Vol. 1

The British Gliding Association Journal

No. 3

JANUARY, 1931.

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TWO SHILLINGS AND SIXPENCE
(To Non-Members)

THE BRITISH GLIDING ASSOCIATION
44a, DOVER STREET
LONDON
W.1

The British Gliding Association Journal

Vol. 1 DECEMBER, 1930 No. 3

AIR VICE-MARSHAL SIR W. SEFTON BRANCKER, K.C.B., A.F.C., F.R.Ae.S.

THE BRITISH GLIDING ASSOCIATION deeply mourns the loss of its President, Air Vice-Marshal Sir W. Sefton Brancker, K.C.B., A.F.C., F.R.Ae.S., through the disaster which overtook the British Airship, R101,. at Beauvais, on Sunday, Oct. 5th, 1930. We had considered ourselves most fortunate in having the full support and interest of the Director of Civil Aviation in all matters connected with the Gliding movement.

The work which he, as our President, has done will for many years to come prove of great value.

He has built a memorial to himself through his creative work in the cause of British Aviation, and those who had the privilege of having his personal friendship together with those who were associated with him in his work will long treasure happy memories of his charming personality.

The British Gliding Association has made steady progress since the Journal was issued in August. The number of affiliated clubs has increased from 20 to 35—the number of Glider Pilot's Cetificates from 19 to 37. The first Inter-Club Contest was held at Ditchling Beacon (the Flying Ground of the Southdown Sky Sailing Club) on October 18th and 19th.

The Editor regrets that owing to lack of space the Club reports have had to be omitted.

MEMBERS OF THE COUNCIL OF THE BRITISH GLIDING ASSOCIATION.

PRESIDENT :

VICE-PRESIDENTS :

Lieut.-Colonel M. O'Gorman, C.B., D.Sc., M.I.C.E., F.R.Ae.S., M.I.M.E., M.I.E.E., M.I.A.E.
F. Handley Page, Esq., C.B.E., F.R.Ae.S.
Col. The Master of Sempill, A.F.C., A.F.R.Ae.S.
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CONTEST.	Major H. A. Petre, Chairman, Capt. C. H. Latimer-Needham,	J. R. Ashwell-Cooke, Esq.,
TECHNICAL.	Capt. C. H. Latimer-Needham, C. H. Lowe-Wylde, Esq., L. Howard-Flanders, Esq.,	T. E. Lewitt, Esq. (co-opted), Imperial College of Science,

Secretarial Notices.

MEMBERSHIP TO THE BRITISH GLIDING ASSOCIATION.

It has been decided by the Council that as from the 6th August, 1930, Candidates for Membership to the Association who are Members of the Affiliated Clubs shall be admitted without entrance fee.

It has also been decided that as from 1st January, 1931, the entrance fee for Members be increased to £1 : 1 : 0. All Subscriptions to expire on the 1st January each year except that the 1st Subscription of Candidates joining on or after 1st October shall not expire until the 1st January, after a full year has elapsed from the date of their joining.

J. L. R. WAPLINGTON,
Secretary.

TECHNICAL INFORMATION.

The British Gliding Association would welcome from any member Technical, Meteorological, or other information which may be used for the benefit of the gliding movement.

Permission must be given by the subscriber that the information submitted may be approved, tabulated, and clarified, by the Technical Committee of the British Gliding Association.

It will be readily appreciated that this will help to build up a fund of valuable information which will always be at the disposal of all affiliated clubs and individual members of the Association.

In future no machine may be used for test flights for glider pilot certificates, nor will be allowed to enter any competition, unless it has received a certificate of airworthiness from the British Gliding Association.

MACHINE DESIGN APPROVAL.

It has been decided that all new designs submitted for design approval should be delegated to a Sub-Committee of the Technical Committee. It is a condition of membership that members serving on that Sub-Committee have no direct interest in any manufacturing or designing concern with financial or competitive interest in connection with the designs submitted.

GLIDING CLUBS

Affiliated to the British Gliding Association.

Barrow-in-Furness Gliding Club,
R. Cuttell, Esq., 31, Church Street,
Barrow-in-Furness.

Bridlington Gliding Club,
A. Wilkinson, Esq., Crescent Court,
The Esplanade, Bridlington.

Channel Gliding Club,
F. H. Worrad, Esq., 42, Rendezvous St.,
Folkestone.

Dorset Gliding Club,
J. Laver, Esq., 9, Commercial Street,
Weymouth.

Driffield & District Gliding Club,
R. G. Spencer, Esq., The School House,
Gembling, Driffield.

Dumfries & District Gliding Club,
W. H. Davenport, Esq., "Thornlea,"
Rotchell Park, Dumfries.

Edinburgh Gliding Club,
J. D. M. Murrie, Esq.,
16, Bernard Street, Leith.

Essex Gliding Club,
F. E. Darlow, Esq., 17, Randolph Road,
Walthamstow, Essex.

Falkirk & District Aviation Club,
A. C. Tomison, Esq.,
122, High Street, Falkirk.

Glasgow Gliding Club,
A. Y. Paton, Esq.,
70, Exeter Drive, Glasgow.

Harrogate Gliding Club.
E. T. W. Addyman, Esq., The White House,
Starbeck, Harrogate.

Huddersfield Gliding Club,
C. Brooke, Esq.,
The Cottage, Woodside.

Ilkley & District Gliding Club,
P. T. Fawcett, Esq., The Red Lion Inn,
South Stainley, nr. Harrogate.

Imperial College Gliding Club,
P. Adorjan, Esq., Imperial College Union,
Prince Consort Road, S.W.7.

Isle of Thanet Gliding Club,
J. T. Huddlestone, Esq., 17, Chapel Place,
Ramsgate.

Kent Gliding Club,
Ronald B. Haynes, Esq., 14, King Street,
Maidstone.

Kilmarnock Gliding Club,
Boyd B. Neil, Esq., 29, John Finnie St.,
Kilmarnock.

Lincoln Gliding Club,
H. L. Searle, Esq., The Manor House,
Cherry Willingham, Lincoln.

Littlehampton Gliding Club,
H. W. Carter, Esq., The Laurels,
17, New Road, Littlehampton.

London Gliding Club,
J. R. Ashwell-Cooke, Esq.,
Empire House,
St. Martins-le-Grand, E.C.1.

Manchester Gliding Club,
F. Paxton, Esq., "Cyntra," Poplar Road,
Didsbury, Manchester.

Nottingham Gliding Club,
L. Burbidge, Esq., Welbeck Hotel,
Nottingham.

Oxford & County Gliding Club,
E. Walpole, Esq., Brasenose Farm,
Cowley, Oxford.

Portsmouth & Southsea Gliding Club,
E. A. Finley Day, Esq.,
9, King's Terrace, Southsea.

Sail-plane Club of T.M.A.C.,
E. G. Smetting, Esq.,
2, Wine Office Court, Fleet St., E.C.4.

Scarborough Gliding Club,
Miss G. D. Cox, The Royal Hotel,
Scarborough.

Sheffield Gliding Club,
Wm. C. Wood, Esq.,
C/o Messrs. Cole Bros. Library,
Fargate, Sheffield.

Southdown Skysailing Club,
A. York Bramble, Esq.,
The New Yorke Hotel,
Bedford Square, Brighton.

South Essex Gliding Club,
E. A. Sissons, Esq., 19, The Pavement,
Chadwell Heath.

South Shrops. & North Herefordshire
Gliding Club,
A. Handy, Esq., Dinmore, Hereford.

Surrey Gliding Club,
C. H. Taylor, Esq.,
24, Woodbridge Hill Gardens, Guildford.

Wilts Light Aeroplane & Glider Club,
C. T. Cuss, Esq., Church Place,
Swindon, Wilts.

Winchester Gliding Club,
Walter Russell, Esq.,
Fordington Road, Winchester.

Wolseley Glider Club,
E. H. Doughty Esq.,
C/o Wolseley Motors, Ltd.,
Drew Lane, Ward End, Birmingham.

Worthing Gliding Club,
V. C. Abel, Esq., Sherwood,
Offington Gardens, Worthing.

GLIDING CERTIFICATES.

The following Gliding Certificates of the Federation Aeronautique Internationale have been issued by the Royal Aero Club:—

No.	Name.	Certificates.	
1.	C. H. Lowe-Wylde (Kent Gliding Club)	... A. & B.	
2.	C. H. Latimer-Needham (London Gliding Club) ...	... A. B. & C.	
3.	Marcus D. Manton (London Gliding Club)	... A. B. & C.	
4.	M. L. McCulloch (London Gliding Club)	... A. & B.	
5.	Geoffrey M. Buxton (London Gliding Club ...	... A B. & C.	
6.	F/O. Edward Lucas Mole (London Gliding Club) ...	... A. B. & C.	19-10-30
7.	Colin Aubrey Price (Portsmouth & Southsea Gliding Club)	... A.	
8.	Denys Max Thomson Morland (London Gliding Club)	... A.	
9.	Col. The Master of Sempill (London Gliding Club) ...	... A. B. & C.	
10.	John Raymond Ashwell-Cooke (London Gliding Club)	... A	
11.	Alan Goodfellow (Lancashire Aero Club)	... A.	
12.	Mrs. Dorothy Joan Bradbrooke (London Gliding Club)	... A.	
13.	Thomas Graham Humby (London Gliding Club) ...	... A. & B.	
14.	Leonard Charles Williams (London Gliding Club) ...	... A	
15.	Harry Amein Abdallah (London Gliding Club) ...	... A	
16.	Percy Michelson (Lancashire Aero Club)	... A.	
17.	Frederick Basil Tomkins (Lancashire Aero Club) ...	... A.	
18.	Eric Christopher Stanley Megaw (London Gliding Club)	... A.	
19.	Basil Alfred Gregory Meads (Lancashire Aero Club) ...	... A.	
20.	Robert Gidner Spencer (Driffield & District Gliding Club)	... A	
21.	John Cecil Weale (Lancashire Aero Club)	... A.	
22.	Reginald George Robertson (London Gliding Club) ...	... A.	
23.	Thomas Eaton Lander (London Gliding Club) ...	... A.	
24.	Hamish Allen (London Gliding Club)	... A.	3-8-30
25.	Wm. James Molony Spaight (Nottingham Gliding Club)	... A.	7-9-30
26.	Joseph Meyler Symmons (London Gliding Club) ...	... A.	14-9-30
27.	Alexander Nelson Stratton (Surrey Gliding Club) ...	... A.	24-8-30
28.	Alan Fleming McGlashan (Surrey Gliding Club) ...	... A.	24-8-30
29.	Alan Herbert Reffell (Surrey Gliding Club) ...	... A. & B.	7-9-30—19-10-30
30.	Frederick Slingsby (Scarborough Gliding School) ...	... A.	22-10-30
31.	Stanley Cecil Howard (Scarborough Gliding School)	... A.	26-10-30
32.	Thomas Littleton Green (Kent Gliding Club) ...	... A.	20-7-30
33.	Norman Llewellyn Bowden Puttock (Portsmouth Gliding Club)	A.	18-10-30
34.	John Craven Barnes (Scarborough Gliding Club) ...	... A. & B.	25-10-30—26-10-30
35.	Frederick Louis Gardiner (Scarborough Gliding School)	... A.	26-10-30
36.	Edward Hedley Fielden (London Gliding Club) ...	... A.	15-7-30
37.	Graham Andrew Little (Surrey Gliding Club) ...	... A. & B.	12-10-30—19-10-30

INTER-CLUB COMPETITIONS.

THE first inter-club gliding competition to be organised by the British Gliding Association took place on the 18th and 19th October at Ditchling Beacon. The events consisted of inter-club team matches on Primary and Intermediate type machines and individual duration contests on Primary and Intermediate type machines.

The Clubs competing were

The London Gliding Club,
The Surrey Gliding Club,
The Kent Gliding Club,
The Portsmouth Gliding Club,
The Channel Gliding Club.

One of the features of the Competitions was the total lack of "crashery"—not one machine was damaged, and considering the fact that nearly 50 flights were made during the period we consider the large crowds who attended the meeting on each day were amply satisfied.

About 25 "A" certificates were obtained and a few "B's."

We had the pleasure of welcoming Mademoiselle Lippens and Herr Kronfeld. Mlle. Lippens brought her Professor Sailplane over from Maidstone with a view to trying it out on the Beacon, but unfortunately the wind on both days was unsuitable.

Herr Kronfeld went up twice, but, of course, could do nothing very great through the lack of wind.

At a meeting of the Council which took place on the 14th October, it was unanimously agreed to send a hearty vote of thanks to the following firms who had given prizes for the competition.

The R.F.D. Co., Guildford,
R. & J. Coley Ltd., Kingston,
Titanine-Emaillite Ltd., London, W.I.,
A. E. L. Skinner, Esq., Bond Street,
Cellon Ltd., Kingston,
Burley Ltd., Tottenham Court Road,
The British Aircraft Co., Maidstone,
The Cloudcraft Glider Co., Southampton.

The various events and results were as follows:—

Individual duration contest for PRIMARY TRAINING MACHINES. Open to all Members of Affiliated Clubs.

Prize: Silver Cup, presented by Cloudcraft Glider Co. Won by Capt. Stratton, Surrey Club. 1.40 2/5th mins.

Individual duration contest for Intermediate Type training machines. Open to all Members of Affiliated Clubs.

1st Prize: Value £5 5s., presented by the R.F.D. Co. Won by R. Matheson, London Club. 4.37 3/5th mins.

2nd Prize: Launching Rope, presented by Burley & Co. Won by E. L. Mole, London Club. 2.53 1/5th mins.

Inter-Club Team Match on Primary Type training machines. Teams of 3. Pilot's Prize to go to the best flight in the winning team.

Ist Prize: Dope, presented by Titanine Emaillite Co. Won by the Surrey Club. 7.41 4/5th mins.

2nd Prize: Presented by R. J. Coley. Won by Portsmouth Club.

Pilot's Prize: Silver Cigarette Case, presented by Titanine Emaillite Co. Won by Capt. Stratton, Surrey Club. 1.40 2/5th mins.

Inter-Club Team Match on Intermediate Type Training Machines. Teams of 3. Pilot's Prize to go to the best duration flight in the winning team.

1st Prize: Dope, presented by the Cellon Co. Won by the London Club. 12.42 mins.

Pilot's Prize: Silver Tankard, presented by the Cellon Co. Won by R. Matheson, London Club. 4.37 3/5th mins.

Individual Duration Contest regardless of the type of machine, but flown by a British Pilot.

1st Prize: Silver Cigarette Box, presented by Skinners Ltd. Won by R. Matheson, London Club. 4.37 3/5th mins.

2nd Prize: Silver Tankard, presented by British Aircraft Co. Won by E. L. Mole, London Club. 2.53 1/5th mins.

"GLIDING AND MOTORLESS FLIGHT."

A REVIEW.

Gliding & Motorless Flight, by L. Howard Flanders (M.I.Ae.E., A.F.R.Ae.S., A.M.I.Mech.E., M.R.S.T. Member of the Council of the British Gliding Association), and C. F. Carr; published by Sir Isaac Pitman (price 7/6), is a useful and instructive little handbook, which should find its way into the book shelves of all those sportsmen who tend to be "Air-minded."

The history of gliding, the virtual mother of Aviation, its recent achievement and progress, details of the training required to become pilots, and hints to intending organizers of gliding clubs,. are all concisely dealt with by the Authors.

The headings and arrangement of this practical and well written book are particularly good, so too are the appendices, index, and meteorological diagrams and illustrations.

I recommend all who are interested in the sport of gliding, and particularly those interested in the formation of gliding clubs, to purchase a copy of "Gliding and Motorless Flight," for use as a text book.

Gliding Clubs formed on the lines set out by Mr. Howard Flanders, who was at one time secretary to the British Gliding Association, cannot fail to be successful in their organisation, thereby fostering the elements of sportsmanship and the spirit of adventure, together with useful research, which are all combined in this comparatively safe and inexpensive form of Aviation.—J.W.

INTER-CLUB COMPETITIONS, DITCHLING BEACON, ON 18th AND 19th OCTOBER, 1930.

PRIMARY TYPE MACHINES.

Pilot.	*London.*	*Surrey.*	*Portsmouth.*	*Kent.*	*Channel*
Bruce	—	—	55 4/5	—	—
Stratton	—	1.33	—	—	—
Simms	—	—	30 4/5	—	—
Reffell	—	1.31 4/5	—	—	—
Cooper	—	—	39	—	—
McLashan	—	1.22 1/5	—	—	—
Cockburn	—	—	33 2/5	—	—
Crawford	—	—	—	30 4/5	—
Nicholls	—	—	—	36 2/5	—
Weekes	—	—	—	30 4/5	—
Little	—	1.1 4/5	—	—	—
Reid	—	—	—	31 2/5	—
Esmond	—	—	44	—	—
Wood	—	—	—	28	—
Taylor	—	—	—	57 3/5	—
Papps	—	—	25	—	—
Probyn	—	—	—	—	40 3/5
Haynes	—	—	—	26	—
Pilling	—	58 3/5	—	—	—
Humby	36	—	—	—	—
Jay	—	—	—	21	—
Lowe-Wylde	—	—	—	1.0	—
Stratton	—	1.40 2/5	—	—	—
Knight	—	—	1.5	—	—
McLashan	—	1.20	—	—	—
Woodley	—	—	1.5 3/5	—	—
Puttock	—	—	1.10 1/5	—	—
Taylor	—	1.7	—	—	—
Reffell	—	1.12 3/5	—	—	—
Turner	—	—	31 3/5	—	—
Woods	—	—	—	31 4/5	—
Reffell	—	1.4 4/5	—	—	—
Needham	51	—	—	—	—
Papps	—	—	—	20	—
Matheson	49 3/5	—	—	—	—

Surrey.	Capt. Stratton	1.40 2/5	Little		1.1 4/5
	Reffell	1.31 4/5	Pilling		58 3/5
	McLashan	1.22 1/5	Taylor		1.7
		4.34 2/5			3.7 2/5
		7.41 4/5			

Kent.	Lowe-Wylde	..	1.0		Taylor	.. ..	$57^{3}/_{5}$
	Crawford	..	$30^{4}/_{5}$		Woods	.. ..	$31.^{4}/_{5}$
	Nicholls ..	..	$36^{2}/_{5}$		Weekes	..	$30^{4}/_{5}$
			$2.7^{1}/_{5}$				$2.0^{1}/_{5}$
				$4.7^{2}/_{5}$			
London.	Capt. Needham		51				
	Matheson	..	$49^{3}/_{5}$				
			$1.40^{3}/_{5}$				
				$1.40^{3}/_{5}$			
Portsmouth.	Knight ..	..	1.5		Puttock ..	..	$1.10^{1}/_{5}$
	Woodley	..	$1.5^{3}/_{5}$		Bruce	.. ..	$55^{4}/_{5}$
	Esmond	..	44		Simms	.. ..	$30^{4}/_{5}$
			$2.54^{3}/_{5}$				$2.36^{4}/_{5}$
				$5.31^{2}/_{5}$			

INTERMEDIATE TYPE TRAINING MACHINES.

Pilot.	*London.*	*Kent.*	*Lancashire.*
Col. Sempill	$1.15^{1}/_{5}$ ..	— ..	—
Mole	$2.3^{4}/_{5}$ ..	— ..	—
Goodfellow	— ..	— ..	1.52
Lander	$52^{4}/_{5}$ ..	— ..	—
Needham	$69^{3}/_{5}$ ..	— ..	—
Lander	$37^{3}/_{5}$ ..	— ..	—
Manton	38 ..	— ..	—
Buxton	$2.8^{2}/_{5}$ ..	— ..	—
Mole	$2.53^{1}/_{5}$ ..	— ..	—
Lowe-Wylde	— ..	$2.26^{3}/_{5}$ ..	—
Matheson	$4.37^{3}/_{5}$ ..	— ..	—
Crawford	— ..	1.3 ..	—

London.	..	Manton	..	38			
		Buxton	..	$2.8^{2}/_{5}$			
		Needham	..	$69^{3}/_{5}$	=	3.56	
		Col. Sempill	..	$1.15^{1}/_{5}$			
		Mole	..	$2.53^{1}/_{5}$			
		Matheson	..	$4.37^{3}/_{5}$	=	8.46	= 12.42
Kent	..	Lowe-Wylde	..	$2.26^{3}/_{5}$			
		Crawford	..	1.3			= $3.29^{3}/_{5}$
Lancashire	..	Goodfellow	..	1.52			= 1.52

TECHNICAL REPORT OF THE RHÖN GLIDER MEETING, 1929.

By A. Lippisch, Wasserkuppe, Rhön.

Published in "Zeitschrift für Flugtechnik und Motorluftschriffahrt," 21st volume, No. 4, p. 92 ; editor R. Oldenbourg, Munich.

1. The "gliding figure" as a means of defining high-performance gliders.

THE restriction of this year's meeting to high-performance gliders necessitated the use of a special formula which could in a simple manner make it possible to distinguish between high-performance gliders and school or practice gliders.

As a basis of reckoning the rate of descent was chosen as the deciding factor, and the stipulation made that the calculated rate of descent of a high-performance glider should not exceed the value of 0.80 metres per second.

Therefore it became a question of finding the simplest possible formula of approximation for estimating the rate of descent from easily determined data of a glider. Of such data the following may be taken into account :

1. Area of main supporting surface $= F$ (square metres),
2. Span $= b$ (metres),
3. Aspect ratio $= \Lambda = \frac{b^2}{F}$,
4. Gross flying weight $= G$ (kilograms).

These dimensions and weights can be measured without difficulty even upon entry to the meeting, and so by means of a simple formula the estimated rate of descent can be determined, whereas the constructor's own data, such as for example those obtained from the usual aero-dynamic calculation on the basis of wind-tunnel measurements, allowing for the ever-uncertain additional resistance of body and control-surfaces, offer no sure basis for ready investigation.

In the latter case it would be necessary to work out complete calculations with the help of expert investigations, and to bring into use some settled form of procedure for the purpose. Such a proceeding is however not practicable, as the time at disposal would not suffice for such technical examination of the machines entered for the meeting.

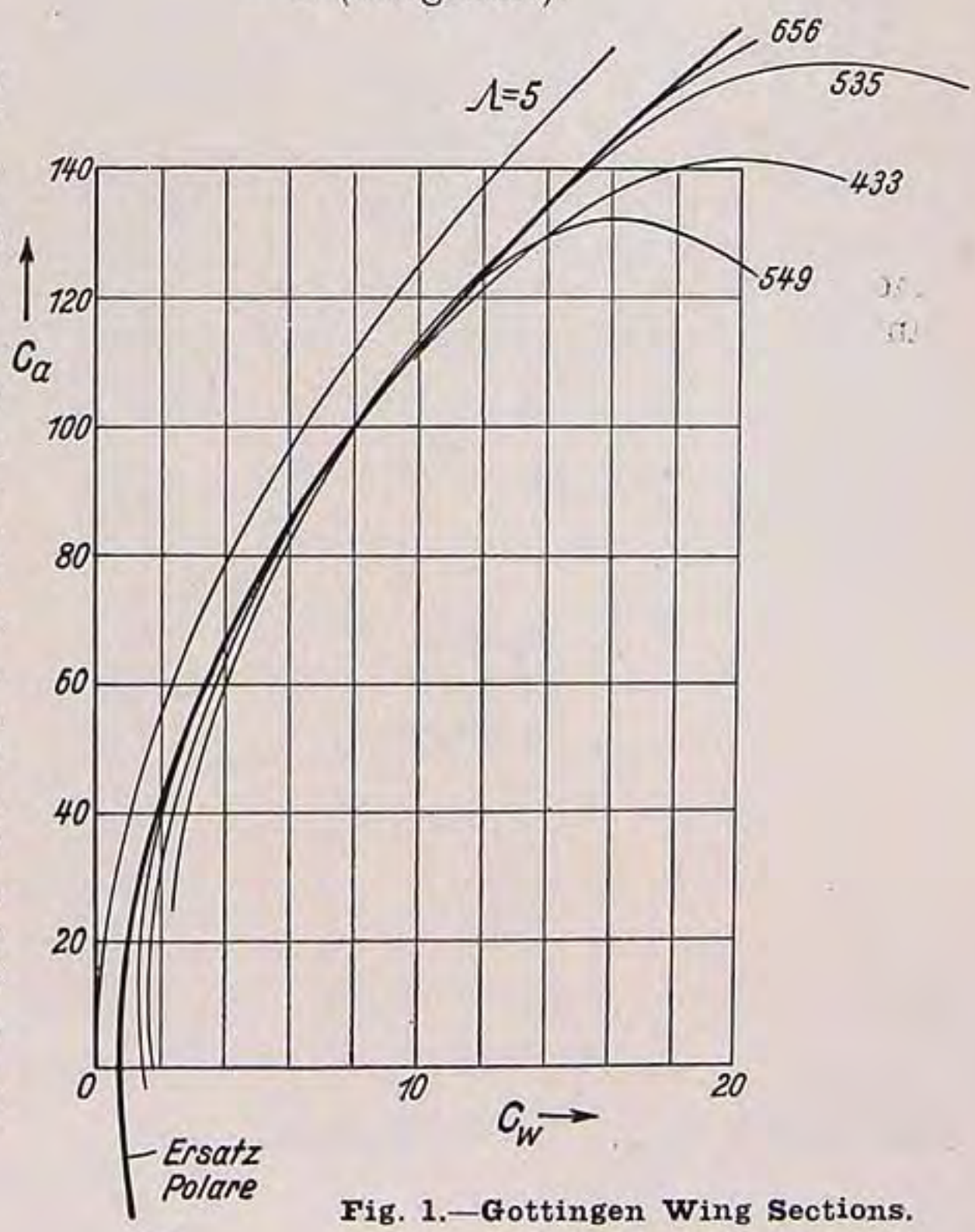


Fig. 1.—Gottingen Wing Sections.

In drawing up the formula to be used as a basis for decision, the following procedure is employed for the purpose :

In place of the performance curves for the various wing-sections a mean curve is employed for calculating the rate of descent. This mean curve for the wing is established as

$$c_w = \left(\frac{1}{\Lambda \cdot \pi} + 0{\cdot}010\right) c_a^2 + 0{\cdot}007 \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Similarly the curve produced by $\Lambda = 5$ is shown in Fig. 1 together with the curves for the wing-sections in common use, obtained from measurements by the A.V.A. Göttingen.

To allow for additional resistances $c_{w_s} = \frac{\Sigma\, c \cdot f}{F} = 0{\cdot}013$ is inserted. A graduated figure in accordance with the different fuselage forms and wing areas was discarded on account of the difficulty of an exact determination of the value c and of the fusclage cross-sections.

The curve of the formula used for the investigation can then be put down as

$$c_{w\ \mathrm{gross}} = \left(\frac{1}{\Lambda \cdot \pi} + 0{\cdot}010\right) c_a^2 + 0{\cdot}020 \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The calculated rate of descent for a given glider then becomes :

$$v_y = \sqrt{\frac{G}{\frac{\varrho}{2} F \cdot \frac{c_a^3}{c_w^2}}}$$

The smallest value of $\sqrt{\frac{c_w^2}{c_a^3}}$ can be defined with the help of Formula (2). With $\left(\frac{1}{\Lambda \cdot \pi} + 0{\cdot}010\right) = a$ and $0{\cdot}020 = b$ we have :

$$\frac{c_w}{c_a^{1{\cdot}5}} = \frac{a\, c_a^2 + b}{c_a^{1{\cdot}5}}$$

Differentiating in respect of c_a gives minimum of $\frac{c_w}{c_a^{1{\cdot}5}}$ which after a few transformations and with insertion of the numerical values gives

$$\frac{c_w}{c_{a\ \mathrm{min}}^{1{\cdot}5}} = 0{\cdot}658 \sqrt{\left(\frac{1}{\Lambda \cdot \pi} + 0{,}010\right)^{1{\cdot}5}} \quad . \quad . \quad (3)$$

If one further puts the air density $= \frac{1}{8}$ and bears in mind that the rate of descent is to be limited by 0·80 metres per second, then the following relation is obtained between the wing-loading and the aspect-ratio :

$$G/F = 0{\cdot}514 \frac{\Lambda^{1{\cdot}5}}{(1 + 0{\cdot}0314\, \Lambda)^{1{\cdot}5}} \quad . \quad . \quad . \quad . \quad (4)$$

This formula thus makes it clear what wing-loadings on the one hand and what aspect-ratios on the other hand must produce an estimated rate of descent of 0.80

metres per second. The relation between these wing-loadings and their corresponding aspect-ratios is given by the expression :

$$\frac{G/F}{\lambda} = \frac{G}{b^2} = 0{\cdot}514 \sqrt{\frac{\Lambda}{(1 + 0{\cdot}0314\,\Lambda)^3}} \quad . \quad . \quad . \quad (5)$$

A calculation from this formula shows that the value of G/b^2 within the range of commonly-used aspect-ratios remains very nearly unchanged. The following table hows the calculated values within the range of normal aspect-ratios and Fig. 2 the change in value of the function $G/b^2 = f\,(\Lambda)$.

Λ	6	8	10	12	14	16	18	20
G/b^2	6·97	1·04	1·08	1·10	1·11	1·11	1·10	1·09

Therefore the stipulation is made that the types to be recognized as high-performance gliders must satisfy the condition that the quotient of wing-loading and aspect-ratio should not exceed 1.10.

Ultimately this demand implies a limitation of the span-loading, if one understands thereby the loading which is spread over a surface equal to the square of the span.

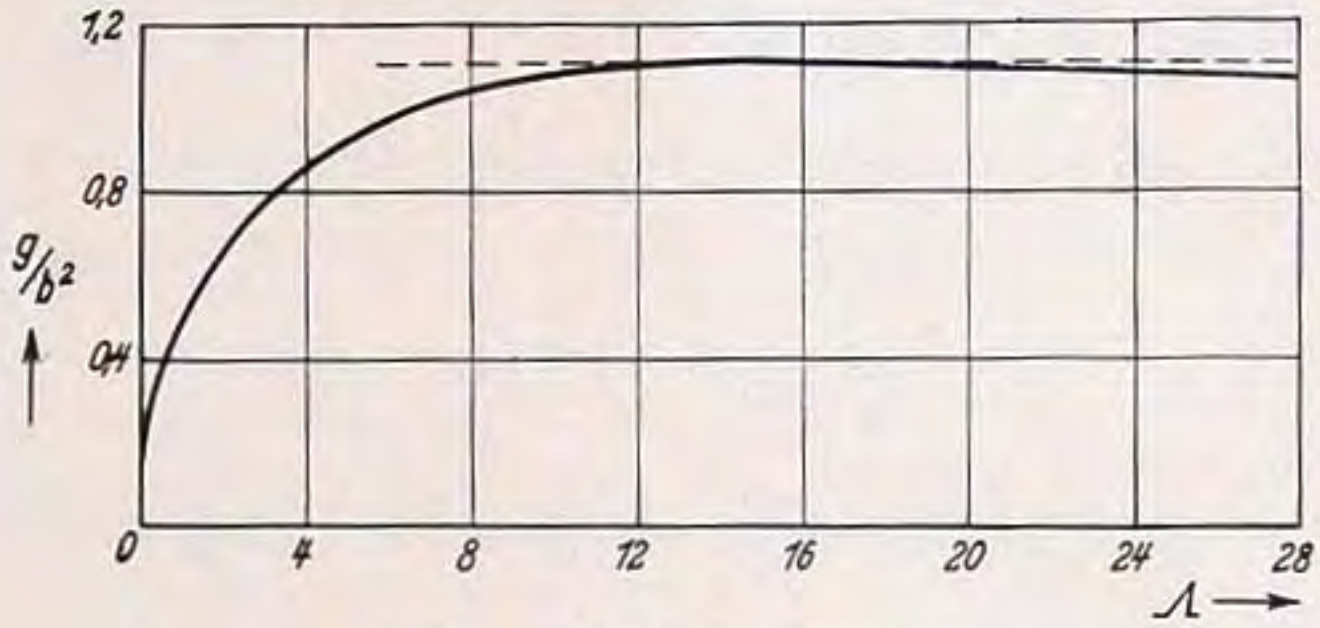


Fig. 2.—Gliding Figure.

That the span-loading is a decisive factor in influencing the rate of descent has already been demonstrated in various ways.

The employment of this simplification produces on the other hand the following expression for calculating the rate of descent from wing-loading and aspect-ratio :

$$v_y \cong 0.762 \sqrt{\frac{G}{b^2}} \quad . \quad . \quad . \quad . \quad . \quad . \quad (6)$$

It is self-evident that a strict handling of this formula for defining the boundary-line was not necessary, nor was it the intention with such a formula of approximation.

2. Discussion of the new aircraft designs.

Thirty-six aircraft in all were entered for the meeting, of which however ten machines did not appear. Of the remaining twenty-six machines only those are discussed here which were specially noteworthy as new designs.

The winning machine of the meeting was the strutted high-wing monoplane " Wien " which Kronfeld had had constructed after a design of the author's. This

machine was a further development from the well-tried "Professor" type of the Rhön-Rossitten Gesellschaft.

The further development of this design as a high-performance aircraft involved a substantial improvement of the aspect-ratio, and in fact this was increased up to 20. With the same wing-area as the "Professor," the machine had span of 19.1 metres, which however, owing to the braced method of construction, gave rise to no special difficulty. The aircraft is shown in Figs. 3 & 4. The wing is in two sections, so as to avoid the weight of the necessary junctions in the case of a plane divided into three. The straight middle portion of the wing has, owing to the increased aspect-ratio, a more strongly cambered wing-section, which was developed from Göttingen 549. The outer portion of the wing was strongly tapered and the camber and thickness of the wing section reduced, in order to obtain a more advantageous aileron control.

Fig 3.—" Wien " Sailplane.

The wing is of single-spar structure, with a light rear spar added locally where required. The junction of the struts with the main spar is purposely made eccentric, in order to relieve the compression-member of the centre section. The strut is V-shaped, as in the "Professor."

The body has an egg-shaped section and shows in side-elevation the form with turned-down nose which was tried out in the "Professor." The attachment of the rudder on to the end of the fuselage was likewise in conformity with the parent type. An interesting feature of this machine was the employment of differential aileron control, which contributed much to the fact that the machine was also pleasant to fly, a circumstance that doubtless first made possible the achievements which were attained with it. Further information concerning the machine will be found in the table of figures given at the end of this article.

In the opinion of most of the experts the Munich group's improved high-performance glider "Kakadu" was the most highly thought-of machine at the meeting. The Munich team had only altered the ailerons as far as the wing was concerned; on this occasion each wing-tip was joined to the aileron to form a balancing horn. The body on the other hand was completely rebuilt. The new body is longer and has a

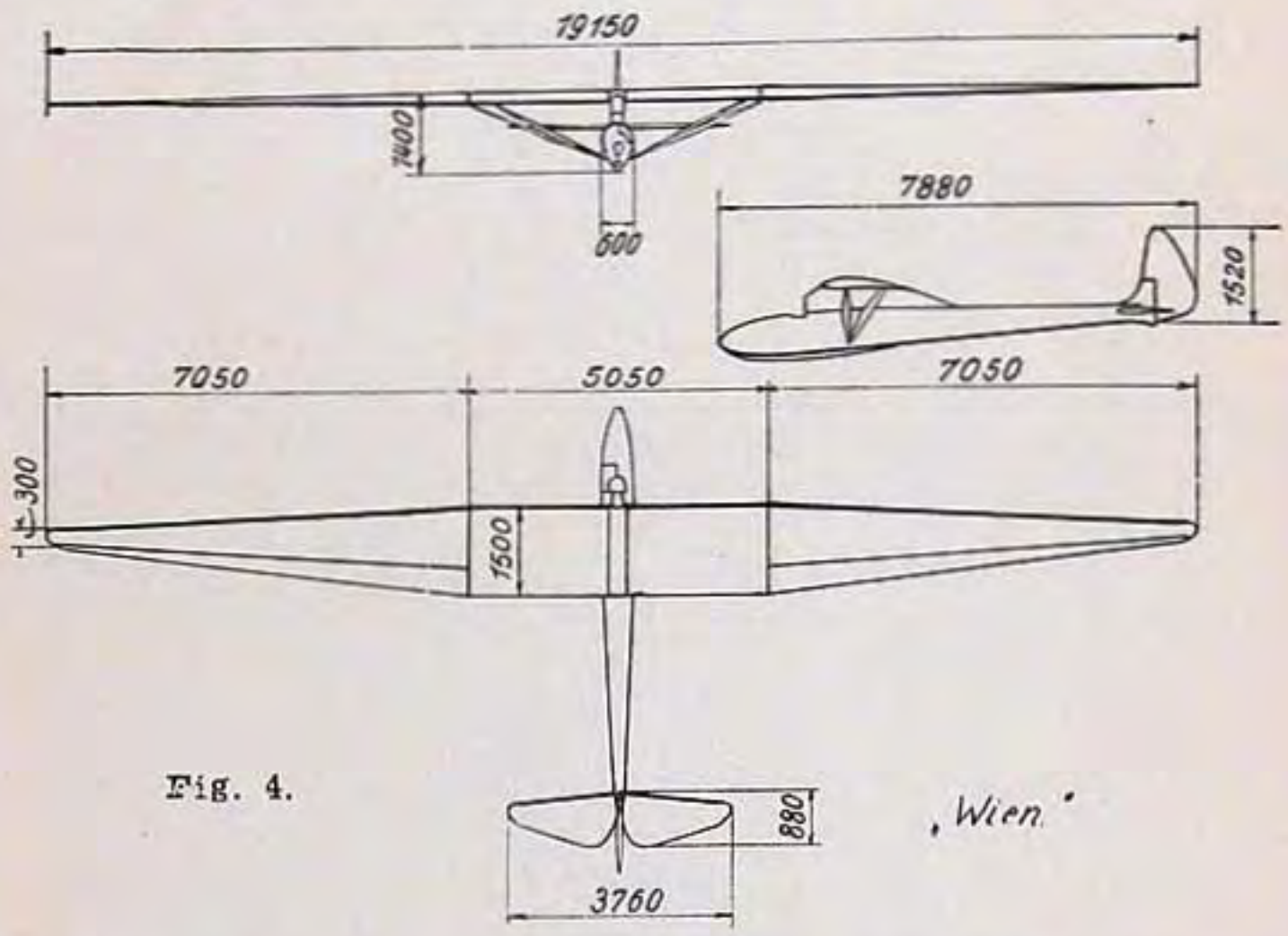


Fig. 4.

substantially smaller cross-section. In fact this cross-section turned out to be almost too small, so that the pilot's head came out into the open in front of the wing. The machine was flown by Krebs of Munich, and this time it thoroughly came up to

Fig. 5.—" Kakadu " Sailplane of the Munich Club.

expectations. Unfortunately the wing showed somewhat large distortion in normal flight, so that the machine was not flown during very gusty weather.

Fig. 5 shows the machine after a start. An exact investigation of the weight of the wing has shown moreover that the specific wing weight is somewhat high at

6.9 kilograms per square metre, while the wing of the "Wien" weighed only 4.5 kg. per square metre.

W. Hirth had likewise at his disposal a new design by Laubenthal, which the Württemberg Aeronautical Association had had built by the Klemm Light Aeroplane Works.

The machine represented a further development of the "Württemberg" type of the previous year.

The cantilever wing was constructed in three sections. The middle portion, with wing-section Göttingen 535, was rectangular in plan form, the adjacent outer wing portions being rounded off elliptically. This form is indeed peculiar to nearly all the designs of the Darmstadt School.

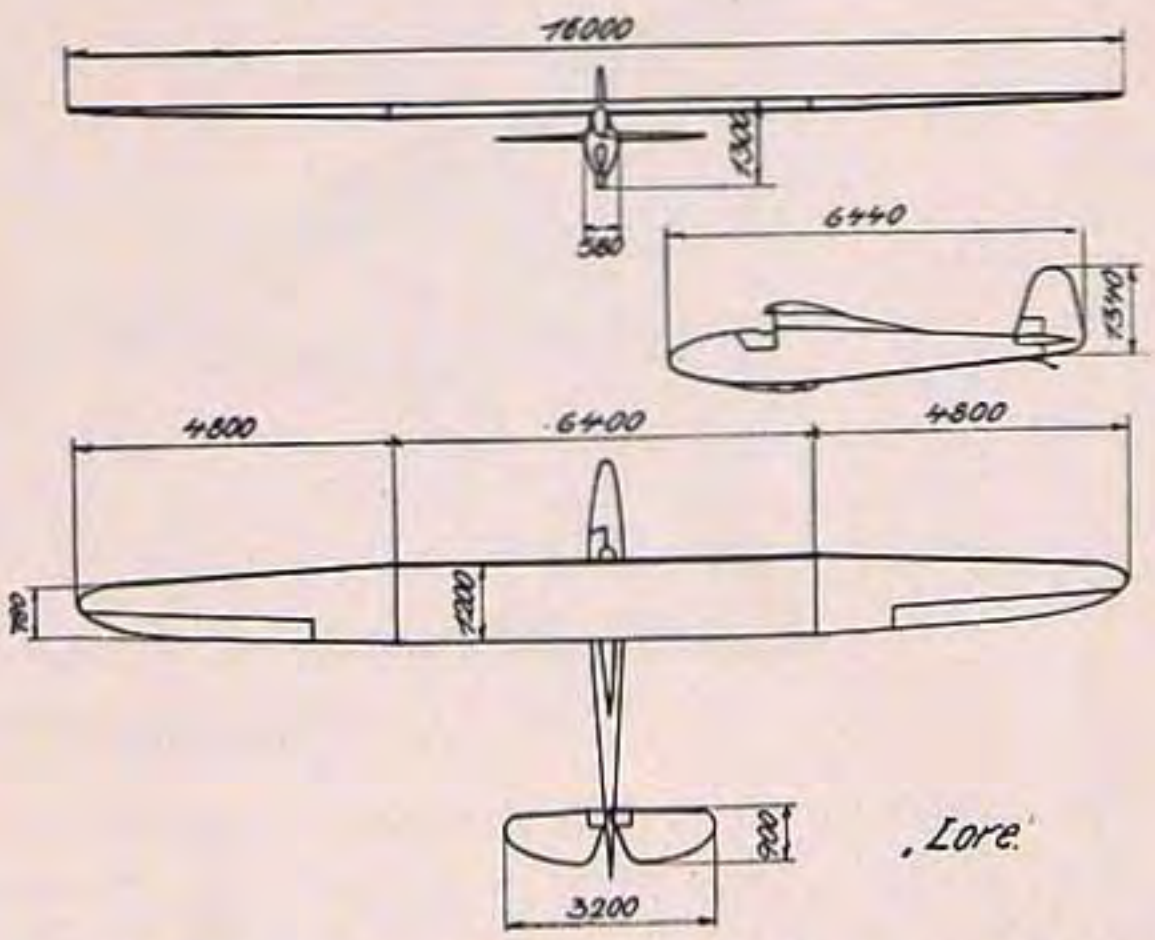
The wing construction is of the single-spar type, with its leading edge stiffened against torsional stresses. There are no additional spars. The wing lies upon theusual protecting support from the body, and is attached to it by means of clasps to the leading edge and to the spar. The pilot sits directly in front of and under the wing.

The body has an egg-shaped cross-section with an underlying skid. The side-elevation of the body is of larger area than that of most other gliders. The body is surfaced throughout with plywood and is built up with three longerons and hoops.

It ends at the rear in a vertical edge with a small stabilising fin. For attachment of the elevator a small fin is built firmly into the body, but it can hardly be looked upon as a stabilising fin.

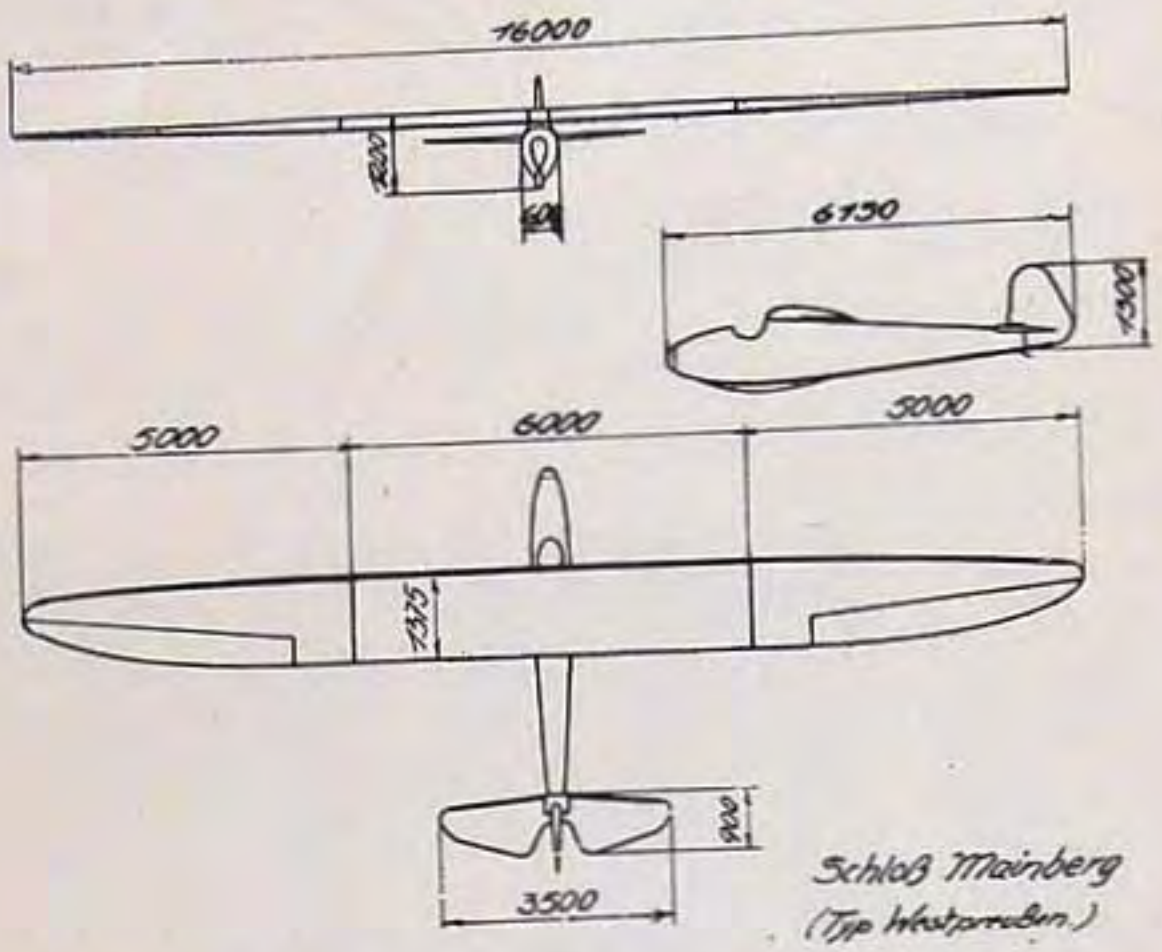
Piloted by W. Hirth, the machine was one of the most successful at the meeting.

The "Lore."



As an improvement upon the "Westpreussen" type Dipl.-Engineer Hofmann brought out the high-performance glider "Schloss Mainberg," which had been built by the Kegel Aircraft Works at Cassel.

The wing, with Göttingen 535 section, is likewise of single-spar construction; it is unsupported, and built in three sections. As in the Westpreussen it lies on the upper surface of the body, without the intermediary attachment usual with other designs.



The pilot's head is thus directly in front of the leading edge of the wing.

The body, of plywood construction, is of egg-shaped section with a skid underneath; it has three longerons with cross-frames.

" Darmstadt II."

The attachment of the rudder is carried out in a similar way to that of the machine "Lore." The attachment of the elevator suspension was not satisfactory, so that it had to be strengthened during the meeting.

As a result of these small defects the machine, piloted by Dittmar of Schweinfurt, put in only a few flights.

The Darmstadt Flying Group brought to the meeting, in addition to their previous year's machine "Darmstadt II," the "Starkenburg" as a new type of m chine. In its measurements this type corresponds almost exactly to Hofmann's new design "Schloss Mainberg" (Fig. 10).

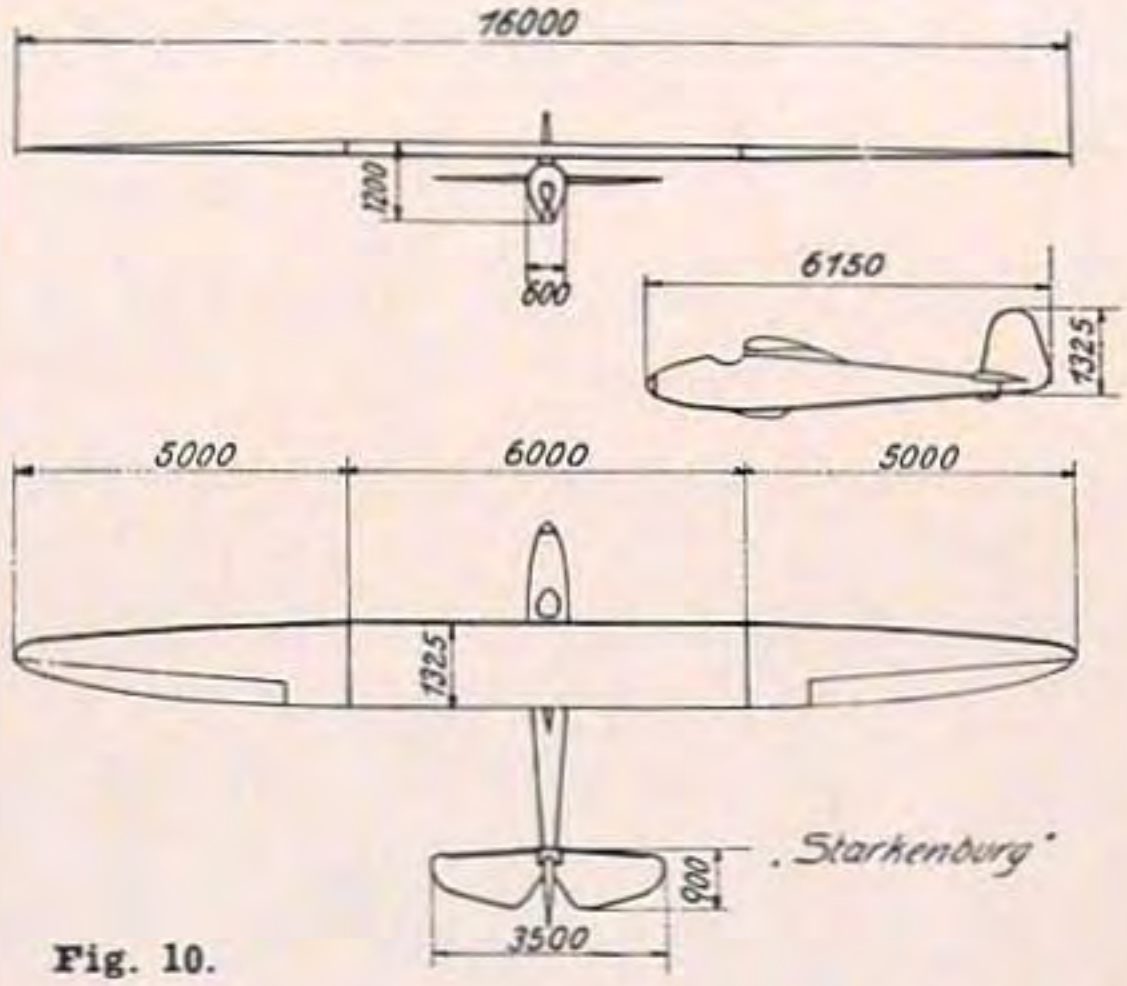


Fig. 10.

The wing-section and the junction of the wing with the body are different, as well as sundry details.

The construction throughout was refined and showed a series of interesting novelties.

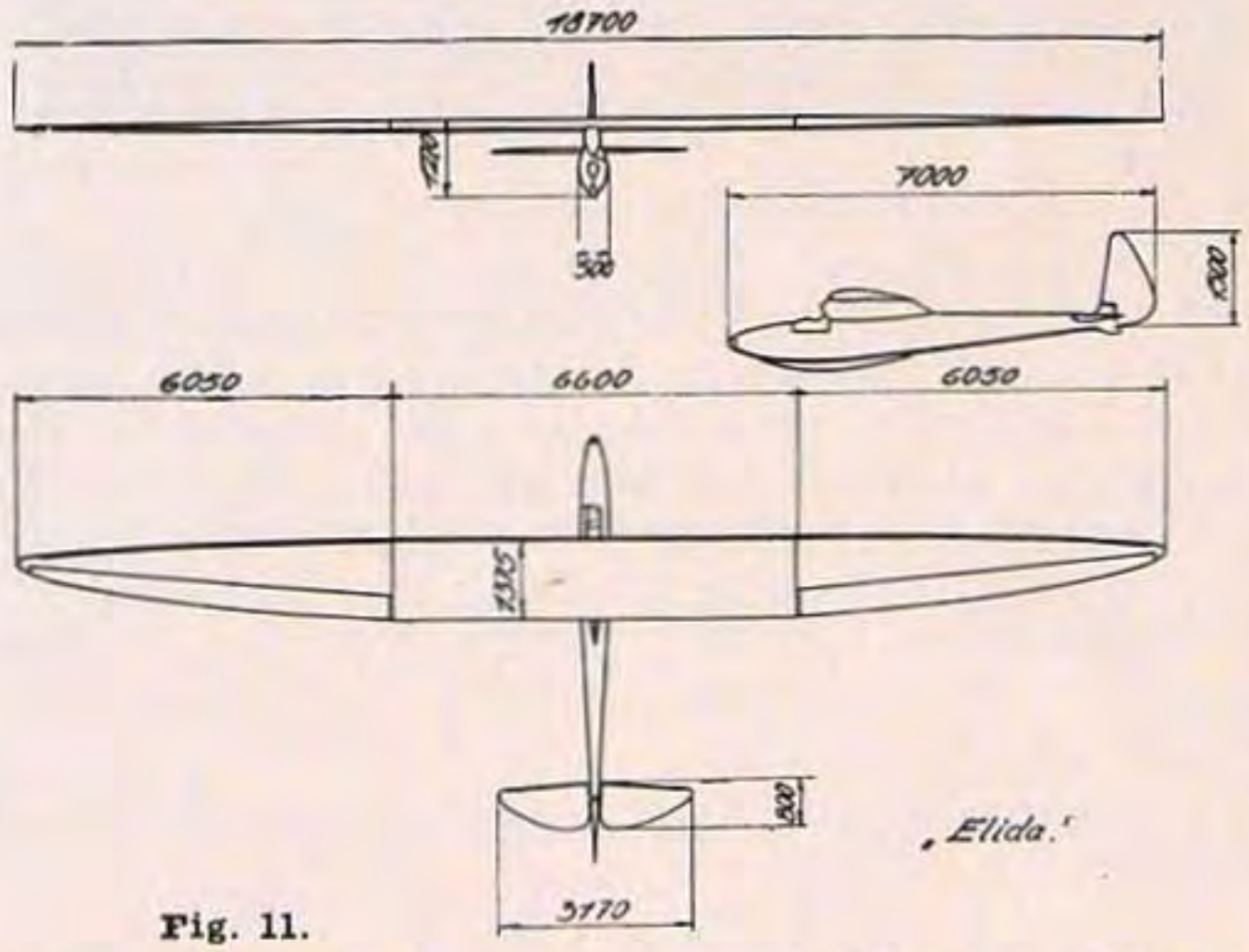


Fig. 11.

Once again, as in the case of the "Consul," the Darmstadt team set to work to couple the rudder and aileron control in such a way, that when the rudder control was put into action, it was automatically accompanied by the assistance of the aileron control, without any resulting direct action upon the control-stick. This method of differential coupling had proved itself very good in the case of the "Consul."

Unfortunately this promising machine had crashed on its trial flights, and it was not rebuilt during the meeting.

As their own personal contribution the Kegel Aircraft Works of Cassel had built for the Lower Hessian Aeronautical Union the high-performance glider "Elida," as well as the two-seater glider "Herkules."

The glider "Elida" is of the cantilever wing type, with a large aspect-ratio and a thin wing-section (Fig. 11).

The wing, with Göttingen 549 section, is in the usual manner built in three sections, with a rectangular middle portion and strongly tapered elliptical outer portions. The internal construction differs from the ordinary type of design, in order to attain greater stiffness of the wing, with its narrow thickness in proportion to span. The

Fig. 12.—The "Herkules."

main spar, situated at the highest point of the wing-section, is almost square in the inner portion of the wing, and is stiffened by means of three strips of wood, thus forming in effect two box spars placed side by side. Behind the main spar a light additional spar is situated at about $\frac{2}{3}$ of the way along the wing-chord. As far as this additional spar the wing is covered on both sides with plywood. As a result of this method of construction the wing naturally became somewhat heavy, so that the gain expected from the unsupported type of wing with good aspect-ratio did not come to fulfilment. The specific wing weight of 6.9 kg. per sq. metre is as high as that of the "Kakadu."

The body, of egg-shaped section, bears some resemblance to that of the "Wien." The cross-section however is smaller and the nose more slender.

The weight of the body is proportionately light, so that the great weight of the wing is to some extent compensated for.

The attachment and the form of the empennage conforms to the "Professor" type of construction, but the very short length of the rudder attachment appears to be rather too weak.

The aircraft was disappointing in its flying performance, when one considers that, with an aspect-ratio of 1 to 17.5 and a wing-loading of 12.8 kg. per sq. m., its rate of descent must have been less than that of most of the other machines. Evidently its controllability was prejudiced by the heavy wing and the consequent moment of inertia about the vertical and longtitudinal axes.

On the other hand it might be beneficial with such a good aspect-ratio to arch the camber of the middle portion of the wing more strongly.

The two-seater "Herkules" was built more with the idea of being a school glider. Its design can be described as an enlarged "Prüfling" type (Figs. 12 & 13).

The wing is in two sections, built up in the normal two-spar method of construction, and braced to the body by two pairs of parallel struts. Each pair of struts is

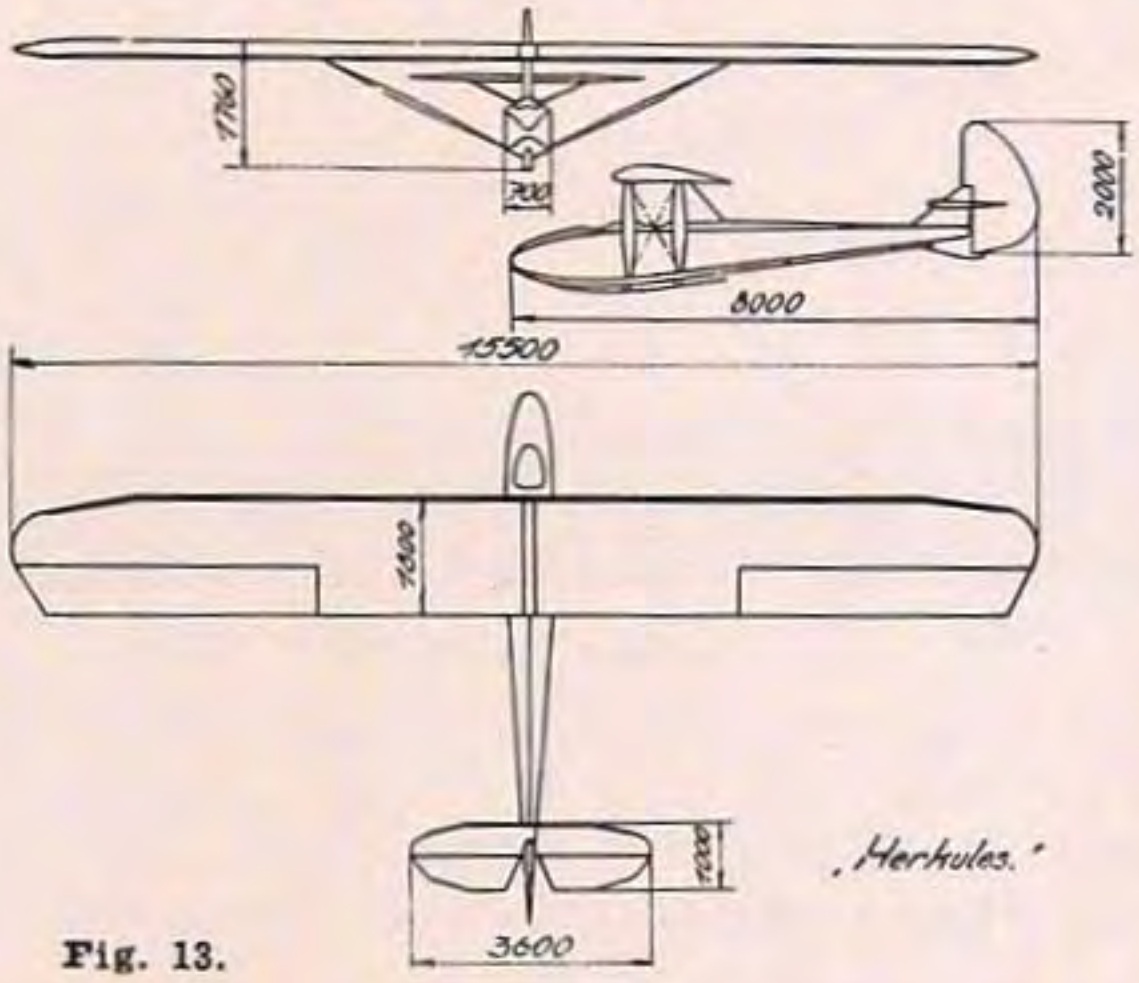


Fig. 13.

cross-braced by wires. In the centre the wing lies upon two supports projecting from the body. The foremost support, situated between the first and second cockpit, and the rear support, behind the second cockpit, are built together solidly with the corresponding members of the body framework. This wing suspension is very satisfactory in respect to air resistance and frontal area, and has also proved to be good constructionally.

As the ailerons are attached to the rear spar, this necessitated a rather deep aileron, so that the loads upon them produced heavy loads in the control cables. With such types of design it is now preferred to compensate such large control surfaces, both as regards weight and aerodynamically.

The body was six-sided and resembled in its shape that of the "Professor." It terminated at the rear in a vertical edge which was prolonged upwards and downwards by means of the vertical stabilising fin. The horizontal stabilising fin, braced by struts, was built on to the upper part of the vertical stabilising fin, so that the elevator control mechanism stood further from the ground, and was better protected from injury. The aircraft possessed dual control so that it could be used for teaching purposes.

The machine was successfully entered in the competition, flown by the Cassel glider pilot Hurtig.

The Berlin Gliding Association e. V. also took part again successfully in the competition with a high-performance machine.

The Chairman of the Association, O. Hohmuth, had himself constructed the glider "Luftikus," and the members of the Association carried out its erection. The form of the machine as a whole conforms to the earlier "Vampyr" design with improved and finer lines. The wing, of Göttingen 535 section, is in three parts and of single-spar construction, with a straight middle portion and trapeziform outer portions.

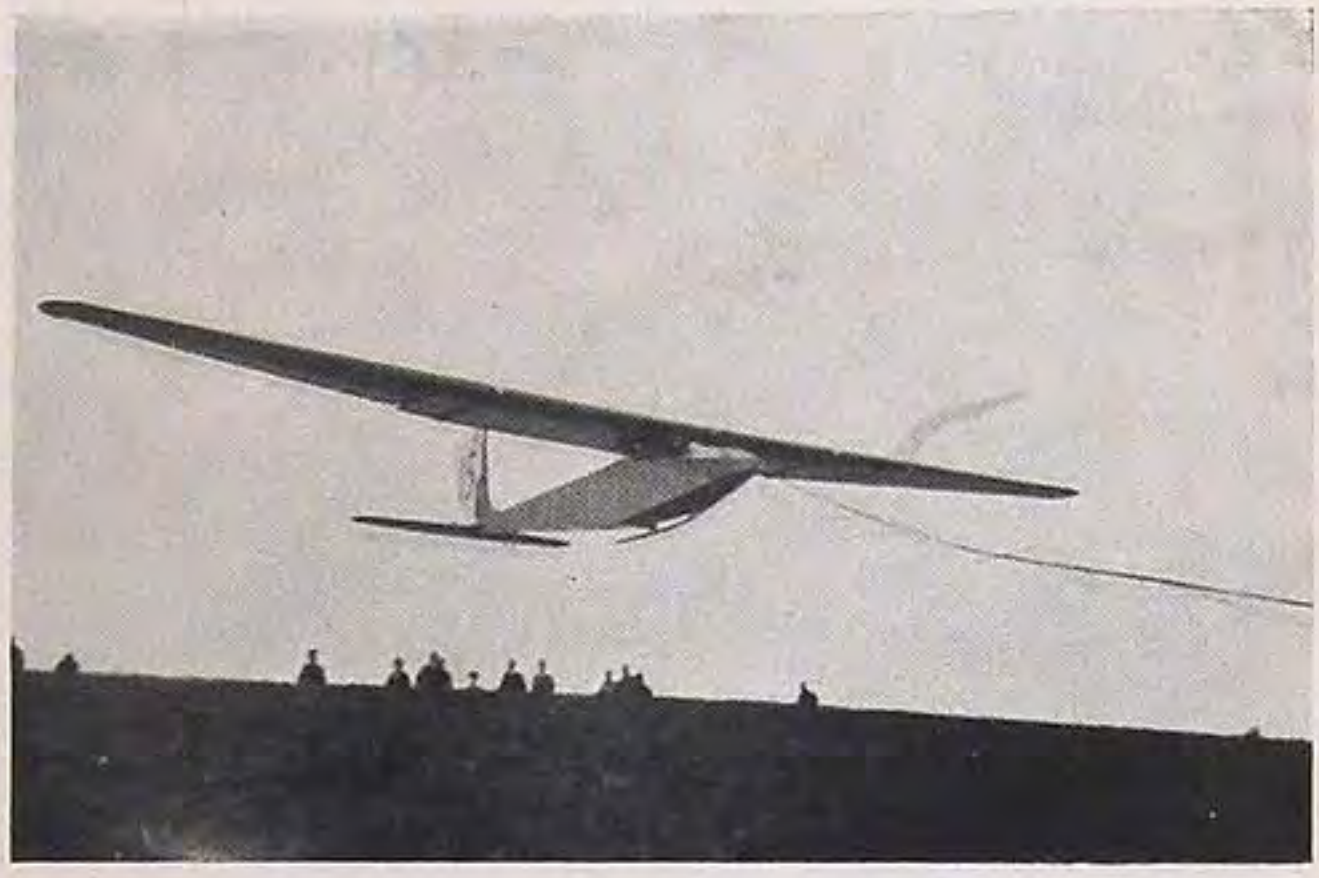


Fig. 14.—The "Luftikus."

An additional spar running inwards from the thrust point towards the rear further stiffens the middle portion. The wing lies upon a straight and somewhat high projection from the body and is further supported at a short distance from this by two short hollow steel struts, which are attached to the upper edge of the body.

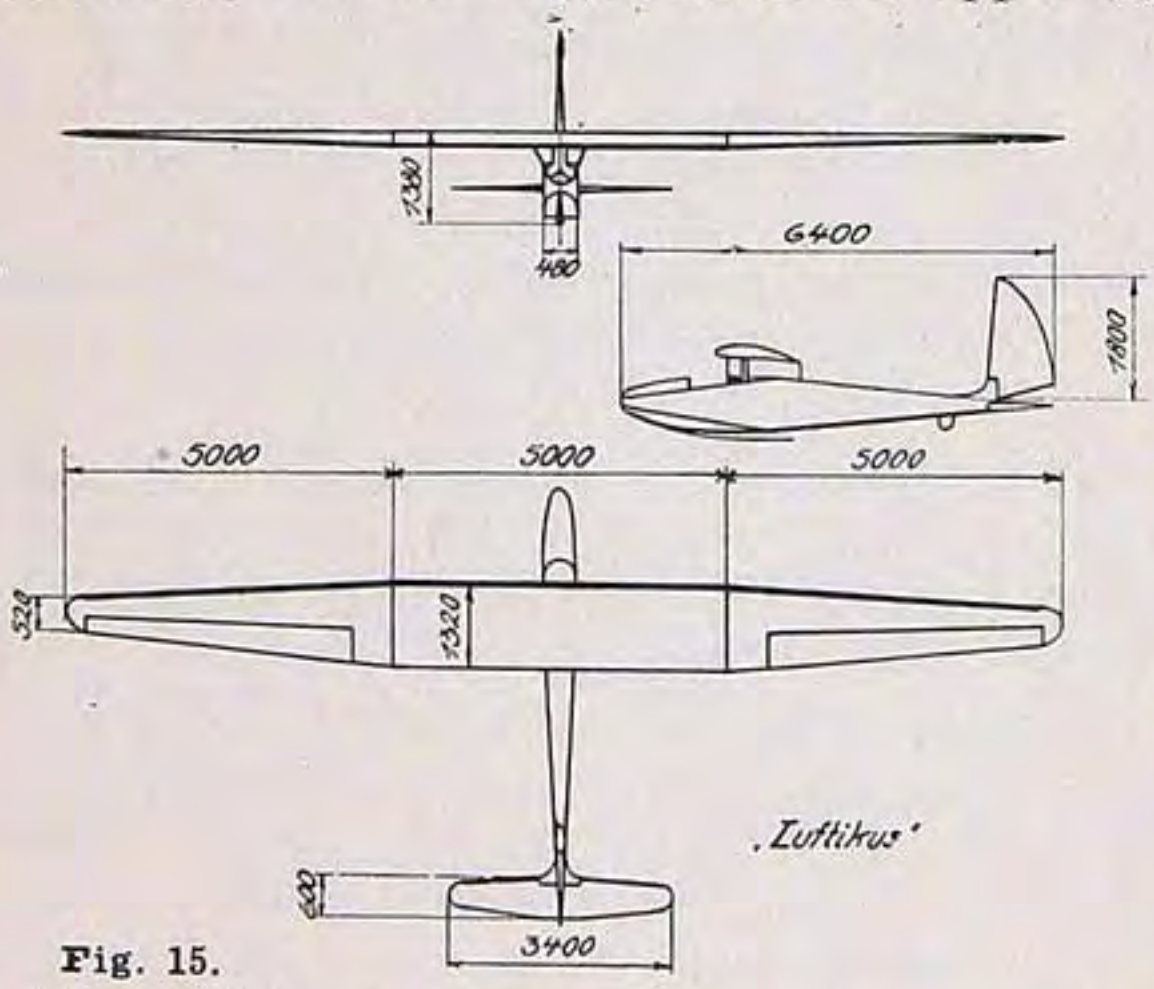


Fig. 15.

The body is surfaced with plywood, and is of hexagonal section in front and rectangular behind, like that of the "Vampyr." The greatest width of the body, 0.48 metres in the neighbourhood of the pilot, is astonishingly narrow, so that during a long flight the pilot is allowed little freedom of movement. The body terminated at

the rear in a horizontal edge, which was broadened by a small horizontal stabilising fin. The high, pointed rudder was attached to a small fixed stabilising fin on the upper surface of the body in front of the elevator control mechanism. In fact this arrangement of the controls was formerly the general custom. The control surfaces were extraordinarily light but at the same time strongly built.

In spite of the angular form of the body this machine surpassed many other high-performance gliders, so that the "Luftikus," which was excellently flown by the young pilot Bedan, who at the very beginning of the meeting passed his "C" test on it, was one of the most successful aircraft of the meeting. (Figs. 14 & 15).

Fig. 16.—The " Aachen " M.I.

The Aachen Team likewise reappeared at the meeting after an interval of some years of inactivity. The Aachen Aeronautical Union's practice glider "M 1" of strutted wing type, had been constructed by Dipl.-Engineer Mayer with the object

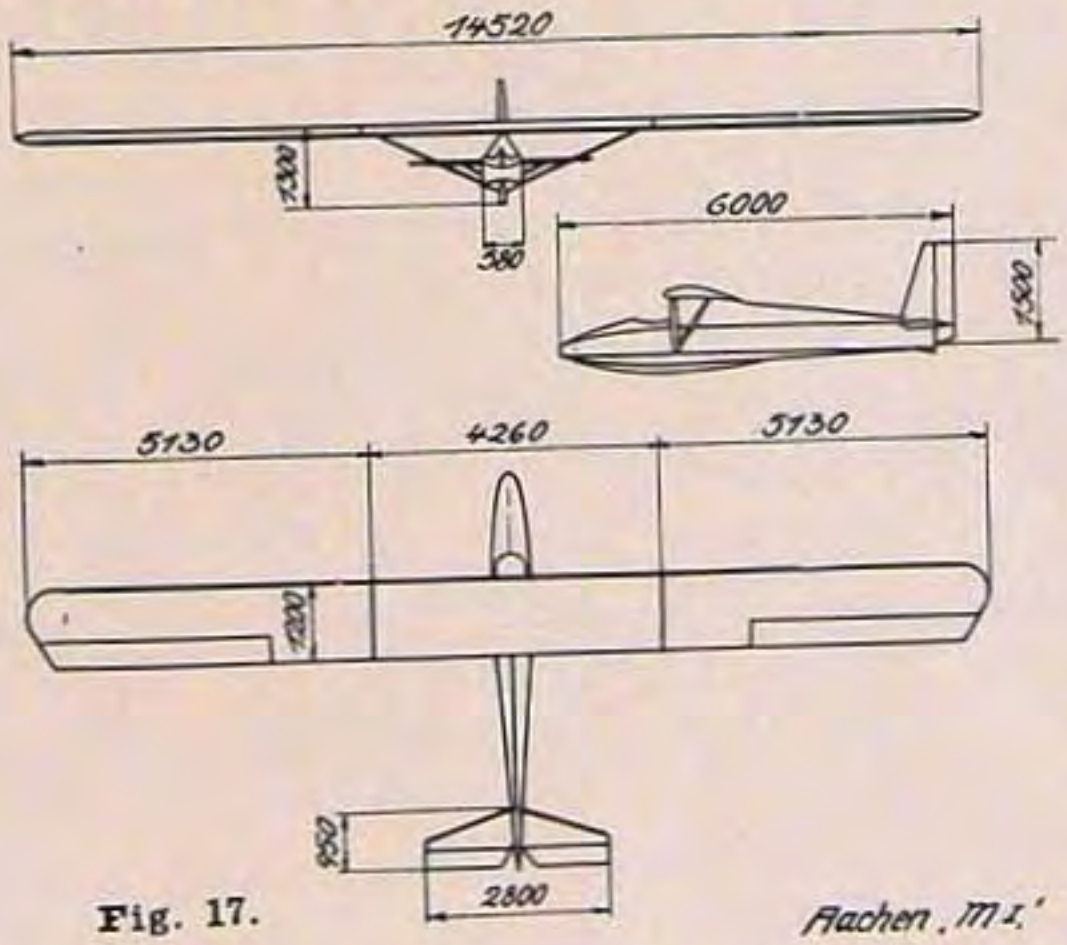


Fig. 17.

of producing a practice glider, of simple type but at the same time with good soaring qualities, as an improvement on the "Prüfling" (Figs. 16 & 17).

The wing is of two-spar construction ; it is built in three sections, and throughout its span is of equal thickness and has the same wing-section (Göttingen 535). The middle portion lies upon the upper border of the body, and is supported by V struts at the points of junction with the outer portions. Thus the struts are held on by the same attachments as those which serve for the junctions with the outer wing portions.

The body has a hexagonal cross-section. It is covered with plywood as far back as the rear spar and from there onwards with fabric.

At the rear it terminates in a vertical edge, which is continued upwards into the vertical stabilising fin. The rudder is rectangular, and narrow in width.

The horizontal stabilising fin is fixed to both sides of the body and supported underneath by a strut to each side. The elevator is rectangular with a portion cut away for the rudder.

The performance of this aircraft was very satisfactory, so that the machine, piloted by its constructor Mayer, was able to carry out some very notable flights

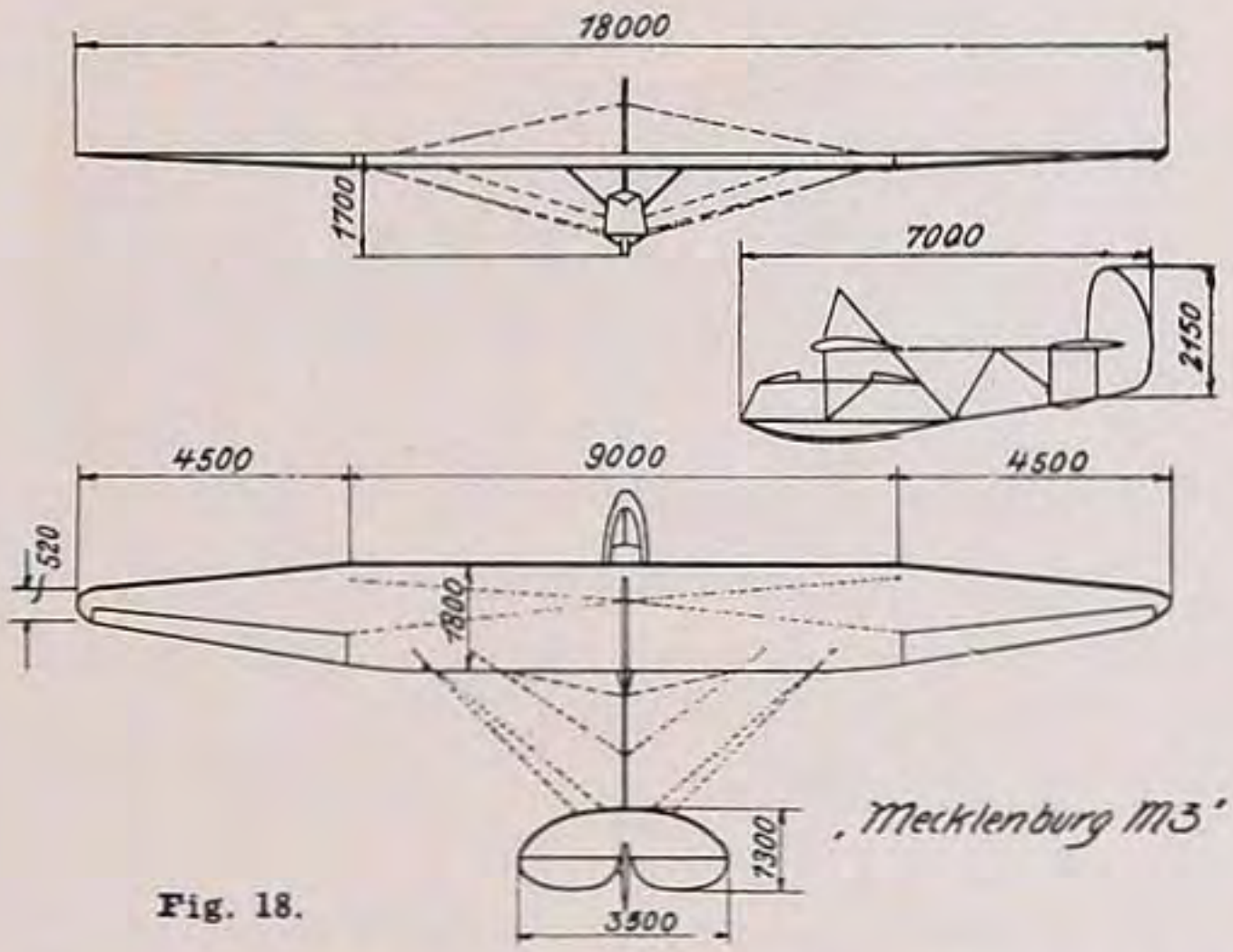


Fig. 18.

during the meeting. The Aachen team thereby performed a valuable service for the further development of the school sail-plane type.

The Rostock Aero Club of Mecklenburg devoted themselves to the further development of the light school two-seater. Under the direction of Dipl.-Engineer Krekel the "Baumeister M I," known from its appearance at the 1928 glider meeting, was improved and entered in the 1929 meeting as type M II.

The wing, with its aspect-ratio improved in comparison with the previous year, is in two sections ; it has two spars, with wire bracing in the inner panels and rigid diagonals in the outer wing portions. The individual details, such as attachments, rib details, etc., were even more carefully carried out and as far as possible standardised.

All the other parts of the aircraft, such as the body and the empennage, were carried out in hollow steel construction. The body, a roomy enclosure as in the previous year, is longer and higher than the nacelle of M I. Dual control is provided, with detachable control levers. Doped fabric serves as a covering for the nacelle.

The cabane is arranged to be detachable, and is built up of streamlined steel tubing. The junction of the four opposing cables is so arranged that the cables can be tightened or relaxed by means of one turn-breckle, which naturally simplifies the rigging and dismantling and makes it possible during school practice to connect up the cables without much expenditure of labour. The fuselage is carried out in the usual way as a plain framework, likewise of steel tubing, and is braced to the wing. Elevator and rudder control mechanism composed of fixed and movable surfaces are likewise of steel tube construction. The horizontal stabilising fin can be set for trimming purposes. Both rudder and elevator are elliptical in outline.

This school aircraft was, as regards its specific weight, the lightest at the meeting, the structural weight of the whole machine being 5 kg. per sq. metre.

With the intention of developing this strutted two-seater type still further, the design "Rostock M III" was brought out. With this machine the design of the fuselage and tail of the "M II" were retained in detail and the wing still further developed in the direction of soaring efficiency.

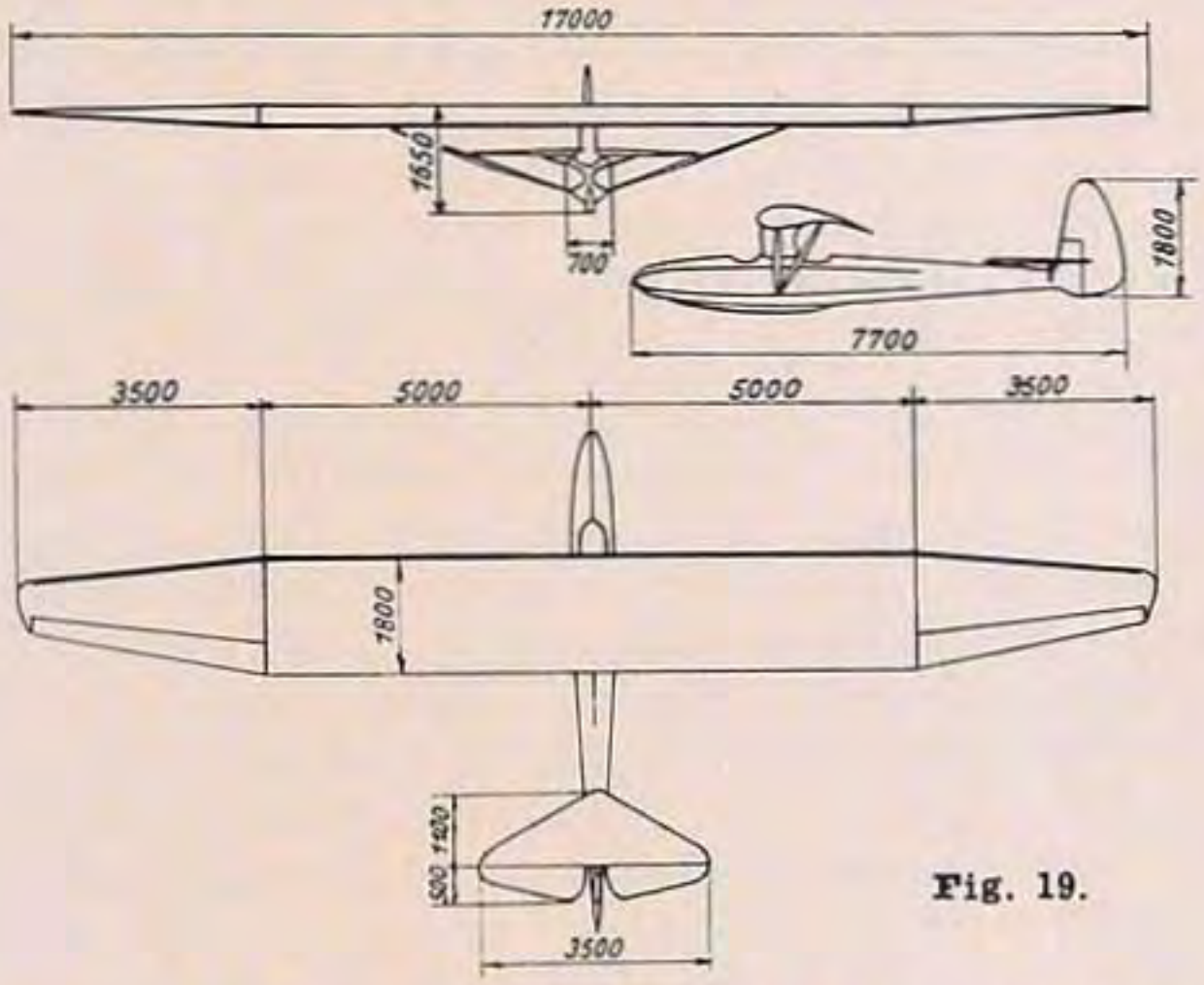


Fig. 19.

The main supporting surface is, on the contrary, braced in the case of the "M III," and is carried out in four sections. The inner wing portions are rectangular in plan form, of two-spar type of construction with rigid wooden diagonals. The outer wing portions, which are attached at the points where the wing is braced, have a trapeziform outline with rounded tips. Both spars meet in a point and in the inner panels are likewise cross-braced with wooden diagonals. The ailerons stretch along the whole length of the outer wing portions.

Apart from the wings all other parts are carried out in welded steel tubing construction and are hardly altered as compared with the "M II." As special features this machine possesses ailerons with differential movement and the dihedral angle of the outer wing portions is adjustable.

By doubling the aspect-ratio of the "M II" the structural weight of the whole machine was increased to 5.8 kg. per sq. metre, so that this aircraft also can be described as exceptionally light. Furthermore it showed also very good soaring capabilities both as single-seater and as two-seater, and at present is the type best adapted to school purposes.

The "Schleicher-Poppenhausen" Aircraft Works likewise brought to the meeting a two-seater built from a design of the author's, which in its general build approached more nearly the form of a high-performance glider. This aircraft "Rhönadler" (Fig. 19) has an understrutted wing, built in two sections, with a straight middle portion and tapering trapeziform outer portions. The wing-section of the innner portion is the R.R.G. No. 652, which was also employed for the Munich Machine "Kakadu." In the outer wing portions this wing-section is gradually and evenly reduced to a thin slightly-cambered wing-section, in order to increase stability and and controllability.

By the internal construction of the wing a further attempt was made to develop the method of construction with a supporting outer skin, such as had already been put into practice in a different way by the Munich group.

Two deep I-spars situated at 10% and 35% of the chord depth constitute a large box, resistant to bending and torsional stresses. Between these two spars, the bracings of which only serve for binding the supporting skin to the framework members, light longtitudinal strips are arranged outside the wing-ribs parallel to the spars and formed with T-shaped cross-section, for the purpose of stiffening the plywood skin. The entire cross-section is carried through the ribs, the bracings of which lie underneath at these places and are strengthened through the nodal points. Both the main spars are stiffened by means of the upright members of the rib framework, which is made possible by the fact that these members are glued direcly to the plywood wall of the spar.

In addition another light assisting spar was situated at 68% of the chord depth for stiffening the ends of the ribs. The connection of the wing-support to the wing spar was likewise carried out in a novel manner. Through the neutral axes of the box spar ran a strong tube, which was enclosed in such a way that it could be turned inside the encased spar-members. On the tube a shoe was fixed, which was likewise attached on the under side to a tube, into which the wing-support was than introduced, and rigidly attached to it with bolts. In this way a simple mounting of the wing-support and good transmission of forces to the wing surface were obtained. This main wing-support formed, with a light additional support to the rear spar, a "V" which was braced to the body towards the front and the rear with cables.

The wing was laid upon a long "neck" with the main spar between the first and second cockpit. The body has the cross-section of a regular hexagon in its fore part, and towards the rear it changes into the shape of a circular cone. Six light longerons were arranged to correspond with it. This method of construction was chosen in order to simplify as far as possible the assembling of the body. The body was continuous with the vertical stabilising fin, whereas the horizontal stabilising fin was placed above the body on short supports and was braced by two struts.

The wing structure proved itself to be exceptionally rigid, so that no distortion was noticeable even with strong gusts. The rigidity of the "neck" of the body was not satisfactory, a fact which was established during a cloud flight up to a height of 1275 metres with the machine flown as a two-seater and piloted by the glider-pilot Groenhoff. By this record altitude flight for two-seaters Groenhoff at the same time exceeded the distance record for two-seaters with a flight of 33 kilometres.

The high-performance glider of Schleicher from the previous year was likewise flown by Groenhoff. Only the machine's rudder was somewhat altered. In the

early days of the meeting Groenhoff carried out various successful flights with it. During a sharp turn above the wooded south-easterly slope of the Eubeberg the machine side-slipped down on to its wing and crashed.

The "Dresden Academic Flying Group" likewise took part in the meeting with two aircraft. The unsupported high-wing monoplane "Baunmumer 8" possesses a strongly tapered trapeziform wing, in three sections and of two-spar construction. As far back as the rear spar the wing is surfaced with plywood so as to produce good torsional stiffness. This form of construction is similar to that of the "Elida," with the result that, what with an aspect-ratio of 1 to 21, its specific wing weight of 7.3 kg. per sq. metre was greater than that of any other machine at the meeting.

The body possesses a rectangular cross-section with a large vertical edge at the end, so that the side elevation of the end of the body possesses a very considerable keel action. The horizontal stabilising fin is unsupported and is placed upon the upper surface of the body. The elevator itself is astonishingly small.

Owing to the copious employment of plywood surfacing, the machine proved exceptionally heavy, and as owing to the heavy outer wing portions the moment of inertia about the longtitudinal and vertical axes must have been very considerable. There were at first some scruples on the part of the Technical Commission against allowing it unconditional admission.

Various flights at the end of the meeting, as well as during very gusty weather, showed the aircraft to possess sufficient controllability. As a result of the high wing-loading and the distortion of the long unsupported wing the machine flew astonishingly smoothly.

The "Badisch-Pfälzige Aeronautical Union" of Mannheim turned up with the two-seater "Mannheim," known from the previous year, which in fact represented a two-seater structure of the "Professor" type. The aircraft, which was flown chiefly as a single-seater by the Mannheim pilots Christ and Schlerf, appeared late at the meeting, and only a few flights could be carried out on it. Unfortunately the machine was not readily overhauled, so that the defects still pertaining to it did not permit of clear examination.

In Table 1 are given the various constructional measurements and weights of the machines taking part in the meeting, as far as they are available. Likewise the different rates of descent calculated from Formula (6) are given for comparison.

By examining the various barograms of gliding flights recorded during long-distance flights of high-performance aircraft it can be established that the actual rates of descent were from 10 to 20% greater than the amounts ascertained by calculation. Had one taken as a basis an exact calculation by making use of the measurements obtained with complete glider models given by A. V. A. Göttingen, Part III one would obtain even more favourable values than those calculated from the formula. As the gliding figures show in general a better correspondence, it must be admitted that with highly increased values the profile-drags appear smaller in the measurements and that disturbing influences still interfere considerably with the air-flow. It will however only be possible to clear up these inconsistencies by extensive measurements.

In spite of the outstanding performances which have been achieved during this year's meeting, and which also can certainly in part be traced back to the considerable

Table 1.

Name of Glider.	Total weight of the machine in kg.	Weight of wing in kg.	Wing area in sq. metres.	Specific wing weight in kg. per sq. metre.	Span in metres.	Aspect ratio.	Specific weight of the machine in kg. per sq. metre.	Wing loading: kg. per sq. metre.	"Gliding figure" [see page 68].	Wing Section	Specific weight of elevator: kg. per sq. m.	Specific weight of rudder: kg. per sq. m.	Specific weight of the body relative to its length: kg. per m.	Flying weight: kg.	Flying weight as two-seater: kg.	Calculated rate of descent: metres per sec.	
Lore	161,8	102	16,6	6,1	16,0	15,4	9,8	14,0	0,91	535 modi-	3,30	2,65	8,8	231,8		0,724	
Stadt Stuttgart	140,6	87,2	16,0	5,4	14,5	13,1	8,8	13,2	1,00	430 fied.	4,25	4,45	7,2	210,6		0,763	
Hugo	153,1	97,2	15,5	6,5	15,0	14,5	9,9	14,4	1,00		2,63	2,45	8,2	223,1		0,759	
Wangen i. Allg.	143,8	90,8	18,1	5,0	15,7	13,6	8,0	11,8	0,87	535 ,,	3,17	3,20		213,8		0,710	
Elida	186,2	139	20,0	6,9	18,7	17,5	9,3	12,8	0,73	549	2,65	2,80	6,0	256,2		0,653	
Schloß Mainberg	142,8	92,2	17,0	5,4	16,0	15,0	8,4	12,5	0,84	535	3,80	3,72	7,3	212,8		0,695	
Kakadu	168,6	122	17,6	6,9	19,2	21,0	9,5	13,5	0,65	652				238,6		0,613	
Wien	158,1	81,6	18,0	4,5	19,1	20,0	8,8	12,6	0,63	549 ,,	2,14	2,60	8,1	228,1		0,600	
Kassel	140,0	100	20,5	4,9	17,5	15,0	6,8	10,2	0,68	549	2,79	2,66		210,0		0.629	
Starkenburg	145,2	99,6	17,5	5,5	16,0	14,8	8,05	12,3	0,84		2,95	3,00	6,8	215,2		0,697	
Luftikus	143,0	82	15,4	5,3	15,0	14,6	9,3	13,9	0,95	535	1,00	1,00	10,0	213,0		0,742	
Aachen	120,4	69,6	16,8	4,1	14,5	12,5	7,1	11,3	0,90	535	4,40	3,20	5,5	190,4		0,726	
Dresden	227,4	139,5	19,0	7,3	20,0	21,0	12,0	15,6	0,74	527	6,50		10,0	297,4		0,656	
Rostock M II	121,5	60,0	24,0	2,5	12,1	6,1	5,0	10,9	1,78		2,20	1,88	13,8	191,5	261,5	0,871	1,017
Rostock M III	153,2	97,6	26,5	3,7	18,0	12,2	5,8	11,3	0,90	532	1,82	1,90	12,8	223,2	293,2	0,633	0,725
Rhönadler	207	123,2	27	4,4	17,5	11,3	7,7	12,8	1,14	652				277,0	347,0	0,725	0,811
Mannheim	200,4	101,6	27,1	3,7	17,3	11,0	7,4	12,6	1,14	533	2,95	2,70	9,7	270,4	340,4	0,725	0,812
Herkules	193,5	108	27,0	4,0	15,5	8,9	7,2	12,4	1,38	549	3,30	3,57		263,5	333,6	0,798	0,898

improvement in high-performance gliders, a further increase in flying performances will be attained through systematic development of proved types. The strutted design, for instance, allows of ready development of actually still greater aspect-ratios. The tapering throughout of the unsupported type of wing construction with large span will give greater resistance to bending and torsional strains and lead to a reduction of the structural weight. It cannot be foreseen what possibilities in sailing flight will then be rendered possible, and it will be the task of the designers to work towards a steady improvement and refinement in construction for the attainment of these objects.

Translated by Dr. Alan E. Slater, Member of the British Gliding Association and of the London Gliding Club, who very kindly undertook this difficult and honorary task for the benefit of the readers of the Journal.

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THE GLIDING MOVEMENT IN GERMANY.

Report and observations by Members of the Council of the British Gliding Association of their visit to the School of the Rhön-Rossitten Gesellschaft on the occasion of the Annual Competitions in August, 1930.

SOARING is a sport which calls for high physical and mental efficiency, and fulfils the old, old dream of human flight. By the study it involves of many meteorological, aerodynamical and aerotechnical questions, it renders Science important service. Soaring is also an excellent preliminary training for pilots of air liners, owing to the knowledge to be gained regarding air currents and the like.

The objects of the Rhön-Rossitten Gesellschaft are: to promote the gliding movement in Germany, deal with the scientific problems through their Forschungs Institut*, give advice to those interested in gliding, and to attract the coming air-minded generation to their schools in order to test aeronautical skill, in order to provide incentive for further work and the opportunity for exchange of views on scientific and aeronautical matters, and for the sake of scientific discovery.

Gliding as a serious sport was becoming established in Germany in the year 1919, when there were two Associations, viz. :—the Deutsche Luftfartverband and the Deutschetscher Modell and Segleflugverband.

These Associations operated on the Wasserkuppe and were supported by the gliding clubs. This organisation was not found to be entirely satisfactory, and in the following year the various gliding interests came together and founded the Rhön-Rossitten Gesellschaft. (Hereinafter referred to as the R.R.G.).

This Society approached the Government for help, pointing out the great future of the gliding movement and its value to the cause of aviation in general. The German Government granted the first subsidy in 1924, and made the R.R.G. responsible for the control of Gliding. Thus the R.R.G. controls the Gliding Movement in Germany with the aid of Government approval and support in all its technical, scientific and sporting activities.

The Rhön-Rossitten Gesellschaft.

Constitution.—The R.R.G. is an independent body working with and within the four principal aviation Associations, i.e.,

(1) The Deutsche Luftfartverband (German Air Sport Association).

(2) The Deutsche Modell und Segelflugverband (German Model and Soaring Flight Association).

(3) The Sturmvogel (Labour Party Air Organisation).

(4) Der Ring Der Segelflieger (Association of Soaring Pilots).

Membership.—The Society is supported by a personal membership of those interested in the movement similar to that of the British Gliding Association at a minimum subscription of 20 M. per annum. The only privilege of its members is to receive the annual report and to have free entrance to the annual competition.

Finance.—In addition to the subscription from its members the R.R.G. has the benefit of the donations of well wishers and also the Government subsidy.

Clubs do not affiliate to the R.R.G. and make no contribution to its funds. They do not even pay for C's of A., but only the expense of the inspectors making the inspection.

The vesting of complete technical and scientific control of the movement in the R.R.G. may seem to invite the danger of a tendency to limit original thought

**Research Establishment.*

and retard progress, if not exercised with considerable care. On the other hand it has to be remembered that the R.R.G. has, perhaps, the only organised research and technical departments in the whole of Germany, and their work is carried out in an orderly and consistent manner.

The technical committee of the R.R.G. is the highest authority and has the last word, in everything appertaining to gliding. It appoints inspectors of two classes. The first class for design approval, the second for inspection of machines. No club is allowed to appoint an inspector, but can appoint its own ground engineer.

Manufacturers are glad to have the approval of the R.R.G., because the clubs seek the advice of the R.R.G. before placing orders. It sends inspectors secretly to approved firms, and thus keeps a check on their produces. It does not undertake detail inspection or the passing of each glider. Clubs inform the R.R.G. of any faults in gliders, and if the manufacturer does not make good the defect the R.R.G. asks for an explanation; if the refusal to remedy defects occurs twice the R.R.G. cancel the approval agreement. At present there are two approved firms, with agreements similar to that offered to the British Gliding Association in respect of R.R.G. designs.

In the event of a serious accident the Government inspectors investigate the cause, and the R.R.G. inspector attends the inquiry to give technical advice. The R.R.G. receives a report from the Government inspector as well as from its own inspector.

To obtain the Government subsidy the R.R.G. prepares a budget showing the expected income and expenditure of each department. This is placed before the Government for approval, with a request for a subsidy to cover the deficit. The Government makes a grant to the scientific side only.

Aircraft manufacturers cannot help financially, but recognise the R.R.G. as a very important body. Professor Hoft, who is a Director of the Technical Advisory Committee for Aeronautics in Berlin, has given a lecture on the influence of gliding and soaring aircraft on the development of power aircraft. It is of interest that 50 per cent. of the personnel of the Scientific Research Institute at Jurkens have been trained at the R.R.G.

Duties.—The R.R.G. is the authority which :—

(a) Grants all licences for glider pilot's certificates.

(b) Appoints observers and time-keepers (two per club).

(c) Inspects flying grounds when a club is forming a school (but not otherwise).

(d) Grants C's. of A.

(e) Controls the Gliding Movement in Germany with the aid of Government approval and support in all technical, scientific and sporting activities.

Activities.—The activities of the R.R.G. may be summarised as follows :—

(1) It conducts a school for approved pupils at its headquarters on the Wasserkuppe.

(2) It exercises complete technical and scientific control of the movement in Germany and conducts the only organised Research and technical departments in the whole of Germany.

(3) It organises an International Soaring Competition on the Wasserkuppe in August of each year.

Directors.—The board of Advisory Directors is:—

Konsul Dr. Karl Kotzenberg,
Professor Dr. Walter Georgii,
Bankdirektor Max Heinkien,
Direktor Willy Fischer,
Landesrat Dr. Hans Gebauer,
Dr. Otto Lamy,
Oberregierungarat Muhlig-Hofmann,
Direktor Herman Schleissing-Junkerswerke,
Direktor Max Joseph Stelzmann,
Oberstleutnant D. Feliz Wagenfuhr,
Zivil-Ingenieur Oskar Ursinus.

The actual head of the R.R.G. is Konsul Dr. Kotzenberg, who is chairman of the board. The de facto head is Dr. Georgii, who is the inspiration and final authority in all departments.

The R.R.G. Establishment on the Wasserkuppe is open throughout the year. Flying is only possible between March and October owing to snow.

The Heads of the various departments are:—
Principal, Dr. Georgii.

General Secretary, Dr. Graf von Ysenburg.

Secretary to the Administration and Manager of the Hostel, W. Gobel.

Technical Department, A. Lippisch; Aerodynamics, Herr H. Knott; Meteorological, Dr. Georgii; Power Flying Research, H. Reidel; School, F. Stamer.

The staff numbers approximately thirty, assisted by thirty to fifty students from the school.

Objects.—It seems quite obvious from conversations that the main object is to develop the scientific and technical side of soaring flight in such a manner that the various clubs and technical schools throughout Germany shall always have available for their use the most up-to-date information. In their endeavours to do this they realise that the sporting side must not be overlooked or allowed to flag. A considerable part of the activities of the R.R.G. seems to be directed in the organisation of the sport.

Through their investigation of motorless flight they expect to discover much that will be of great value to the Aviation Industry of Germany, and to this end

certain power aircraft experiments are carried out, but there seems to be a strong determination to keep away from any connection, beyond this, with motor flying.

The school is looked upon as of importance as a means of keeping up the standard of training throughout the country, and as a means for providing facilities for gaining "C" certificates, which cannot be taken elsewhere in Germany.

Through the control of the scientific and technical side of the movement the R.R.G. can prevent clubs and institutions from wasting money upon impossible machines and futile experiments. Dr. Georgii is undoubtedly fired with a keen desire to assist in the building up of a great international and universal movement for the study and practice of soaring motorless flight.

The Rhön-Rossitten Gesellschaft Schools.

The schools of the R.R.G. are for the use of all; the fee for the course is less than the actual expense incurred, consequently the R.R.G., in choosing pupils, sets a high standard as regards the character and physique of applicants, and reserves the right to discharge unsuitable pupils during the course of instruction.

There are two schools for soaring flight, in the Rhön and at Rossitten respectively. The school which was built in 1924 by Dipl. Ing. Martens on the top of the Wasserkuppe, 1,500 m. high, is now part of the Forschungs-Institut of the R.R.G., and it accommodates 25 pupils housed four in a room. Central heating and electric light are installed providing comfort in winter. There is a spacious workshop for the construction and repair of aircraft in the same building, and the hangar adjoins the school. The pupils have their meals at the mess of the flying camp.

The Wasserkuppe is about 9 km. from Gersfeld railway station.

The school for soaring flight at Rossitten was founded in 1926. It is three-quarters of an hour from the fishing village of Rossitten on the Kurisch Nehrung, at the foot of the Predinberg, which is used as instruction ground. At first there was only one residential building, one workshop, and one hangar; two hangars were added in 1927. At present the house accommodates only 20 pupils, but it is being enlarged to cope with the increasing number of pupils. The camp is provided with its own electric power station. The pupils take their meals in a common-room.

Both the Wasserkuppe and the Rossitten schools afford good opportunity for many forms of sport.

Course of Instruction and Training Regulations.

The object of the training is to obtain the German Gliding Certificate "C."

Theoretical instruction is also given, and practical experience of construction and repair of aircraft is gained in the workshops. The courses of instruction are open to young people, generally between the age of 17 and 24, who can produce a medical certificate showing that they are fit to fly, and who have also had some previous instruction in the theory and the principles of the chief branches of aeronautics.

If the applicant has not received such previous instruction at a High School or a Technical Institute, before he can be admitted to the course it will be necessary for him to attend a course of instruction given by the Jugendfliegerhorstel, by a juvenile group of a Wereinses Deutschen Luftfahrt-verband e.V.„ or a similar recognised course of instruction; an attested certificate testifying that the applicant has passed such a course must be attached to the application. Exceptions can be made while the number of such preliminary courses are insufficient. In such cases the applicant will be accepted provided he can pass an acceptance test.

The courses generally last four weeks. Promising pupils who do not attain the " C " standard in this time, may be called upon to attend an advanced course. Pupils who have already qualified will be given every possible opportunity of making practice flights. Any pupil who proves to be unfit for flying or is in any other way unsatisfactory is liable to be dismissed at any time.

The R.R.G. advises clubs to form their own schools adapted to local conditions and gives special courses for club instructors. Technical High School teachers attend these courses and qualify to give gliding instruction, theoretical as well as practical, in connection with their schools. Parents do not object to children gliding, because it has been proved (and they have seen it proved) how safe gliding really is. Statistics will be issued shortly showing the number of boys there are in gliding clubs, number of boys trained, and number of boys hurt, etc.; this report will be available at the B.G.A. when published. The R.R.G. decide when a boy is capable of flying and a boy cannot fly unless told to do so.

Pupils start the course in groups and follow a regular time-table, starting with physical exercises 7—7-30 a.m., breakfast 8—8-30 a.m. Each group is responsible for the glider and its repair. If a pupil crashes the whole group works on the repair. If the glider is completely destroyed a second glider is issued to the group. The group system is elastic and pupils are transferred from group to group according to proficiency.

The team work is greatly to be admired; everyone takes his, or her, full share of launching, recovering, and, when necessary, the repairing of machines. One of the outstanding features of the school is the splendid order and discipline that is maintained, apparently without any special effort or regulation. This is remarkable when it is realised that the total establishment often reaches between 250 and 500 persons, mostly young schoolboy sudents, 15—20 years of age. This result is achieved through:—(1) voluntary police under one or two officials; (2) the threat of expulsion. Each group has its teacher and its own discipline„ and as there is a large waiting list only the best and most serious students come. The voluntary police, which is composed of all social scales, is hardly ever called upon to take action. A wonderful spirit of keenness and seriousness is observed throughout the school, and it is evident that it calls for special note amongst Germans in that they refer to it as " Rhön Geist."

In fine weather pupils require 20 to 30 flights to qualify for their " A " and 15 to 20 for their " B " certificates. Theoretical instruction and model making occupies wet days. Work proceeds as usual on Sunday.

Synopsis of Lectures Given During a Course in Gliding and Soaring.

1. General Rules of Aviation.
   (*a*) Aerodynamics—resistance of the air—wing sections.
   (*b*) Types of aircraft—normal—canard—tailless.
2. Stress Calculations.
   Calculation of aerodynamic loads—typical example of stress calculations.
3. Meteorology.
   Recording of weather maps, clouds.
4. Method of Soaring Flying.
   Flight in upcurrent of the hills, cloud flying, distance flying.

Lectures on the Special Work of the Forschungs Institut.

Research on tailless aircraft.
Results of Meteorological Research.
The construction of Gliding and Soaring Aircraft.

The large area of the Wasserkuppe gives ample opportunity for soaring flight with winds from almost any direction. There is a choice of slopes for training as well as advanced work. The ground is not ideal on account of ditches, trees and stone, with thick pine woods on the lower slopes, though there are clear fields below. One part free from these obstructions is used as a gliding ground for first flights on advanced machines. Glides of several miles are possible in three directions where there are clear slopes to the valley.

Good gliding weather seems to be exceptional on account of calm weather, rain and cloud on the top of the hill. High wind is rare in Spring and Summer. No statistics as to the number of flying days are available.

In addition to the original school buildings previously mentioned there are the central offices with central heating and electric light, comprising:—offices for Dr. Georgii, Dr. Graf von Ysenberg, Herr Gobel; Meteorological, Technical and Design, and Power Aircraft Departments, Library, Kitchen and Restaurant seating 200 persons, accommodation for 350 persons, Hangars housing 40 gliders, and Workshops. The buildings are of wood with felt roofs substantially built to withstand the snow and high winds on the top of the mountain. There are two hotels, post office telephone exchange, and garages. Much of the electric and other equipment was presented to the R.R.G. by manufacturers and others.

The staff and students are provided with rough and simple accommodation, sleeping in rooms with two or four bunks or beds. The staff wear flannels and sweaters, but owing to the sun bathing craze many of the pupils only wear shorts. The staff and pupils dine together in the restaurant. There is a general good feeling between both the staff and the pupils; this is attributed to some extent to Dr. Ursinus, Editor of "Flugsport," who has taken great interest in the gliding movement.

Considerable revenue is derived from a car park, the charge for which is 2 m.50, a charge of .50 pf. for each visitor, and the sale of 25 pf. stamps for 2 m., for the glider post to Gersfeld.

Machines—Types and Construction.

As all school machines were packed away to make room for competition machines it was not easy to make an inspection of them. It was, however, clear that most of these machines are in a most dilapidated state, having been repaired and rebuilt many times. The repairs are rough but soundly carried out in all essentials. There appears to be in use a large number of Zöglings, a few Pruflings and Professors, and a few single-seater Poppenhausen. The Zögling is the standard machine used for school work. These machines are the property of the club, or institute groups, and are brought to the Wasserkuppe by them.

Several of these Zöglings have the front part of the skid detachable by bolts, with "fly" nuts, so that it can be removed quickly for repair. Much stronger safety belts are used than in England, and in every case shoulder straps appear to be considered essential. All Zöglings have either a strap or heavy cord for "strap hanging." This seems most advantageous, as it gives the pupil a feeling of security and definitely occupies his free hand.

Although glides of a quarter to half a mile are normal, during instruction no other than manual means are provided for the recovery of the machines, a light two-wheeled trolley of simple design being used.

Competition Machines.

As regards the competition machines, so far as could be seen the majority of the competitors used what were developments of the Professor type in one form or another. A few had fixed tail surfaces and one had balanced ailerons. Some had the fuselage close up to the wings and others a well defined "Neck." Variations of the plan form of the wing and control surfaces were general. Very high aspect ratios were general. In some of the machines, particularly the Aachen, efforts had been made, while keeping to the "Professor" type, to simplify the construction by multi-sided lattice girder fuselage and rectangular wings of constant chord and camber. On the whole little variation on machine design was to be seen, and it would seem that Kronfeld's great achievement has set a fashion for the present.

It seems reasonable to suggest that much that is claimed to produce a high efficiency machine is of doubtful value. It is particularly interesting to record that the Poppenhausen two-seater machine competed on level terms with all the high efficiency machines and showed that under the same conditions it was very little inferior to them. This machine made a flight of over 9 hours, which was a record for the day. In the evening, when dark was descending over the hill, this machine showed very little falling off in performance and was the last to alight.

The Poppenhausen machines are of very simple construction, inexpensive, and it would seem wise to investigate the possibilities of this type further. The single

seater seemed particularly suitable for soaring flight in clubs; it has poor controls, and this should be considered by British Clubs which have restricted areas over which to operate for soaring flight.

Most of the competition machines were fitted with instruments, i.e., air speed indicators, compasses, altimeter.

The quality of the workmanship was generally of a very high order, and the use of thin three-ply has been brought to a fine art.

Tailless Machines.

There are several interesting machines of the tailless type which are giving reasonable account of themselves as soaring machines, and are now being developed as low powered aeroplanes. The opinion is held that the motorless tailless machine can be made really efficient without going to high aspect ratios. At present Herr Lippische is working at a machine with an aspect ratio of 8/1, and claims to be getting results equal to the normal type with a ratio of say 20/1. It seems reasonable to conclude, from conversations held, that a great advance is expected from this type of machine, particularly the new wing sections.

Two tailless machines have arrived but have not yet performed,. but are of interest because they are the work of independent designers and are not connected with the work of the R.R.G.

General.

There seems a definite desire to develop the two-seater type.

The R.R.G. has purchased four power aircraft (two-seaters), which are used for metorological observations.

A small but well equipped wind tunnel is installed in the school building.

Clubs, Institutes, and individuals are invited to submit their designs to the R.R.G. for inspection and report before any constructional work is undertaken. This is essential, as all machines must be approved as airworthy by the R.R.G. before being used. As no machine may be used in Germany on any recognised ground except under the supervision of the German Air Police, the R.R.G. simply advises the police if a machine is not approved.

New types are evolved by a systematic study of the subject, by wind tunnel experiments, and by scale models of various sizes that are subjected to free flight in the open, and when these are considered to have given satisfactory results full scale machines are built at the Wasserkuppe by the Technical Department.

Drawings and specifications of tested and approved types are available on most reasonable terms to Clubs, Institutes, and individuals. The R.R.G. will undertake to supply all materials and some of the more complicated metal fittings. Price lists are published.

REGULATIONS GOVERNING AIRWORTHINESS.

(*a*) All machines entered for competitions are strength-checked by the technical officials of the R.R.G.

These are members of the regular R.R.G. staff.

As the number of new machines for each competition is small this does not entail as much work as if it would if every machine was checked.

Test flights are then carried out.

Subject to a machine satisfactorily passing these tests it is stamped with a rubber stamp, this being the form of the certificate of airworthiness.

Note :—Flight tests are of a simple nature. Certain machines are limited to certain limiting velocity winds.

(*b*) Machines not entered for competitions are checked by the R.R.G. or other recognised technical organisation.

(*c*) Machines may be built for experimental purposes without being strength-checked and flown on suitable soaring grounds, but if danger is thereby caused to the public the civil police may stop further flying.

Where the R.R.G. knows of machines being built or flown by anyone who is not trustworthy the police are warned to keep a watch for their activities.

Note :—The police in Germany possess very wide powers.

(*d*) Each club has one official who is responsible for checking repairs.

(*e*) Firms may build any number of machines to an approved design but if any machine is found to be defective, the licence is stopped. Apart from this the manufacturer gets a bad name and clubs avoid purchasing machines from such.

Note :—Most designs are supplied to the manufacturers under licence by the R.R.G. and are prepared by the R.R.G. technical staff. Firms generally do not design their own machines.

THE RHÖN ROSSITTEN INTERNATIONAL COMPETITION.

The 1930 International Competition at the Wasserkuppe attracted a large number of visitors. From England, the late Air Vice-Marshal Sir Sefton Brancker, The Master of Sempill, Sir Gilbert Walker, Capt. Needham of the Royal Air Force, Mr. Gordon England, and Mr. J. L. R. Waplington of the British Gliding Association. From Belgium, Major Massaux of the Belgian Aero Club, and Miss Lippens, daughter of the Belgian Minister of Transport and Aeronautics. Italy was

represented by Eng. Teichfuss (representing Capt. Nanini, who was prevented from attending), and a civil engineer sent by the Italian Government. Hungary was represented by Lieut. Bernard, director of the Budapest Gliding School. Spain sent Mr. Juan Boix, director of the Albacete Gliding School. Russia sent Mr. Sergev Stoklitz of the Aerohydrdynamic Institute of Moscow, and France was represented by the constructor and glider Abrial, who is well known on the Rhön.

The Competition is held in August to coincide with the vacations of the Universities and Schools, but in future it is probable that the competition will be limited to one week, with provision to extend to another.

Machines are entered from anywhere, but have to pass a one minute test at the Wasserkuppe before competing.

There is no entrance fee, but the R.R.G. must be informed 18 days beforehand. Prizes are given by different Societies such as the Deutscher Laftfahrerverbund, the Deutscher Modell and Segelflingverbund, etc., and by gliding clubs.

This competition has proved of great interest to those who have never had the opportunity of seeing such a vast collection of soaring flight machines, but as a competition in the spectacular sense it is impossible to follow.

No attempt is made to interest the public or to tell them what is going on or to instruct them in any way whatsoever.

The competition is run on the most free and easy lines and the greatest possible latitude allowed in everything.

In addition to the fixed main competitions there are daily competitions that are arranged to suit the actual conditions ruling at the time and these appear to be very well conceived.

There seems to be a very strong desire on the part of the authorities to develop cross-country flying and every encouragement is given to flyers to develop this art.

A great deal of damage was done to machines during the competition due to bad landings on unsuitable ground.

In the four flying days during which these notes were made two machines were completely wrecked, and no less than eight were seriously damaged and some 10 more had minor repairs to be attended to.

Pilots landed up wind, down wind and across wind with equal facility, and very seldom is the landing made upon comparatively flat ground; more often it is up, down or across an appreciable slope.

Cross-country flying presented the greatest difficulty to the majority of the pilots; very few showed any aptitude for this work.

Observation would certainly seem to indicate that the personal factor of the pilot was of far greater moment than the quality of the machine.

It is therefore interesting to note that no limitation is placed upon the number of pilots that may fly any one machine.

A very great deal of flying was done and on one day over 58½ hours were put in.

Great care is taken in the testing of machines entered for the competition; no machine being permitted to fly off the soaring heights until it has had some test glides on almost flat ground.

Machines that have been altered in any serious degree are subjected to the same tests.

This year's Rhön Competition finished on the 24th August with a magnificent event. All the high-performance machines were in the air. Sometimes as many as fourteen machines could be seen performing during flights at various heights, and others disappeared into the clouds. The indefatigable Bedau with his Berlin 'plane "Luftikus" after having disappeared into the clouds for some considerable time, suddenly reappeared "looping the loop." On landing the barogram showed that he had climbed almost vertically for 1,000 metres, and eventually lost his equilibrium in the very high clouds and got into a spin. On arriving under the clouds he at once flattened out and flew on happily for several hours until the signal was given to descend.

Shortly after mid-day a considerable number of pilots started out on long-distance flights. Hurttig on the Cassel machine "Elida" flew to Kieselbach, a distance of about 40 km. Mayer of Aix-la-Chapelle, on the "Frankefurtia" as far as Marisfeld, 45 km. Grönhoff on the "Farnir" flew to Dorensolz, 26.1 km., and Krebs of Munich on the "Kakadu," to Wohlimutslmsen, 21.1 km. Kronfeld's performance was indeed splendid. He excelled his previous long-distance flight of 150 km. by flying to Marktredwitz on the Czecho-Slovakian frontier, a distance of 162 km. On the 24th at exactly 7 p.m. the conclusion signal rocket was given and the gliders still unwearied, landed amid hearty cheers and patriotic songs.

Owing to the long distance flight performed by Kronfeld from whom no news was received before 11 p.m., the prizes could not be distributed on the 24th. The sports committee was kept busy during the night in judging the flights on the 24th. The prize committee assembled at 10 a.m. on the 25th under v. Wilamowitz-Mollendorff. At 11 o'clock everyone assembled in front of the Ursinus House, and the prizes were distributed.

There are three appendices to this report which are both too bulky and too technical for inclusion in the Journal.

These are held available at the British Gliding Association's Headquarters for reference if required.

Appendix 1.—Conditions for Instruction in the Soaring Flight School of the Rhön Rossitten Gesellschaft.

Appendix 2.—Report on the 11th Rhön Gliding Competition, 1930. Details of Events.

Appendix 3.—Detail of quantities and price (German) of materials used in construction of various German machines.

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Printed by Atkinson & Pollitt, Kendal, and Published by the British Gliding Association,
44a, Dover Street, London, W.1.