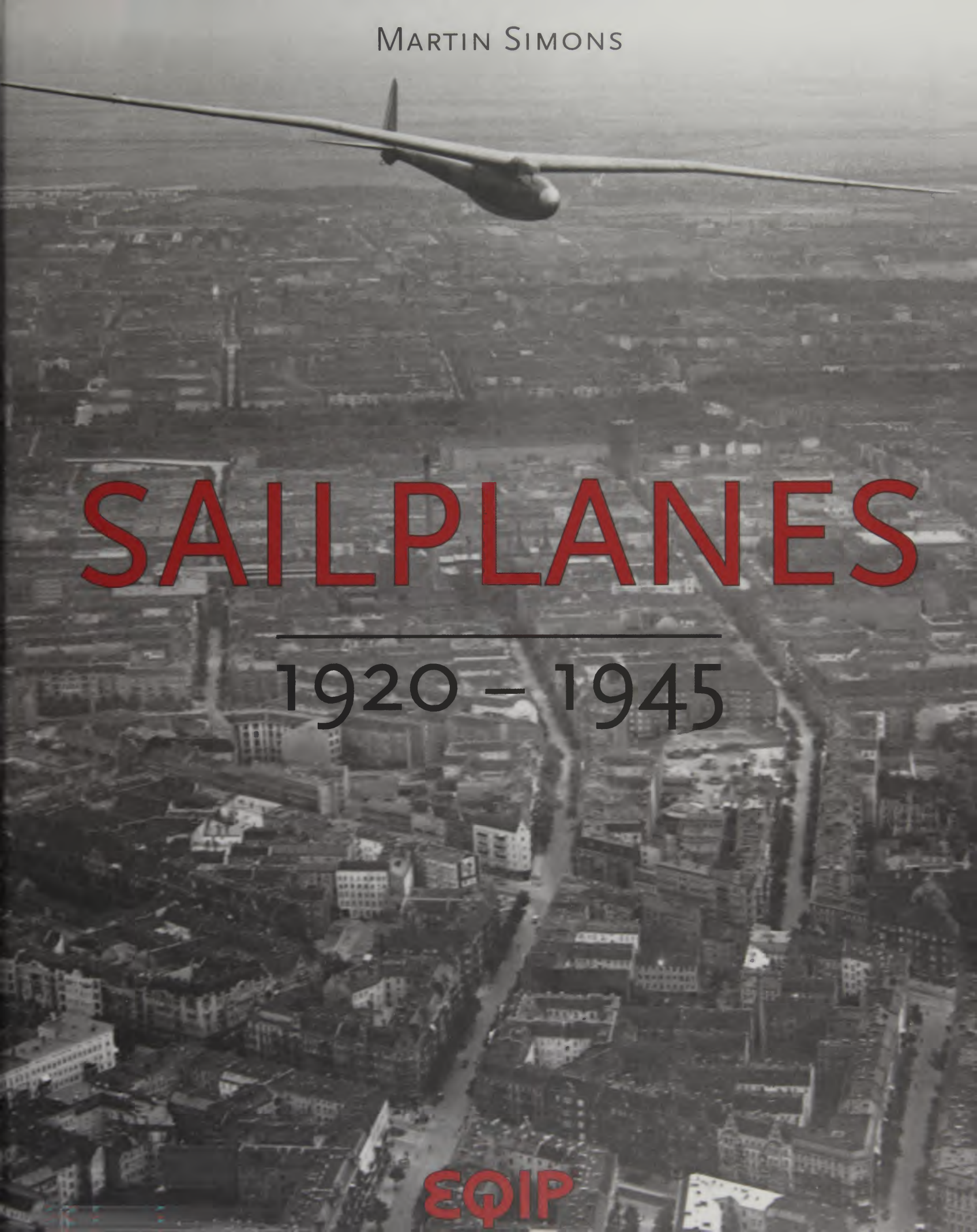
MARTIN SIMONS



SAILPLANES

1920 – 1945

EQIP

Martin Simons

SAILPLANES

1920 - 1945

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„Their slim shapes are smooth to touch and slippery like ice. Their rounded backs catch the light and reflect it like polished glass. Their curves are symmetrical, continuous, and blended into one another as geometrical designs which are happily married. When their wings are against the sky they are transparent, and you can see their ribs against the light beyond. No bird has better-shaped wings, no wings were ever spread in such a challenge. To see them is to know that they can fly. It is clear that they belong to the wind and the sky and that they are part of it as much as the clouds of a summer day."

Terence Horsley, Soaring Flight, 1944

The publishers seek unusual photographs and documents from the early days of aviation. We would like to hear from anyone owning such materials, who would wish to have them published.

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Martin Simons

SAILPLANES

1920 - 1945

For Wally, with
all best wishes
Martin Simons

EQIP

Contents

PREFACE

My first experience of sailplanes was on 15th July 1939 when, as a child of nine years, I visited the British National Gliding Competitions, held at Camphill in Derbyshire. The indulgent father of my friend Brian possessed a small car. He took us boys out for the day to this bare, exposed stretch of upland some 24 kilometres south west of Sheffield where we lived. I had always been fascinated by the idea of flying, as many were. I had seen occasional biplanes passing over our suburb and all the kids in the school yard had once watched a sky writer advertising washing powder.

Gliding was a mystery to all of us. I thought it must be something like sledging which, when there was snow, we did in the streets near home. We could pay a halfpenny, or sometimes a full penny, in the sweet shop for little aeroplanes made of card. These flew well when catapulted into the air with the rubber band (supplied), but they always came down quickly. Today, it seemed, we were to see big gliders, carrying grown men, being thrown off the top of a hill with big rubber bands.

Within minutes of arriving at the flying field, I was enraptured. There began an obsession which has continued for the rest of my life. Not catapults and mere toboggan rides down to the valley floor, but steep, swift ascents like kites pulled up on wires, wings spread against the sky, then long, floating, graceful flight, flute like sounds, smooth turns and gentle landings.

Long afterward I learned that this summer day had been poor for soaring. Only three pilots were able to scratch away from the site in weak thermals. The best distance for the day was a mere 20 km. I didn't see any soaring, or if I did, failed to understand. All I observed were winch launches and circuits hardly longer, though much more beautiful, than those of my halfpenny toys.

Brian and his dad were soon bored and wandered away from the action. They did not see, as I did, one of those beautiful, bird like aircraft with arched translucent wings and gleaming, varnished skin, flying away from the winch with the cable still hanging on. It stopped with a jerk, dived and slammed into the ground to disintegrate in a cloud of dust a few hundred metres from where I stood. I hardly needed to be told the pilot was dead. Later I stared long and sadly at the wreckage, stacked against a wall behind the hangar. That lovely wooden shell was splintered and crushed, bits of fabric still gleaming but torn and flapping wretchedly in the breeze.

How could such a thing have happened to such a wonderful craft? Gliding, so lovely to see, was evidently not without dangers. Such beauty and grace were not achieved easily. A few weeks after that visit, war came. All civilian flying in Britain was forbidden for six years.

I read everything I could find about gliding and soaring. There was little within the comprehension of a child, but I learned and began to collect pictures, drawings, articles, books. One of the most inspiring books about gliding I ever discovered was Soaring Flight by Terence Horsley, published when I was fourteen. I read it avidly and met the author soon afterwards. I still find his writing admirable. The quotation on the title page here comes from Terence's book. It captures in a few words all the sense of awe I felt when I watched sailplanes performing gentle, almost silent, circuits above my head, and when I stared and even touched them on the ground. I did not imagine I should ever be able to fly in one myself. Men who did that, I thought, must be demigods. My parents were strongly opposed to such ambitions.

I did learn to fly as soon as I could. No demigod, I have continued ever since. I have flown about a hundred sailplane types and my archive of books, articles and photographs has never ceased to grow. There is much more literature available now, as the bibliography shows.

In preparing this book, and my earlier writings, I have had help from innumerable people and organisations. As many as possible are listed in the Appendix. For the present volume special thanks are owed to Marici Phillips for translations from Japanese, Brigitte Keane for help with German texts, Vincenzo Pedrielli for advice, photographs and drawings from Italy, Raul Blacksten, archivist for the Vintage Sailplane Association of the USA, Chris Wills, old friend and President of the Vintage Glider Club, Marton Szigeti, who provided several photographs and my publisher, Klaus Fey of EQIP GmbH, whose idea it was to make a new book and who has supported and encouraged me at all stages.

The book is about sailplanes, much less about designers, pilots and advanced techniques. This is no doubt a fault, but it was the aircraft themselves that fascinated me at the beginning. For those whose interest is chiefly in the people involved, or the influence gliding has had on other aspects of aviation and history, or competition strategies in modern soaring, the bibliography lists many references to be followed up.

Martin Simons
Adelaide, 2001

INTRODUCTION

The early history of flight has been written many times by other authors and will not be repeated here. A question still requiring an answer is, why did gliding not begin sooner than it did? Controllable kites for sporting combat were flown in ancient China where there are legends of men being carried aloft by them. There were sailing ships and windmills all over the world. No one could doubt the power of the moving air to raise roof shingles, drive boats, pump water and grind corn. Superstition and fear of the gods did not prevent people trying to fly. They usually injured or killed themselves by jumping off towers or cliffs. All the necessary materials and techniques needed to build simple gliders were available, yet not even the genius of Leonardo da Vinci produced anything remotely airworthy.

The first successful gliders were designed and built by the Yorkshire baronet, George Cayley in 1804. He flew 'free flight' models based on a simple kite and built one big enough to carry a boy, probably a household servant, for a few metres. After a long interval, Sir George's man - carrying glider flew in 1849 - 53. The coachman who had been persuaded to act as pilot, survived the flight but resigned at once. Despite Cayley's publications, no one showed any interest. A modern replica of the glider has been flown and proves that Cayley understood the essentials.

Otto Lilienthal began to fly hang gliders in 1891. It was his successes that led directly to the inspired, but business-like, work of the Wright Brothers. They made many gliding flights to develop methods of controlling their aircraft before the extremely brief 12 second powered flight in 1903. It was not until 1905 that they could measure their aeroplane flights in minutes. Not till 1908 did they fly for an hour and were confident enough to demonstrate their success fully in public.

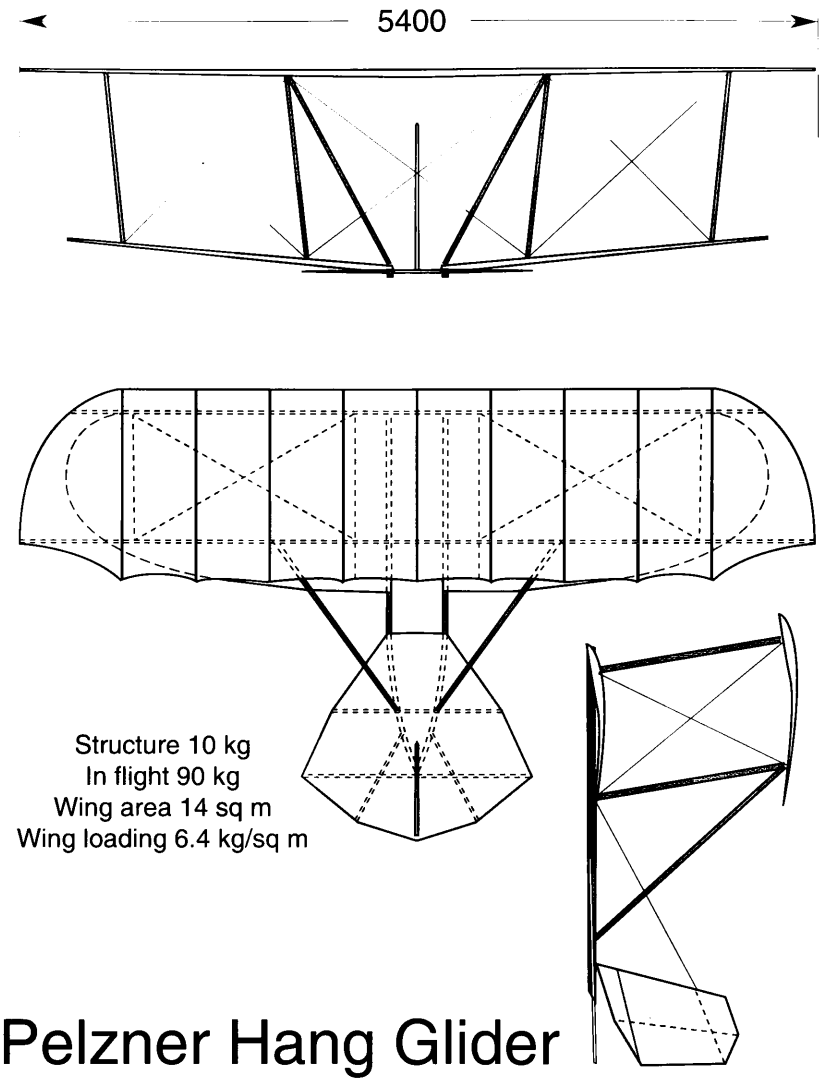
Early pioneers thought of gliding as a mere preliminary to powered flight, but Lilienthal himself had noticed that sometimes he would gain a little height from the wind blowing up a slope. In 1909 E.C. Gordon England, flying a tailless glider built by José Weiss, made a brief soaring flight at Amberley Mount. More significantly, Orville Wright at Kitty Hawk in 1911 soared over the steep dunes for more than nine minutes and afterwards wrote that there was no reason why a duration of several hours could not be achieved. When, at the age of 68, he was asked about the purpose of these experiments he remarked that the brothers had always known it was more fun to fly gliders than powered aeroplanes.

In 1909 a group of schoolboys from Darmstadt formed a club, the Flugsport Vereinigung Darmstadt, and began a systematic and well organised series of trials. Needing more space than they could find near home, they chose in 1911 to continue their gliding on the Wasserkuppe in the Rhön district of central Germany, near Gersfeld. The pastures on and around the summit were made available to them by the local cattle breeders. The land was (and still is) swampy in some places, for here were the springs of the Fulda River, but slopes free from obstructions could be found facing any wind direction. The boys spent the summers of 1911 and 1912 camping there. Their best flight was about 800 metres distance. Their club then was absorbed into a Darmstadt powered flying group and dissolved. World War came soon afterwards. Half the original members of the FSV were killed.

By their choice of the Wasserkuppe, the Darmstadt club had a profound and unanticipated influence on the future development of soaring. Reports of their flights had been published in the magazine Flugsport. After the armistice, Germany plunged into the depths of economic and political crisis which threatened to destroy the nation entirely. The Versailles treaty, finalised in 1919, forbade the construction and flying of aeroplanes. The armed forces of the victorious powers occupied the country, ensuring that this ban and many other restrictions, were enforced.

The Darmstadt boys were now remembered. Erich Meyer, a student at the Dresden Technical University, with his friend Wolfgang Klemperer, another Dresden engineering student, discovered that gliders, in the official mind, were not aeroplanes and so were not forbidden. Meyer published a series of articles in Flugsport, showing how such craft could be built easily at minimal cost. It was a way of getting into the air without running foul of the distasteful law. In March 1920 Meyer and Klemperer published an invitation for a gliding competition, to run from the second week of July till the end of August. It would be on the Wasserkuppe where the schoolboys had proved the ground. No one ever seems to have questioned the choice of site. This was probably not the best possible place in Germany, the weather was often bad with low cloud settling on the top, there was no road, no shelter, no facilities except an isolated tavern, little more than a hut for hikers, on the very summit at 950 metres above sea level, the Baude. This opened only in the summer. To search for another location would take too long. The Wasserkuppe it was to be and the Wasserkuppe it was. The Baude was a very necessary refuge but even to find it in the all too common bad weather, was not easy.

The editor of Flugsport was the enthusiastic Oskar Ursinus who threw all his weight and influence behind the young men's proposal and offered to help organise the event. He knew where to look for financial support, Karl Kotzenberg, a wealthy businessman in Frankfurt. A generous cheque was written, a managing committee was formed and Ursinus set to work. When the time came, tents and small huts were erected on the mountain, and from 20th July the first competitors began to arrive.



Pelzner Hang Glider
1920 - 22

Chapter 1 The discovery of soaring

By most standards the first Wasserkuppe meeting was not successful. Aeroplanes had been flying reliably for more than ten years and, partly under the pressures of war, a great deal of theory and good practice in construction and pilotage had been worked out. But some of those arriving at the first gliding contest lacked understanding. They produced strange and even dangerous contraptions which either would not fly at all or, if they did get into the air, collapsed almost at once through structural failure or mishandling, or both.

There was, and perhaps still is, a type of ambitious person so determined to demonstrate the validity of some half mystical belief that they are prepared to stake everything, including life itself, on their convictions. Rather than proceeding by careful and methodical trials and learning from other people's experience, they try to fly instantly like birds without the many millions of years of evolution which brought birds to their present condition. Not much better than the ancient tower jumpers, they failed. This kind of thing continued to some extent for years.

It was recognised that for a glider to make long flights it would be essential somehow to extract energy from the air. No less a person than Gustav Lilienthal, brother and helper of the great Otto, devised a 'rams-horn vortex' theory which, he claimed, would keep a glider aloft by trapping a rotating mass of air below the wing, to drive the aircraft forward. This amounted to a belief in perpetual motion. Quite a lot of hopeful constructors, even skilled craftsmen, lacked the education to see through these claims, and were misled. Some wasted years and small fortunes. Even when regular scheduled airliners were operating outside his shed on the airport in Berlin, Gustav was still trying to build a weird and impractical flying machine.

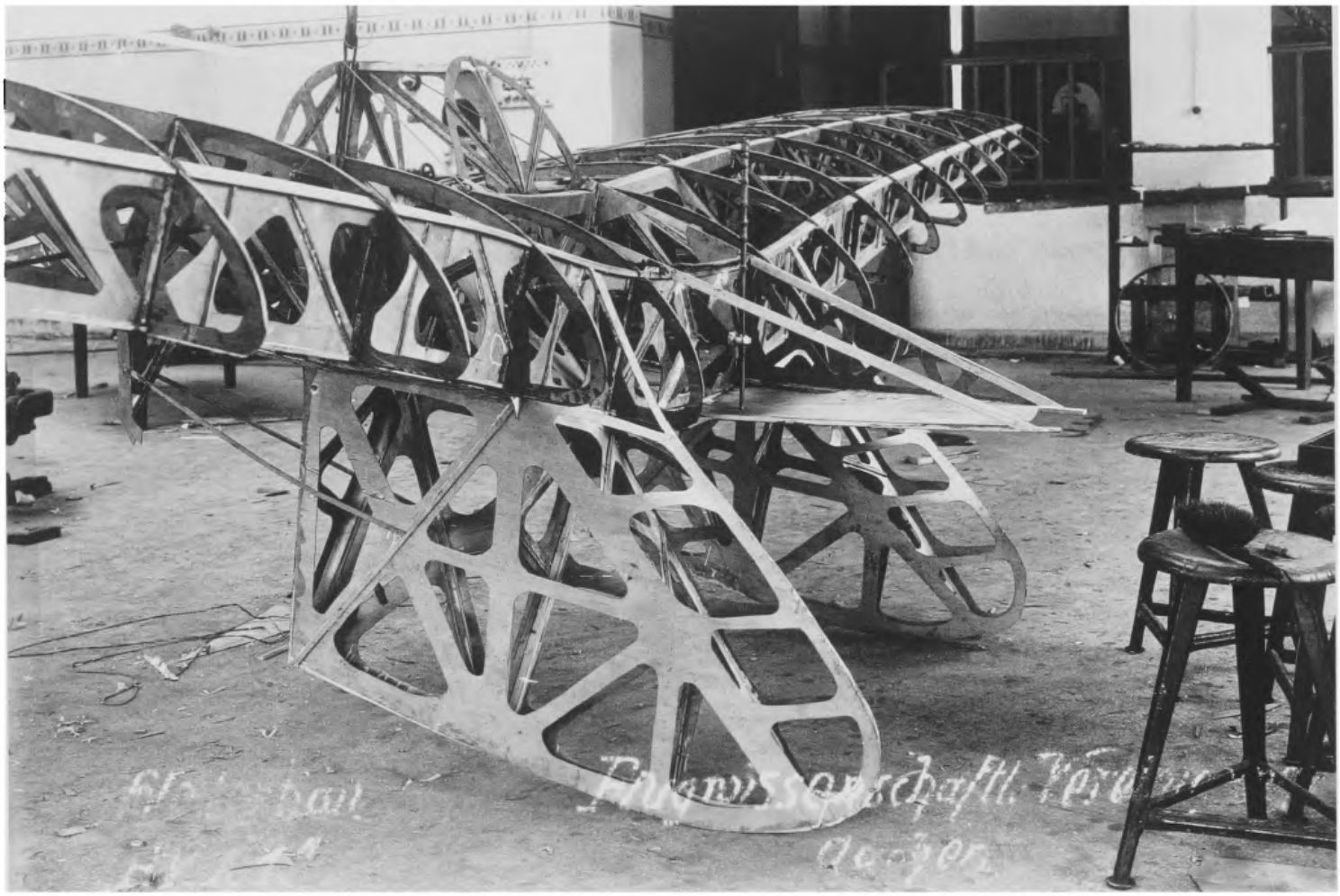
Only about ten gliders actually made flights at the Wasserkuppe in 1920. Most of these took off only once, usually landing with serious damage. One aspirant who had expended weeks of work, in despair at the end of the meeting, smashed his creation to bits with a hammer and then sat down weeping.

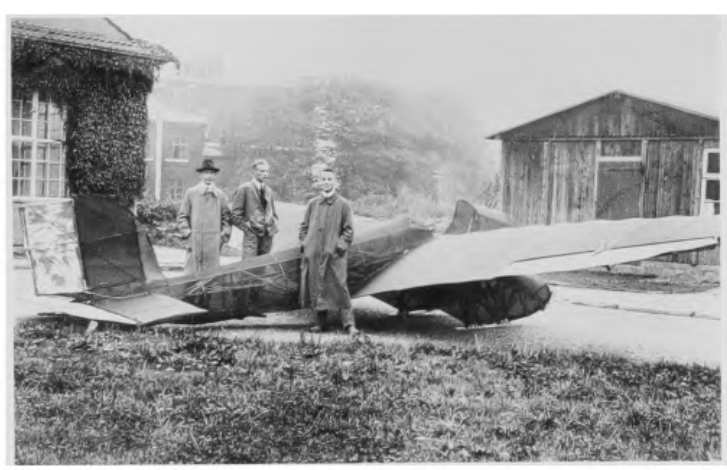
Pelzner with his hang glider

More distressing than the numerous failures to get off the ground at all, one of the more promising aircraft, the biplane of Eugen von Loessl who did achieve one good, controlled flight, lost its elevator on the next attempt after covering about 800 metres. It crashed and Von Loessl died.

Pelzner

For most of that first Rhön meeting, it seemed that the only way forward was through hang gliding. Willy Pelzner built himself a very light biplane hang glider of 5.4 metres span, weighing only 10 or 15 kilogrammes but well braced, the wings and tail unit covered with





Above: The FVA - 1 Schwatze Düvel under construction in the workshop of the Aachen Technical University. The deep wing profile at the root allowed the strong but very light spars to be fully enclosed without external struts or bracing wires.

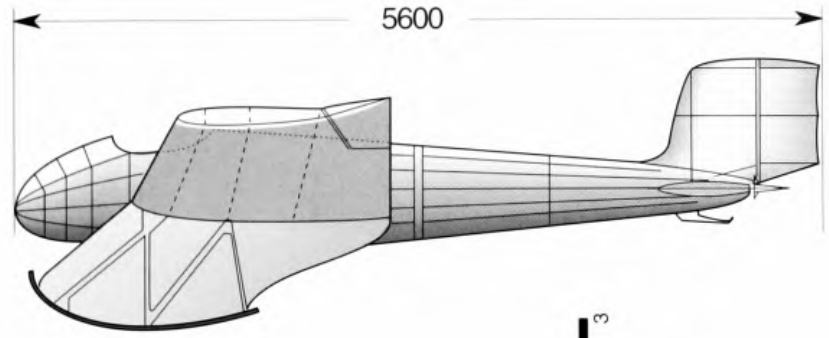
Below: Completed, the Schwatze Düvel was prepared for the railway journey to Gersfeld. On the left is Wolfgang Klemperer, the designer, on the right Peter Terkatz who had the job of riding secretly with the glider in the railway truck, hidden under tarpaulins.

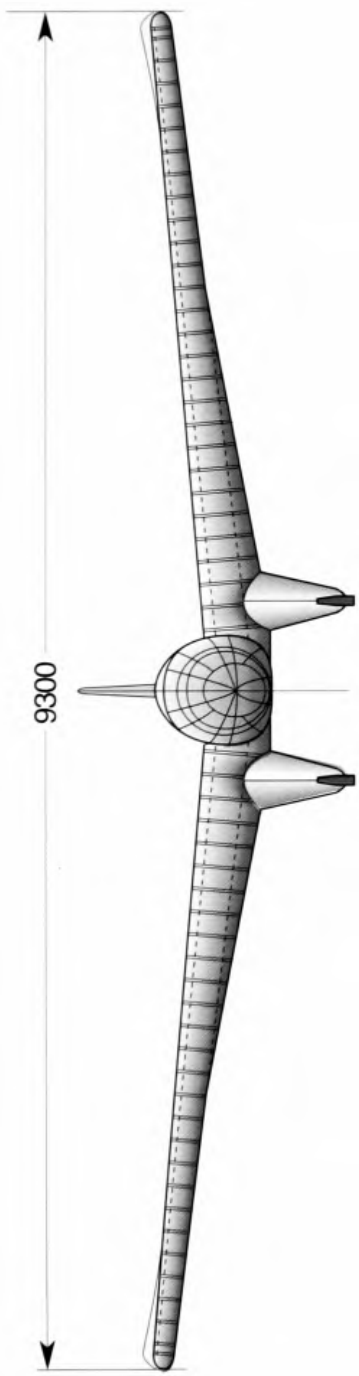
oiled paper. Almost tirelessly, he repeatedly carried his glider to the top of the hill facing the wind, ran forward, took off, controlled the flight by swinging the weight of his body and legs this way or that as needed, and glided to land somewhere down the slope. Pelzner's best flight covered 452 metres distance and lasted 52 seconds. Altogether he achieved 16 recorded flights for a total of 2728 metres, an average of 170 m. This, it seemed, was the best anyone could do.

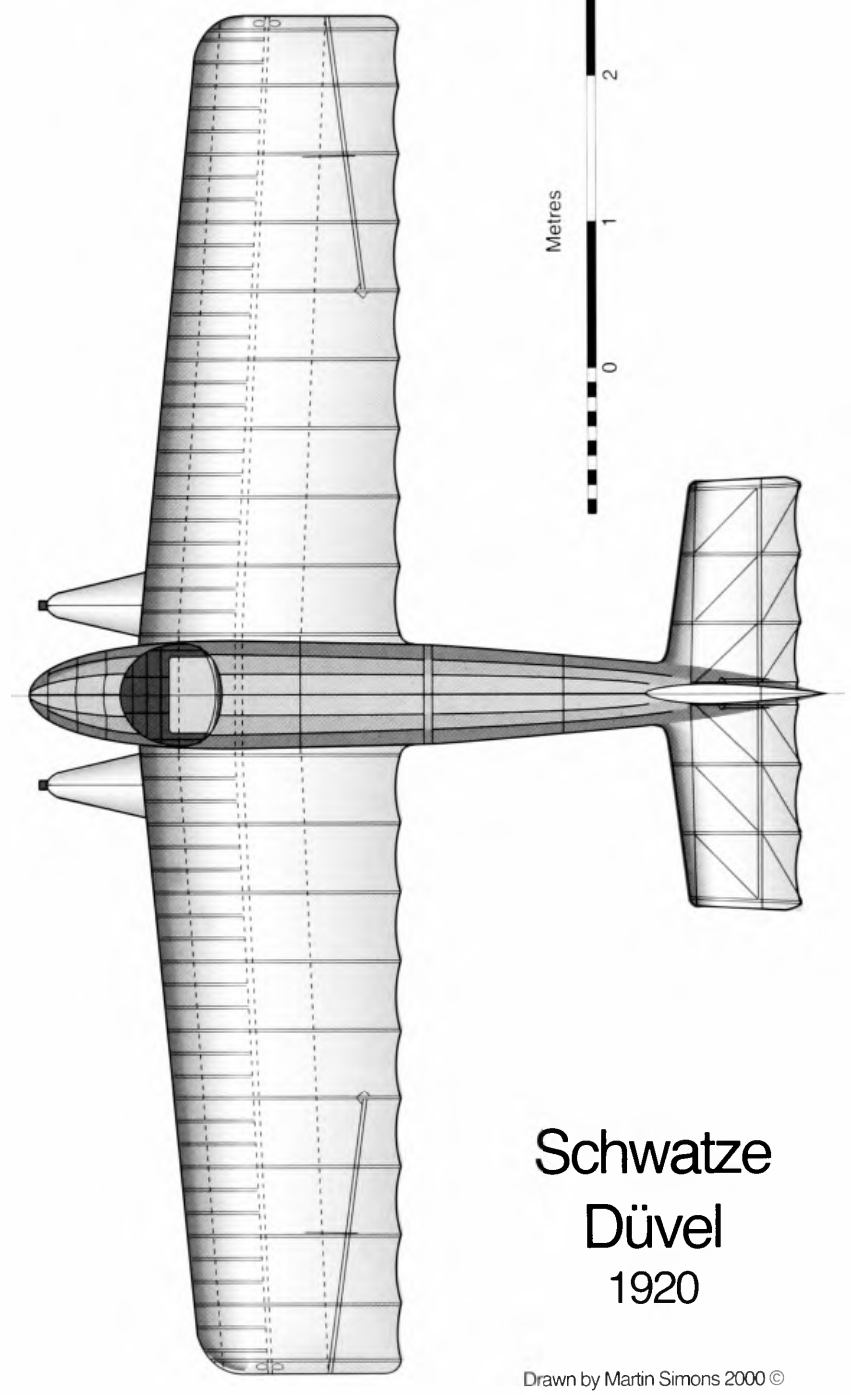
Schwatze Düvel

It had been a very depressing month. The situation was saved at the last moment. Bad weather ruined the last few days of August so the meeting was extended for another week. Belatedly, from the Technical University of Aachen, came the FVA - 1 Schwarzer Teufel or in the dialect form Schwatze Düvel, the Black Devil. It had been built in a great hurry by members of the Flugwissenschaftlichen Vereinigung Aachen , a student club, one of the academic flying groups or Akafliegs which were to play, and still play, a crucial role in the development of soaring. Wolfgang Klemperer, who at the beginning with Meyer had formulated the idea of the gliding contest, was now a lecturer at Aachen Tech under the outstanding Professor Von Kar-

Structure 62 kg
In flight 136 kg
Wing area 15 sq m
Wing loading 9.07 kg/sq m
Aspect ratio 6.02







Schwatze Düvel
1920

Above: Several examples of the FVA - 2 Blaue Maus were built to order by the FVA. This one was flown by its owner, Mr J. Jeyes, at the 1922 Itford Hill meeting in England, but after take off he drifted into the hill slope, touched a wing tip, cartwheeled and reduced the glider to matchwood. Another of the type was used by Klemperer in experiments to launch gliders from a balloon.

Left: One of very few photographs of the Schwatze Düvel in flight, immediately after launching. The rubber bungee method of launching was invented by Wolfgang Klemperer.

Below: The Blaue Maus after landing in the valley near Gersfeld in 1921. Klemperer stands at the nose.

man. Klemperer designed the FVA 1, a simple monoplane with cantilever wings and orthodox controls, elevator, rudder and ailerons, lightly built but stressed properly and braced internally to withstand high air and landing loads. It was covered in a light, black muslin fabric donated by the girl friend of a student, whose father owned a textile shop. Some cardboard was used to stiffen the covering along the wing leading edges and fuselage nose, the group having insufficient money for aircraft quality plywood. The name Schwatze Düvel was a natural choice, for in ancient myth Aachen had once been plagued by a monster of this name.

The Weltensegler prepares for flight. Disaster followed.

When the weather cleared on 3rd September Klemperer made three successful glides. For the first time a rubber bungee was used for the launches. The third flight duration was 2 minutes, 22 seconds, ending near a village in the valley, 1830 metres from the start. Pelzner's best effort was far exceeded.

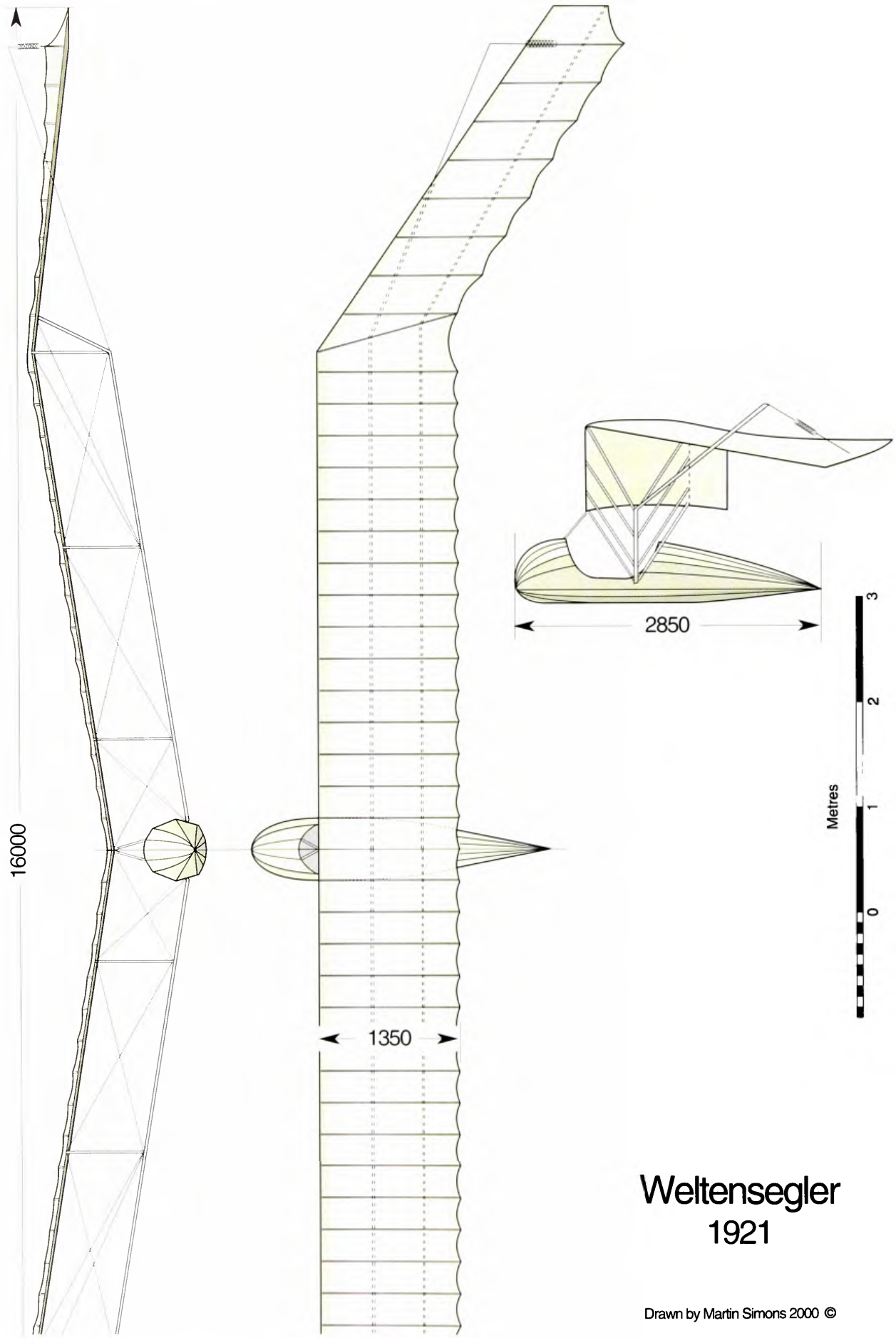
Bad weather returned but on September 7th Klemperer, who knew of Orville Wright's dune soaring of 1911, did succeed in gaining about 30 metres height after launching into a wind of 30 knots, hovering for a minute or so before gliding down to land. Two more flights were made by other FVA pilots, ending in a spectacular stall and crash. This effectively ended the first Rhön competition. There was no question that the FVA - 1 had won but Pelzner's hang gliding gained him second prize.

Despite the poor results, the second Rhön meeting began on August 10th 1921, Willy Pelzner and a new hang glider making the first flight. Some forty-five entries had been received but only a couple of dozen gliders arrived. Several of these were quite unairworthy but there were six hang gliders and five apparently more promising aircraft. Klemperer and the Aachen group came with the Schwatze Düvel repaired and a new glider, the Blaue Maus (Blue Mouse).

Weltensegler

Sadly, within a few days the competition was again almost brought to an end by another fatal accident. Friedrich Wenk had been experimenting with flying since his teen age and had discovered that a tail-less monoplane would fly if the wings were swept back and the centre of gravity was well forward. The outer panels of the swept wing performed the same balancing and stabilising function as a tailplane, providing they were set or twisted to a negative angle relative to the central mainplane. After some limited successes he found generous financial backing, launched a company called Weltensegler GmbH, and established a workshop on the Wasserkuppe. In the new shed the 16 metre Weltensegler was built. The tailless glider was controlled by a curious and quite unorthodox arrangement of cables and springs. Moving the control column forward would bring both wing tips together to a higher angle of attack. The resulting increase of lift behind the centre of gravity would cause the glider to pitch nose down. To return to level flight the pilot would move the stick back but there was no positive link between the pilot's hand and the wing tips. The springs in the control circuit were expected to provide the necessary corrective warp. Moving the stick to left or right would pull one wing tip down but not the other, to bank and turn, and again the springs, not the pilot's hands, should return the wings to the neutral position. Why Wenk adopted this system is not clear but it may be that, like many others at this time, he hoped to extract energy from gusts of wind, a kind of dynamic soaring. A gust would cause the springs to compress slightly. The wing tips would yield under the extra pressure, pitching the glider nose up. The gust passed, the springs would return automatically to neutral, all before the pilot could react. There would be a kind of flapping motion which would transmit some gust energy to the glider and perhaps enable it to gain height. It remained to be tested in practice.

The glider was ready for trial on 14th August. The company test pilot, Willy Leusch, was experienced in powered aircraft. The glider, with him in the cockpit, was lifted bodily by the crew, carried forward at a gentle trot and thrown off into the breeze coming up the slope. At first all went exceptionally well. The Weltensegler, after a momentary hesitation, flew forward and smoothly climbed to about 80 metres above the launch point. But a turn to the left became a steepening spiral dive and the airspeed increased rapidly. In aerodynamics, loads generated by an airflow increase according to the square law: twice the speed means four times the force. The springs could not provide sufficient corrective power. Within sec-



Weltensegler
1921

onds the wing fluttered and collapsed, the nacelle fell down the slope with the remnants of the flimsy wing trailing like a banner. Leusch was killed. Gloom descended over the camp.

Nonetheless, Leusch had soared. However briefly, a glider had gained altitude in flight after a gentle launch. Recovered from their shock, the witnesses remembered but at the time, not many understood. It was still supposed by some that gust energy and instant changes of the wing's angle of attack to the airflow, were responsible for this, drastically limited, success. The idea of gust soaring was not abandoned; even Klemperer was attracted by it, other leading scientists supported the notion. The proposed solution was, not to rely on dubious springs and automatic controls, but to let the pilot alter the wing angle of attack instantly on feeling a gust, riding it up, then gliding forward anticipating another surge and ready for it.

Probably today it would be recognised that Leusch was carried up simply by slope lift, the air rising up the hill. Perhaps a thermal was passing through as he took off.

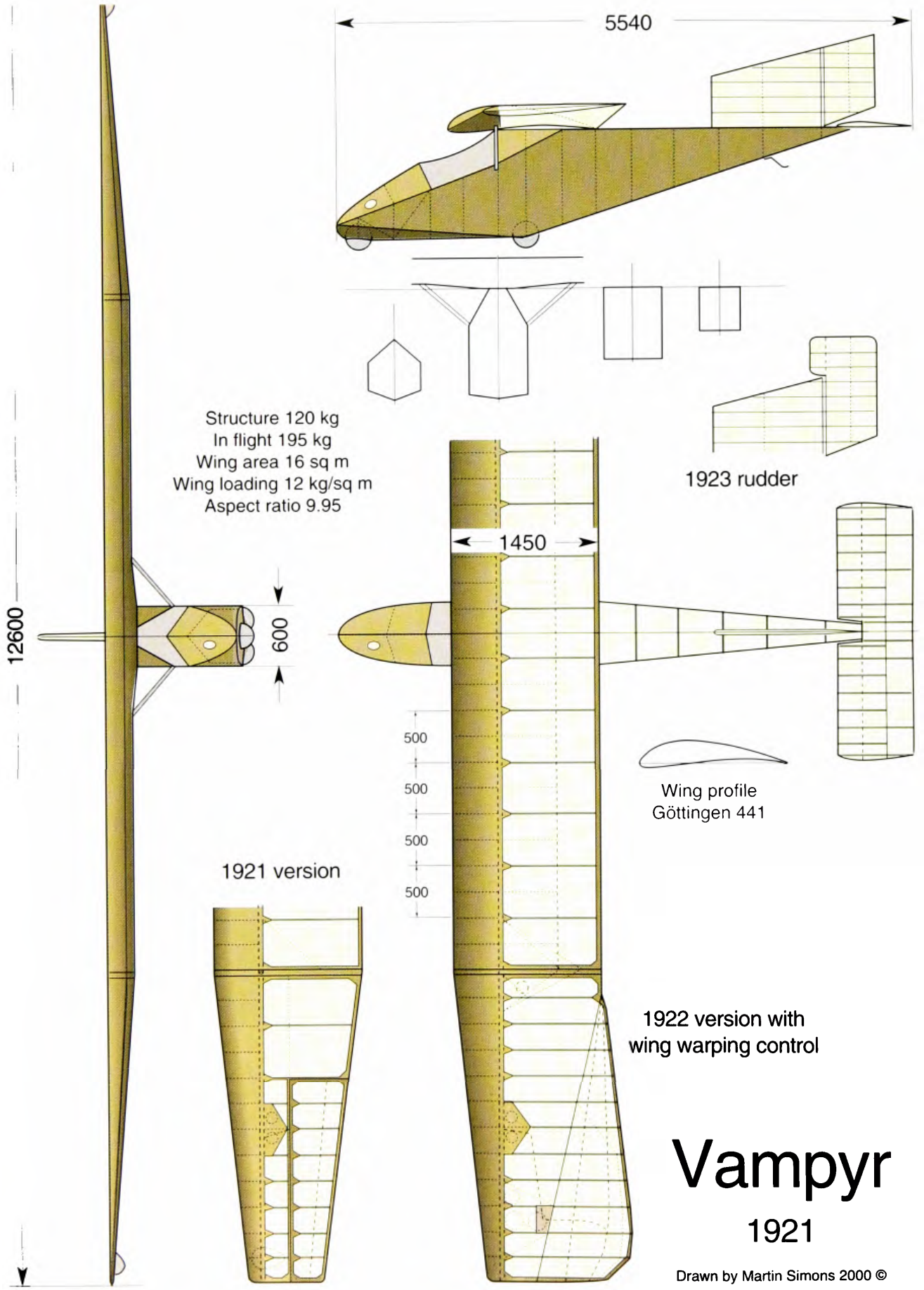
The Vampyr, showing the pneumatic, tricycle undercarriage and the leather cockpit cover which was fastened over the pilot's shoulders, leaving only his head exposed. The pilot here is Hentzen.

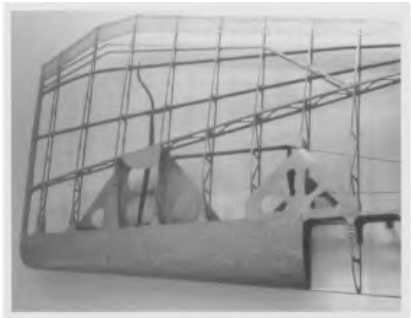
Vampyr

On August 21st the Akaflieg from Hannover arrived with their new glider, the Vampyr. This was revolutionary. Designed by lecturer George Madelung working under Professor Arthur Proell, of Hannover Technical University, the Vampyr was built professionally at a Hannover coachworks. The box-like fuselage, skinned with plywood and varnished, was not particularly refined, though the cockpit was almost fully enclosed by means of a leather cover, leaving only the pilot's head exposed. The wing, in three pieces, a centre section mounted simply on top of the fuselage with detachable outer panels, was superior to anything seen before at the Wasserkuppe and, indeed, was more advanced in some ways than the wing of any other type of aircraft.

The Vampyr had a stressed skin.

Almost all aircraft in 1921 had wings with multiple spars and cross bracing. The most usual layout for powered aeroplanes at this time, and for another ten years, was the biplane with exposed struts and numerous diagonal wires. These formed a strong truss to resist


5540
Structure 120 kg
In flight 195 kg
Wing area 16 sq m
Wing loading 12 kg/sq m
Aspect ratio 9.95
1923 rudder
12600
600
1450
500
500
500
500
Wing profile
Göttingen 441
1921 version
1922 version with
wing warping control
Metres
0
1
2
3
Vampyr
1921
Drawn by Martin Simons 2000 ©



Left: The Vampyr soaring.

Right: The Vampyr wing, as displayed in the Deutsches Museum, showing the complicated wing warping mechanism adopted for the 1922 Rhön competition. It was in this form that the long soaring flights were made.

both bending and twisting. The high penalty in terms of air resistance was accepted. There was enough engine power available to permit flight, the structures were light so useful loads could be carried although speeds were low. If the engine failed, the glide angle was steep and the rate of descent rapid.

The Vampyr wing had only a single spar. There was a very short strut near the root, to relieve some of the high bending moment and transfer the stress there to the fuselage. All the other loads, especially torsion which would tend to twist the wing, were resisted by a thin plywood skin wrapped completely round the leading edge, glued to the ribs which formed the forward third of the aerofoil section. A tube of D shaped cross section was formed. The wings behind the spar were the lightest possible framework of ribs covered with fabric. (The idea of stressed skin construction was published first by Adolph Rohrbach, a designer for the Zeppelin - Staaken Company, but was not widely adopted until long after sailplanes had demonstrated its benefits.) Aerodynamically the Vampyr also had another great advantage. Because of the stressed skin, the wing could have a high aspect ratio, a large span in relation to its total area. This, as new theories developed in the University of Göttingen showed, had a most important effect in reducing drag at gliding airspeeds.

The Vampyr quickly demonstrated a performance much better than anything earlier. Arthur Martens, the pilot, made several long gliding flights into the valley, though not yet soaring. After several flights, the Vampyr was damaged in a launching mishap. The competition was almost at an end so Martens did not win, but the excellence of the Hannover design was recognised with a special award.

The Hannover and Aachen students stayed on after the others dispersed. Klemperer's Blaue Maus, not blue but covered in ordinary white fabric, was an improvement on the Schwatze Düvel, with the pilot's seat lower in the fuselage and a slightly larger wing, but it represented no substantial advance in design. The Blaue Maus was not a very efficient sailplane but Klemperer was a trained engineer who now had some gliding experience. On 30th August he again made a brief soaring flight over the windward slope, performed a well controlled 360 degree turn in the rising air, then glided down into the valley to land 4.6 kilometres away, the duration being over 13 minutes. It was a record surpassing Orville Wright's flight of 1911, though Klemperer had been gliding down most of the time. The principles of hill soaring were understood now by some, but full public demonstrations were still lacking.

The Vampyr, when repaired, began to show its potential and Martens achieved a 7.5 kilometre flight early in September, still without soaring.

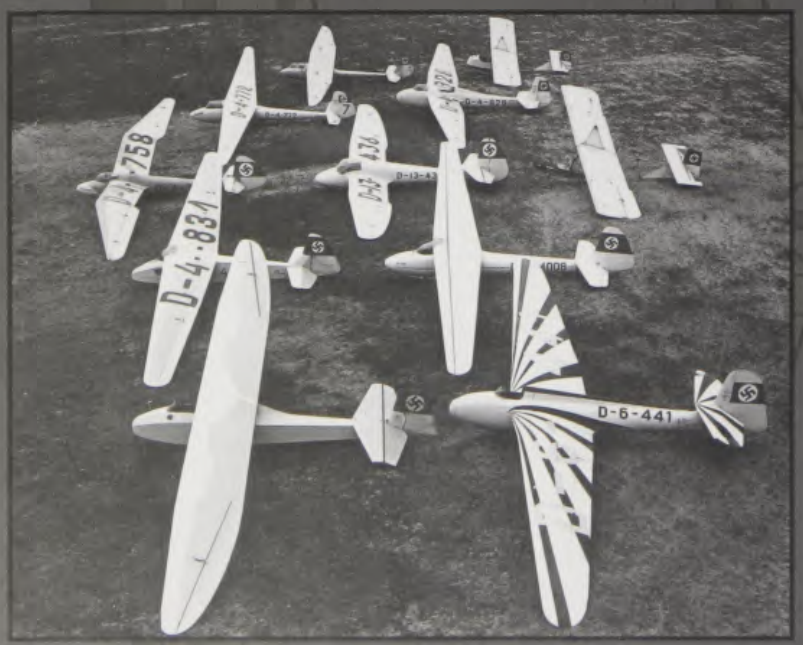
Harth and Messerschmitt

Almost unknown to the Wasserkuppe people, Friedrich Harth with a young boy assistant, Willi Messerschmitt, had been working for years on gliders. Harth was one of those who was convinced that soaring required the use of gusts. The Harth gliders were controlled in pitch by changing the angle of incidence of the mainplanes, the tailplane being fixed. The pilot sat within a light framework below the wing with two control sticks, one to change the angle of wing

This book, Volume 1 of a projected series, describes and illustrates more than 120 types of sailplane, designed, built and flown in many countries during the quarter century following the first organised gliding competition on the Wasserkuppe in 1920. The astonishing achievements of designers and builders, lacking modern materials and production methods, and the flights made by the pilots of those times, deserve to be recorded and remembered.

New scale drawings, produced in digital form, show structural details with colour shading to indicate the materials used. Exact dimensions, cross sections and profiles are included. There are more than 300 authentic photographs, many previously unpublished. The textual commentary draws attention to significant trends and developments in sailplane design.

This book will prove a rich source of accurate information for scale modellers, who were much in mind when making the drawings and selecting photographs. To fly most of the sailplanes described here, the only way now is to build a large scale radio controlled model.



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