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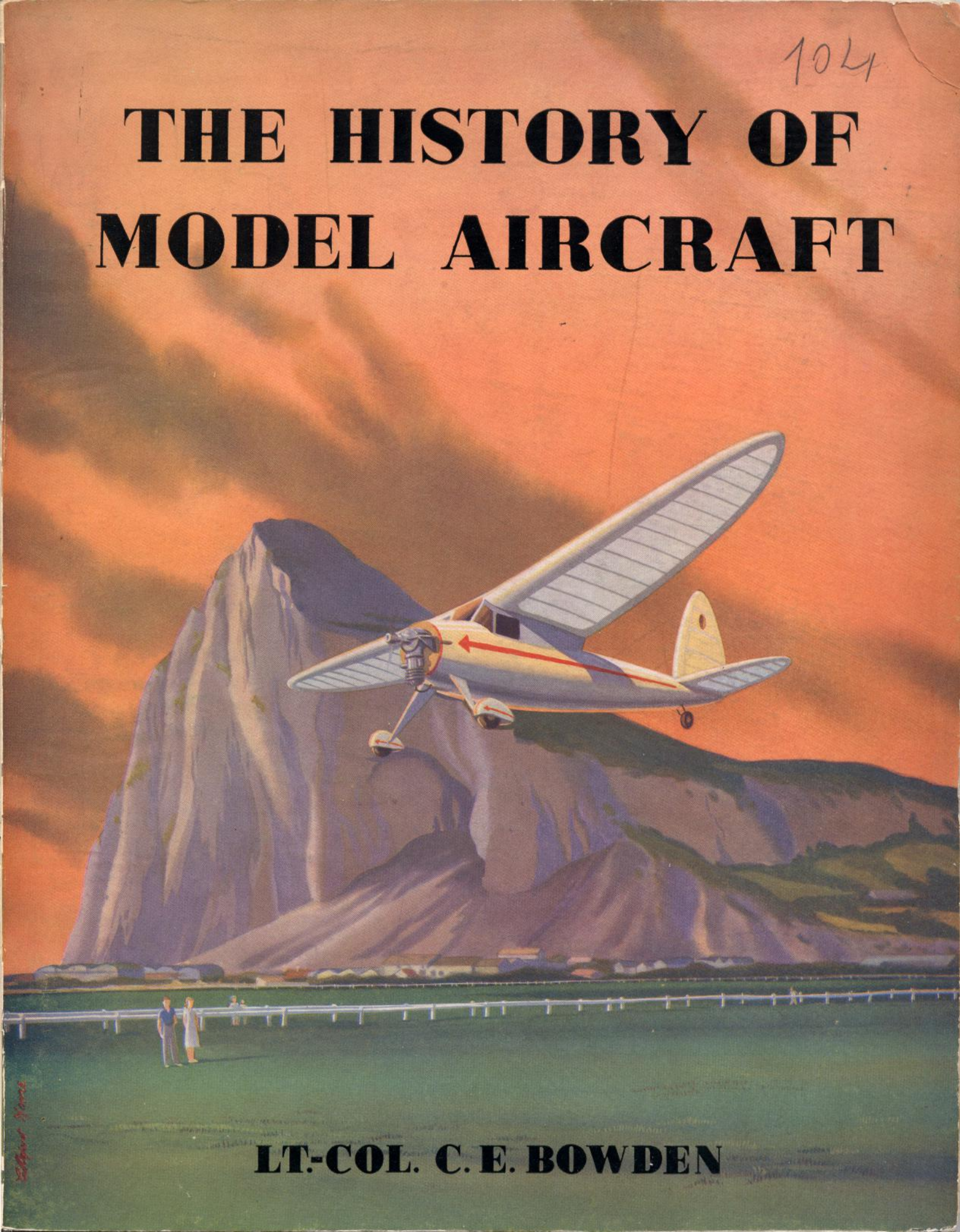
THE HISTORY OF MODEL AIRCRAFT



LT.-COL. C. E. BOWDEN

Gustavo Clemini
+1947+

THE HISTORY

and technical development of

MODEL AIRCRAFT

by

Lt.-Col. C. E. Bowden, A.I.Mech.E.

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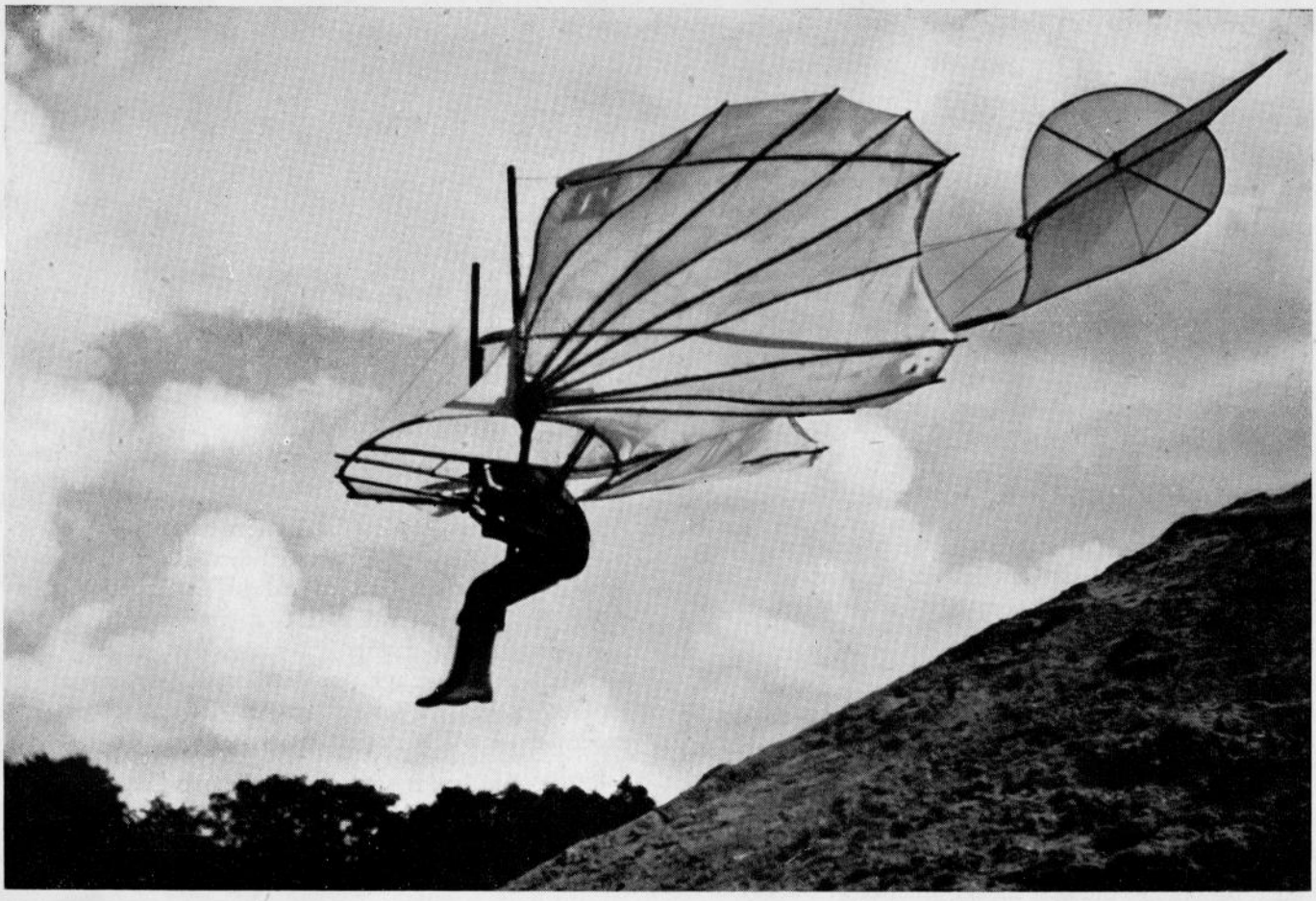


FRONTISPIECE.—*These two photographs are taken from the film "Conquest of the Air," and show the types used by Otto Lilienthal in his first attempts at gliding.*

PREFACE

In this book I have set out to trace the development of the model aeroplane.

There are so many well-known names involved that space forbids mention of them all. I have had to be content with picking on names of men who happen to illustrate the point I have been trying to make.

I hope particularly that the newcomers to aero-modelling will find both interest and inspiration from the doings of others. There is a great deal one can learn from the "early ones."

There is a saying that there is nothing new in this world. This is not quite true in the case of the aeroplane, but it is true that since the aeroplane really got into its stride, improvement has been chiefly in the nature of development rather than radical change.

Whilst writing this book, and recalling the data and ideas of some of the best model practice in the country during the history of the model aeroplane, I have felt a great urge to design and construct, incorporating all sorts of exciting combinations of shape, wing loading, power and gadgets, and I feel that aeromodellers cannot but get the same stimulus when they find set before them all this thought that has gone into the production of famous and winning models by so many people. It is not only from the latest models that one finds oneself wishing to borrow ideas—many of the older ideas can be used, or modified and adapted.

Designers of full-sized motor vehicles, ships and aeroplanes frequently delve into the past and sometimes find that even when a scheme or idea has failed, it becomes a winner when modified in the light of modern knowledge.

We should remember, that all the models described in this book were successful during the development of model aircraft.

It is interesting to compare the early flying models with those of the present day, and there is endless enjoyment to be obtained from the design, construction, and flying of model aircraft. It is a hobby that always provides room for further effort and ingenuity. Time spent in making and flying model aircraft is never wasted, as there is always something new for the observant experimenter to find out.

For the old hands at the game I hope that the book may revive happy memories, whether they themselves appear in its pages or not. I only wish I had the space to mention the doings of more of them and I hope, also, that they will not be too critical of my efforts to dig out details of the past. If any mistakes have occurred I must plead war conditions that have forced me to rely upon my memory in certain cases.

Model development is an interesting subject and I trust that you will have as much pleasure in reading about it as I have had in compiling this book.

I wish to thank the following publications for their kindness in permitting me to make use of material that has been published in their columns from time to time : *Flight*, *The Sketch*, *The Model Engineer*, *The Aeromodeller*, *The S.M.A.E. Journal*, *Newnes' Practical Mechanics*.

C. E. BOWDEN.

FOREWORD

By F. J. CAMM
(Editor : Practical Mechanics)

The history of aeronautics is the history of models, and it gives me especial pleasure to write a foreword to this latest work of one who is himself a pioneer in petrol driven model aircraft, and who has done so much to raise the standard of model aeronautics and lift it from the toy stage to the status of an important experimental hobby, a fascinating pastime and a leading branch of model engineering. I have read through the proofs of this book with more than ordinary interest, for being one of the earliest of the model experimenters in this country I have had my memory refreshed by it on some of my earlier associations with model aircraft.

This book brings to the new aeromodeller an accurate and chronological digest of the work which has gone before, and which made model aircraft construction and flying to-day less hazardous in its results, and contributed so much to the durability of the models, the duration of their performance and to the control which can be exercised by the flyer on their performance in the air.

Whenever one delves into the history of aeronautics one finds that the original experiments started with small models—the germs which fructified into the successful completion of an idea. Penaud, Phillips, Stringfellow, Henson, Hargreaves, Pilcher, Chanute, Weiss—these are but a few of the names of early modellers whose work produced the backcloth of the stage on which the growing science of aeronautics was to be set.

It was not until Benz, Otto and Daimler between them produced the internal combustion engine that there was provided a source of power to propel aircraft in the air ; for most of the early efforts to apply steam power were only qualified successes and had an adverse power-to-weight ratio (apart from the risk of fire) which made them quite unsuitable for heavier-than-air craft.

The early model maker wishing to propel his model had the choice of compressed air, flash steam or elastic. Miniature petrol engines were not produced until the beginning of the present century, but they were heavy, temperamental, and called for the construction of an unwieldy model.

The author of this book, by his experiments with petrol driven models, demonstrated that engines properly designed could propel a model without producing a wreck at the end of its flight. Moreover, that it would fly consistently, and that its flight could be controlled by various ingenious mechanisms of his own devising. Naturally the success which attended his efforts focused attention on miniature petrol engines, which have in the past twenty years descended from 15 cc. to 1 cc.—perfectly reliable little mechanisms weighing a few ounces and capable of delivering high power for long periods.

A large amount of the credit for this belongs to the author of this book, which will not only fascinate the newcomer but will intrigue the old hand, for between the covers of one book and for the first time are gathered together all of the names and the facts which have made history. It must have been a gargantuan task, but now that it is done it provides a permanent record of the pastime and the science.

Most of our successful designers of full-sized aircraft, including my brother Sydney, C. R. Fairey, De Havilland, Handley-Page, A. V. Roe, to mention but a few, were keen model experimenters.

Those who aspire to enter the aircraft industry with a desire to reach the top positions in it can lay the foundations of their careers by first mastering model aircraft building and flying, starting of course with the simpler rubber-driven models ; for notwithstanding the progress of tiny power units, rubber is still by far the most popular form of motive power, providing under modern systems of using it, a torque curve reasonably constant for all practical purposes.

This book faithfully records the work of nearly everyone connected with the movement, and credit is correctly accorded and proportionated. I commend it to every aeromodeller, and in congratulating my old friend on his assiduity in marshalling in so orderly an array such a mass of historical data I express the hope that his work will bring him the reward which it undoubtedly merits.

LONDON, 15*th May*, 1946.

CONTENTS

PART ONE

THE EARLY BIRDS: 1874 to 1921

THE MODERN AEROPLANE IS DESCENDED FROM MODELS.

" Cor, what a speed 'e be doing—'e must be a ' Spitfire '."

" Garn, Mister, that's not a ' Spitfire,' that's a ' Thunderbolt '."

Yes, everyone is used to seeing and discussing our modern war-winning bombers droning high overhead, or our streamline fighters screaming just over the house-tops. But I wonder how many of us realize how these highly developed machines have descended directly from models. How the first flights were made by models. How these were developed into man-carrying power-driven flight by the Wright Brothers and how many originators of the famous aircraft firms of to-day commenced their careers by flying models.

For instance, can you visualize Sir Alliot Verdon Roe's mighty bomber, the " Lancaster," and then think of Sir Alliot himself, in 1909, flying an elastic-driven 'A'-framed model aeroplane.

In this book I hope to show you how it all happened in the very early days, and then to trace model development up to the present day.

We will not be too technical or too historical, but as keen aeromodellers I know you will want some technical details of the outstanding models.

I cannot mention all the names of those who have contributed towards advance. Space will not permit, as aeromodelling has expanded so tremendously of recent years.

THE BEGINNING OF FLIGHT.

For hundreds of years man has watched the birds and wanted to fly. At first men made some sort of crude and weird apparatus. They then jumped off towers or hill-tops and they either failed or killed themselves.

There are stories of a British king Bladud, who attempted to fly in 300 B.C. He was killed during his attempts.

Perhaps the first successful man to fly models was Leonardo da Vinci (1452). He made spring-driven models rise into the air.

Men then turned to the balloon, and using heated air or hydrogen. They found they could rise into the air, but they had no control over direction. In those days there were no engines, so these experimenters tried rowing their balloons with large oars. They could only just move in still air. The arrival of the steam engine allowed crude airships to be propelled forward and steered by an oar or rudder.

Attempts were made to flap birdlike wings attached to the human body, but these failed except in the case of a man named Besnier. He had two rods on his shoulders, and at the ends of these rods were hinged surfaces that closed on the upstroke and opened on the downstroke. With these he was reputed to have started from a height and flapped his way across a river.

Model experiments then set men thinking, and produced logical research. As a result the cambered wing was discovered and dihedral for lateral stability. The revolving propeller was also devised to convert power into forward thrust—and so forward motion. And now we have jet propulsion for aircraft. Models were also used for the initial experiments and development of this latest accomplishment.

Sir George Caley, who has been termed " the father of British aeronautics," not only wrote about problems of flight by heavier-than-air machines, but carried out research work with model gliders. During this work he found out the advantages of the cambered airfoil. He suggested horizontal and vertical surfaces to control aircraft, and the obtaining of lateral stability by the upturning of wings. Caley even went so far as to foreshadow the development of some sort of internal combustion engine. Finally he made experiments with large model gliders which proved very stable and responsive to controlling surfaces.

This man's contribution to the heavier-than-air machine was indeed very great, and the interesting fact is that he did his research work with models. The full-sized machine had not yet arrived.

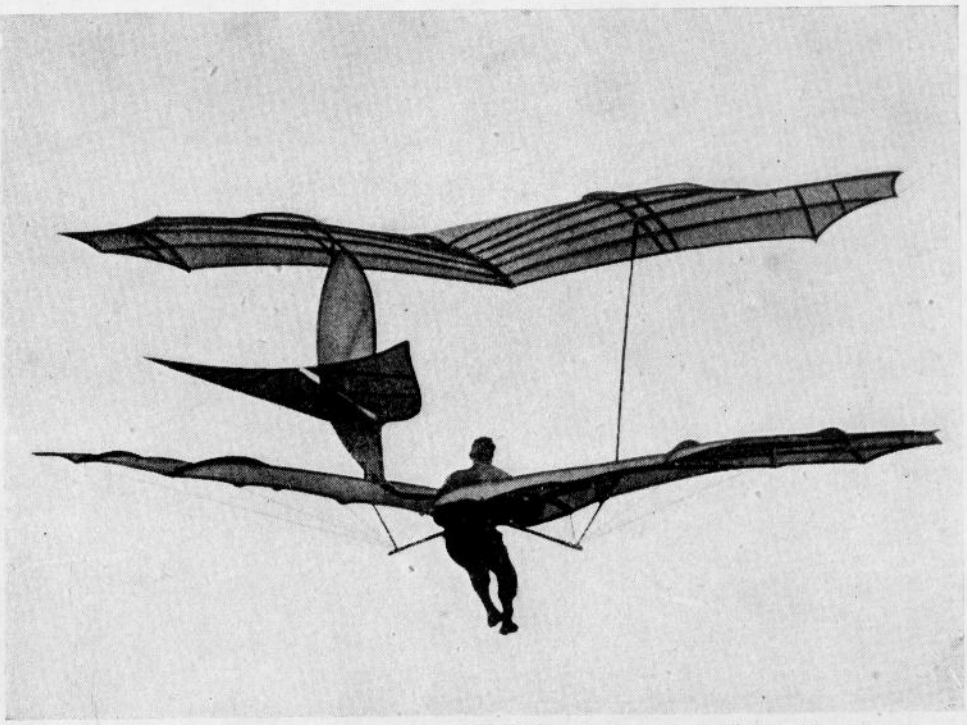


FIG. 1.—*A biplane glider in which Lilienthal was gliding 300 feet in 1894.*

In 1768 Caley gave a practical demonstration of the air-screw. A model was constructed of corks and whalebone, with feathers for the screws, and was sufficiently powerful to rise from the ground under the action of these light propellers. This was the seed from which a great tree grew.

As you will shortly see, Caley's work, and the work of two other men who experimented with models, produced sufficient evidence and data for several people to make themselves man-carrying gliders, and eventually for the Wright Brothers to make the first power-driven flight in 1903.

After certain failures, Stringfellow of Chard, in 1848, produced the first power-driven flight. This was done with a model. The model was driven by a steam engine, and the machine weighed 8 lb. and had a wing span of 10 ft. This was the first engine-driven model in the world to fly, although it only flew indoors.

Stringfellow's flights were carried out in a large room in a disused lace factory. He launched his model from a wire runner, and the model's flight was arrested by a canvas sheet.

Unfortunately no one of consequence seemed to realize the significance of this achievement, and it was not until the Aeronautical Society was formed in 1866 that Stringfellow was encouraged to proceed with his investigations, which had up till then merely caused him monetary loss.

Stringfellow then built a model triplane of 12 lb. weight and an area of 28 square feet. The engine produced ½ h.p., and the model was shown at the Crystal Palace in 1868.

The late King Edward, then Prince of Wales, was most interested in Stringfellow's triplane at the exhibition, and the model was made to run along its launching and tethering wire in the Crystal Palace for the Prince's inspection.

Stringfellow therefore has the honour of being the man to design, construct and fly the first power-driven aeroplane that ever flew.

It seems extraordinary to think that many of us can remember King Edward VII's reign, and here the world has recently been trying to batter itself to pieces by air warfare on a giant scale, and yet only a power-driven model aeroplane had flown at that time.

Otto Lilienthal in Germany followed Stringfellow's achievements by making full-sized glider flights. He used his own legs as an undercarriage, and by 1894 with a biplane glider he was making glides of about 300 feet.

Unfortunately, these highly successful experiments were ended by Lilienthal breaking his spine.

In 1874 Alphonse Penaud made the first model aircraft to be driven by twisted elastic. Rubber enthusiasts will now sit up and take notice ! Penaud also designed a large man-carrying machine, but he died from ill health at an early age before anything of note had been achieved.

Several other experimenters made models, and produced ideas, but little of noteworthy advance took place until Professor S. P. Langley produced his successful steam-driven model and later his man-carrying machine which nearly achieved success.

In the year 1896, Langley produced a steam-driven model which was the first model to make free flights in the open air. The model was a tandem monoplane, weighing approximately 26 lb. The engine weighed 8 lb., and developed about 1½ h.p.

Langley launched his model from a houseboat on the Potomac River in America. On one test flight the model made three circles in the air, estimated as a distance of three thousand two hundred feet. On another occasion the model flew for about three-quarters of a mile, and attained an average speed of 30 m.p.h.

The chief items of interest to my mind were that Langley had now obtained *free flight* in the open air, and his model was found to be *very stable* in the air. It was no lucky chance. A glance at Figs. 3 and 5A of this model will reveal the dihedral angles that provided lateral stability, and the tandem planes that provided the longitudinal V angle for stability.

Langley then attempted to produce an enlarged version of his model for man carrying. Eventually in 1903 he launched his full-sized replica from the houseboat on the Potomac River with C. M. Manly as pilot.

Mr. Manly had in the meantime produced the first successful internal combustion aero engine. It was a 5-cylinder radial, and developed 42 h.p. at 950 r.p.m. and weighed only 3.6 lb. per horse-power with all accessories such as radiator and ignition.

Unfortunately Langley's full-sized aeroplane dived into the river on two subsequent attempts, due to fouling of the launching gear with struts on the machine. Luckily Manly was not hurt on either occasion, but the American authorities who had been financing Langley refused to provide any more funds, and the project had to be dropped just when Langley was undoubtedly about to attain success.

How often this sort of official impatience and lack of vision set back aviation at the beginning of its history.

Particularly was this true in the case of service machines when the aeroplane was just making its first appearance. For instance, in 1911 very few machines were in use by the Services. Even private individuals had to give machines to the Government, and officers had to pay for their training at the very early flying schools on their own initiative. It may be recalled that a Mr. Barber gave the Government four Valkyrie monoplanes, two of which were for the Navy.

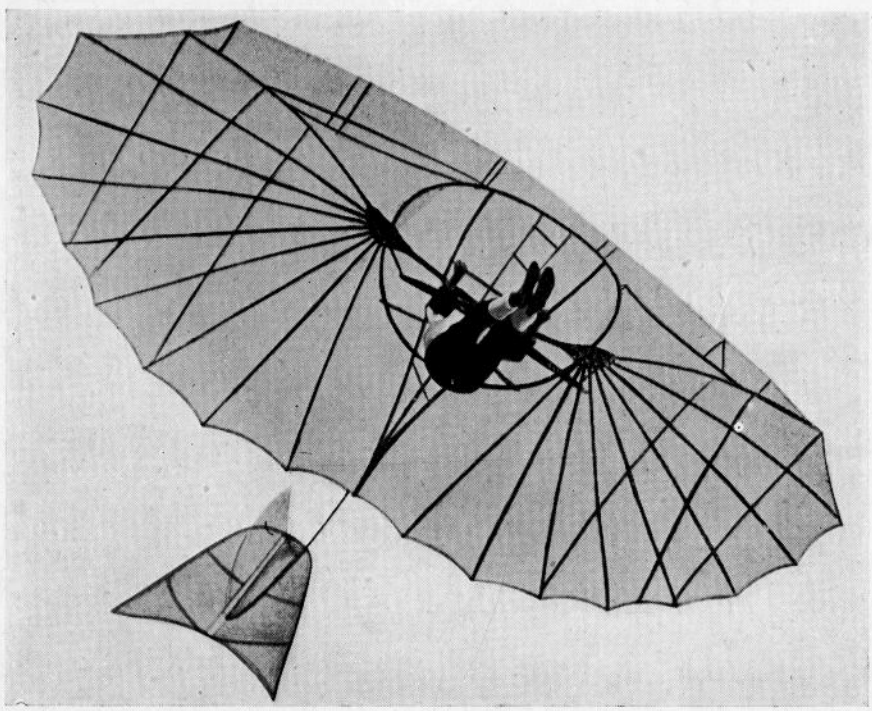


FIG. 1a.—*Low aspect ratio wings of elliptical form that save wing-tip losses. It is doubtful if Lilienthal realised in this machine how such a wing allows an efficient low aspect ratio.*

To support the view that Langley would most probably have been the man to obtain the first full-sized aeroplane flight as well as obtaining the first open air model powered flight,

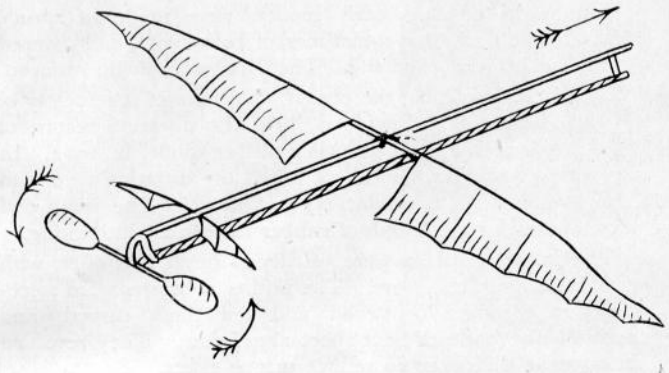


FIG. 2. *Alphonse Penaud's Model in 1874. This was the first Model Aircraft to be driven by elastic.*

it is worth recording that in 1914 Glenn Curtis took the original Langley machine from the Smithsonian Museum, re-covered its wings and mounted it on floats. He piloted it himself. Curtis made a short flight of approximately 150 feet. The machine ascended and alighted smoothly, and flew with stability whilst in the air.

The Wright Brothers obtained the first actual power-driven full-sized aeroplane flight with a man aboard the machine in 1903.

These two men carefully studied the model research work of Caley, Stringfellow, and Langley, and the full-sized gliding of Lilienthal, Pilcher and Chanute.

Their first move was to produce a wind tunnel, and try out model wings and control surfaces. They then built themselves gliders in which they lay flat along the glider, which was fitted with landing skids, instead of using their own legs as an under-carriage. The gliders were launched from rails by a rope and a falling weight.

When the Wright Brothers had learnt to glide satisfactorily they built themselves a four-cylinder petrol engine and designed their own propellers. These propellers were so efficient that they gave 66 per cent. effectiveness of the power produced.

Their engine ran at 1,300 r.p.m., and drove two pusher propellers at 350 r.p.m. by a chain gearing.

By December 1903 the brothers were ready to make their attempt. Their machine was placed on a trolley which ran along a 70 ft. track. The initial acceleration for the launch was made by a weight being dropped from a tower.

Only five people turned up on December 17th to see the world's first power-driven flight.

Orville Wright acted as pilot and made a first flight of 12 seconds. On the fourth flight 59 seconds was obtained in a wind of 20 miles per hour; 852 ft. were covered before alighting.

After these flights, and whilst they were talking over the event the wind got up and turned the machine over, wrecking it.

The brothers then retired to think out certain control problems. In 1904 the brothers made circular flights, and in September 1905 they accomplished a flight of over 12 miles. In October they flew 20 miles, and the machine was in the air for over half an hour without alighting.

The heavier-than-air machine had started and proceeded apace from that date. A number of full-sized aeroplanes were developed immediately after the Wrights' success.

Wilbur Wright died at the age of 45 in 1912, but Orville Wright is alive to-day and at the age of 73 he is still hard at work on aviation problems, particularly in research connected with gliders, his first interest. Orville Wright made his last flight as a pilot in 1918.

I will now return to the model aeroplane and its development. I felt that it was worth breaking off to describe

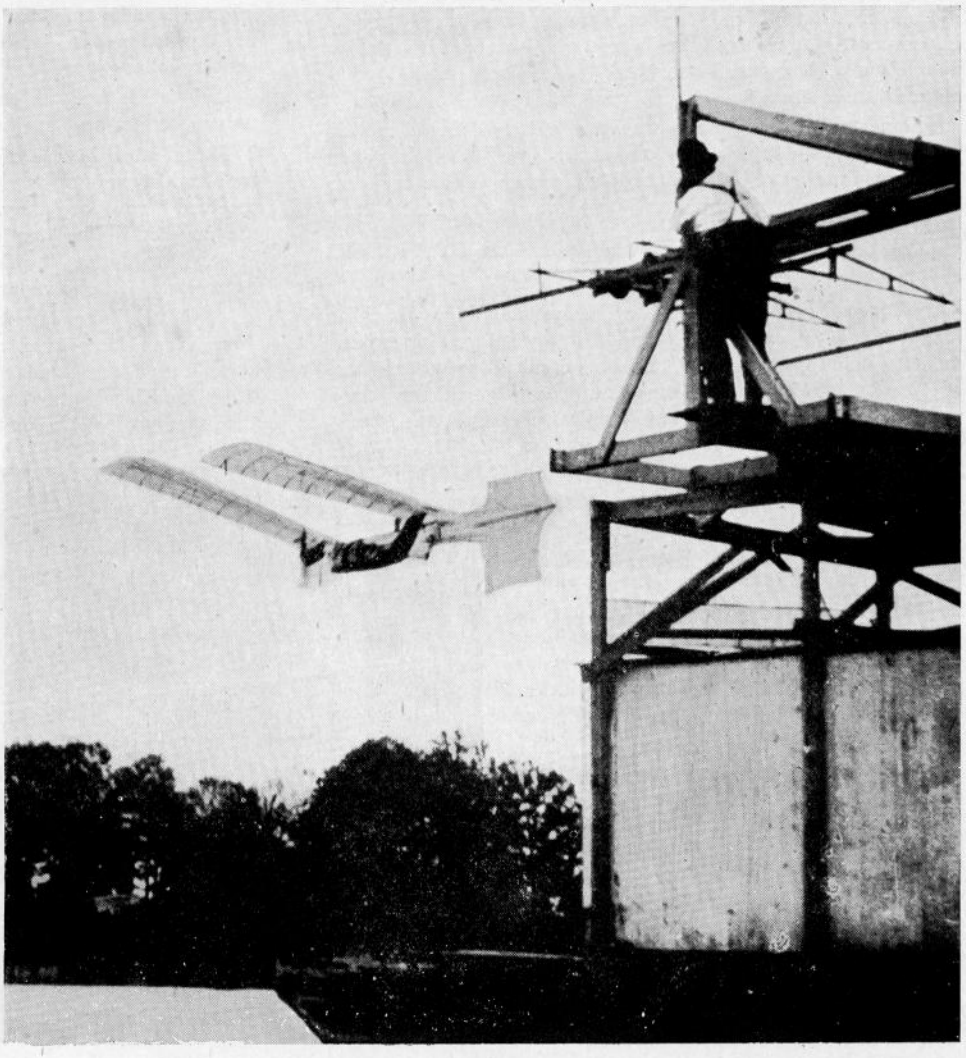


FIG. 3.—*Professor Langley's steam driven model flying from his houseboat on the Potomac River. This was the first model to fly in the open and in free flight.*

FIG. 4.—*Mr. Houlberg and his duration record model in 1912.*

Langley's attempt at full-size craft after his model success, and the Wright Brothers' great success, for these events were the culmination of, and in fact owed their being to, model experiment. Apart from the information obtained from other people's model experiments, the Wright Brothers had commenced their great work with models.

The next phase in model work was the early flying of models by a number of people whose names are now household words as the originators of great aircraft concerns. These concerns are the backbone of our great war-winning air fleets to-day.

SOME EARLY PIONEERS WHO BEGAN BY FLYING MODELS.

In England around 1911, after the famous Wright machine had flown, a Mr. José Weiss made many interesting experiments with soaring gliders. These were lead weighted, and often gained height after launching. In these modern days we should call them early examples of sailplanes. Weiss eventually made full-sized gliders and an aeroplane. His machines were remarkable in that they took the shape of birds' wings.

The general type of model flown in the early days between 1912 to about 1920 was the 'A' framed model, and the spar single propeller pusher or tractor.

Many of the early model pioneers flew the 'A' framed model in competitions when the Kite and Model Aeroplane Association was the leading model club before the great war of 1914-1918.

It is interesting to mention here that Sir Richard Fairey, Sir Frederick Handley Page, Sir Alliot Verdon Roe, Sir Geoffrey de Havilland, Sir Thomas Sopwith, Mr. M. Desoutter, Wing-Commander Slatter and the late Colonel Cody all flew these models. In fact they may be called the direct ancestors of the modern bomber and fighter! Sir Sydney Camm, who designed the "Hawker Hurricane," one of the machines that saved this country in the "Battle of Britain," and his brother, Mr. F. J. Camm, flew models from the very early days.

The wings of these early models were made of spruce with steamed ribs, or sometimes of piano wire, and covered in most cases with oiled silk. The wings were single surfaced.

Mr. A. F. Houlberg, the present chairman of the Society of Model Aeronautical Engineers, held the duration record of 89 seconds with a twin-propeller pusher model in 1912. In September 1913 Mr. Houlberg raised the duration record to 128 seconds with a similar type of model. The bentwood airscrews and great length of rubber motors are interesting.

The frame members were usually of birch and often with cross bracing of thin wire. The pusher airscrews were sometimes of steamed bentwood and sometimes carved, and occasionally made of bent sheet aluminium. They revolved in opposite directions to reduce torque effect.

Most of the early 'A' framed models were hand launched, but a wheeled undercarriage was sometimes fitted, and R.O.G. flights were obtained. The average weight was from 2 oz. to 7 oz.

Mr. Bragg Smith rather surprised people with his unique biplane with its lower plane bent up to meet the top plane. This model had a single pusher propeller. See Fig. 7.

The general construction was similar to the 'A'-framed models and the surfaces were usually of the "single type." The hollow spar fuselage made from thin birch veneer then followed. The spar was polished and the rubber motor was usually externally located. A. E. Jones Ltd. produced a veneer hollow spar in which the rubber ran in french chalk.

Twin gears became popular as they helped to reduce the twisting effect on the fuselage spar.

The idea of the use of geared motors was brought forward by Mr. Mayer in 1914. The proposal was "quite favourably received" to quote a report of that period. The question of the covered-in fuselage was also brought up for discussion. It was stated that "quite a number of such fuselages have been flown with considerable success recently."

Mr. V. E. Johnson used to edit model news in *Flight*, and there is an interesting report of a discussion on "Hydro-aeroplanes" as seaplanes were called in those days. G. P. Bragg Smith suggested a step on floats, and advocated long and narrow floats, with the length 12 to 15 times the length

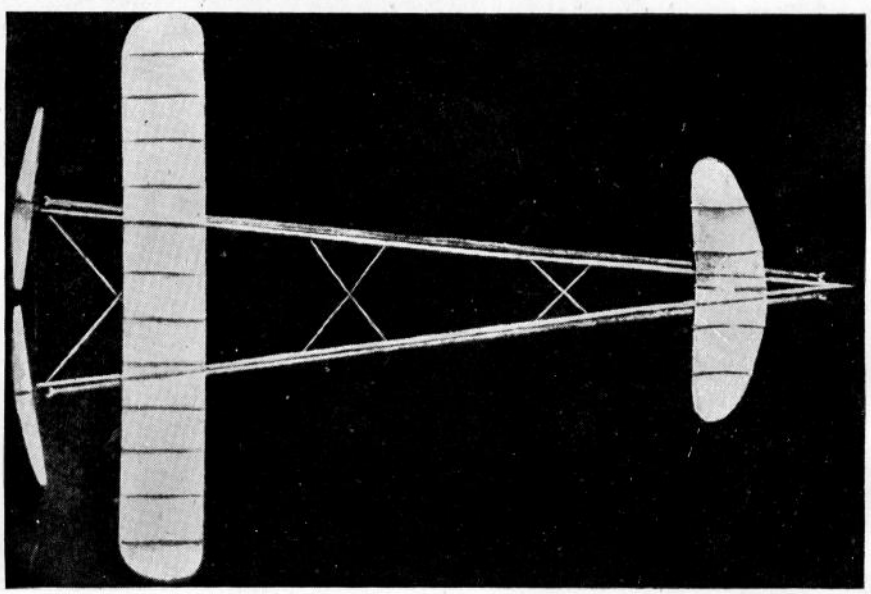


FIG. 5.—*A typical 'A'-framed pusher monoplane as used by early aeromodellers, 1914 to 1920.*

of the breadth. Mr. Johnson did not agree. He advocated the wider float with the maximum length to width ratio of 9 to 1.

The discussion included varying opinions as to whether the canard (tail first) or the tractor type of machine, and whether the single spar or 'A'-framed model was the most suitable for hydro work. Should there be one float forward and two aft or vice versa? Opinions were varied.

There was an excellent photograph of Mr. Whitworth's "hydrobiplane" published, which gives a good idea of the main features of a model of the period. See Fig. 10.

No doubt a list of the records of 1914 will interest readers, and help to show modern development by comparison with figures given later in this book, particularly at the end of Part III.

Hand Launched
Distance : A. E. Wollard 477 yards
Duration : A. F. Houlberg 89 secs.
(See Fig. 4.)
Off Ground
Distance : G. Rowlands 232 yards
Duration : A. F. Houlberg 51 secs.
Hydro Off Water
Duration : F. Whitworth 37 secs.
Single Tractor Screw
(Spar Model)
Distance : F. G. Hindsley 173 yards
Duration : J. E. Louch 44 secs.
Single Tractor Screw
(Off Ground)
Duration : J. E. Louch 40 secs.

POWER DEVELOPMENTS.

The period 1911, 1912, and 1913 saw some most interesting power-model developments. Fig. 9 shows Mr. Desoutter's power-driven model aeroplane taking off the sea at Bexhill in 1913.

Below I give an extract of Mr. Johnson's remarks on the petrol engine. It is particularly interesting as he predicted that the single cylinder petrol engine would not be a success. It is a dangerous thing to make prophecies in the aeronautical world! There are very few model engines to-day that are not single cylinders, although one hopes that multi cylinders may become more in evidence for the sake of interest. The smallest commercially obtainable engine is now of 1.4 c.c. — the "Mighty Atom" — and weighs 2 oz. bare. This engine is described later.

Extracts from "Flight," dated January 27th, 1912. By kind permission of "Flight."

"The number of petrol driven model aeroplanes that have actually flown is surprisingly small. Personally we only know of two, viz. that built by Mr. D. Stanger and one constructed by Messrs. J. Bonn & Co. It is worthy of careful note that in the former case the power developed was 1¼ h.p. at 1,300 r.p.m., and the total weight of the model 21 lb. In the latter case the power developed was 1½ h.p. at 1,500 r.p.m. and the total weight 36 to 45 lb. according as to how the model was fitted with planes, etc.

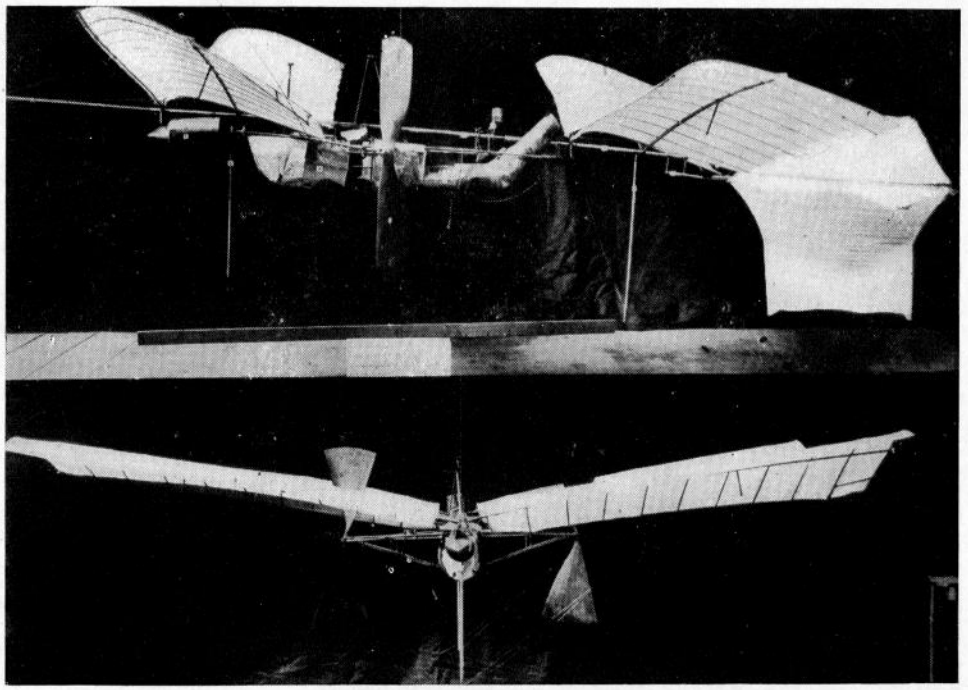


FIG. 5A.—*Front and side elevations of Langley's steam-driven "aerodrome." Note the cambered wings and dihedral angle.*

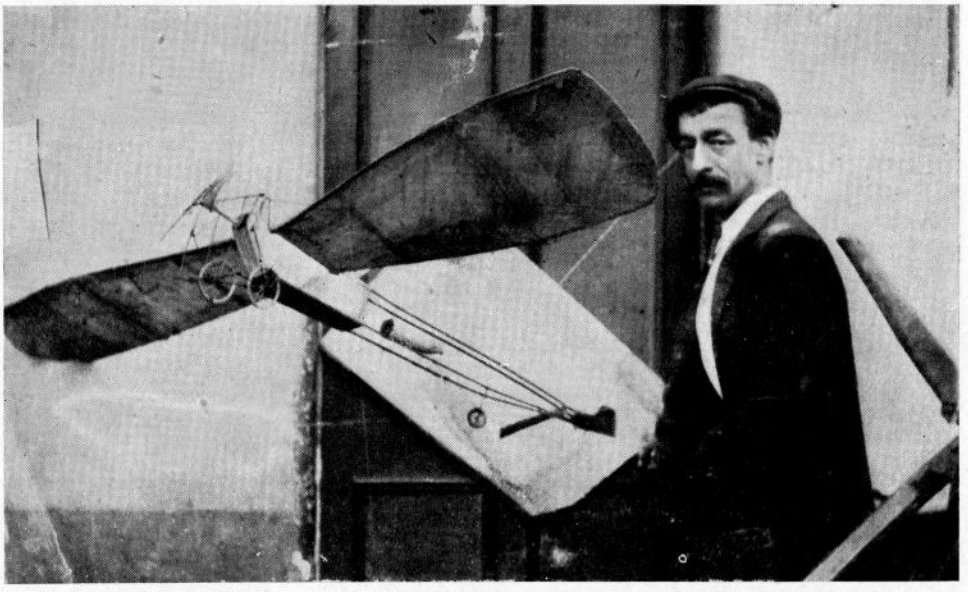


FIG. 5B.—*Model, after "Bleriot" monoplane, built by the late P. Palmer, of Cheltenham.*

"In the former model the engine was a four-cylinder and in the latter case a two-cylinder, in any case it was not a single-cylinder motor.

"So far as we can learn, no success whatever has as yet attended any single-cylinder petrol motor. Nor should we think any success is likely to attend any such efforts. The vibration is excessive and it is heavier in proportion than the two-cylinder type, and not so efficient. The question of vibration alone is a very serious one; even a badly balanced propeller will seriously interfere with and curtail the length of flight, to say nothing of shaking loose on the model everything that can be so affected.

"Another point to carefully note in the case of petrol motors is that it is only those of from 1 to 1½ h.p. that have met with any success, and from enquiries that the writer has made there does not appear to be any likelihood of one of a lower power giving any success at all. If this be so, then, so far as a motor for model aeroplanes in anything at all approaching a general use, the petrol motor is ruled out of court.

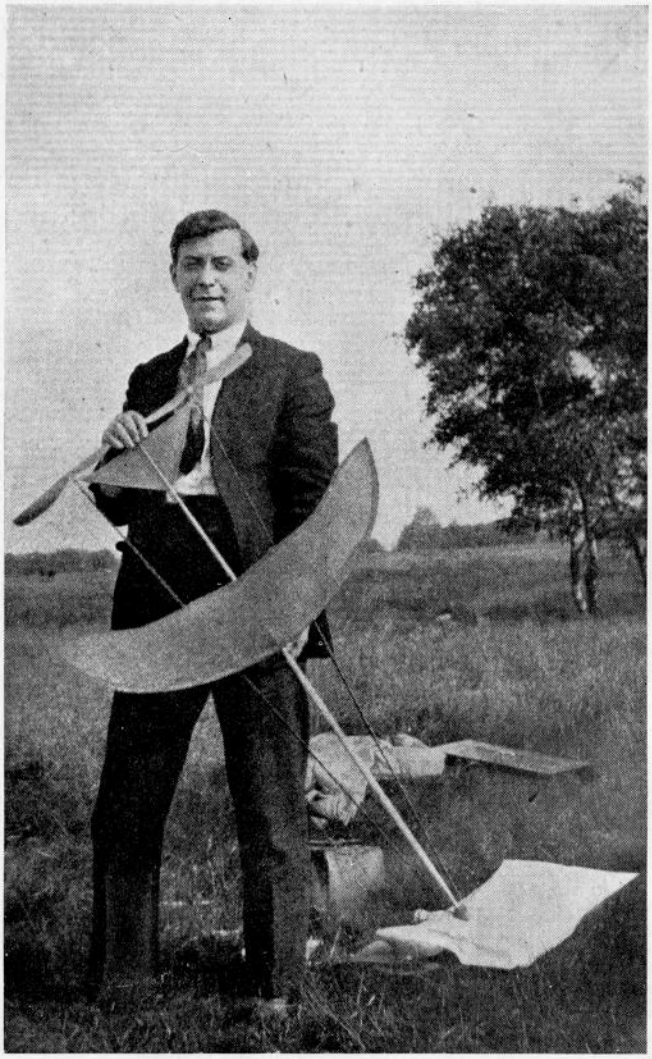


FIG. 6.—*Mr. Houlberg's record-breaking machine in 1913, with a duration of 128 seconds hand launched.*

" For large models weighing, say, from 20 lb. upwards, this motor can no doubt be successfully applied, and one such model might with great advantage be owned by the larger and more important model clubs.

" Mr. Stanger's propeller gave a static thrust of about 7 lb."

Mr. Johnson has given us the main data of the two successful petrol engines constructed at that period—the Bonn-Mayer and the Stanger engines.

Let us examine these two interesting forerunners of model petrol flight. Firstly the Bonn-Mayer engine.

I can not do better than to quote the report of this motor in *Flight* dated January 18th, 1913, as it not only tells us about the engine but expresses interesting views on the problem of stability of the large type model.

Extract from " Flight." (*By kind permission.*)

"THE 'BONN-MAYER' MODEL PETROL MOTOR.

" We publish this week two illustrations of a new model petrol motor, designed by Mr. F. Mayer (Messrs. J. Bonn & Co., 97, New Oxford Street), which is to be known as the Bonn-Mayer Model Petrol Motor, and which the above-mentioned firm are about to place on the market—the one illustrated has just been delivered to a customer. The photo of the engine alone gives a very clear view of the motor as seen from the rear—showing the ignition gear (out of focus). The weight of the engine alone is under 7 lb., and complete with battery coil, carburettor, propeller, fuel, and oil, i.e., in complete running order—9 lb. It is hoped that a large model monoplane driven by one of these engines will be complete in time to be exhibited at the forthcoming Show at Olympia in February next. Further particulars will be published later—including propeller thrust, B.H.P. of engine, etc. The plant is being entered at Olympia for the motor test. The photo showing the propeller revolving was taken by means of a two seconds' exposure (flash light) and gives a very good idea of the speed. The draught from the propeller acted as an excellent broom, clearing the floor of all dirt, grit, etc. We certainly hope that not only the plant but also the monoplane referred to above will be not only on show but also amongst the competitors at Olympia. Experiments with *large* power-driven models are badly needed, for it is, it appears to me, very largely by actual experiments with such models that the stability problem will in all probability be really solved. In the case of a full-sized machine there is always the personal element—the personal equation of the pilot—to be taken into account, and no mathematical symbol can be found for *that*. A pilot can scarcely be supposed to allow the inherent stability of his machine to reach the limit (presuming he knew it, which as a matter of fact he would not) before applying personal control and adding that unknown personal quantity—x or whatever you like to term it—which upsets all further application of mathematical analysis.

" I say *large* power-driven models because the meteorological conditions of the atmosphere are such as to preclude more or less the successful application of data culled from experiments with smaller models—to the successful solution of problems affecting full-sized machines."

Shortly after Stanger produced his engines, Mr. F. J. Camm made an 8 c.c. petrol engine for model aircraft. In later years he produced a 1 c.c. engine mentioned later in this book. Mr. Camm for a number of years was editor of the model section in *Flight*, and also technical editor of the old *Aeronautics*, and organized the model sections of the Royal Aero shows until their cessation.

FRANCE.

About this period (in 1911) things were happening in France.

The brothers Godfroy had produced a successful V-twin petrol engine, and fitted it to a model of the famous " Antoinette " full-sized monoplane. They flew their model around a pole (round-the-pole enthusiasts please note) and attached to a line, at the ancient Vélodrome du Parc des Princes, in front of a large crowd.

Monsieur Suzor observed this flight, and was naturally particularly impressed by it, because it was the first petrol-driven captive flight on record.

It reminds one of Stringfellow's historic first steam-driven captive flight later followed by Langley's first free steam flight.

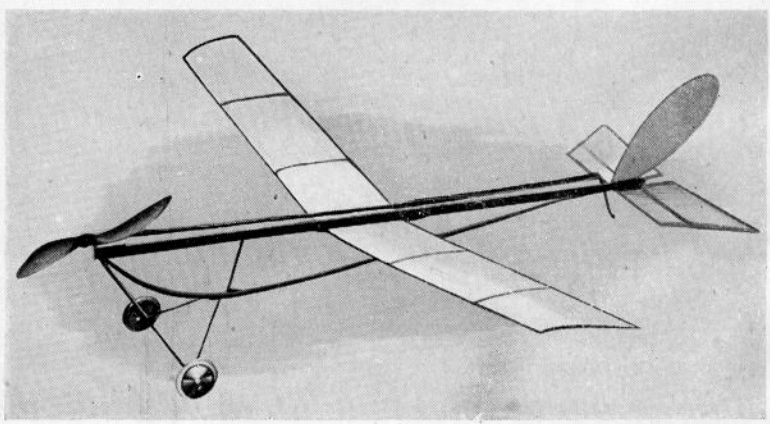


FIG. 6A.—*A popular type of early Tractor model. The planes were oiled silk covered and were single surfaced.*

This first petrol captive flight was shortly to be followed by the first petrol free record flight by an Englishman, Mr. Stanger.

The Godfroy brothers' flight was of five laps around the pole. The line then broke, and the model flew into some railings. For some reason or other the brothers appear to have left matters at that, just when they were so near successful free flight, and 26 years later Suzor was able to retrieve the engine and take a photograph of it. See Fig. 12.

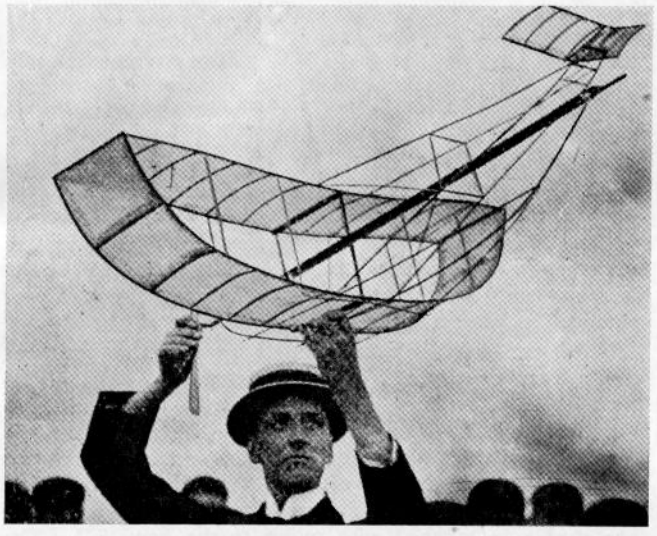


FIG. 7.—*The Bragg Smith Biplane. This model was exceptionally stable due to the up turns and tips of the lower planes which met the top wing.*

A BRITISH RECORD.

The *piece de resistance* of this period was Mr. Stanger's petrol model record. One of his models in 1914, a biplane, set up the first petrol-driven model record which was not beaten until my own petrol model biplane "Kanga" set up the second petrol record in 1932.

We have now seen a series of first trial events : Stringfellow in 1848 obtained steam power flight indoors ; Penaud made the first successful elastic-driven model in 1874 ; Professor Langley in 1896 made the first steam-driven flight out of doors. Stanger now obtained the first official record for petrol flight in 1914. Professor Langley is reputed to have flown a petrol-driven model as well as his historic steam model.

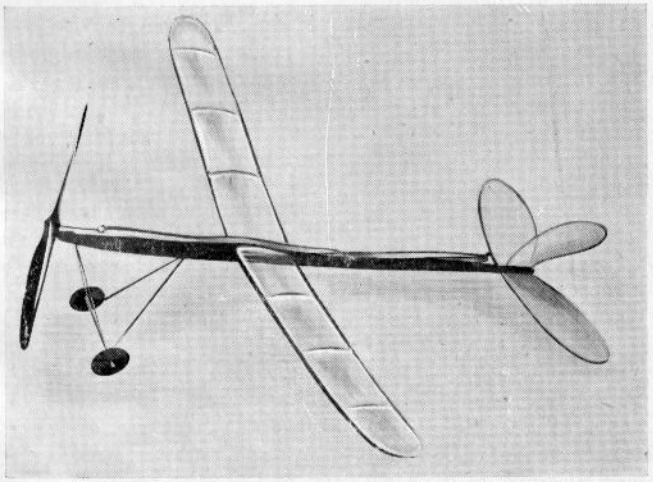


FIG. 8.—*The hollow spar fuselage model, made from very thin veneer, followed the stick model.*

FIG. 9.—*This picture, and the one below, show Mr. Desoutter, now well known in the manufacturing world to-day, getting one of the first power driven models off the sea at Bexhill in 1913.* (*'Flight' photo*)

Stanger built two models : one was a tractor monoplane very like a Bleriot full-sized machine. It had a span of 10 ft. and chord of 2 ft., with a lifting tail plane. The planes were double surfaced, covered with silk-faced fabric and doped with standard cellon. In fact, rather like our modern covering and doping for petrol models. The length of the model was 7 ft. The engine was a four-cylinder V type driving a 30 in. diameter propeller of 22 in. pitch at 1,600 r.p.m. The total weight of the model was 20 lb.

The machine was reputed to have made a number of good flights. One finds it difficult to see how this occurred as

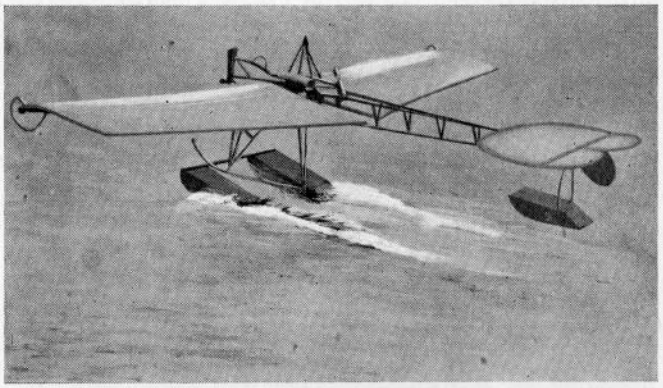


FIG. 9A—*Desoutter's steam model with tail up, taking off.* (*'Flight' photo*)

there was no dihedral or any other method of obtaining lateral stability. The flights must have been of short duration and made in dead calm weather.

The second machine is by far the more interesting model as it set up the officially observed flight of 51 seconds, and it has definite stability features. It was a tail-first biplane and the lower plane had upturned wing tips for lateral stability like the Bragg Smith rubber-driven model biplane. (Fig. 13).

The machine also had four vertical fins—two on the top elevator and two between the main planes. The span was 7 ft. and the chord 12 inches. The model had a 13 in. gap between planes. The elevator span was 30 in. and chord 8 in. The length of the model was 50 inches.

The petrol engine was a Stanger two-cylinder V type driving a 22 in. diameter propeller of 18 in. pitch at 2,000 r.p.m., and giving a thrust of 9 lb. The flying speed was estimated at 20 m.p.h. and the weight of the engine 2 lb. 12 oz. The weight of the model complete was $10\frac{3}{4}$ lb.

Mr. Stanger's famous flight was officially observed by the Royal Aero Club at Hendon and Mr. Stanger won a prize of £10. No other entrants to the competition for power-

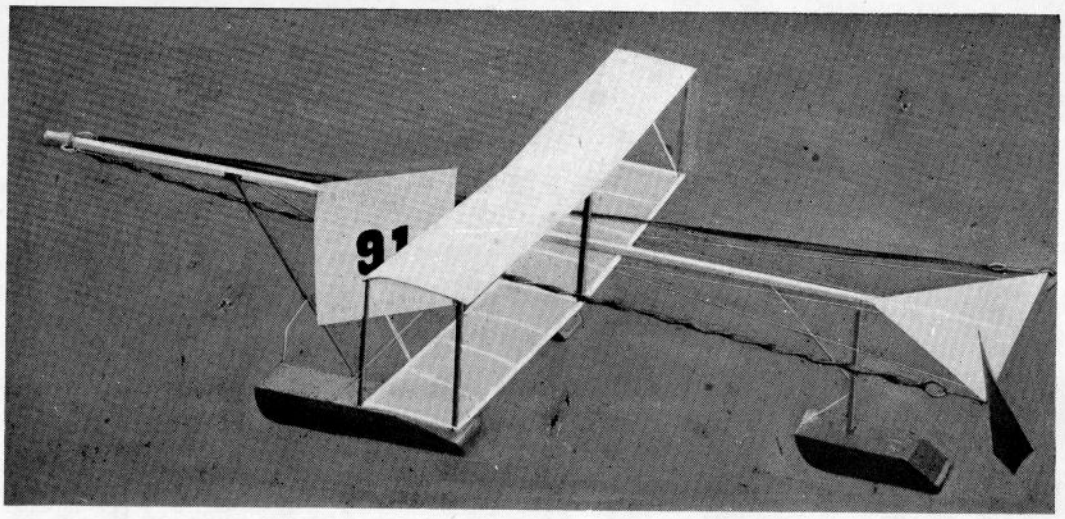


FIG. 10.—*Mr. Whitworth's seaplane was one of the first of its type.*

driven models qualified. The machine rose from the ground, but according to report, damaged itself at the end of the flight, although it flew with great stability.

COMPRESSED AIR.

I think that perhaps the next most interesting advance in the model aeroplane field was in the compressed air model. Although there had been a number of compressed air engines and machines made, Mr. D. A. Pavely, who ran the D.A.P. Model Aeroplane and Engineering Co., was undoubtedly the master man of compressed air. Paveley won the Sir John Shelley Cup for power-driven models (any power except rubber) in 1926 and created a record for compressed air models in 1929 with a flight of $67\frac{3}{5}$ seconds for a typical Pavely model.

The illustration of one of his models gives one a very fair idea of the general lay-out and construction. His biplanes were of similar construction. Some years later when the petrol model had got under way, Pavely suddenly blossomed forth with a petrol model. It was true to type. He still retained his original method of bracing wires from king posts for his mainplanes even in the days of cantilever wings. He also had a very " Paverlish " undercarriage.

His petrol model could not be called a success when I happened to watch its performances. Nevertheless, Pavely was undoubtedly the compressed air king of his day, and it will be observed that the secret of his success was simplicity, except in respect of the wing bracing, which followed current practice for large machines.

I had one of Pavely's compressed air machines and can speak from experience. The engine was a horizontally-opposed twin cylinder of very simple design and construction. The fuselage was formed by the compressed air container and two birch side members which retained the wire single surfaced tail unit and fin. The air container was made of thin brass foil and wound closely with very fine steel wire touched with solder to the brass foil. The wings were single surfaced and covered with oiled silk. The cambered ribs were steamed to shape. The undercarriage also served as the bottom king post for the lift bracing wires.

Pavely's record holding model had a wing span of 7 ft. 6 in., chord 9 in., length 3 ft. 6 in., and weight $1\frac{3}{4}$ lb. (Fig. 14).

Later on, compressed air models were cleaned up, and a very fine example is shown in Fig. 15. This model shows considerable development.

It was made in 1932 by Mr. R. T. Trevithick, who is well known in the model world for beautiful workmanship. Many will have seen Mr. Trevithick's striking drawings of Fairey aircraft on the covers of aircraft journals.

The wing of Trevithick's model was cantilever and double surfaced, whilst the whole of the tail unit was faired into the end of the air container.

The principal dimensions were : overall length $23\frac{1}{2}$ in., span 46 in., mean chord 4 in., tail span 13 in., diameter of propeller 12 in. The weight of the complete machine was $10\frac{1}{2}$ oz. The little three-cylinder engine was a beautiful piece of mechanical construction ; the cylinders were only $\frac{5}{16}$ in. bore by $\frac{3}{8}$ in. stroke. It had a ball-race crankshaft, and the pistons were of duralumin. With an initial air pressure of 150 lb. per square inch the propeller made 2,200 revolutions per minute. The machine had an effective colour scheme ; the body was cellulose sprayed in vermilion, and the undercarriage and wheels similarly treated in white. The wings were treated with natural dope. The engine was nickel-plated.

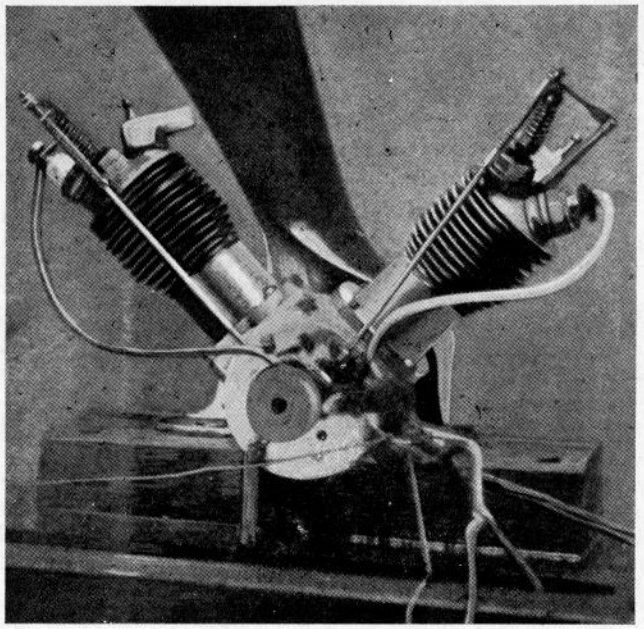


FIG. 11.—*The Bonn-Mayer engine. A two-cylinder V four-stroke engine, 1912. ('Flight' photo)*

A FAMOUS AIRCRAFT DESIGNER'S EARLY REMINISCENCES.

Sir Alliot Verdon Roe, founder of A. V. Roe, manufacturers of the world-famous 504, Anson and Lancaster, wrote some reminiscences of his early days, and how he commenced his career with model aircraft. These reminiscences appeared in

the first issue of the *Amateur Aviator* in April 1912. This model aeroplane journal has long been defunct.

Sir Alliot's remarks are of absorbing interest to model enthusiasts, in fact to anyone interested in men and aircraft.

Below I have made some extracts from Sir Alliot's article, as it shows us how his models grew into full-sized aeroplanes. It also shows the lack of interest, in fact, local official discouragement, that the early pioneers often encountered.

" My first serious model was made on the lines of an Albatross, whose graceful antics I had admired so much when at sea as an engineer.

" From my point of view this model was not a success (at least not so successful as I could have wished.) I therefore tried another on the same lines as that of the Wright Brothers, of whom I had just at that time heard, I quickly found out that it was advisable to have a large plane in front or behind and from that time constructed my models with such, and good results were obtained with either type.

" Gliders I made by the score, and very soon I found myself loaded with basketfuls of them.

" About this time the *Daily Mail* offered £250 in three prizes, for models making certain flights, so I immediately set to work and made a three-foot model, which I had flying within ten days of the competition.

" As there was plenty of time to spare, I made some others eight feet long by eight feet wide, and it was ultimately with one of these I won the *Daily Mail* Prize in April 1907, just five years ago this month."

" Thus encouraged, I set to work on a full-size machine fitted with a 24 h.p. Antoinette engine, and in June 1908, managed to obtain a few short hops with it at Brooklands.

" Previous to this in the latter part of 1907, I ought to add, I obtained many flights in a machine towed behind a car. I used to regulate the height up and down by the front elevator. On one occasion the machine broke away from the car, and I was powerless to prevent the smash that followed. (They generally ended that way, and many exciting adventures befell me.) I remember vividly my boot heel was torn away as I was dragged among the wreckage. The tower's instructions were to let go as soon as the machine swerved away from behind the car, being attached to about 60 feet of cable ; but I had the greatest difficulty in getting new hands to do this.

" Unfortunately, the then manager of the Brooklands track was not at all sympathetic towards aeroplanes or aviation, in fact, instead of receiving encouragement, reasonable requests were refused and every obstacle placed in my way.

" It was only on condition I would lend my shed on Race Days that I was allowed to stop at all, and just as I was reaching the hopping stage I was requested to remove my goods.

" The shed was purchased by the authorities for a mere fraction of its cost.

" After this I returned to London and started on designs and plans for a triplane with the engine forward, very much like our last triplane in general appearance.

" After building the machine I rented some railway arches on Lea Marshes. Here many amusing and unplesaant experiences befell me.

" Although the engine was only a 9 h.p. J.A.P. heavy motor-cycle type, I managed to get many short flights rising to twenty feet in height.

" Early one quiet morning I was just about to start some trials when the ground inspector of the Lea Marshes turned up and ordered me off the ground, which, by the way, is used chiefly by lovers.

" I therefore went to the next ground which I had used previously, but had not been there long before a gentleman in blue, plainly labelled policeman, bobbed up and took my name and address. Just at that time, however, Bleriot flew the Channel and this made all the difference in the Inspector's attitude, for he too became interested, so all was easy and plain sailing again, and I was allowed to continue.

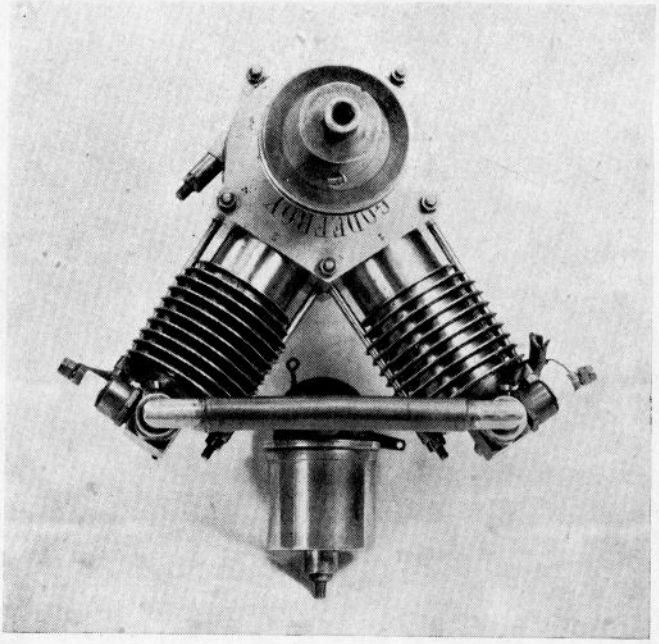


FIG. 12.—*A very early French engine made by the Godfroy brothers, which flew a model round a pole for 5 laps in 1911.*

" Many readers will remember England's first flying meeting at Blackpool. I received an offer at the last moment to take my machine down there ; this I managed, but it was all ' rush,' we worked night and day to do it, but eventually succeeded in arriving there with our 9 h.p. triplane.

" The engine was very obstinate and I managed to get a few short runs so we put on the 20 h.p. machine ; meanwhile the wind blew in hurricanes tearing off the covering of the roof and swamping us in rain.

" The new 20 h.p. triplane was ready on the Monday when the all-British Prize of £300 for a flight of at least 100 yards was offered, but just as bad luck would have it the wind blew and the rain rained, with the result that the meeting was declared off.

" I managed to get the machine out and obtained a seventy-yards' jump at the first attempt.

" Early in 1910, my brother, H. V. Roe, joined me and we started building in earnest at Brownsfield Mills, Manchester, (my brother's place) and made our flying quarters at Brooklands.

" Most people will recall our bad luck in the August of 1910, when two of our triplanes were burnt up on their way to Blackpool through a spark from the railway engine. Both

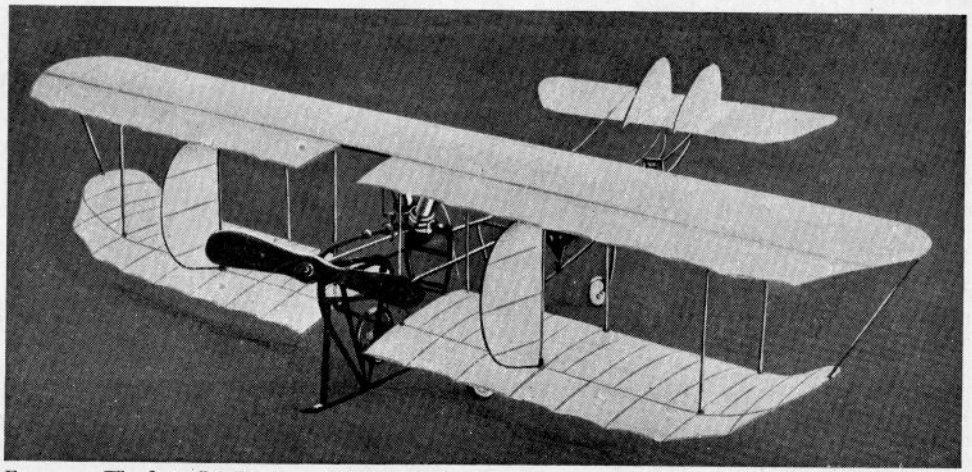


FIG. 13.—*The first officially observed flight made by a petrol model was accomplished by Mr. Stanger's model shown in this photograph, 1914.*

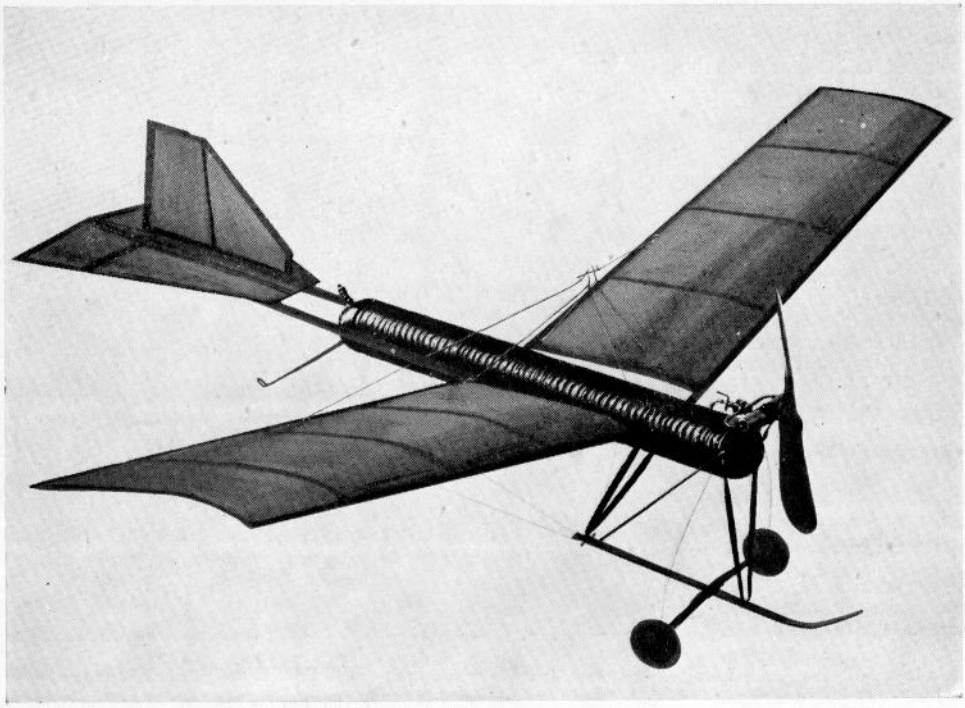


FIG. 14.—*Mr. D. A. Pavely set up the first compressed air record. This illustration shows a D.A.P. Model.*

machines were tuned up to pitch, and one I had flown some hundreds of miles ; on the other I had carried my brother as passenger and I had taken up a twelve-stone passenger for flights of figure eights.

" However, we managed to rush another machine through in three days from some oddments we had lying by, but it was not like the other old machines.

" With this I flew three times round the course first time out. Not so bad, considering.

" After this came an offer from America for us to go to Boston. We refused at first as we did not feel justified in taking our only machine, but eventually after pressing offers we decided to go.

" I am sorry I was unable to make a better show than I did, but so little time was at our disposal for tuning up. It couldn't be helped, the public were very generous and applauded what little I did.

" Mr. Graham White was very popular and between the meetings we were motored all over the country, on one occasion a trip to President Taft's country seat, where were were introduced to him.

" We are now turning our attention to monoplanes and no doubt by the time this article appears, shall have had our latest machine down from Manchester. However, apart from this we are building our latest biplanes to order of British War Office, and so I think my labours have been rewarded. That I think finishes my article to the date when my success with Biplanes started."

Those beginnings of aviation with their background and inspiration of model experiment were perhaps the most exciting days in the history of aviation for the men involved. They can never be quite repeated—the birth of a new form of travel is a new adventure, and all the possibilities it opens up will always be a greater thrill than any later development work, for the simple reason that the pioneers are involved in adventure with the unknown.

Complete novelty and the unknown are heady wines and not easily come by in these scientific times that we live in.

We are now in the great age of development which too has its lure and excitement, but I think never quite so acute as the original pioneer work.

The doings of men described in Part I all sounds so elementary and simple now that we *know*.

If the reader ponders on Part I, I think he will probably realise two outstanding facts—firstly how the full-sized aeroplane owes its being to model work at every stage of its early history, and it is often surprising how few people realise this fact, and secondly the model and " full sized " enthusiast of those days had to get over greater difficulties than we have to surmount nowadays with the knowledge *behind* us and with the materials that are now readily available.

No, those days were not easy, but they were a great adventure, and that is not to say that the further development of aviation has no thrills, or absorbing problems. There are great voyages of discovery yet to be made.

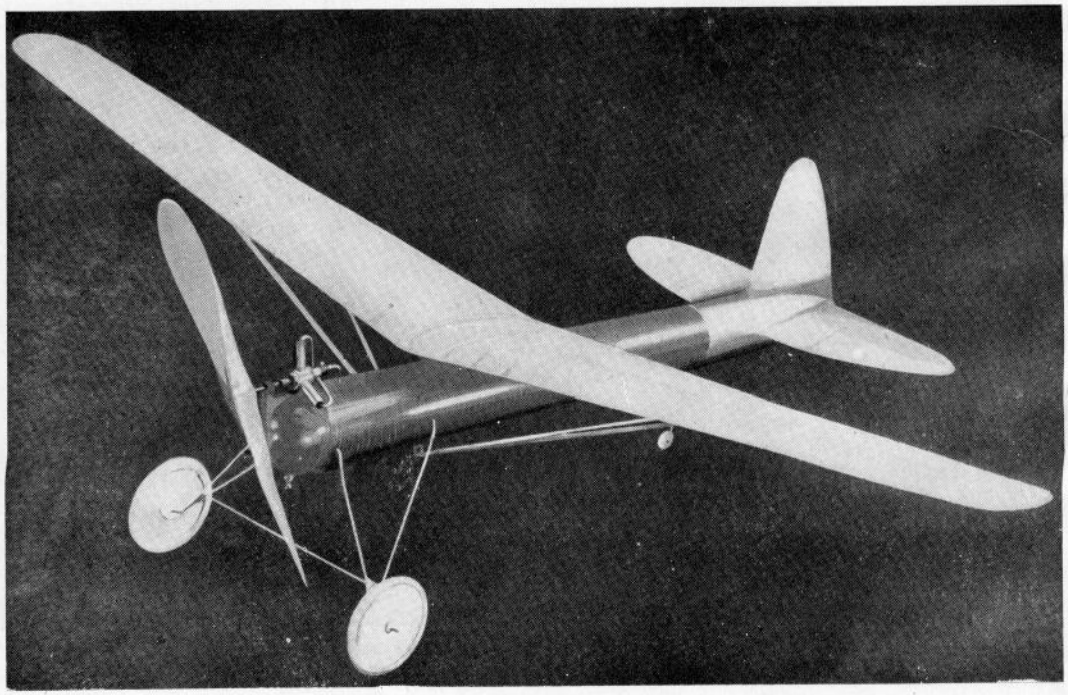


FIG. 15.—*Mr. Trevithick's beautifully made little compressed air model.*
(Photo 'Model Engineer')

PART TWO

THE MIDDLE AGES OF AEROMODELLING 1921 to 1935

THE S.M.A.E. AND A NEW ERA OF DEVELOPMENT UP TO THE AMERICAN INVASION OF " WAKEFIELD CUP " WINS, IDEAS, AND BALSA WOOD.

It may not be generally known that the Society of Model Aircraft Engineers started its life in 1922, and was the successor to the Kite and Model Aeroplane Association and the London Model Aeroplane Society, as the generally accepted leading bodies of aeromodellers in the country.

The credit for the foundation of the S.M.A.E. goes to Mr. A. E. Jones, who was also the Society's first secretary. It was his endeavours which led to the revival of the old London Model Aeroplane Society after the war 1914-1918, and which eventually changed its name to the Society of Model Aeronautical Engineers at the suggestion of Mr. F. J. Camm.

In passing it is worthy of note that the Paddington Aero Club was reputed to be the first club to challenge other clubs to inter-club competitions.

Later the S.M.A.E. took over control of the model movement all over the country, and the majority of model aero clubs joined under its banner. The Royal Aero Club has always accepted the S.M.A.E. since its inception, as the governing body of the model aeroplane movement. In the latter part of 1922 Mr. A. F. Houlberg was elected Chairman, and he has filled this position continuously ever since, except for a short period. He has probably done more for model aviation over the years than any other man. Dr. A. P. Thurston was the first president of the Society and this position was later occupied by Air Vice-Marshal Sir Sefton Brancker in 1927. Dr. Thurston was again to lead the S.M.A.E. during its peak years just prior to World War II.

I have already made mention of the names of those pioneers who have since produced full-sized aeroplanes. The following individuals were wholly devoted to models in the very early days. Mr. Twining, Mr. Clark, Mr. Aston, Mr. Bragg-Smith, Mr. Ding, Mr. Sayers, and Mr. Akehurst. A few of the better-known men present at the inauguration of the S.M.A.E. were Dr. A. P. Thurston, Mr. F. J. Camm, Mr. B. K. Johnson, Mr. A. F. Houlberg, Mr. A. E. Jones, Mr. W. E. Evans, Mr. C. Burchell, Mr. C. A. Rippon and Mr. D. A. Pavely. If I have missed any well-known names I apologise and hope I shall be forgiven. Mr. F. de P. Green, a very enthusiastic member of the S.M.A.E. in 1927 approached Lord Wakefield, who presented the well-known "Wakefield Cup."

The chief records of model flying in the early days seem to be concerning the doings of those men who operated around the London area.

Model activity was alive in many parts of England, although on a small scale as compared to now, and there were a number of lone hands even in those days. I was reminded of this fact quite recently when talking to Capt. Grant of Bournemouth, a very old lone hand at the game, and also by the fact that I started building and flying models as a boy in 1910 and formed a club at Radley in 1911, although I did not fly with the " Londoners " until after the last war.

The doings of the " London Brigade " were reported in the *Aero* and early flying journals. News from the provinces did not travel as quickly, nor was it collected so freely, as now ! I hope that this book may draw some interesting reminiscences from the old hands both from the London area and from outside, and that these reminiscences may be published in the model journals. In this way we may dig up some lost history for future recording.

After the formation of the S.M.A.E., and up to the invasion of American methods and balsa wood, there was a very interesting period of model aircraft development along enclosed fuselage, hardwood constructional lines, gearing and silk covering. Many of the models produced make fine general purpose machines even now. In fact they were more durable and in many ways are more suitable for all weather flying in our rigorous climate than the modern, easily damaged, tissue-covered super lightweight all-balsa models. The silk-covered model is capable of some very fine durations.

Apart from my petrol models, I personally always keep one of the silk-covered type of models handy to fly on suitable occasions, as well as the all balsa and tissue type which requires such a lot of careful handling, and is so easily damaged by

FIG. 16—*Mr. R. N. Bullock and his low-wing Wakefield Cup winner in 1929.*

children who pick it up at the end of a flight, also by dogs, broken rubber motors, trees and so on.

I propose to describe this period and some of the better-known machines, and their general performance, in some detail as it has its historic interest, as well as possibly giving present day aeromodellers something to think about when designing their new general-purpose models. It gives a line on hard-wood construction and sizes of wood, when balsa is not readily obtainable. It must be admitted, however, that the use of all-balsa construction requires less trouble and skill. The wood is so easy to cut and slice up and sticks together with blobs of balsa cement instead of more skilled joints having to be made. After this period I will follow on with the "American Invasion" and show how it influenced British model design and construction.

In 1927 Sir Charles Wakefield (later Lord Wakefield) presented a very handsome cup and prize money sufficient for three years for an international competition for rubber-driven models. This yearly event became the blue riband for the rubber-driven model. In the same year the Director of Civil Aviation, Sir Sefton Brancker, became the president of the S.M.A.E.

The Society produced the Wakefield formula on which is based the modern model aeroplane the world over. Mr. A. F. Houlberg started this formula going.

In 1924, Mr. R. N. Bullock introduced his unique feather planes, actually constructed with single birds' feathers for wings and tail. He broke the spar tractor record with a duration of 108 seconds in 1926. He also broke the fuselage duration record with a flight of $42\frac{1}{5}$ seconds in 1925.

Both Bullock and B. K. Johnson got seaplanes to take off from the Welsh Harp in 1926, whilst Pavely did 22 seconds with an autogiro model. Mr. T. H. Newell won the first "Wakefield Cup" with a flight of 52.6 seconds.

In 1927, Mr. J. Plater raised the seaplane record to 20 seconds and Newell the fuselage R.O.G. record to $48\frac{2}{5}$ seconds. In 1928 Bullock put up a record speed of 34 m.p.h., whilst in 1929 he won the "Wakefield Cup." His model was a low wing hardwood machine fitted with twin gears. It had a span of 48 in., a length of 34 in., and the weight was 10 oz. The winning flight duration was 70.4 seconds.

The model was the first low wing fuselage machine to win the premier rubber driven award. It was peculiar in that the formers of the fuselage were of spring steel wire, as were the leading and trailing edges of the wings. The fuselage longerons were of birch. The tail unit was a simple wire outline, and of the non-lifting type. The wing was double surfaced and the whole model was covered with doped jap silk.

Both this model and the next model to be described would still make excellent general purpose and strong all-the-year-round flying models for any reasonable weather.

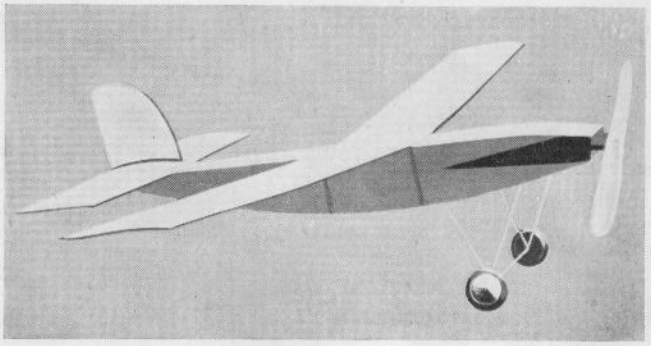


FIG. 17.—*Mr. Newell's famous "Falcon" which established a record in 1929. (Photo: Model Engineer)*

Bullock's model was put on the market in the form of a kit and performed well in the hands of many people.

T. H. Newell created a British record for fuselage models rise off ground, of 85 seconds in 1929, with his well-known and distinctive high wing model "Falcon." This model, and Bullock's low wing Wakefield winner, created much discussion at the time as to the relative values of high wing and low wing models for competition and duration work. The

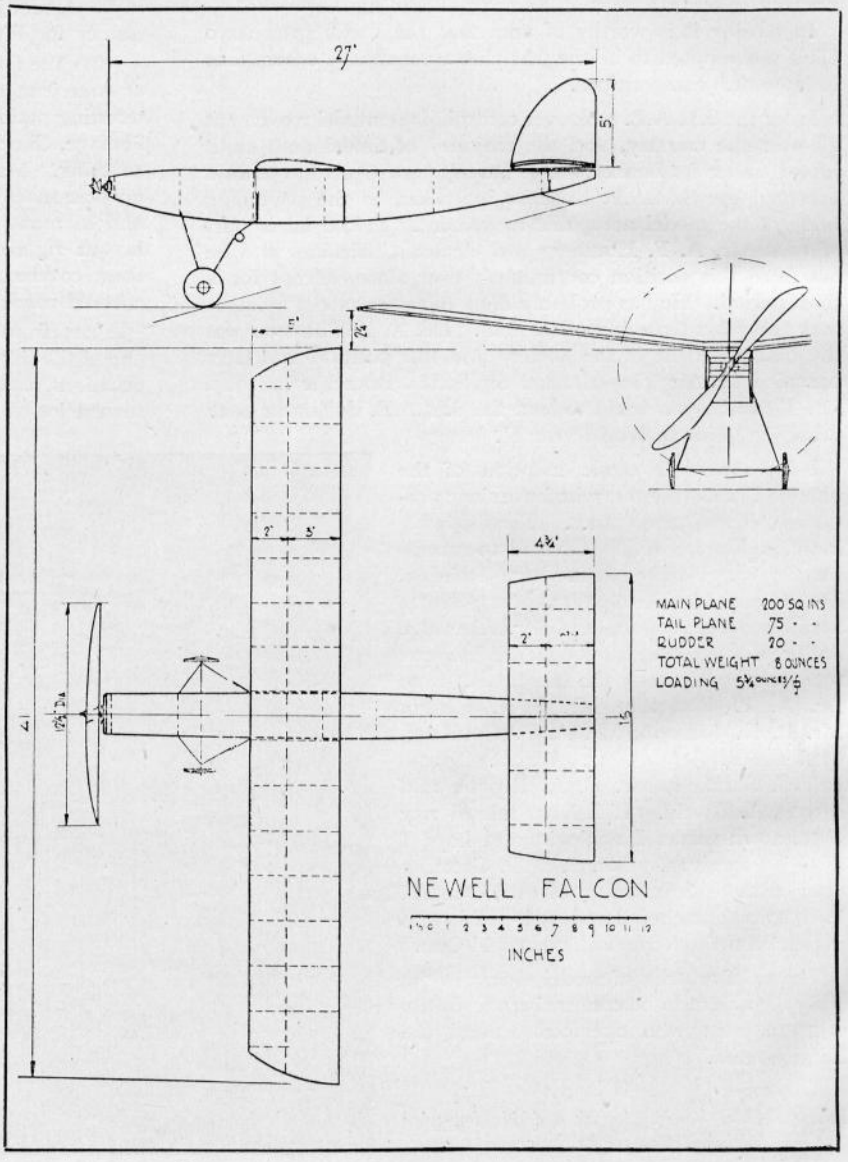


Fig. 18.—*A plan of Mr. Newell's "Falcon."* (*'Flight' drawing*)

pendulum has swung towards the high wing model in recent years, although there are still prominent people who believe firmly in the low wing, particularly for general purposes and petrol. We shall hear more of these arguments as we proceed with this history.

Newell's " Falcon " had an unusual arrangement of triple gears. There were three gear wheels, each of $\frac{1}{2}$ in. diameter, with the three rubber skeins lying horizontally inside the fuselage. Each skein was of four strands of $\frac{1}{4}$ in. x $\frac{1}{32}$ in. strip, 36 in. long, allowing 1,000 turns fully wound. It was suggested that the horizontal position of the rubber skeins made for less interference between themselves when rotating.

The span of the model was 42 in., chord $4\frac{1}{2}$ in., length 27 in., and weight 7 oz.

Newell had cut 3 oz. from the weight used by Bullock. A side view of the " Falcon," and a general dimensional sketch of the model (which was made from hardwood) are shown on this page.

The fuselage was built up of $\frac{3}{16}$ in. x $\frac{1}{8}$ in. silver spruce longerons with three-ply formers $\frac{3}{32}$ in. thick. The propeller was carved from satin walnut and covered with silk and doped. The diameter was $12\frac{1}{2}$ in. and the pitch 19 in. The main plane was 41 in. span, 5 in. uniform chord. Clark Y section. Ribs were of $\frac{1}{16}$ in. plywood well fretted out. Dihedral $2\frac{1}{4}$ in. The tailplane was rectangular in shape and of a thinner Clark Y section. It was of the lifting type, and double surfaced, 16 in. x $4\frac{3}{4}$ in. This was rather an unusual feature in those days.

It is worth studying the general sketch of the model, as the " Falcon " was an exceptionally fine and reliable performer.

I remember that I built myself a slightly modified version of the " Falcon," and entered it in the first competition of the Harrogate Aircraft Club (model section). The machine easily won first prize, rise off ground. The flight was described by a reporter as " the beautiful flying of Capt. Bowden's models was much admired." One of the models was borrowed glory !

A model which was well known at this period was Mr. J. Plater's " Resurgam." It was a consistent flying model with a usual rise off ground duration of 60 seconds, and hand launched 70 seconds. It was remarkable at this time for using an under-cambered double-surfaced wing section. This model was fitted with twin floats when used as a seaplane ; another unusual feature. It rose off the water and made a flight of $30\frac{2}{5}$ seconds, thus beating the existing seaplane record. The total weight of the machine was $17\frac{1}{2}$ oz. This was an unusually heavy weight for a twin geared duration machine.

One of the most attractive model action photographs was taken about this time and published in the *Model Engineer*. It can be seen on page 22 and shows a model aeroplane of the period flying over model yachts racing on a pond.

LOW WING DEVELOPMENT.

We have reviewed R. N. Bullock's Wakefield-winning, twin geared, low wing model. Let us now turn to another well known low wing exponent of this time, J. E. Pelly Fry (now Group-Captain Pelly Fry, who was Extra Equerry to H.M. the King). His model " Heron " was extraordinarily successful in all competitions, and was noteworthy for its happy combination of low weight, streamlining, suitable propeller and correct amount of rubber to obtain maximum duration. The model was not a high climbing machine, but it used to carry on and on at a low altitude, much to the perturbation of fellow competitors. It was one of the outstanding duration models of its day, and is well worth careful examination. Some of this model's achievements were :—

Winner, Pilcher Cup, 1929.
Winner, Weston Cup, 1930 (Weight Lifting).
Winner, *Model Engineer* No. 1 Cup, 1930.
Winner, Brooklands Aero Club Competition, 1930.
Second, C.S.S.A. Cup, 1930.

The model would seldom ever stay up for less than one minute, and its best flight was $95\frac{2}{5}$ seconds. Its designer was one of the most imperturbable and painstaking workers. He took his time over design and construction. To watch him testing a new model on Wimbledon Common was an education in itself—no hurry and every adjustment made in careful sequence according to plan. It is not surprising that one of the daily papers called him an " Ace Bomber Pilot " in the recent war. " Pelly," as everyone called him, was also keen on skilful repair work, and later on when I took to petrol work I used to lure him home to tea and show him a damaged wing or fuselage. The stratagem seldom failed ; he would call for material and dope and presently the most beautiful repair work would emerge.

The " Heron " was a light twin-geared low wing model, with a span of 37 in. and tapered wings, with a chord 5 in. to $2\frac{1}{2}$ in.—wing section Clark Y—wing area 128 sq. in., length of fuselage 20 in., overall $22\frac{1}{2}$ in., total weight $3\frac{1}{4}$ oz., wing loading 1.06 oz. per foot of effective span.

The fuselage had four $\frac{1}{16}$ in. square birch longerons, and eight 1 mm. three-ply bulk heads. The tail plane and fin were built integral with the fuselage ; the leading edge being placed below the top longerons and the trailing edge above the top longerons. The undercarriage consisted of two simple detachable legs sprung to the lower longerons. To facilitate transport the lower halves of the bamboo legs plugged into copper sheet tubes wrapped round the top of the legs just below the coil springs. I wonder why this dodge is not used on general purpose models now. It is far stronger than the simple plug-in bamboo legs, and nearly as light.

The power was supplied by two motors 28 in. long, consisting of four strands each of $\frac{3}{16}$ in. rubber, geared to a 12 in. diameter white pine propeller, having a $21\frac{1}{2}$ in. pitch. The gear wheels were clock wheels and only $\frac{5}{16}$ in. diameter.

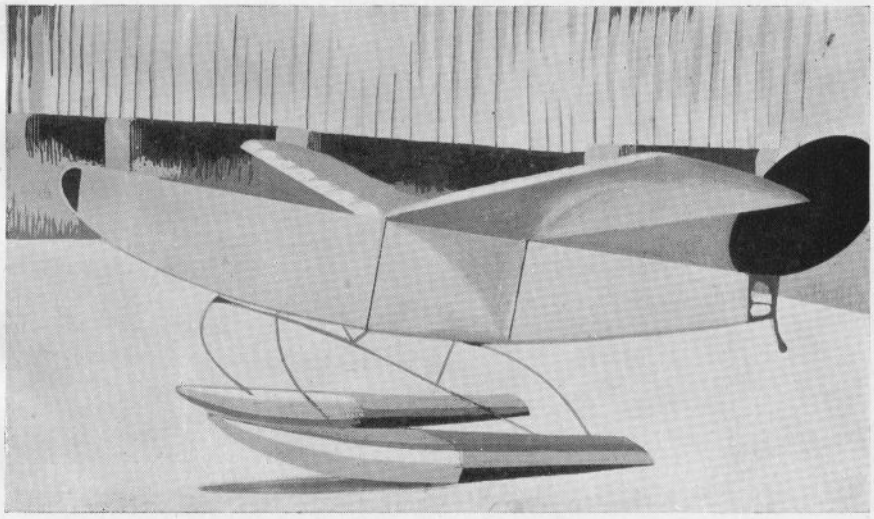


FIG. 19.—*Mr. Plater's " Resurgam," which set up a seaplane record.* (*Photo : Model Engineer*)

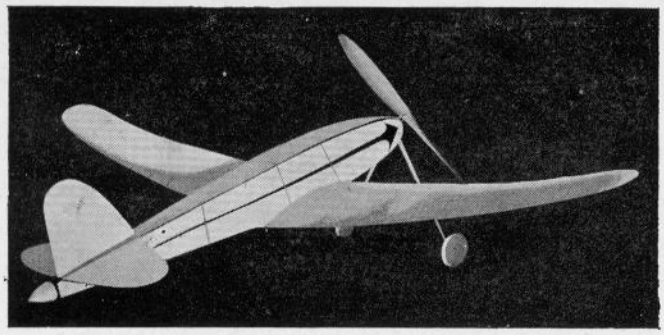


FIG. 20.—*Group-Captain J. E. Pelly-Fry's noted "Heron" the winner of many early contests. (Photo: Model Engineer)*

Maximum turns given were 960, and a free wheel was fitted to the propeller.

The wing was constructed with two birch spars $\frac{3}{16}$ in. by $\frac{1}{16}$ in. reduced to $\frac{1}{8}$ in. by $\frac{1}{16}$ in. at the tips. Balsa ribs were used; the leading edge was $\frac{1}{16}$ in. square birch rounded off in front. Strengthening spars were used in the centre. 22 s.w.g. steel wire was used as a trailing edge. The wing and fuselage were covered with Jap silk and doped. Tail plane and fin were made from $\frac{3}{64}$ in. square bamboo, steamed to shape, and covered with tissue paper. One coat of dope only was given.

Pelly Fry later built a low wing competition model called the "Drinking Straw." It was remarkable for its fine performance and also for the fact that the uprights and cross pieces of the fuselage were all made from hollow drinking straws! A photograph on page 22 shows the model in flight.

BABY MODELS AND BIPLANES.

Before the year 1929 was out, two baby models were introduced that proved a case for the "vest pocket" silk-covered model. They were novelties in their day for their small gears.

Pelly Fry produced a baby monoplane with twin watch wheel gears and a span of 22 in., weighing as a landplane $1\frac{1}{4}$ oz. and, as a seaplane, 2 oz. The wing-loading of the landplane was 3.33 oz. per sq. ft., and the length $13\frac{1}{2}$ in.

I came out with a tiny biplane with a span of 20 in. and triple watch wheel gears. The weight was $2\frac{1}{2}$ oz. with double surfaced wings and tailplane, and the whole model was silk covered.

Both models aroused a considerable amount of interest when they flew on Wimbledon Common, and also when they were exhibited at the *Model Engineer* exhibition. Curiously enough, the "Bumble Bee" was the only flying biplane exhibited, in an age when practically every full-sized aeroplane was a biplane.

The monoplane put up average flights of about 40 to 50 seconds and the biplane from 30 to 40 seconds.

I then concentrated on biplanes and low wing monoplanes for a few years, and won a number of S.M.A.E. and other competitions with these types. Eventually I set up a record for the first post-war petrol flight with a biplane, and I also obtained the longest duration flight for a biplane to date at an early S.M.A.E. competition with a rubber driven biplane, The flight lasted 66 seconds.

All my biplanes had considerable positive stagger, with the top plane flying at a slightly greater angle of incidence than the bottom plane. The bottom plane in this set up acts partially as a stabilizer, as well as a lifting surface. Biplanes built on these lines are very stable longitudinally, whereas one of the great snags of the model biplane is usually the difficulty of obtaining longitudinal stability, unless an unusually large tailplane is fitted to offset the large area forward.

THE RACING MODEL'S DEBUT.

That versatile designer R. N. Bullock, who served the S.M.A.E. as technical secretary for several years, in 1928 started a new standard for the racing type of model aeroplane.

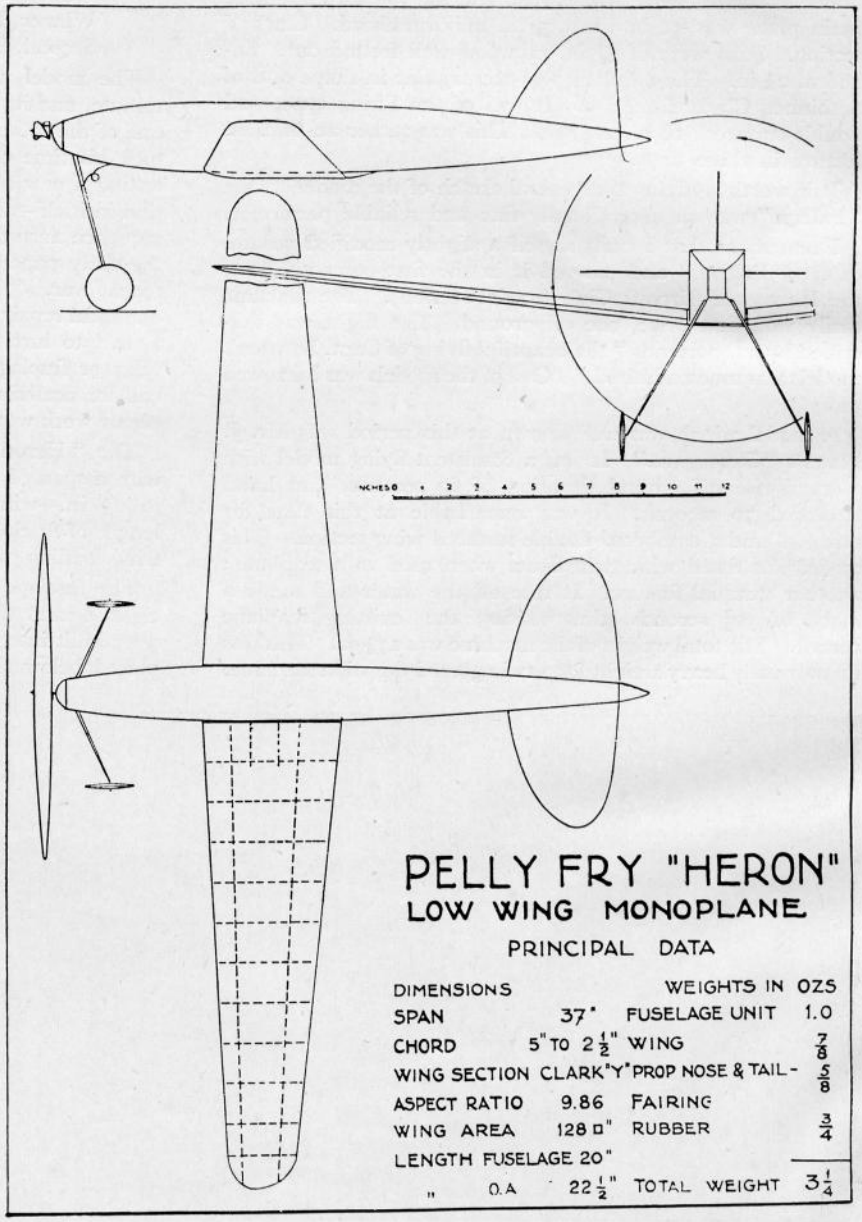


FIG. 21.—*A plan of the Pelly-Fry "Heron." ('Flight' drawing)*

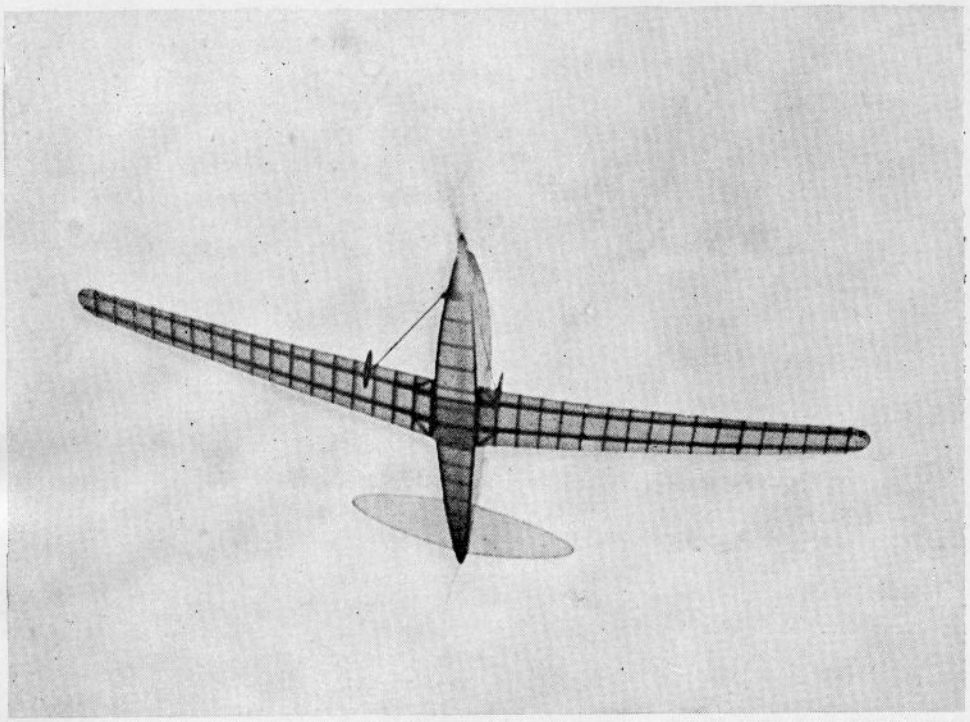


FIG. 22.—*Pelly-Fry's "Drinking Straw." The uprights and cross-pieces of the fuselage were made from drinking straws!*

Speed had been rather neglected up to that date. Bullock produced a model that put up a record speed of 34 m.p.h. in 1928.

This speed was all the more remarkable for that period when it is realized that the model covered its own length twenty times per second. The Supermarine S.5 full-sized record-breaking aeroplane, flying at over 300 m.p.h., covered its own length only 16 times per second.

Bullock's model was a beatifully streamlined machine with red fuselage and white wings.

I have watched it flying in the early speed competitions. Although tricky and uncertain, as this type of model is likely to be, it was a most thrilling spectacle with its snarling gears and terrific power.

No one had ever seen a model flying as this machine did. A general view of the machine is shown on the next page.

The particulars of the model were: span 34 in., chord 4¾ in., length overall 26 in., 4 gear wheels, with propeller and spindle geared 3 to 1; weight 35 oz.

The fuselage was made from two pieces of yellow pine gouged out to form hollow top and bottom halves. The propeller had a diameter of 13 in. and a pitch of 16 in. The model flew just above the ground in true racing style.

Bullock's model was followed by Messrs. White's and Debenham's racers, on similar lines but with differences in detail design.

All honour must go to Bullock for starting off the speed model.

At this time I wanted to win the Civil Services Cup which was given for the highest total number of points gained in all S.M.A.E. competitions during the year. I therefore decided that a reliable flying speed model that was sure of a place was indicated, so I produced a slower and more stable type. It obtained second place for two years. A photograph on this page shows this model in flight. This type of more lightly loaded model provides a great deal of sporting flying, as many flights are obtained without damage, and if the out and out racer cracks up without getting in a flight during a competition one may be the lucky winner. A number of people in this country pin their faith on this type of model.

The Americans have shown us a different method. They make exceedingly small all-balsa models, quite light, but full of rubber, and they have obtained some very high speeds.

This type of model is not so imposing and cannot look so exciting in action. It usually has only a single skein of rubber.

For instance, the 1936 American speed record was 50 m.p.h. Speeds of 70 m.p.h. have been unofficially claimed. The 1936 model was a very small balsa semi-high wing, with a single motor of 30 strands of ⅛ in. rubber.

Yet another compromise is the "slab sided" type but with a very high wing loading, and plenty of power. An excellent example was J. Van Hattum's "Ghost."

The future of speed models is an interesting one and sets the designer a really tough problem. They are difficult models to design and construct, and have to stand some very hard knocks.

Personally I favour the speed model that is reliable and stable. The freak and lucky flight may put up a record when fortune smiles, but it is not such an achievement as the model that will repeat the dose, to my way of thinking.

Of course, one cannot deny the fact that in one sense a designer has achieved his object if he creates a new record, even if his model smashes itself at the end of the performance.

The existing British speed record at the time of writing is 33.25 m.p.h., and is held by Mr. C. H. Debenham. This is based on the average of three up-wind and three down-wind flights.

H. E. White's "Hornet," already referred to, had a wing loading of 57 oz. per sq. ft., and was powered with five skeins of ¼ in. rubber weighing 1 lb. and developing 1 h.p. for the 5 seconds required to cover the 150 ft. course. This model

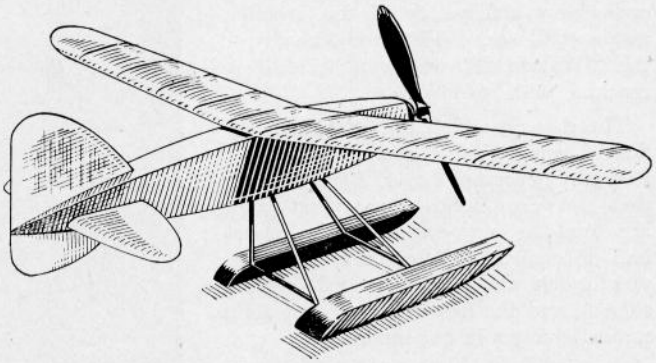


FIG. 22A.—*J. E. Pelly-Fry's baby twin-geared high wing model. ('Flight' drawing)*

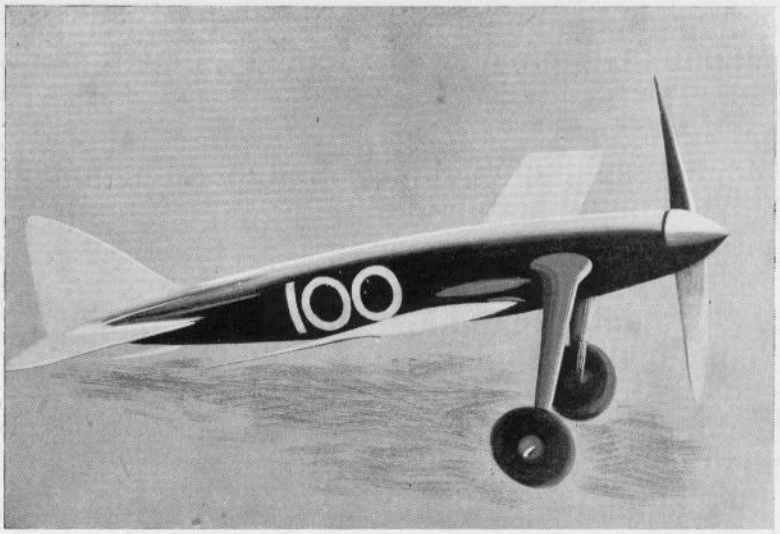


FIG. 23.—*R. N. Bullock's racer, which set a new standard for model racing machines.* (*Photo 'Model Engineer'*)

won the S.M.A.E. speed cup at 42 m.p.h. in 1936, but declined to function in 1937. It should be made clear that these speed competitions are for a flight in one direction only, and not as stated above for the record. Speeds are therefore higher.

One other particularly interesting machine is worthy of note. J. E. Pelly Fry made a compressed air racer in 1931. It was a beautifully finished and streamlined piece of work.

Unfortunately power plant troubles developed, and so this attempt at power other than rubber did not produce results.

As we settle down to peace-time conditions, racing round the pole will be indulged in, like the present model hydroplane racing.

From the aeroplane angle, racing round a pole lacks certain design problems, such as directional stability. The model may be designed like a powered brick hurtling around on a piece of string. Therefore a lot of the appeal is lost.

THE YEAR 1930.

1930 was of particular interest in the development of model aviation, for it saw the Americans capture the Wakefield Cup. This feat eventually had a number of repercussions on the model endeavours and policy of this country, as we shall see. The model that won the "Wakefield" was a light all-balsa machine with no gears.

The day on which the Wakefield was flown was windy and rough, and naturally everyone over here thought that a very light, and what then appeared to our eyes a flimsy model, had no chance. After the event, there was much thought expended on the subject, and the following year saw some radical changes in our models.

FIG. 24.—*Model sport in the air and on the water.* (*Photo 'Model Engineer'*)

Balsa became the fashion, gears began to die, tissue paper took the place of silk for covering.

Later still, the "Wakefield" rules were changed to encourage the heavier machine, but I am going ahead a little too fast, and we will come to that in due course.

Mr. Joe Earhart was the man who shook us to the foundations of our very "constructions and designs." He won the "Wakefield" with a best flight of 155 seconds. There was little extraordinary about his model except its great simplicity, and its light weight due to the use of balsa and tissue paper.

A glance at the illustration will show the reader a simple fuselage, a large propeller for those days, and a wing with a lift bracing wire in the form of thread! This last feature was due to a very thin and under-cambered wing section making the cantilever wing construction liable to fold up. The very large diameter propeller naturally demanded a stalky under carriage, and Earhart ensured that the model was in the correct flying position for quick take-off by using an enormously long tail skid of bamboo. This was a very vulnerable feature, but a good idea for the type of model.

The weight of the model for its size was extraordinary to us British aeromodellers. It weighed only 2½ oz. The propeller

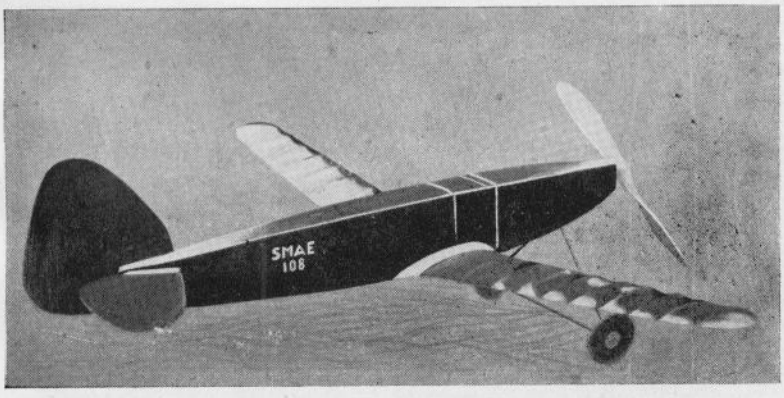
FIG. 25.—*A medium loading was used on this successful model.*

revolved at about 450 r.p.m. as against the British average r.p.m. of 900.

The Americans also taught us to stretch wind our elastic. Everyone does this now, even on general purpose models, and not only increases the duration, but decreases the chance of damage to the rubber.

For the benefit of the uninitiated, stretch winding consists of one man holding the model, whilst another hooks on a winder (usually a brace with a wire hook in the chuck) to a suitable loop on the propeller shaft. No. 2 operator then walks away from the model so that the rubber is stretched approximately five times its length. He then commences to wind up the motor, gradually walking in towards the stationary model as he winds up, and the skein shortens. This method allows the rubber strands to bed into each other nicely without fraying the edges. Sometimes models are wound up from the rear instead of the front.

As a final fillip to greater efforts on our part, the Americans, with their all-balsa construction, put up a record of 213 seconds R.O.G., in America. Also Joe Culver's model (another American) was credited with a flight in America of 14 minutes,



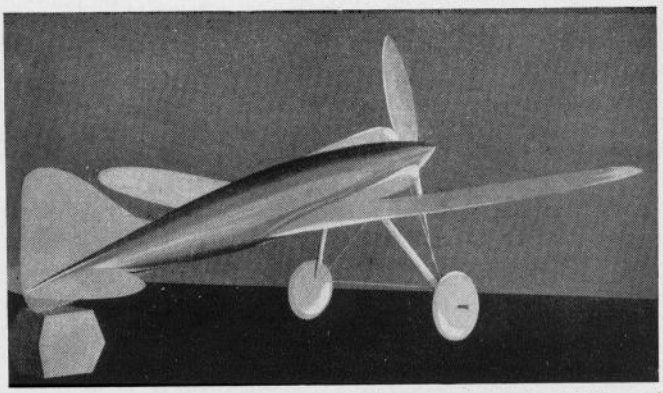


FIG. 27.—*J. E. Pelly-Fry's compressed air racer. A very beautifully constructed model.* (*Photo : 'Model Engineer'*)

unofficially timed, with several flights of over 10 minutes. This model was very sportingly loaned to us, and was shown at a S.M.A.E. meeting.

As a result of this, at the January 1931 meeting of the S.M.A.E., J. E. Pelly Fry produced a beautifully constructed, all-balsa wood and paper-covered low wing model. 1931 became the great British balsa year.

Great controversy now raged as to whether a high wing or low wing all-balsa model was the best type for duration work. Honours up to date had been fairly even in the major competitions between high and low wing models.

GLIDING.

Soaring fans will be interested to recall that in 1930 Horst Winkler, the German, made a glider that covered a distance of one and three-quarter miles.

We usually call them sailplanes now. A glider to moderns is usually a machine that glides forward losing height the whole time. A sailplane gains height by riding the air currents. Of course it eventually turns into a glider and comes down, for the old saying that everything that goes up must come down is still true so far as the air is concerned.

Winkler's model was about 6 ft. span and had upturned wing tips, an unusual feature for those days. It was made from hardwood with a three-ply covering to the leading edge of the wing.

COMPETITIONS AND RECORDS.

A. M. Willis set up a record R.O.G. of 97.8 seconds. His well-known " Sky Rover " had a phenomenal climb. It was fitted with twin gears, a lot of rubber and a lifting single surface tailplane with cambered wire ribs and a wire outline. This tailplane rather reminded one of an umbrella but it was most effective and at the top of the climb the model was straightened out ready for a long flat glide. In other words the tailplane was an anti-stall device.

D. A. P. Pavely was unopposed in the S.M.A.E. Sir John Shelley Power Cup. He won the cup with his compressed air model with a best flight of 21½ seconds. Things have happened in the Power world since 1930 ! The power competitions just prior to World War No. 2 were a continuous scream of exhausts from tiny petrol engines, from dawn to dusk.

FIG. 26.—*Mr. J. Van-Hattum's racer " Ghost."*
(*Photo : 'Model Engineer'*)

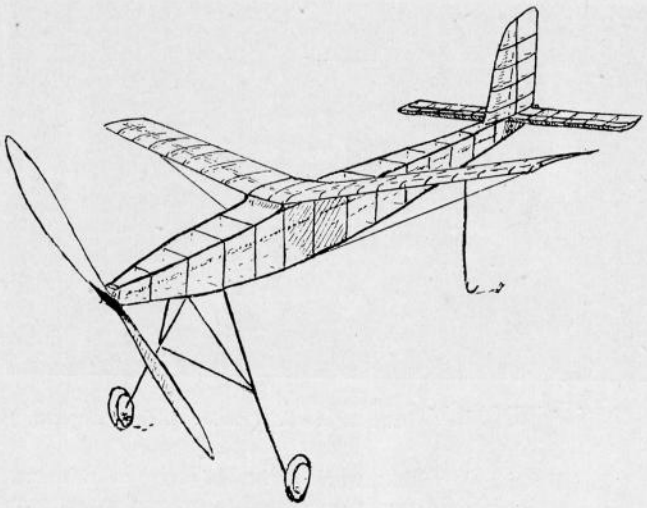


FIG. 28.—*Joe Earhart's Wakefield winner of 1930. ('Flight' drawing)*

Not one model succeeded in rising from the water at the Lady Shelley Seaplane competition in 1930. There have also been great advances in this branch of model aeronautics since then ! Models now leap off the water without difficulty —however I still consider that the rules of the leading seaplane competitions are not severe enough. Matters should be arranged so that models count no flight unless they land upon the water as well as take off. In the leading power competitions no flight is allowed if a model does not land upon the aerodrome, so there is no reason why, having found a suitable piece of water, we should not encourage control and the ability of the model to perform as a seaplane—that is to land upon the water the right way up and remain in that position for a specified period. Under the existing rules model seaplanes are not really seaworthy. They are at present just stunt machines fitted with tiny floats that scarcely keep them upright on the surface of the water, and certainly will not do so with any wind blowing. After a very short flotation test the model is placed upon the water, the propeller is released and the over-powered motor whisks the model off the water without any real planing. The excuse that competitors find it too difficult to find their way to a suitable stretch of water and to retrieve their models from water is to my mind a bad one, for it does not develop the seaplane. The design of the British model seaplane has remained stagnant for years, in fact, as someone said to me only a few days ago, " Why call it a seaplane ? " Even in major competitions in recent years, a small canvas bath has solemnly been placed in the centre of an enormous aerodrome, from which the models convulsively leap ! Let us hope that now the war is ended British model seaplanes are developed, and only enthusiasts for this type of model, who are willing to put themselves out, and even possibly to get a little wet, are encouraged to compete.

Finally, the 1930 list of records makes interesting reading when compared with those already shown for 1912, and also with those shown for 1942 at the end of this book.

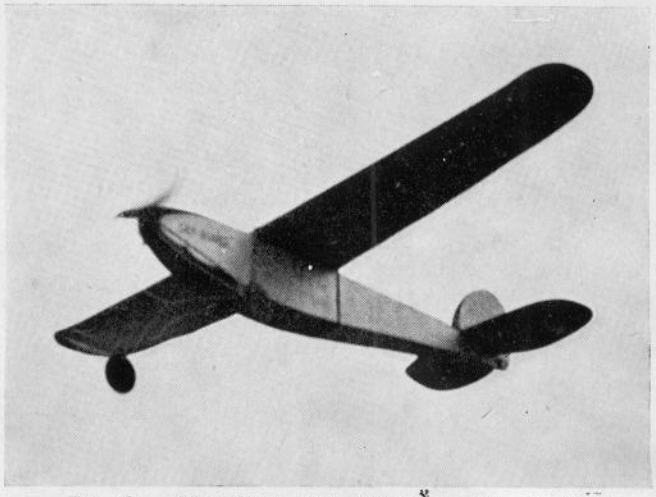


FIG. 28A.—*The " Sky Rover." A famous model by Mr. Willis.*

LIST OF BRITISH RECORDS (1930).

Fuselage Machines ..	Off ground	W. J. Plater	110	secs.
,, ,, ..	Off water	W. J. Plater	31.4	secs.
,, ,, ..	Hand launched	W. J. Plater	162	,,
,, ,, ..	Speed	R. N. Bullock	30	m.p.h.
,, Glider ..	Hand launched	C. J. Burchell	58	secs.
Spar Twin Pusher ..	Off ground	S. C. Hersom	247	,,
,, ,, ,, ..	Off water	S. C. Hersom	65	,,
,, ,, ,, ..	Hand launched	D. A. Pavely	113.5	,,
,, Auto-Gyro ..	Hand launched	D. A. Pavely	25.8	,,
,, Tractor	Off ground	D. A. Pavely	111.2	,,
,, ,, ...	Off water	S. C. Hersom	43	,,
,, ,, ...	Hand launched	D. A. Pavely	110.6	,,
,, Farman Type ..	Off ground	C. A. Rippon	32.4	,,
,, ,, ,, ..	Hand launched	C. A. Rippon	37.8	,,
,, Glider	Hand launched	C. J. Burchell	53.4	,,
Compressed Air-Driven				
Fuselage	Off ground	D. A. Pavely	67.6	,,
Non-fuselage ..	Off ground	D. A. Pavely	70	,,
Petrol Driven	Off ground	D. Stanger	51	,,

FLYING SCALE MODELS.

Flying scale model enthusiasts and pilots of early full-sized machines will be interested in the photograph on this page. This shows a model of the " Fairey Firefly " fighter. It was built by Mr. Austin and flew very prettily for short durations on Wimbledon Common. A novelty at that time was the system of plug-in detachable wings, complete with bracing wires, which could knock off in the event of a crash. Triple gear wheels and a three-skein motor were used.

THE BRITISH BALSA YEAR 1931

The single skein motor was now *de rigeur* and even the old die-hards began to make all-balsa models, although a lot of

FIG. 29.—*Mr. Austin's flying scale Fairey Firefly fighter, perhaps the most practical and successful flying scale model of its day.*

excellent flying was seen with the lovable silk-covered hard-wood and geared machines. There was one man who did not pander to the single skein motor vogue for a number of years. His name was J. B. Allman and eventually he won the "Wakefield" in 1934. He not only used twin gear motors, but he geared his motors up so that the propeller ran slowly. He also used a very simple variable pitch propeller. Allman's theory was that a very long motor run was better than a short and gay one with terrific climb, searching for a thermal or uprising air current, that the Americans had taught us. Incidentally the Americans had taught us to lengthen our motor run by very large propellers revolving slowly and flying lighter models, sometimes rudely called "paper bags drifting around." Allman conceded to popular thought in one respect and used all-balsa construction.

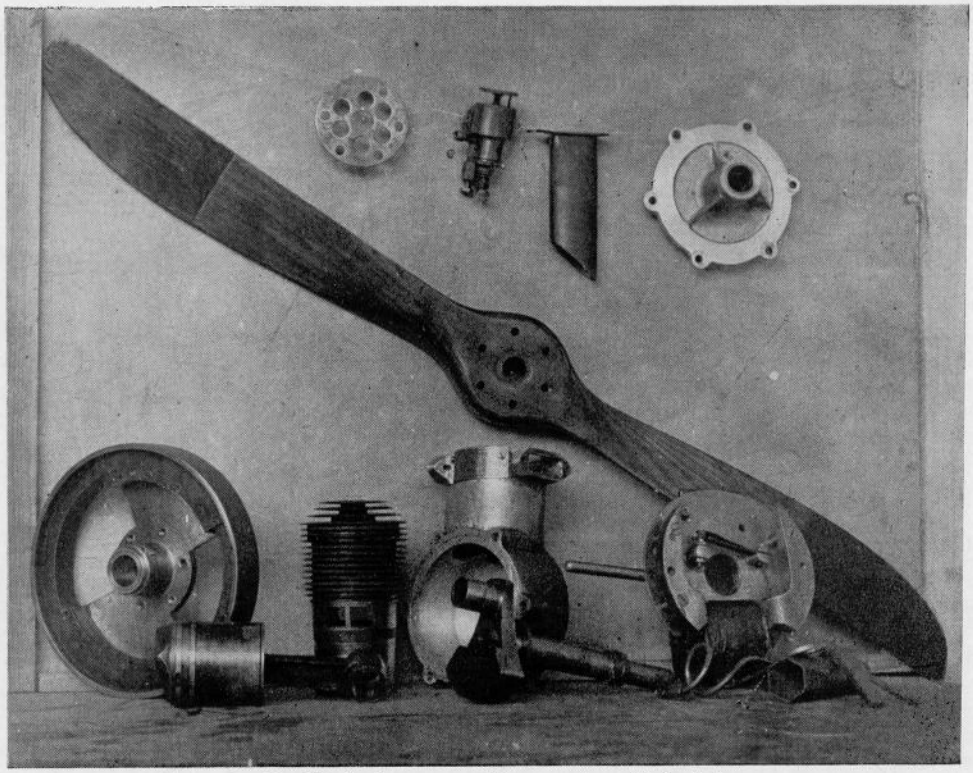


FIG. 30.—*Mr. Westbury's 52 c.c. model aero engine with flywheel magneto.*

Perhaps the outstanding duration machine of the year was R. N. Bullock's largish low wing model, of all-balsa construction. It had a most inspiring type of climb, looked well in the air, and had a large 18 in. diameter balsa propeller which revolved quite slowly. The span was 49 in., tapered wing; weight 4 ounces; loading 2.83 ounces to the square foot.

The model was sent to America and flown by proxy for the Wakefield Cup. As the Americans had won the cup in 1930, the following year's contest had to be flown in America. Bullock's model clocked 162 seconds, which was confirmed as a British R.O.G. record. This duration, however, only won the machine a fourth place, and the Americans retained the cup with 264.8 seconds, J. H. Earhart again being the winner. This second American win made the British really sit up and take notice. They realised they must organise and send a team to America, if the cup was to be won back for Britain, in order to gain first-hand experience of flying conditions over there, so that suitable machines could be designed.

I think we may look upon 1931 as a year of experiments for most people. Everyone was trying out balsa wood and single-skein motors.

Pelly-Fry produced what became another well-known low wing model called the "Avenger," with a span of 38 in. and a weight of 1⅜ oz. Loading was 1.83 oz. per square foot, and a general outline very reminiscent of the "Heron," which we have already described, whilst up North, Mr. Kenworthy produced a noteworthy high wing model of very low weight and very high aspect ratio called "Condor IV."

The swing of the pendulum through all this American influence and balsa wood, caused the weights of British duration models to drop heavily.

We inaugurated "Wakefield Trials" to select the best possible team to represent Britain in the Wakefield Cup competition, but for this year we were unable to afford the expense of sending a team over to America. We had again to content ourselves with sending the selected models to be flown by proxy.

The following year (1932) Lord Wakefield himself helped with finances, and we sent a team, but again the Americans won the cup.

The winning American model weighed only 1⅛ oz.! The

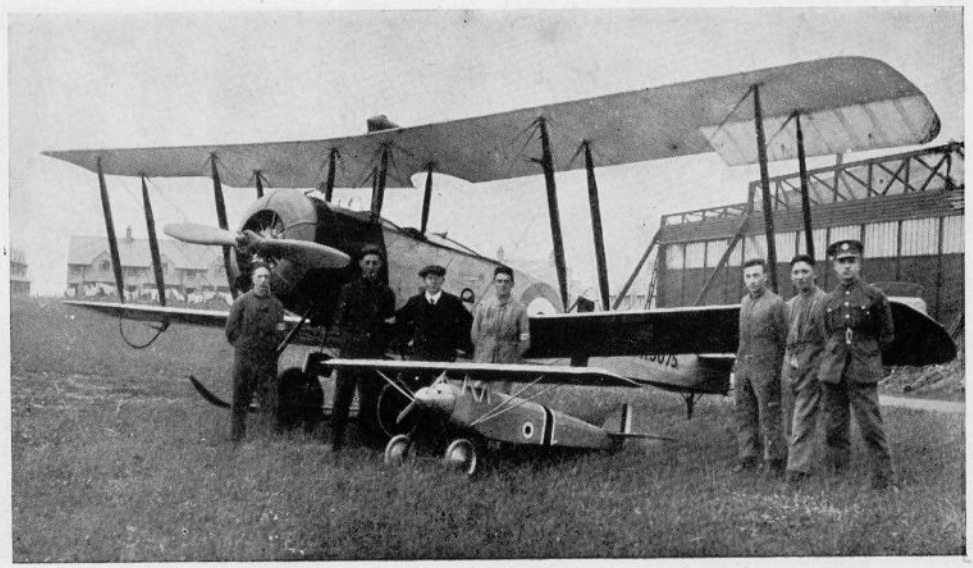


FIG. 31.—*The late Flight-Lieut. Nick Comper's petrol model built in 1932.*

machine was driven by 8 strands of $\frac{1}{8}$ in. x $\frac{1}{32}$ in. rubber and an 18 in. diameter propeller. The span of the model was 38 in. and its length 32 in.

The Wakefield Trials have remained as a yearly event, and competition has become keener each year.

At Bournemouth Mr. Baster launched out with a large all-balsa model of peculiar construction called the " Whale." It created a hand-launched record of 190 seconds. I remember running down to Bournemouth to visit the club there, and to see this model fly. Like all large models it made an excellent picture in the air, and its record flight was not a freak performance. The model consistently put up long durations.

Tony Willis, the young son of Mr. A. T. Willis, suddenly raised the seaplane record by a large margin. His model was a high aspect ratio all-balsa high wing of very fine workmanship with three tiny floats. It leapt off the water, but could not be called a seaworthy affair. This was not the fault of Willis, as the rules permitted the use of this type, as I have already mentioned.

FIG. 32.—*Mr. Merrifield's record-making float plane shown at " The Model Engineer " Exhibition on the extreme left of the picture.*

The model caused a considerable amount of discussion. I happened to be on the council of the S.M.A.E. at the time, and strongly advocated that there should be a flotation test before each Lady Shelley Seaplane Competition, to prove that competing models could at least float upon the surface of the water for more than a few seconds without their floats becoming waterlogged or the models blown over. This point was eventually adopted, although, as I have already stated, the rules do not even yet ensure a really seaworthy float plane.

This question of a flotation test reminds one of the Schneider Trophy for full-sized machines which demanded a suitable test to eliminate freaks. It also recalls the fact that in 1931, the year under discussion, Flight-Lieut. J. N. Boothman won the Schneider Seaplane Trophy for Great Britain. Boothman was also a keen aeromodellist.

The year ended with the following new British records having been created :—

Fuselage Glider
T. H. Ives 59.3 secs.
Fuselage Seaplane R.O.W.
A. M. Willis 64.6 secs.
Fuselage Seaplane R.O.G.
A. T. Willis 155 secs.
Fuselage Seaplane H.L.
G. F. Baster 190 secs.

The British glider record in those days does not show a high duration ; chiefly because in this country we used to convert small rubber-driven models. They were too small and light for the task, and were not specially designed for this interesting branch of aeromodelling. We were still *gliding* in Britain and had not really learnt the art of soaring.

Incidentally, Mr. Ives was noted at the time for his beautiful little rubber-driven models. I always admired them. In fact so much so, that he promised to make one for me. It is not often that one aeromodellist will part with a cherished model to another. I remember, however, that Pelly Fry gave me a low wing that I fell in love with, and on another occasion I gave one of my most successful petrol models away. Its new owner promptly gave it its head " somewhere in Scotland." It flew across some sea and landed on the opposite shore of some semi-inland water. The local press wrote up quite a colourful picture about this ' strange gift.'

Mr. Ives' glider, " Gadfly II," was a converted rubber model. It had a span of 52 in., chord tapering from $5\frac{5}{8}$ in. to $4\frac{3}{4}$ in., and a total length of $28\frac{1}{4}$ in. A small 1 mm. three-ply fin was attached above the nose with the idea of keeping the model gliding straight down the

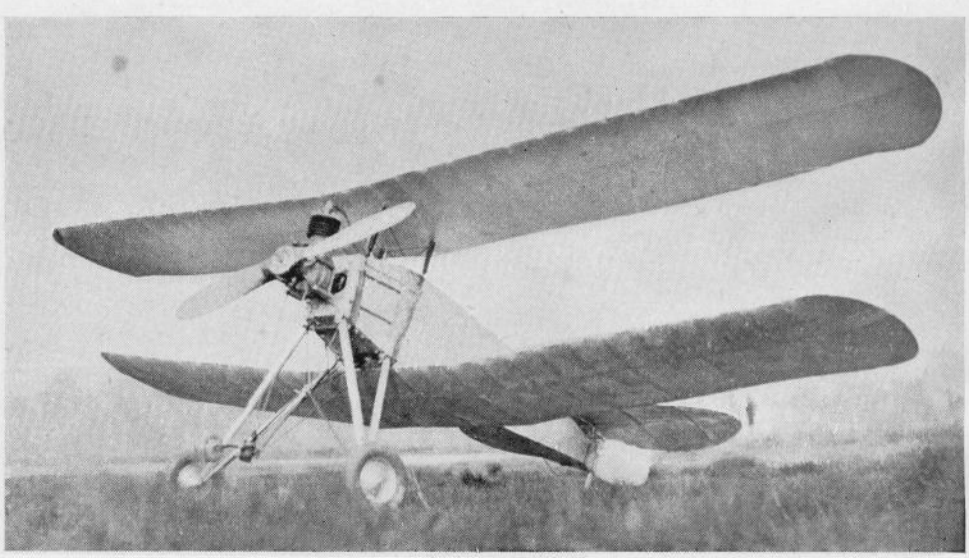


FIG. 33.—*The author's original record-breaking 28 c.c. " Wall " engine*

hill. Sudbury Hill, where these events were usually held, had a rising slope of 342 yards to 83.7 feet, and an average gradient of 1 in 12¼.

Before we leave 1931, I think we should mention Mr. Mullins, the energetic secretary of the S.M.A.E. at the time. Later he was succeeded by Mr. Cosh. We often fail to remember what an enormous amount of voluntary work the S.M.A.E. secretaries do, the great value of their work, and the many kicks they cheerfully take for performing a task that almost prohibits their flying models.

Both Mr. Mullins and Mr. Cosh were very efficient makers and flyers of models, but there was practically no time left for these activities after they had completed their secretarial work.

THE BIRTH OF MODEL AERONAUTICAL JOURNALS.

To-day we have the *Aeromodeller* as the British journal for model aeroplanes.

In the early days the *Aero* and later *Flight* provided model sections. *Flight* carried this feature on up to the beginning of World War 2. In 1912 the *Amateur Aviator* was started and priced 1d. for its monthly issue ! The price of living has gone up since those days ! The *Model Engineer* then gave regular space for model aeronautics.

Mr. W. E. Evans, of the S.M.A.E., voluntarily and very sportingly edited and produced a S.M.A.E. journal from 1926 to 1932 for members of the Society. He was also well known for his flying models and at one time was Treasurer of the S.M.A.E. as well.

After six years the journal was closed down. It has now been re-established.

Model Aircraft and the *Model Aeroplane Constructor* appeared, and catered for the model aeroplane enthusiast, whilst Mr. Camm has for a number of years run a regular feature on model aeronautics in *Practical Mechanics*. Earlier, he was the model editor of *Flight* and technical editor of *Aeronautics*.

Mr. Russell then got the *Aeromodeller* going with a swing, overcoming many difficulties in the course of his labours. He has been rewarded by constantly increasing sales so that now the *Aeromodeller*, with its plans service and large range of books on the subject, has become a very large concern which provides the aeromodellist with his own special journal and literature, backed up by other model aeronautical publications.

The interest in the model aeroplane is increasing by leaps and bounds, and an organization such as Mr. Russell's has a powerful stimulating effect, greater than some people imagine.

American news and development has always been most instructive, and has been obtainable from the American monthly journal *Model Airplane News*, and *Air Trails*, and also from Frank Zaic's interesting " year books," as he calls them. In England we now have a similar type of year book edited by eight well-known modellists, called *The Model Aeronautical Digest*. And so Model Publications increase in number each year, which is all for the good of the movement.

THE S.M.A.E. AGAIN.

The S.M.A.E., as father of the movement, in many ways has made the development of the model in its various branches, backed by all its attached clubs. The rules framed by the S.M.A.E. for various leading competitions have had a big influence on the size and type of model in the various branches of the hobby. That is why, in this book, I am giving a few peeps into the history and construction of the S.M.A.E. from time to time.

A new association called the A.B.A. started in 1944, but more of this later in the book.

For the interest of the " old hands " I am giving below some extracts from the last issue of the old S.M.A.E. journal before it closed down. This begins with the constitution of the S.M.A.E. as it was in 1932. I hope these extracts will bring back many memories of the times, as well as interest to more recent members.

GAMAGE CUP COMPETITION.

The Gamage Cup Competition has always been an interesting one because any type of model was allowed to compete. It used to draw all sorts and kinds of entries. The particular Gamage Cup event reported below in the S.M.A.E. journal is

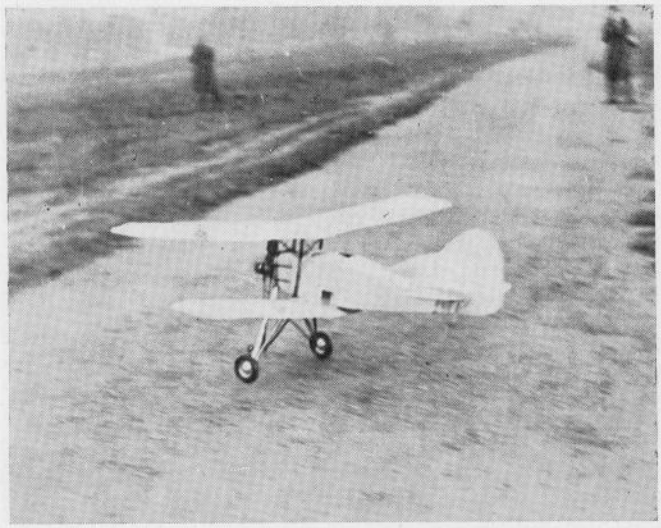


FIG. 34.—*The biplane " Kanga " taking off on Wimbledon Common. The wheels can be seen just off.*

particularly interesting in that it was marked by the entry of the last of the few remaining 'A'-frame models of the very early days.

" This Competition, the first of the season, was held on the 19th of March at Wimbledon Common. The weather was dull and the atmospheric conditions were not as good as one expected them to be after the fine morning. There were seventeen competitors, ten of whom flew high-wing monoplanes, four low-wing models, one biplane (Capt. Bowden, of course) and two twin pushers (antiques). The latter were no match for the efficient tractor fuselage models of to-day, as their durations were no better now than they were 10 years or more ago, and the owners did not seem happy in their attempts to get a good flight out of them. If twin pushers are to compete successfully, they will have to be of the balsa and tissue paper variety if the weather is not really windy.

" Mr. G. F. C. Saunders, T.M.A.C., deserved to win with a flight of 110.2 seconds ; A. T. Willis, T.M.A.C., was a good second with 103.0 seconds. D. A. Pavely (twin pusher) was a bad third nearly half a minute behind the second, and only 4/5 seconds in front of N. Peters, T.M.A.C., who was fourth. J. A. Doodson, who came all the way from Manchester to compete, was fifth with 66.5 seconds. Then followed C. Pearce, 58.6 ; Pelly-Fry, 55.6 ; R. A. White, 51.6 ; Capt. Bowden, 51.0 ; F. Baggs, 48.6 ; M. Knight, 45.0 ; F. A. Whippey, 32.0 ; B. K. Johnson, 31.0 ; F. M. Hughes, 22.5 ; R. N. Bullock (under-powered), 16.0 ; A. M. Willis and G. Foden each 10.0 (boobies)."

"GERMAN MODEL GLIDERS.

" Germany leads the world in full sized gliding and model gliding. Mr. Ernst Schalk has kindly sent me scale drawings of two notable German model gliders, including the Winckler Book on Gliding. The drawings are two-fifths full size and show the entire construction most clearly. Oskar Geutsch's Glider covered a record distance in the Rhön of 8,850 metres (nearly 5½ miles) and took 20 minutes to accomplish it. The model is of substantial construction and has a span of 7 ft. 2 in. The length of fuselage is 4 ft. 8 in.

" Winckler's Glider, a photo of which was shown at the last *Model Engineer* Exhibition, is a spar model and has a span of 5 ft. 6 in. and length of 4 ft. 6 in.

" In the description of Geutsch's Glider, instructions are given for launching by means of a 50 metre line."

" SOME RECORD !

" On Sunday morning, 13th March, Mr. Willis, junr., put up an astonishing record flight on Wimbledon Common. This was a hand-launched, fuselage tractor monoplane, and the duration was 9 minutes 2/5 seconds. Official timekeepers : Messrs. A. T. Willis and F. G. Portsmouth.

" The weather at the time was fine and sunny with a light easterly wind ; temperature rose rapidly during the morning, from 19 degrees to 46 degrees by noon and was just feeling spring-like when a fog drifted up and stopped any further flights out of the ordinary."

THE YEAR 1932.

1932 saw some increases in durations of rubber-driven models, and considerable development in the hitherto two backward classes of model aircraft, the seaplane and the petrol model.

The Lady Shelley Cup, for Seaplanes, as they are popularly called (although I suppose to be really correct we should call them float planes), produced greater competition and more reliable results than the petrol model.

The first three places were as follows : 1st, T. H. Newell, 46.7 seconds ; 2nd, J. G. Brown, 38.8 seconds ; 3rd, C. E. Bowden, 38.5 seconds.

It was no longer such an outstanding feat to get off the water as it had been in previous years.

The third place that I obtained was with a twin float plane which is a rarity even now. The usual method of obtaining longitudinal stability on the water is with three small floats.

Later in the year, G. Merrifield from Bournemouth put up a really fine official record flight of 90 seconds with his large three-float seaplane.

In the photograph on page 26 Merrifield's seaplane can be seen on the S.M.A.E. stand at the *Model Engineer* exhibition.

There are also several other record breakers displayed. The land plane record holder next to the seaplane is M. E. Hunt's model with 157 seconds to its credit, then my own second record petrol plane, 86.8 seconds.

These *Model Engineer* exhibitions organized by Mr. Percival Marshall each year were the culminating yearly event of all model makers. Record models were on view as well as interesting new constructional efforts. Enthusiasts came from all over the country and discussed models, exchanged ideas, and made friends.

Models of all branches were on display and the model firms had their stands to show off their latest wares.

It is to be hoped that the *Model Engineer* exhibition will flourish again after the war. Mr. Percival Marshall has done invaluable propaganda work, and created an immense amount of enthusiasm by his yearly " M.E. Exhibitions."

THE WAKEFIELD TRIALS.

During the " Wakefield " trials to select a team for America, Bullock used his 1930 low wing model (already described). He was placed first with two flights of 120 and 116 seconds. A. M. Willis created a record flight, beating Hunt, with a flight of 186 seconds, and Pelly-Fry gained third place with flights of 63, 126.5 and 119 seconds. Needless to say all were now using all-balsa models and single-skein motors.

Pelly-Fry had adopted the American concave under camber to his wing. This is now almost universal practice.

We therefore had two low wings and one high wing for the " Wakefield." Mr. Kenworthy very sportingly came all the way from Manchester. He brought an all-balsa model that had its fin located below the tailplane. The model insisted upon rolling over onto its back every now and again ! This fin arrangement is not suitable for out of doors models.

" THE WAKEFIELD CUP."

In 1932. The contest was declared null and void.

THE FIRST POST-WAR (1914-1918) PETROL RECORD.

The petrol-engined model had hung fire since the day when Mr. Stanger had created the first petrol record in the open air in 1914, as described in the previous chapter.

Two serious attempts to produce petrol engine models were made between this time and 1932, but unfortunately neither met with much success, although both models were of considerable interest.

Many readers will remember the full-sized aeroplane called the " Comper Swift." It was a highly successful little sporting aeroplane and was designed by the late Flight-Lieut. Comper. Comper was also responsible for the Cranwell II, a small full-sized biplane built for the 1924 Lympne light aeroplane competitions.

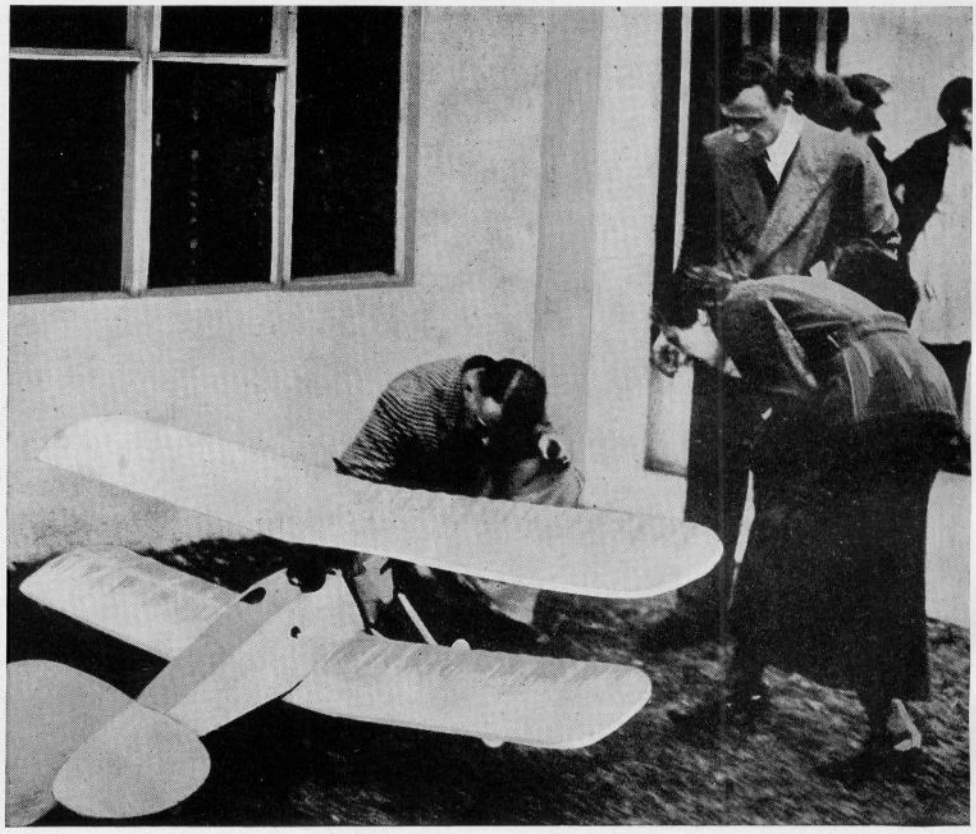


FIG. 35.—*Miss Amy Johnson and Mr. J. A. Mollison, two well-known record breakers, show their interest in Captain Bowden's record-breaking model at the Household Brigade's Flying Club Meeting at Heston, 1932.*
(*'Sketch' photo*)

Before he turned to full-sized design he designed a petrol-driven model which was constructed by the R.A.F. boys' training establishment at Halton.

The model was constructed on full-sized lines. The fuselage and wings were built in the braced wooden construction practice of the period. The undercarriage and wing lift struts were also similar to a full-sized machine. No dihedral was given to the main-plane. In fact the model was not really adapted to model requirements of simplicity, stability, and sturdiness, although it looked very nice. The model did not fly owing to restrictions at Halton, although it is doubtful whether it could have flown with stability.

On the other hand, except for its large size, the engine, which was designed by Mr. Edgar T. Westbury, the well-known model speedboat engine designer, was a thoroughly practical proposition. It was a 52 c.c. two-stroke with disc valve and a flywheel magneto.

The component parts of the engine are shown on page 25 while another photograph shows the model parked alongside an old Avro biplane, the type on which so many fighter pilots received their preliminary training during the last war.

The second attempt was called the " Dowsett Hawk Special." This model was designed on model lines, and had a wing span of 8 ft. 4 in., chord of 1 ft., and a length of 4 ft. 11 in. It was a parasol and strut-braced machine, with a single cylinder two-stroke engine, bore and stroke 1⅛ in., but could not be called a success in actual flying practice, although it created a great deal of interest at the time.

THE FIRST POST-WAR RECORD.

Owing to my interest in and experience of internal combustion engines of all sorts, I decided to divert some of my rubber model activities to the construction of a petrol plane. My aim was to produce a model for petrol general purpose flying, as this could not be said to have been attained up to that time. It seemed to me that to achieve this object I had to concentrate upon the following points : sound automatic stability to prevent damage to the valuable engine, and devices to control engine revs. during flight ; obtaining control of duration of flight ; a model of reasonable size that could be taken to pieces and erected quickly and carried in a car, and most important, after having been erected, original flying settings should not be disturbed ; the whole model to be made as crash-proof as possible by component parts kept in position by absorbent rubber fixings. I was determined not to make the mistake that previous unsuccessful enthusiasts had made ; that is, over-rigidity of construction and the use of strut-bracing and wires. The latter invariably became strained in the event of a hard landing or crash. They also required a considerable time to erect, which was wasted flying time, and settings were inclined to vary.

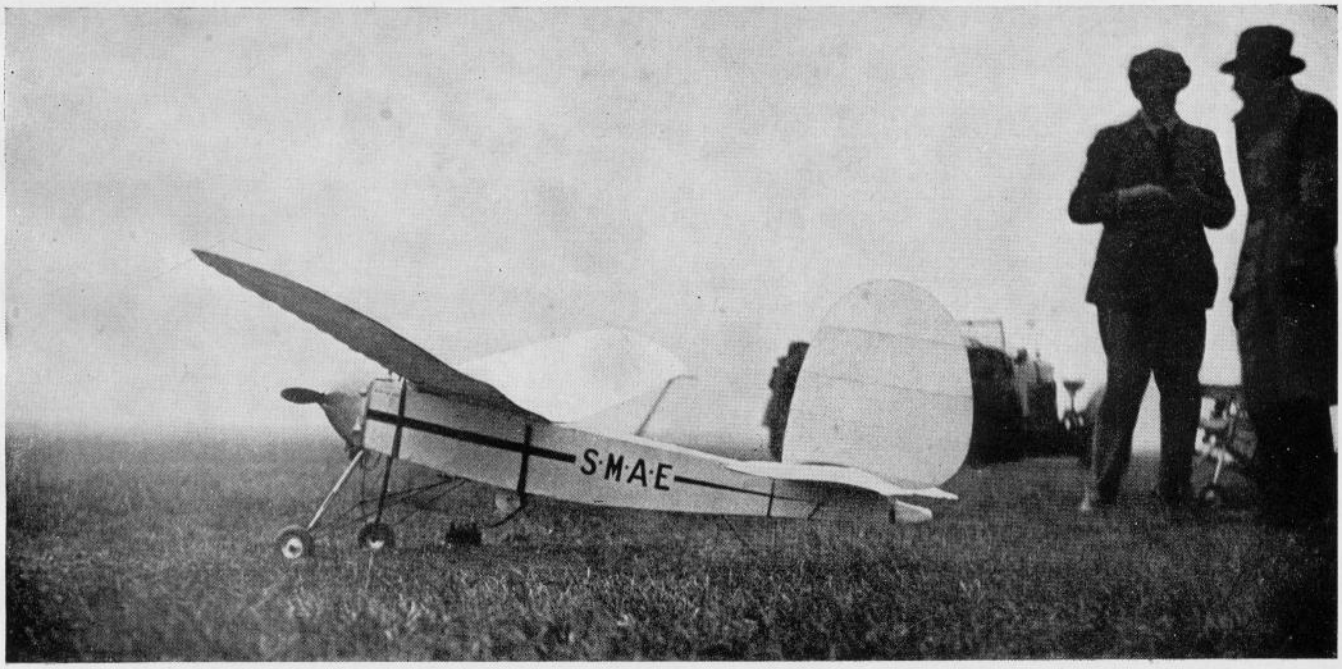
It is obvious from the above that cantilever construction was necessary, and that wings and tail unit should be held in position by resilient rubber bands. The only engine that I could obtain weighed 2¾ lb. and in order to cut down overall size of the model I decided upon a biplane with my usual arrangement of the top wing flying at a greater angle of incidence than the bottom plane. It should be mentioned that, in addition to the weight of the engine, the lightest coil I could obtain in those days weighed 11 oz.

I arranged my comparatively big engine to throttle down in the air, by a clock controlling device, after 60 seconds, and I cut my ignition weight by using a 4 oz. flash lamp battery for flight instead of the usual model accumulator of those days which weighed approximately 12 oz. I started up on a booster ground accumulator with suitable wiring and plugs. This system has been adopted on petrol models ever since. I also fitted an arm that protruded between the undercarriage legs, so that when the model came in to land with its engine ticking over after it had been throttled back by the clock mechanism, the ignition was cut by the arm being forced back by the ground. The engine I obtained was a slow speed two-stroke and would throttle quite well.

I decided to call the model " Kanga " after A. A. Milne's story of the mother kangaroo, because I hoped the model would hop when required !

I consulted Mr. Westbury with regard to the engine as I knew all about his venture in connection with Comper's model. He dug out an old but very stout 28 c.c. " Wall "

FIG. 36.—*The author's record-breaking 15 c.c. monoplane " The Bee." The first small petrol model (7 ft. span) to be produced. The author can be seen with the well-known secretary of the S.M.A.E., Mr. Mullinson, on the extreme right.*



two-stroke engine from one of his speed boats, as it was the smallest engine we could find and, as I have already described, may aim was to make a model of reasonable dimensions for the sake of portability.

In passing it should be mentioned that the Dunlop Rubber Company very sportingly made me two special wheels to my requirements. They had a rubber flange on the thick moulded tyres. This flange was riveted between two spun aluminium discs. Between the discs a brass bush was located. The tyres, therefore, could not tear off in the event of a landing with drift on. I have tried many types of wheel since those days, but have not found a more satisfactory solution. It seems almost incredible, but only the other day I came across these old original Dunlop wheels and found them in excellent condition ; this after 13 years!

Mr. Fairey (now Sir Richard Fairey) kindly allowed me to use his beautiful flat aerodrome at Hayes, just outside London. He had started his aeronautical career as a keen aeromodellist himself. The culmination of all this was that the biplane " Kanga " set up the world's second petrol record for free flight in the open air at Fairey's aerodrome. And what I feel was more important, this proved that petrol flight was a practical proposition for any aeromodellist without incurring serious financial outlay, for the model proved to be stable and capable of frequent flights without undue damage or adjustment ; in other words general purpose flying for petrol models could now be indulged in after a little development work. Subsequent history shows that from this date the petrol model aeroplane rapidly developed into a world-wide movement, especially amongst our cousins in the United States of America.

In this country petrol models up to the beginning of World War No. 2 could be measured by hundreds whereas in America they ran into thousands. The American commercial world took up the manufacture of model engines on a large scale, whereas the British firms interested in the model engine only laid down small numbers with the obvious disadvantage of increased costs. There are indications that after the war is over the movement should become as widespread in Britain as in America, provided that foolish actions by individuals do not lead to restrictive legislation.

An eye witness's account of " Kanga's " record flight was published in *The Model Engineer* at the time and an extract is given below.

Extract from " The Model Engineer," dated June 2nd, 1932.

" NEW DURATION RECORD FOR PETROL DRIVEN MODEL AEROPLANES BY A MEMBER OF THE S.M.A.E.

" In April, 1914, D. Stanger made the last record for a petrol driven model aeroplane. This record of 51 seconds has stood for eighteen years. On Whit Sunday afternoon, at the Great West aerodrome, Captain C. E. Bowden broke this more than once. For the trials Mr. C. R. Fairey, who is a patron of the Society of Model Aeronautical Engineers, very kindly gave permission for the use of the Fairey Aviation Company's aerodrome at Heath Row.

" The best timed flight was 71 seconds. This may not seem a great advance on the old record, but it must be remembered that Capt. Bowden's present machine is purely experimental, and that by a timing device the engine was throttled down after a run of 60 seconds.

" Those who know Capt. Bowden's rubber driven machines will not be surprised to learn that for his first essay in petrol driven work he has kept to the type with which he is most familiar—a cantilever biplane.

" ' Kanga ' may be regarded as an enlarged edition of the Bowden general purpose biplanes. The span is 7 feet and the total weight is 8 lb. 14 oz., of which 3 lb. 8 oz. is power plant and 6 oz. timing clock mechanism. The engine is a ' Wall ' two-stroke which has been ' hotted up ' by E. Westbury, of Halton. The ignition weighs 18 oz., including 4½ oz. of wiring due to the experimental nature of the machine.

" The timing device to limit the duration of flight is most ingenious. At present it is, for convenience, fitted outside the fuselage, and must add considerably to the resistance. This will doubtless be altered on future machines, and that there will be future machines from the same designer the writer can give every assurance. A small clock is set to run for any prearranged time before pulling a hair trigger, which in turn is connected to the throttle control. Another most important and equally ingenious fitting is the ignition control, which breaks contact and stops the engine on landing, thus leading to economy in airscrews and preventing damage to the engine. In the air a small flash lamp battery provides the current for ignition. On the ground it is relieved of this work by an accumulator. The undercarriage is a simple split type with spring legs. The wheels were specially made for the machine by Messrs. Dunlop.

" The operations involved in commencing a flight are these. The timing clock is set. The accumulator is plugged in, contact is made and the propeller swung. After the engine is started there is a quick succession of events. The ignition is switched over to the battery, the accumulator disconnected, the clock started and the machine released. After leaving the ground it commences a climbing turn, and continues to circle while the engine is running. Then the clock does its job, the engine slows down and the machine glides to earth.

" There may be greater thrills in model work, but the writer has never seen anything quite so exciting as the flight of a petrol driven model aeroplane.

" On the day this record was made the weather was sultry, and more would have been done had not rain interfered more than once with the work.

The timekeepers were J. E. Pelly-Fry and R. Langley. A third witness was Warrant Engineer H. Harris, R.N.(Ret.). During the afternoon J. E. Pelly-Fry produced his new rubber driven model ' Stork ' and made a first flight of 89 seconds."

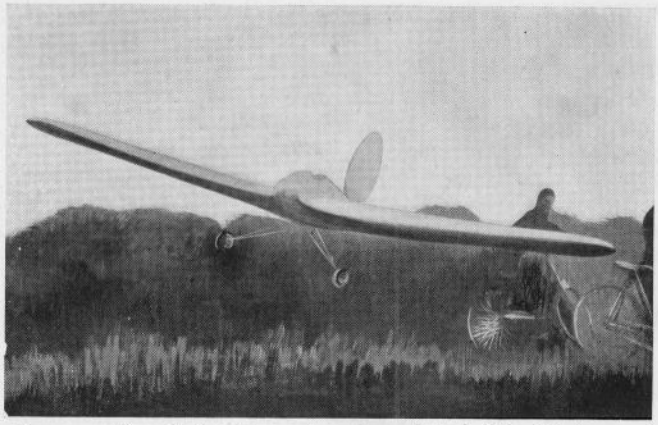


FIG. 37.—*The author's 9 ft. span low wing model " Gull." The first petrol low wing to be produced.*

After the record flight " Kanga " flew frequently at various full-sized aeroplane displays, also on Wimbledon Common, and on Fairey's Great West Aerodrome. A film was made of the machine by " Pathetone Weekly."

On page 27 is rather a nice action picture of the model taking off on Wimbledon Common. The old lady has her tail well up.

Fig. 35 is of special interest as it shows the late, and famous record-breaking woman pilot, Miss Amy Johnson, looking at the model biplane with her fiancé Mr. J. A. Mollison, also well known for his record-breaking flights.

This photograph was taken at the Household Brigade's Flying Club meeting at Heston aerodrome, and published in the *Sketch* dated May 25th, 1932.

THE YEAR 1933.

The year 1933 saw the beginning of petrol enthusiasm and activity. I think I cannot do better than reproduce firstly a report by Mr. Mullins, then Secretary of the S.M.A.E., of the Sir John Shelley Power Competition, and secondly an article summing up the year's petrol doings, that I wrote for *The Model Engineer* :

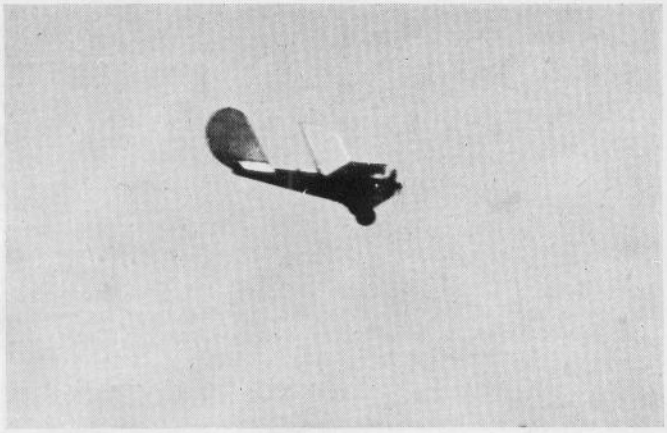


FIG. 38.—*Mr. B. K. Johnson's 8 ft. span 15 c.c. engined light-weight model.*

Report from "The Model Engineer," dated September 14th, 1933.

"THE SOCIETY OF MODEL AERONAUTICAL ENGINEERS.

"The competition for the Sir John Shelley Cup, which is offered for power driven models (excluding rubber) was held at Fairey's Aerodrome on August 27th.

"Hitherto this competition has received little support in the way of entries, but this year there were five competitors, four of whom employed the internal combustion engine as motive power—namely, Messrs. Bowden, Stalham, Andrews and Johnson—while Mr. Trevithick used one of his compressed air plants.

"The advent of the ultra-light petrol engine had undoubtedly induced some of the bolder aeromodellists to build machines for this competition, but it was clearly evident that this type of engine requires a good deal of 'humouring' to make it develop its full power, for three competitors failed to get their machines into the air owing to this cause.

"Captain Bowden was more successful, and won the competition with his model, 'The Bee,' with a flight of 8 minutes 42 seconds (yet another record to his credit), Mr. Trevithick being second with 24.4 seconds. The enthusiastic Mr. Stalham journeyed from King's Lynn to take part, and was employing a new twin four-stroke engine which he has built. Mr. Andrews was using his now well-known petrol-engined scale Moth, but had no luck. Mr. Johnson's model was an entirely new machine of unusually light loading for a petrol model, but his engine could not be induced to 'rev. up' to its proper speed."

"THE DEVELOPMENT OF PETROL-DRIVEN MODEL AIRCRAFT IN 1933.

By Captain C. E. Bowden

By kind permission of "The Model Engineer."

"INTRODUCTION.

"This year has seen the greatest advance in the small internal combustion engine as a power unit for model aircraft, of any year.

"I have been fortunate in being present at practically all the known test flights of the various machines built by different enthusiasts. I therefore propose to discuss these experimental efforts and illustrate my remarks with photographs, ending with a brief general summary of impressions gained.

"I hope I shall be forgiven if I introduce the subject with my own petrol models.

"There is no doubt that the petrol engine has come to stay. The difficulty of large size can no longer be seriously considered, as it is quite possible to produce a small portable biplane, using existing 15 c.c. engines now on the market, with a wing span of not more than 4 ft. 6 in. and a length of approximately 3 ft., that will fly sufficiently slowly to be manageable in comparatively small spaces.

"One may say that 1933 has been an experimental year, and an important guide for future development. Next year will produce many more petrol models. There are already quite a number in the course of construction.

"It will be remembered that in April, 1914, Mr. Stanger produced two petrol models, a Canard biplane and a tractor monoplane, and for purposes of comparison it is interesting to note certain details of these machines.

"The biplane set up a record with a flight of 51 seconds. This machine had a V twin-cylinder engine, and weighed 10¾ lb. The engine weight was 2 lb. 12 oz., and produced 2,000 r.p.m. The monoplane had a four-cylinder engine, and weighed, complete, 20 lb., with a wing span of 10 ft.

"THE WRITER'S MODELS.

"Owing to the war, successful activity on petrol models practically died out. However, in 1932, eighteen years later, the biplane 'Kanga' was produced, with a 28 c.c. two-stroke single-cylinder engine as an experiment. The model managed to beat the Stanger record with a flight of 71 seconds.

"Early in 1933, with the knowledge we had collected from 'Kanga,' Mr. Westbury and I got down to the problem of producing a really small petrol-driven model. He tackled the engine, and I the aeroplane. The keynote was simplicity and easy portability. The result was a most efficient little engine, and an ugly but simple and robust model, called the 'Bee,' which on its first day out raised the record to 86 seconds on a very windy, wintry day.

"This model has flown a great deal, and suffered little damage, while it has taught us quite a lot. Its most recent success was winning the S.M.A.E. Sir John Shelley Cup for power driven models, in August, with a flight of 8 minutes 42 seconds out of sight.

"I followed the machine in my car to the other side of the Great West Road, and it actually flew for nearly 14 minutes until the tank ran dry, the last two minutes or so being taken up by glide.

"The model hit a school building end on, the only serious damage suffered being to the spinner, and the engine spider mounting, which collapsed. I mention this because it is a very fine testimonial to the Westbury crankshaft mounting in its robust, plain main bearing. The following day I put in another aluminium spider mounting, and the engine ran with its vigour unimpaired. The desirability of an easily bent engine mounting to act as a shock absorber in such a case, is also brought out. Probably better still a detachable nose held by rubber bands.

"The cylindrical petrol tank measured only 2½ in. by 1¼ in., and was only good for about 12 minutes full throttle. The model climbed to between 800 and 1,000 feet during the flight, although the engine was not giving full revs. on that day. The cause of the trouble in the petrol mixing valve has since been found.

"The engine is, of course, the 'Atom Minor' single-cylinder two-stroke, of 14.2 c.c., placed in an inverted position to keep weight low. It drives a 15 in. diameter propeller, cast in elektron, at 3,500 r.p.m.

"The model weighs 6½ lb., and has a wing span of 7 ft. It has a watch device, weighing 1¼ oz., to control duration of flight, when short flights are desired. The model was fully described in *The Model Engineer* dated March 2nd, 1933.

"A third and more ambitious machine I produced for the 'Atom Minor' is the 'Gull.' This is a low wing monoplane, of 9 ft. span, and with oval fuselage. This model has been rather neglected owing to the fact that the wing is liable to damage, due to being too rigidly fixed.

"A SCALE MODEL MOTH.

"The scale model enthusiasts, Messrs. Andrews, Bennett and Collins, decided to tackle the petrol problem, and, needless to say, they launched out into a scale model. The D.H. Moth was chosen, and they produced a most interesting little machine, with the amusing name 'Corsicanfly.' It weighs 6½ lb., and has a wing span of 5 ft., and is powered by a 15 c.c. two-stroke engine, designed and constructed by Mr. Andrews. The model is an exceptionally good looker, but, naturally, is somewhat handicapped by the fact that scale effects have to be retained. For instance, the undercarriage is in the scale position, and this prevents the model from taking off rough grass, and the rigid mounting of the engine, in its exposed position, causes damage on occasion to propellers, engine and fuselage. However, one cannot have everything. The model looks amazingly like the real thing in the air, as the photograph will emphasize.

"I always envy this happy trio of operators. They are detailed off as engine fitter, and rigger No. 1 and rigger No. 2. On any trouble developing, the appropriate artificer attends to it! For some reason or other, the engine fitter actually pilots the machine, which is an unusual procedure.

"The model has mysteriously grown three-quarters of a lb. since its early days. Repair work is suspected. As a result, the two-stroke engine is now not quite powerful enough, and the engine fitter informs me that the model is about to be fitted with a 15 c.c. four-stroke engine, the performance of which should be interesting to watch, as well as likely to give the extra power required. The two-stroke engine will be fitted to a scale Puss Moth, which is at present going through the drawing office.

"MR. BISHOP'S TWO MODELS.

"A very determined experimenter is Mr. Bishop. I originally ran him to earth on Bagshot Common, on the first afternoon on which he had taken his scale Comper Swift, named 'Lonehand,' up there. The ground was unsuitable, and we repaired to Fairey's Great West Aerodrome.

"The Comper Swift was Mr. Bishop's first model, and weighed 10 lb.

"The first flight was a most thrilling affair. After a considerable run, the model leapt into the air suddenly, and climbed to about 80 ft. in true interceptor style. But, unfortunately, after a short flight, a crash took place. The model was too heavily loaded, and insufficiently stable. It had a very interesting feature, however ; namely, a four-stroke single-cylinder engine of 30 c.c., made by Mr. Bishop. I was very much impressed by the excellent slow running, power at full throttle, and lack of vibration, although no external flywheel was fitted, and the engine drove a light wooden propeller.

"It is worthy of note that, in a leading aeronautical journal, in 1912, it was predicted that no success with a single-cylinder petrol motor was likely to be achieved.

"The Comper Swift 'Lonehand,' on the occasion of its next flight, on the following Sunday, did about 30 seconds before the model made a power dive for earth, nearly unseating a spectator on horseback. This was probably due to insufficient lateral stability. (On the part of the model, and not the horseman !)

"The result of these experiments induced Mr. Bishop to design and construct the very large biplane exhibited at the *M.E.* Exhibition this year.

"It was a beautifully constructed model of light loading, 10 ft. span, and strut braced wings, which, however, were braced in two outer bays, so that each pair of wings formed a unit, and was kept in position to the centre section by elastic bands, thus allowing the wings to knock off in the event of a heavy landing.

"This model is being flown regularly, and improves in performance every time.

"The length of flight is controlled by an ingenious clock mechanism, which closes the throttle to a slow running stop, as in the case of my original biplane. This is desirable on an engine large enough to run slowly. The engine is the same 30 c.c. engine as in the Comper Swift, but is now inverted and cowled in.

"A SUCCESSFUL MODEL FROM THE MIDLANDS.

"A Midland enthusiast is Mr. Stalham. Readers will remember photographs of his model 'Peggy' in *The Model Engineer* some time ago, and that this model made a flight of over two minutes early in its career. Mr. Stalham has now made a most intriguing four-stroke flat twin engine of 30 c.c., with overhead valves, which was exhibited on the S.M.A.E. stand at the *M.E.* Exhibition, 1933. He has also built a 'Peggy II' for this engine. The machine, a mid-wing monoplane, was unfortunately damaged just before the Sir John Shelley Cup competition this year, and so Mr. Stalham fitted the flat twin into 'Peggy I,' and very sportingly came down to the competition. He had bad luck, and crashed shortly after getting off, and damaged the strut brace wings beyond repair.

"There happened to be a tachometer available that day, and we tested his engine for revolutions. It registered 4,500 r.p.m. Probably a more suitable propeller to slightly reduce these revs. would be beneficial, as the model did not seem to get really going, in spite of the high revs. Mr. Stalham is experimenting with wireless control.

"A MODEL WITH UNUSUAL FEATURES.

"Mr. Johnson, the well-known competition secretary of the S.M.A.E., has joined the band of petrol enthusiasts. He has constructed a model with some unusual features, and of exceptionally light weight and wing loading. The design is a development of a large rubber-driven model, the 'Gull,' built some years ago, and described in the *M.E.* dated July 10th, 1924.

"The weight is only 4¼ lb., and the wing span is 8 ft. Weight is economised by eliminating the normal type of undercarriage and carrying a spring axle at the bottom of the deep fuselage, after the style of the old 'Wren' plane used in the Lympne trials of 1923. An inverted 'Atom Minor' 15 c.c. engine is fitted. Unfortunately, on the day of the power competition, the engine refused to perform satisfactorily. The machine has great possibilities when it has had more time to get over its teething troubles. The illustration makes clear all the main details of design.

"I entered the first petrol model in the 'Gamage Cup' this year, on Wimbledon Common. My engine was behaving very badly that day, and on a test flight the wind changed. The model kept low for about two minutes, and then headed for a house on the edge of the common, after circling some trees. Fortunately, just as the crash was about to take place, the timing apparatus functioned, and the model landed on the pavement in front of the house. I did not attempt any more flights that day !

"CONCLUSION.

"In conclusion, I think it may be said that 1933 produced an astonishing number of petrol models.

"The very small petrol engine has been proved a success, and enthusiasm for the internal combustion engine has now definitely been raised. Engines can now be bought commercially.

"After very carefully watching all these experiments, I still feel that certain of my original conclusions hold good, namely that whether a tractor or pusher type is chosen, it is desirable to avoid all types of bracing. Cantilever wings and tailplanes that are held in position by elastic, and that can be knocked off in a crash, save an enormous amount of repair work, act as shock absorbers, and do not lose their trim for the next flight when placed in position again. Engine mountings should be constructed so that, although rigid when the engine is running, there is sufficient give in a crash to prevent damage to engine, propeller and fuselage.

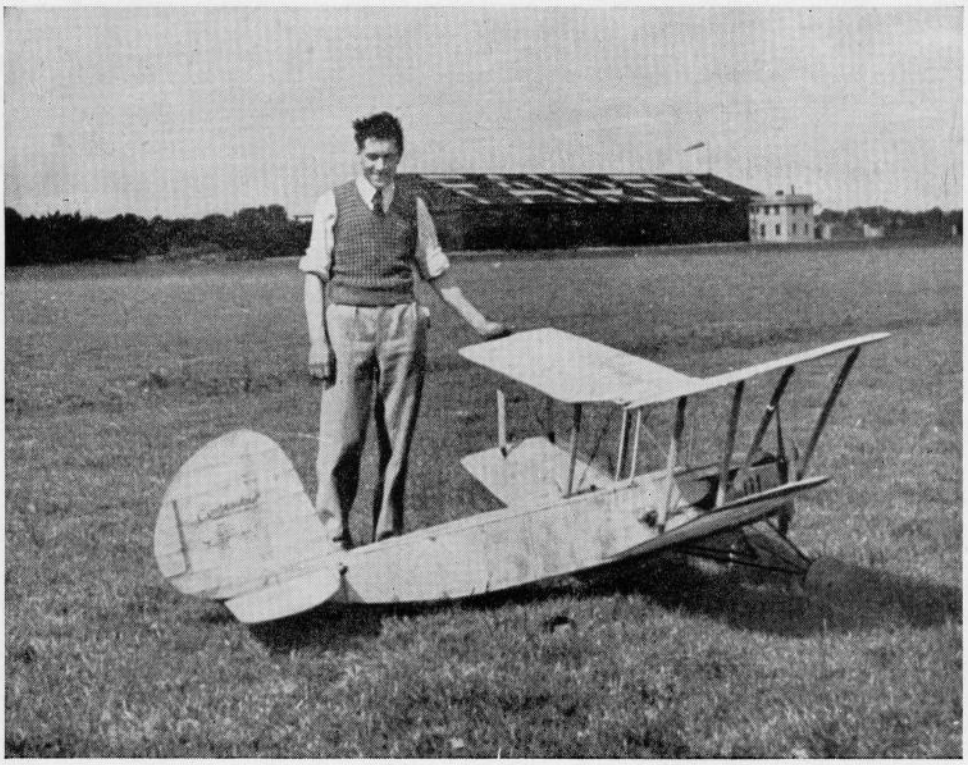


FIG. 39.—*Mr. Bishop's large biplane "Endeavour," fitted with a 30 c.c. four-stroke engine.*

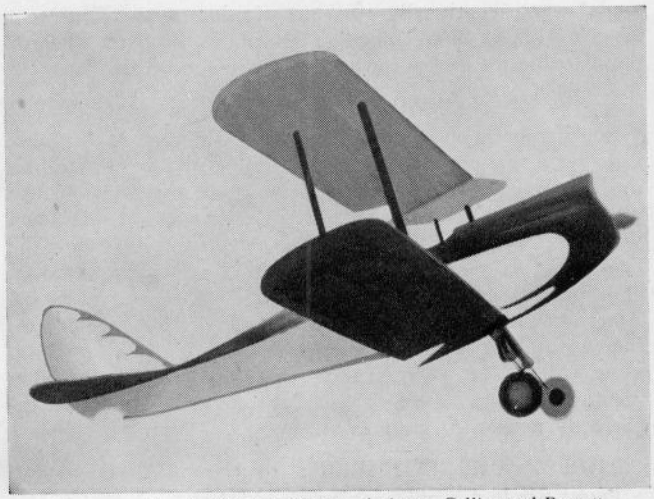


FIG. 40.—*A scale Moth by Messrs. Andrews, Collins and Bennett.* (*'Model Engineer' photo*)

"To obtain lateral stability, a greater dihedral angle is required than with rubber-driven models, due to greater torque created by the high revolutions of a petrol engine.

"Longitudinal stability requires large tail surfaces, in conjunction with correct thrust line setting. A petrol model that requires rebuilding after each flight is discouraging to the owner, and poor propaganda. Heavily loaded and rigidly designed models will suffer in this way.

"There is still a lot of room for improvement in the ignition system, and also in simplification of the undercarriage. The flywheel magneto may be the solution for the former."

THE YEAR 1934: PETROL.

Before we leave the petrol model for a while and return to rubber, we will make a few comments on 1934 doings and developments, for there was little dividing line between 1933 and 1934 in petrol happenings. It was a matter of steady modification and development work.

Firstly the Sir John Shelley Power Cup.

I had been stationed in Scotland during 1934 and through my model speedboat activities I met Mr. A. D. Rankine, the well-known speedboat man. He got hold of the original "Atom Minor" engine and set about opening up its ports and fitting it with a fixed jet carburettor with float chamber instead of the mixing valve previously fitted. The result was a very big increase in power; 8,000 r.p.m. running light on the bench was obtained.

Incidentally I built a very light streamlined hydroplane hull for this engine on model aeroplane lines and put up an official world's C class record on the water.

Considering that Mr. Westbury had rushed through the construction of the "Atom Minor" engine at my insistence and been unable to give time to development work, I think it speaks very well for his design that it was capable of so much more power than originally designed for. This engine is still in excellent fettle to-day.

Its only disadvantage in modern times is its rather large size and excessive power output!

I also built a new model aeroplane with a wing span of 8 ft. designed entirely for competition work, called the "Blue Dragon."

On its first flight it climbed very high and flew for 20 minutes, landing far too close to Glasgow for my peace of mind. I packed it up and brought it down to Fairey's Aerodrome for the Sir John Shelley Cup Competition. It leapt off the ground with its phenomenal power for those days and climbed up to what was estimated by experienced flying men as 4,000 feet, when it disappeared as a speck into the clouds after an observed flight of 12 minutes 42 seconds "out of sight." This easily won the competition and created a new record that was unbroken until 1937.

Although it was a simple and crude machine it introduced several features that are standard practice on most models to-day. The backward travel for the undercarriage legs; the detachable engine mounting, and split detachable wings, with an under-cambered section. The model was 8 ft. span, 16 in. chord at wing root, weight 6½ lb., wing loading approximately 10 oz. per square ft.

A reprint from a local Nottingham paper is inserted as it shows the interest and attitude adopted to the petrol model in those early days.

"SOCIETY OF MODEL ENGINEERS—CLAIMS FOR UNIQUE MONOPLANE.
"NOTTINGHAM EXHIBITION.

"A model aeroplane, which once soared to 4,000 feet, disappeared from view, and landed smoothly eight miles away, after having flown for 25 minutes on three ounces of petrol, will arouse great interest at the annual exhibition of the Nottingham Society of Model and Experimental Engineers, which opens at the lower Palais de Danse to-day.

"The model was made and is entered for the Society's Challenge Cup competition by Capt. C. E. Bowden, of Birmingham. It is claimed that this unique monoplane is foolproof. Its revolutionary design has attracted the attention of aircraft experts.

"Ignition is controlled so as to pre-determine the length of time that the engine will run. On the occasion of its disappearance in the air, it won the Sir John Shelley Power Cup and the British 'rise off the ground' record. If reproduced in full size it is claimed, the monoplane would require two controls and would always land on an even keel without danger of side-slips or stalls."

Mr. Harris, from the model speedboat world, entered the petrol ranks with his model "Flamingo." He entered this model in the Sir John Shelley Cup. It had a four-stroke 15 c.c. model boat engine and flew remarkably slowly and well. Some readers may remember Mr. Harris's petrol model hydroplanes running around circular tanks at the London Schoolboy and other exhibitions at Olympia. They always drew very large crowds of interested onlookers. (Fig. 46)

The photograph (Fig. 44) will interest Scottish readers. It is a photograph of my low-wing model "Drone," 15 c.c. "Atom Minor" engine, after taking off from Renfrew aerodrome.

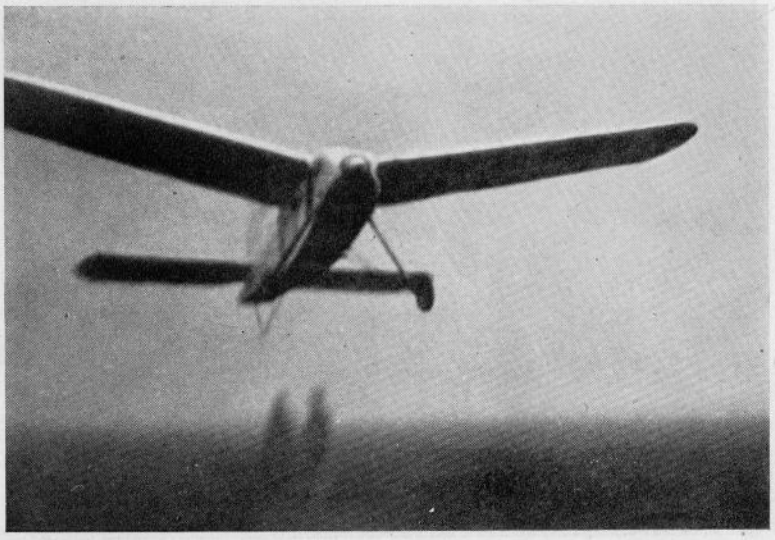


FIG. 41.—*The first and last petrol model to be entered for the Gamage Cup.*

A LIGHTER ENGINE FROM AMERICA, AND A FEW DEVELOPMENTS IN FITTINGS.

One outstanding petrol development in 1934 was the 9 c.c. " Brown Junior " engine from America. The Americans had cut down the weight to a phenomenal degree, and I can clearly remember the excitement with which I received the first " Brown Junior " engine to arrive in England, and the surprise I got when I tried it out for power. Of course it had not the power that the modified "Atom Minor" produced, but it was far lighter and it flew my 8 ft. span " Blue Dragon " model well, climbing slowly but steadily. It made people on this side of the Atlantic think in terms of even smaller and more lightly constructed models. We introduced more balsa in our petrol models. The coil was also far lighter than anything we had in England ; 2½ oz. as against the lightest commercial coil of 11 oz. Not very long afterwards the Americans followed up the 9 c.c. " Brown " with the famous 6 c.c. " Baby Cyclone " engine. Both these engines were excellent power producers, and reasonably good starters, and have remained amongst the best engines commercially obtainable ever since. They were followed in subsequent years by a number of engines from America varying in reliability and performance. This further decrease in size and engine capacity helped on the desirable reduction in size of the petrol model.

In 1934 I introduced the detachable elektron cast engine mounting held in position by rubber bands and easily knocked off in the event of a crash. This feature is still in vogue to-day in England, and saves the power unit a great deal of damage, besides making it quickly detachable and easily adjustable on the field for slight variations in down or side thrust to meet the peculiarities of a new model.

Maxwell Bassett in America produced his extremely simple 8 ft. span parasol monoplane, powered by a " Brown." This model was exceptionally efficient, winning event after event in the U.S.A. and doing an enormous amount towards popularising the petrol movement across the water.

COMMERCIAL ENGINES.

Looking back on some old records I see that A. E. Jones Ltd. put a version of the " Atom Minor " engine (15 c.c.) on the market for £10 10s. 0d. This was one of the first British model aero engines to be marketed. Prices have come down since then, but there must be a further price reduction if the British market is to become popular, and there is a vast amount of room for improvement on British engines, and although American engines are laid down for mass production and are, therefore, cheaper in America they can still be cleaned up quite a lot. The power is there, but detailed design is often inconveniently arranged for the aero engine. Tanks are incorrectly positioned, and so on.

RUBBER DEVELOPMENT : 1933, 1934 AND 1935.

Petrol has had a good innings in the last few pages of this chapter, for the years 1932-33-34 were when it had its real beginning. Now let us see how things were developing during 1933, 1934 and 1935 in the rubber world. I have taken these years around the early thirties in some detail, for there is no doubt that the model aeroplane in all branches really made great technical strides during these years. Clubs started up all over the country and meetings and displays were organised on a large scale in various parts of England. Below are reproduced two reports by the *Model Engineer* which describe the Wakefield Cup competition and the S.M.A.E. speed competition. Britain retained the Wakefield Cup and one will observe that the high aspect ratio wing was now in greater evidence. See the photograph of Mr. Kenworthy's model. The two leaders used a high aspect ratio. They did not make

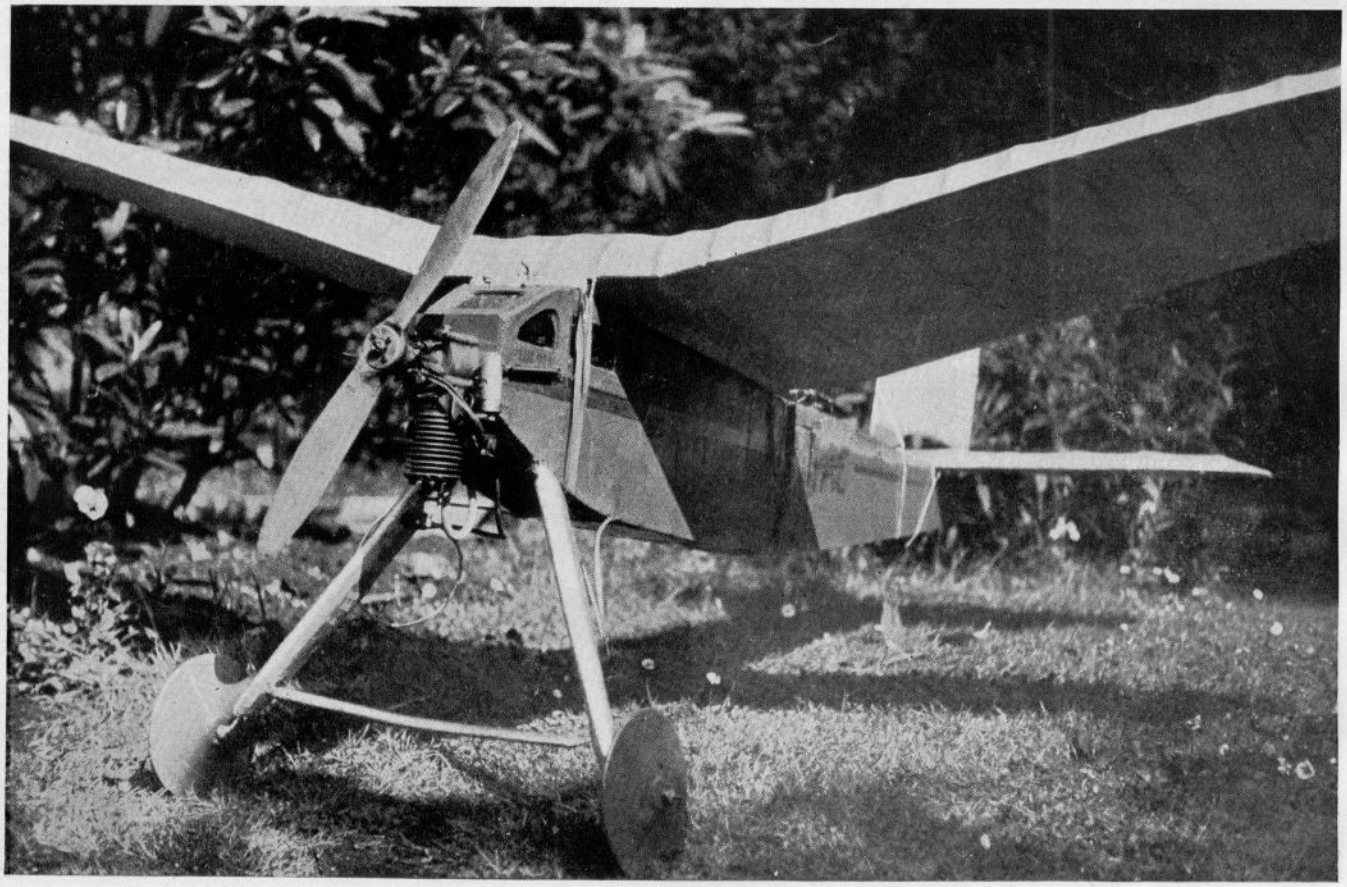


FIG. 42.—*A close-up of the old record monoplane " Blue Dragon."*

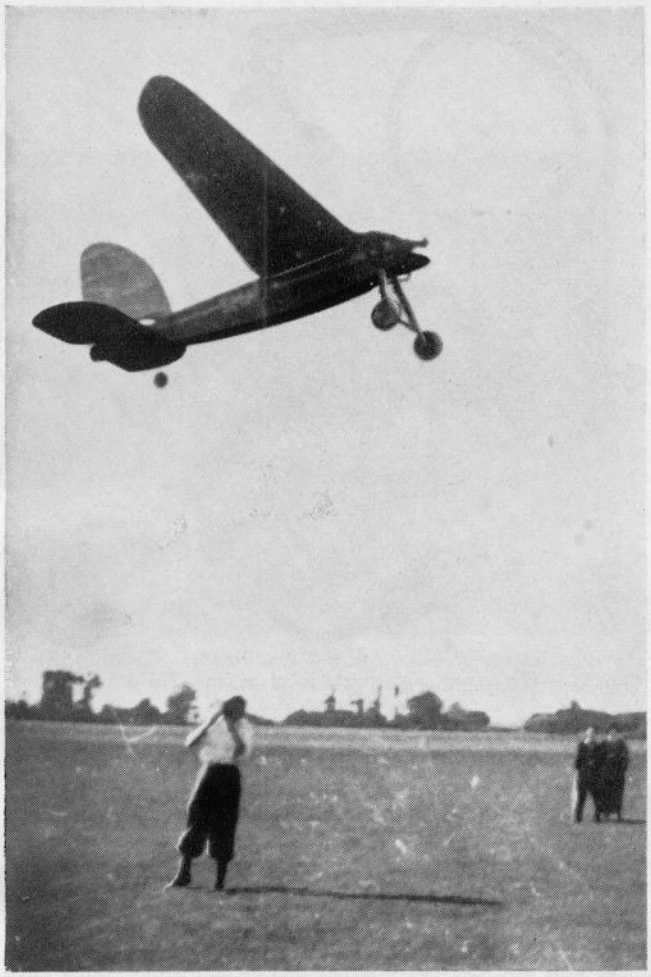


FIG. 43.—*The author's "Blue Dragon" 8 ft. monoplane takes off on its record flight.*

the mistake, however, that a few people at the time were making, and still do sometimes, even now, of producing wings—and particularly tapered wing tips—of less than 3 in. chord. Airflow over these very narrow chords is not efficient. It will be noticed that Gordon Light's American model had a slightly lower aspect-ratio wing, but nevertheless was a very fine duration machine, and was the forerunner of the very popular American type of Cabin high-wing model, much used to-day. It had a very large propeller of exceptional blade area and a motor stick, also small streamlined "wheel pants."

Report from the "Model Engineer," dated July 20th, 1933, and October 19th, 1933. By kind permission of the "Model Engineer."

"SOCIETY OF MODEL AERONAUTICAL ENGINEERS.
"(WAKEFIELD INTERNATIONAL CUP.)

"A temperature of 70 degrees in the shade, the barometer steady at 30 in., brilliant sunshine, and a breeze varying from 15-20 m.p.h., making the spectators declare it was a perfect day and the competitors point with disgust at the wind sock, which rose and fell with distressing frequency and irregularity. This was the day on which was flown, at Fairey's Great West Aerodrome, the most important model aeroplane competition of the year; that for the Wakefield International Cup. It was unfortunate that only one other country, America, formed the opposition, and then with only one machine. This was sent by Gordon S. Light, of Lebanon, Penn., and his model was flown for him by that old fighter, J. E. Pelly-Fry. The English team consisted of J. W. Kenworthy, J. Pearce and C. S. Rushbrooke, of the Manchester Model Aircraft Society, H. W. Bexley (The Model Aircraft Club), R. N. Bullock and A. M. Willis (S.M.A.E.)

"The competition started with the qualifying test for directional stability, each model having to cover a course of 200 yards without circling. At six o'clock the wind had fallen a little, and the duration flying commenced. It was real quality flying. Although individual flying on other days and at other places may have equalled it, it is certain that in this country no seven machines have been so consistently good. The winner of the Cup, J. W. Kenworthy, broke the British R.O.G. record with a flight of 5 minutes 21 seconds (out of sight). Second came Tony Willis, with 2 minutes 23.5 seconds, and the American entry Gordon Light close on his heels with 2 minutes 23.2 seconds. The fourth, fifth and sixth men were R. N. Bullock (2 minutes 16.5 seconds), H. W. Bexley (2 minutes 14.4 seconds) and J. Pearce (1 minute 18.1 seconds.). All of these were fine flights. C. S. Rushbrooke, who failed to get through the qualifying test, made many good flights—one was unofficially timed at 1 minute 19 seconds. It will be seen that five competitors made flights of over 2 minutes.

"Mr. Kenworthy's winning model weighs 2.8 ounces, has a span and mean chord of 48½ in. by 4.2 in., and a 14 in. propeller driven by a single skein motor weighing ⅞ ounce. The American model weighs 1¾ ounces, span and chord 36 in. by 5 in. The most notable feature of this machine is the propeller, which is 17 in. diameter, with blades 2½ in. wide.

"The main business of the day being over, Capt. Bowden quietly brought out his petrol driven model 'Bee,' and put up a hand-launched flight of 3 minutes 55.4 seconds, and so established another record. This machine has recently been described in *The Model Engineer*.

"THE SOCIETY OF MODEL AERONAUTICAL ENGINEERS' SPEED COMPETITION.

"On Sunday, September 24th, the competition for speed models was held at Golders Green, London. The conditions of this competition stipulate that the models must be fuselage machines (complying with the S.M.A.E. formula), and that they must pass over a course 150 feet long in free flight, the machine covering this course in the fastest time to be the winner.

"This competition, for which the cup known as the S.M.A.E. Cup is offered, is considered by many as being second only in importance to the Wakefield International Competition; but as a speed model calls for exceptional ability in design and construction and very considerable patience in its flying tests, the number of entries in previous years has been low. It was therefore gratifying to see no less than eight racing models put in an appearance for the event on this occasion. Not only was interest aroused by the number of the competitors, but also by the variety in type of machine entered, ranging from what might be termed the orthodox racing model as produced by C. H. Debenham to the twin fuselage type built by R. L. Rogers.

"The competitors were: C. E. Bowden, K. G. Cuming, C. H. Debenham, W. J. Downs, E. A. F. Holmes, R. L. Rogers, L. Temple, and H. E. White. The cup was won by H. E. White with his machine 'Wasp' at a speed of 27.5 miles per hour, C. E. Bowden being second with 25.6 m.p.h. The following are particulars of Mr. White's winning machine, a low-wing monoplane:—(See Figs. 49 and 52)

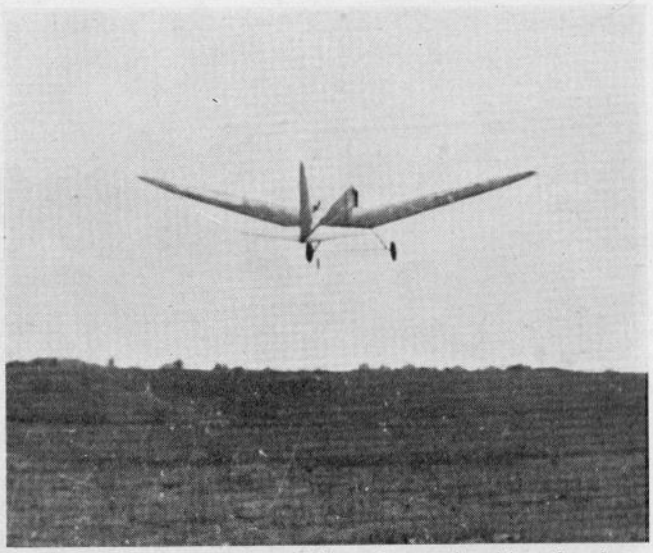


FIG. 44.—*One of the first successful low wing petrol models to fly. It was 8 ft. span, powered by a 15 c.c. two-stroke engine.*

" Overall length, 35 in. ; wing span, 42 in. ; wing area, 1 sq. ft. ; total weight, 29 oz. ; wing loading, 29 oz. per sq. ft. ; motor, 7½ oz. rubber in three skeins, each 27 in. long ; airscrew, 14 in. diameter, 21 in. pitch, wound to 275 turns ; duration of run in still air, 4¾ seconds, at average speed of 3,000 revs. per minute ; static thrust, 2 lb. (maximum) ; fuselage, of symmetrical design, having longerons $\frac{3}{16}$ in. square, and covered for half its length with plywood.

" Four of the other competitors were successful in getting their models to cover the course a number of times—some at faster speeds than those given above—but unfortunately not without their machines just touching ground whilst in the timed area, thus disqualifying themselves. Those who have had experience in this work will appreciate the bad luck of these competitors, the chief sufferers in this respect being Messrs. Downs, Holmes and Debenham, whose speeds were of the order of 30 m.p.h. and over.

" Mr. Debenham, although starting as ' favourite ' appeared to have an ' off-day ' ; he had, however, the satisfaction of knowing that he still retained the British speed record of 33.25 m.p.h., in spite of the efforts of the other competitors to wrest it from him."

REMINISCENCES.

Although we have not seen Mr. Knight's name mentioned as yet in competitions in this book, he had produced two excellent general purpose low wing models known as " The Kinglet " and " Klemlet." He was, and is, a personality in the model aeroplane world, and was at one time responsible for the many excellent reports and sketches on models published as a regular feature in *Flight*. He did a lot to popularise the type of model that is not a true scale and yet looks " scalish," and what is most important, usually flies far better than true scale, for there is more latitude for ingenious adaptation to suit model flying requirements.

Incidentally Mr. Knight's witty speeches were always looked forward to at S.M.A.E. dinners and gatherings. This reminds one of another personality known as " the Golden Voice " over the microphone at the large model meetings we have already mentioned, namely Mr. Smith, the technical secretary of the S.M.A.E. at the time, who did such a lot of hard work for the model movement ; also Mr. Harry York who could be found at every important model meeting. He acted as Press Secretary of the S.M.A.E. for some time.

I wonder how many people realize the great amount of work that Mr. L. J. Hawkins has done for the S.M.A.E. as Hon. Treasurer. He goes about his work so quietly and efficiently.

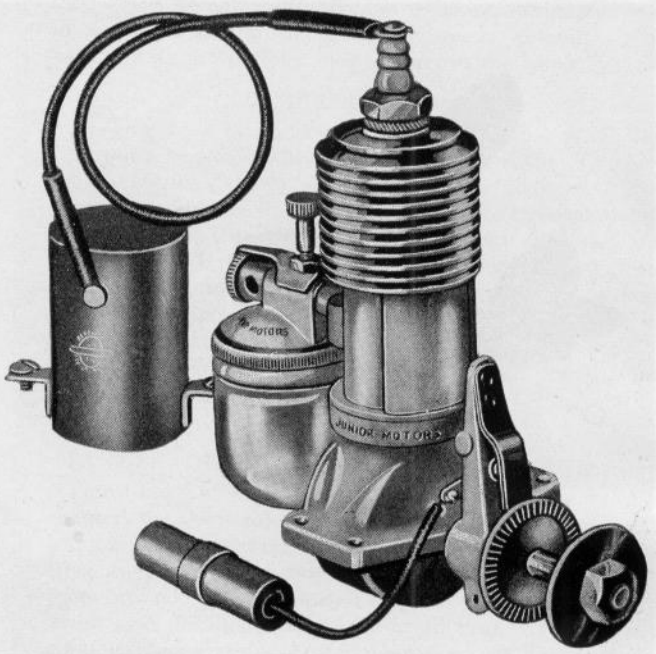


FIG. 45.—*The original light-weight petrol engine. The 9 c.c. " Brown Junior."*

My change of army station to Glasgow at this period (1933) started aeroplane interest in the model engineer club there, and we formed a model aeroplane section. The photograph (Fig. 51) shows one of the first meetings at Renfrew aerodrome with the " Mr. Everyman " model I designed for the club. The photograph may interest present members of the club and also the old original members. Many clubs have started in this modest way, and the Glasgow club is now a very flourishing concern.

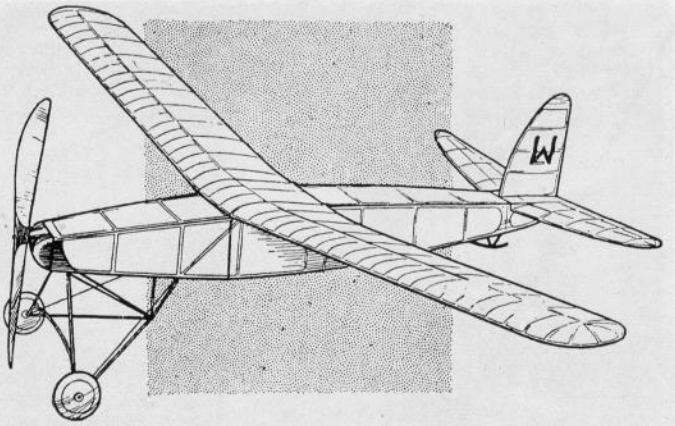
One interesting item of the 1934 Power competition was that Mr. Stanger, the original petrol flight pioneer, visited the event. He expressed a great re-awakening of his old enthusiasm. Mr. Groves, an early pioneer of steam for model aircraft, also visited this competition. He had with him an incredibly light flash steam plant, which interested all the power enthusiasts. Unfortunately I have been unable to find any record as to whether this power unit eventually flew a model.

FIG. 46.—*A 15 c.c. four-stroke petrol model made by Mr. Harris of Farnborough.*

THE WAKEFIELD CUP, 1934.

The " Wakefield " was again won by Britain. This time J. B. Allman was the winner with his twin geared " slab sided " all-balsa model. The flying conditions were bad and typically rough English weather. The Americans sent over a team of six models which were flown by proxy. Franc Zaic's

FIG. 47. — *(right) Mr. J. B. Allman's 1934 Wakefield winner.*



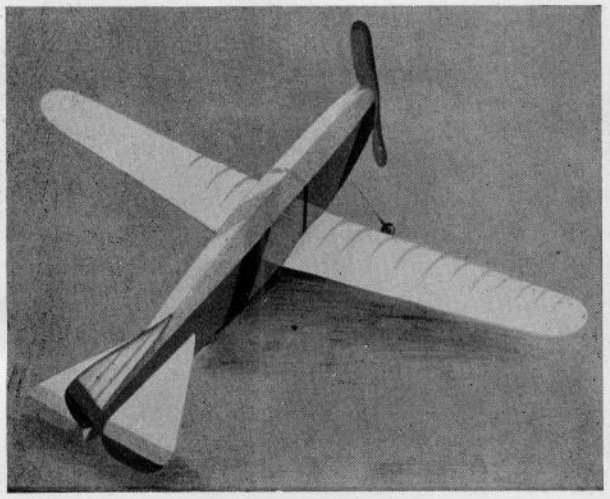


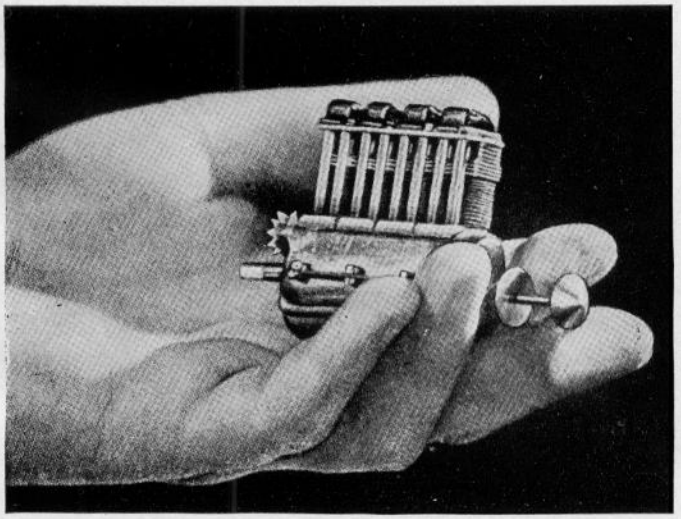
FIG. 48.—*Mr. White's 1933 S.M.A.E. Speed Competition winner.* (*'Model Engineer' photo*)

all-balsa planked monocoque model, a new type for the "Wakefield," came in third. Models this year had to have a wing area of not less than 200 sq. in. and a weight of not less than 4 oz. As we shall see, the weight was put up for the following year's competition. The ultra light model, like Joe Culver's 1⅛ oz. machine that we have already discussed in a previous "Wakefield," was from now on ruled out. France and Australia also sent teams, and the competition was now getting an International flavour.

The British win was a come-back for gearing and naturally caused great discussion as to whether to gear or not. Allman geared up his propeller and used a variable pitch prop as well, which varied its pitch as the power died down. This was done by a simple spring under tension. His two best flights were 163 and 164 seconds. (For 1934 to 1939 the times have been taken as the average of three flights. Allman won the 1934 "Wakefield" with 111.8 seconds.) His model had no unusual features beyond the gearing and propeller, which gave a long and reliable motor run, with the propeller revolving at an efficient speed and pitch for the varying power output of a rubber motor. This method is different from the more usual powerful climb and shorter motor run, which seeks after a lucky thermal as exemplified by the single-skein brigade and originated by the Americans. Allman's type of power unit gives a very long, slow climb, usually of less altitude. As far as I can remember, Allman geared his propeller up approximately 3 to 1.

1934 marked the beginning of the almost universal use of the high wing model for competition duration flying.

FIG. 49 *(below).—The engine shown in this illustration is a very ingenious little working model of a "Gipsy III." Driven by compressed air, the inlet for which can be seen protruding from the left of the crankcase, this model develops about 1/50 h.p. at 2,500 revolutions, with a running duration of 1 min. It weighs 2½ oz., and the container, which is about 16 in. long, weighs another 6 oz. The induction and exhaust is through grooves machined in a "camshaft" rotating within a sleeve and geared from the crankshaft, while oil is automatically sucked in and splashed over the walls of the crankcase and cylinders. The designer and maker, Mr. C. H. Debenham, of 7, Princes Park Avenue, Golders Green, hopes to fit an engine of this design in a model of a Comper "Streak."*



AN R.O.G. RECORD.

Mr. G. M. Merrifield put up a new R.O.G. record during the year of 9 minutes 50 seconds—a handsome flight 'for those days.'

The photograph overleaf shows the S.M.A.E. stand at the *Model Engineer* Exhibition: on the left is Bullock's famous speed model; next to it my "Blue Dragon" record holder, followed by Franc Zaic's balsa sheeted monocoque "Wakefield" model and Crow's record autogiro.

THE YEAR 1935.

The T.M.A.C. staged a "Grand Rally" at Wimbledon. This was a great success, and was the forerunner of many

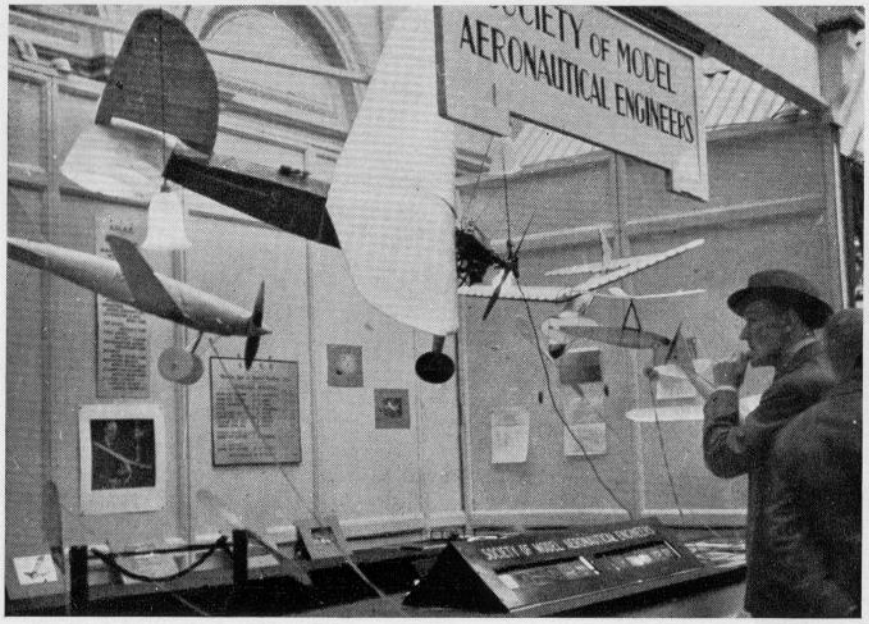


FIG. 50.—" *The Model Engineer* " *Exhibition of 1934, showing the S.M.A.E. Stand, which exhibited all the record breakers.*

FIG. 51.—*The beginning of the Glasgow Model Club.*

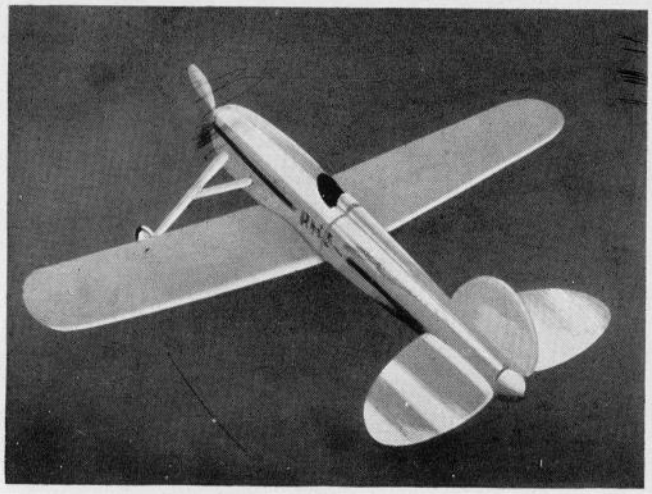


FIG. 52.—*The author's model, of lower wing loading, that came in second in the S.M.A.E. Speed Competition.* (*' Model Engineer' photo*)

others during successive years. Messrs. W. C. Henery and C. H. Orchard were the originators of this successful idea. It was later carried on by Mr. Rippon, more popularly known as "Rip." "Rip" is one of the old pioneers.

During the Rally L. B. Mawby put up a record R.O.G. rubber-driven autogyro flight of 18.5 seconds. The model weighed 2¾ ounces. (See Fig. 56)

The whole question of models with rotating wings is a most interesting one and has not yet really been solved. This type of practically unstallable aircraft should make an excellent petrol development. However, there are a number of difficulties to be overcome such as damage to revolving rotor-blades, and the rotor torque is difficult to absorb.

I think that twin rotors on outriggers will probably be the best solution.

In 1935 during my stay in Scotland I actually did obtain a few unofficially observed and very short flights with a petrol driven autogiro model, before the model caught fire and was totally destroyed in a few seconds. This was a most unfortunate and unusual happening. (Fig. 53)

Mr. Bishop produced a beautiful scale model petrol autogiro in 1935. It was fitted with a Grayson 30 c.c. engine. This model was a grand show-piece but did not help development of the type by flying successfully.

SIR JOHN SHELLEY POWER CUP.

The power competition was won by A. T. Willis (the well-known " Tony ") with a scaled-up and adapted "Sky Rover" of 9 ft. span, and with a commercially produced Westbury " Atom Minor " engine of 14.2 c.c. This model was extremely simple, most controllable and flew exceptionally well. The rules of the competition had been altered for this year: three flights had to be made as near to 45 seconds each as possible. Mr. Baster from Bournemouth obtained second place with a four-stroke engine of 30 c.c.

Only one compressed air model entered and this was the last year that saw a compressed air plant in the Sir John Shelley competition.

Competitors had considerable trouble with ignition and engine starting. In several cases models were under-powered. Engines, as a whole, still lacked power below 30 c.c.

THE BABY ENGINE.

Canada this year produced a really small, commercially obtainable petrol engine, and I was lucky enough to obtain two of the first 2.3 c.c. " Elf " engines. These little engines were very well made, and had two bearing crankshafts, with a small car type contact breaker mounted at the rear. They ran with remarkable smoothness but lacked power according to modern standards. Nevertheless up to the petrol ban at the beginning of the recent war, I was flying these two engines regularly in small models with a very light wing loading. Their induction system has been modified with a 4 in. long

FIG. 53.—*The author's petrol Autogiro prior to its catching fire.*

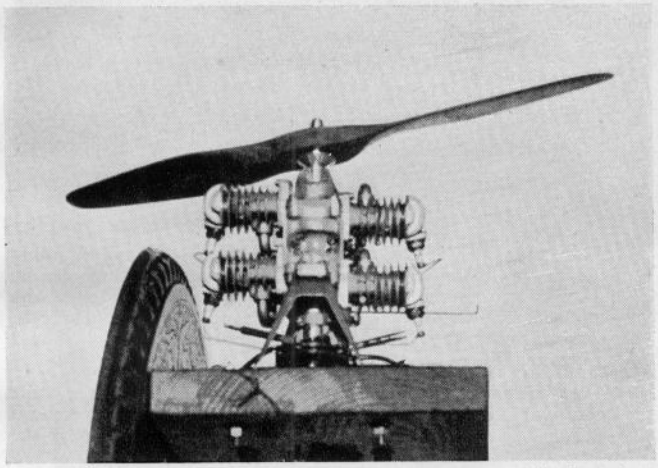


FIG. 54.—*The "Elf" four-cylinder model aero engine owned by the author.*

FIG. 55.—*The 1935 Sir John Shelley Power Competition. There was a large increase in numbers of competitors this year.*

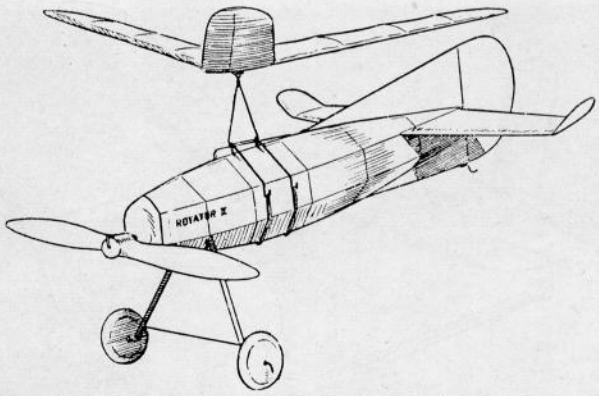


FIG. 56.—*Mr. Mawby's record R.O.G. Autogiro.* (*'Flight' drawing*)

induction pipe, which improves their power output. There are very few model engines that are not improved by a 4 in. long induction pipe, I have found. It gives a more even flow of gas and therefore improves steady power output. Anything over 4 in. is unnecessary. The old "Elf" is shown overleaf beside "Kanga's" early record engine of 28 c.c. The "Elf" weighed 4 oz. against the "Wall's" 2¾ lb.

There is also a modern "Elf" single and a twin cylinder of small capacity on the market. As can be imagined, the four-cylinder "Elf" (an example of which I possess) has an exhaust note which is a delight to the heart of the engine enthusiast.

The power of the midget engines is now excellent, but the ignition gear is still heavy in relation to the power output, and requires rather a specialized type of model. A light wing loading and a streamlined model with little drag is required. This forms a powered glider that requires little power to keep going.

Mr. Hammond's petrol model is shown in the photograph overleaf with its intricate wing construction but severely simple lines. It was an excellent flying model of 8 ft. span, and it carried an 8 oz. flash lamp battery with the result that the ground battery for starting up was dispensed with.

In 1935 Mr. D. A. Russell built a large low-wing monoplane. It was certainly one of the heaviest petrol-driven model aeroplanes to be built at that time. It weighed 14 lb. and was powered by a "Comet" 18 c.c. engine. The photograph shows this model which was largely made from thin three-ply, whilst another illustration shows method of constructing the monocoque fuselage.

THE WAKEFIELD CUP.

The cup was won for America by Gordon S. Light's high wing cabin monoplane (rubber driven). The model flew from Fairey's aerodrome at Heath Row and landed after two hours twenty minutes on Hanworth aerodrome several miles away. It must have been soaring for most of the time. This will interest those who argue for and against "stream-liners" versus "slab siders." The model was officially timed as 7½ minutes "out of sight." Following is a description of the model written after the event.

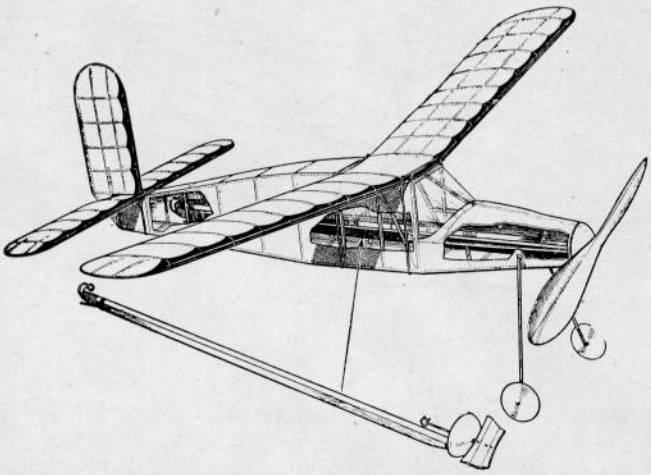


FIG. 57.—*Mr. Gordon S. Light's American Wakefield winner, 1935.*

" The model is typically American in structure and appearance. The wing is mounted very high above the thrust-line, the fuselage being considerably humped to secure this placing. Another distinguishing feature is the following of the American system of using a removable ' motor stick ' or ' torque rod ' to take the strain of the rubber motor, instead of allowing it to be borne by the fuselage structure, as is now the British practice. This motor stick is actually a hollow spar constructed of four strips of balsa $\frac{3}{8}$ in. x $\frac{1}{16}$ in., plugged at intervals to enable it to withstand constant handling. It is permanently coupled to the removable nose-block, both being withdrawn from the fuselage for the purposes of fitting and winding the rubber.

" Of $39\frac{1}{2}$ in. span, the one-piece cantilever wing has a constant chord of $5\frac{1}{2}$ in. The dihedral angle is 8 degrees. The lower surface is slightly concave. The eighteen ribs and four spars are of balsa, and the curved wing-tips of $\frac{3}{32}$ in. x $\frac{3}{32}$ in. bamboo. The covering material is thin Jap tissue, given one coat of clear dope.

" The fuselage is circular in section from the nose-block to the wing, being built of $\frac{1}{32}$ in. balsa veneer glued around a series of bamboo rings. From the wing leading edge to the sternpost the section is rectangular, with four longerons of $\frac{1}{8}$ in. x $\frac{1}{8}$ in. balsa. It is covered with Jap tissue, clear doped, with the exception of the cabin, which is covered with cellophane.

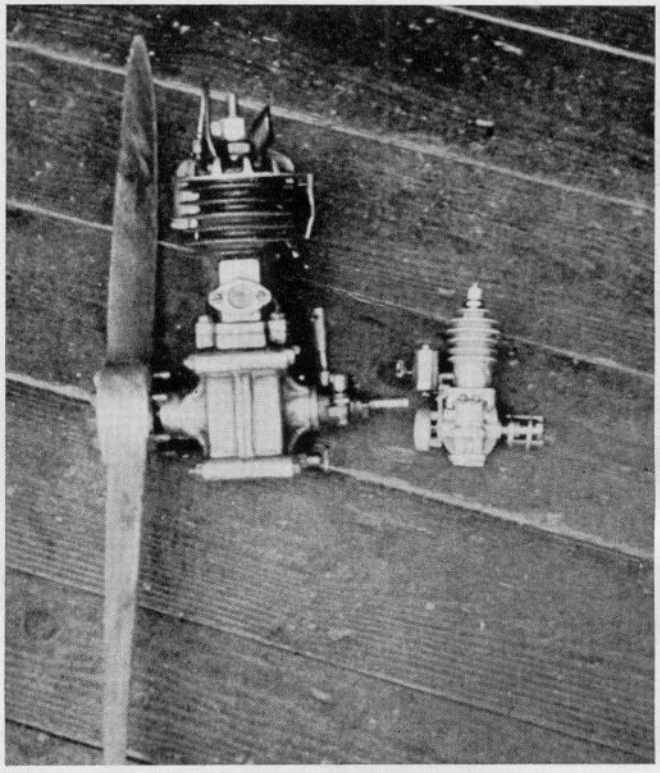


FIG. 59.—*The original 2.3 c.c. " Elf " engine beside the old record-breaking " Wall " engine of 28 c.c.*

This cabin idea is utilitarian as well as ornamental, enabling the user to fit the rear end of the motor stick accurately in the securing clip instead of pushing it through the sides of the fuselage. The undercarriage consists of 2 in. balsa wheels, carried by bamboo legs which push into tubes of rolled and glued cartridge paper secured in the fuselage.

" Built similarly to the wing, the tail plane has the same concave under-surface. The span is $39\frac{1}{2}$ in. and the chord 4 in. The unusual height of the fin is accounted for by the

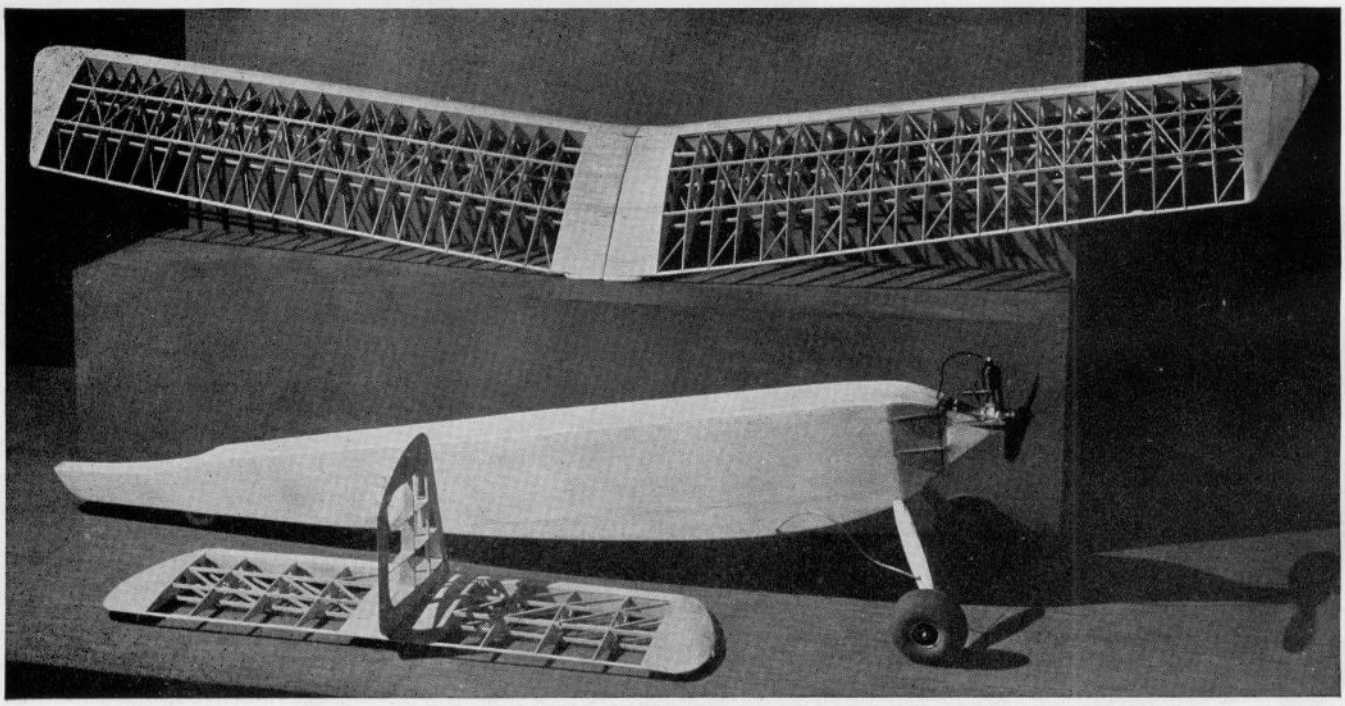


FIG. 58.—*Mr. Hammond's 8 ft. span simple model and an excellent flying machine.*

fact that it is identical with one half of the high-aspect-ratio tail plane, the only difference being that the section is symmetrical.

"The airscrew is carved from balsa, and the blades are very wide and almost symmetrical in shape. They are rather thin, and are strengthened by having doped Jap tissue glued over the convex side. The diameter is 17 in. The motor consists of twenty strands of $\frac{1}{8}$ in. flat rubber. A simple free-wheel device serves to reduce resistance when the model is gliding."

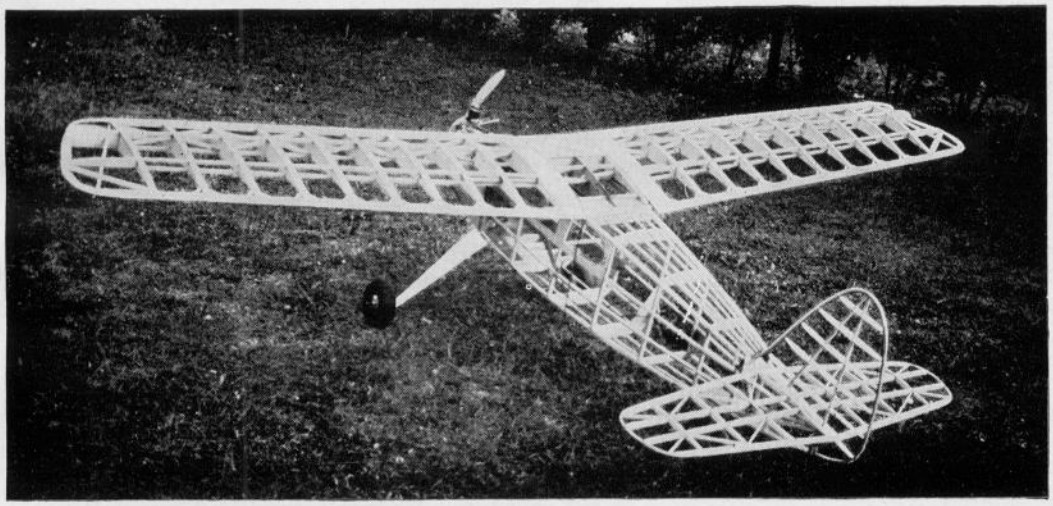


FIG. 61.—*Covered and uncovered views of Mr. D. A. Russell's well-known high wing monoplane "Vulcan."*

Below:—
Mr. D. A. Russell's 10 ft. span low wing petrol model.

PART THREE

MODERN TIMES — 1936-1945

THE YEAR 1936

As time had progressed, competitions sponsored by the S.M.A.E. had been increased. New cups and trophies had been presented, and many of the competitions directly operated by the S.M.A.E. officials had been decentralized among the affiliated clubs. In a work of this nature that has to cover such a large field of activity, it is unfortunately not possible to trace out each year, all these competitions. The book would run into several volumes : neither, perhaps, is it desirable, for we are attempting to trace the general technical development of the model aeroplane ; our international competitions —and the generally accepted leading competitions—form sufficient to provide the data required. These competitions always produce the best and latest design in models. We must remember, however, that the affiliated clubs and the decentralized competitions are the backbone of the movement.

From now onward we arrive at a stage of the model's general development that has not altered very much up to the time of writing in 1945. Improvements as to detail have been the main features.

THE WAKEFIELD CUP

In 1936 we sent out a team of six to America and won back the cup. A. A. Judge of the T.M.A.C. won the trophy at Wayne airport, Detroit, his time being 249.0 seconds. His model was on quite normal lines of the " Slabsided " type, except that it was nicely cleaned up, with a good entry at the airscrew and nose. Readers will perhaps notice that I sometimes speak about airscrews and sometimes use the term propeller. Although airscrew is the correct technical term, the word propeller is more generally used nowadays. The good lines of Judge's model are evident in the photograph. The tail and fin are pleasantly led into the fuselage. It will be remembered that in the previous year that well-known American aeromodeller and writer, Frank Zaic, entered the first all-balsa sheet-covered parasol monocoque model. This year his model was the same but had become a high wing, and was eventually sent to Mr. Rushbrooke (" Rushy "), who flew it in this country. The photograph shows Mr. Rushbrooke with the model at Manchester. " Rushy " is well known to all aeromodellers as editor of the " Aeromodeller."

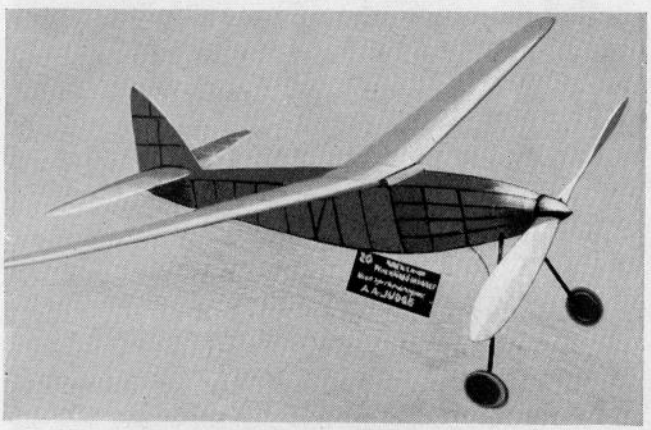


FIG. 62.—*Mr. A. A. Judge won the* 1936 *Wakefield with this model.* (*'Model Engineer' photo*)

It was decided after this Wakefield competition that the rules for the following year should demand a wing area of 190-210 sq. ins. and a minimum total weight of 8 ozs. (the 1936 minimum was 4 ozs.), the idea being to give more scope for design and a better and stronger all-weather flying model more suitable for the English climate, which would eliminate the lucky thermal flight. In actual practice, as we shall see, thermal flying was not killed. The effect of adding the extra weight has meant that having weight to spare, builders have constructed better models and have made the models more aerodynamically clean. That is to say, streamlining has been developed, also finish has developed by high-gloss dopes and varnishes. All this diminishes drag and thus improves the sinking speed. Weight provided, it is accompanied by clean design, creates momentum for soaring (*e.g.* the Albatross). With regard to finishes, it will interest aero-modellers to realize that the famous " Mosquito " aircraft used by Britain for high speed work in the war had 25 m.p.h. added to its speed by the use of a glossy finish instead of a matt paint. Incidentally another 15 m.p.h. was gained by releasing the radiator air through jets behind the wings.

It is also perfectly true that the 1 oz. or so model will be caught up in a thermal somewhat on the same principle as the paper bag or a leaf on a hot day will sometimes be sucked up. The very light model of course has the added advantage that it is designed more efficiently than the paper bag ! An extract written at the time of the " Wakefield " is given below, in regard to events other than the " Wakefield."

> " Even without considering the Wakefield Cup victory, the 1936 season was one of outstanding progress. In the Scale Model category Mr. W. L. Henery (T.M.A.C.) achieved 59.5 seconds with the large Leopard Moth recently described in *Flight*, Mr. G. J. Liggitt (I.M.A.C.) raised the seaplane record to 153.8 seconds, Mr. S. R. Crow (Blackheath M.F.C.) raised the autogiro records to 29.3 seconds R.O.G. and 49.9 H.L., Mr. H. E. White (Northern Heights M.F.C.) established biplane records of 79 seconds R.O.G. and 93 seconds H.L., Mr. Crow promptly raised the biplane R.O.G. record to 91.2 seconds, and Mr. C. A. Rippon (N.H. M.F.C.) achieved 51 seconds with a fuselage pusher.
>
> " Last—but most obviously not least—Mr. R. Copland (Northern Heights M.F.C.) in the Albert Hall, London, raised the indoor tractor spar record to 11 minutes 57 seconds with a microfilm-covered model weighing one-sixth of an ounce ! "

INDOOR FLYING

Flying of indoor microfilm-covered models now became the vogue. The idea of microfilm covering originated in America. It is a fascinating and extraordinary sight to watch these very slow flying models, lazily drifting around, and gradually working their way up to the roof of the enormous Albert Hall.

A FOLDING AIRSCREW AND AERODYNAMICALLY CLEAN MODEL

A model that deserves special note is W. L. Henery's folding airscrew machine. The model is of exceptional interest and ingenuity as it embodied most of the modern features used

to-day. It was distinguished by the neatly filleted wing roots, as opposed to the usual elastic-secured centre section. The airscrew blades folded back when the power ceased, and the tail unit was neatly faired into an oval fuselage. The folding mechanism of the airscrew was concealed in the spinner. Centrifugal force held the pivoted airscrew blades outstretched during power flight, and for the glide the rotating of the airscrew was stopped by a trip, actuated by a rubber tensioning mechanism. As the power ran out and the rubber skein slackened, the airscrew shaft was drawn forward by a compression spring in the forward end of the spinner. A trip wire prong soldered to the airscrew shaft was then brought in contact with a stop located in the rear face of the nose block (a small protruding wood screw). The shaft was then prevented from turning and the airstream past the stationary propeller blades folded them back along each side of the fuselage. This arrangement is in general use on our modern models to-day, except that a single bladed propeller, with a counter weight, is often used.

The model was called " Wilfred " because it resembled a rabbit with its ears folded back when gliding—I refer to the model and not a gliding rabbit ! The model's span was 45 in. with chord tapering from $5\frac{7}{8}$ in. to $3\frac{1}{2}$ in.—6 degrees dihedral and under surface of wing section slightly concave, and the tips slightly negative. Each wing half had two hard balsa projections which engaged in slots in the fuselage. They were thus detachable and easily knocked off to prevent damage in the event of a crash. The length of the model was 34 inches and the total weight 6 ozs. All-balsa construction and Jap tissue covering was used.

SCALE MODELS THAT FLY

The introduction of balsa wood helped the scale enthusiast to produce reasonably light flying models.

Mr. Henery's $1\frac{1}{2}$ in. to 1 ft. scale " Leopard Moth " was an interesting example. He chose a good type for a flying model, an important point in itself, and he made it of a fairly large size thus giving himself a sound chance of success, as the model could be constructed rather on the lines of a powered glider.

A description of this model published in *Flight* and written by Mr. Knight is quoted below.

By kind permission of " Flight."

" A SCALE CUP-WINNER.

" The model illustrated is the large Leopard Moth with which Mr. W. L. Henery, of The Model Aircraft Club, won the " Flight " Annual Trophy at the Northern Heights Club's Gala Day, described on this page. The scale is $1\frac{1}{2}$ in. to 1 ft., the wing span being $56\frac{1}{2}$ in.

" Practically all the structure is of balsa wood, the weight being 14 oz. Power is derived from four skeins, each of four strands, of $\frac{1}{4}$ in. x 1/20 in. rubber, geared to an airscrew 14 in. in diameter.

" First flown at Warwick in July, 1934, the model has since put in many hours at Wimbledon, and took a prominent part in the displays which the M.A.C. Circus gave at the Hurlingham Polo Club in 1935 and 1936, and at the official opening at Walsall Aerodrome in 1935. It won the M.A.C. Scale Model Contest in 1935, Grand Rally Contest for Scale Models 1935, and the Scale Model Contest at the ' Northern Heights ' 1936 Gala Day. The longest flight made to date is 45 seconds—which, of course, is a good figure for a model built exactly to scale except for the airscrew."

SPEED 1936

The course for 1936 was 150 feet, and the models had to R.O.G. Each competitor was allowed as many attempts as he could induce his model to put up with. Mr. H. E. White's low-wing racing model won with a speed of 42.61 m.p.h. The model put up a spectacular flight, hurtling along just above the ground and zooming up at the end of the flight. His model needed a ground speed of over 40 m.p.h. to become airborne in still air. Second place was obtained by Mr. W. Worden with a speed of 22.54 m.p.h.

The winning model had only one square foot of wing area ; weight 57 oz., approximately 1 h.p. developed by 16 oz. of $\frac{1}{4}$ in. flat rubber arranged in 5 skeins. R.p.m. approximately 3,000. The maximum turns given was 300, the motor run being under 5 seconds. Steel gears were used in phosphor bronze bearings.

The airscrew and noseblock were of birch. The fuselage and wings were also birch, with stressed-skin covering of 1mm. 3 ply. The tail was of steel wire. The fin had a small trimming tab. The undercarriage was made from 10 s.w.g. spring steel wire encased in wood, and had a coil spring-in compression. Wheels $\frac{1}{4}$ in. plywood.

The British speed record still stood at 33.8 m.p.h. The speed record, of course, was arrived at by taking the average of three up-wind and three down-wind flights, which accounts for the lower speed.

THE AUTOGIRO

S. R. Crow produced a very simple and most effective autogiro and raised the records for this type. R.O.G. 39.5 secs. and H.L. 49.4 secs. The model climbed well, flew steadily and sank to earth with rotors auto-rotating correctly. It was practically unstallable, and if the nose rose at too great an angle the model would sink in true autogiro style. Which reminds me that the full-sized autogiro company produced a pleasant little autogiro model kite which was patented and intended to be placed on the market. It flew well, and the climb and descent could be controlled by pulling a string which was attached to a hanging arm, which in turn altered the angle of incidence of the rotor hub. The hub had ball-bearings and the rotor blades had spruce leading edges and

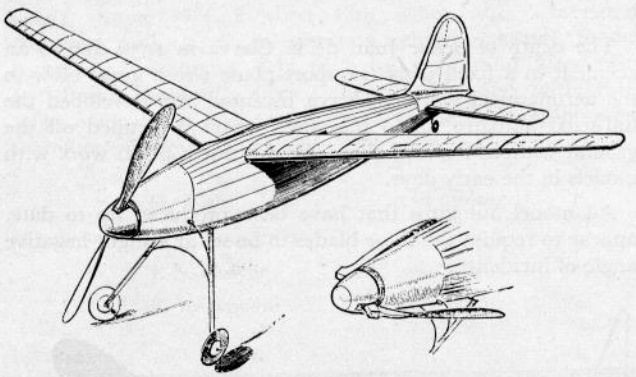


FIG. 63.—*Mr. Henery's folding airscrew model of very advanced design. ('Flight' drawing)*

FIG. 64—*Frank Zaic's American Wakefield entry is seen in this photograph.*

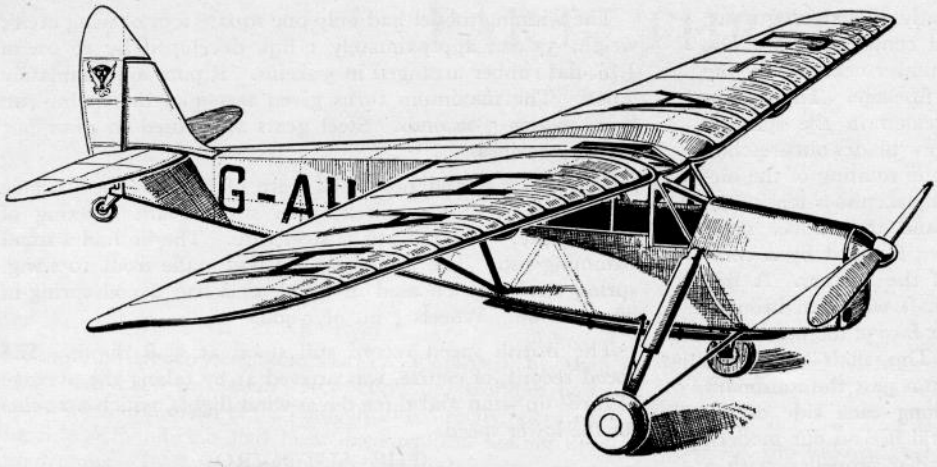


FIG. 65.—*Mr. Henery's scale "Leopard Moth." A very suitable type to choose for a flying scale model.*

(*'Flight' drawing*)

FIG. 66 (*below*).—*Mr. White's 42 m.p.h. racing model "Hornet."*

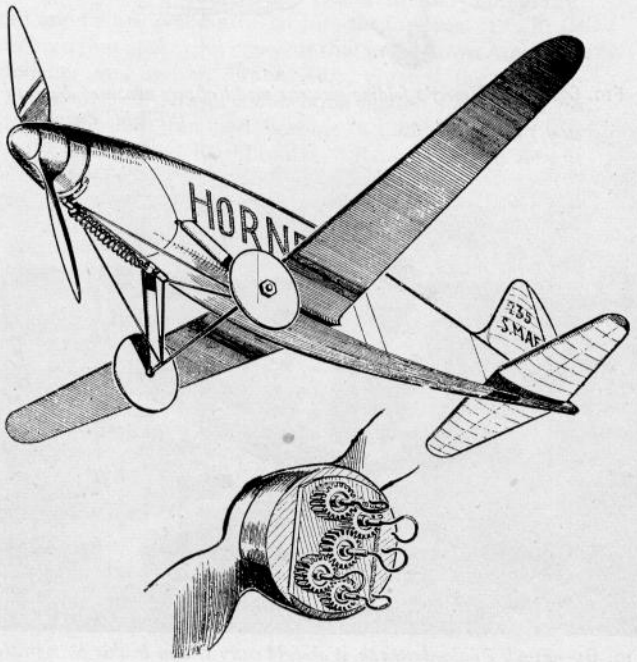
(*'Flight' drawing*)

solid balsa for the remainder of the blades. The blades were hinged in true autogiro style, as it was found on the full-sized machine that blades had to have a certain amount of up and down as well as back and forward movement.

I built myself another petrol model autogiro with a ball-bearing rotor hub and up and down movements of the blades by attaching them to the hub with flat clock spring. There was a stop to prevent the springs dropping the blades too low when the rotors were at rest and not being flung out by centrifugal force. This model had lower aspect ratio rotor blades. It flew, but it suffered so much damage due to accidents to the revolving rotor blades on landing that I put the model aside until I could find time to think of something better.

The death of Senor Juan de la Cierva in 1936 due to an accident in a fixed wing transport plane was a great blow to the aeronautical world. Cierva invented and developed the full-sized autogiro up to the stage where it jumped off the ground without forward run. He did much of his work with models in the early days.

All model autogiros that have been produced up to date, appear to require the rotor blades to be set at a slight negative angle of incidence.



POWER DEVELOPMENTS

Bad weather marred the Sir John Shelley Cup competition. There was a wind of 30 m.p.h. which gusted up to nearly 50 m.p.h.—not very suitable conditions for petrol models. Models were required to make two flights of one minute each, the first to include a left-hand turn and the second a right-hand turn. A duration below or above the minute, and any model straying outside the aerodrome, entailed loss of marks. E. Ross won with a flight of exactly one minute and circled to the left. He was unable to circle to the right. A. E. Brooks came in second with his 7 foot span Comet-engined machine.

The drawing of the 8 ft. span winning model gives all the essential details. A "Brown Junior" 9 c.c. engine powered the model.

Meanwhile in France our old model speedboat friend, Monsieur G. M. Suzor, who visited this country every year to compete in the Model Hydroplane International Competition, won the Coupe de France with the curious and interesting monoplane shown on the opposite page. The engine was a "Brown Junior" 9 c.c., and the model remained in the air for 17 mins. 12.4 secs.

THE YEAR 1937

1937 development saw a new petrol duration record and the first rise-off-water record by a petrol flying boat.

Considerable development in the petrol world occurred during this year, both in the petrol model and also in the production of British engines.

SOME BRITISH ENGINES

Two noteworthy midget engines were produced during this year. Firstly, Mr. F. J. Camm produced a working model aero engine of 1.155 c.c. and then Mr. C. Desoutter made an engine of 1.4 c.c. Mr. Westbury produced a larger engine which will be dealt with a little later. In the commercial world, Messrs. E. Gray and Son put the 3.5 c.c. "Grayson Gnome" on the market, in addition to their 15 c.c. "Grayspec" engine which had been out for some time. J. Hallam & Son Ltd., of Poole, Dorset, developed the "Nipper" of 5.8 c.c. followed by the "Baby" of 2.3 c.c. A little later, if memory serves me aright, the promising little Cloud (model) Aircraft "Hurricane" of 3.8 c.c. arrived and was later followed by a 9 c.c. engine. The Model Aircraft Stores of Bournemouth were busy, first with the 2.5 c.c. "Spitfire" and 18 c.c. "Comet" and later with the 3.5 c.c. "Hornet" and 6 c.c. "Wasp." These last engines were fitted with rotary valve induction.

The Villiers motor-cycle engine firm made a very fine little 9 c.c. engine but unfortunately decided not to go into production. None of these British engines was built in any quantity.

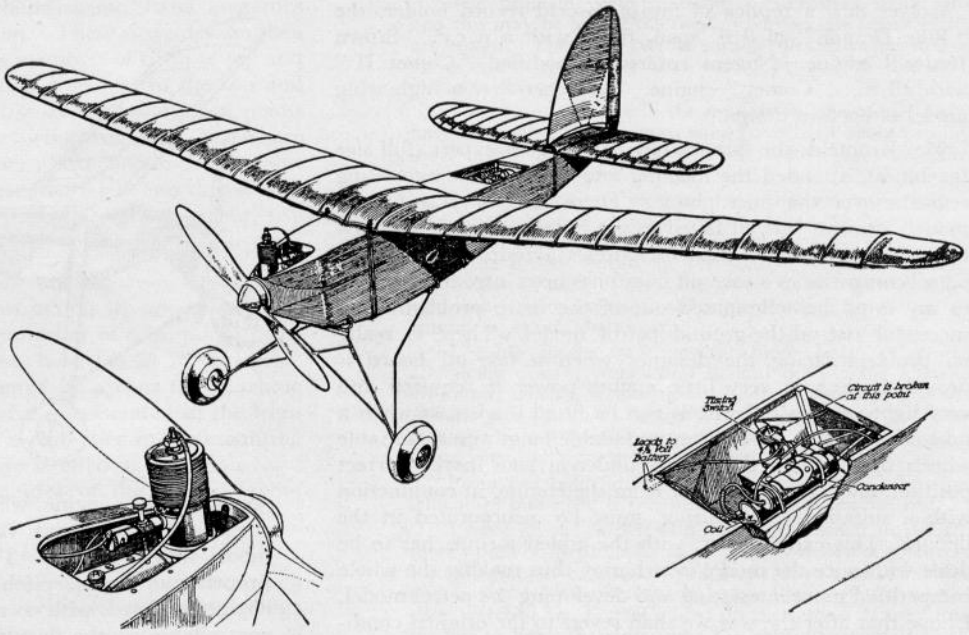


FIG. 67.—*Mr. E. Ross's 8 ft. span Sir John Shelley Cup winner for 1936.* (*'Flight' drawing*)

FIG. 68 (*below*).—*The model with which Mons. G. K. Suzor won the Coupe de France in 1936.* (*from a 'Model Engineer' photograph*)

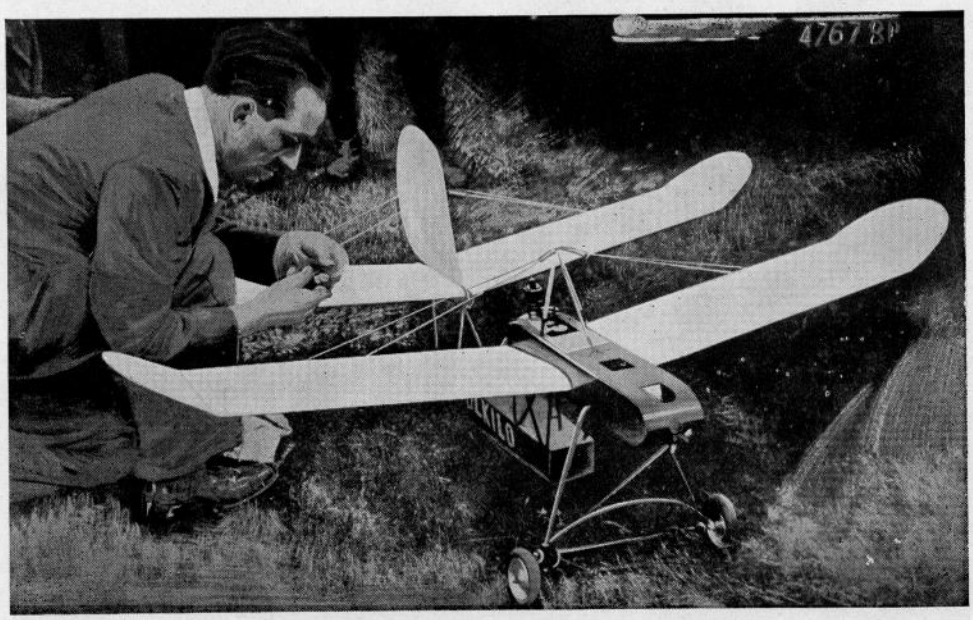
THE PETROL DURATION RECORD

The petrol duration record that I had held since 1932 was broken by Mr. A. T. Fraser from Bournemouth, who made a flight out of sight of 16 mins. 25 secs. The model was temporarily lost as in the case of my old record machine five years before. An attempt on the record was made at the same time and place by Mr. G. Rickard. His model passed out of sight of the official timekeepers after 11 mins. 30 secs. These petrol duration records had become rather a test of the timekeeper's vision, as stable petrol models and reliable engines had now been developed, that could fly for long periods provided a good ignition battery and a tank containing a suitable quantity of fuel were installed in the model. Both the model that made the attempt and the successful machine were "Comet II's," designed at Bournemouth by A. E. Brooks. They were excellent rugged machines with no frills.

AN INTERNATIONAL CUP FOR PETROL MODELS ONLY

The petrol movement had advanced so rapidly during the last few years that I felt that a Cup for petrol models only, in which the rules were designed to develop the petrol model, would further increase interest in the type. Accordingly, I gave an international trophy to be flown for annually in this country. Up to this time there had not been a competition entirely devoted to petrol, for the Sir John Shelley Cup included all types of power, excluding rubber. The rules could now be designed to improve the petrol model's reliability and controllability in the same way that the Wakefield rules are designed to develop the rubber driven model. It is of interest to record the rules as first produced for this trophy. Keen petrol men can then think out improvements. Modification of the rules is in the hands of the S.M.A.E. but useful suggestions will always be considered. The group photograph includes the first year's winner, Mr. Herbert Fish, who came over from America with a 6 ft. constant chord, parasol model, constructed almost entirely of balsa wood and fitted with a "Brown Junior" 9 c.c. engine. He tied with three other competitors and certain parts of the competition were therefore reflown. The final results were :—

H. Fish	.. ..	150 points
J. C. Gardener	..	120 points
J. S. Colyer	..	90 points
F. E. Nugent	..	90 points



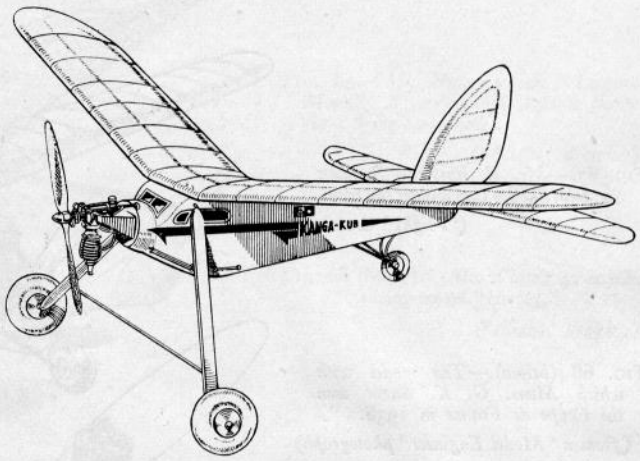
Colyer flew a replica of my old world record holder, the " Blue Dragon " of 8 ft. span, fitted with a 9 c.c. " Brown Junior " engine. Nugent entered a modified " Comet II " with 18 c.c. " Comet " engine. Gardener flew a high wing model of his own design.

Mr. Kronfeld, the famous German soaring expert (full size machines), attended the meeting and made a few interesting remarks over the microphone. There were several French models present, but all failed to get off the ground. Models had to rise from the grass of Fairey's aerodrome ; in later petrol competitions a take-off board has been introduced which to my mind has eliminated one of the main problems of a successful rise-off-the-ground petrol model. There is really no problem facing the designer when a take-off board is provided, because very little engine power is required and very light under-sized wheels can be fitted ; whereas when a take-off has to be made from reasonable length grass, suitable wheels must be fitted with an undercarriage in the correct position, and sufficient power from the engine, in conjunction with a suitable wing loading, must be incorporated in the design. This extra power, with the added torque, has to be dealt with once the model is airborne, thus making the whole competition more interesting and developing the petrol model. I hope that after the war we shall revert to the original conditions that faced the early machines.

SIR JOHN SHELLEY CUP

Mr. C. R. Jefferies of Birmingham won the cup with a small model " The Kanga Kub " with a 6 c.c. " Baby Cyclone " engine installed. Mr. R. J. Trevithick gained second place with his high wing model which was noteworthy for an unusually high wing loading of 23 ozs. to the square foot, and had a rudder-bias gear which automatically eliminated engine offset by absorbing the torque reaction. After the model had taken off under full power, a dash pot control altered the rudder.

Since those days Mr. Jefferies has obtained one of the few successful radio-controlled flights of a model aeroplane in this country. He is seen in the photograph with the original model before the radio control was fitted to it. The perfect surface of Fairey's aerodrome will be observed ! This model, when modified for radio control, was 8 ft. span and now has a



30 c.c. 4-stroke engine, which is a modified model hydroplane engine with overhead valves. With radio equipment the model weighs 11½ lbs. The engine drives a 22 in. diameter propeller of 12 in. pitch at 4,500 r.p.m. maximum. The engine is fitted with a miniature carburettor and is very controllable on the throttle, and the model can be throttled down by the wireless control when in the air, and yet when opened up will start climbing again. Mr. Jefferies remarks that, although the engine is a single cylinder four-stroke, it runs more smoothly than his original " Brown Junior " two-stroke. There is a lot to be said for the four-stroke engine and its greater controllability for radio work. Jefferies has since flown other radio-controlled models for flights of over 30 minutes.

A NEW METHOD OF CONSTRUCTION

" The Kanga Kub " that won the Sir John Shelley was constructed on a somewhat different principle to most British petrol-model fuselages up to that time, which had consisted of a silk-covered birch and spruce framework. This model was a design of mine that simplified construction considerably. It also increased the strength and yet did not add to the weight of the fuselage. It is a method of construction that will be found useful to-day for rectangular fuselages. Each side of

FIG. 69 (*above*).—*" The Kanga Kub " flown by Mr. C. R. Jefferies won the 1937 Sir John Shelley Cup.*

FIG. 70 (*left*).—*This group was taken after the first year's Bowden International Trophy was flown. Left to right are Mrs. Bowden, the author, " Eddie " Cosh and Mr. Herbert Fish.*

the fuselage is cut from $\frac{1}{16}$ in. balsa sheet. Balsa longerons and uprights are then cemented on. These two sides are then connected together by a few cross members of balsa at top and bottom. $\frac{1}{16}$ in. balsa sheet is then glued on to the top and bottom, a little plastic wood being used to strengthen points where undercarriage fittings or wing retaining hooks are located, also where the nose former is attached to the fuselage. The whole structure is then covered with silk and doped with full strength glider dope, and can be painted any colour.

A FIVE C.C. ENGINE BY A WELL-KNOWN DESIGNER

Mr. Westbury came out with a 5 c.c. two-stroke aero engine "The Kestrel," suitable for construction by amateurs. The engine drives a 12 in. diameter propeller of 9 in. pitch. The cylinder dimensions are 18 m.m. bore by 20 m.m. stroke. It is a rugged little engine, mounted on a cone for attaching to a bulkhead, with a mixing valve incorporated in the front of the crankcase. The fuel tank is embodied in the mounting and the admission of the mixture is effected by means of a rotary crankshaft valve. A good idea of the general layout is given in the illustration.

THE FIRST PETROL FLYING BOAT RECORD

In 1937 I produced a very curious looking flying boat, which set up an official record of 30.4 sec. rise-off-water and, strange as it may seem, this record is still unbeaten up to the time of writing. As there has been very little practical experiment with petrol flying boats and float planes in this country, other than by Dr. Forster and myself, I am reproducing an article I wrote in 1943 which explains some of the problems. I hope that after the war a number of people will carry on the development of this most intriguing side of aero modelling.

Here is the article :—

"THE PROBLEM.

"The petrol-driven flying boat is rather a mystery to most petrol fans, for there have been only a limited number of attempts to build and fly this type of petrol model, and certainly a very limited number of successes.

"It is a particularly intriguing type of power-driven model because, apart from the fascination of operation from water, there is the dual excitement of producing a stable, airworthy machine and also a seaworthy machine that is stable on the water.

"The problem perhaps sounds harder than it actually is, and this may be one of the reasons why so few petrol boats are attempted. There are certain simple rules and facts that make for a satisfactory flying boat, and I propose to discuss these points in this article.

"I have noticed that in the majority of the model designs I have seen these fundamental rules have been broken in one or more cases. As a result the boat is not likely to be a satisfactory performer.

"So far, I have not seen anything comprehensive laid down in connection with petrol-driven model flying boats. I think my early hideous and extraordinary-looking boat that still holds the British record for this class of model, was the first model boat to take off the water under its own power, and land again the right way up, although I admit in rather a wet condition, as you shall hear.

"I subsequently built several more boats of gradually advancing design, which flew in and outside the harbour at Gibraltar, when I was stationed at that 'Outpost of Empire.' Around this time Dr. Forster built a flying boat and brought it out to Gibraltar, and later it became a success and I saw it flying very well over the Bristol Channel at Porlock.

"From this boat he developed the 'Mermaid,' drawings of which are published by Aeromodeller Plans Service Ltd.

"I have often heard it said, and even seen it in print, that there would be no difficulty in beating my record of 30.4 seconds. I quite agree, that from the flying angle there is no real difficulty, and in fact I have often made longer flights off the water and have watched Dr. Forster's boat do the same. It may interest readers to hear, therefore, why the existing record is so short, and why in all probability it had not been improved upon up to the beginning of the war.

"The strange-looking craft that I evolved in order to set up the first officially observed flight off water, took off from Poole Water, about 1937, just above Hamworthy. A model petrol flying boat was a completely unknown quantity at that time, so there were no previous data to draw from and therefore the boat had certain exaggerated features to guard against the troubles I foresaw would have to be overcome to make a model stable both in the air and on the water. As a result, the boat had too large a wetted surface and was reluctant to get off the water with the 9 c.c. Brown engine originally fitted, but it was perfectly stable on the water. It would fly with perfect stability after a push start or hand launch on 9 c.c., and it would land and sit on the water in quite a severe wind and sea.

"The problems I had to face were many. I was stationed at the time in the Midlands far from any suitable water and I had to get two official S.M.A.E. observers to come down for one day to some selected stretch of water, and it had to suit

FIG. 71.—*Mr. Trevithick's petrol model that gained second place in the* 1937 *Sir John Shelley Cup.*

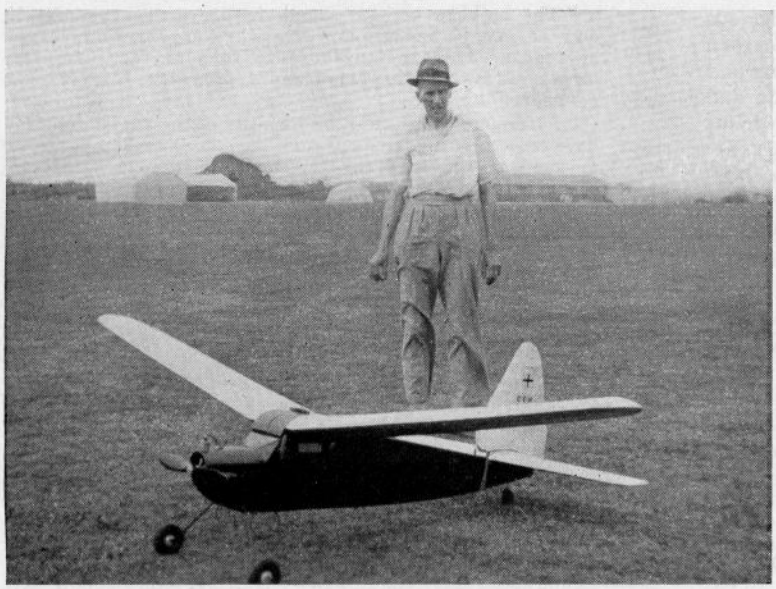
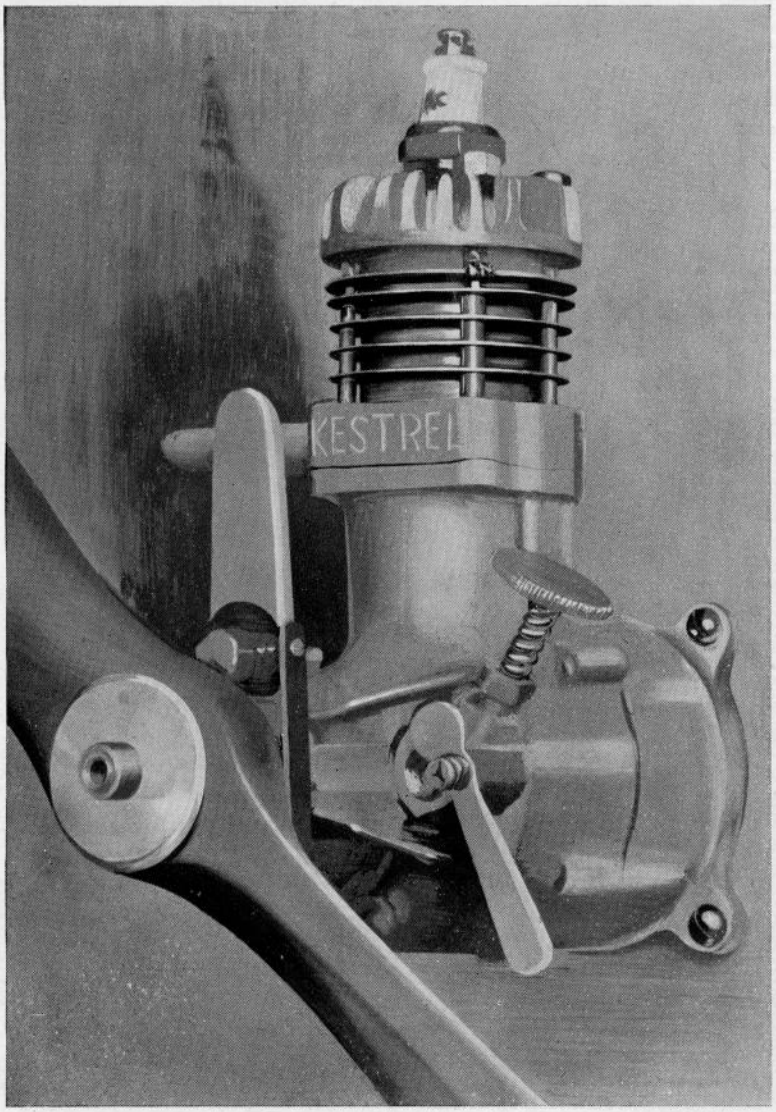


FIG. 72 (*above*).—*Mr. Jefferies carried out a successful radio control flight with the model shown.*



their convenience and my leave period. I had to ensure that my full-sized little speed boat was available on the selected water at the time decided upon; also the weather had to be suitable; so you will agree that in this busy world it was not easy to get all these factors to coincide!

"I chose Poole Water for my leave, and trailed my little speed boat behind my car from the Midlands, hoping that the weather would suit, and the official timekeepers recognized by the S.M.A.E. would be able to make it on the date arranged. My leave was short and the days went by, my wife expected me to fit in other holiday pursuits besides flying model flying-boats, and the weather was bad! As a result of all this I only got in one or two flights and I had to assist the boat off the water because I found the engine power was just not quite enough. On one occasion it got off unassisted after a long run, because the water had just the correct 'popple' to assist unsticking, also there was just enough breeze to help the take-off.

"I knew that all these circumstances were most unlikely to repeat themselves on the day arranged for official observation! I therefore fitted an old 'Atom' two-stroke 14 c.c. engine that I had by me; in fact the same engine with which I had put up one of the very early land 'plane records, which remained unbeaten for several years. This engine had a lot of power but was heavy according to the advanced standard of those flying-boat days, and it therefore upset all my balance arrangements of batteries, etc., on the 8 ft. span boat, just to make things a little more unlikely!

Anyhow, in went the engine at the last moment, and I had no time to test the boat before the fateful day. The weather was fairly reasonable, the time-keepers arrived and my speed boat started! I dared not make a trial flight as I felt if things were not so good there would be no observed flight at all.

"Those of you who have not done any water flying cannot appreciate what may happen to an overheated little petrol engine that dives into salt sea water. There is unlikely to be any more flying that day, and if there is elektron in the engine's construction, as there was in my 14.2 c.c. engine, the engine must be stripped at once or the corrosion due to salt water will seize everything solid.

"The compression of the 14.2 c.c. engine was fairly high as it had been hotted up for model hydroplane racing, after it had retired from landplane work. As a result of this high compression I had to use two flash-lamp batteries for flight.

"In order to get an approximate balance I had to sling these batteries along the hull well aft, but this was guesswork without a test flight.

"The boat got off well, but those infernal batteries were just too far back and the machine climbed at a pretty fierce angle and was stallish. This appeared to affect the flow of petrol. In those days I used gravity feed on this particular engine to a carburettor with midget float chamber. *Now* I should suck up the petrol!

"Anyway the engine eventually cut out and the boat landed with rather a wet splash the right way up and had the decency to sit on the water for master to retrieve. But nothing would induce that engine to start again that day.

"I therefore contented myself with having set up the first rise off water record for petrol flying-boats and determined that I would, at some later date, have another go at it with a better boat, incorporating the knowledge I had gained, *and* when I could get leave, weather, water and official timekeepers to synchronize. In the meantime I was ordered off to Gibraltar where official timekeepers just did not exist. I had a lot of good and soul-satisfying flying off the blue waters of the Mediterranean up to the time that Hitler—the anti-model man—put an end to all such pleasant occupations.

FIG. 73 (*left*).—*Mr. Westbury's 5 c.c. engine designed for amateur construction. (from a 'Model Engineer" photograph)*

" There will be no difficulty about putting up a nice fat record time now that the war is over, and it is my great hope that we can organize a flying-boat week at some large and suitable stretch of water, centrally situated and within reach of the majority. We should have some rare sport of a most interesting and absorbing nature.

" MY LATEST BOAT.

" Some readers will remember a description of two of my boats at Gibraltar with photographs of these boats in flight in the harbour with a background of the famous old ' Rock ' that means so much to our country now.

" One of these boats, and a very successful one too, had a tapered wing span of only 4½ feet, but with a very large centre chord. It was powered by a 6 c.c. Baby Cyclone engine, which is not easily affected by a little spare sea water.

" This little boat was quickly whipped off the water by its engine and due to its fairly high wing loading was rather a fast, but very stable, flying machine. It landed fast after a fast but flat glide and its most satisfactory feature was its ability to ride on rough water before taking off and after landing. I have absolutely no use for a boat that is not really seaworthy, and that is liable to be blown over or dip a wing into the water. Anyone can produce such a machine, and I suggest that we adopt a stiff flotation test before and after the flight in any post-war record that is granted, and also in any flying-boat competitions that are organized. The same applies to model seaplanes (*i.e.* floatplanes). From these boats I learnt that a short span is a great asset for lateral stability on the water, also that to locate one's ignition with a battery in the hull is a very bad practice as it gives rise to all sorts of ignition troubles due to damp. Wing tip slots and a fairly heavy wing loading, but with plenty of engine power, are the answer.

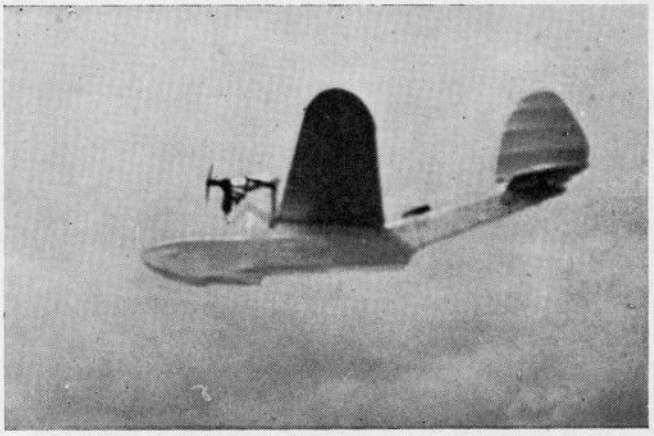
" The photographs shown with this article are of my latest boat, which is a development of my previous efforts. I built it during the war.

" Let us examine its main points, because I have incorporated in this design the features that I have found desirable for success. I feel that this boat will be a useful competition machine, as well as a reliable boat to obtain pure fun in flying.

" On page 51 is a photograph of the boat showing general features. A balsa-planked monocoque and streamlined fuselage is fitted with wide sponsons in lieu of wing-tip floats. These sponsons are provided with steps to assist the take-off. They have sufficient surface to keep the model laterally stable on the water. Wing-tip floats are not usually desirable for a single-engined model, for owing to engine torque one float will usually touch and slew the model round out of the wind during the take off. Again, if the model lands with one wing a little low a wing-tip float may cartwheel the model round, and will then cause one wing to go into the water.

" On this model the boat hull is watertight, and has no batteries, coil or wiring in it ; merely a small breathing hatch that can be opened if any leaks are sprung.

" The engine and coil and baby accumulator, weighing 3½ ounces, are all in a detachable power egg. This power egg is mounted on a thick 3-ply rib that is sandwiched between the two detachable wing halves. Two dowels pass though the power egg rib. The two wing halves are kept together by



rubber bands and keeper wire hooks fixed in the wing halves at leading edge, trailing edge, and centre spars both top and bottom.

" The accumulator and the engine are thus mounted high and out of the way of spray, and yet the weight up high is counter-balanced by the hull low down, due to the parasol arrangement. The parasol wing makes for good stability, quick take off, and good glide, and therefore good, clean landings. It also keeps out of the way of spray and unnecessary weight of water ; an important consideration. The wing is elliptical, which gives an efficient wing with a short span and yet plenty of surface. Thus we get our weights near the centre of the boat and so lateral stability on the water is good—and we get a reasonably light wing loading. We also obtain a large central chord and this is efficient for model work. Many people do not realise that small chord does not give an efficient airflow over a model wing at the slow speeds models fly. A properly designed elliptical wing with suitable section is the answer to the petrol modeller's prayer !

" My original wing-tip slots are fitted to ensure that there is no nonsense with regard to stalling. I have touched on this matter in articles in *The Aeromodeller* on the subject of stability, and I have described the construction of these built-in wing-tip slots. They are very simple to construct.

" The centre-section struts are built into the hull and are a permanent fixture that the detachable wing is located upon by rubber bands to wire hooks.

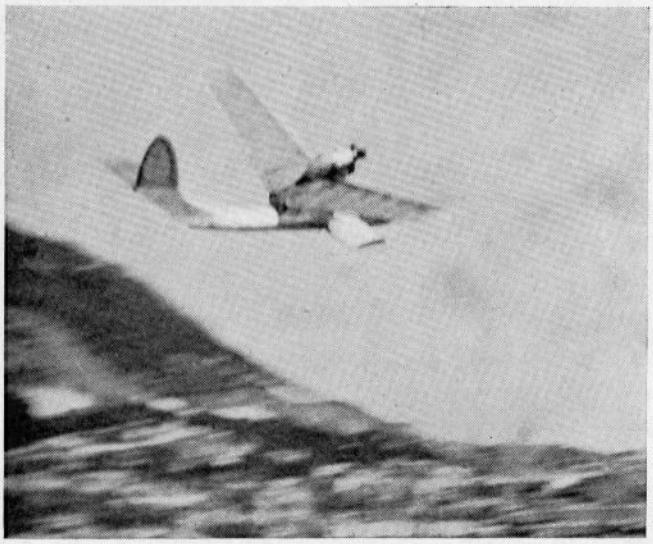
The centre-section struts are made from wire with balsa fairings bound with silk.

" The tailplane is dihedralled and has small twin fins. I have found that this type keeps the model into wind excellently during the all-important take off if the fins look very slightly outwards from each other on the principle of trailing a drogue. The tailplane is kept on to its platform by rubber bands. The fins are well clear of the water.

" The fuselage is made long : this looks after longitudinal stability both in the air and on the water. There is plenty of surface below the hull to keep the model from getting its tail

FIG. 74 (*above*).—*The author's record flying boat seen in flight. Presumably this photograph of the model was taken on a different occasion to the one on the right, as the motor has been inverted.*

FIG. 75 (*right*).—*The first petrol model flying boat to rise from the water and create a record flight.*



unit blown into the water and becoming waterlogged when sitting on the water. Every model constructed by my fellow aero-modellers that I have seen to date, has suffered from this defect without exception, although their proud owners snort at the idea of their boats being unstable longitudinally on the water. There must be enough surface sufficiently far aft to stop this distressing habit.

"A seaplane or flying boat model always tends to dig its nose in and porpoise during the take off because of the high thrustline. There is no pilot to check this until the boat is well on its main step. I completely overcame this trouble on my first flying boat by fitting an extra step which is situated ahead of the main step at the centre of gravity of the boat. Thus the model tries to dig in its nose and is at once checked and bounced back by the forward step.

"A slightly V step helps smooth landing and prevents a mighty splash. On the other hand a very pronounced V bottom tends to make a quick take off difficult; therefore a happy compromise is necessary.

"The boat is painted shiny white, which waterproofs it and at the same time makes it look well on the water or in the air. To relieve its whiteness it is called 'Blue Goose'! The engine at present is a 9 c.c. Brown."

THE PETROL FLOAT PLANE

In America there have been a number of petrol model float plane ventures, but very few in this country. In fact, I have been unable to trace any reliable record of successful petrol float planes in England. Perhaps these remarks will draw a numbers of interesting denials—I hope so!

It is not good practice in my view to convert a land plane into a float plane, which seems to have been the usual practice in America. Considerable trouble will be experienced with damp wiring and ignition gear and, if the model is flown from sea water, corrosion of wiring will also give trouble. A special machine for the job should be designed. When I was stationed at Gibraltar (from 1937 to 1939) I built two petrol float planes, a large model and a smaller model. The larger model is illustrated on the opposite page.

Both these models were of an entirely experimental nature to find out essential points of operation, as I believe in building models in a simple way. Later, when the necessary data has been obtained, a cleaned up and better looking model can be produced. The larger machine could have had smaller floats, although a good reserve of planing surface is of great advantage for the take off, provided the angle of the step, or steps, is correct. Three floats are generally advisable if the tail is to be prevented from being blown into the water. Once the tail of a flying boat or float plane becomes submerged the whole model is useless, as the machine becomes tail heavy for the next flight.

The smaller model had an unnecessarily large dihedral angle —I had given the model this large dihedral to counteract the side area of the rather large floats, but I found later that the model operated quite satisfactorily on less dihedral, although on a little more than would be given for a land plane. Both models had a forward step in front of the main step, as in the case of my flying boats, in order to prevent the high thrust line pulling the nose down against the drag of the water low down during the take-off. This worked well on the seaplane.

In future float planes I should incorporate a V under-surface at the nose of the floats, and I should use elliptical wings to keep the span small. It is to be hoped that we shall have a competition for petrol flying boats and another one for float planes after the war. It might very well be organized at some place like Poole Water, not too far from London, and the organizers could provide a punt with an outboard engine for timekeepers and competitors. I should always be only too ready to provide an outboard engine if the S.M.A.E. Council or the A.B.A. Council would consider the project.

To all aeromodellers interested in petrol, I would remark that the off-water operated petrol model is more interesting than the landplane. It entails the mastery of two elements simultaneously.

Water is not as hard to alight on as the ground, which I think is proved by the fact that broken props are unknown.

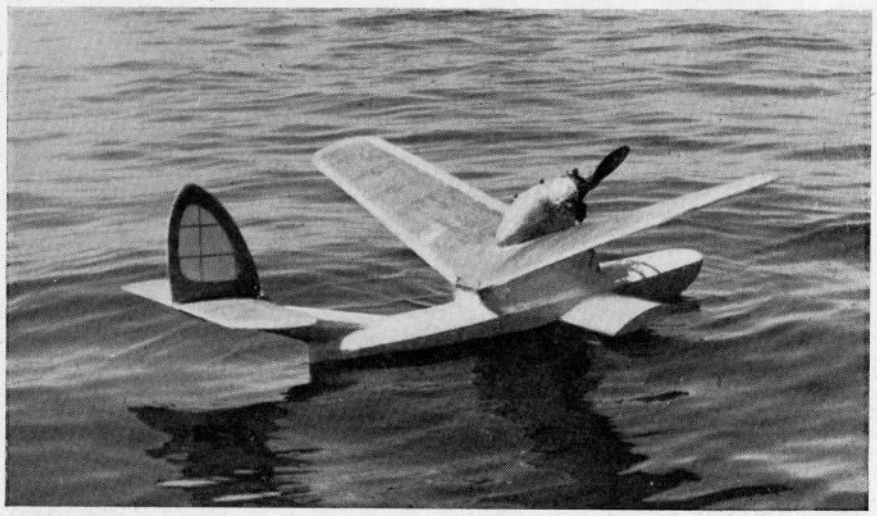


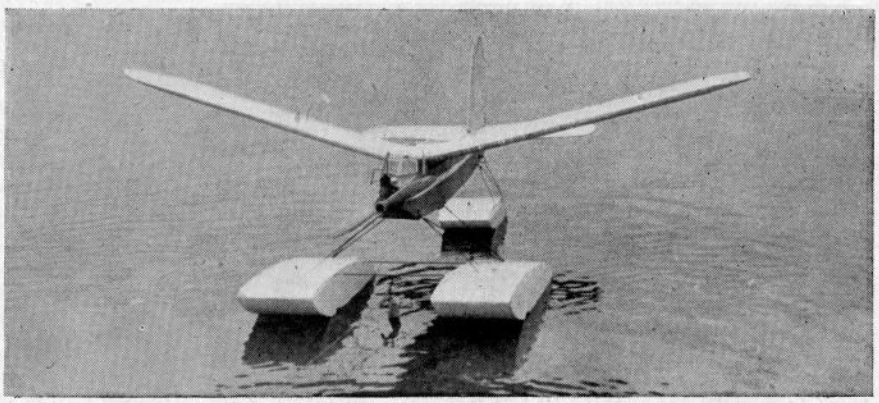
FIG. 76 (*above*).—*The Author's 6 c.c. boat is seen flying around the harbour of Gibraltar.*

FIG. 77 (*left*).—*The same boat at rest. Note the large amount of dihedral to the wings.*

There is a delightful sense of freedom and space as a rule with no obstructions and pleasant long flights can be attempted.

There is a thrill and beauty attached to the take off when the model rises on its step or steps, planes over the surface of the water at suddenly accelerated speed, and leaves the surface with the light scintillating on the spray and drops of water from the bottom of the hull.

In addition the carefree feeling of being on the water one's-self, and away from the overcrowded land, completes the afternoon's relaxation. A successful day's water flying gives me a great feeling of achievement and some pleasant pictures to carry in the mind.



ELASTIC DRIVEN MODELS

An outstanding model in a number of particulars was produced by Mr. E. W. Evans. This machine was on show at the "Model Engineer Exhibition," and I have seldom seen a more beautifully finished model. It combined in a truly remarkable manner modern conception in design, structural ingenuity, superlative workmanship, and first-class flying qualities.

The fuselage was formed from three laminations of balsa sheet $\frac{1}{32}$ in. in thickness. Two layers of strips $\frac{1}{4}$ in. wide ran spirally in opposite directions, and the third layer ran longitudinally. The monocoque shell was painted dark blue, and given a beautiful polish. The airscrew was of balsa with bamboo reinforced leading edges and tips. There were five rubber skeins and a gear-box running in an oil bath !

The machine was of the 1937 Wakefield or "8/200" specification. It had a wing span of 47 in. and a wing area of 207 sq. in. and a total weight of $10\frac{3}{4}$ oz. With a power run of 110 secs., the average duration in non-soaring air was $2\frac{1}{2}$ mins., and the ceiling 200 ft. In the Wakefield Trials, without encountering thermal air currents, the model averaged 136 secs. and secured fifteenth place. The best flight obtained in 1937 was 15 minutes, in the course of which the model travelled $6\frac{1}{2}$ miles.

The wings were covered with Jap silk and the tail unit with tissue. The wings were attached in an ingenious manner. Two wooden dowels projected from each side of the fuselage. These plugged into cleverly shaped wire grips in the wing interior, which allowed them to slip out in a crash.

NOTES ON COMPETITIONS

France won the "Wakefield" for the first time in 1937, with a parasol, diamond-sectioned fuselage model, and American layout, with a single skein motor. Monsieur M. Fillon was the winner, and his time 253.2 secs. (average over three flights).

The Germans mostly flew cabin high-wing models, and used synthetic rubber ! Holland had several twin-tail models designed by our old friend Van Hattum, one time S.M.A.E. Competition Secretary. Belgium and Sweden also entered.

The Americans for the greater part relied upon diamond fuselage parasols, and South Africa was also represented.

Unquestionably one of the finest models was the tapered shoulder-wing circular fuselaged model of R. N. Bullock, which secured second place for Great Britain.

BIPLANE RECORD

A British R.O.G. Biplane record of 1 minute 56.1 secs. was put up by a Bristol man, Mr. C. W. Needham.

SPEED

The "Flight" Speed Trophy was won by R. L. Rogers with his novel twin-fuselage speed model which covered the 150 ft. course at Hurlingham at a speed of 46-48 m.p.h.

LORD WAKEFIELD OF HYTHE

Lord Wakefield's Cup has done so much for model aviation, combined with his generous financial aid from time to time, that I am including below a report published by the *Aero-modeller* of a banquet given by him during this year.

FIG. 78 (*above*).—*The Author's 7 ft. 6 in. span experimental float plane with 9 c.c. Brown Junior Engine.*

FIG. 79 (*right*).—*The Author's latest petrol-driven model flying boat.*

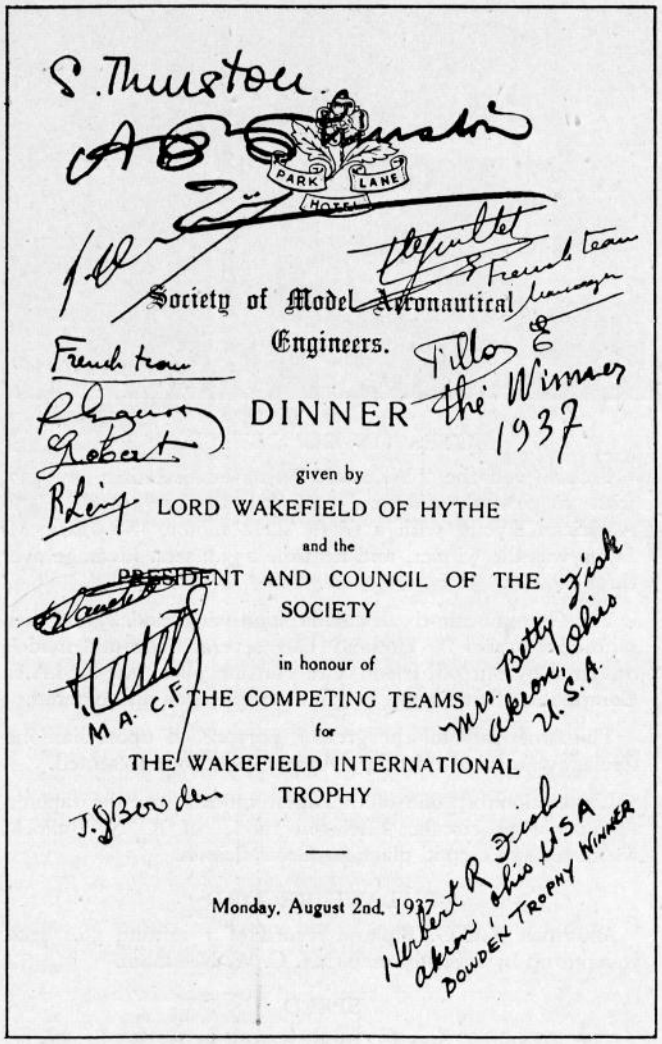
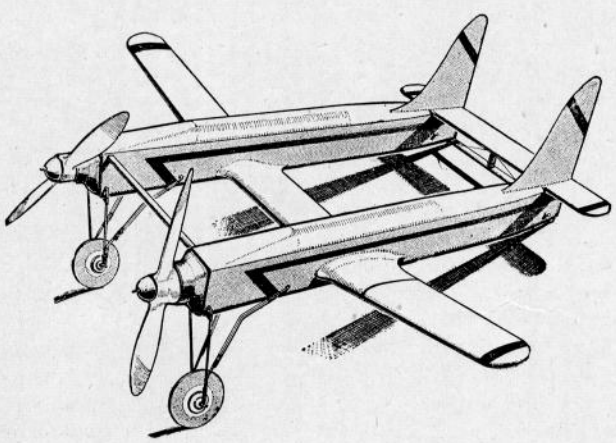


FIG. 80 (*above*).—*A memento of the Banquet. Mr. Russell's signed menu card.*

FIG. 81 (*below*).—*The speed competition for* 1937 *was won by a twin fuselage racer made and flown by Mr. R. L. Rogers.*



A BANQUET

GIVEN BY
THE LORD WAKEFIELD OF HYTHE
AND THE
PRESIDENT AND COUNCIL
OF THE SOCIETY OF MODEL AERONAUTICAL ENGINEERS
IN HONOUR OF THE
COMPETING TEAMS
FOR THE WAKEFIELD INTERNATIONAL TROPHY
MONDAY, AUGUST 2ND, 1937

" On the evening of the second day of the August Meeting, a sumptuous banquet was given by Lord Wakefield of Hythe, and President and Council of the Society of Model Aeronautical Engineers, at the Park Lane Hotel, Piccadilly. For *some years*, if we read correctly, receptions of this nature for competitors have been given in the U.S.A., generally sponsored by some commercial enterprise. This, however, was the first time that anything on a large scale had been given over here, and we are more than pleased to owe our debt, not to a publicity or advertising campaign, but to a very gracious gentleman, Lord Wakefield of Hythe. His repeated generosity and goodwill, given in all sincerity and without any thought of personal advantage, has more than endeared him in the hearts of all who follow the pursuit of model aviation.

" Invitations were extended to all competitors and stewards, all officials and affiliated club secretaries, a select number of guests, and the Press. A reception was afforded to all in the foyer adjoining the banqueting hall, by the President and his Lady. There, amidst much gilded splendour of architecture, one met all one's friends, heavily bronzed with the past few days' sun and resplendent in suiting. As the various guests were announced, so numerous were the foreign visitors that it sounded more like an international conference !

" Following a stentorian voice announcing that ' dinner is served,' we entered the banqueting hall, which was tastefully arrayed with large ornamental mirrors running the full length of the walls, emitting from their scintillant depths soft gleams of light from the exquisitely cut glass chandeliers.

" ' Grace ' having been said, we enjoyed with right good will a very tasteful dinner. (Running around an aerodrome the size of Fairey's for two days induces a very healthy appetite !) And for the benefit of those who were unable to be present we will spare them the envy of a detailed description of the courses. Sufficient to say that it was served as only a West End hotel can serve !

" Dr. Thurston commenced an excellent speech by reading a letter he had received from Lord Wakefield :—

" ' Dear Mr. President,

" ' I very much regret that I am prevented from being present at the banquet in honour of the competitors for the International Trophy which bears my name. It would have been a great pleasure to join with you, as President of the Society of Model Aeronautical Engineers, in welcoming our guests from so many different parts of the world, and I know that you will, on my behalf, tell them how delighted we are to do so.

" ' It is not the least of the pleasures associated with the British victory in 1936 to be able now to offer some return for the splendid hospitality that has been shown to British teams competing for the Wakefield Trophy in previous years. We rejoice particularly in the presence of American contestants, for the abounding kindness of our American hosts last year will long be remembered.

" ' I write before the event, and thus can have no knowledge of the result of this year's competition. What is quite certain is that, whatever the result, it will be accepted in a spirit of true sportsmanship, and all concerned will join in warmest congratulations to the victors.

" ' As you know, I have been interested in model aeronautical engineering from its early days, and I rejoice that the movement has spread far and wide. It is a science as well as a sport. Its practical value is everywhere recognised, proof being afforded by the fact that many of the early enthusiasts in model construction have since become famous designers and builders of the model aeroplane. Some of the younger competitors—and I remember that the British team last year included some who were very young—may well prove to be leaders in this great industry ten or twenty years hence. I hope they will not have forgotten the friendships and kindnesses engendered by these competitions, where twelve or more nations meet in a rivalry which is pure enthusiasm and goodwill. In this respect the world-wide model aeronautical movement has a value and importance which we shall do well to prize and preserve.

" ' And now, Mr. President, may I thank you and Mrs. Thurston for so kindly and graciously acting as hosts to our many guests, and may I also convey through you my warmest wishes for a most enjoyable evening.

" ' Yours very sincerely,

" ' WAKEFIELD OF HYTHE.'

" Proposing the health of Lord Wakefield, Dr. Thurston said :—

" ' I think the supreme glory of this country is that its great men are also its good men. As Milton puts it : " None but such as our good men can give good things."

" ' Lord Wakefield is an outstanding example of this great truth. He has shown that it is possible for a young man without special influence to rise by his own ability and worth to the highest rank of wealth and fortune, and that he can use his wealth in the public interests wisely and economically.

" ' It is difficult for me in a few words to give more than the barest account of his good works. Suffice it to say that he has been actively associated with almost every beneficient enterprise in London and the country during the past generation, has been a most successful Lord Mayor of London, a great ambassador of friendship and good will in many lands, chairman or president of several hospitals, donor of many scholarships, national treasures, public institutions, etc. He is an Honorary Freeman of the City of London, and the only member of the Corporation of the City of London who has received that great honour. If America, or France, or Germany, or any other country represented here to-night wants Lord Wakefield they can't have him—we can't spare him, he's ours—but he will do any of them a good turn when the opportunity occurs.

" ' Lord Wakefield's establishment of the Wakefield Cup has undoubtedly been one of the prime factors in the growth of the S.M.A.E. The Society has grown so rapidly that its resources have been fully taxed to cope with the demand for leadership. We are, therefore, deeply grateful to Lord Wakefield for his further generosity in 1936 and again this year. Probably no Englishman has done so much in so many different ways to forward the cause of Aviation. He has twice won the King's Cup Air Race, and hopes to win it again this year, but he has never won the Wakefield Cup—I think it's about time he had a try. Lord Wakefield's Secretary, I am very glad to say, is with us to-night, and will doubtless let him know your opinion in the matter.

" 'Lord Wakefield has been instrumental in the development of the internal combustion engine by racing cars, speed boats, aeroplanes, etc. Sir Malcolm Campbell, the present holder of the World's Land Speed Record has, on several occasions, paid tribute to Lord Wakefield's assistance. May I remind you of just two examples indicating his far-seeing benefactions to mankind. He purchased and endowed Talbot House, Poperinge, the birthplace of the Toc H Movement, and also " Lone Tree Crater," on the British Western Front, now preserved as a Pool of Silence and Remembrance for ever.

" ' Only a few days ago Lord Wakefield took part in a television programme in which he spoke on the subject of his scheme for Tower Hill improvement. We need no television this evening to show us Lord Wakefield—he is with us in spirit. I give you the toast—our Host and Patron, Lord Wakefield. Long may he be spared to inspire " A rivalry between nations which is pure enthusiasm and good will," and long may he live in happiness and prosperity to enjoy our affection and esteem.'

* * *

" Amidst resounding plaudits the much-contested Wakefield Trophy was presented by Mrs. Thurston to beaming M. Fillon, of France. Despite the language handicap the victorious Frenchman had made many friends, and in a brief speech he thanked the S.M.A.E. and those present for the warm welcome the team had received, and expressed a wish that we could all be present for the tenth international contest for the Wakefield Trophy in Paris next year, where we should be assured of a right royal welcome.

" Captain Bowden being unable to be present for the presentation of his trophy, his place was very ably filled by his charming wife, who, in a brief speech, expressed Captain Bowden's complete satisfaction with everything.

" Followed speeches by representatives from all the other competing countries, in which they praised the organisation of the S.M.A.E., and thanked their fellow competitors for making the meeting so enjoyable.

" So ended a most enjoyable evening, one long to be remembered by all those present, as an example to the world of how international rivalry could, and *should*, exist for the furtherance of good fellowship among the nations."

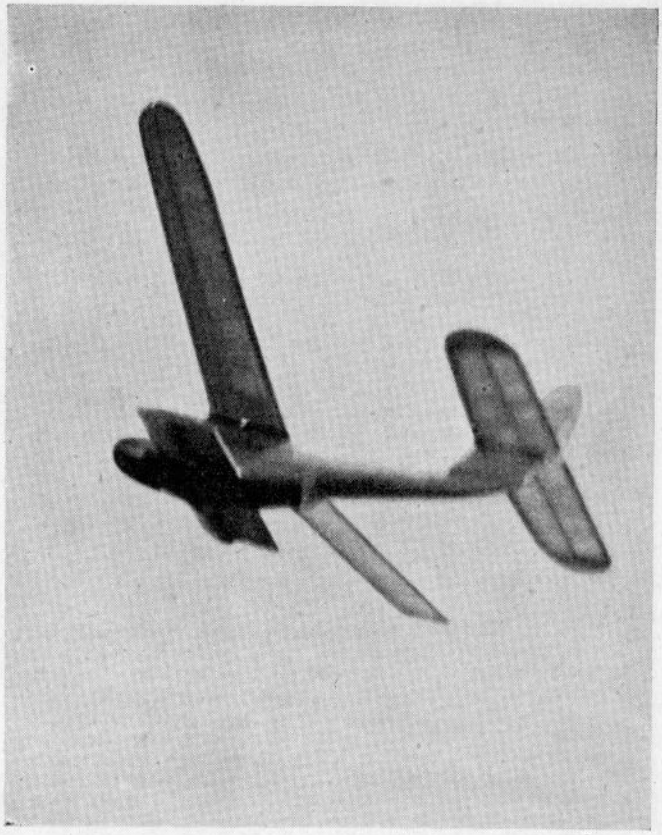


FIG. 82.—*Dr. Forster's flying boat in the air.*

A PERSONAL GATHERING

A further example of the good fellowship existing amongst aeromodellers was the farewell dinner given to my wife and myself in the autumn of 1937 at " The Cheshire Cheese " before we left for Gibraltar. A large gathering of aeromodellers and the Press were present and it will always remain a very pleasant memory of the many friendships made through the hobby of aeromodelling.

THE YEAR 1938

THE " WAKEFIELD "

J. Cahill won the " Wakefield " Cup for America with his rather novel high-wing model. His time was 654 secs. (average of three flights).

The wing was of standard American practice with a constant chord and the dihedral began towards the tips. This dihedral was about 13 degrees. The novelty was in the single-bladed folding airscrew. As we have seen, these had been used before but not in the " Wakefield." The power on the great day lasted for less than one minute. The model then found a thermal with its prop folded. The new weight rule had thus again been defeated.

Cahill's fuselage was of good streamline form and the wing had an aluminium cover to fair it into the fuselage. The belly was swept down forward rather like certain birds. This was to keep the undercarriage legs short. I have found this downward sweep of the belly has a very favourable stability factor as well. The legs were rather further back than normal, which helped take off, but not the landing. However, the folded airscrew did not easily suffer damage.

No definite conclusion has been arrived at as to whether all the pros. and cons. really favour a folding prop versus a free wheeling prop, or whether a single bladed prop is better

than a two bladed prop. There are points for each type and combination.

It is worth noting in passing that if the " Wakefield " had been decided upon the basis of the team average, Great Britain would have won.

The following account of the proceedings at Guyancourt in France (you will remember France won the year before and therefore the Cup had to be flown in France in 1938) was contributed by a witness to the event.

> " The Wakefield contest has now become truly international. In 1936, when Great Britain retrieved the cup from America, there were six countries represented. In 1937 there were eleven, whilst in 1938 teams from fourteen nations met at the Caudron Aerodrome, Guyancourt.
>
> " On the day of the contest, July 31, there were thermals in abundance, a complete absence of wind, and at times a temperature of about 100 degrees. The first outstanding flight was made by Mr. E. Chasteneuf, of Great Britain. His shoulder-wing model continued to climb steadily long after the power ceased and was timed for 10 minutes ' out of sight.' The same thermal enabled Mr. Milligan's Canadian model, flown by a British ' pilot,' to clock 11 minutes. There followed a 9½-minute flight by Mr. R. Smith, of Great Britain, a 17-minute flight by a Swedish model, and the 33-minute flight which gave Mr. Cahill the victory.
>
> " Mr. R. N. Bullock (Great Britain) was unable to complete his flights, as his magnificent shoulder-wing model was lost after soaring for 8 minutes at a great height right over the aerodrome. Mr. L. Stott, of Great Britain, was similarly handicapped, though his model was found after the contest closed. Second and third places went to France, fourth to Sweden, and fifth to Germany. Messrs. F. J. Almond, E. Chasteneuf, R. N. Bullock and R. Smith secured respectively for Great Britain sixth, eighth, ninth and fourteenth places. The remaining member of the team, Mr. H. White, also flew well. Despite the loss of two models, the British team secured the best team average.
>
> " The countries competing were America, France, Sweden, Germany, Great Britain, Australia, Belgium, Canada, Czechoslovakia, Holland, Norway, Poland, South Africa and Switzerland. The Cup was presented to the winning team by Mme. Wibault, wife of the well-known aeroplane constructor, and President of the Comité Français des Modèles Réduits d'Avions, in the presence of the French Air Minister, at a banquet given at the Palais d'Orsay."

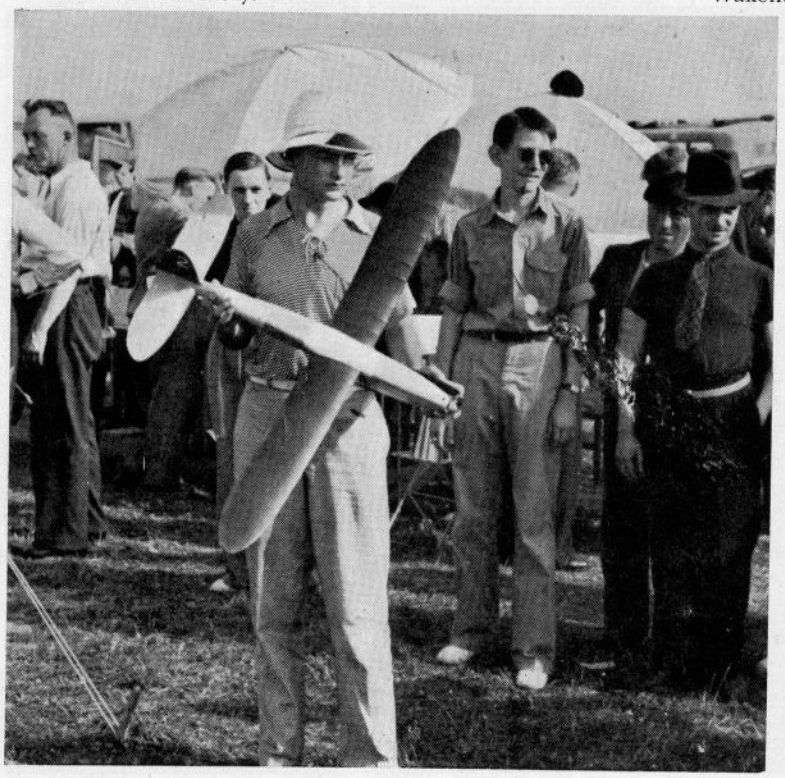


FIG. 83.—*Jim Cahill, the 1938 Wakefield cup winner, with his model.*

THE S.M.A.E. 1938 GLIDER CONTEST

This competition was won by E. Chasteneuf, who also put up a British record of 20 minutes 7 seconds. The span of this model was 52½ in. and the length 28½ in.

British gliding machines were beginning to take on a streamlined form, and be specially designed for the task in hand, and were not merely converted rubber-driven models as so often had been the case in the past. Size and weight were beginning to rise, as they should do for really sound soaring. I think from now onwards they deserve the term of " Sailplane."

A NEW BRITISH DURATION RECORD AND A WORLD RECORD

During the 1938 " Weston " Cup competition Mr. Copland's " G.B.3 " set up a British R.O.G. record of nearly 28 minutes. This same model was taken out to Yugoslavia with the British " King Peter " Cup team, where it made a flight of 33 minutes 9 seconds and so created a world's duration record which at the time of writing has not yet been beaten. The photograph shows Dr. Thurston and Mr. Copland with the model, just after the record flight.

A SUCCESSFUL EXPERIMENT IN THE TAIL-LESS FIELD

The R.A.F. has experimented with a tail-less fighter in the past. This " Pterodactyl " was made by the Westland Aircraft Ltd., and will be remembered by regular visitors to the old R.A.F. Air Pageants, or Displays, as they were later renamed.

Mr. Baggs was well known on Wimbledon Common with his tail-less model which eventually reached a record of 90 seconds.

The Westland Aircraft Ltd. afforded Mr. W. P. H. Goodsir valuable assistance when he constructed the model shown on page 58. This model is perhaps the most interesting rubber-driven model of its class that has been seen.

The firm put forward the interesting suggestion that the tail-less model would compete on level terms with the normal Wakefield type model, if the combined area of wing and tail was specified in the rules, and the individual designer left to apportion the respective sizes. A " Pterodactyl " requires at least 25 per cent. more area than the conventional type to make good the loss of lift through the upward deflection of the controllers.

Mr. Goodsir's model weighed 7 oz., including 1½ oz. rubber. The leading edge of the wing was swept back at an angle of 47 degrees from a point 6½ in. from the fuselage, whilst the trailing edge had a uniform sweep back of 27 degrees root ; chord 5 in. ; centre chord 8.325 in. ; tip chord 1½ in. ; tip to tip span 38½ in. ; total area 208½ sq. in. There was one degree of anhedral. The aerofoil section was R.A.F. 34, the airscrew 14 in. in diameter with 20¼ in. pitch.; 14 strand skein of $\frac{3}{16}$ in. rubber. A tensioner was fitted to the motor, as this is an important point in the tail-less model for good longitudinal trim.

SEAPLANE COMPETITION

The Lady Shelley Cup was won in a " nearest to 45 seconds " seaplane contest held by the S.M.A.E. at Danson Park by Mr. T. W. Wickens (N. Kent M.A.S.). He clocked 44.5 seconds rise-off-water

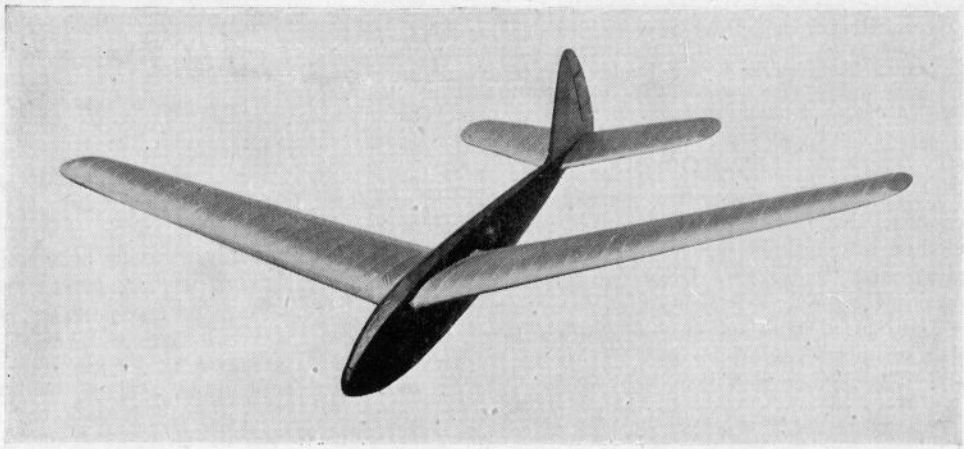


FIG. 84.—*Mr. Chasteneuf's winning model of the 1938 S.M.A.E. glider contest.*

with a constant-chord high-wing cabin model of 33 in. span, 129 square inch loading and 23 in. overall length. Three flat-bottomed floats were used. An airscrew of 12 in. diameter and 12 in. pitch were turned by five strands of ¼ in. Pirelli rubber.

GLIDING CONTEST; REPORT EXTRACT

"A message from Dr. A. P. Thurston, president of the S.M.A.E., announces that Great Britain has won the King Peter Cup and all first prizes in the contest just concluded in Yugoslavia. Eight countries participated. Mr. R. Copland (Northern Heights M.F.C.) is understood to have set up a world record. The other Britishers were Messrs. R. N. Bullock and E. Chasteneuf (Blackheath M.F.C.) and J. Worden (T.M.A.C.). The British team was enabled to attend in person through the munificence of Lord Wakefield."

1938 PETROL DEVELOPMENT

The year 1938 saw a great increase in the number of petrol models competing for the two leading petrol events, the Sir John Shelley Power Cup and the Bowden International Trophy. As I was abroad at the time, and did not see the decided impetus to the petrol model in this year, I am quoting Mr. Knight's report that appeared in *Flight* dated August 4th, which sums up the situation in his usual interesting manner. *By kind permission of "Flight."*

"PETROL POWER PANORAMA.

"Substantial progress in all directions has been made with petrol-engined models in recent months. Three years ago five of these craft flew at Heath Row in the S.M.A.E. contest for the Sir John Shelley Cup, and lulls of an hour between attempts were not uncommon. This year the same contest attracted thirty-six entries, and with the forty-one entered for the Bowden Trophy, models were continuously in the air from 11 o'clock until dusk. With the exception of two biplanes all the machines were of the well-tried high-wing type, and ranged from the 40 in. span 1¼ lb. 'Satellite' (2.4 c.c. Trojan) of Mr. E. Ross to the 9 ft. span 6 lb. monocoque of Mr. A. Wilson. The biggest engine was an inverted 15 c.c. Atom Minor in Mr. W. E. Evans' high-wing model. This machine has made over one hundred flights without untoward incident. One model folded its wings and disintegrated as it hit the ground, but otherwise mishaps were confined to a few cases of overturning in taking off in the choppy wind which sprang up at the close of a perfect day.

"The S.M.A.E. has formulated sound rules for the safe operation of petrol-powered craft. Flying is barred from public open spaces, a time switch limiting the engine run to two minutes must be employed, and every model must bear its official S.M.A.E. registration. Both the Bowden and the Shelley contests were designed to promote reliability and control, and officials and competitors went about their business in a manner calculated to inspire confidence in the S.M.A.E. management of power flying.

"The assembled company was welcomed over the microphone by Mr. Richard Fairey, president of the Hayes and District M.A.C.

"THE BOWDEN TROPHY.

"In the Bowden International contest three unassisted rise-off-ground flights of 40-60 seconds were stipulated with loss of points for duration above or below this range. Failure to start the engine within three minutes of the competitor's name being called involved disqualification in that round. Extra points were awarded for an undamaged or only slightly damaged model.

"The absence of foreign entries was understandable in a year when the Wakefield contest is not being held in this country. Two competitors scored 120 points, and three further flights were made before Mr. E. Ross (Essex Power M.A.C.) was able to beat his opponent and win the cup. He flew a 'Southern Star,' a picture and brief description of which appear on page 59. The runner-up was Mr. L. A. George, of the Hayes Club, whose modified American-type constant-chord high-wing (6 c.c. Baby Cyclone) was characterised by the small amount of dihedral.

"Mr. S. T. Grant's 5 ft. biplane 'Grampus,' though scarcely a thing of beauty, flew exceptionally well. Certain contestants found the flat glide of their models a difficult factor in securing the stipulated flight duration. For instance, Mr. T. W. Longley (R.A.F., Halton) obtained a flight of 88 seconds with a 15 second engine run, and only kept within the required range by setting the time switch for 10 seconds. Several other British-built American designs shaped well, including Mr. S. R. Crow's 5 ft. 6 in. cabin high-wing 'Buccaneer,' Mr. P. W. Clempson's 7 ft. 6 in. 'Super-Buccaneer,' and Mr. R. Brigden's 'Zephyr,' a 6 ft. cabin high-wing with typically American wing, constant chord for the major portion of the span, and sharply dihedralled elliptical tips.

"THE SIR JOHN SHELLEY CUP.

"The Shelley Cup rules called for two flights of 60 seconds and one of 45 seconds, with loss of points for duration above or below these figures, and complete forfeiture for a landing beyond the aerodrome boundary. Three competitors scored 57 points, and an additional 'nearest to 45 seconds' attempt was imposed to decide the winner. This proved to be Mr. J. S. Wreford (Essex Power M.A.C.), who achieved 47 seconds with a constant-chord high-wing of his own design. It has a span of 5 ft. 11 in., an overall length of 4 ft. 9 in., 781 sq. in. of wing area, and a total weight of 4 lb. 12 oz. The fuselage was of hardwood, silk covered, and wings and tail of balsa covered with bamboo paper. An inverted American 9 c.c. Ohlsson was employed.

"Mr. F. J. Almond (N. Kent M.A.S.) secured second place with a constant-chord high-wing of original design, weighing 4 lb. 5 oz. and powered with an American 7½ c.c. Gwin Aero. The span was 6 ft. 9 in., the chord 10 in., and the section R.A.F. 32, balsa, spruce, and hard plywood were the constructional materials, the covering being bamboo paper finished with aluminium dope. Mr. J. C. Gardener (Banbury D.M.A.C.) came third with an original high-wing of about 7 ft. span.

"A WINNER.

"The 'Southern Star,' with which Mr. Ross won the Bowden Trophy, is a small cabin version of his 1936 Shelley Cup winner, which was described in *Flight* of September 3 of that year. Built for heavy duty, spruce has been substituted for balsa for all parts except the ribs. The covering material is Jap silk, doped, and finished with cellulose paint.

"The two-piece wing has a span of 6 ft. 6 in. and a section 1½ times the depth of Clark Y. A backswept leading edge

tapers the chord from 8 in. to 11 in. The tailplane has a lifting section, but is set at 2 degrees negative incidence. Brass rods projecting from the fine-base pass through the tailplane and through plywood plates in the fuselage and are secured with nuts. The American 7 c.c. Mighty Midget normally turns the satin-walnut airscrew of 14 in. diameter and 8 in. pitch at 3,000 r.p.m., but full throttle gives 7,000 r.p.m. The model weighs 3¼ lb., and the wing loading is 7½ oz. per sq. ft."

PETROL BIPLANES

Mr. Sharvell's biplane was a particularly well designed and constructed model with balsa planked fuselage and a sound method of detachable interplane bracing. It is seen in the photograph on Fairey's Great West aerodrome obediently awaiting its master's decision to fly.

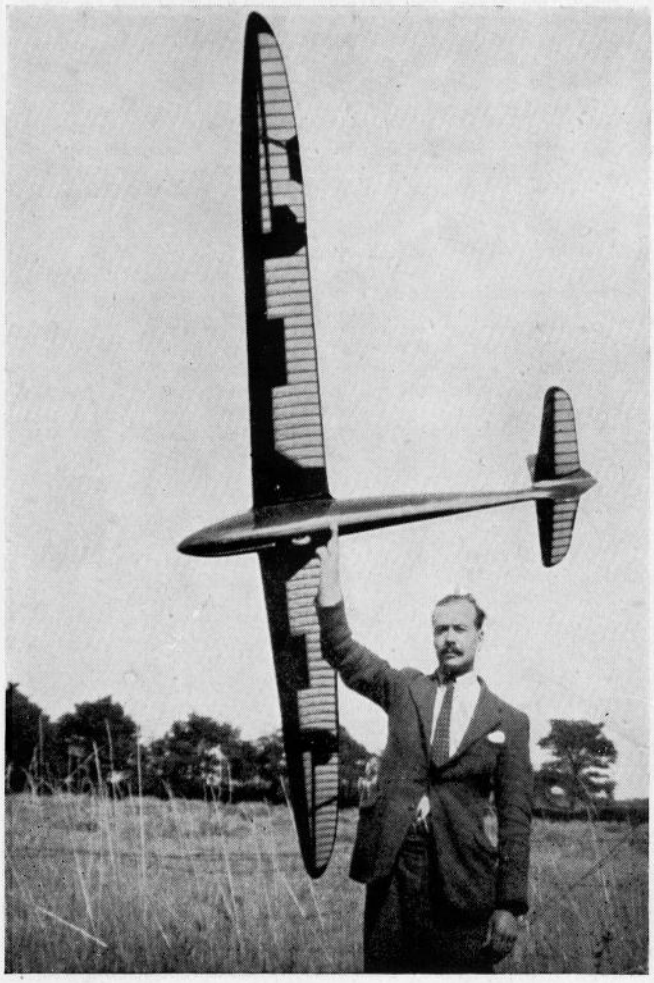
Reproduced is an action photograph of my own little 5 ft. span cantilever cabin biplane, the " Mouse," just after taking off. The engine was a 6 c.c. Baby Cyclone.

AN OUTSTANDING SCALE PETROL PLANE

The *piece de resistance* was Mr. D. A. Russell's magnificent one-fifth scale " Lysander " model. It was started during this year, and is still not quite complete. It has entailed an enormous amount of work, as scale detail is really complete in practically every point. The model is now being fitted with wireless control gear by Sqdn.-Leader P. Hunt, author of " Radio Control for Petrol Planes."

It should be one of the big moments when this model takes the air for the first time, and I hope I may be there to see results. The model, besides being 10 ft. span, has flaps and slats fitted that actually work, and a 40 c.c. two-cylinder horizontally-opposed American flat twin engine drives a 26 in. diameter, 3-bladed prop.

The airfoil section is approximately R.A.F. 34 with the standard thickness chord at the wing tip thickened to some 15 per cent. at the maximum width, and reduced to approximately 7 per cent. at the juncture with the cabin superstructure.



The slat opening is about 10 degrees and the flap depression something over 40 degrees. When the slats and flaps are in full operation C.L. is about 2.3 at 20 degrees.

Messrs. The De Havilland Airscrews Co. were kind enough to offer some information in regard to the airscrew blades, which are of Clark Y section, and calculations indicate that the thrust would be about 9 lb. with the blades set at an angle of 6.7 degrees, corresponding with a speed of 40 miles per hour and 4,000 r.p.m.

At a speed of 20 miles per hour and a blade angle of 4.8 degrees the thrust would be some 15 lb. Both these figures should take care of the drag of this model.

Originally it was intended that some form of pendular control for the elevators should be incorporated in the model but, as already stated, it is hoped, with the aid of Sqdn.-Leader Hunt, to have an efficient radio control apparatus available as soon as circumstances permit of testing out this model aircraft.

Latest information appears to indicate that there is a large change of trim between the high- and low-speed conditions on the full-sized " Lysander," which necessitates a large negative tail incidence for the landing condition, although this (the tail incidence) is practically neutral in the high speed conditions.

Opening of the slats and flaps tends to depress the nose somewhat further, so that it appears that a powerful and positive control of the whole tailplane, or at least the movable (elevator) portions, will be necessary.

However, that is all part of the fun of trying out a big scale model like this, and no doubt there will be plenty of snags and trouble to overcome before getting the 'plane into proper flying trim.

The estimated flying weight of the model is 25 lbs. !

Mr. Russell is, of course, the managing editor of the *Aeromodeller*, the author of " The Design and Construction of Flying Model Aircraft," and has produced several notable petrol models amongst his many model activities, including a very successful 8 ft. span general purpose petrol model that flies as well as it looks. That it looks well is evident in the photograph. It is powered by a 9 c.c. engine, and is a good example of the semi-scale type.

THE YEAR 1939

1939 saw the beginning of the second world war. This naturally had its effect upon the model movement in a number of ways. The international competitions, which were the high lights of endeavour and design, and produced the greatest stimulation in model thought and development each year, ceased. Petrol flying was banned.

This cramped the style of model development, but did not kill it. In fact in some ways it has been the means of actually increasing the numbers of those with an interest in the hobby, and I believe will make the movement even greater after the war than in pre-war years.

No one could go through these war years without becoming at least somewhat air-minded ! Many people who have hardly thought about an aeroplane have been brought in contact with the air and its doings.

Youth in mass is taking more interest in models, rather reminiscent of the years in America just prior to the war.

FIG. 85.—*Mr. L. G. Temple, a leading exponent of the model sailplane, with his magnificent " Celestial Horseman."*

In England, aeromodelling then was more the mature and older man's hobby. It is now definitely the hobby and interest of the youth of the country, which is all to the good. The " greybeards " and the " semi-greybeards " are still there, and I hope will always be there to leaven things, and help with their backing of experience.

So many of the older hands at the game are still just as interested during the war years, but have not the time to go at it 100 per cent. Then again, material is limited.

THE LAST " WAKEFIELD " UNTIL AFTER THE WAR.

I have extracted part of a report that appeared in the *Aeromodeller*, written by Mr. Stott and Mr. Lees who accompanied the British team to America. This provides us with a vivid picture of events that lead to a victory by a " Slab-slider " of outstanding stability, high power, and with excellent soaring capabilities. The winner was R. Korda of America, with a time of 950.2 seconds (average of three flights).

" On arrival at the proposed flying ground it was immediately seen this was far from ideal, and an inspection of the spot allocated for the contest proved this to be quite impossible as it was sandwiched between a dense wood and the airship hangar. The remainder of the airport was under long grass except for the runways used by the full-sized machines, which of course could not be made use of. The alternative to this was the golf course attached to the aerodrome, which was equally unsuitable owing to being studded with numerous trees and shrubs.

" The officials accompanying the team protested strongly against the unsuitability of both sites, receiving full support from the British and American contestants, including the proxy flyers.

" After considerable pressure the organisers made an attempt to fix up an alternative site, but due to lack of available time before the contest this effort was unsuccessful, and there was no alternative but to use one of the sites mentioned.

" After a meeting of the contestants and officials it was decided the golf course possessed fewer disadvantages than the aerodrome. According to English standards even this ground would be considered unsuitable for an ordinary club competition, much less an international contest.

" Whilst awaiting the return of the officials, the boys had a flip round the city in one of the ' blimps.' This was an interesting experience, each airship taking up six passengers for each flight.

" The day was broiling hot and a few of the more adventurous American boys put on more turns than was wise whilst test flying, and a few machines were even lost to sight in the clouds. Apart from one model which was fortunately not in the competition, the others were returned. Later in the evening, as the temperature dropped a little, our own boys got out their models and were soon putting in some good practice.

" It was evident that our methods and ideas were totally different to those of the Americans. They almost all favoured short, thick motors, which literally tore the models up, whilst our boys had longer motors and a steadier climb.

" Under these conditions the flights obtained by the English team showed up very favourably, and the Americans freely admitted their apprehension for the contest.

" We returned to New York about seven-thirty, and were just in time to hear the weather forecast for Sunday. This was bad from our point of view—becoming warmer, calm at first, wind increasing later in the day. This proved itself to be an accurate forecast.

" Later in the evening came the check-up and weigh-in of the models. This proved something of an ordeal, lasting until 2 a.m., with Messrs. Houlberg, Cosh, York, Faulkner and Lees doing yeoman service in various capacities, the latter working with his slide rule until he fell asleep.

" Quite a number of foreign models did not comply with the Wakefield rules and required numerous alterations. Korda's, for instance, was underweight, the cross section of his fuselage was small and his tail area too large. To overcome these faults he had to make the necessary adjustments, and submit his model for another re-check in the morning.

" The great day arrived, and before we left New York for the contest the temperature was almost 90 degrees, and on our arrival at the field it was stifling hot as there was no wind whatever. In fact it was a similar day to that experienced at Gouyancourt, in France, last year. A fly tent was erected by the English team to protect their models from the sun, and after another weigh-in, the contest was soon under way.

" In the draw for positions, New Zealand was first, followed by America, Great Britain, France, Canada and South Africa. As the New Zealand entry was scratched, the first machine to take off was that of America's No. 1 man, Dick Korda.

" With a great ' zip ' his machine took off and climbed almost vertically, in tight circles. It attained a good height under power, and, still rising, it was evident it had contacted a thermal. Within a few minutes it was over a thousand feet, and soaring up with each turn.

" In the meantime, Charlie Gibson, flying proxy for Fred Almond, who unfortunately could not make the trip, wound up for his first flight, but broke his motor with only three-quarters of the turns on. By the time N. Lees was called upon to wind up, Korda's time was announced over the microphone as 22 minutes, and still soaring round in circles, almost over the take-off board—a heartbreaking sight for us.

" We realised we were up against it, and when Lees' rubber broke, this was blow No. 2 with a vengeance.

" As Pacham had his model ready, he went off to No. 3, but unfortunately his machine was faultily adjusted, and failed to rise above about 100 feet, his time being 82 seconds.

" By this time Korda's machine was still up in sight, having clocked 34 minutes and broken Bob Copland's world record.

" The Canadian entry of Fred Bowers had also connected a thermal, and turned in a flight of 12 minutes.

" Things were certainly not going too well, and when Copland took off we were hoping for better things. His model, however took a different direction to Korda's, and made a normal flight

FIG. 86.—*Bob Copland with his world record model of* 1938.

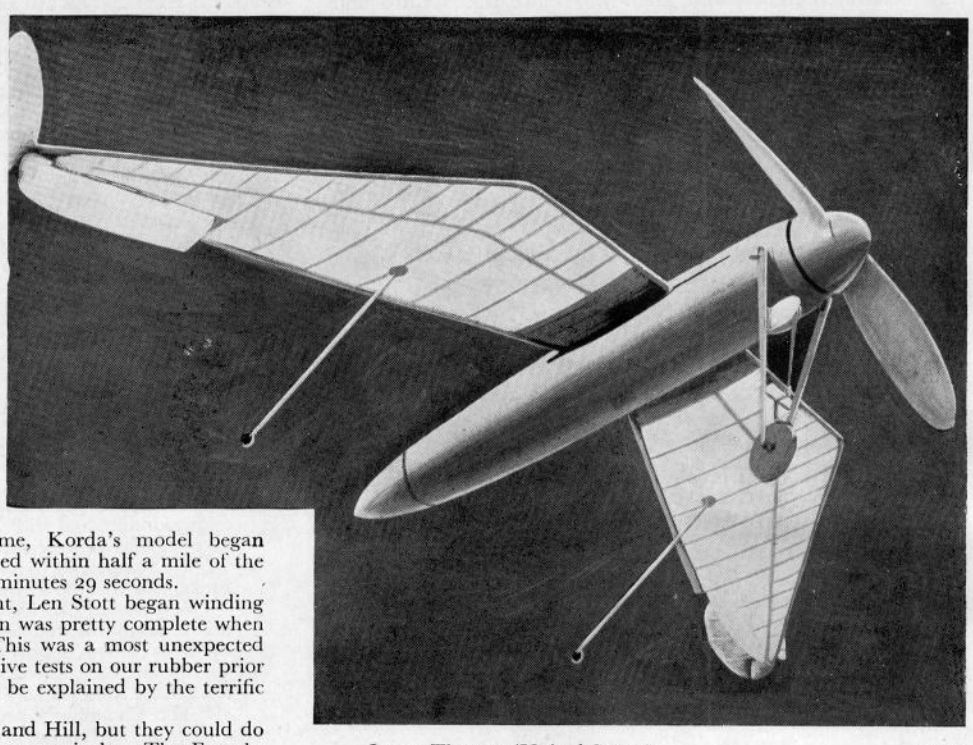


FIG. 87. — *Pterodactyl made by Mr. Goodsir with the advice and assistance of the Westland Aircraft Ltd.*
(*'Flight' photo*)

of 165.4 seconds. About this time, Korda's model began planing down, and eventually landed within half a mile of the field after a wonderful flight of 43 minutes 29 seconds.

" Spurred on by this achievement, Len Stott began winding for his first flight, and consternation was pretty complete when his motor broke in the middle. This was a most unexpected blow as we had carried out exhaustive tests on our rubber prior to the competition, and could only be explained by the terrific heat of the day.

" It was now the turn of Gibson and Hill, but they could do no more than 128 and 80 seconds respectively. The Frenchman, Giovanni, whose machine was being flown by Shoenbrum, had just clocked 9 minutes, the third best flight of the day.

" Len Stott now took his first flight, which was something of a gamble, due to the fact that the nose-former of his 'plane had been knocked out when his motor broke. Our luck was still out, however, his 'plane made a normal flight of 150.75 seconds, thermals at this time being conspicuous by their absence.

" A break was made for lunch, but this was brief, and the contest was soon on its way again.

" Our greatest blow came now : a stiff breeze sprang up and the sky became overcast. It was obvious that it was impossible to improve on Korda's time. In fact, the Americans were so sure of victory that Korda was freely photographed with the cup—this before the second and third flights were made.

" Copland made the best flight of the second round with 308.5 seconds, followed by Stott with 211.5 seconds.

" The times generally decreased as the day wore on and the best flight in the last round was 195.4 seconds by N. Lees.

" From the foregoing it can be plainly seen the contest was over after the first flight.

" Once again the Wakefield Cup had been won by one outstanding thermal flight, and whilst not in the least begrudging the Americans their victory, one was left with a feeling of dissatisfaction that the trophy should be won in this manner.

" There were showers of congratulations for Dick Korda, who is one of the best, and has been consistently successful for many years.

WAKEFIELD INTERNATIONAL CONTEST, 1939

Held in New York, U.S.A.

	Seconds
Dick Korda (United States)	950.2
Fred Bowers (Canada)	272.66
M. Giovanni (France)	217.53
Robert Copland (England)	211. 3
Norman Lees (England)	168.87
Robert Chaillie (United States)	159.83
Leonard Stott (England)	152.41
Levalle Walters (Canada)	150.83
Vincre (France)	126.33
Edward S. Booth (Canada)	125.86
Charles Gibson (England)	98.1
Reg. Parham (England)	98.0
Tournadre (France)	96.94
Chabot (France)	90.03
Phil Dalgetz (South Africa)	83.83
Ralph Baker (United States)	81.8
Chinaud (France)	64.66
Ronald Hill (England)	64.66
Ted Foti (South Africa)	59.53
James Thames (United States)	58.53
Barthelmy (France)	57.01
Spango (South Africa)	54.73
R. B. Leslie (South Africa)	45.83
J. Bohash (United States)	41.63
J. Dilly (Canada)	31.23
P. A. Connoly (South Africa)	30.5
Roy Nelder (Canada)	24.16
Earl Stahl (United States)	20.3
Endean (South Africa)	4.0

THE LAST BOWDEN INTERNATIONAL PETROL TROPHY OF 1939.

The fact that a low wing petrol model won the Trophy was a pleasing fact. This was the first petrol driven low-wing model to win a major power competition. Below is given an extract of a report of the results, and also of the 1939 Sir John Shelley Cup.

" In contrast to the previous day, the weather was very dull, with a slight drizzle in the earlier part of the morning. Nevertheless, 30 entrants for the Bowden lined up their models in the enclosure for inspection by the judges. This year there were no foreign entries, which is unfortunate, as their presence would have made the competition even keener than it was.

" On inspecting the models, several of them were particularly outstanding. Mr. Wilson (Hayes) had a well streamlined black and silver parasol monoplane which performed very well ; Capt. Rickard (Bournemouth) had a very neat strut-braced monoplane which was rendered interesting by the fact that, unlike most others present, it had a British engine ; Mr. Wellens (Croydon) had the largest model, a silver high-wing monoplane of 10 ft. span. The streamlining was very good on this machine, especially the engine, which was completely cowled in ; another outstanding model was a ' Comet Clipper ' from Leeds, whose finish and lining was beyond reproach.

" The two most unusual models there were those of Mr. Worden and Mr. Coxall. The former had a strut-braced cabin biplane, and the latter a large low-wing monoplane with lines not unlike those of a Miles Hawk. Mr. Coxall disproved the belief that low-wing models do not fly, by making not only three very successful flights, but also by lifting the Bowden Trophy !

" When flying was commenced the lack of wind and the damp, slippery state of the grass proved such a handicap that only 50 per cent. of the entrants succeeded in taking off. Mr. Ross (Northern Heights), however, scorned the use of the take-off board, and made three perfect take offs from the grass.

" At the end of the three rounds it was found that Coxall, Ross and Stubbs were the only competitors who gained a

maximum of 180 points for their flying. After adding the points previously awarded for streamlining, the results were:—

1. J. M. Coxall (Hayes) .. .. .. 200 points (which was the maximum obtainable)
2. E. Ross (Northern Heights) .. .. 195 ,,
3. R. Stubbs (Essex Power) .. .. .. 181 ,,

" After an interval of half an hour, during which an excessive amount of unrestricted and dangerous testing took place, the Sir John Shelley Cup was started. At this stage I should like to point out that Mr. J. C. Smith was greatly handicapped in his organization by the lack of a public address equipment, which had not been ordered for the meeting. Mr. Smith appeared, armed with a large megaphone, whose owner, I understand, has on occasions used words through it which are by no means as golden as those of Mr. Smith.

" In the Sir John Shelley competition the models did not find it so difficult to take off as earlier in the day. One of the best performers was a " Redwings " biplane, which made three perfect flights. The competition resulted in a close fight between Messrs. Rowe (Bournemouth), Ross (Northern Heights), Almond (North Kent), Blunt (Brighton), and Byfield (Hayes), who eventually finished in that order. Only 7.25 points separated Rowe from Byfield."

THE INTERNATIONAL SAILPLANE CONTEST.

A report by " Clubman " of The King Peter Cup competition before the war :—

" THE 1939 KING PETER CUP COMPETITION.

" To do full justice to this event would require a greater pen than mine, but I will do my best to give you a comprehensive idea of the happenings and incidents that took place from July 21st to 24th.

" Instituted last year, this event is now of only secondary importance in the aeromodelling calendar to the Wakefield Cup, and has created a great deal of interest among the European countries, more especially with this year's contest being for model gliders, a phase that receives much more attention abroad than here. With others, I'm afraid I looked on this year's event as a foregone conclusion for a foreign win, and it was a pleasant surprise to find that in the final totals, England was placed second, though at one time it did look as though we should be the ' wooden spoonites.'

" With Belgium, Denmark, France, Germany, Great Britain, Holland, Switzerland, and Yugoslavia competing, the event was assured of wide interest, and the types of models were almost as varied as the different languages and accents to be heard throughout the four days.

" The actual technical details commenced on the Friday, when models were measured, weighed and checked at the Y.M.C.A. Headquarters in Great Russell Street, and although a large room and ante-room had been booked, the space was just chock full of gliders and humanity. Models ranged from three to twelve feet in span, and were of all shapes and sizes. To attempt to describe the models in detail is impossible here, but the majority of the continental jobs were of around six to eight feet in span, with sharply dihedral tips in vogue. The English machines were amongst the smallest of the lot, and our chaps will have to get down to some serious thinking on the glider question for 1941. Undoubtedly, very few of us here have given a deal of thought to gliding, and without wishing to appear unpatriotic, I say the British collection of models looked rather a haphazard bunch against some of the foreign equipment.

" Messrs. Smith and Houlberg were kept hard at it, steel rules and callipers in hand, and were later assisted by Mackenzie and Rushbrooke, when the pressure began to get overwhelming. Lunch was partaken at the Corner House, and proved a very jolly affair.

" At the conclusion of the checking, the party adjourned to the Royal Aero Club for tea, where Sir Lindsay Everard welcomed the visitors, and promised to fly down to Fairey's on the Sunday to witness the competition. Dr. and Mrs. Thurston, who had an extremely busy week end, were to be seen everywhere doing the honours among the visiting teams and friends. (This was one of the occasions where I wished I had paid more attention to my French lessons at school, and I shall have to start brushing up in readiness for next year !)

" Saturday saw the commencement of flying at the aerodrome, kindly loaned for the occasion by Mr. C. R. Fairey. Unfortunately, test flying of large machines was taking place, and caused a long delay in the start of proceedings, but that was out of the control of the organisers. While many hitches occurred during the flying period, I would like to stress the fact that this was not the fault of the S.M.A.E. Competition Committee, but more to be blamed on the rather too complicated

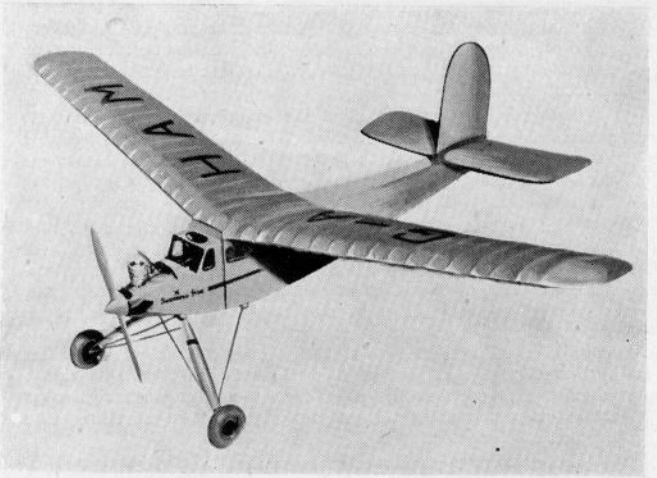


FIG. 88.—*The "Southern Star" petrol model by Mr. Ross that won the 1938 Bowden International Trophy. (' Flight ' photo)*

rules and regulations laid down for this event, many of which I'm afraid were formulated without regard for the interpretation of them, or the expense involved.

" The most serious delays were caused through the lack of range-finding equipment, only two articles being available—and only one being in working order during the first day's flying. This was a great pity, and must have given our visitors a poor opinion of our resources, especially those of our military sections. Foreign enthusiasts seem to be able to obtain much more help from such sources than we can here, as witness the meeting in Yugoslavia last year, when the whole technical side was handled and equipped by the Military. Obviously, the S.M.A.E. are not in a position to purchase unlimited equipment for such an event, and it says much for the way in which things had been arranged that the event was run as efficiently as it was, considering the limitations imposed.

" With the flying order drawn for, flying got under way with conditions far from perfect for model flying. A fair wind, blowing from the ' brook end ' of the 'drome, took models out of sight far sooner than was comfortable, and the range finding gang were hard put to it. W. O. Gutteridge, in charge of the charts, etc., was going at it hammer and tongs, and a word of praise is due to all those willing helpers who did so much towards the running of this undoubtedly difficult event. Air Force cadets under the charge of Messrs. Gutteridge, Crittle, and Adams were of invaluable service, likewise the stewards, time-keepers (under the charge of Mr. Gordon), and many other willing horses. The owner of " Dick Turpin's Kitchen ' must also be thanked for the use of the telephone, many machines being quickly recovered through this service.

" Slowly but surely the first round went on, but by the time a halt had been called for the day, many had not had even their first flight, and there were four rounds to go ! Evidently something had to be done, and representations were made the following day to discontinue the use of the range-finders, and continue on time factors only. This would have been the only reasonable solution to the many difficulties, but certain objections were raised, and the second round was proceeded with, though with both range-finders now working, things were run off smarter. Time was getting so short, however, that the third —and final—round was judged on time only.

Many fine flights were witnessed, one very interesting flight being made by a tailless type, flown by one of the Dutch team. All kinds of durations were being made, and it looked as though England was going to be well and truly down the list, our best time being just under three minutes, by Mr. Hill, of the Lancashire Club, whose machine was flown proxy by " Rushy." (Incidentally, following this flight, after getting the model right up on the end of the string, and having quite a struggle to release it, ' Rushy ' was in great demand as ' official winder-upper ' to the English team !) He certainly had the knack of playing a model like the proverbial trout.

" French, German, and Yugoslavian machines were putting up durations of many minutes, with the English team, not exactly despondent, but nevertheless rather uncomfortable. On his second flight, Mr. A. Cox, of Northern Heights, who was placed third in the trials, made a magnificent flight of 8 minutes 35.5 seconds, and after some considerable time the model was recovered from 8 miles 220 yards away. It was this flight that pushed England up into second place, as, under the conditions,

distance is measured in metres, one point being scored for every metre travelled, whilst duration is scored as one point for every fifth of a second. (Remember this when considering the duration figures in the list, and divide by five to get the duration in seconds.)

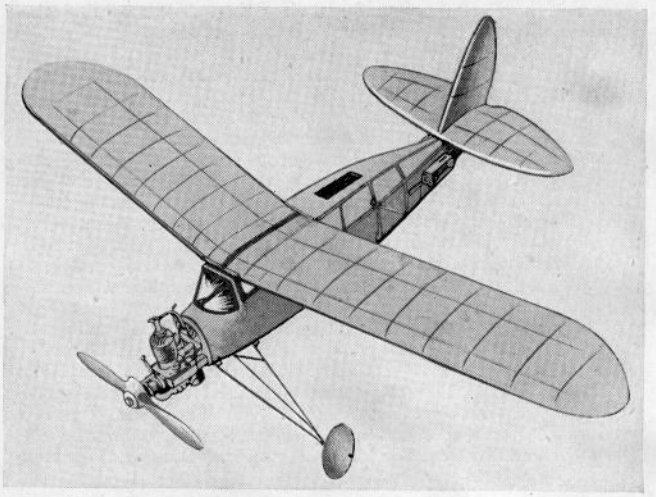
" Apart from this flight, as will be seen in the list, we had no comparison with either the French or German teams, and I think the majority of us felt it rather a hollow victory. However, the fact remains, and our thanks are due to Mr. Cox for pulling the old country out of the depths.

" The final results were eagerly awaited on the field, and much cheery and witty chatter was heard in the interim. At last Mr. J. C. Smith—to whom at long last I hand out an unqualified bouquet !—called for attention, and announced that, subject to recheck, etc., ' France had won, with a total score of 25,278.05.' The enthusiasm was terrific, our French friends truly letting themselves go. (Earlier in the day, M. Guillet had been tossed in a blanket in honour of his fortieth birthday, which coincided with his visit. I don't know whether this was a new experience for him—if not, I am sure he thinks the English madder than ever !)

" Then came the unexpected news that England was second, 800 odd points behind, and Germany third only 400 points behind us. The Germans received a great reception and cheer, and it is my pleasure to record that these chaps were most likeable and sporty, earning the respect of all of us. Herr Schroeter is very popular with many of us here, and his team did their utmost to justify his faith.

" Monday morning was brightened by a visit to Kent, the various visitors being the guests of Dr. and Mrs. Thurston, for cocktails at their beautiful country house at Bidborough. Lunch was taken at a real old English inn at Penshurst, where Lord De Lisle and Dudley presided, and welcomed the foreign teams, etc. It was strange indeed to hear German, French and Yugoslav songs in this atmosphere. Following lunch, his Lordship personally conducted the visitors over his wonderful old home—Penshurst Place. This must surely have given our visitors a taste of the England we love, and will be long remembered.

" And so to the final item—and what an item ! As guests of our beloved Lord Wakefield and the S.M.A.E., over three hundred people sat down to a dinner at Grosvenor House. With Lord Wakefield in the chair, and distinguished visitors in Sir Kingsley and Lady Wood, Col. Moore-Brabazon, H.E. the Yugoslavian Minister, etc., a brilliant affair was witnessed, long to be remembered by all who were in attendance. Lord Wakefield's speech is published here in full, and I would only add that, to many of us, meeting our ' guardian angel ' for the first time, the impression was that instead of a hard-headed business man, we found a gentleman the very soul of kindness. I trust he was amply repaid by the expressions of gratitude and goodwill paid him—the singing of ' For he's a jolly good fellow ' was good to hear—and the enthusiasm truly international.



" Many were reluctant to leave, and the night finished with songs of all nations ! Swiss songs, German lieder songs, and even the 'Lambeth Walk.' It was a scream to hear the ' international Lambeth Walk,' lead by Guillet and ' Rushy,' the latter also tickling the foreigners with a rendering of 'The Old Sow.' Yes—I said rendered ! "

" KING PETER CUP COMPETITION, 1939.

" Final Placings.

		Points
1.	France	25,278.05
2.	Great Britain	24,391.1
3.	Germany	23,974.65
4.	Yugoslavia	22,962.34
5.	Holland	16,959.675
6.	Switzerland	16,328.00
7.	Belgium	5,519.4
8.	Denmark	5,295.575

" VISCOUNT WAKEFIELD'S SPEECH.

" Your Excellencies, my Lords, Ladies and Gentlemen,—Throughout the centuries the conquest of the air has been an ever-recurrent dream of mankind. From close observation of the flight of birds and study of the mechanics of their wing-structure, the great aim has been steadily pursued by successive generations of enquirers. At all vital stages, and particularly during the past twenty-five years, the model has been an essential means of experiment.

" I make this elementary point, because I wish to lay emphasis upon the fact that the movement which brings us together to-night is practical, serious, and of great potential value to the future of aviation. It comprises in its hundreds of local

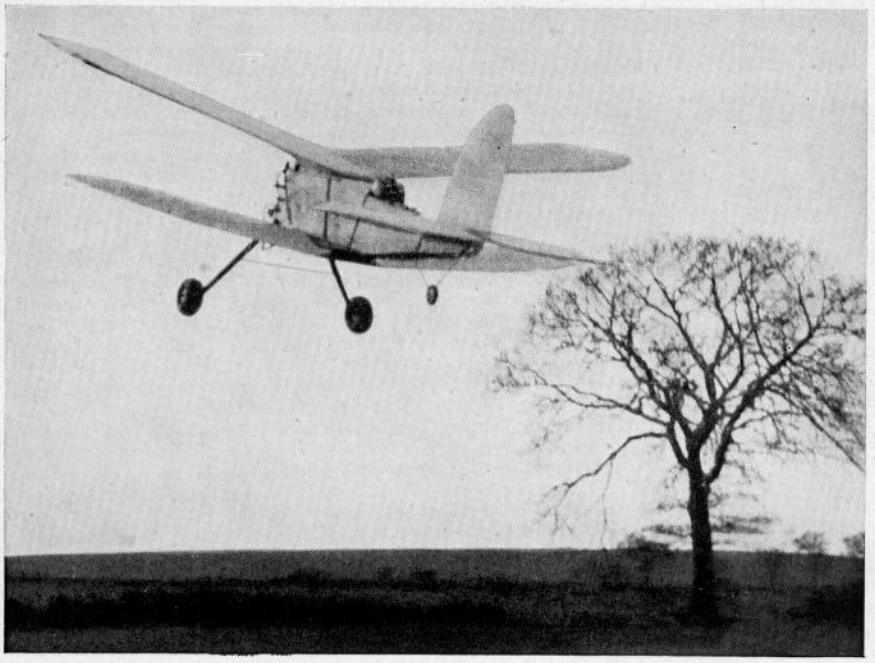


FIG. 89 *(above).—Mr. Ross produces a vest pocket petrol model which is seen at competitions.* (' *Flight* ' *photo*)

FIG. 90 *(left).—The Author's 6 c.c. petrol biplane caught in flight by the camera.*

clubs up and down the land, and similar groups in almost every country in the world, thousands of enthusiasts.

" Some of our guests to-night are very young. Personally, I am glad of it ; for, of our most famous full-scale constructors, some in their own days of youth were doughty pioneers in model-making and flying. The youth of the movement is a sign of its strength and vitality. An examination of the journals and year-books of the movement will show them to be full of most learned articles and abstruse diagrams. The Society of Model Aeronautical Engineers is well named. In Dr. Thurston, its President for very many years, the Society has as its leader a man of high professional standing, from whose enthusiasm its members derive constant encouragement. I am quite satisfied that this international movement has a scientific basis.

" For many of us, it is of equal importance that the pursuit of model aviation is also a sport—a sport in which most of the civilised peoples of the world meet in friendly rivalry. And here I am sure that I speak for all my countrymen in offering a very cordial welcome to the teams from eight European countries who have been competing for the Cup so graciously offered for the first time in 1938 by His Majesty King Peter of Yugoslavia. The British team were fortunate last year in becoming the first winners of the trophy, and so we have the honour of entertaining the visiting teams this year. Mindful of the wonderful hospitality we received in Yugoslavia, we have done our best to show our deep appreciation. I offer my warmest congratulations to the winning team upon their success, and also to all the teams upon their spirit of gallant sportsmanship. We are very happy to think of many friendships, reaching across many frontiers, that have resulted from this meeting.

" This is no new feature of the movement. Over a long period of years another trophy has been the subject of keen and enthusiastic competition amongst teams from many nations. Our visitors from abroad, will, I know, forgive me if I turn aside here, just for a moment, to express our good wishes to the members of the British Team which is leaving for America to make a bid for the Wakefield Trophy. Naturally, I hope for their success, but I am very sure that, whatever the result, the contest will still further cement those long-standing international friendships to which I have already referred.

" The British model aviation movement is very proud this evening to welcome as its principal guest, Sir Kingsley Wood, His Majesty's Secretary of State for Air. His presence confers upon us the right, which we have always claimed, to regard our work as of national value ; at least, I hope that is a justifiable interpretation. It certainly is a compliment which we most deeply appreciate.

" It is a great pleasure to me to couple with this toast the name of my old friend, Sir Kingsley Wood, His Majesty's Secretary of State for Air, to whose speech we shall listen with immense interest. We are delighted to acclaim one who has proved himself to be a great organizer of national endeavour, who has also the wider vision and the genius for friendship, which are the essentials of statesmanship.

" I now ask you to drink to the toast of ' The Science and Sport of Aeromodelling.' "

GALA DAYS.

Gala days in various parts of the country had become a great feature of pre-war days and were at their height just before the war. They attracted huge gatherings of model enthusiasts, and were the counterpart of the Air Displays and Meetings of the full-sized aeroplane enthusiasts. They were generally organized on some large aerodrome.

Mr. Rippon, or " Rip " as he is generally known, will always be remembered for his able work in the London area in this direction, *vide* an extract from a report of one of the last gala days held prior to the war. :

> " Mr. C. A. Rippon and his colleagues of the Northern Heights Model Flying Club were fortunate in having Lt.-Col. J. T. C. Moore-Brabazon, M.C., M.P., to open their seventh Annual Gala at Fairey's Great West Aerodrome on June 18. He came at the invitation of Dr. and Mrs. Thurston. The presence of British pilot No .1, and his speech over the microphone, wherein he described himself as a ' relic of the past,' were a tremendous encouragement to the modelling community."

SOLID MODELS.

The making of solid models has become a very large side of the hobby during the war. War machines stir the imagination of countless people, who wish to keep little replicas. Others just enjoy making something and unleashing their creative powers. The solid can be made with such very little equipment and material in all sorts of odd places where the service men or women and the war-workers may find themselves.

Many thousands of solid models have been used for training service personnel in aircraft recognition and tactics, and the solid model has done a lot in its subtle way to make people air conscious, and I feel sure will lead a number of people to the eventual flying of model aircraft.

FIG. 91.—*Mr. Sharwell's balsa planked petrol model biplane.*

THE YEAR 1941

THE S.M.A.E.

1941 saw the death of our great patron of model flying, Lord Wakefield of Hythe. Tributes were paid by the S.M.A.E. to the help that he had given to the model aeroplane movement. These are contained in the S.M.A.E. Journal describing the Annual General Meeting of the society for 1941. I am, therefore, giving below a copy of the Journal which was published after the meeting, as a very excellent picture of the model movement's war time activities can be obtained from this. I also want to publish this issue of the Journal because it is a record of many of the old names that have done so much for model aviation, for it must be that after the war the individuals closely connected with the S.M.A.E. will be considerably changed.

There are interesting remarks from the American winner of the Wakefield Cup and also the old controversy " slabsider " versus " streamliner " is aired. In this case the " slabsider " is championed. Both have won recent " Wakefields."

" SOCIETY OF MODEL AERONAUTICAL ENGINEERS.

" Notes on the Annual General Meeting of the Society, held at the Royal Aero Club, 119, Piccadilly, W.1, on Sunday, February 9th, 1941, at 10.30 a.m.

" Mr. A. F. Houlberg was in the chair.

" Mr. H. York, the Acting Hon. Secretary, read the minutes of the last Annual General Meeting, which were confirmed and signed. The Chairman then asked Mr. York to give the annual report on the work of the Society. This report was duly accepted and Mr. York was given a vote of thanks.

" At this juncture it was suggested that those present at the meeting should rise and stand in silence for one minute in memory of our patron, Lord Wakefield of Hythe, and other members of the Society who have passed away. The suggestion met with the approval of the meeting, and the silence was duly observed.

" While the balance sheet was being handed round, Mr. Houlberg announced that Mr. D. A. Russell had offered to print and provide paper for the S.M.A.E. Bulletin. He proposed that the Bulletin should be issued monthly and that Mr. C. S. Rushbrooke should do the necessary lay-out on receipt of the material from the Editor of the Bulletin. This offer was entirely free of cost to the Society. The meeting warmly thanked Mr. Russell and had very much pleasure in accepting his generous offer.

" Mr. J. C. Smith, the Hon. Competition Secretary, gave his annual report on the 1940 competition programme, which was duly accepted, and Mr. Smith was given a hearty vote of thanks.

" The meeting then discussed the proposed constitutional rules and Mr. Houlberg read out the individual items for the meeting to vote on. One or two slight alterations were made and the rules were then accepted. Mr. Bell was accorded a vote of thanks for his work.

" It was decided that the office of President should remain open *pro tem.*

" The following gentlemen were then elected :—

" *Vice-Presidents :* Lieut.-Col. C. E. Bowden, Mr. C. R. Fairey, Col. Moore-Brabazon, Capt. Pritchard.

" *Chairman :* Mr. A. F. Houlberg.

" *Vice-Chairman :* Mr. C. A. Rippon.

" *General Secretary :* Mr. A. G. Bell and Mr. H. York were both proposed as General Secretary. A ballot was taken, which resulted in favour of Mr. Bell by 15 votes to 11.

" It was proposed that Mr. H. York should be made a Fellow of the Society in recognition of his past work. Mr. Houlberg coupled his name with this proposition, which was carried unanimously.

" *Hon. Treasurer :* Mr. L. J. Hawkins.

" *Hon. Competition Secretary :* Mr. J. C. Smith.

" *Hon. Press Secretary :* Mr. H. York.

" *Hon. Records Officer :* Mr. C. R. Clarke.

" *Hon. Technical Secretary :* Mr. A. F. Houlberg and Mr. M. R. Knight were both proposed as Technical Secretary. A ballot was taken, which resulted in favour of Mr. Houlberg.

" A vote of thanks was accorded Mr. R. N. Bullock for his past work in this position.

" It was decided that the auditors of the Society should be drawn from amongst its members, and Mr. D. A. Russell and Mr. E. H. Keil were elected to this position.

" It was proposed that Messrs. L. J. Hawkins, M. R. Knight and D. A. Russell be made Fellows of the Society. These three proposals were carried unanimously, and the gentlemen were duly elected.

" By virtue of their office, the following gentlemen automatically became members of the Council : Messrs. Houlberg, Rippon, Bell, Hawkins, Smith, York and Clarke. The following gentlemen were then elected to the Council to bring the number up to the desired twelve : Messrs. F. A. Briggs, H. P. Costenbarder, H. W. Hills, M. R. Knight and Flying-Officer P. R. S. Gutteridge.

" At this juncture Mr. N. Blacklock handed to Mr. Houlberg the Gutteridge Trophy which he had won during 1940. Flying-Officer Gutteridge took over the trophy for photographic purposes.

" A claim for an indoor Round-the-Pole record with a Class A model of 2 minutes 57.5 seconds made by Mr. Clarke was granted.

" Mr. Briggs asked that the S.M.A.E. recognise spar model records.

" It was proposed that the S.M.A.E. should set up standard record classes for all types of models. This proposal was carried.

" Mr. C. S. Rushbrooke announced that the Fighter Fund stood at £219 10s. 2d., and after some discussion it was finally decided to close the fund.

" Mr. H. York and Flying-Officer Gutteridge announced that they had been in communication with the Air Ministry *re* the Air Training Corps. Correspondence was still in progress.

" The meeting closed at 4.55 p.m. with a vote of thanks to Mr. Houlberg, who had occupied the chair.

" H. YORK, *Hon. Press Secretary.*
" REPORTS.
Hon. Acting Secretary.

" 1940 will be regarded by many associations organizing outdoor activities as a year of very serious decline. This, I am

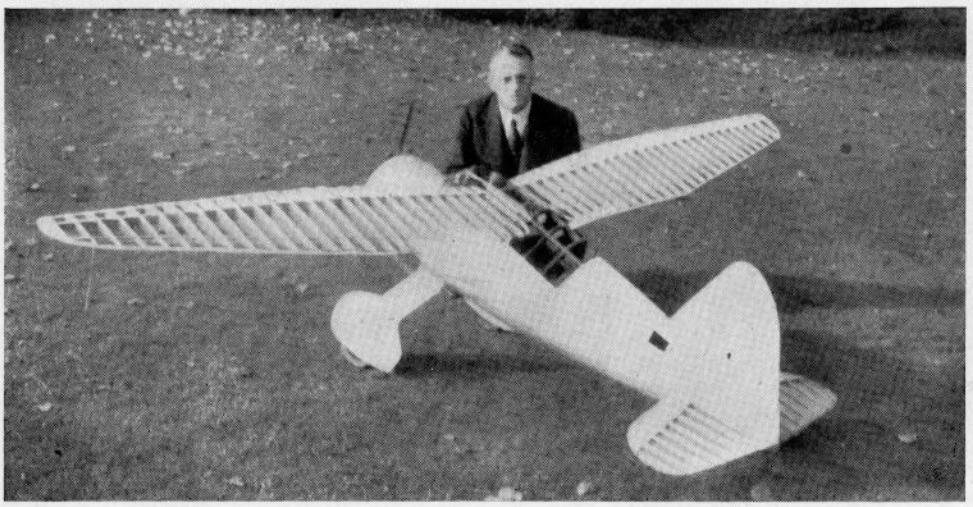


FIG. 92. — *Mr. Russell is seen with his magnificent scale* 10 *ft. span Lysander model.*

happy to say, does not apply to the Society of Model Aeronautical Engineers and its affiliated clubs.

Mr. Cosh, in his annual report last year, said that in August, 1939, when the Society was at its height, there were 134 affiliated clubs. In the first three months of war, this figure dropped to 85. Last year, 1940, despite greatly increased enemy activity, 81 clubs re-affiliated, and 22 new clubs joined the Society, making a total of 103, an increase of 18 clubs on the year. I think we can congratulate ourselves for making up this leeway, and I feel sure that a word of praise and thanks to the officers of affiliated clubs who have so gamely carried on, is not out of place here. To the officers and members of those clubs, who, through no fault of their own, have been compelled to temporarily cease their activities, I would say that if there is anything the Society, its officers or members of the Emergency Commttee can do, please let us know. We extend a hearty hand of assistance.

" The Emergency Committee is also to be praised. The members have met regularly and have given many hours to your interests. The Constitutional Rules and the new indoor Round-the-Pole competitions, are only two items bearing witness that you, in your wisdom, elected live and capable men, and I feel confident that it is their experience and guidance that has kept the Society alive and healthy.

" Mr. Hawkins will shortly give you the financial position of the Society. As is to be expected in these difficult times, our credit balance has depreciated, but as you are aware, the Society is not run for profit, simply that we may all enjoy our hobby to the full. I am sure that we greatly appreciate having Mr. Hawkins' guiding hand on all questions of finance, and I hope you will take advantage of a suggestion he will make when he gives his report. This will mean extra work for him, but he seems to thrive on it.

" Mr. J. C. Smith, the Hon. Competition Secretary, will give his annual report on the 1940 competitions. I understand that if the difficult times are taken into consideration, the programme was most successful. I hope that I am not poaching on Mr. Smith's preserves when I say how much those happy centralized competition days are missed, and the sooner he calls for assistance to put up the enclosures on Fairey's the better we shall all like it.

" It is now my grievous duty to recall the greatest loss the Society has ever experienced, the death of our patron, Lord Wakefield of Hythe, G.C.V.O. Lord Wakefield had been associated with our movement for very many years. Indeed, he presented the original Wakefield Cup prior to the last war. No words of mine can amplify the high regard and esteem which we all held for him. We can only reiterate our expressions of heart-felt sympathy to Lady Wakefield, and we trust that courage and fortitude will be given her.

" Before I conclude, I should like to thank everyone, from our Chairman, Mr. Houlberg, down to the newest member of the Society. Not once in my five months of office as Acting Hon. Secretary have I asked for assistance without it being forthcoming immediately and without stint.

H. YORK,

Acting Honorary Secretary.

" *Competition Secretary.*

" In presenting this report, it is as well to remind you all that the competition season just past was in the nature of an experiment. Its success, considering all things, no one can deny. My opening remarks last year contained something of a prophecy when I said, 'The phase ahead will call for all our ingenuity to master.' How true were those words !

" Despite immense difficulties, the 1940 programme—though in my opinion optimistic at the time of arrangement—has been most successfully concluded, no less than eight events, all of a decentralized nature, being run—one, the Gamage Cup, attracting 206 entries. As the season progressed, entries diminished, noticeably from London and around, for reasons all too well known.

" Now to some reference to outstanding performances.

" The Halifax M.A.C., for the second year in succession, is to be generously congratulated on gaining the Plugge Cup Championship, with a total of 1,055 points. This result has not hitherto been published, but it is one I am happy to sort out from my badly—or shall I say well ?—shuffled correspondence. A grand effort, Halifax.

" Another result disentangled is that of the Thurston Individual Cup. Mr. A. Tindall, of the Lancashire M.A.S., wins this splendid trophy with no less than 383 points (allocated as for the Plugge Cup). He thus becomes in effect the S.M.A.E. Competition Individual Champion, and he certainly deserves the sincere congratulations of all. No less than 323 separate modellers competed during the year, many of them for the whole programme of competitions.

" The past year has been, as I said, very difficult, and the fact that continuity has been preserved augurs well for the future of the Society. It is pleasing to note that new clubs affiliated during the year have sent in entries for most of the competitions, and while not figuring as actual winners, many new names appear well up on the result sheets.

" Difficult times undoubtedly lie ahead. Your officials find so many calls on their limited spare time, but fully appreciate your co-operation and understanding when things do go a little wrong !

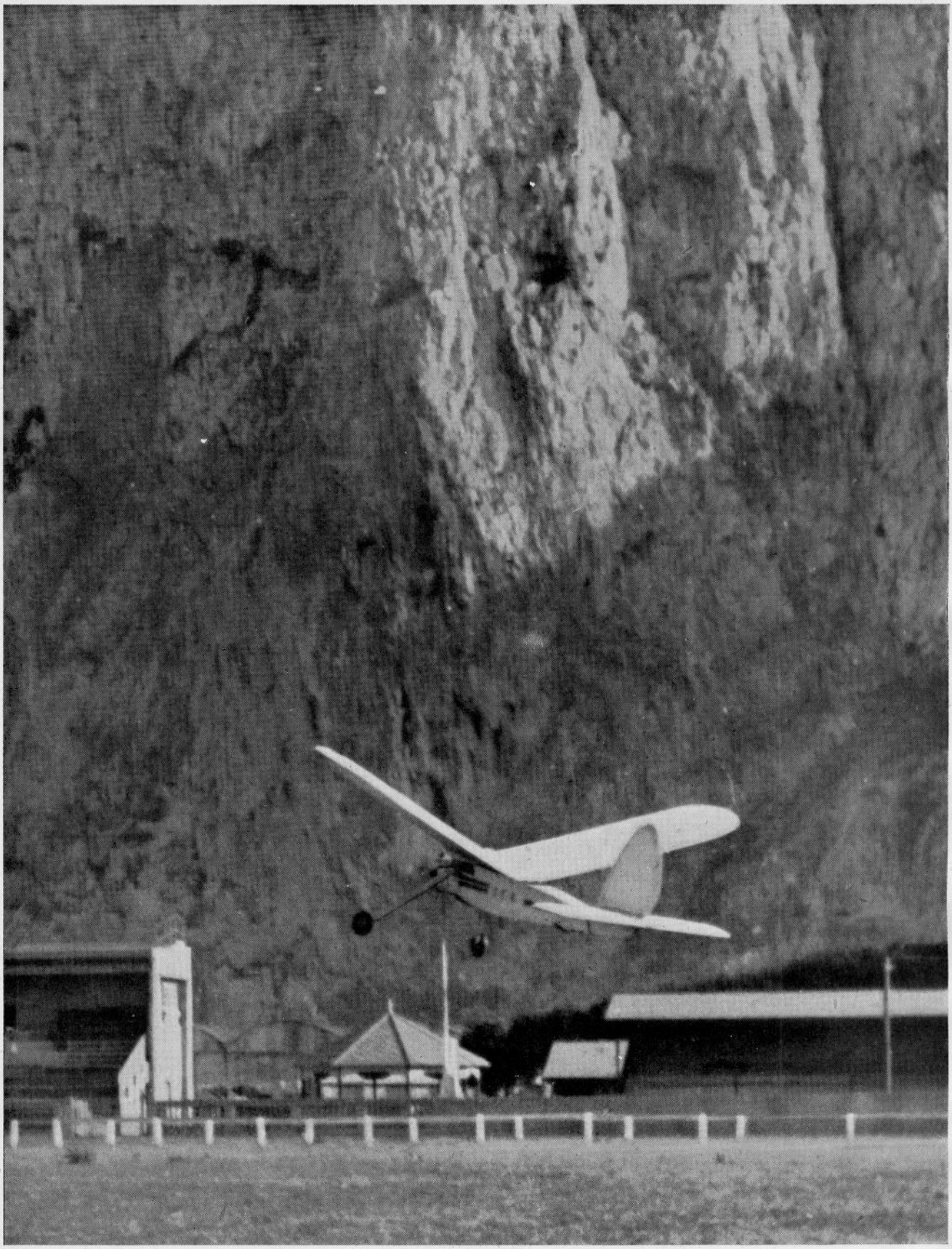
" In advancing to a new competition season, clubs are reminded that the Air Ministry has already had occasion to limit our activities—fortunately only in a minor way. Tactful handling at the time succeeded in retaining most of our liberties, but please do not let such sympathetic treatment by the authorities lull any of us into carelessness.

" In closing, I should be grateful to be allowed to record appreciation of our late patron, Lord Wakefield. We have lost a leader and sponsor whose loss we do not yet appreciate. To him we undoubtedly owed the position we held among aeromodellers throughout the world before the ' upheaval '—and which we all hope we shall hold again. Loved and respected by us all, his associations with us during his lifetime will be remembered always.

J. S. SMITH,

" *Hon. Competition Secretary.*"

FIG. 93.—*Dick Korda's American model wins the* 1939 "*Wakefield*" *held in America. This win for a slabsider has reopened the arguments for and against the type.*



The author's high wing petrol model climbing away from the racecourse at Gibraltar with the famous "Rock" forming a rugged background. This was the first petrol model in history to fly at Gibraltar.

PART FOUR

FUTURE FLYING

Owing to war conditions I put aside my pen in connection with this book in 1943. Now that the war is over and the book is going to press I am making a rapid and I admit very incomplete survey of the period 1944 to early 1946.

One can only hope to pick on some main events, and a few typical models of interest from the many that have been produced.

Although the war was at its height in 1944 and 1945, there was quite a lot of activity quietly going on in the model world—People snatched odd moments and opportunities during their various war activities, and the model journal sponsers looked ahead where possible with a view to starting the ball rolling for the future. Those clubs that were able to do so did likewise.

Let us look for a moment at three important events under this heading that will doubtless have a considerable effect on the future history of the model aircraft movement.

In the autumn of 1943 a considerable section of opinion believed that the time was ripe for certain major extensions in the policy of the S.M.A.E. To give point to their beliefs a sum of many hundreds of pounds was offered on the occasion of the Annual General Meeting to provide for a paid whole-time Secretary and permanent London Headquarters. The Society, however, was not prepared to take this momentous step and the offer was withdrawn.

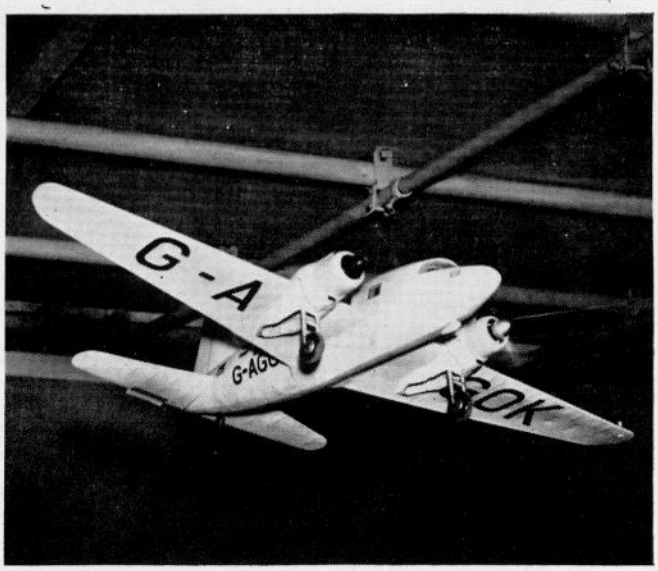
It was about this time that our old friend Mr. Rippon, a pioneer modellist already mentioned in this history, conceived the idea of a new body largely devoted to the interests of petrol modellers. The idea appealed, but, before coming to fruition, was discussed at length, and a wise decision made, extending its activities to embrace every phase of aero-modelling and put in hand those radical changes in outlook that the S.M.A.E. had been reluctant to consider. So, early in 1944, was born the Association of British Aeromodellers under the Chairmanship of Mr. Rippon, while Sir Robert Bird, Bart, M.P., J.P., became the President.

This new body received considerable support from influential enthusiasts including Mr. D. A. Russell, M.I.Mech.E., Managing Editor of the "*Aeromodeller*," who followed his usual custom of giving unstinting assistance to any body acting for the good of the cause. Permanent Headquarters were established at 28 Hanover Court, London, W.1., a whole time Secretary engaged, and an intensive press and publicity campaign launched.

As a result of this, and the work of the Public Relations Officer, Mr. F. C. Carter, the A.B.A. received adequate support from a large proportion of the Model Aircraft trade, practical assistance from some of the best known enthusiasts in the country, to mention but one or two, Dr. J. F. P. Forster, Mr. H. W. White, B.Sc., Sqd. Ldr. Peter Hunt, Mr. Lawrence Sparey, Mr. B. A. Germany—who is now Chairman following Mr. Rippon's resignation for business reasons—and hosts of other figures well known for their work in model aeronautics. To mark the progress made it is interesting to note that by the end of 1944 even "*The Times*" was devoting its columns to a report of the Association's activities.

The A.B.A. appeal has been both all embracing and yet selective. Thus members can belong generally or can also join sections devoted to their particular speciality. Nine main divisions include rubber duration, gliders, scale models, petrol models, flying boats and seaplanes and experimental types. Another popular innovation

Fig. 62.—*Lord Balfour of Inchyre shares a joke at the opening of Britain's Second National Aircraft Exhibition, with Lord Winster, Minister of Civil Aviation, in the centre, and Mr. D. A. Russell on the extreme left.*



was the reference library which placed a comprehensive selection of model aeronautical books at the disposal of members through the post. Hundreds of volumes a month now pass to and from the London Headquarters. To keep in touch with the fast growing membership a fortnightly News Letter was instituted, which is sent free to every member and affiliated club.

Affiliation of existing bodies was a cardinal point in the policy of A.B.A. Amongst bodies officially affiliated are the Air Training Corps, L.C.C. Men's Evening Institutes, and nearly one hundred clubs all over the country. A new section now caters exclusively for Club interests.

A selection of handsome cups and trophies have been donated for annual competition and a number of successful contests held. As I write the A.B.A. announce an International Eliminating competition to select a team to compete in the Irish Internationals, where teams from several countries are expected including representatives from the U.S.A.

This cleavage in the ranks of aeromodellers naturally caused a considerable discussion and partizanship. Some took the gloomy view that a split in the solidarity of the ranks of model enthusiasts was bad for the movement's future, whilst others felt that it had added a spur to the efforts of the S.M.A.E. in the form of healthy competition. Only the future will show which school of thought is correct. As an existing Vice President of the S.M.A.E., and also a member of the A.B.A., I wish both success and healthy competitive rivalry tempered with a spirit of friendliness and determination to serve the individual model enthusiast, not forgetting that the model movement has a very important place in making the youth of the nation airminded in a world where the British Empire owes its greatness to its strength in the air and on the sea, in the civil world of enterprise and in defence. It is my earnest hope that a fusion of these two bodies will take place in the future.

The Second noteworthy event in the period under discussion and one that has already, and also will doubtless have a very considerable future effect on the success and publicity of the model aeroplane movement, has been the organization of an exhibition devoted solely to Model Aircraft. Mr. D. A. Russell, The Managing Director of the "*Aeromodeller*," organized a National Exhibition of Model Aircraft at Dorland Hall in the centre of London during 1945 and again in 1946. The 1945 exhibition had a most encouraging reception and this has been followed up by an even greater success of the 1946 exhibition also held at Dorland Hall.

Mr. Russell and his fellow organizers can congratulate themselves upon the ample proof of success obtained in the great interest shown by the public. The aircraft industry, as we have seen in the early pages of this book, was largely based on the early efforts of its leading members in the model field. The Industry showed its interest at Dorland Hall by being well represented amongst the visitors. About one person every ten seconds non stop for eleven hours per day passed through the Exhibition for twenty-three days. These figures give a very clear indication of the interest taken in model aircraft in 1946. Especially is this so when it is remembered that there have been several other smaller but

Fig. 63 (Above).—*The electrically driven scale model Vickers Viking built by Mr. J. S. Evans of Rothwell. This model was remote controlled including the retracting undercarriage.*

Fig. 64 (on left).—*A superbly detailed scale model of the Hawker Hind built by Mr. K. A. Vicars and judged to be the most outstanding model in the 1946 Exhibition.*

very well attended exhibitions staged in towns outside London.

The 1946 Dorland Hall Exhibition was opened by Vice Admiral (Air) Sir Dennis Boyd, K.C.B., C.B.E., who was responsible at the time for Royal Naval Air matters. Their Royal Highnesses The Duke and Duchess of Kent and Her Royal Highness the Princess Alexandra honoured the exhibition by paying a visit.

There were many other distinguished visitors, including Lord Balfour of Inchyre, Lord Winster, the Minister of Civil Aviation, that great sportsman and racing motorist, Earl Howe, Sir Frederick Handley Page and Sir Alliot Verdon-Roe both pioneer aeromodellists already mentioned in Part I of this book and of course the leaders of vast aircraft firms today ; Rear Admiral (Air) M. S. Slatter, Vice-Controller (Air) R.N., Air Attaches of the Turkish, Soviet and Danish Governments, and the well known writer on aeronautical matters, Mr. C. G. Grey, a great advocator of safety devices for civil flying.

Having just returned from the British Army of the Rhine I was able to visit the exhibition. My first impression was of the vast numbers of models of all shapes and sizes exhibited (approximately 2,000 I was told), also the very high standard of conception, construction, and finish displayed. Not so many years ago it was unusual to see many well covered models even at an exhibition. Now one could find little fault with covering and finish. There was a very considerable advance in the design and the size of the sail-planes on view, although there is still a great deal of room for improvement in this field. We in this country have sadly lagged behind the Germans, both in the full sized and the model sailplane. However there were encouraging signs of improvement in this direction at Dorland Hall. I had examined some of the outstanding features of sailplanes on the continent and particularly in Germany, for my Army duties caused me to travel all over Germany, Holland and Belgium. I had also discussed the matter with knowledgable Germans. These features might be summed up by the fact that the Germans have taken their soaring very seriously and scientifically, whereas we in this country have left it to a few sporting enthusiasts to ferret out the secrets of the subject. The Germans have carefully submitted their models to wind tunnel tests. They use weight to give momentum, as in the case of soaring birds like the Albatross that has to soar for hours over the vast expanses of the Atlantic or perish. The Albatross for example weighs approximately 30 lbs. has a wing span up to 10 to 11 feet and a surface of about eight and a half square feet. The Germans build their models and full sized craft in a really large size, the models with wing spans of nothing less than 6 feet and generally considerably more. They are great believers in simple straightforward streamline shapes, and the suppression of all excrescences. These beautiful lean lines they choose never have any peculiar curves, such as bentbacks and bulging bellies. They use a high aspect ratio with wings like long thin Stilleto blades, mount their wings well fared into a high wing position, and they invariably place their tailplanes along the top of the oval fuselage and ahead of the fin and rudder. There is also usually a small under-fin in the form of a rear tail skid. They maintain that " gull-wings " and high mounted tailplanes are not as efficient when all the pros and cons are weighed up, as the normal high wing mounting and straightforward V dihedral.

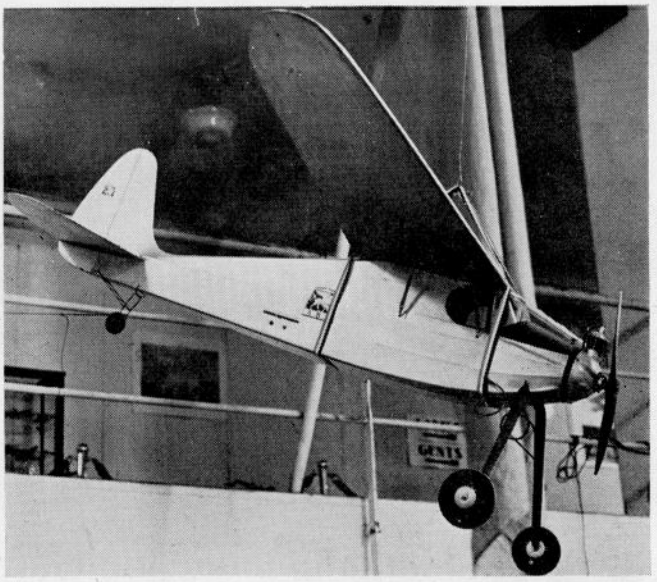
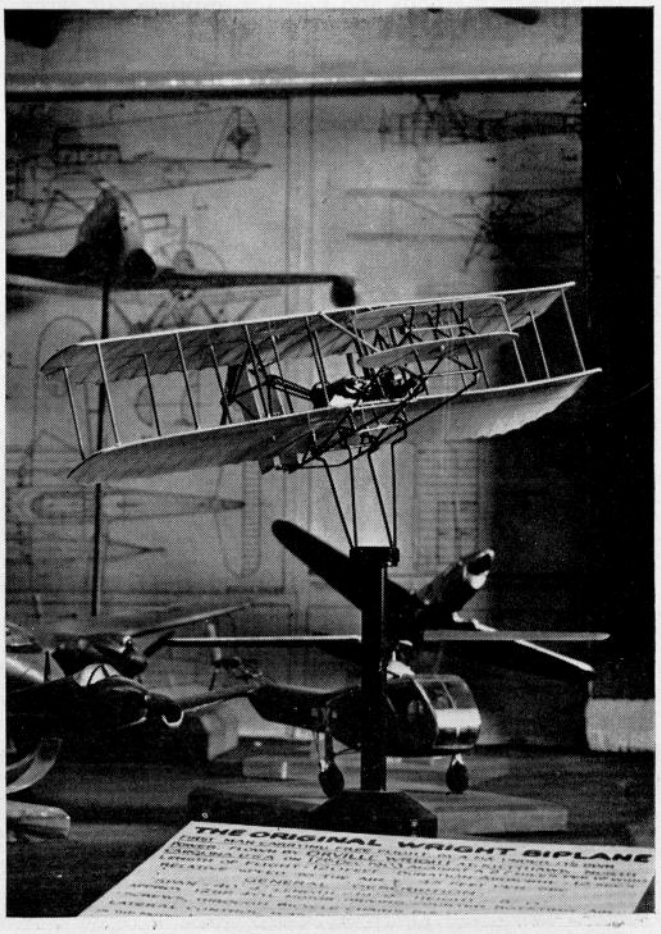


Fig. 65.—*A clean looking petrol model built by Mr. J. S. Balfour which took first place in the first "Aeromodeller" Exhibition.*

Fig. 66 (below).—*A magnificent 1/72 scale model of the Wright biplane built by Mr. C. B. Maycock of Barnet.*



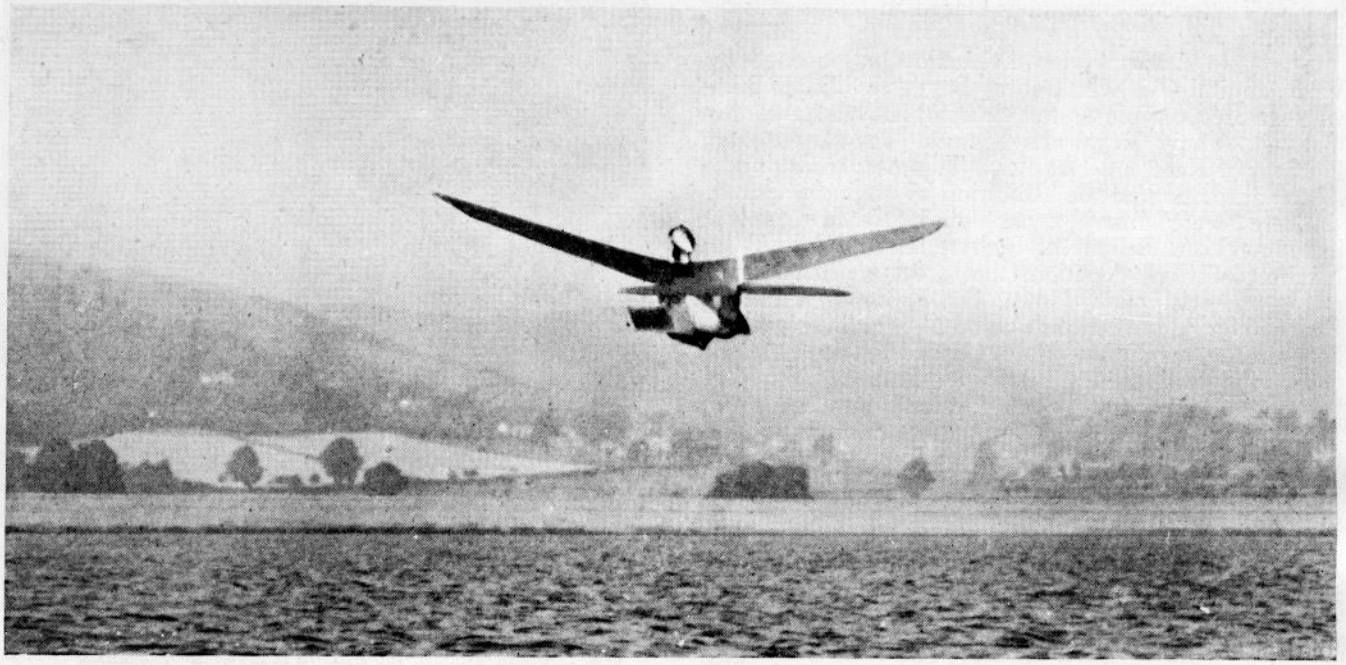


Fig. 67.—*Dr. Forster's first flying boat climbing steadily after taking off the sea at Porlock, Somerset.*

They also are great exponents of a high gloss finish.

There is little doubt that the Germans know their subject as far as sailplanes are concerned, and that they have expended an enormous amount of energy on research over this subject. It therefore behoves us to examine their methods and perhaps improve our rather behindhand model and full sized soaring knowledge.

I am including three photographs I took of German full sized sailplanes that help to bring out German practice.

In my view a large exhibition like the Dorland Hall would be of even greater benefit and interest to serious aeromodellists if the outstanding models were fearlessly ctiticised by knowledgable people in the "model" press, also if the prize winners of each class were exhibited together on some central stand. Critics are by no means always right, but they do stir up thought and discussion which leads to progress.

I was sorry that Mr. Temple's beautiful sailplane "Celestial Horseman" was absent from the exhibition. Mr. Temple is a designer who understands the usefulness of size and weight coupled with cleanliness of form, stability and finish. This model was the pride of the 1945 exhibition and should have formed a lesson to British sailplane enthusiasts.

Mr. P. Smith's "Apocalypse" was a very fine piece of craftsmanship, and was finished in an exciting bright yellow with a lovely smooth surface. It was large and had many fine attributes, but one wondered why it had to have that peculiar shaped curved fuselage and tail mounting, which was not a true streamline. A high mounted tailplane is supposed to help stability, but as the Germans have found out it also causes out of place longitudinal leverages, and provided the fin is mounted so that it is free to act in reasonably clean air when the model is being tow-launched at a very acute angle, the tail mounted normally as the Germans do, will give all the stability required and allow of a really clean streamline form.

Another example of the intrinsic beauty of a well

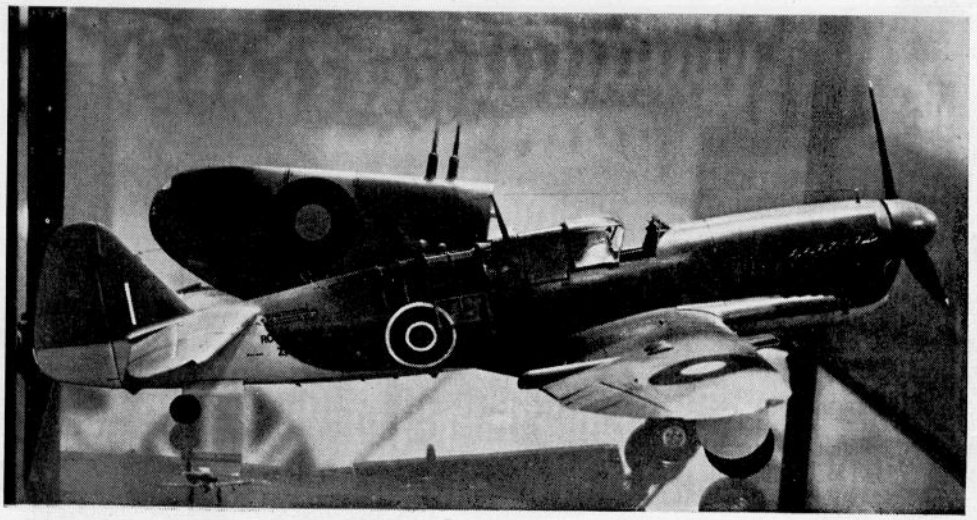


Fig. 68.—*Probably one of the most detailed models ever produced, this Fairey Firefly was the centre of attraction at the first Dorland Hall Exhibition. It was constructed in metal by Mr. C. A. Tidman, a draughtsman employed by the Fairey Aviation Company.*

designed sailplane was Mr. E. W. Evan's " Avis."

The " Round the Pole " (R.T.P.) model was ingeniously displayed in the form of a really beautiful scale model of the Vickers Viking, which flew over a circular track of Perspex of ten feet in diameter. This model was controlled by Flight Lieut. Tucker by remote control and took off and landed on the Perspex track. The Viking was powered by two 18 volt electric motors, running off the normal 240 volt mains, via a transformer the motors turn under load at 2,500 r.p.m.

The power is controlled by two throttle controls, connected to rheostats, giving ample and realistic variations in speed from idling to maximum. Normal full throttle speed is about 25 m.p.h.

Each of the four legs of the undercarriage is spring loaded, and the two units are retractable from the control box. A small 18 volt motor, weighing one and a half ounces, operates through a friction drive of 1,000 : 1 reduction, the crank for moving the undercarriage mechanism. Micro-switches stop the motor in the fully up and down positions. Red warning lights and a horn urgently demand that the " pilot " lowers the wheels, should he throttle back with them up. The whole model weighs 2½ lbs., and is a testimony to the fine workmanship of the builder Mr. J. S. Evans.

I noticed that each time this and the smaller duration type R.T.P. model was flown around the pole under their electric power, the crowd examining various models in the building made a mighty rush to the rails in order to see the interesting spectacle of these models open up their engines, taxi off, get their tails up and then become airborne after a short run, and in the case of the Viking retract the undercarriage just like the real thing.

A working model is always a tremendous draw, and accomplishes a great deal towards arousing interest and propaganda. In this respect it is interesting to note that the action picture presented by scale models flying around a pole forms a new and fruitful form of advertisement for aircraft firms. If every manufacturer and air transport company had in their show rooms a flying miniature of their latest aircraft, the public interest would increase enormously.

Apart from the publicity aspect, model aircraft can also be shown to have their uses in the present day Aircraft Industry for research purposes, as they did in the early pioneer days.

At the Dorland Hall there was a fine model of the Gloster Meteor IV made by the Gloster Company, this being the original wind tunnel model used to examine the effect of lengthening the jet unit nacelles. It will be remembered that the Meteor III has very short extensions of the nacelles ahead of the leading edge. It was thought that this might bring the centres of pressure of the nacelles and the wing too close together, and thereby cause a shock wave to form at comparatively low speeds. Accordingly, the model was built, embodying a new nacelle entry further ahead of the leading edge. The experiment was conducted in a wind tunnel, and the amount of success achieved can be judged by the results. No undue stresses occurred in the record attempt except the straining of a few rivets—a simple matter to rectify.

Here is an excellent example of the scientific application of models to the demands of industry.

The model Compression Ignition engines, more popularly called diesels, were developed during the war in Germany, Switzerland, France, and Italy, where they reached quite a high degree of development.

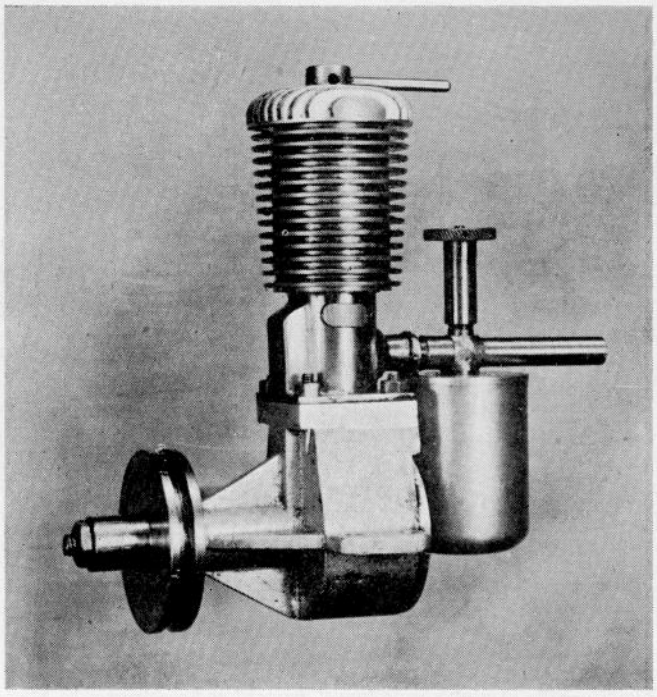
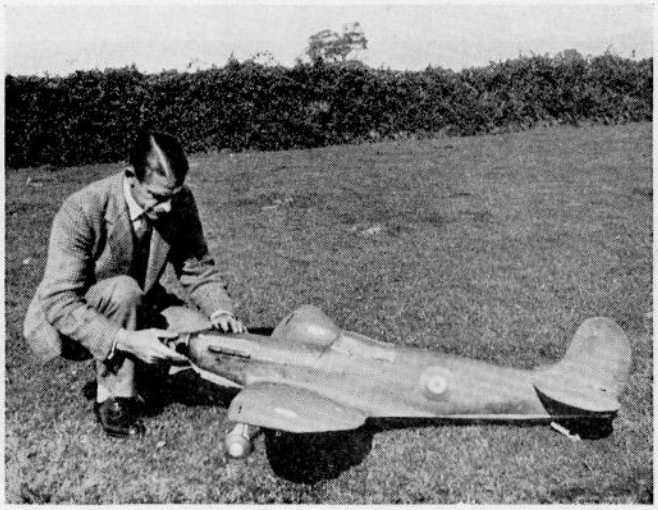


Fig. 69 (above).—*An example of the compression ignition of " Diesel " engine designed and built by The Research Dept. of the Aeromodeller, which has pioneered research on these engines in this country.*

Fig. 70 (below).—*Dr. Forster and his flying scale petrol driven Spitfire which incorporates an extension shaft drive to the airscrew.*

During the war years this type of power unit for model aircraft seems to have been neglected by Britain and America. Recently however, strides have been made in Britain by several experimenters, and examples are coming on the market. There were several Diesels on view at Dorland Hall designed by the Aeromodeller Research Staff with a number of interesting petrol engines including one ambitious and well conceived model aero engine by a young man of only 18.

The diesels are normal ported two strokes, and without any of the usual full sized complications of fuel injection. They breathe mixture from the usual model needle



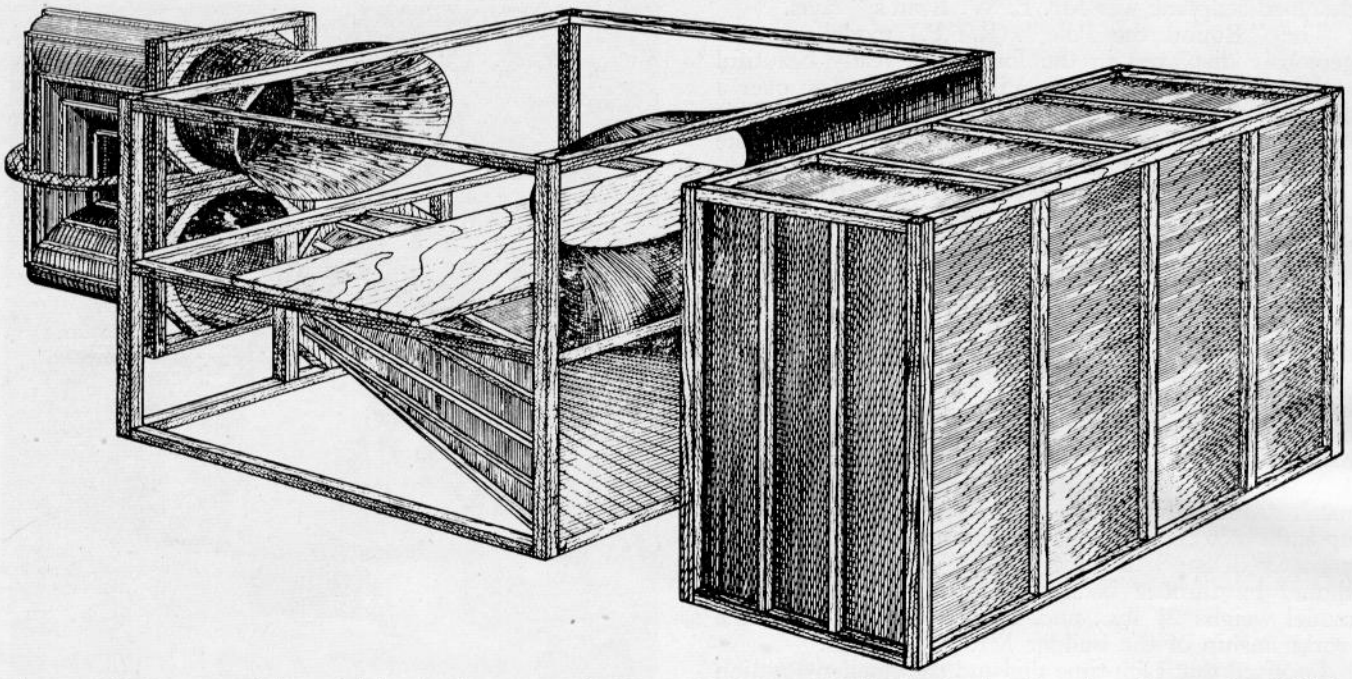


Fig. 71.—*The Prestatyn wind tunnel designed and constructed by Messrs. Hardman and Walker for the scientific testing of low speed model flight.*

valve " Carburetter ". The compression ratio is around the neighbourhood of 16 to 1, whereas the model petrol engine has a compression ratio of approximately 5 or 6 to 1.

The diesel has to withstand much greater stresses as a result, and is therefore more robustly constructed and weighs more. This matter of added weight is however offset by the elimination of all electrical ignition gear. The final result is about the same weight for any given c.c. between a model petrol and model Diesel engine. Diesels like their full sized brothers are inclined to knock, but the diesel knock should not be confused with pinking of a petrol engine, which is a local affair. Diesel knock is due to shock and comes from the whole structure. It is therefore important that the amateur constructor of a model diesel shall build really robustly.

In the full sized diesel engine air is compressed at a similar high compression ratio by the piston. But at the most suitable moment, around the top of the compression stroke, a small metered quantity of fuel is injected. The fuel ignites in the very hot air caused by the high compression. The resultant expansion forms the power stroke. The model diesel however " cheats " by using a percentage of ether in the fuel, so that when the mixture is compressed to a suitably high temperature the fuel automatically ignites. The forced injection fuel apparatus is therefore eliminated.

One difficulty of the model diesel for aerowork is the absence of electrical ignition that can be switched off by a time switch in the air. The engines, with one exception, that I have so far seen have had no device to control the duration of engine run so important for safe model power flying. It is obvious that in this densely populated country we aeromodellists will soon become very unpopular if we fly our powered models away into strange gardens. An Englishman's house is his castle, etc., and he does not like strange appliances, aerial or otherwise, arriving uninvited. Neither can the rambling pedestrian, who does not happen to be a happy modeller, be expected to appreciate a screaming

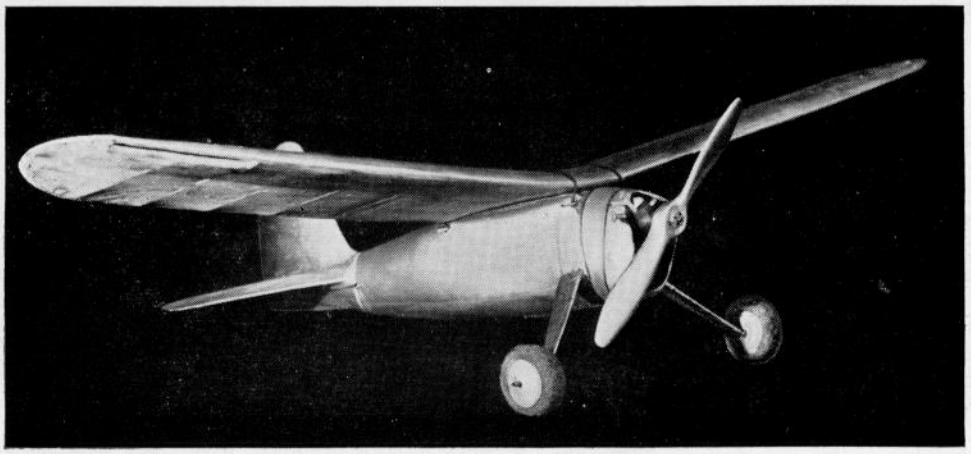


Fig. 72.—*One of the smallest petrol models ever built is Mr. P. E. Norman's 31″ span "Natsneez."*

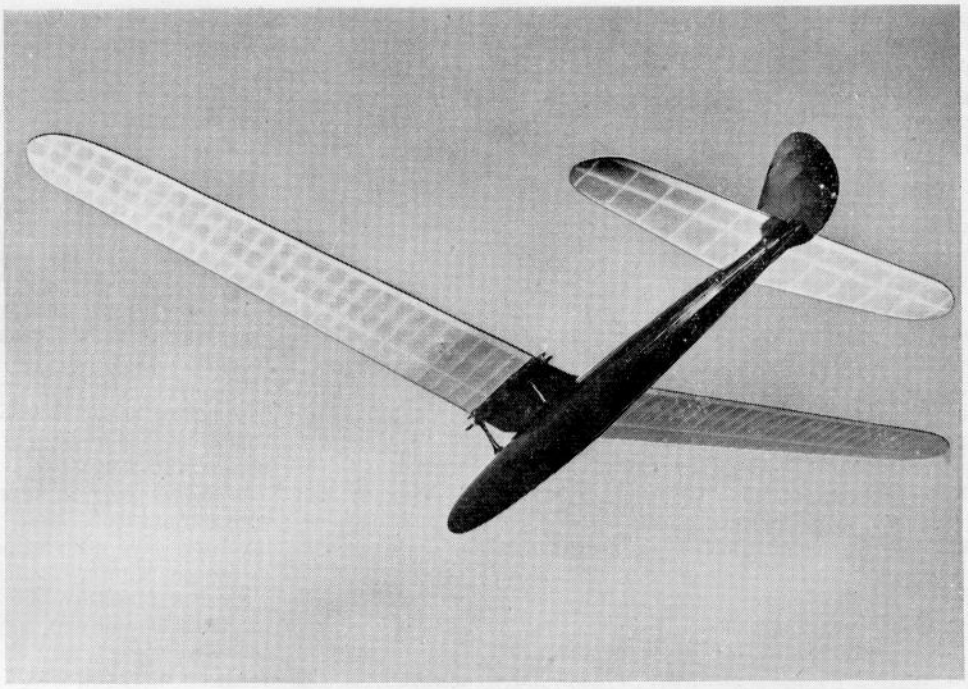


Fig. 73 (right).—*Mr. G. W. W. Harris' famous sailplane "I.G.O." which has the remarkable record of an 88 mile flight to its credit.*

Fig. 74 (below).—*Col. Bowden's 8' span low-wing monocoque petrol model constructed with the aid of simple tools which were carried around in an attache case on his war duties.*

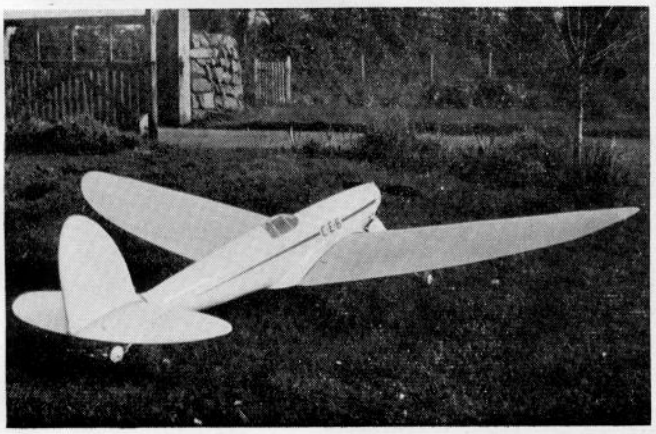
Fig. 75 (below right).—*Silvio Lanfranchi, winner of the 1944 and 1945 Sir John Shelley Cup Competition, who also placed in the 1945 Bowden contest. He is shown here with his model "Indian Chief" at the 1945 Sir John Shelley Cup, amidst typical British weather and under the admonitory finger of Sgt. Rushbrooke, Editor of the "Aeromodeller."*

diesel-engined model whizzing by his person, when going about his lawful occasions. The exception I mentioned is a German made diesel that I own. It solves the problem in a very simple and ingenious manner. An ordinary "timer" operates a catch that releases an air tube on a sleeve around and below the fuel needle valve tube. This air tube flies back on release due to the tension of a spiral spring and registers with a hole in the needle valve tube that is normally covered by the sleeve. The suction on the jet is broken and the engine stops. This method can be adapted to any model C.I. engine.

A point that is noticeable, is the fact that these model diesels, if well designed and constructed, develop greater power at lower R.P.M. than petrol engines of similar c.c. This is a considerable advantage, because lower revving propellers can be used more efficiently at speeds around 2,500 to 3,000 r.p.m., which are far more effective than the absurdly high r.p.m. around 5,000 to 7,000 that so many baby petrol engines produce their maximum power. A propeller revolving at these speeds expends a great deal of its efficiency with stalled blades.

The field of experiment with model aircraft is becoming wider every day. Radio control is now a practical proposition. For many years target aircraft of the R.A.F have been controlled by radio, and model engineers have long been developing a similar system of control for model aircraft. The only limit to the possibilities of such apparatus is the weight penalty and the carrying capacity of the model. The system of control employed in full-scale aircraft is based on gyro-pilot control for level flight. The radio signals are employed either to alter the auto-pilot follow-up ratios or to apply known torque to its gyros in order to cause precession. This results in an alteration to the trim of the aircraft which will re-align itself with the gyro's new position. In models, gyro control is practicable only for yaw and roll. and is not ideally adapted to radio control. However, radio is more easily used to control small servo motors actuated by the relays of the receiving set. These motors are connected directly to the control surfaces.

The number of controls which can be installed is, as has been stated, limited by weight, but by using three relays (each of which can be operated by three different "tones" on a carrier wave) they can be inter-connected to give seven different channels of control. The weight



is as low as one and a quarter pounds.

In larger models, ancillary controls are sometimes necessary. Pneumatic pressure is now proved to be most effective. It is rather restricted owing to the limited capacity of the compressed air reservoir, but it is cheap to make and install such a system and is quite light enough to be worth while.

Air is also used as a medium for producing power in model engines. At the Dorland Hall there was a very neat example of a compressed air radial. This was made mostly of brass and was very light.

The Dorland Hall exhibition has come to stay and will be a great asset to model aircraft development. It has just been announced that the old yearly " Model Engineer " exhibitions that did a great deal to popularize model aircraft in the pre-war days, are to be recommenced this year, the first of the post-war series being arranged to take place in August, 1946, at the New Horticultural Hall, Vincent Square, Westminster.

Very many of the " Early Birds " will remember with affection the " ME " exhibitions. These exhibitions were not entirely devoted to model aircraft as in the case of Dorland Hall exhibitions. They covered all types of model activity.

At the beginning of 1946 the S.M.A.E. journal was taken over by Messrs. Percival Marshall and Co. Ltd., and was published monthly under the title " *Model Aircraft.*" This was an important event in the history of model aircraft as the British aeromodellist now has two monthly journals devoted entirely to his favourite hobby, the old and well established " *Aeromodeller* " under the able and progressive direction of Mr. D. A. Russell, and the new " *Model Aircraft* " under the Editorship of our old pioneer friend mentioned in Part I of this book—Mr. A. F. Houlberg.

With two large national model organizations and also two monthly journals devoted to the model aeroplane, the future of model aeronautics looks buoyant and healthy.

Many an enthusiast in previous years was heard to express the wish that aeromodellers might have an aerodrome of their own. It was left to Mr. D. A. Russell, M.I.Mech.E., Managing Director of the " *Aeromodeller* " to turn this wish into reality with the acquisition of a 76 acres aerodrome at Eaton Bray near Leighton Buzzard. On a gusty day in September, 1945, this first aerodrome in the world exclusively devoted to model aircraft made its rather timid bow.

During the months that followed the immense task of turning 76 acres into something approaching an aerodrome has gone on apace. The ground has been sown, concrete take off bases laid, and the essential facilities of lavatory accommodation and water supplies laid on. A mobile Flying Control has also been built, equipped with the latest public address system. Competitions large and small can be run by the organisers under the sponsorship of any body that so desires. Equally, facilities are available, for those not competition-minded to come along for a day's outing unhampered by any irksome restrictions and with every opportunity to make use of the huge level site and take-off facilities just as they wish. Thus for the 1946 season the basic needs of Mr. and Mrs. Everymodeller are available.

This, however, is only the beginning. As materials

Fig. 76.—*Mounting enthusiasm was shown at the first post-war Hamley Trophy contest held on Hounslow Heath. Many well known personalities will be recognised.*

and labour become available again a far more ambitious project will be unfolded. Adequate shelter is to be provided to protect visitors from the vagaries of the British climate. A free-to-all workshop to effect running repairs will be available, together with a model shop retailing everything from balsa to ballraces that the visiting flyer may require. A canteen for snacks, hot and cold drinks and the like is to be erected. Camping sites for visitors' trailers, tents and caravans have been allocated to cater for those who wish to spend their holidays at Eaton Bray. Indeed, situated in Britain's finest flying country, there is much to be said for this way of enjoying the healthy open air and indulging in our favourite hobby at the same time.

A Member's Clubhouse is also envisaged with private lounges and a Common Room and a special members' enclosure in the best " Brooklands " tradition. While this building has yet to be erected alternative accommodation is ready so that Founder Members will be able to enjoy most of their amenities this summer.

Other ambitious developments include the provision of lakes for flying boat and seaplane enthusiasts as well as our brother modellers who specialise in power boats and yachts. Special tracks for the growing body of model car builders will also be set up—though it is intended that these allied groups shall be accommodated outside the actual flying area of 76 acres.

Altogether, Mr. Russell and his fellow directors are to be congratulated on a magnificent effort on behalf of aeromodelling enthusiasts everywhere. I am convinced that as transport facilities improve, and conditions come back to normal, the " Modellers' Special " from Euston will be a common place and regular coach services will be run to this " Modellers' Mecca."

THE YEAR 1944

Dr. J. F. P. Forster produced a successful petrol driven flying boat of note and obtained a number of interesting flights in Porlock Bay, Somerset. He has been a very consistent pursuer of the flying boat problems since the day he saw my early "record" flying boat and then armed with his masterpiece of the time, came to stay with me at Gibraltar when I was stationed there just prior to the war. Fig. 67 shows Dr. Forsters' boat taking off at Porlock. This boat was a sound flying machine but was unstable on the water, as Dr. Forster had not then appreciated the fact that a model flying boat must have ample area of hull well aft to prevent the large tail from being blown under by the wind during the time that the model is sitting on the water prior to take off, and also after landing and whilst waiting for its owner to retrieve it.

About this time, Dr. Forster built a flying scale " Spitfire " driven by a 6 c.c. Baby Cyclone petrol

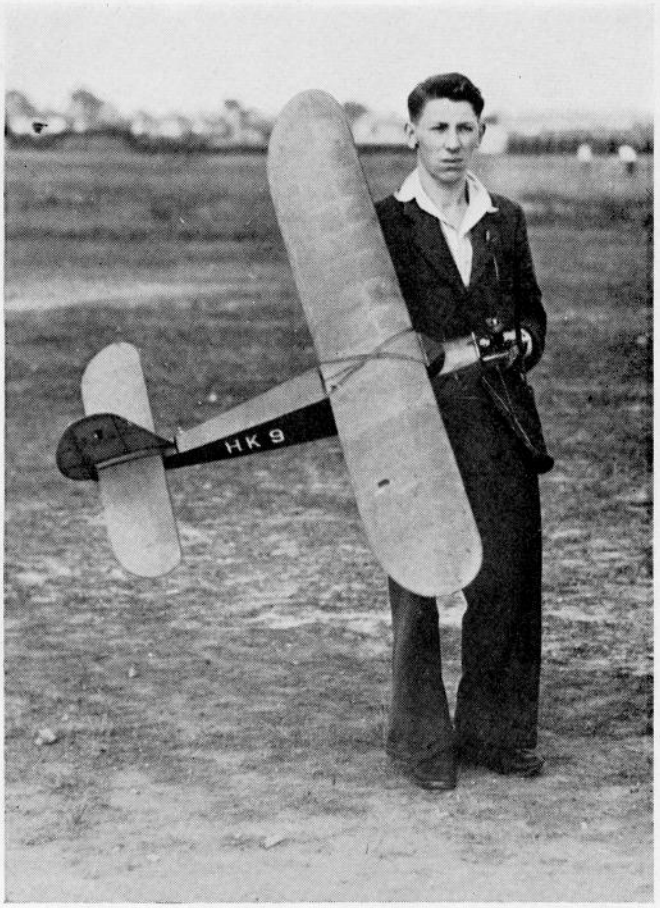


Fig. 77 (above right).—*R. C. Monks with the 5′ span petrol model that won him the 1945 Hamley Trophy.*

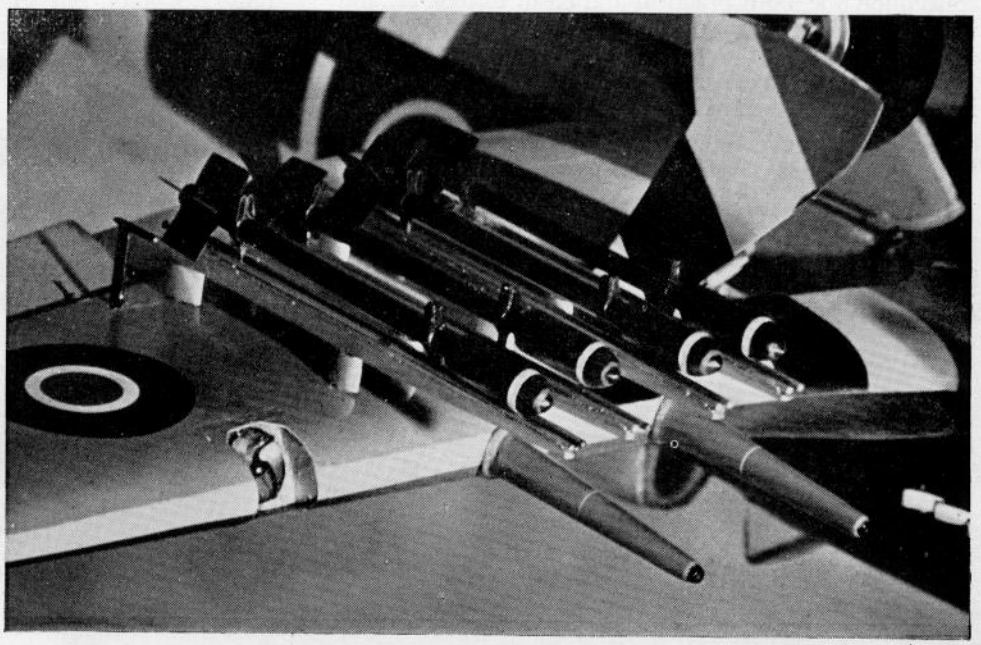


Fig. 78.—*The present day " Solid " enthusiast's attention to detail is fully demonstrated in this closeup of the R. P. racks on J. M. Hardman's prize winning " Typhoon."*

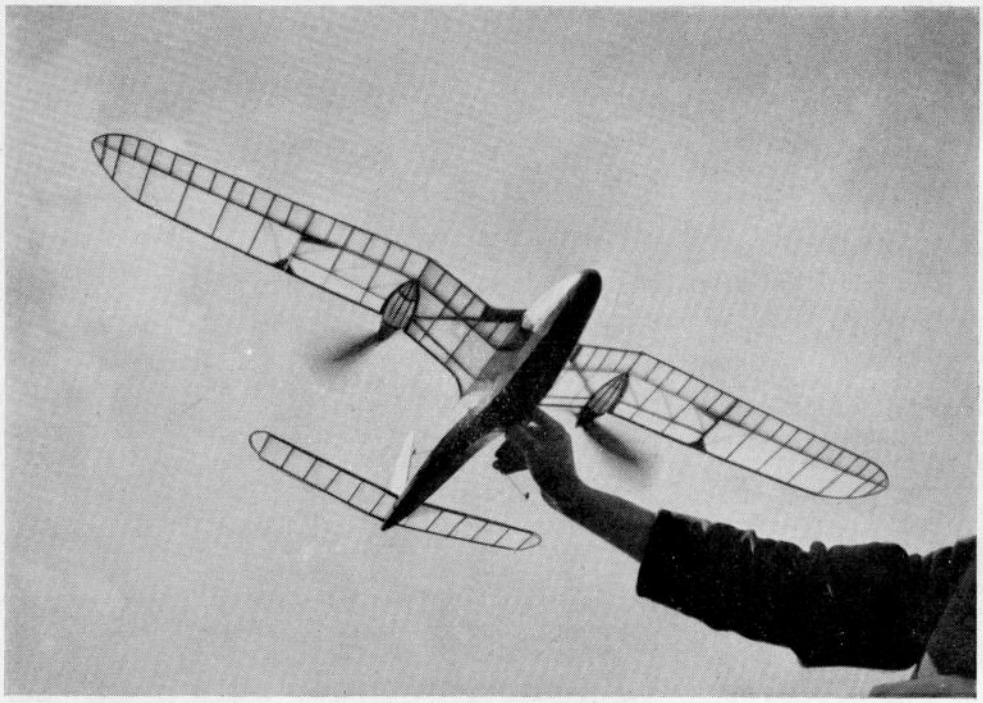


Fig. 79.—*A new theme in Wakefield models. This successful experiment by C. Rupert Moore utilised twin airscrews and his well known "Moore Drive."*

Fig. 80 (below, left).—*This superb flying scale model of the "Bristol Blenheim" was built by C. Rupert Moore, A.R.C.A., well known for his paintings on the "Aeromodeller" cover and his excellent series of twin-engine flying scale models. This model incorporates the well known "Moore Drive" patented by the designer, which has provided a really efficient twin drive for the Aeromodeller.*

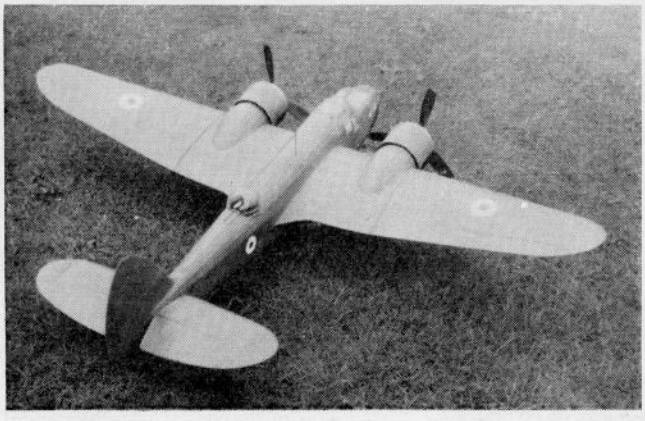
Fig. 81 (below, right).—*A splendid solid model of the "Hawker Tempest," built by G. Parry of Norfolk, that took first prize in the 1945 A.B.A. competitions.*

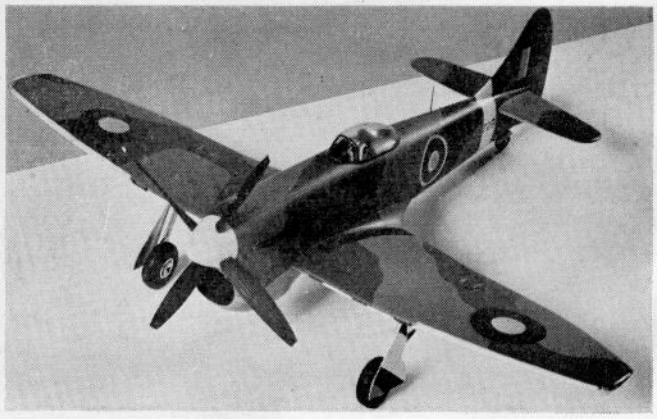
engine. This model was perhaps one of the most practical flying scale models then produced. I have seen it in operation on several occasions. The main features were the extension shaft drive from the engine to the nose on the lines of a model hydroplane, which allowed the engine to be located in the inverted position, several inches to the rear of the nose block. Dr. Forster wisely retained the old detachable nose block idea by making the shaft articulated and the nose with propeller and spinner detachable.

The detachable wings were made in two halves and mounted on rearward facing three ply tongues from a fixed leading edge centre section and brought up to a bottom platform by rubber bands concealed inside the fuselage. The undercarriage legs, located along the leading edge of the fixed centre section were sprung by elastic bands, also inside the fuselage. The whole conception was both practical and clean to look at, and plans of the model were produced by the "*Aeromodeller*" Plans Service.

Probably the smallest petrol model aeroplane to fly in free flight has been Mr. P. E. Norman's "Natsneez" which had a wing span of only 31" and was powered by an engine of his own design of 1.8 c.c. A 8½" diam. propeller of 4½" pitch was fitted and a baby accumulator was used for ignition, weighing only 1¾ oz. I have examined this model and it does fly frequently! Naturally the flight is not highly stable as the moment arm of the fuselage is too short for really first class longitudinal stability, and the glide is rather brick like. But one must sacrifice something if one produces a petrol model that will almost pack up in a woman's handbag. Such a small model has a definite interest and appeal, but requires a skilled person to operate it consistently.

The construction of Mr. Norman's little 1¾ oz. lead acid accumulator for ignition can be seen in the figure below. It recalls the fact that since then a great advance in mini-accumulators has recently been made by the introduction of the commercially obtained Nife accumulator for model flying, boatwork and race cars. The Nife nickel cadmium alkaline accumulator produces only 2.5 volts, but in practice the output is so good that it is superior to larger voltage flash lamp batteries for flight, and with modern type coils there is no necessity for a booster battery to start up. The little battery weighs 8½ ozs. which is a little heavy, but will be reduced in the future I am told by fitting a plastic case instead of the present steel one. The chief advan-





tages are : no acid, no sulphation, no loss when standing idle, undamaged by heavy discharge, all steel construction, plates cannot buckle or lose active material.

When we consider all the troubles that the baby lead acid accumulator is heir to, we modellists interested in the model petrol engine are indeed fortunate in the advance shown by this new commercially obtainable accumulator.

A WIND TUNNEL FOR MODEL WORK

There have been several wind tunnels produced for model test work at one time and another, particularly in Germany. One deserving special mention as a really serious and practical affair is the Prestatyn wind tunnel designed and constructed by Messrs. J. M. Hardman and N. K. Walker. This tunnel can be seen in Fig. 71.

In 1945, Mr. Walker produced another wind tunnel in conjunction with members of the newly formed " Low Speed Aerodynamics Research Association " a new body formed to examine low speed flight, under the leadership of Dr. H. Roxbee Cox, the president, Mr. Walker being the Director of Research. The headquarters of the Association moved in 1946 to Farnborough and it prepares reports and data for the serious minded model maker.

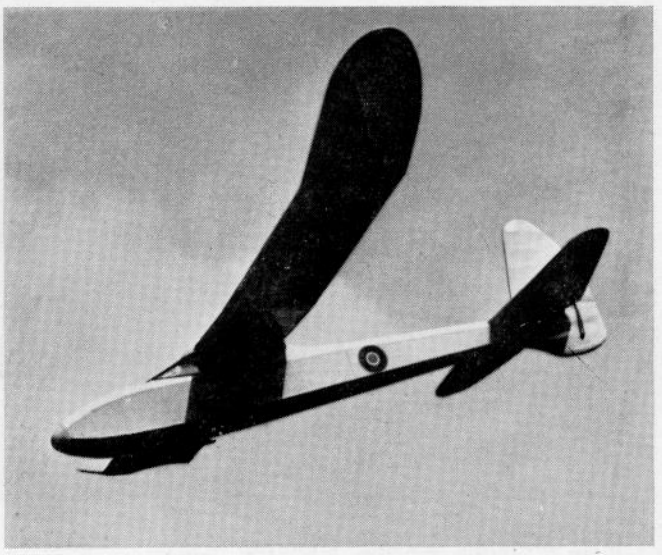
I was interested to see what could be done in a war time billet with a pair of pliers, small soldering set, some razor blades and a few simple tools, so I produced an 8′ span monocoque low wing flying petrol model to my own semiscale free lance design. The operation proved to me that anyone not fortunate enough to possess a fitted out workshop can produce a quite ambitious and large petrol model. I only used tools that could be carried around with me in a small attache case, during my army travels. The result of my labours is seen in Fig. 74. The fuselage was planked with $\frac{1}{2}$″ wide $\frac{1}{8}$″ thick balsa planks on oval balsa formers.

THE YEAR 1945

Sailplane size and performance crept up in this country during 1945. Mr. G. W. W. Harris opened the season with a noteworthy example called "I.G.O."—a 60″ span sailplane of pleasant straightforward lines with a good performance.

In Palestine, Dr. Sultan went really large, and produced a sailplane of 12$\frac{1}{2}$ ft. span which weighed 4 kgs. Fig. 88 shows this model and the constructor.

Mr. D. R. Murrin's sailplane "Evander" (see Fig. 89) plans for which were published by the " *Aeromodeller* Plans Service " was a mach ne of grace and personality



with a really excellent performance. It had a wing loading of 10 oz. per square foot and proved the capabilities of a well designed heavy weight for soaring.

The Sir John Shelley Cup for power driven models, was held at Sutton Park, Birmingham, for the first time since the war began and was reasonably well attended considering war time restrictions on travel, petrol, balsa wood silk and leisure time.

Mr. Silvio Lanfranchi won the event in very bad weather conditions. He has followed this success up with much petrol model activity in the North and has already made a name for himself in the petrol world.

The Hamley Trophy for petrol models, was flown on Hounslow Heath, a happy hunting ground of mine when I was testing out the old record breaker " Kanga " in 1931 and 1932. The " Hamley " was flown on July 8th, 1945, when over 30 models put in an appearance together with a large crowd of spectators, making the largest gathering since the lifting of the war time ban on petrol models. Mr. R. C. Monks of Birmingham won the competition with a 6 c.c. American Baby Cyclone engined highwing model of 5′ span and weighing 3$\frac{1}{2}$ lbs.

THE HANDLEY PAGE TAILLESS CONTEST

Sir Frederick Handley Page, the early pioneer modellist and later founder of the vast Handley Page Aircraft

Fig. 82 (above).—*Probably more Ivory Gulls have been built than any other glider. This well known model was designed by R. F. L. Gosling who has produced many other successful glider designs.*

Fig. 83 (right).—*The " Bowden Contest " petrol model for newcomers to the ranks of petrol flying. Note the wing tip slots.*

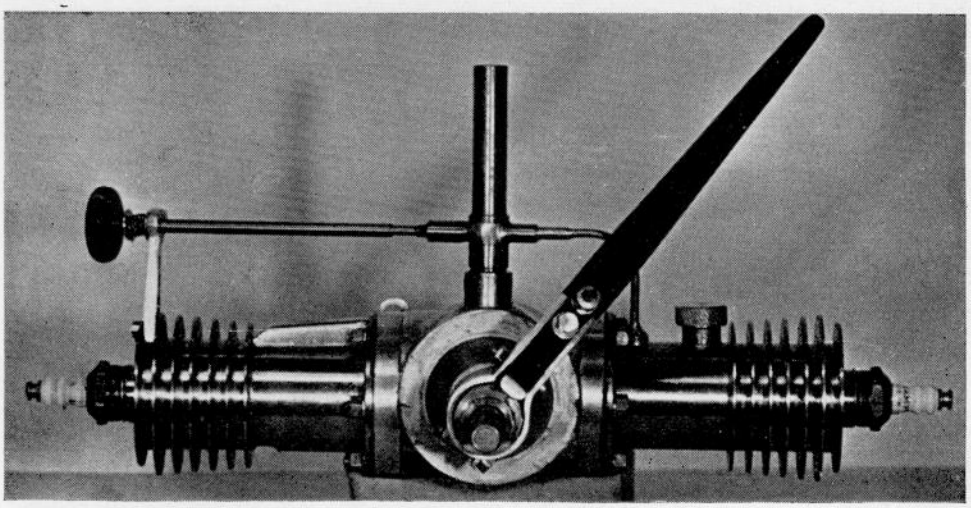


Fig. 84.—*L. H. Sparey's single cylinder engine designed to look like a flat twin, one cylinder containing the petrol tank.*

firm, sponsored a new competition for Tailless gliders or tailless power driven aircraft. This important competition was held at the Handley Page aerodrome at Radlett. Sir Frederick sent a message as follows :— " The intelligent and careful making and design of model aircraft is a tried and valued means of approach for youth to the aircraft industry. The employer always on the look out for the best and keenest young brains for his drawing office, his research section and his production department, knows that the model maker has an interest in aeronautical engineering and a love for the mysteries of flight which is bound to be reflected in the quality of his work. So on all counts I say ' Good Luck to the Society of Model Aeronautical Engineers,' it is performing a valuable service to the Nation."

It was apparent from the start of the competition that tow launching was to be no picnic in the prevailing high winds, as longitudinal stability is apt to be sensitive on tailless models. To qualify, models had to obtain a minimum duration of 60 seconds, each competitor being allowed three competition flights, points being awarded for duration, directional control and aerodynamic excellence.

All models, with two exceptions, were flying wing gliders,Mr. D. A. Pavely, our old pioneer friend, provided one of the exceptions with a model of the pusher type, employing a slabsided fuselage, and tapered wings with pronounced sweep-back and ailerons at the tips. The other competitor, Mr. Vanderbeek produced a rubber driven model with sweep-back of the wings but it had a short pod with a large fin and utilized flaps below the trailing edge of the outer wing sections. Mr. Pavely gained third place with his rubber powered model, an excellent performance that proves powered models of this type are practicable.

It is hoped that in future events there will be greater numbers of powered models.

The majority of the gliders had central pods and wing tip fins, and almost without exception employed ailerons or flaps of varying types.

Mr. Annenberg produced the only flying wing with none of these aids.

Mr. A. H. Taylor caught a thermal and made a flight of 147 seconds out of sight, the best flight of the day. Mr. R. E. Connor won the competition.

The first post-war Bowden International Trophy for petrol models was flown off at Radlett Aerodrome on the same day as the Handley Page Tailless contest, September the 2nd.

Mr. G. Clark of Bushey Park won the competition with a highwing model of American appearance. The last pre-war Bowden Trophy was won by a low wing 8′ span model. It is to be hoped that 1946 will see International entries. The rules had not been announced in the " *Aeromodeller* " in advance and there was a general lack of information in connection with this event that marred its normal popularity.

Perhaps I shall be forgiven for making mention of three petrol models produced by myself that are a little out of the ordinary. The last example being particu-

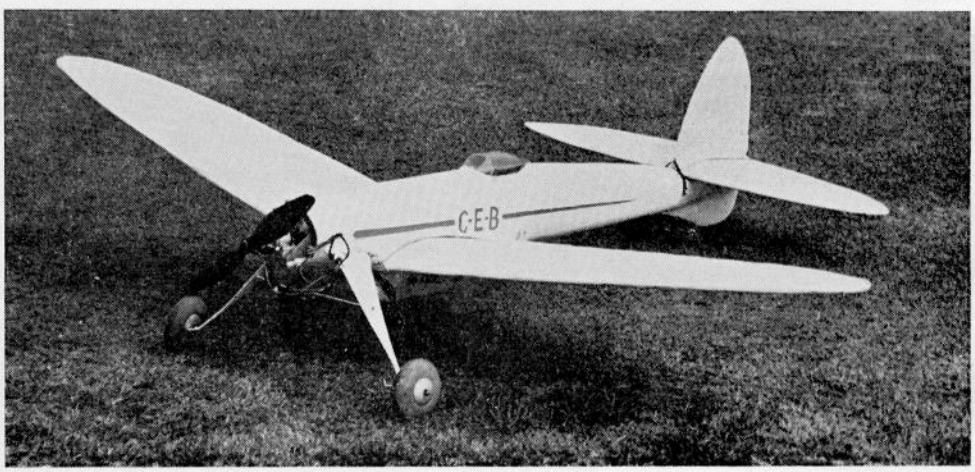


Fig. 85.—*A Small low wing petrol model made by the author with dummy radiator containing all the electrical gear slung beneath the centre section.*

larly suitable for the beginner, or the rubber enthusiast going over to petrol. As the readers of Part II of this book will have gathered, I have always been interested in the petrol biplane as a side line, because of its stability problems. In 1945 I designed a very small model of 32" span, one inch larger than the span of Mr. Norman's midget monoplane, but of course I had more wing area as the model was a biplane. This model was powered by a 1½ c.c. American Mighty Atom and flew in the hands of Dr. Forster at Porlock during one of my leaves. The model, like Mr. Norman's midget suffered slightly from too short a moment arm for really first class longitudinal stability. The model was called " Kangette," a diminutive descendant of the original old record breaking biplane " Kanga." The great difference being Kanga had a 28 c.c. engine of 2¾ lbs. weight and " Kangette's " engine weighed 2 oz.

I then designed and built a " Kangette Senior " with monocoque fuselage more calculated to please the eye, and powered by a 3.5 c.c. Ohlsson Engine. The result was a successful little model that could be packed up in a suitcase. The main snag was that now one could only carry one bottle of beer in the case for lunch, but with " Kangette " there was room for two bottles !

Owing to the war ending, and the revived interest in petrol model building I designed what I considered the best model for stability, medium size convenient to carry about, longevity, and ease of building, so that a beginner or a rubber aeromodellist changing to petrol might have a machine suitable for either general purpose, fun flying or competition flying. The main points about either flying and particularly contest flying are stability and strength of construction. A design for the beginner must also be as fool proof to build as possible. By that I mean for instance, that the construction must not have difficult curves at nose or tail that may warp when erecting the model during the building stage. The correct angles of incidence of the mainplane and tail must be automatically built in as the beginner constructs the fuselage. I used the original method I developed for an early Sir John Shelley cup winner of cutting out two $\frac{1}{16}$" sheet balsa sides with all these angles of incidence automatically cut out to the plan shape and then glueing longerons and uprights ontop of the sheet sides. The two sides then are put up right and cross pieces glued in with a solid balsa tailpiece so that there should not be curves to pull out of line. Also a special square nose, with a laminated balsa distance piece to obtain the nicely streamlined nose was fitted for similar reasons. I called the model the " Bowden Contest " and plans were produced by the *Aeromodeller* Plans Service. Besides having this foolproof fuselage of great strength (I have models still flying after 12 years use constructed on this principle) the model had Elliptical wings to give a large area for a short span and these were fitted with my simple type of inbuilt wing tip slots. " Wheel spats " as our cousins from America call them were fitted, and the detachable nosepiece can be adapted or lengthened to suit varying sizes and weights of engine from 3.5 c.c. to 6 c.c. All the ignition gear including battery coil plugs and timer are mounted in a detachable " Lamblin " type streamline radiator slung below the fuselage. This dummy radiator saves the usual ungetatable wiring inside a fuselage and main weights are grouped around the C.G. and can also be moved to alter the adjustment of C.G. position during gliding tests when different weight engines are fitted. One can also change the whole electrical gear from one model to another in a few moments, and this saves one's pocket from buying spare coils, etc., for every model built.

Fig. 86 (above).—*A 1/12 scale Avro 504 k built by Mr. E. J. Riding. The internal construction as well as the external construction on this model is to scale, which accounts for its accurate and realistic appearance*

Fig. 87 (left).—*The Shallufa Model Aeroplane Club formed in the Middle East during the war by P/O B. E. D. Beckett.*

A large number of these models have already been built and it will be most interesting to see how Mr. Everymodeller gets on with them. It is no easy task designing for the inexperienced so that the instructions and the model are foolproof!

Mr. Rupert Moore's drawings are known to every aeromodelling enthusiast. They have decorated for many years the covers of the "*Aeromodeller*" and the dustcover of this book was painted by him from a photograph I took of a small monocoque model I was flying at Gibraltar on the famous racecourse, since turned into an aerodrome during the war. The photograph Fig. 80 shows a fine example of Aeromodelling, a Blenheim built by Mr. Moore. He is an expert modellist.

Dr. Forster produced a more advanced and cleaned up petrol flying boat for 1945. I have examined this boat, and may say that it is a great advance on the 1944 model. The wings are elliptical and mounted high on a similar system to his low wing "Spitfire" with a slightly dihedralled tailplane to look after longitudinal and directional stability. There is now more area forward to bring off better landings. Sponsons are fitted for lateral stability on the water, which is an excellent feature as wing tip floats on a petrol model so often cause swinging during the take off. Even now Dr. Forster admits that his latest brainstorm could be improved by yet a little more area aft on the hull to improve longitudinal stability on the water. This will be a very simple modification on this particular model, which is the basis for a really first class model flying boat with a delightful appearance in the air.

A new World's record was established in Switzerland by a sailplane when the G.41 flew for 2 hours 21 minutes out of sight. This model was designed by Emil Glunkin and was built and flown by Transgott Haslach.

The interest taken by our Services during the war, in model aircraft was very considerable. Thousands of men made solid models and a number constructed flying models. The Middle East Model Aircraft Club was formed during the war by P/O B. E. D. Beckett and had 40 members. The chief difficulty met with was the lack of balsa and materials generally. At first models were built from plans taken from model journals. Later members launched out with duration models of their own. The Sahara presented a useful flying field! The formation of this club was a stout show worthy of mention.

Mr. R. H. Warring, the well known writer on model aeronautical matters has produced several outstanding sailplanes and Wakefield models during the later years of model aeronautical history.

An "old timer," Mr. H. E. White, whose name has appeared before in this book in connection with early speed models, and who has a long line of successful models of different types to his credit, built an interesting rubber driven model flying boat called "Dryad," plans of which were made available by the "*Aeromodeller* Plans Service." The model is a semiscale type and has two rubber motors in engine nacelles mounted on the wing. Wing tip floats are fitted for lateral stability when the model is resting on the water.

And so my efforts as an amateur historian come to a close in early 1946 with the prospects of a very interesting and busy future for model aeronautics. I am somewhat appalled and deeply conscious of how much material and how many well known names I have been forced to omit for the sake of reasonable brevity. This is the first model history to be published, and I hope that at least it will have put on record the activities of a number of outstanding contributors to the model movement, but more important I hope it will give pleasure to model enthusiasts and get many reminiscing, talking and designing. May it also stimulate a very pleasant and intriguing hobby.

Fig. 88.—*Dr. M. Sultan with his glider "Maha II." This weighs 4 kgs. and has a wingspan of 12½ feet*

Fig. 89.—*"A machine of grace and personality with a really excellent performance." Mr. D. R. Murrin's "Evander" in flight.*

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Lt. Col. C. E. Bowden holding his 68 ins. span "Bowden Contest" petrol model plan of which is in the Plans Service.

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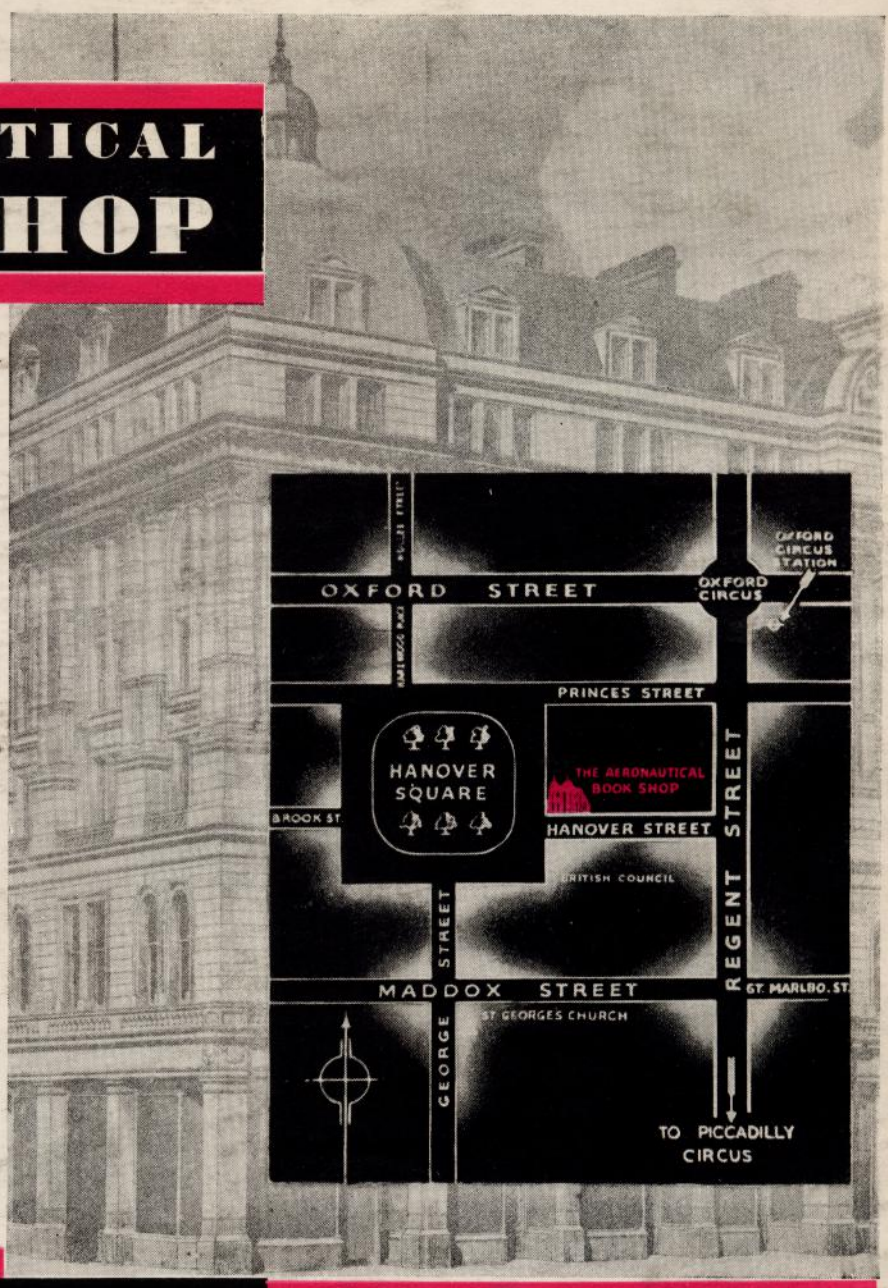

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