pillage the banks.

The revolution had started with an outbreak of sailors at Kiel, and marines were temporarily in possession of Berlin. Therefore, I made arrangements to have myself guarded day and night by four marine guards. Accompanied by this bodyguard, I moved to my quarters in the Bristol. The marines stood post at my door, and went with me through the town. I paid them the equivalent of two pounds a day for their protection, until the city finally quieted down and something like order was restored.

The two guards in Schwerin, from whom I had escaped, were shot by their infuriated comrades.

I was more affected by the horrors of the revolution than by the whole war. They shattered my nerves. No one knew from day to day whether he was rich or poor; whether he would even escape with his life. I dared not go back to Schwerin, but kept in communication with a small band of faithful workmen, who were more or less running the factory.

Disheartened by the whole mad situation, I became desirous of somehow liquidating my German enterprises, at whatever cost, and returning to Holland. For their help, I promised to take a certain group of loyal workmen with me. To stay in Germany longer seemed worse than folly.

XIX

THE GREAT SMUGGLING PLOT

WHEN the war ended, my profits were something more than 30,000,000 marks. Had I paid close attention to the financial end of all my interests, these profits might have been doubled. The money I made, however, had never meant so much to me that I wished to give up the more absorbing problems of invention and manufacture to garner every possible farthing. As long as there was enough money, there was no need for more.

As I look back, the fact that I emerged from Germany with less than one-quarter of the profits actually accumulated does not distress me overmuch. Later, more of the money was lost through the decline of the mark, which, however, did not start its precipitous descent until I had been in Holland a year. Prominent Berlin bankers, whose names would prove too startling to disclose, swindled me out of two million marks. Other funds disappeared through trying to maintain a failing industry, bad investments in real estate, foreign currencies, securities, bonds, and interest coupons. But the mingled excitement and pleasure I derived from the intrigues, schemes, and careful plans necessary to get out even the quarter which I finally saved from the wreckage fully repaid all those losses. I never knew and never shall know exactly how much money I made in Germany, and beyond the belief that I lost at least seventy-five per cent. of these profits, I don't know exactly how much disappeared.

It is only within the last five years that I have learned to handle money with any regard for its use or abuse. Before that time I had not the slightest interest in it except as a necessary means of transacting business. Nor am I to-day interested in money, except

in investing a certain amount outside my aeroplane business.

My attitude must be something like that of an artist. I have always been more concerned with what I was doing than with what I was getting out of it. Necessity forced me to pay some attention to contracts—and once forced to pay attention I drove as good a bargain as I could—but that was only a minor interest really.

The revolution, which caught the German people as they were still dazed from defeat, destroyed general industry and commerce, but proved to be a life-preserver for me. It was only because no order existed—government was at a standstill and officialdom topsy-turvy—that I managed to preserve even so small a proportion of my assets. During that period there was neither army control, Government control, nor Allied control. We decided to take advantage of the confusion to smuggle all the hidden aeroplanes, engines, and materials into Holland.

On the face of it, our project seemed preposterous. The frontier was guarded not only by Dutch but by German and Allied patrols. While it was possible to slip a man, or even a motor-car secretly across the border, our design was to slip an entire trainload of supplies and materials over the regular right-of-way from Germany to Holland. Wilhelm Hahn, the chief of our transportation department, who had proved his efficiency in getting planes to the front during four years of war, organized the programme and handled the intricate negotiations. Even to-day, knowing that the smuggling was accomplished, I cannot quite believe it was done. It seems simply too incredible.

Every detail of the plan bristled with difficulties. Had it not been that we had nothing to lose—for Germany seemed drifting steadily towards a greater and greater chaos—we should not have dared to go on. In the first place, merely to obtain sufficient railway trucks, without informing the world of our purpose, proved a task. Every

railway official knew that we had no immediate use for railway trucks for shipment around Germany. By bribes, by means of old friendships, in any and every way, the trucks were gathered together. Then a specially selected crew of old employees was entrusted with the secret and mobilized for quick action.

With a fleet of trucks, this gang, working day and night, unearthed a large number of the hidden engines, still in their crates, and piled them rapidly in closed box cars. On top of these was placed any kind of material which fitted the space. The doors were shut and sealed. In the open flat cars various kinds of army equipment were loaded on the bottom. On top were laid wood and steel tubings, and the whole covered with tarpaulins. The entire train, consisting of sixty trucks, ranged guiltily on sidings near the station at Schwerin. It is impossible to hide a box truck in one's waistcoat pocket, let alone sixty. We did our best, however, by distributing them on various sidings. And the world happened to be looking the other way.

The whole scheme was devised and carried into execution within a week, for quick action was imperative. Hahn urged me to bury a quantity of money in one of the box trucks, but it seemed to me impossible that we should ever successfully smuggle the trainload to Holland, and I refused. Positive orders had been issued by both the German customs and the Allied officials against the transport of money and valuables out of Germany, and the Allied Commission had specifically forbidden any army materials to be diverted out of the country. A sharp look-out was supposed to be maintained, particularly over the trunk lines, but Hahn, who knew the intricacies of the railway business, himself undertook to ride the first transport train out.

Merely to route such a big special train from Schwerin, through the large centre of Hanover, was difficult enough in those troublous times, but the neck of the bottle was at

Saltsbergen, the last German stop, and Hengelo, the first station across the Dutch border. Guards all along the way had been "seen," of course, so the tracks to the border were greased. Even more important was the bribing of the stationmasters on both sides of the frontier, and the small army of German customs officials. Fortunately for us, the revolution and the depreciation of money had so reduced their circumstances, that they proved more open to corruption than usual. Then, too, the German officials were naturally not in sympathy with obeying the Allied demands, and were willing to close their eyes if they thought they could do so in safety. As far as the smaller officials were concerned, it became comparatively easy to pay our way, once they were assured of the connivance of the men higher up.

By arrangement with the customs officials, the train was deliberately made up of sixty trucks because it was then too long for the sidings at the frontier, which could only accommodate forty trucks at a time. Thus, in order to keep the train from blocking the main line, it would have to run on into Holland to Hengelo. Everything was arranged to prevent delay, so that no official who was not in on the proceedings would have a chance to investigate. Since it was impossible to run a German locomotive out of the country, Dutch locomotives were brought to the last stop twenty or thirty miles into Germany.

Just before the transport rolled into Saltzbergen, a report was flashed to the Allied and German patrol that a large smuggling attempt was being made at a railway station a short way down the border. Hahn had actually organized this smuggling party as a blind, and it, by pre-arrangement, of course, abandoned the bait when the patrol had been thrown off the scent. With the coast clear, our transport steamed on, and Hahn telephoned me from Hengelo that the first train would soon be in Amsterdam.

A further complication was smoothed over in the usual

way when the Dutch customs officials came to inspect the train at Hengelo. Even Hahn had not the slightest idea of the train's inventory, when it came to paying duty, especially since two or three cars had been side-tracked somewhere in Germany and irretrievably lost. Hahn simply guessed at the value of the transport.

Much of the bribing—this was specifically true in Holland —was not done by money at all. In the case of a minor official, usually a model of the Fokker plane was asked for. This demand seemed unlimited, and Hahn declared that he could accomplish as much with one aeroplane model as with a hundred guilders. Sewing machines and bicycles were other favourite bribes, and even to-day when I return to Holland, customs officials whom I have never met, stop me to say that their wives are still using the sewing machines I gave them in 1919. Hahn never gave me an itemized statement of the bribing necessary, because I told him to write the ticket himself, but the cost was about 20,000 guilders to clear the track, with the actual money all going to the Germans.

One train was safely across. I had hardly believed that this stupendous feat could be accomplished, and had even less faith that it could be repeated. But Hahn assured me that it would be easier next time, and so it proved to be. Instead of increasing, the difficulties practically disappeared, and we ran six trains of sixty trucks each into Holland before we were through. The Allied patrol never did catch on, for each time they were sent on a wild-goose chase. Each time we allowed them a little capture and they never dreamed of the far greater loot which was at that moment steaming across the border into safety. The last transport which rolled across the line contained nearly thirty flat cars, loaded with aeroplanes, covered with tarpaulins on which was boldly printed the name of "FOKKER FLUGZEUGWERKE" and "SCHWERIN," because we had run out of anonymous covers. The aeroplanes we hadn't

dared put on before, because their shape could not be disguised.

Altogether those 360 cars brought out of Germany over 400 engines, 120 D-7's, in a complete or nearly complete state, at least 60 of the two-seater observation planes, which had never been released for the front, a score or more of D-8's, to say nothing of truckloads of brass and steel fittings, rubber tubing, aluminium plates, screws, propellers, upholstery materials, and the thousand other little gadgets which are necessary in aeroplane construction. Everything removable at Schwerin which was valuable enough to transport was put on board anyway in the rush. No doubt some of the material was stolen *en route*, for we could not stop to trace lost trucks, nor call in the police to protect our property. Several truckloads of wood we knew were lost in the shuffle. But I didn't expect to smuggle everything to Holland. I was not even sanguine that we should be partly successful. The fact was that against all obstacles, and contrary to every expectation, we moved the contents of an entire factory, one of the largest aeroplane factories in Germany, from one country to another, all in about six weeks.

Practically everybody in Germany, even to-day, believes that I flew my money out of the country. The day that I officially left Germany, the yellow press printed a cartoon of me sitting in an aeroplane from which dangled a big sack tagged 100,000,000 marks. I was waving good-bye to Germany, and flying towards Holland. The actual fact was that I never brought my money out by aeroplane.

On the contrary, I left Germany with the complete knowledge of the Government, customs, and tax officials. My firm paid all its war taxes up to the date of my departure, after which I received an official release and permission to leave the country.

During the revolution I had fixed up a D-7 with a second seat and a large tank for a six-hour flight, which would

have enabled me to fly from Schwerin to Holland in one hop, but I was kept too closely under guard to use this plane for that purpose. Taking a lot of planes, which would have had to be destroyed anyhow, out of the country did not mean much to revolutionary authorities; but taking a lot of money did, and I was kept under a close personal surveillance. The second seat was for the girl to whom I had become engaged half a year before the Armistice. I had decided to take her to Holland and marry her there because I did not wish to acknowledge my forced German nationality. This I should have had to do in case of a marriage in Germany, having no other official papers than those which had been sent to me by the German army.

The future Mrs. Fokker was the daughter of General Kurt Ernst von Morgen, one of the leading commanders on the Western Front and later on the Russian Front. It was through his influence that I was often saved from much annoyance, and he was largely responsible for saving me in many difficult situations. I had met Elizabeth von Morgen while yachting on the Wannsee, a little lake close by Berlin on the shores of which her grandfather had an immense estate. During the last two years of the war, when I made my headquarters in Berlin for the most part, I had taken up my old hobby of sailing and had bought a six-metre yacht for racing. I noticed how skilfully Miss von Morgen handled her fast yacht and formed a liking for her, but was too shy to seek her out until an accident gave me an opportunity.

She was standing in the bow of her yacht ready to pick up a buoy when a sudden dip of the boat threw her overboard. I happened to be near by and thought it a good moment to show my interest, so I jumped overboard to rescue her. This was entirely unnecessary, because she was one of the best swimmers around the lake, as I well knew. But the result of my rescue was that she invited me to change my clothes at her grandfather's house, and

borrow dry ones from her brother. After that I was invited to dinner, and the rest was moonlight.

After our engagement, I took her up in this plane, but we were too closely under guard to permit of my executing an escape that way.

While I was waiting for another loophole, money was depreciating steadily along with my other investments, and I was faced with the necessity of getting some sort of real value for my German paper money. People in a situation similar to mine were buying property, and as I did not expect at that time to leave Germany permanently, I bought a beautiful house near the Tiergarten, close to the present Esplanade Hotel, from a former director of the Dresdner Bank for 1,000,000 marks. In addition to his house, I bought his furniture, including various bronzes and paintings, which I still have. The house was later arbitrarily sold by officials, temporarily in power, for 400,000 marks without my knowledge, under some trumpery law. The marks were then almost worthless.

Meanwhile I had been buying every bit of foreign currency offered for sale, dollars, pounds, francs, pesos, lire, guilders, anything that wasn't a mark. There was no regular exchange, transactions taking place in every conceivable place, even in the street. I also did a big trade in coupon slips, buying them by the thousands through two brokers, and taking a chance as to whether I should ever be able to collect the interest. I acquired several suitcases of these coupons, along with suitcases of American dollar bills and English pound notes. The storage of these easily negotiable bills became quite a problem. Banks were not safe, because of the uncertain times. Yet this was the only way of getting possession of real money in a manner which could not be traced. Part of it I stored with friends on whom I could rely, but the greatest part I stored in the safe of a foreign Red Cross, sealed in fourteen different packages. This I was able to do through friends. I was able

to convert practically all my liquid capital into foreign bills in one way and another.

My various dabblings in real estate proved unfortunate for the most part. One of the pieces purchased was a country home ten miles out of Berlin, where I planned to live in the summer, but because of high taxes I had to sell this later for about ten per cent. of its value. Another place bought in Bavaria proved to be a dead loss when I tried to liquidate it after leaving Germany. Everybody was too poor to buy property for anything like its worth. The contents of the twelve-room apartment of the Hungarian Consul, costing 220,000 marks, turned out to be the best investment. All the rich residents feared, with more than a little reason, that Bolshevists were going to loot their fine homes. This man was so frightened that he wanted to flee the country, and was glad to find someone to buy his goods, which he expected to have confiscated any minute. It was an unusual opportunity, and I immediately began living in the apartment, inheriting his cook, chambermaid, and provisions, which were important, as well. Eventually I moved all these household effects to my new home in Amsterdam and later to America.

It was possible, I was told, by a little legal hocus-pocus to transfer money through one of the large banks doing business with foreign countries. But this forced one to depend upon the honesty of the bankers. Although I should have known better, I accepted the offer of two bankers to make such a transfer. They were to charge five per cent. for their services. Their method was to buy goods in Germany, export them to Holland, sell the goods, and deposit the money in a Dutch bank. I agreed to their proposal when they assured me that it could be accomplished safely and legally. One of the financiers to-day holds an extremely prominent position in German financial circles; the other is in prison.

I was told the bank itself could not handle the transfer,

but that these directors would do it with the facilities of the bank and through personal influence. Therefore, I put 2,000,000 marks in their hands, without obtaining a receipt, to be delivered in Holland less five per cent. Later when I arrived in Holland and attempted to claim the money, I was put off for a year. The upshot was that I got nothing at all. I could not even sue them, because the transaction actually was illegal, as I later discovered.

While they were supposedly handling the 2,000,000 marks for me, I was devising another scheme, and for the purpose bought a twenty-eight-metre yacht at Travemünde, on the Baltic Sea, where I had maintained a small factory during the war to supply the navy with seaplanes. It was my intention to load part of my money on the yacht some day and sail it to Holland. In order to disguise my real purpose, because my movements were watched, I used to lend the yacht to my future father-in-law, General von Morgen. He went sailing with it over the week-end, several times, while I matured still another method of getting my fortune out of Germany.

The Dutch Minister coldly refused to lend me any aid in his official capacity. My persistent inquiries were not fruitless, however. Others revealed to me a practical method of transferring my money to Holland, where I should need it to organize my industry there. It seemed that there was really quite a steady traffic along that line, as there were many foreign organizations which enjoyed the privilege of customs immunity, and many a thing slipped by. I was assured that a suitcase, containing mostly foreign currency in big and small bills, would be delivered in The Hague at a certain office. I was given the exact date when mail sacks were supposed to go, and so I set my plans to take the same train and despatch my yacht to Holland a few days before.

Therefore, I motored up to Travemünde with a car full of suitcases and bags as though going for a week-end sail.

The stuff was put on board quickly; the yacht hurriedly got under way. My captain was reliable, I thought. He had won scores of races with me in the six-metre yacht class as a paid hand, but I didn't know whether I could trust him with several million marks and some hundred thousand pounds' worth of coupons. He could so easily sail off to Denmark or Sweden and live on easy street the rest of his life, for I should be powerless to recover my fortune. It was a chance I had to take, and I shouldn't know for five or six days whether I won or lost.

Hurrying back to Berlin I bought the oldest, most decrepit-looking suitcase I could find, because it was to travel in some legation's luggage as the bag of a cook, who was going to Holland for one reason or another. As the hinges and lock were in sad condition, I tied a string around the suitcase for safety's sake, after I had packed it full of bills. Then I turned it over to my new friends and hoped for the best.

Meanwhile, I paid off all my taxes, obtained a certificate from the tax commissioners that I had cleared up everything, gained the sanction of the proper officials for my departure, and purchased a ticket on the train which was carrying the cook's luggage. I couldn't see my suitcase when I strolled by the baggage room to look for it because it was either in the official mail sacks under heavy seal or not there. I spent a horrible time all the way to the border, wondering whether I had been double-crossed. Then I watched the legation's luggage dumped out of the baggage car at the frontier. My heart rose to my mouth until I saw the customs officials decide not to open the official bags. For the remainder of the trip to Amsterdam I could not sleep a wink, either, for there was £80,000 in good currency in that cook's suitcase; for once I really worried about money.

Once arrived, I lost sight even of the luggage, and simply had to assume that everything would go through as

planned. Waiting and waiting at my hotel without a word, I imagined the suitcase discovered a hundred times after it was taken out of the mail sacks. I could picture the thing accidentally going to the cook, who would be obliged to find that she had inherited a fortune of a million guilders by the simple act of travelling between Berlin and The Hague. After another sleepless night and various telephone calls about "Mr. Franklin's suitcase" which yielded no comforting information, I suddenly received a message from the porter of an office in The Hague. A suitcase was held for Mr. Franklin, I was told. Mr. Franklin might have it if he called for it at once.

When I arrived only a few minutes later at the porter's lodge, my heart jumped again at the sight of the suitcase standing under a little table. Both locks were sprung open, and a gap of half an inch between the two halves, held together only by the string, would have permitted anyone to reach in and extract a small fortune. I half expected it to be empty, and lifted it quickly, nearly hugging the bag, when it was placed in my arms, too far gone to be carried by the handle. Hurriedly I slipped the porter a twenty-guilder note and ran to my motor-car outside.

In the tonneau I found that some of the packages had been broken when the mail containers were tossed about by baggage-men, but apparently everything otherwise was just as I had packed it. Nobody had paid any attention to the dilapidated old suitcase, which probably looked to the porter as if it were hardly worth the value of his tip.

Then I went to look for my yacht in den Helder, the sea harbour thirty miles out from Amsterdam proper, expecting to find it on hand, but it was nowhere in sight. A day passed beyond the time it was scheduled to arrive, and no sail appeared. I began to give up hope. It was carrying the greater part of my fortune. On the last day the boat could possibly come in, unless the captain had decided to stop at Denmark or Sweden, a terrific storm broke. The

entrance to the harbour between the islands is very treacherous, and it would be doubly so for my man because it was unknown water full of sandbanks. Even if he were faithful there was a chance for him to pile up the yacht on the shoals. I went to bed that night feeling very low in my mind about the honesty of human beings, but the next morning at eight o'clock a telephone call from den Helder to my Amsterdam hotel informed me that August had arrived. When I appeared in haste, the captain gave me the wink, and pointed to the suitcases snugly stored in the cabin.

To each of the five men in the crew I gave a generous tip, and a much larger purse to the captain, who was the only one in on the secret of the trip. He would have to remain in Holland because he might not be able to explain to inquisitive German marine authorities why he had sailed from Travemünde to Amsterdam without correct clearance papers. He stayed with me during the next year, while I used the yacht for sailing in the North Sea, until a gale nearly foundered us. We lost our rigging in the all-night blow, our masts were levelled, and nobody showed up in answer to our distress signals. In the morning we managed to creep into Ymuiden, but the yacht was a wreck.

All the cash and coupons I deposited in an Amsterdam bank, but several months passed before I got a final accounting. Some of the papers I had bought proved worthless, and it took years to collect on other paper for which I had paid good money.

Because of the tremendous howl which went up from the German yellow press after my departure, with cartoons depicting the " flight of capital," the German Government suddenly made a demand on me for 18,000,000 marks of taxes due. I do not remember the full details of such an extravagant claim, particularly after I had left the country with a clean slate, but it was made. Most of my important papers had been lost in all the hurly-burly of

post-war revolution, so I could not prove how much money had been consumed in trying to keep my factories going or in the decline of the mark. But I foresaw that if I wished to return to Germany at any time, I should have to settle the affair somehow. The German Tax Commissioner declared all my remaining properties, real estate, factories, and other visible items in Germany seized until I paid the 18,000,000-mark tax.

In making this violent protest against my taking the twenty-five per cent. remnant of the money I had earned hardly out of Germany, the fact was always ignored that I thereby provided work for some 150 German workmen I brought with me to Holland. Moreover, things were in such a pass in Germany that my rapidly dwindling fortune would have entirely melted away, to no one's good, had I left it there. During the war, and ever since, I have continued to support a dozen orphaned families in Germany. I know of no better way to invest one's money than in the future of children. I do not mean to imply that what little I have given to others has forced me to stint myself. All I say is that in being provident for myself, I have been useful to others as well. Such considerations, of course, are lost sight of in practical dealings, and certainly didn't help me in my negotiations with the tax officials.

After some jockeying back and forth I entered into negotiations with the Finance Ministry. I was invited to return to Germany to settle the matter, but I had little confidence in the officials, and refused. My proposal of Amsterdam was rejected on the ground that negotiations could not officially be held in a foreign country. But representatives were willing to meet me on the frontier. We met in a small restaurant in Oldenzaal—on the Dutch side—by my stipulation. My two lawyers and three men from the Finance Ministry (among them Matthias Ersberger, leader of the Centre party, who was later to be assassinated) talked and talked for two days before a settlement of

6,000,000 marks was agreed upon, the amount to be paid over a five-year period, unless I wished to clear the slate sooner. At that time the depreciation of the mark was not as rapid as a year later—at a time when Erzberger was Finance Minister—when I found it profitable to pay the whole 6,000,000-mark debt with a few thousand guilders, rather than take a chance on a new law revaluing outstanding debts. Such a law was later passed. By this means I cleared away even these extra taxes with no trouble, and was able to return to Germany at my pleasure.

I had arrived home from Germany with a bride, a fortune, and a desire to take life easy. It had been my intention to go straight to the Town Hall in Haarlem, obtain the necessary papers and get married immediately. But I struck my first snag with an ignorant bureaucratic official at the Town Hall, and it was actually six weeks before I was able to marry. It seems that the Town Clerk had read in German newspapers that I had become a German citizen during the war. He refused to take my word for it that his newspaper information was wrong, yet he had no legal proof that I didn't know more about my citizenship status than he did. In his dilemma, he did what all of his kind do—shifted the responsibility on to someone else. I was referred to the secretary of the mayor, who in turn referred to the mayor.

The mayor, I thought, would have sense and backbone. I showed him what papers I had from Germany. Before leaving Berlin, I had tried to get an official release from the army's enforced naturalization order. In the chaotic condition of affairs then prevailing, I was unable to find anyone with authority and courage enough to countermand the original illegal military order. But I had obtained statements from the Minister of War and former officers' statements, duly sworn to, which revealed the illegality of the naturalization order. I could get no more than this, because everyone was afraid of burning his fingers. Never-

theless, I had thought this would be sufficient, since it clearly showed the circumstances under which the order had been issued.

I had not figured on Dutch red tape, however. The mayor, after hemming and hawing, decided that the matter must be left to higher authorities, and referred me to the Governor of the Province. The Governor pulled a long face and sent me to the state department. The Minister of State, still under the thumb of the Entente, was reluctant to make so important a decision. He dared not decide without consulting the Minister of Foreign Affairs.

The whole episode had disgusted me. I could see how four years of trying to satisfy everybody in the world in order to maintain Dutch neutrality had softened the Dutch backbone. Whichever way they decided, they feared someone would be offended. Finally the Minister of Foreign Affairs suggested that the Dutch Minister in Berlin should be consulted. This didn't please me, for I knew him. He would only make matters worse. It looked as though I was up a blind alley. Finally they decided to place the matters in the hands of the Department of Justice, since it was obviously a legal question.

Desperately, I recalled that I had performed certain favours for Prince Hendrik, the Prince Consort. When he was re-forming the Boy Scout organization, his hobby, I had given his adjutant in Berlin 150,000 marks for the movement. So I called on him for advice, visiting him in The Hague one morning.

He proved extremely friendly and listened to my story with interest. He knew the Minister of Justice, he said, and would see him at four that afternoon. I should return at five. When I returned he explained what he had said to the Minister of Justice. The nickname for lawyer in Holland is " law twister." He had told the Minister that as the biggest " law twister " in Holland, he should twist the law my way.

The following day the Minister of Justice saw my lawyer and adviser, who showed him the various documents I had been able to obtain in Germany. A day later he informed me that my Dutch citizenship was intact and gave me a letter to that effect to the Governor of my province.

Within a day or two my papers were cleared and I was married, with the congratulations of Prince Hendrik, who knew the bride's father very well.

Immediately after my marriage, I planned to make a three-year cruise around the world in a three-masted schooner yacht I had bought, which was waiting for me in Denmark. My wife was delighted with the prospect, and we looked forward to a lazy, happy time.

But before we could get away, the problem of disposing of those 220 smuggled aeroplanes, 400 engines, and other materials began to absorb my attention. Furthermore, there were still financial matters in Germany requiring my best thought, beside the necessity of setting in order my investments in Holland. Before I knew it, I had another business going in Holland, with a 750,000-guilder investment to start it off. A force of 1,500 men were working for me, and during the next three years, while I was supposed to be sailing around the world on my honeymoon cruise, I was actually selling £1,600,000 worth of aeroplanes instead.

The first problem which presented itself was the matter of storage, for this vast fleet of aeroplanes could not be packed away in an attic. I found that some sheds in the Standard Oil harbour, affording excellent fire protection, were available, and for the time being stored everything there. But that was only the beginning of the project of disposal. I had to work fast before even my advanced types became obsolescent.

I had no choice in the matter of attending to the formation of my Dutch company. Many of the smaller neutral

countries had been starved for aircraft so long that a big market was ready to absorb anything offered it—one reason why it had been important to get my aeroplanes and engines out of Germany. Conditions had reached such a pass in Holland that the Government had ordered 220 aeroplanes and 200 engines from the Spyker motor-car company, because none of the Allies could furnish them. The Spyker factory at the time was making de luxe cars, and went into the production of aeroplanes with the confidence born of ignorance.

The firm had no experience, no proper materials, and no trained personnel for the job, with the result that army inspectors rejected their planes as fast as they built them. Even their engines would not run satisfactorily. When I reached Holland the factory faced a critical situation, with over 200 engines in production and none of them acceptable to the Government. Their aeroplanes were already obsolete, comparing in no way with those I had brought out of Germany, which were the latest fighting and observation types.

First, I tried to sell my planes to the Government direct, but all their appropriations were tied up in the Spyker contract. It was indicated, however, that the Government would gladly buy my planes, if some way could be devised to get out of the earlier agreement. Further investigation disclosed that the Spyker firm, finding itself in a blind alley, was looking for a guide. They faced the loss of millions. I suggested a solution.

My German planes, having once been figured as a total loss, could almost be counted as so much velvet. The price which the Dutch Government had contracted to pay for the Spyker plane was very high. Therefore, it was possible to make a deal whereby the Spyker firm could write off its losses and I could, at the same time, obtain a suitable price for my planes, while the Government would spend no more money than it originally planned to do.

Thus I hoped to turn my planes from frozen assets into good Dutch guilders.

Negotiations with the Minister of Defence let out the secret of the enormous smuggling operation, of course, and the Allied Intelligence Department in Amsterdam got wind of it. Since Holland was a neutral country nothing could be done directly. But the Vickers aeroplane company, of England, which was competing with me in an attempt to sell its obsolete war stock, and which exerted a great influence at that time in Holland, got up in arms. It did its utmost to break up my deal with the Dutch Government, in order to substitute Vickers planes. The army air service officials favoured my machines, however; the contracts were drawn, and I thought the deal was concluded, because only the signature of the War Minister was lacking. But a few hours before the contract was to be presented for his signature, the British Ambassador to The Hague paid him a call and informed him that the purchase of Fokker aeroplanes would be considered an " unfriendly act."

There had been no reason to inform the Dutch Government that these planes and engines had originated in Germany, but the Vickers firm had discovered the fact for themselves. One way they could check the origin of the engines was by their serial numbers. They tried this through one of my secretaries, who informed me that she had been approached by a representative of the Allied Intelligence Department. He asked her to learn how many engines we had got out of Germany and obtain a list of their numbers. They hoped in this way to prove that the engines should have been delivered to the Allies by the German Government. I told the secretary to play along with the agent. We gave him a list of all the engine numbers, but the numbers were all wrong. She got her reward, and the agent went away happy. But a few weeks later he returned, telling us sadly that he had lost his job,

because it had been discovered through other channels that the numbers we gave him were false. He suggested that we hire him, because he knew of all the activities of the Intelligence Department against us, and this we did.

As a matter of fact, I was able to convince the Dutch Government of the truth, namely, that the smuggled aeroplanes and engines had been my property, and had never been owned by the German Government. But it took eleven months and further big concessions on my part before the deal actually went through. The rest of the aeroplanes were eventually sold to other countries in the same position as Holland.

XX

SPREADING WINGS

WHEN the war ended, most designers the world over continued to think exclusively in military terms. But while I was still in Germany we built the first really commercial cabin aeroplane, the F-2, and had it secretly flown over to Holland by De Waal.

Most manufacturers merely converted their surplus military planes into some kind of acceptable commercial aircraft. Passengers were asked to climb into high cockpits by step-ladder, and to fly exposed to any kind of weather. As a matter of fact, the first air line in Holland used such remodelled De Havillands.

I foresaw the need for more comfortable aeroplanes if we were to ask civilians to pay for rides in them. The F-2, carrying five passengers in a closed cabin, had a bench for three, two easy chairs, and other conveniences. As soon as the Dutch air line began putting these ships in the air, other operators had to follow suit. I believe I can honestly lay claim to having developed a European demand for commercial aeroplanes because of my pioneering. Had this step not been taken, commercial aviation in Europe would have been for a longer period nothing more than a camouflaged military set-up.

As a result of organizing my Dutch company, Nederlandsche Vliegtuigenfabriek N.V., which sold my surplus war planes as well as manufactured the new commercial type, I soon found myself heading the third largest industry in Holland. Taking cognizance of this, Queen Wilhelmina presented me successively with two medals, Ridder der Oranje Nassau Orde, and Gouden Medaille Voor Voortvarendheid en Vernuft. These I added to those received in Germany, Eiserne Kreuz (Iron Cross

for Industry), and the Mecklenburgh Militär Verdienst Kreuz.

For certain of the competing aviation companies in the Allied countries, the war had not ended yet. This was clearly shown during the first international aeronautical exhibition (ELTA) held after the Armistice in Amsterdam. German entries were barred, because one or two English firms, notably the Vickers and Handley-Page companies, refused to enter unless that restriction was made.

Inasmuch as I was a Dutchman, the Vickers firm was powerless to object to my exhibiting. But when, on the opening day, I attracted a disproportionate share of attention by flying my latest fighting plane the D-8, several exhibitors did object. As a compromise, it was agreed that each nation should have its separate day on which to demonstrate planes. This cut me down to one day's flying, although the exhibition had been organized and financed by Dutch business men, a leader of whom was Albert Plesman of the Dutch air corps, present head of the K.L.M., whose energy and enthusiasm had made the show a success.

The following year, the first post-war Paris *salon* was held. I offered my exhibit under the official name of my Dutch company. The entrance committee seemed somewhat surprised when two Fokker planes appeared for exhibition.

One was my five-passenger cabin transport plane, powered by a 185-h.p. B.M.W. engine. I had brought it to Holland from Germany. The other exhibit was a touring glider, made from an original D-8 fighter. The iron crosses were still painted on the wooden wing, but they were covered by Dutch orange circles. It had been my intention to have the glider towed behind a plane for publicity purposes, but as it happened I got all the publicity I wanted without any effort on my part.

On the opening day, the crowds jammed around the

Fokker exhibit. Other manufacturers raged. It was not known, of course, that the air liner had been built in Germany, nor that the glider had been built from a D-8. Just the name of " Fokker " was enough to set them off. Certain exhibitors started a riot round my exhibit. Newspapers, which love a row, devoted their headlines to the excitement. Signs were torn down. The mob was just beginning on the planes when the gendarmes arrived. Thereafter, the exhibit was guarded by a cordon of sixteen gendarmes. This, of course, only attracted more attention than usual to the Fokker planes.

In contrast to the attitude of the smaller competitors was the conduct of the larger firms, like Blériot and Farman. They refused to join the chauvinists. Moreover, Nungesser and many French aces who had been well treated at the Dutch exhibition were ashamed for their countrymen and protested vigorously. They organized a dinner and official reception for me, and altogether behaved in a very sportsmanlike manner.

Another group, headed by Captain René Fonck, France's ace of aces, who had become a deputy and politician, fanned the flames, wrote articles in the newspapers and demanded that the Fokker planes be removed from the exhibition. Gradually the Fokker row became the topic of the day. My planes were getting more publicity than all the rest of the show put together. I cannot say I wasn't relishing the whole absurd performance. Every French paper interviewed me. I told and retold all the war stories I knew.

The French Government, fearing that my life might be attempted by some fanatical patriot, put secret service guards on my heels, the presence of whom I only accidentally discovered. I had just bought an American Cadillac, one of the few in Europe at that time, and used to go for a spin in the Bois de Boulogne, where I could make sixty miles an hour or more. The morning after my first spin, when I went to the Ritz-Carlton garage to get my Cadillac,

a man tapped me on the shoulder and asked if I would be kind enough not to take my motor-car out that day.

" Why should I not take my car ? "

After confused explanations, he finally said that he and his comrade were secret service agents with strict orders to guard me day and night. I was not supposed to be aware of this. The day before, they had lost me in the Bois. Their little Citroën couldn't keep pace with my Cadillac. The next day they would have a bigger car, an 80-h.p. Panhard, but to-day, would I please not take the Cadillac out. I suggested that they ride with me. They declined politely. That would interfere with the secrecy of their protection. And so I proposed that I should follow them, instead of their following me. They turned from protectors to guides.

I told them where I wanted to go and followed them, but sometimes they gave me more protection than I wanted, especially after business hours. I tried to make them comfortable, but they refused to eat or drink at my expense.

On the fourth day of the show, I was walking idly around when I met Commander White, of the American Legation, whom I knew very well. He asked me if I would accompany him and explain various technical matters. Everything went well until we were standing under the wing of a large ship and I started to explain the working of the first oleo shock absorber landing-gear. It was one of the features of the exhibition. To make it clear to Commander White, I drew a pencil from my pocket and started to sketch the system. I heard a big shout behind me.

" Here is Fokker, a spy copying our designs."

It was the inventor, Henri Potez, with three huskies, ready to beat me up, and there is no doubt a number of others would have gladly joined and helped him.

I retorted in French that I did not know how to copy designs, that I had not had five years' practice as the French had, beginning with my synchronizing gears.

One hot word led to another. We were just about to fight when one of the secret service agents jumped between us. The other took me by the arm and whispered that I must escape immediately. A crowd had gathered and half a hundred people pursued me, but I managed to slip out of a side door after eluding them, picked up my Cadillac, and went for a spin in the Bois.

When I returned to my hotel, Commander White was there. I apologized, but he said there was no question of my copying any design, as he well knew, and that I had been in the right. Of course, more publicity followed.

After that I was worried lest someone discover the iron crosses on the wing of my converted glider. I had observed that from the balcony the German design still stood out under the paint in a certain light, and I was worried lest someone else notice it. Had anyone suspected that the plane had actually been made in Germany, there is no doubt a fine row would have broken out, and the glider would have been torn to bits.

My secret guards left me only at the border station, where I did my utmost to persuade them to accept a thousand-franc tip apiece for their courtesy and protection, but was unsuccessful. I was sorry, for they, the exciting episodes at the aviation show, and all the publicity, had made my Paris stay very pleasant.

Not long after this, the American air corps, after testing some captured D-7 and D-8 planes at Dayton-Wright field, purchased several of my latest types, developed in Holland. Among their purchases was the Macready-Kelly ship, which made the first non-stop transcontinental flight. Over a three-year period I delivered £150,000 worth of planes to the army and navy, before it was suggested that I establish a factory in the United States to overcome the opposition of certain American manufacturers who objected to the army's buying planes from abroad. As a result of this invitation I went to America in 1922 and

organized the Atlantic Aircraft Corporation. Frank Ford and George Davis, of the engineering firm of Ford, Bacon & Davis, with Major Lorillard Spencer, were my first partners. Our first domestic order from the army called for the adaptation of the Fokker steel fuselage to 100 De Havillands. This introduced the Fokker steel fuselage in America. It has since been generally adopted. For a time we subsisted on small orders, while I organized my business on a solid basis in anticipation of the expected aviation boom. In 1925, I brought over the first three-engined plane, a ship which created a sensation in the industry, and gave Ford something more to imitate.

Many people have thought I opposed Henry Ford's copying of this tri-engined air liner. Actually, his imitating that machine in all-metal construction has been a great help to me. I showed it both to Mr. Ford and his son, Edsel, during the 1925 Reliability Tour, at Detroit. Edsel thought so highly of it that he subsequently bought it for Commander Byrd's scientific expedition to the North Pole. It is now, I understand, in the Ford Museum for Historic Planes. The problem of the aviation industry is not to fight competitors, but to work harmoniously for the good of the industry as a whole. The Fords, I believe, have unfortunately never made a cent out of aviation. If I have helped them, their interest in aviation has, in turn, reacted to my benefit.

The boom placed me in a difficult position. My Dutch factory was a growing concern, and several continental constructors were dependent on it for licensed designs. I had come to the United States hopeful of creating an aviation industry which would spread over the world. Because I had been practically alone, unhampered by boards of directors unfamiliar with the special problems of aviation development, my American company was well organized to expand naturally along sound lines. But the importance of having American backing was pointed out to me by high

army officials. There seems to have been some objection to my being a foreigner with foreign money and foreign interests, and in the hysterical boom period, when a Niagara of millions was being poured into the coffers of competitors, I realized that it would be impossible to create the organization I had in mind without more capital than I could obtain from earnings in a short time. In the United States, business is not frequently built up out of earnings alone.

I had offers of additional capital from many groups of financiers, and existing organizations offered merger possibilities. But I was looking for financial interests which had direct connections with operating companies, interests that would ensure a market for my planes. In the meantime, I came to an agreement with a Wheeling group of industrialists to open a plant there. They were anxious to operate a factory to compensate for their decreasing steel industry. Shortly thereafter the Wheeling factory was producing tri-engined ten-passenger air liners at the rate of one every five days.

Continuing with my expansion programme of permitting only such financiers to buy in who serve as definite links with important operating companies, I sold blocks of stock to important individuals behind the Universal Air Lines and Pan-American Airways. With these excellent partners, I allowed a group of western air transport operators to invest in the company because their air line had been one of the greatest users of the larger Fokker planes. In addition, I gave them management control. I had pioneered the way, built up an enviable reputation for our product, and definitely put the company " over the hump."

Still there was an imperative need for even more important connections. Certain big aviation groups had been formed by mergers which threatened to dominate the industry. Realizing this, we were in a mood to affiliate ourselves with General Motors. I was confident that the

association with General Motors would bring us bigger gains, greater prestige, and higher standing in the industry, and that the joined American and Dutch companies would inevitably benefit through its world-wide sales organization and enterprise. General Motors offered to put all the weight of its tremendous success behind the Fokker plane, and offered satisfactory terms for a forty per cent. interest, so that we felt bound to accept.

Under the stimulus of the increased demand for giant air liners, I developed the F-32. These, the largest landplanes in America, carrying thirty-two passengers, were put into operation by Western Air Express. At the same time I continued to design various types of pursuit, transport, and bombing planes for military use, both here and abroad.

Then came the financial depression, halting progress in practically all forms of industry. I found myself marking time instead of advancing along lines which the joining of forces with General Motors had so happily presaged. As to the future of aviation, I have no doubts, realizing what astounding developments have already come during my brief connection with fitting wings to mankind. And if General Motors carries on with the faith, enthusiasm, and intelligence which have marked its strides in developing the motor-car, I feel that the Fokker wings will stretch out on even more ambitious flights than have already been successfully achieved.

XXI

GREAT FOKKER FLIGHTS

SPECTACULAR flights turned aviation into a three-ring circus, in the opinion of many serious students of flying. They deplored the publicity given to such flights, and contended that the worth of such hops as Lindbergh's New York-Paris flight has been much exaggerated. Lindbergh's amazing feat, and still more amazing personality, touched off the commercial aviation boom—but it was long coming, they assert. Moreover, they declare that the public was diverted by such tricks from considering flying as merely an advanced form of transport, and led to believe that it was exclusively the sport of heroes.

There is a kernel of truth in such contentions; no more. Such spectacular flights as my plane participated in have certainly not been detrimental to the name of Fokker. They have cost us a tremendous sum of money—even when the ships were paid for—because many sacrifices were made, other orders were postponed, all in the interest of safeguarding the pilots' lives. I fully realize, too, that no sensible operator ever bought a plane merely because Lindbergh or any other hero flew it. Lindbergh himself, as technical adviser to two air lines, did not persuade either to use commercial copies of *The Spirit of St. Louis.* But the heroes served a useful purpose, nevertheless. As pioneers, they dramatically brought to public attention the amazing progress aviation had made since the war.

It was in 1927 that I had the pleasure of watching the entire world, within the space of forty-eight hours, almost completely circumnavigated by Fokker planes. Lieutenants L. J. Maitland and A. F. Hegenberger were hopping the Pacific from San Francisco to Hawaii, Rear-Admiral Byrd and a crew of three were spanning the Atlantic, while

the late Van Lear Black—who later met death not flying but yachting—piloted by G. J. Geysendorffer and J. A. Scholte, was winging his way from Amsterdam to the Dutch East Indies. Three years later, almost to a day, I welcomed Wing-Commander Charles Kingsford-Smith at Roosevelt Field as he was completing the first circumnavigation of the world in the veteran tri-engined Fokker, *Southern Cross*.

Oddly enough, Kingsford-Smith was not even able to sell his historic plane for a fair price, though only seven years before, the Smithsonian Institution had placed the Fokker T-2 within its halls, following Macready and Kelly's first non-stop transcontinental flight. Change is even faster than an aeroplane.

The stories of these flights have been told and retold with such a multiplicity of detail that it would be redundant even to sketch them in here, were it not that there are interesting collateral episodes in which I played a minor part. These may throw light on the more important adventures.

Kingsford-Smith I regard as the greatest flier in the world to-day.* Balchen is perhaps comparable to him, but only in the cockpit. Kingsford-Smith has the advantage of being a great commander as well as flier. He is the best organizer for success I know, and has the most courage of any airman I have met. During the war, he was an Australian ace. Red-haired, slight, he is like an animate copper wire surging with electrical energy, a man not to be downed no matter what the odds pitted against him.

Byrd, of course, does not claim to be much of a flier, but is a great organizer and leader. Bennett flew him to the North Pole. Balchen flew him to the South Pole, after having put Byrd permanently in his debt by saving the lives of the *America's* crew with his hours of " blind flying " and remarkable landing in the surf off the rocky beach of Ver-sur-Mer, following Acosta's collapse.

* Written in 1931.

When Byrd sought to buy the first tri-engined Fokker I built in 1925, he was unknown to me. That plane had been constructed in my Dutch factory on the basis of my cabled instructions to put three Wright engines on a single-engined Fokker F-7. I had devised a manner of slinging the two outboard engines underneath the wings. When it arrived, I entered it in the Ford tour and flew all around the United States, winning the tour and attracting widespread attention to this new type of transport plane.

Byrd heard about the extraordinary plane and wanted to buy it for his North Pole flight. I was not anxious to sell. It had proved such an excellent ship that I wanted to fly it myself. I had no other three-engined plane at the time. I had successfully demonstrated it to the army, and still needed it. Putting the full price on it, I hoped he would refuse, but he fooled me. Finally, I consented, fixing up it for polar work with Bennett, who, I soon realized, was an exceptional pilot and individual. But I hated to see that plane leave me, and only sold it for £8,000 on condition that the Fokker name should be left on it. Edsel Ford had liberally financed Byrd, still, I was somehow surprised to hear later that the Fokker had somehow become the *Josephine Ford.* Little Miss Ford rode to fame and the North Pole on the wings of Mr. Fokker.

For his transatlantic flight, Byrd wanted another Fokker of the same type, but with a larger wing to carry a greater load. We had the wing built in Holland, while we hurriedly constructed the fuselage and assembled the ship at our Teterboro factory. The *America* was built far ahead of all competitors, for Rodman Wanamaker was spurring us on to get it done as soon as possible. Byrd publicly contended that he was simply flying the Atlantic for science, the *New York Times*, and a little bit, maybe, for himself, but he was in truth, naturally, anxious to be the first to Paris as he had been the first to the Pole by air. I

never could understand why he did not take off before Lindbergh. He could easily have done so.

When Byrd's plane was ready I planned to take it up for its first test hop alone. Bennett, who had been the very heart of the flight, asked to go along. Foolishly, I let him, being excited myself at the prospect of taking this fine ship into the air. While I was testing the engines, Noville said, " Me, too."

I should have refused, because without any load in the rear, and with an empty main tank, the ship became nose heavy with the two pilots' seats full. But as I had flown somewhat similar ships under the same conditions without difficulty, I agreed.

At the last minute, when the engines were roaring for the take-off, Byrd rushed over in a comradely spirit, wanting to come along. It was so proper for a commander to take his chances along with his men that I couldn't say no.

In a certain sense, there was no need to be alarmed, but as always happens, one mistake leads to another.

As I took off, however, there was no indication of nose heaviness which couldn't be compensated for by the adjustable stabilizer. Nor did our aerial manœuvres cause either Bennett or me to suspect anything amiss until I shut off the engine. Then I told Bennett to turn the stabilizer all the way down to keep the nose up. It looked as though there would be no trouble landing.

What I hadn't sufficiently figured on was the larger wing of this particular ship. The combination of large wing, empty tank, and small supply of petrol in the wing-tanks made the speed of landing so slow that the efficiency of the elevator was lower than normal. But, coming in for landing, I had an instinctive feeling of danger, and told Bennett to go to the back. He refused, however, paying no attention to my suggestion.

Byrd and Noville were in the compartment directly behind the pilots' seats, and their way to the rear was

blocked by the tank which had been made as large as the fuselage.

Expecting a long float, I tried to use the whole field. But the ship dropped down on its wheels about fifty feet earlier than I expected, owing to the inefficiency of the elevator, in a soft patch of fresh cinders. The tail of the ship was horizontal but still in the air, not depressed as in the normal three-point landing.

The ship rolled for about a hundred feet, but to my surprise the tail was not settling as we lost speed, but very slowly rising. Instantly, I realized the possibility of nosing over. I had something less than a second to decide what to do.

If I tried to take-off again, and failed, the crash would be terrific with the engines running full speed into the ground. There would surely be a fire.

If I cut the switches, we might do no more than go over on to our backs.

In that second I cut the switches.

For some time I had been holding the wheel controls jammed hard back against me, in an effort to bring the tail down. Since the controls were double, this pinned Bennett into his seat as tightly as it did me, and effectually prevented either of us from trying to escape, even had we wished to do so. After the crash the marks of the broken wheel control were firmly outlined on my abdomen.

Byrd said, in his book, *Skyward*, describing this event:

"The wheels touched the ground. Instantly I saw Fokker rise and make frantic efforts to jump out. Bennett was trapped, as Fokker occupied the only exit. There was no way Noville and I could even try to get out."

Maybe Byrd was excited, and imagined this, a description more worthy of a layman than a supposed technician. Anyone used to piloting would have known that I couldn't have tried to jump out, supposing, for instance, that I totally

disregarded the tradition that a pilot sticks to his controls. Naturally, this comment disturbed me, not because I feared what airmen would think—they would know—but because of what the ordinary reader might suppose.

Actually, while we were turning over, I sat in my seat as did Bennett, except that I drew my legs back and held on by my left hand to the side of the cockpit. Probably both Bennett and I wanted at that moment to get out of the front seats, where the whole danger centred, but the steering-wheels' position locked us both in. I knew what was going to happen. No doubt he did, too. I thought we were both finished.

The nose would crumple up, the engine would come hurtling back, and we would be crushed to death.

Instead, the unexpected occurred. The centre propeller, hitting the ground at an angle, pushed the engine to the right side instead of forcing it straight back. Bennett was sitting on the right, which was why he got so badly pinched. On my side the ship didn't crumple in so much. My good luck was his rotten luck. Everything was coming in upon us. There wasn't an inch left to move round in until the ship gently turned on its back.

The weight of the engine then opened up a crack in the cockpit and I fell out on my head. Almost instantly a stream of hot oil covered my face and body as I scrambled to my feet. I heard a cry from Bennett: "Look out for fire."

In cutting off the switches, I had taken care of that.

Bennett was hanging head downward, and with a slight pull he almost dropped down, and I hauled him out.

In the meantime, Byrd and Noville, having turned a somersault in their undamaged compartment, tore their way out. Noville ran away from the wreckage screaming, holding his body in agony. He had been internally injured when thrown against the wall. Byrd, though suffering from a fractured arm, kept his senses.

Poor Bennett's leg was broken, and he was badly cut up. I came out of the wreck unhurt, just a few bruises here and there, and torn clothes soaked in hot oil.

Had the engine stayed in the middle, we both might have been killed.

A doctor who happened to be at the field rushed to our side with a first-aid kit, while we waited for an ambulance. Bennett and Noville both got a shot of morphine, and Byrd went with them to the hospital.

I hadn't enjoyed the accident, and it left my nerves rather shattered, but I was at the factory next day to look over the damage. It wasn't so extensive as I had feared. A few panels in the wing were punched in; two propellers were bent, the rudder askew, and the nose crushed in. We were able to complete repairs in two weeks.

It has often been asked why I, with so much experience, Bennett, who was such an excellent pilot, and Byrd and Noville could have made such a costly mistake. The accident was a combination of four conditions, the elimination of any one of which would have prevented it.

We found later that Bennett hadn't turned the stabilizer entirely to its lowest position. Apparently he hit a tight spot in turning the stabilizer wheel and thought he had reached the end. This trifling difference would have brought the tail of the plane down, had the plane not dropped off before I estimated it would.

The extremely large wing had rendered the elevator inefficient at a low speed, where under heavier load and therefore faster landing it would have worked all right. This I didn't foresee—which is why we make test flights.

The fact that I didn't refuse to take Byrd and Noville aloft was a mistake in judgment, for which I was entirely to blame.

Had the nose heaviness been apparent in flight, I could have sent a man over the wing to the rear of the fuselage, or told the three men to lie on the floor as far back as

possible. But Bennett had handled the controls in the air, and the fact that he refused to leave his seat indicated that he didn't sense immediate danger.

Had I sensed the danger myself in time, I should, of course, have definitely ordered him back—since two pilots were unnecessary—and landed the plane standing up, holding the wheel back to the last minute and then rushed aft to where Byrd and Noville were.

Actually, it was just one of those things.

While we were repairing the plane, we heard about Chamberlin's preparations with the Bellanca ship, and rumours of Lindbergh's activities on the west coast. Lieutenant Noel Davis had been killed in testing the Keystone plane he had bought for the flight. Fonck had failed, when his Sikorsky piled up, killing two, and that gallant pair, Nungesser and Coli, were to give up their lives in a daring westward attempt which Coste and Bellonte were finally to achieve for France so triumphantly. When the ship was ready for the second test flight, everything went smoothly. The plane was transferred to Roosevelt Field, where Wanamaker had trimmed up an old hangar like a boudoir.

Then began the most interminable series of test flights it has ever been my grief to witness. They dragged on for days. It seemed to me that every possible excuse for delay was seized on. The absence of Bennett, who was laid up in the hospital for months, seemed to take the heart out of the expedition. I began to wonder whether Byrd really wanted to make the transatlantic flight, which was basically hardly more than an elaborate advertisement. Instead of eagerly trying to push ahead, it seemed to me every possible excuse to stall was seized upon.

I discovered that Noville was absolutely unfit to act as a relief pilot. Convinced that the crew of three was insufficient, I urged Byrd to take Balchen with him, and exchange Noville for an experienced wireless operator. Byrd said, however, that he was under obligation to Noville, who had

assisted him on the Polar flight. Byrd agreed to take Balchen, however, a lucky decision, after he had gained Wanamaker's deferred consent.

Suddenly, with the abrupt but carefully considered decision with which the world was to become familiar, Lindbergh took off on May 20th for Paris while Byrd was sending out invitations to members of the French colony for an elaborate dedication on May 21st. It was a joke on us, for my sales manager, Roy Russell, afterwards told me that he had turned Lindbergh down when he wanted to buy a Fokker plane for the flight. Russell did not take him seriously.

I was the last person to have a long conversation with Lindbergh before he left, while mechanics were filling up the petrol tanks. Something was said about Byrd. I told him Byrd, even though burdened with all his scientific equipment, had been ready for some time, yet showed no signs of leaving. I was glad that Lindbergh, playing a lone hand, should get a break.

As soon as he climbed into his cockpit, I jumped into my Lancia and raced to the far end of the runway. My car was full of fire-fighting apparatus. I wanted to be of assistance if Lindbergh should pile up as Fonck had done on the same field. If he was successful, the part of the take-off most interesting to watch would be at the end.

Lindbergh's heavily laden monoplane came tearing down the runway, seemingly glued to the earth. Five hundred feet from the end, it still hugged the earth. In front of him was a tractor; telephone wires bordered the field.

My heart stood still—but his ship didn't. It lifted, on the third try, and just cleared the wires. Fortunately, I had no use for the chemical extinguisher that morning. Lindbergh was off on the wings of destiny.

The next day, the christening ceremonies of the *America* were involuntarily turned into a celebration of Lindbergh's arrival in Paris. Byrd joined in, like a good sport, though

it must have irked him to see the " unscientific " Lindbergh nose him out with as perfect a flight as the world has ever seen.

Three times we pushed the completely equipped *America* to the top of the fifteen-foot hill—with wooden wheel-tracks and greased skid slide—which I had devised to give the *America* the equivalent of 500 feet more run. I sent word each time to the Garden City Hotel that all was in readiness, but the fliers failed to show up. Chamberlin had already made his flight to Germany, with Charles A. Levine as passenger-owner. Fed up, I went aboard my yacht in the Sound.

Byrd's hesitation began to look something more than ridiculous, particularly when word was received that Maitland and Hegenberger had hopped off. Suddenly, on a day when the weather was far from ideal, the *America* took off in the rain with only a few people to watch.

At Nova Scotia, the *America* ran into fog and Balchen began to show his worth. Acosta lost the balance of the ship and it started down. Balchen grabbed the controls, and brought it back on an even keel. From then on, Balchen took the controls during all the bad spots. Fog and rain closed in so thickly that Byrd could not navigate. In this excitement, Noville stepped on the radio so that it was out of commission during the last part of the flight. Balchen took over both navigation and piloting when they reached France, and brought the ship over Paris in a dense fog. He saw one or two flashes of a beacon, but lost them immediately and realized that it was impossible to find Le Bourget or attempt a landing. Byrd seemed confused and entirely lost; Acosta was a physical wreck; Noville, by damaging his radio, had destroyed his sole usefulness.

Through the black night, whipped by storms, Balchen steered resolutely back to the coast. He communicated with Byrd by notes. One of Byrd's queries read:

" Are we going to crash ? "

" Hell, no ! " Balchen replied.

When he picked up the beacon from the Ver-sur-Mer lighthouse, Balchen told Byrd that he proposed to land in the water as close to the shore as possible. He asked Byrd to throw out flares, which would burn when they hit the water and give him some indication of where the water line commenced.

In the light of what actually occurred, Byrd's description in *Skyward* sounds faintly ridiculous. About this stage of the unfortunate flight Byrd wrote:

" I felt myself entirely responsible for the lives of my shipmates. I don't believe they thought there was much chance of getting down safely, but still they faced it gallantly . . . to the last they calmly obeyed orders.

" *Balchen happened to be at the wheel.*"

The italics are mine.

Balchen set the ship down on the flares, so accurately did he land. One of them actually flew into the observation cabin. The impact tore off the landing-gear, of course, but Balchen had landed so skilfully that the great ship settled comfortably on the bottom, with the sea running just awash its wing.

Byrd and Noville emerged through specially prepared exits, and launched the bubble boat in which the four rowed to shore and fame.

The wreck, which was hauled out of the sea by fishermen after a day, was shipped back to the factory, and despite the fact that the wing had been in the water twenty-four hours it was in almost perfect condition. After some delay, two Wanamaker trucks appeared for the wing.

Despite this unfortunate end of Byrd's transatlantic trip, enthusiasm for ocean fliers at that time ran so high they were loudly cheered both in Paris, where an official historian greeted the quartet, and in New York, always friendly to aviators. Balchen, not being particularly communicative even to his close friends, stepped into the shadows while

the others told their stories in the spotlight. Perhaps it did not even occur to him to permit himself so much as a compensatory grin. At all events he returned to America bareheaded, not a little tousled, in a hurry to slip away from the hero-worshippers.

When Byrd decided to reach the South Pole by air, he naturally wanted Balchen to go along. Edsel Ford was again heavily financing his expedition, however, and so Byrd felt, for obvious reasons, that he had to take a Ford tri-engine. Balchen refused to go on the expedition unless he had a Fokker ship. He took a Super Universal—a single-engined type in which he knew he would have no difficulty surmounting the 11,500-foot polar plateau—intending to insist on flying it when the actual showdown came for the big flight. The Universal was wrecked in a blizzard which hit them when Balchen and two others were camped in the open on an expedition far from Little America. The terrific wind simply lifted the plane off the ground. It disappeared in a cloud of snow.

The story of how Balchen just managed to fly the Ford up the ice ravine and stagger over the polar plateau by hastily dumping several hundred pounds of food which Byrd had insisted on carrying against Balchen's warning, has been told already.

Balchen's nerves are of iron, but he uses his judgment too. He has not got the credit he deserves, I suppose, because his extraordinary modesty shames the shrinking violet.

XXII

FOOTNOTES FROM EXPERIENCE

Most people who write autobiographies fall into the error of trying to evolve a formula for success. They believe their system can be reduced to words, and that others will be able to follow it. I don't believe that is possible. The best argument I can think of to support my opinion is that everyone achieves success in his own way—admitting that we know what success is.

What I wish to record here, then, are only a few footnotes on my own eventful, somewhat successful career. They may prove helpful. At least, they may prove interesting to the reader. On the chance that they will be neither, forgive me, in advance, for boring you.

Experience is a dear school, but it is my contention that wise men as well as fools can learn in it. The chief reason why I am still of value to-day in the aeronautical industry is because I can make every part of a plane with my own hands if it should be necessary. It is fifteen years since I stood up to a draughting board, but I know exactly what I want, and if others' drawings do not suit me, I can point out specifically what is wrong, where it is wrong, and to what degree. The woods are full of good, conventional plans for aeroplanes drawn by boys fresh from college. In their general outlines, it would be difficult to improve on them. What they miss are all the fine points learned only by practical experience in operating aircraft.

In certain departments of construction I am still more or less a layman. Happily, experts for stress analysis, specifications for materials, chemical formulæ, and the more complicated branches of aerodynamics are more or less plentiful. But some of my best engineers make designs

which are entirely impractical. A few imperfections can ruin an aeroplane for practical use.

Unlike a great many designers, I actually fly my planes, use them as other men use motor-cars and yachts. This experience I have utilized. There is a definite reason why every part of the plane, its size, height, location, is as it is. Nothing should be left to guesswork. A good designer should be able to tell why every part was made in just that way, for every good aeroplane is the result of infinite compromises with aeronautic theory.

An investigator would find that I never built the fastest commercial or military plane, the lightest or the cheapest one, but in the long run our planes have given satisfaction, good service, and closely filled the demands made on them. Other planes, which excelled specifically in one way, such as greater speed, larger capacity, have fallen lamentably short in too many other ways to be really useful. That is why, over a long period of years, the reputation of the Fokker planes is to-day higher than ever. I will never build a freak plane.

Returning from a trip in one of my planes, I know what the problems of the mechanics are in servicing it, what the pilot's point of view is, and what the passenger thinks about its comfort and inconvenience. I have been sitting in the plane, getting in and out, watching others, observing my own reactions, and I must say this of myself: I have always been willing to criticize constructively my own work. Nothing I have yet done has ever really satisfied me. No one has yet found as many flaws in an aeroplane of mine as I could find myself.

Any of my engineers or workmen can argue with me, or criticize my planes if he thinks something should be different. If he can convince me, the change is made; if not, I appreciate his interest. I dislike flatterers or yes-men, though I have a number of employees who believe I like flattery. They are kept, however, for their good points, judged by

their performance alone. I have had so much experience with personnel, putting people in the wrong places and finding that they did better in others, that I have finally obtained some judgment about men. Particularly have I learned not to expect more out of people than they customarily give. I don't expect any man to give more than eighty per cent. of what he should in a job; in fact, I have found that if a workman does sixty per cent. of what he could do, it is a good average.

The same is true of myself. I seldom work at hundred per cent. efficiency. I constantly slip up, fail to do things on time, but my average seems to have been high enough for sound achievement. If I had not made so many mistakes, I can see that I should have been much more successful, for one not only does the wrong thing often, but fails to grasp the opportunity of doing the right thing, which in the end is the chief secret of success, I believe.

Everybody who has been successful in life could start out at any moment, begin all over again, and in a comparatively short time reach at least the same level. This has often been proven. People who have succeeded, and for some reason been ruined, have started once more and picked up their old gains very quickly, provided they have not lost their vitality. Few people obtain success on anything but their own merit. Those who are put on top arbitrarily seldom can stay there if they don't have ability.

I have seen many brilliant fellows among my employees who had every ability but lacked the important knack of grasping opportunity. The ability was there and so was the opportunity, but they couldn't see it. At times I have tried to help them, but they have overlooked some later advantage when no guide was around. And this oversight wrecked them. Many people with ability cannot capitalize it. Others, with less ability, see further ahead, and make the most of what they have. To a certain extent I have

had that knack—a sort of native shrewdness, I suppose it would be called.

Sometimes I am very inefficient. I realize it. To an outside observer it might seem that I completely waste much time. But whether you are wasting time or not depends on what is going on in your head. An outsider cannot see that. I cannot work in routine fashion or keep a schedule. I could not come to my office at nine o'clock, clear up my mail, make a trip to the factory at eleven, and lunch at twelve-thirty. That has never been my way. Sometimes I may wake up in the morning at six, and for an hour think out a certain problem which has been awaiting attention. Finally, I see it clearly, analyse it, and settle on a solution. Often I do more in the first two hours than in all the rest of the day.

All my life I have been something of a lone wolf. Neither in Germany nor America have I been particularly popular among my competitors. Very often, others cannot see why one is successful, or in what manner one manages to beat them. I have always felt hated, not personally, because I do not know many of my competitors, but generally, as a force.

On the other hand I think most of my employees either like or admire me. This is true especially of those with whom I have worked side by side for years. They have learned to understand my ways, make allowances for my idiosyncrasies as I do for their little quirks, and know that I try to be just. They know that I appreciate them and their work, in spite of the fact that I drive them, and sharply criticize their results. More than ninety men have been with me over nine years, and ten over fifteen. None of them are under contract, and all have been approached by competitors. Some took more attractive offers, but most of them came back, and I found them even more loyal afterwards. They learned that everyone has something to complain about, but that by working for one man they had

appreciation and contact, and were treated with at least human justness. In some of my employees I have implicit confidence, but I cannot say that I have a nature for making personal friends. I like to have people around me, particularly if they are enjoying themselves, whether I am joining in with them or not, but if I am alone I am occupied all the time. Although I have a lot of friends, no one of them is the outstanding one.

No matter how much one helps others I find that they end up by thinking that what was done they did alone. They like that. I have managed to learn how to coach people without their knowing it. In exchange I ask a great deal from my employees and usually get it. I expect them to be ready day or night and to be interested in their work. But if extra jobs come up, I make it my business to be on hand, too. And I never hesitate to take my coat off, grab tools, and show how the task should be done. When unexpected night work is necessary, I take care that the workmen get fed, are cheered up, and made to feel appreciated both in spirit and in pocket.

The real payment I have had out of life is not the money I have acquired but the sheer satisfaction of winning a fight. Just doing something which was hard gave me all the kick I needed. Money is only interesting as a source of power. If I could control a hundred million pounds I should like to do so, merely as raw material, a tool, a necessity of the game, to see how well I could organize a business and what could be got in the way of more power.

I have never found any pleasure in spending money on myself. It is no fun, for instance, to buy a motor-car without having to worry whether the price is £1,000 or £5,000. Unless the payment comes hard, so that one appreciates it, there is no fun in buying it at all. The whole purchase loses its incentive. The fact that I made my money by hard work and fighting gave me more satisfaction than I ever got later buying myself luxuries.

In the end, I suppose it is all vanity. In Germany I wanted my products to gain proper recognition. I have heard people say that I like publicity and notoriety. That may be true to a certain extent. Certainly one wants acknowledgment of one's success. If one were alone in the world, one wouldn't start making a big hill which nobody would see. But if there were people around to watch the operation, and still others trying to make a bigger hill, there would be some incentive in making the biggest. Regardless of what men are after, money, fame, or just publicity, basically their purpose is the same, to fight to show their superiority. The usual measuring stick of success in this world is money, so that is what people fight for. Artists are living for fame, not money, but in business one cannot get fame without money, for that is the synonym for success. But my own satisfaction lies in the way I do a thing, and the fact that I have done it against odds.

Whatever I do, I try to do well. I have always been thorough. Even if I am merely scrubbing the deck of a yacht, I always do a better job than a deckhand working beside me. Sometimes I haven't the ability to do a task as well as it should be done, but I can see, at least, that it is not well done. Many people are too easily satisfied that they have done a good job. They would know, if they were more critical, that they could do it better.

In other words, if I build a plane which functions badly, I improve it, just as I constantly perfected the synchronizing gear, because I have never reached the point of being really satisfied with anything I have done.

Many people attribute success to luck. I have certainly had my share of good luck—everyone needs it now and then. But that hasn't prevented me from having bad luck, as much as many people. My early crash in Johannisthal was the worst sort of set-back. It seemed that my whole reputation was lost, in addition to the costly ruin of the

plane. I couldn't afford it at the time. My business seemed on the rocks. The bottom simply fell out of my life. Many pilots at Johannisthal, who had similar crashes, passed out of the picture. Bruised mentally as well as physically, I managed to pick myself up and start again.

When I was very young I had the idea that I wanted to be merely a successful flier. But when I became that, I decided to be a manufacturer. After that I found that I wanted to become an industrial force. Then, when I had an aeroplane factory operating, I was not satisfied, but felt that I must have a finger in engines. The next wish is to control the industry, and when one has gained control one is not satisfied because competition is lacking and the fighting element is gone. If in Holland I see someone starting up an aeroplane industry I want to fight as long as my competitor is on his feet; not because he will take any money away from me, but because I am like a dog on a plot of ground who will not allow anybody to get in because that is his territory.

As long as there is something new to fight for, I am happy. That in the end is what gives real satisfaction, for if things run along so smoothly that anyone could attend to them, the fun is gone out of them.

XXIII

FLYING ON

AFTER spending my life helping to bring the aeroplane to its present stage of development, flying is no longer the thrilling pleasure for me it once was.

When I recall how at Johannisthal I would not let a day pass without flying, because I loved it, the change seems incredible. Its cause, however, is a simple psychological matter, and because I can explain it to myself I continue to fly.

The truth is that from beginning to end of my experience with aeroplanes I have encountered so many different kinds of failures with the wings, the tail, the guy wires, the controls, the engine, the fuel lines, the petrol tank, propellers, everything almost that goes into the making up of an aeroplane, that I cannot stop thinking of them unless I am either piloting myself or concentrating on some important engineering problem. But if my mind is entirely free, my imagination visions the engines running at their enormous speeds, and the hundred-and-one points of stress and strain in the aeroplane. My reason, of course, tells me this is foolish, but I saw so many things go wrong in the early days, and have been so close to death myself more than once because of structural failure, that I have to struggle to convince myself that such things no longer happen.

I know many old pursuit pilots—men who have distinguished themselves by extraordinary courage and skill —who have a certain fear about flying to-day. They are mentally disturbed because their memories of old dangers have coagulated, like a clot on the brain pressing for recognition and thwarting reasoned thought. Such men only fly now because they know they take no risks, and because it is their job. But if they had a chance to quit they would

jump at it. Rickenbacker, America's leading ace, who demonstrated even before he took up flying the courage he had on the motor-car race-track, had this fear for a long time. By the end of the war he was convinced that each flight would be his last. The human nerve can't stand such a strain for ever. After the war he didn't fly for a long time. He is flying again now, and seems to enjoy it. He has succeeded in eliminating his old fear, now that he does not fly among bullets, and planes are no longer dangerous.

I do not fly for sheer pleasure or sport, but for reasons of transport. If I want to get to my yacht in a hurry, I just jump into a seaplane because that is the quickest way to cover the distance. When I am showing off a plane to someone really interested I get a kick out of it still, and I will always use aeroplanes for transport purposes, or to give my friends a ride.

I could never win back the thrill which I had on my first flights. They were only hops, a few feet off the ground or a hundred-foot leap-frog. Then came the satisfaction of the first curve, the first complete circle, and the first time I was a thousand feet high. These delightful moments will never return. But perhaps that is to be expected.

Instead, at the present time, we have practically eliminated structural weakness, so that almost none of the accidents to planes operated by responsible companies are now attributable to mechanical failures. Even the engines have been brought to a stage of near-perfection which is little short of an engineering marvel. It is rarely that one breaks down.

The record of our air-mail service, the most extensive in the world, proves the reliability of the modern aeroplane, although I suppose few people, as they nonchalantly lick an air-mail stamp, realize what an elaborate system their action sets in motion. To transport that letter it is necessary to have the finest equipment and personnel, doubly safeguarded by a complicated hook-up of telephone, tele-

type, telephony, weather service, and lighted airways. Behind all this is a small army of trained mechanics, wireless operators, and highly experienced pilots, all endeavouring to carry the letter with the regularity of clockwork, often in the face of adverse elements.

If cold figures mean anything, I should like to mention that to-day there are more than 100,000 miles of mail and passenger airways operating daily in the United States. During the last six months of 1930 regular American airways showed a record of one fatal accident for each ten million miles flown—ten million miles is four hundred times round the earth.

One can readily understand the satisfaction I have had in seeing outstanding airmen such as Byrd, Bennett, Balchen, Kingsford-Smith, and so many others fly to fame on their long-distance flights in planes bearing my name.

I am proud to feel that I have contributed my share in establishing the first connection and later a regular service by air between Holland and her vast colonies and incidentally between my Fatherland and my birthplace eight thousand miles apart. And turning to America it is gratifying to see that planes of my design are so extensively used on so many of the great American airways and that they are daily crossing oceans, mountains, and jungles as their part of the greatest aeroplane system in the world, Pan-American Airways, connecting the United States with the West Indies and South America. In contrast to these activities a great number of Fokker planes are at work in the frozen waste of Northern Canada in the service of Western Canada Airways.

With practically no incident, Boeing Air Transport and Transcontinental Western Air Express are daily adding to their admirable safety and operation records. Similarly, in Europe, the aeroplanes have become fixed factors in the transportation systems. The outstanding ones are the Imperial Airways, Luft-Hansa, Air Union, and K.L.M.

The future of air transportation is promising, air lines are growing and the demand for equipment is growing. Since the war, my Dutch factory has developed from nothing into an organization having its designers build for fourteen different licensed factories in as many countries. Fokker planes are now flying on approximately forty different air lines throughout the world.

When I look back, it seems that I have come a long way from the little boy with his kitchen chair and paper-and-wood models. But if I look to the future, it seems only a small beginning that has been made.

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