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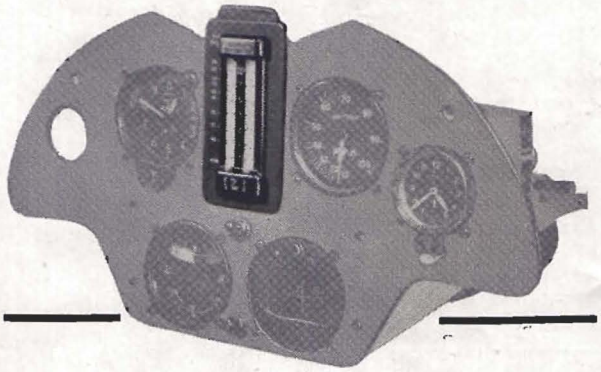


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COVER PHOTO:

Long Mynd, Church Stretton, site of Midland Gliding Club, Shropshire—from the slope. By D. B. Minterne, 1/300 f 8.

Editorial

THIS month's issue of *Sailplane* contains the last part of K. G. Wilkinson's brilliant and authoritative article on "The Design of Sailplanes for High Performance." With this technical guidance drawn from a study of so many sailplanes already built, somebody, someday, is going to design a better aircraft on orthodox lines, than either the "RJ-5' or the 'SKY.' And this we believe, will not be far from the absolute type beyond which it is not possible to improve. For unorthodox types such as the Flying Wing, the Swept Back and the Swept Forward types there is still a great deal of scope though it may have to be proved that these are ultimately more efficient than the orthodox design. At the moment it appears that the 'Horten IV' and its derivatives are the most efficient types in the world but we are not at all sure that all the problems of stability which that type of design seems to arouse, have been solved.

However important (and there is no denying that it is paramount) may be the design, no project is any practical use until an attempt is made to fly it. Construction of any type of sailplane is an undertaking of no mean order, even when there is all the technical equipment, skill, knowledge, and experience available to enable it to be begun. There is still a necessity for the resources of money, materials, time and labour and the will to see the thing through, before what was on the drawing board becomes a machine with the pilot in it. The intervening time may be many years. When Arthur Hardinge built his famous Yellow Witch 'Olympia' in Australia from plans supplied from *Sailplane* he probably had no idea of what he was letting himself in for. In addition to having to modify the design for the use of local materials, which necessitated re-stressing, and after having waited for metal parts, he and his friends still had some five thousand hours of work to do. With finance from friends and relations the machine was ultimately to be completed and Arthur Hardinge, with no previous High Performance machine experience, went on his famous 'Barn-Storming' trip round New Zealand, with great effect on New Zealand but at some considerable personal financial cost. This has always been the lot of pioneers and it cannot be said that this experience is much encouragement to the others.

In Germany to-day there are many pioneer projects afoot and we publish on page 282 a list of the German Gliding Manufacturers who have sprung into being this year since gliding was again allowed in Germany. We hear that one of the new aircraft seen at the German Meeting, the 'Heuhopfer' has already come to grief as the result of inherent instability and no doubt its builders are feeling rather sorry for themselves but we are sure that they will try again. We know of no private venture sailplanes being built in Gt. Britain and there are very few in any other part of the world except Germany. Such new types as we hear about are usually the development of Government or Government supported construction companies.

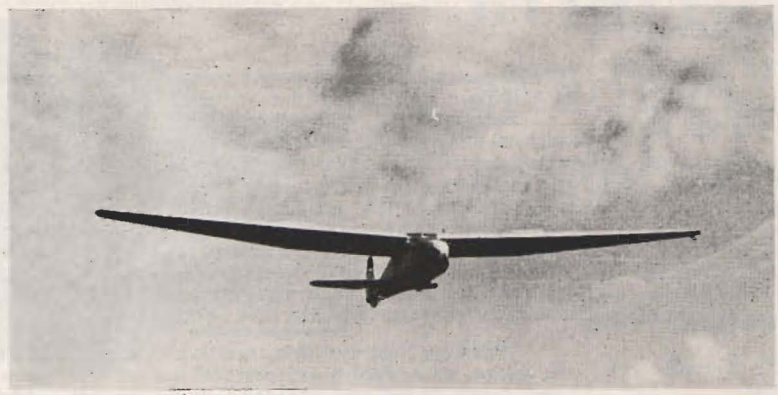
Richard Johnson's 'RJ-5' owes its pre-eminence largely to the improvements made by R. J. and Dr. August Raspet which were of course mostly done by R. J. himself. In this country we occasionally hear of slight modifications, but on the whole there are not very many, and the established types are improved over the years as experience shows the practicability of modification.

This side of the Iron Curtain there are probably as many sailplanes being built commercially in Gt. Britain as anywhere else. In the United States where Bill Ivans and Richard Johnson have so signally succeeded in wresting the World's Height and Distance Records from German and Russian holders respectively, there is practically no commercial production at the moment. The 'Schweizer' All-Metal Machine is no longer being produced at Elmira because the production capacity is needed for Government inspired aircraft contracts. We believe that a certain South American country is placing an order for seventy sailplanes of more than one type with a certain British Manufacturer and we doubt whether, short of War preparation, such an order has ever been given before in Peace-time. But on the whole it seems clear that the movement lacks the ancient fire of Private Enterprise which inspired the early pioneers, and there is most gliding where its participation costs the individual least in effort and cash. We doubt now whether it will ever be any different.

SOARING IN FRANCE

THE 'CASTEL MAUBOUSSIN' TWO-SEATERS

By GUY BORGÉ



'Castel 25' two-seater in flight. (Photo: Borgé)

The Pre-War Period

IN the pre-war period, training was mainly by single-seaters, and apart from a few 'Avia 20 A' primary two-seaters and one 'Austria,' no high-performance two-seater existed in France. Therefore the arrival in 1936 of the new 'Castel 24' machine, a performance tandem two-seater, was very noticeable.

With its great wing span of 18 metres, tapered, but accompanied by a square and crude fuselage, the 'Castel 24' seemed to be an extremely interesting sailplane for 'Captêmes de l'air' and advanced training.

SIMPLE CONSTRUCTION

Its construction appeared simple and a few were built in the Aéro-Clubs, the best-known being the Billancourt Olympic Club machine, which soared 200 kms. in 1939 (124 miles), piloted by Messrs. Colin and Melleton.

This same sailplane was used for a curious method of ab initio training, recalling the methods of instruction in motor planes, pupils received lessons in the 'Castel 24' with an instructor and when their progress seemed to him good enough, they soloed the same 'Castel.'

It was a difficult machine to take-off due to its weight and absence of auxiliary wheels, and several original solutions were found.

WATERING CAN ABOVE SKID

For instance a watering can was placed above the skid to help soften the ground and decrease friction. Sometimes the machine was bungied during its aero-tow start to ease the take-off!

In 1941 the Air Sport Service decided to build a little batch of 'Castel 242,' an improved version of the 'Castel 24,' with a new wing which was given

CHARACTERISTICS OF THE 'CASTEL 24'; 'CASTEL 242'; 'CASTEL 25'; 'CASTEL MAUBOUSSIN CM 7'; 'CASTEL MAUBOUSSIN CM 71'.

Two-Seater	*Security Factor*	*Wingspan*	*Wing Area*	*Aspect Ratio*	*Empty Weight*	*Full Weight*	*Max. Gliding Ratio*	*Min. Sinking Speed*
'CASTEL 24' ..	8	18 m 60 (61 ft)	20,60 m² (228,4 sq ft)	15,7	216 Kg (475 lbs)	376 Kg (827 lbs)	23	—
'CASTEL 242' ..	8	18 m (59 ft)	21 m² (233,1 sq ft)	15,5	237 Kg (521 lbs)	415 Kg (913 lbs)	20	0,85 m/sec (2,79 ft/sec)
'CASTEL 25' ..	9	16 m (52,5 ft)	22 m² (244,2 sq ft)	11,6	240 Kg (528 lbs)	405 Kg (891 lbs)	20	0,87 m/sec (2,85 ft/sec)
'CM 7' ..	12	18 m (59 ft)	22,2 m² (245,4 sq ft)	14,5	355 Kg (781 lbs)	535 Kg (1,177 lbs)	27	0,75 m/sec (2,46 ft/sec)
'CM 71' ..	12	18 m (59 ft)	22,2 m² (245,4 sq ft)	14,5	330 Kg (726 lbs)	510 Kg (1,122 lbs)	29	0,82 m/sec (2,69 ft/sec)

a certain amount of sweepback, improving the C.G. trimming, but the general shape was kept, with the square fuselage (an actual soap-box), the strutted 18-metre wing and the same Gottingen 535 airfoil. Other characteristics included the door, with its little lock giving access to the rear seat where the instructor became practically blind under the high wing.

Flight handling remained poor and not classical. I sometimes take pupils in a ' Castel 242 ' and it is a hard job. But its soaring abilities, with its low speed and small sinking speed, appear wonderful and superior to many other sailplanes, with one exception: when thermals remain calm, the machine does not seem very strong and its flying in rough weather becomes almost dangerous.

GRAVE ACCIDENT

A grave accident occurred in 1945 at the Challes les Eaux Centre when during an aero-tow start, a sudden gust lifted the nose of the ' Castel 242.' The fuselage was smashed, a wing broke and the instructor found himself in the open air and managed to open his parachute at the tree-top level, but alas the pupil died in the accident.

A few ' Castel 242 ' remain in activity—at Troyes, Grenoble, Lyons, Persan-Beaumont and La Montagne Noire. In this last-named centre the two-seater is specially kept for duration record attempts of which several succeeded :

23.5.1946.—Miss Choisnet and Mrs. Lafarge, 7 hours, 21 minutes.

13.6.1946.—Mrs. Renaud and Miss Buquet, 13 hours, 53 minutes.

25.3.1947.—Mrs. Melk and Miss Buquet, 16 hours, 3 minutes.

23.6.1948.—Messrs. de Lassagees and Noirtin, 28 hours, 50 minutes.

In distance, Miss Choisnet and Miss Gomichon broke the international record with 237 Km. (147 miles), from Beynes.

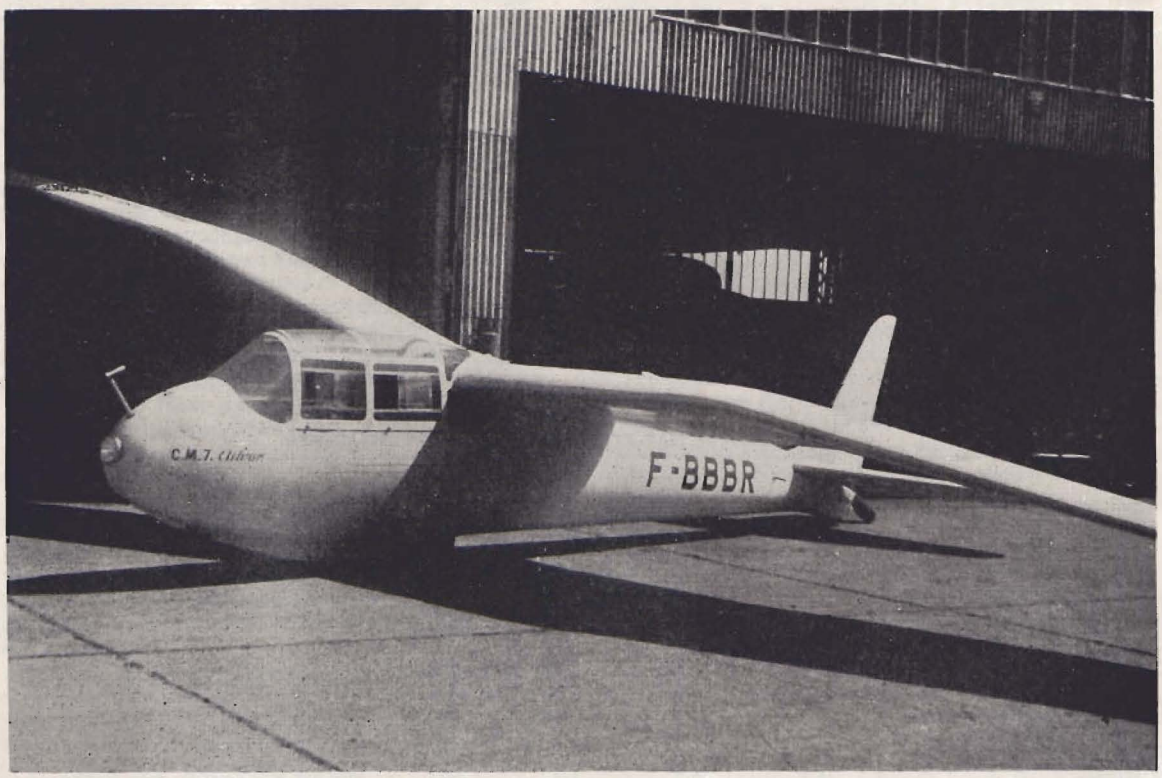
SIDE-BY-SIDE TWO-SEATER

But the formula of the tandem two-seater had proved its difficulties for Training School and the Air Sport Service, in 1941, conceived a programme of side-by-side two-seaters.

Four types came into existence : the ' Guerchais 105 ' and the ' P.M. 200,' that were only prototypes, the ' Caudron C.800 ' and the ' Castel 25 ' that were built in quantity. 100 ' Castel 25's ' came into existence and numerous Aero-Clubs received one of them.

The type proved a good one with excellent flying, handling and performance qualities. Several instructors, however, preferred the ' C.800 ' which was easier to fly for beginners having less sensitive controls, and being more comfortable with its staggered seats.

Both occupants of a ' Castel 25 ' find themselves rather cramped on a bench (*Continued on page* 280)



'Castel Mauboussin' CM 7 two-seater *Photo: Borgé*

The Design of Sailplanes for High Performance

An Analysis of the Basic Requirements for Maximum Performance in Thermal Soaring

Concluded.

By K. G. Wilkinson, B.Sc., D.I.C., A.F.R.Ae.S.

In the 67 cases so far considered only cantilever sailplanes have been admitted. It is of interest in surveying this aspect of design to find out whether other types of single-seat sailplanes show equipped weights differing significantly from the first batch. TABLE IV lists 19 further examples varying from wire-braced primaries (such as the SG38) to special types such as the Austria (with its fantastic wing span of 98 feet) and the Horten tailless types.

Considering firstly the whole batch, we find the residual variance of weights is 7,770, giving a ratio of 1·71 ($n_1=16$, $n_2=64$) relative to the original batch. This reaches a significance level between 5 and 10 per cent indicating that the equipped weights are rather more variable than we would expect from a random selection from the first batch. The mean differs by +24 lb. from expectation (based on Equation 4) and from statistical tables we find that this has a 30 per cent probability of arising from random error. It is, nevertheless, a surprisingly small divergence from expectation considering the wide variety of types in the second batch. This is an index of the importance of the possible differences in similar cantilever high performance designs, this being of the same order as produced by indulgence in more obvious structural differences, such as wire bracing, struts, tailless layout and so forth. Inspection of TABLE IV shows that the biggest source of variance lies in the five examples of strut braced high performance sailplanes—the primaries, tailless and Austria lying quite close to expectation.

Consider now the small number (5) of high-performance strut-braced sailplanes. These show a mean difference of −30 lb. compared with cantilever designs. A test for significance shows a 30 per cent probability of this being due to random sampling effects and the difference is therefore not very significant. The variance

REFERENCES TO LITERATURE

(1) Loften and Smith. Aerodynamic Characteristics of 15 N.A.C.A. Airfoil Sections at Seven Reynolds Numbers from $0·7\times10^6$ to $9·0\times10^6$. *N.A.C.A. Tech. Note No.* 1945, October 1949.

(2) Loften and Bursnall. The Effects of Variations in Reynolds Number between $3·0\times10^6$ and 25×10^6 upon the Aerodynamic Characteristics of a Number of N.A.C.A. 6-Series Airfoil Sections. *N.A.C.A. Tech. Note No.* 1773, 1948.

(3) Abbott, Doenhoff and Stivers. Summary of Airfoil Data. *N.A.C.A. Rep.* 824, 1945.

(4) W. Spilger. Flugleistungsmessungen an verschiedenen Segelflugzeugen. *Jahrbuch der Deutschen Luftfahrtforschung*. Bd. 1 S 293, 1937. (*N.B.* Data from this reference was reproduced in the *Journal of the Royal Aeronautical Society* for August 1948 in an article by B. S. Shenstone.)

(5) W. Spilger. Weitere Flugleistungsmessungen an Segelflugzeugen. *Jahrbuch der deutschen Luftfahrtforschung*, 1938.

(6) Hans Zacher. Ergebnisse der Leistungsmessung und Flugeigenschaftsprüfung des Segelflugzeuges D30 'Cirrus'. *Mitteilungen der Flugtechnischen Fachgruppen und Arbeitgemeinschaften Folge* 6/Sept. 1944.

(7) *Flugzeug Typenbuch*, 1944.

(8) Dr Karl O. Lange. Thermals at low altitudes. *Soaring*, Sept.-Oct. 1945.

TABLE IV

DATA FOR OTHER TYPES OF SINGLE-SEAT SAILPLANE

	Span ft.	A.R.	Equipped Weight	W_e from Equation (4)	Type
GB IIa	44·3	12·8	298	314	Strutted utility
GB IIb	44·5	13·0	375	315	" "
Gö 5	31·8	10·2	206	182	" "
Prefect	45	16	364	316	" "
Gö 1	46	13·5	335	330	" "
Moazagotl	65·7	20	419	515	Strutted high performance
Commodore	52·5	15·5	320	398	" " " "
Condor HD I	56·6	18·4	507	426	" " " "
Condor HD II	56·6	18·4	529	426	" " " "
FVA 9	49·2	17·9	196	350	" " " "
SG 38	34·2	6·8	232	217	Elementary trainer—wire braced
R 2	35·4	7·3	298	230	" " " " "
DH Sparrow	38·3	8·6	234	260	" " " " "
H.II	54·1	8·5	585	438	Tailless
H.III	65·7	10·7	573	558	"
H.IV	65·7	20·9	529	509	"
Seeadler	56·9	16·8	529	435	Hull and wing floats for water landing and take-off
Habicht	44·6	11·7	551	320	High factor aerobatic
Austria	98	25·4	865	821	Not designed for cloud flying

ratio in this case is 2·9, giving a significance level of about 5 per cent. This sample is therefore somewhat more variable than the cantilever design indicating a rather large difference in such matters as design factor and structure efficiency.

Two-seater sailplanes are not so numerous as the single-seater variety, nor has it been possible to select only cantilever medium and high performance types, but 25 types for which weight, span and aspect ratio data have been published are tabulated in TABLE V.

TABLE V
DATA FOR TWO-SEATER SAILPLANES

	Span ft.	A.R.	Eq. Wt. lb.
SGU-2-22	43	8·8	450
Grunau 8	47·2	9·6	418
Goppingen 2	47·6	9·8	435
Goppingen 4	48·5	11·5	471
TG 4 A	50·0	15·1	511
C-800	52·5	11·6	528
BG-8	50·3	13·3	600
MG-9	58·2	15·1	539
MU 10	57·3	15·9	407
MU 15	62·3	19·3	552
Kranich	59	14·3	561
EW-I	62·3	15·9	485
B 9	62·3	15·6	705
Stachanowetz	66·2	17·8	647
E3	68·5	22·5	440
Sturm	82	20·2	835
Obs	85·3	17·8	858
Nimbus	62	16	800
Harbinger	60	15	440
CM-7	59	14·6	600
CV.V6	63	17	616
TG-1A	46·3	11	500
D 31	65·7	20	398
Kangaroo	63·0	17·1	618
Slingsby 21B	54·0	11·2	600

A similar analysis to that given above establishes the best linear equation for equipped weight as:

$$W_e = -370 + b(22{\cdot}6 - 0{\cdot}44A) \quad \ldots\ldots\ldots\ldots \quad (6)$$

Once again aspect ratio is seen to have a lightening effect. The significance level is in this case 1–5 per cent so that the result is again established that aspect ratio has a systematic effect. In this case the effect is apparently more pronounced (larger value of k_3).

The standard deviation of an equipped weight found from Equation (6) is 93 lb.

As it was not possible to be so selective in choosing the sample and as the numbers available for study are small, the results are less significant than those obtained for single-seaters.

To illustrate these results FIGS. 6 and 7 have been prepared showing the data of TABLES III and V plotted against the regression lines of Equations (4) and (6) for aspect ratios of 10 and 20.

3.3 Theoretical Equipped Weight Trend for a Family of Similar Sailplanes

If we specify a family of similarly shaped and constructed sailplanes with varying span, it is possible to develop formulae giving the relationship between weight and wing span.

Mr C. W. Prower has derived a relationship for wing weight by breaking down the structure into its basic elements. He gives the following formula for conventional wooden construction, taper ratio 2·5 to 3, spars joined on the aircraft centre-line (as on the Olympia, Weihe and Reiher) and 45 deg. diagonal ply on the wing leading edge and spar webs:

$$W_w = \frac{W_n N b}{15{,}800}\left(4{\cdot}7\frac{A}{T} + 1{\cdot}0\right) + \frac{\left(W_n N \frac{A}{T}\right)^{1{\cdot}5}}{11{,}200} + \frac{V_d^2 b^3}{340{,}000 T^2} + \frac{b}{3} + 0{\cdot}45S \quad \ldots\ldots\ldots \quad (7)$$

where W_w = Weight of mainplane group
W_n = Nett lift on wings
N = Ultimate factor C.P. forward or gust case
S = Wing area (sq. ft.)
b = Wing span (ft.)
A = Aspect Ratio
T = Root thickness/chord ratio (per cent)
V_d = Design max. diving speed (m.p.h. E.A.S.)

The total equipped weight can then be written approximately as:

$$W_e = W_w(1+F) + W_c \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

W_c being the weight of equipment, instruments, flying controls, cockpit furnishings, canopy and that part of the fuselage structure which does not vary appreciably with the size of the sailplane.

$W_w \times F$ being the weight of tail surfaces and that part of the fuselage which varies with the size of the sailplane.

FIG. 8 shows how the weight predicted by this formula for a family of sailplanes compares with the estimates given by Equations (4) and (5), assuming aspect ratio constant at 15 in all cases.

The following values were assumed for the main parameters in Equations (7) and (8):

Ultimate factor	$N = 10$
Aspect Ratio	$A = 15$
Thickness Ratio	T 16% at wing root
Max. dive speed	$V_d = 137$ m.p.h. E.A.S.
W_c was estimated as	50 lb. for single-seater
F " " "	0·45 lb. sailplanes.

Equation (8) is seen to agree fairly closely with the regression lines over a span range 35-70 ft., any differences being well within the random scatter amongst examples of actual construction. 85 per cent confidence limits have been drawn on either side of the linear regression line from Equation (4) to demonstrate this point graphically. It will be clear from the discussion in 3.2 that there is nothing in the statistical analysis to show that the Formula (8) is at variance with the facts over the span range investigated; indeed it is very close to the average of current achievement.

3.4 Conclusions from Structural Analysis

In applying a generalized relationship for structure weight to discover performance trends, account must obviously be taken of the liability to error in weight estimation. The probable error is so large that there is little point in using an elaborate formula since a designer can obviously distort the result out of all recognition by the care and skill he exercises in detail design. From the analysis made it seems sufficiently good to accept the simple linear relationship in Equation (4) for estimating equipped weight over a span range 30-65 ft.

BREVITIES

CORRECTION

J. NEUMANN, Israel Meteorological Service, has asked us to make the following correction to the article 'A Case of Strong Turbulence,' by himself and U. Schwarz, in the July issue. Col. 2, Para. 2, Line 5, should read 3×10^4 *not* $3 + 10^4$.

The footnote at the bottom of Col. 2 refers to Line 18 of Col. 1, and Footnote appropriate to Col. 2 referring to last but one Para should have been included as : Sutton, O.G.: Atmospheric Turbulence, London, 1949, p. 89 et. seq.

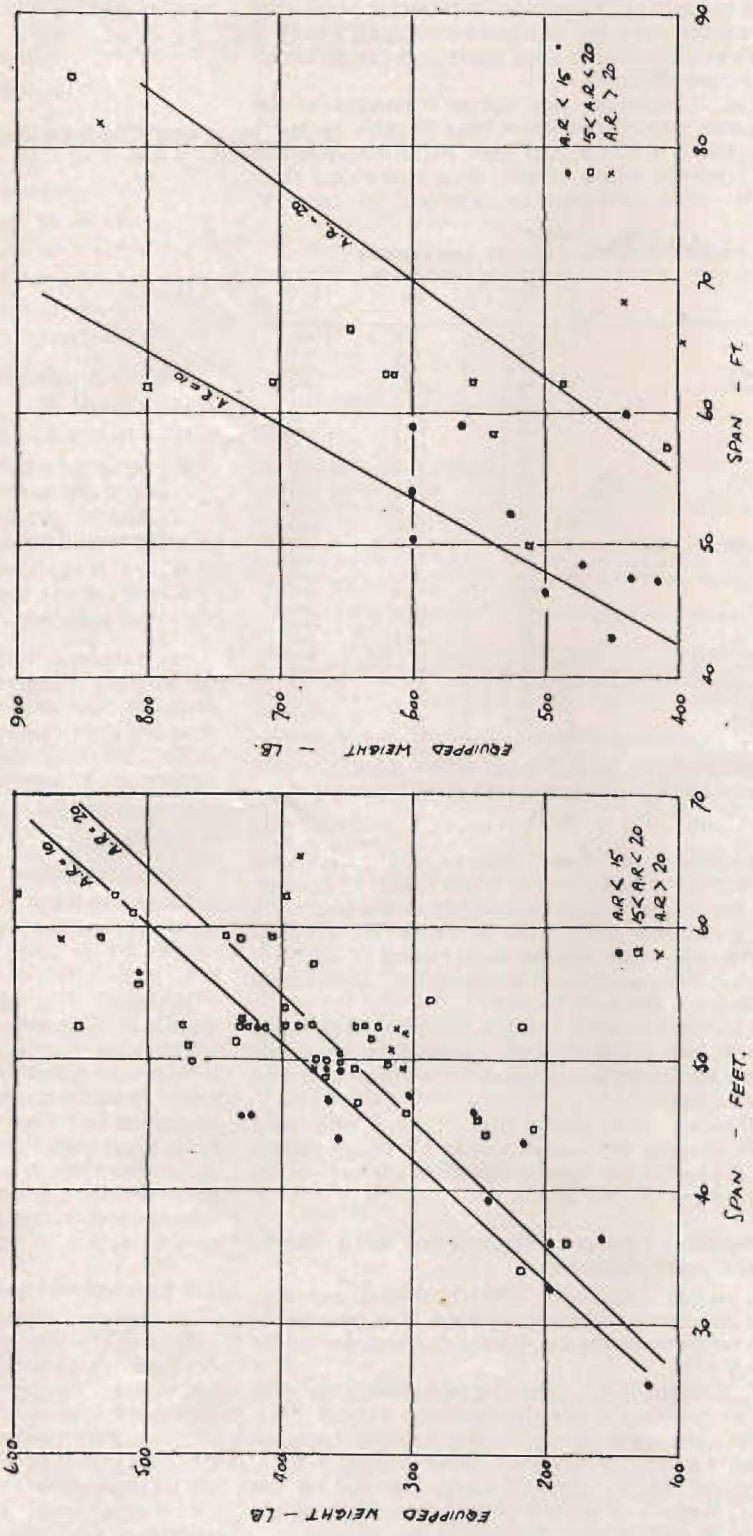
GLIDING FIRMS LINK UP

FRANKFURT, Monday. —German manufacturers have formed a working committee in Frankfurt to co-ordinate the production of gliders in Germany, once a leading nation in the field of motorless aircraft. B.U.P.

ULSTER GLIDING CLUB

ULSTER Gliding Club recently gave a farewell dinner to Lieut. H. Stubbins, R.N., who has been the mainspring behind the Gannet Gliding Club for two years.

'Stubby' as he is better known, was in a folding dinghy which recently capsized in Lough Foyle. The occupants were in the water for three hours before being rescued. 'Stubby' never lost hope although he lost his dentures.



Figs. 6 and 7.—Influence of span and aspect ratio on equipped weight. Left: single-seaters. Right: two-seaters

A further simplification can in fact be made: the factor of interest in studying performance trends is the flying or gross weight and this is found by adding the pilot and his parachute (200 lb.) to the equipped weight. It is

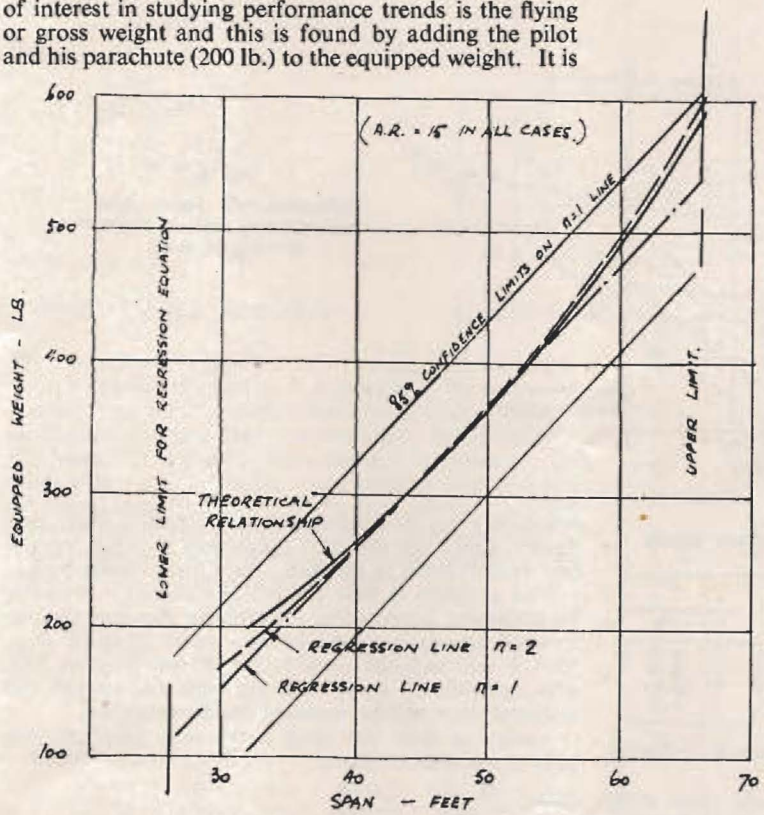


Fig. 8 (left). Comparison between regression lines and theory for equipped weight—single seaters

a convenience if the resultant weight can be expressed in the form $W_f \propto b$, and investigation shows that this can be done without departing perceptibly from the best line from Equations (4) or (7). A suitable equation for spans between 30 and 65 ft. is:

$$W_f = 11{\cdot}4b \quad \text{(Aspect ratio 15)} \qquad (9)$$

W_f being the gross weight in lb.

If the effect of aspect ratio is to be introduced, a suitable simple formula catering for aspect ratios between 10 and 20 is:

$$W_f = b(12{\cdot}4 - {\cdot}07A) \qquad (10)$$

Corresponding to (9) and (10) we have, for two-seaters:

$$W_f = 16b \qquad (11)$$

or

$$W_f = b(22{\cdot}6 - {\cdot}44A) \qquad (12)$$

4. ESTIMATION OF PERFORMANCE TRENDS

4.1 Minimum Sinking Speed and Best Glide Ratio

The derivation of these characteristics presents no problem, given the relationships for drag and weight developed in Sections 2 and 3. Aspect ratio has been assumed to have no influence as the magnitude of the effect found in Equations (4) and (5) was small and the accuracy of determination not high. This neglect will, however, introduce a slight tendency for sinking speeds and forward speeds to be slightly under-estimated at low aspect ratios and over-estimated at high values of aspect ratio.

FIG. 9 shows how sinking speed and the forward speed at this condition vary with span and aspect ratio. Results are given for single- and two-seat sailplanes with 20 per cent of laminar flow on the wings and also for the case of 40 per cent of laminar flow on a single-seater (as would result from the use of the sections recommended in 2.1, combined with a smooth wing surface). It is noticeable that increase in span has the major effect in reduced sinking speed; increase in aspect ratios has a favourable effect, but this is very small once a value of 20 has been reached. This is because the higher the aspect ratio, the higher the operating lift coefficient called for in these conditions. If profile drag rise is incurred (as it will be above a C_L of about 1·1), the optimum conditions are not reached and the minimum sinking speed and forward speed are both higher than the value possible if the profile drag remained constant to whatever lift coefficient was necessary. This point can be made clear by tabulating the lift coefficients at minimum sinking speed conditions on the assumption of no profile drag rise at high lift coefficient (TABLE VI).

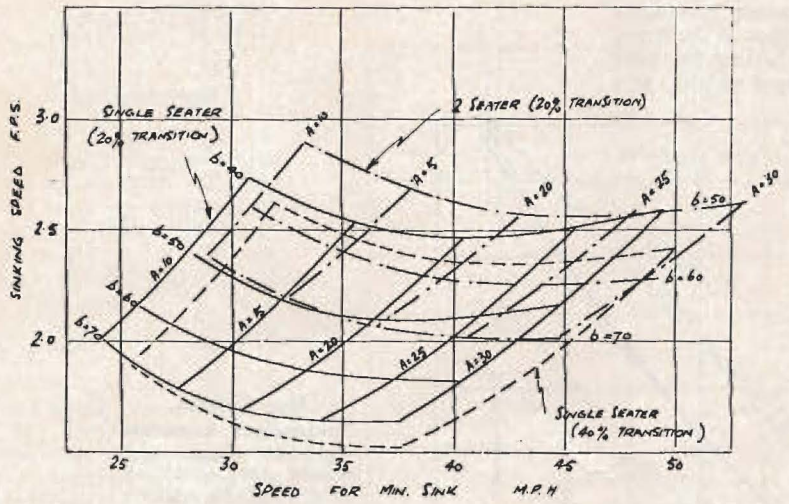


Fig. 9
Influence of span and aspect ratio on minimum sinking speeds

TABLE VI
LIFT COEFFICIENTS AT MINIMUM SINKING SPEED FOR CONSTANT C_{D_0}

	ASPECT RATIO			
	10	17	23	30
b=40 ft.	1·14	1·58	1·91	2·31
b=50 ft.		1·47	1·76	2·19
b=60 ft.		1·43	1·69	2·00
b=70 ft.	1·05	1·39	1·63	1·92

The extra laminar flow has a slight effect in reducing sinking speed.

A similar diagram for maximum glide ratio conditions plotted in FIG. 10 shows less distortion because the operating conditions have moved into a more favourable lift coefficient region. Results are again given for the single-seater with 20 per cent and 40 per cent wing transition; the two-seater at 20 per cent transition is shown in FIG. 11. Lines of constant glide ratio are drawn in. Large span is seen to have little influence on glide ratio at low aspect ratios, but a marked favourable effect at A=30. The important effect of laminar flow is now apparent and it is clearly of more value to achieve the extra 20 per cent of laminar flow than to increase span from 60 to 70 ft. and aspect ratio from 25 to 30.

4.2 Cruising Speeds in Thermal Conditions

Although the criteria discussed in 4.1 are fundamental, they do not show how useful a sailplane is for high performance flying. In this type of flying a sequence of manoeuvres takes place as follows:

(1) The sailplane is flown in circles in a thermal upcurrent until this gives out or the pilot encounters undesirable conditions.
(2) A straight glide is then flown at optimum speed in the desired direction until another suitable upcurrent is reached. Manoeuvre (1) is then repeated.

It seems likely, therefore, that a useful evaluation of design will result from postulating a series of thermal strengths and finding out how the optimum cruising speed varies between different designs. Although actual conditions will be variable and the 'ideal' cruising speed may not be achieved in practice, it is likely that designs achieving the best index will also put up the best performance in practice, other things being equal.

This problem is best tackled analytically. We start by obtaining expressions for sinking speed at various forward speeds in terms of the profile drag of D_{100}, span b and induced drag factor K (see Section 2.5). The methods of doing this are well known but the essential steps will be repeated for completeness.

Assuming that the drag curve is a parabola, we have the energy equation:

$$Wv=\frac{D_{100}V^3}{100^2}+\frac{2W^2K}{\pi\rho_0 b^2 V}$$

Where V is the forward speed f.p.s. E.A.S.
v is the sinking speed f.p.s. E.A.S.

Putting in values for the constants:

$$Wv=\frac{D_{100}V^3}{100^2}+\cdot0268\left(\frac{W\sqrt{K}}{b}\right)^2\frac{100^2}{V} \quad \ldots\ldots\ldots \quad (13)$$

Differentiating the R.H.S. with respect to V and equating to zero gives the condition for minimum v. Call this v' and denote the corresponding value of V as V'. This gives:

$$\frac{V'}{100}=\left[\frac{\cdot0268}{3D_{100}}\left(\frac{W}{b}\sqrt{K}\right)^2\right]^{1/4} \quad \ldots\ldots\ldots\ldots \quad (14)$$

If we take $W=11\cdot4b$ from Equation (11), this becomes:

$$V'=102\left(\frac{K}{D_{100}}\right)^{1/4}\text{f.p.s.}$$

$$=69\cdot7\left(\frac{K}{D_{100}}\right)^{1/4}\text{m.p.h.} \quad \ldots\ldots\ldots \quad (15)$$

$$v=39\frac{D_{100}^{1/4}K^{3/4}}{b}\text{ f.p.s.} \quad \ldots\ldots\ldots\ldots\ldots \quad (16)$$

Any other forward speed can be expressed as a multiple n of V'.

From (13) and (14) we get:

$$Wv=\frac{D_{100}V^3}{100^2}+\frac{3V'^4}{V}\frac{D_{100}}{100^2}$$

So that $v=\frac{1}{W}\frac{D_{100}}{100^2}V'^3\left(n^3+\frac{3}{n}\right)$

When $n=1$ $v=v'$

$$\therefore v'=\frac{4}{W}\frac{D_{100}}{100^2}V'^3$$

$$\therefore v=\frac{1}{4}\left(n^3+\frac{3}{n}\right)v' \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (17)$$

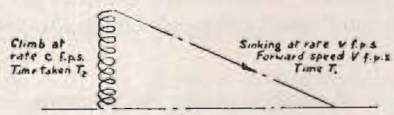
For best glide ratio $\frac{v}{V}$ is a minimum. Therefore n has to be such that:

$\frac{1}{4}\left(n^2+\frac{3}{n^2}\right)\frac{v'}{V'}$ is a minimum.

The condition for this is $n=3^{1/4}$, which is well known.

From earlier discussion it is clear that the values of v' and V' are fictitious since over a large part of the field of interest the assumed parabola has broken down. For values of n greater than about 1·4, however, the relationship is valid in the most adverse case that will be considered, and, as will be seen shortly, the use made of the theory will be restricted to this regime.

Consider now an element of cruising flight as described at the beginning of this section.



Mean cruising speed

$$\overline{V}=\frac{V\times T_1}{T_1+T_2}=\frac{V}{1+\frac{T_2}{T_1}}=\frac{V}{1+\frac{v}{c}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (18)$$

Putting $V=nV'$ and putting v in terms of v' from (17) (V' and v' being the fictitious speeds derived above):

$$\overline{V}=\frac{V'}{1/n+\frac{v'}{4c}\left(n^2+\frac{3}{n^2}\right)}$$

$$\frac{\partial\overline{V}}{\partial n}=-\frac{V'}{\left[\frac{1}{n}+\frac{v'}{4c}\left(n^2+\frac{3}{n^2}\right)^2\right]}\cdot \left\{\frac{v'}{4c}\left(2n-\frac{6}{n^3}\right)-\frac{1}{n^2}\right\}$$

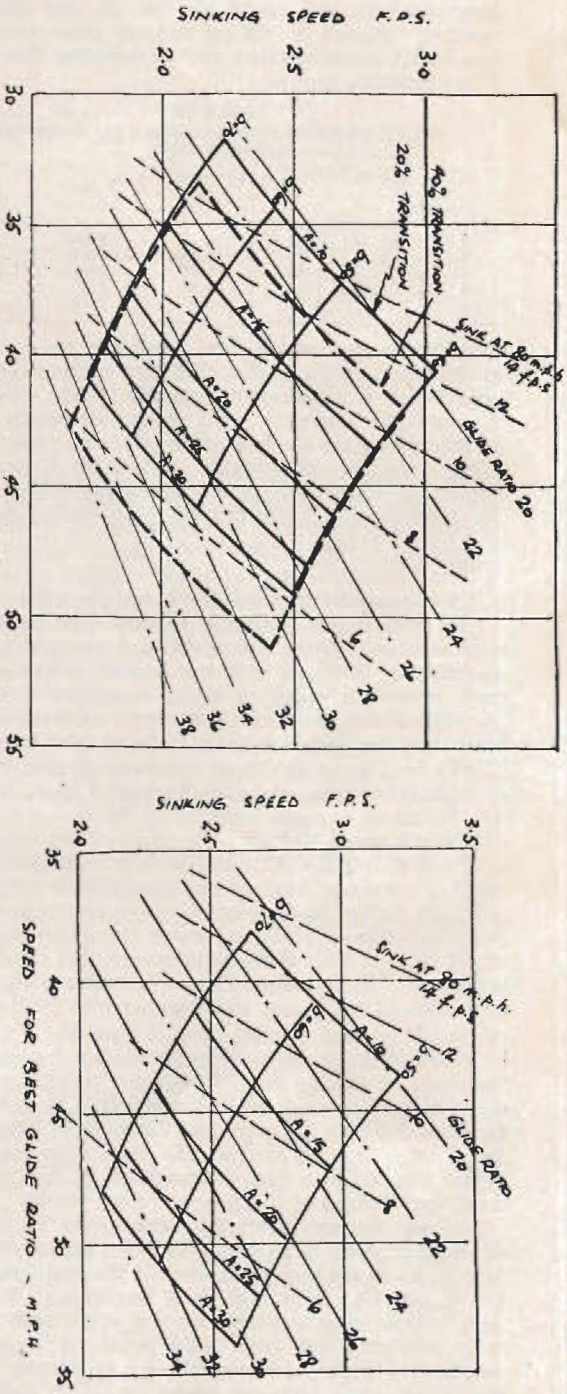
$\overline{V}$ is a maximum when this $=0$.

The condition for this is:

$$\frac{v'}{4c}\left(2n^3-\frac{6}{n}\right)=1$$

$$\text{i.e. } n^4-\frac{2c}{v'}.n-3=0 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (19)$$

This equation can be solved for various values of $\frac{c}{v'}$ and leads to values for $\frac{\overline{V}_{\max}}{V'}$ and n. The results may be compared with the results from flying the sailplane at its best glide ratio speed between thermals (denote the resulting mean cruising speed as $\overline{V}_2$). It is convenient to divide n by $3^{1/4}$ to get n_1, the ratio between inter-



Figs. 10 and 11.—Influence of span and aspect ratio on glide ratio and high-speed performance. Left: single seaters. Right: two seaters

thermal speed and best glide-ratio speed: this is a better datum because the best glide ratio speed is not greatly affected by actual departures from the ideal drag parabola and would also be the best speed for covering distance in still air straight glide conditions. Results are given in TABLE VII. Remember that v' and V' are fictitious speeds.

TABLE VII
RELATIONSHIPS FOR CRUISING IN THERMAL CONDITIONS

c/v' $(=M)$	n	n_1	$\frac{\bar{V}\,\max}{\bar{V}'}$	$\frac{\bar{V}\,\max}{\bar{V}_2}$
1	1·58	1·20	0·642	1·04
2	1·78	1·35	0·930	1·11
3	1·96	1·49	1·115	1·17
4	2·11	1·60	1·26	1·23
5	2·25	1·71	1·38	1·28

Values for n show that best conditions are equivalent to operation on the undistorted part of the drag parabola, which is a necessary condition for the validity of the method. The only other precaution which has to be taken is to use the true value of v' when calculating c in a given thermal strength. Values for n_1 show that speed well above best glide ratio speed are required, the benefit from doing this being shown in the final column for $\frac{\bar{V}\,\max}{\bar{V}_2}$.

The parameters of main interest are plotted in FIG. 12.

The final step in charting performance trends can now be taken. Three typical thermal strengths are first assumed, of 3, 6 and 9 ft. per second rate of ascent; these cover the range of major interest. It is then postulated that to keep in the area of best life the pilot flies the sailplane in a circle of 200 ft. radius. This is to a great extent an arbitrary choice, but has some support from research by Karl Lange (Ref. 8), who found an average diameter of 700 ft. for thermals of strength about 10 f.p.s. The effect of this restriction is of course to put a premium on turn manoeuvrability, which is certainly a prized characteristic in sailplanes; although further study may give more precision in final evaluation, the weighting of design features is probably about right. With these assumptions, the climb performance 'c' of Equation (19) can be evaluated from the basic data of FIG. 9, and this together with the fictitious minimum sinking speeds v' and V' enables $\bar{V}$ max. to be established. A series of such calculations results in the chart of FIG. 13 for single-seater sailplanes. The effect of varying amounts of laminar flow is shown for the critical 3 f.p.s. thermal, and the result of employing an efficient flap to extend the low drag range to higher lifts has also been investigated (N.A.C.A. have developed designs of this type in recent years).

At low thermal strengths, large span is a great advantage; given large span (60-70 ft.) aspect ratios as high as 25-30 are profitable, but for the small sailplane (40 ft. span) 15 is as high as is warranted. Efficient flaps appear most valuable on the small high aspect ratio sailplane, but have little point on large span machines. Increased laminar flow is of greater benefit than aspect ratio increases above the values noted and is also likely to be more effective than further span increase above 70 ft.

As thermal strengths increase, the value of large span is diminished and virtually disappears at thermal strengths of 9 f.p.s. unless an aspect ratio around 30 is being used. Conversely, aspect ratios of up to 30 become useful at progressively smaller spans as thermal strengths increase. Flaps are at all times restricted in usefulness to the small span—high aspect ratio type; the reason for this stems directly from the operating lift coefficients called for (see table and discussion). The diagrams of FIG. 13 shed some light on the success of small span sailplanes (e.g. Screamin' Weiner) in competition work in Texas, and suggest that in regions of less powerful thermal they would have difficulty in holding their own.

4.3 Effect of Weight Variations on Cruising Speeds

It has been noted that structure weights are liable to vary considerably from the estimate on which the trends in 4.2 have been based. Weight variations deliberately produced by loading sailplanes with water ballast are also a fairly common practice. The influence of such changes will now be considered.

Assume a variable ratio 'r' between actual flying weight W_2 and the estimate W_1 of Equations (9) and (11), due either to ballast or errors in estimation.

Minimum sinking speed (fictitious) is now

$$v_2' = v_1'\sqrt{r}$$

The forward speed corresponding to this condition is

$$V_2' = V_1'\sqrt{r}$$

The rate of climb in a thermal becomes

$$c_2 = c_1 + v_1'(1-\sqrt{r})$$

then, denoting the ratio c/v' by M, we have

$$M_2 = \frac{c_2}{v_2'} = \frac{1}{\sqrt{r}}(M_1+1)-1 \quad \ldots\ldots\ldots\ldots \quad (20)$$

$$\Delta M = M_2 - M_1 = \left(\frac{1}{\sqrt{r}}-1\right)(1+M_1) \quad \ldots\ldots \quad (21)$$

If we distinguish again between the actual minimum sinking speed (denoted by v'') and the fictitious value we have denoted by v', Equation (20) becomes

$$M_2 = \frac{1}{\sqrt{r}}\left(M_1 + \frac{v_1''}{v_1'}\right) - \frac{v_1''}{v_1'} \quad \ldots\ldots\ldots\ldots\ldots \quad (22)$$

For the moment (20) will be used to arrive at general conclusions on the influence of weight change.

We have seen in the previous section that the cruising speed can be expressed as a function of the ratio M. Call this function (values for which appear in TABLE VII) F, so that $\frac{\bar{V}}{V'}\text{max.} = F(M)$.

The effect of weight change on cruising speed can be analysed as follows:

$$\bar{V}_2\ \text{max.} - \bar{V}_1\ \text{max.} = V_2'F(M_2) - V_1'F(M_1)$$

$$\therefore \Delta\bar{V}\ \text{max.} = V_1'\left[\sqrt{r}F(M_1)\left\{1+\frac{\Delta F(M)}{F(M_1)}\right\} - F(M_1)\right]$$

$$\therefore \frac{\Delta\bar{V}\ \text{max.}}{\bar{V}_1\ \text{max.}} = \sqrt{r}\left\{1+\frac{\Delta F(M)}{F(M_1)}\right\} - 1$$

$$\frac{\Delta\bar{V}\ \text{max.}}{\bar{V}_1\ \text{max.}} = (\sqrt{r}-1) + \sqrt{r}\frac{\Delta F(M)}{F(M_1)} \quad \ldots\ldots\ldots\ldots \quad (23)$$

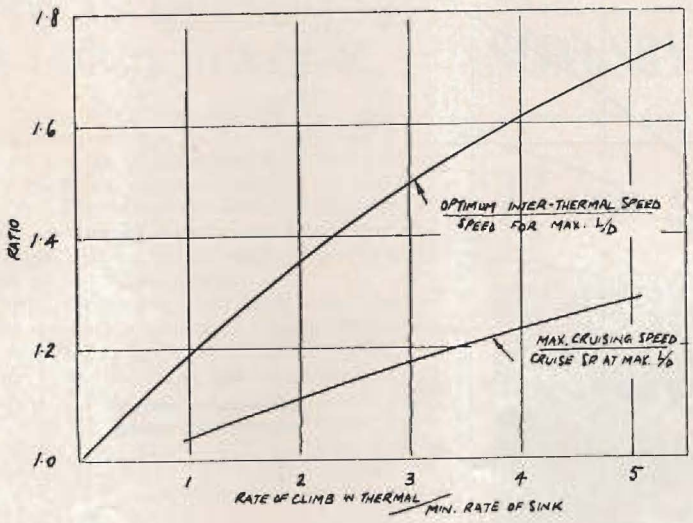


Fig. 12.
Optimum conditions for thermal distance flying

By selecting a series of values for M_1 and r, evaluating ΔM from (21), and finding the corresponding value for $\frac{\Delta F(M_1)}{F(M_1)}$, the proportional change in cruising speed can be found. Values are plotted in FIG. 14 and given in TABLE VIII.

For values of M_1 above a critical value of about 1·5, performance obviously benefits from a relatively large increase in weight; indeed, if the weight increase is not of the order of 30 per cent, the performance change is not very marked.

If M_1 is less than 1 the performance loss from increased weight is large. The conditions for the use of ballast are therefore well defined:

(*a*) The expected meteorological conditions should give a rate of climb of, preferably, about three times the minimum sinking speed of the sailplane.

(*b*) Design should allow for substantial increase in gross weight. Water ballast distributed along the wing span permits this without disproportionate increase in empty weight (e.g. the Schweitzer 1-21).

(*c*) Empty weight should be kept as low as possible so that the sailplane can be flown in the most favourable configuration (ballast jettisoned) when thermals weaken towards evening or on days with marginal soaring conditions.

Returning to FIG. 13, it is now clear that variation in equipped weight (note that approximately 80 per cent

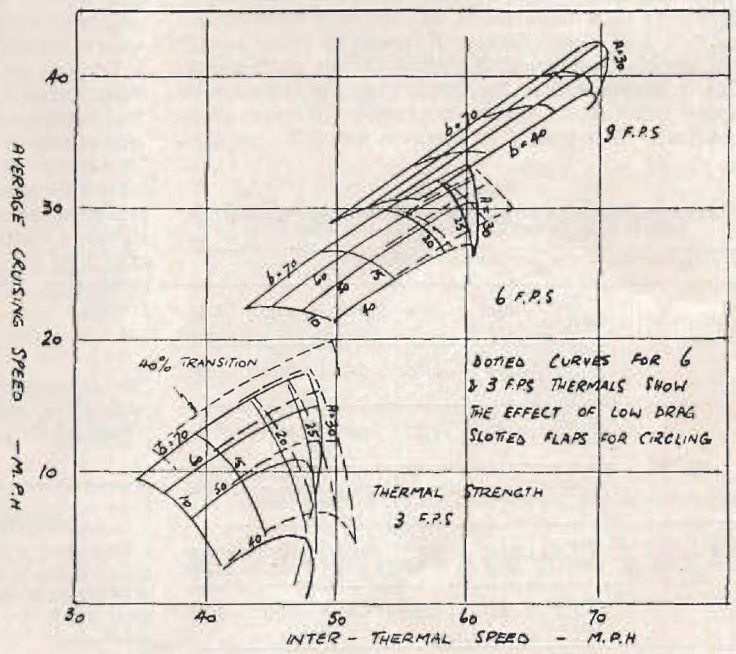


Fig. 13.
Ideal cruising performance (single seater—normal wing)

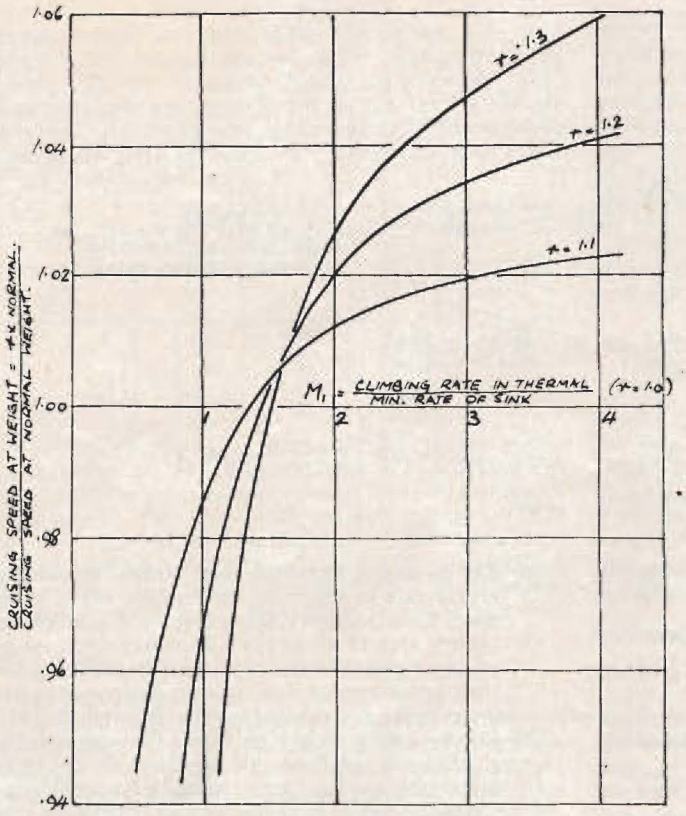


Fig. 14.
Influence of weight on cruising speed

of cases will fall between r 0·9 and 1·1 and very few will fall outside r 0·8 and 1·2) will have very different effects depending on thermal strength. In strong thermal (9 f.p.s.) conditions, M_1 will vary between 2·5 and 4·5, and all sailplanes will benefit by from 3-4 per cent on cruising speed by being 20 per cent heavy. This is, however, less significant than the influence of aspect ratio as a design parameter, though more significant than span. In medium strength thermals, benefits will still accrue but will be between 1 and 3 per cent; the large span, high aspect ratio types will gain most. In weak 3 f.p.s. thermals the small span sailplanes will lose heavily (10 per cent) but the large span types may still gain slightly.

To sum up, therefore, we may remark that, unlike other forms of aircraft, the sailplane does not necessarily lose anything from coming out on the heavy side. The best results in all conditions can, however, be obtained by aiming for a light design and providing for water ballast for use in good soaring conditions. The general performance trends with span and aspect ratio shown in FIG. 13 are on the whole more significant than the effects of all but extreme variations from the weight-dimension relationships assumed in calculating the results.

TABLE VIII
RELATIONSHIPS FOR CRUISING SPEED AND WEIGHT RATIO FOR VARIOUS THERMAL CONDITIONS

M_1		·5	1	2	3	4
r=1·1	$\frac{\Delta F(M_1)}{F(M_1)}$	·0978	·0614	·0350	·0285	·0256
	$\frac{\Delta \bar{V}\max}{\bar{V}_1\max}$	−·054	−·0156	·0120	·0189	·0220
r=1·2	$\frac{\Delta F(M_1)}{F(M_1)}$	·190	·122	·0678	·0559	·0480
	$\frac{\Delta \bar{V}\max}{\bar{V}_1\max}$	−·1126	−·0386	+·0212	·0343	·0428
r=1·3	$\frac{\Delta F(M_1)}{F(M_1)}$	·274	·187	·0995	·0813	·0707
	$\frac{\Delta \bar{V}\max}{\bar{V}_1\max}$	−·173	−·073	·0267	·0470	·0600

We acknowledge our thanks to *Aircraft Engineering* who have made it possible for us to publish K. G. Wilkinson's article in *Sailplane*.

NEW 'SAILPLANE' OFFICES

'SAILPLANE' has now moved its Editorial and Advertising Offices from The Strand to **8, LOWER BELGRAVE STREET, VICTORIA, S.W.1.** (**Telephone : SLO 7287**), to which *all* correspondence should now be addressed.

GLIDING AT MIDDLE EAST AIR FORCE STATION

SINCE a Gliding Club was formed last April at R.A.F. Station, Kabrit, in the Suez Canal Zone, gliding has been put on an organised if limited footing in the Middle East Air Force Command for the first time. Over 450 officers and airmen have experienced the delights of unpowered flights over the desert and several have qualified for the ' A ' and ' B ' certificates of the British Gliding Association.

Members are enthusiastic over their new pastime and spend nearly every afternoon and week-end on the airfield, learning to glide in a ' Kirby Cadet ' or teaching others to do so. The highest altitude reached has been 1,100 feet in a 6 min. 25 sec. flight by Flight-Lieutenant Hart, and the longest flight one of 10 minutes by Major White. The club is looking forward to getting a ' Kirby Tutor ' into use, a launching winch in place of its present launching truck, and a sailplane.

The Middle East is well suited to gliding, mainly owing to the frequent thermals (rising hot-air ' bubbles ') encountered.

President of the club is the Station Commander, Group-Captain J. O. W. Oliver, C.B., D.S.O., D.F.C. Officer in charge, and chief flying instructor, is Flight-Lieutenant M. Turner, who is assisted by Squadron-Leader L. V. Bachellier, A.F.C., Major D. B. White, R.A., Army Liaison Officer at Kabrit and Flight-Lieutenant P. I. Hart, D.F.C., former test pilot with the de Havilland Aircraft Company. All are members of the British Gliding Association and recognised by it as official observers and instructors.

ATTENTION 'DOC' SLATER

A. E. SLATER'S statement in the columns of *Aeroplane* recently—' It is amusing to find oneself . . . virtually writing up the news for competing publications '—is one that the Editorial Staff of *Sailplane* do not intend to let go unanswered.

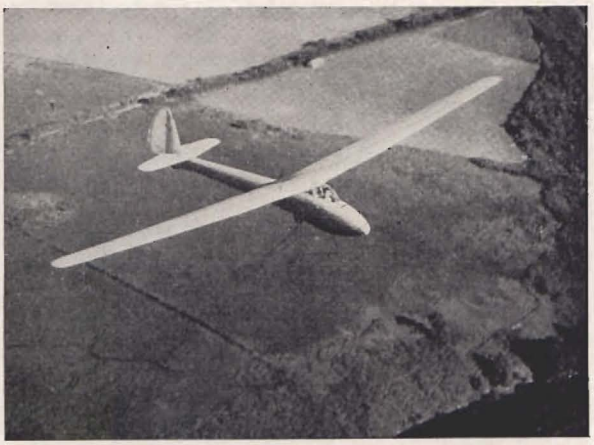
He says that he is amused by the fact, when we all know that he is *not*, and the bitter tones which have crept into his contributions recently is proof. What everyone does not know is that other people besides the *Times* fell into the same error. We ourselves saw the report as stated the day before Mr. Slater's report appeared in the *Times*. We should be surprised if the ' Doc ' wrote this as well. If he did, we are wondering if the *Times* know about it? If he didn't, what becomes of his claim to have written other peoples' report?

We know that it is unprofessional conduct to exploit the labour of another 'journalist' by using his copy without permission. The ' Doc's ' contributions to *Sailplane* finished when he left us in 1945.

The report of the National Competitions which appeared in the September issue of *Sailplane* was compiled by three members of our Staff, two of whom attended personally. Agency reports and all possible resources helped us compile what Jon D. Carsey, President of the Soaring Society of America says was : ' . . . . undoubtedly the best that I have seen, I hope that it will serve as a pattern for all contest reports in the future.'

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DÜNYANIN EN MÜKEMMEL YAPILI PLANÖRLERİ BERİTANYA MAMULU PLANÖRLERDİR -

إن صناعة هذه الطائرة الشراعية لا تفوقها أية صناعة أخرى
هي بريطانية وأحسن الطائرات الشراعية

" Εἰς οὐδὲν ἕτερον ἀγεμόκρατον αἱ συναντήσητε καλλιτέραν ἐργασίαν. Εἶναι βρεττανικῆς κατασκευῆς καὶ βοιστον "

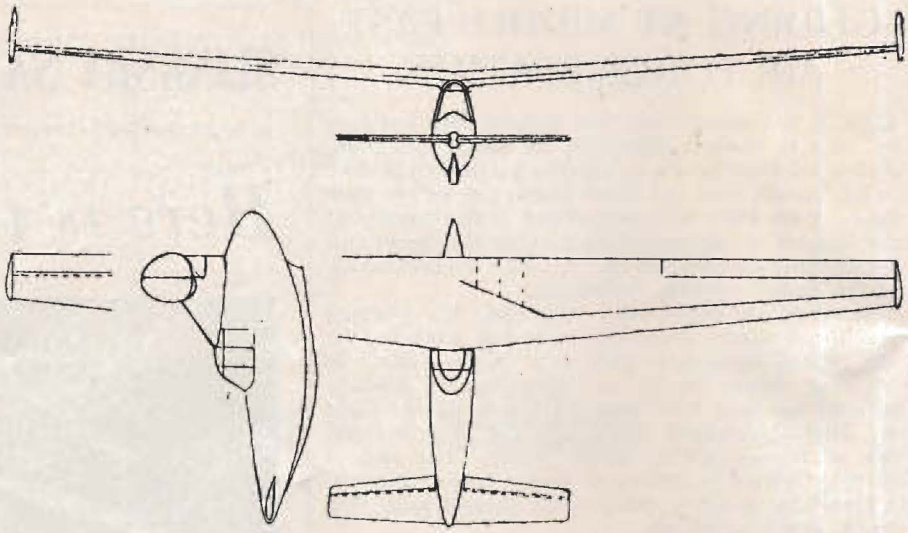
わが製品程に精巧な技術が使はれてゐる帆前飛行機は他に英國製で、最優秀機。

Kirbymoorside - Yorks

TELEPHONE 312

The 'IS-5 Kaczka'

A Polish Canard Experimental Glider



By R. A. G. STUART
M.A. (Cantab.)

ONE of the few modern canard designs and probably the only aircraft of this layout ever built in Poland is the ' IS-5,' appropriately named ' Kaczka ' (Duck).

Although, as can be seen from its designation, it was the fifth design of the Instytut Szybownictwa (Gliding Institute) at Bielsko, it was actually their fourth type to be completed.

This was due to the fact that the ' IS-4 ' Jastrzab (described in an earlier issue of the *Sailplane and Glider*) was delayed owing to pressure of other work.

DESIGNED BY WOMAN

Another distinction of the ' Kaczka ' is that it is one of the few types designed by a woman. Its chief designer was inz. Irena Kaniewska, assisted by inz. Kostia. It was designed as an experimental intermediate type and the designers were assisted in their calculations by the ITL (Instytut Techniczny Lotnictwa = Aviation Technical Institute, now the GIL = Gówny Instytut Lotnictwa = Principal Aviation Institute).

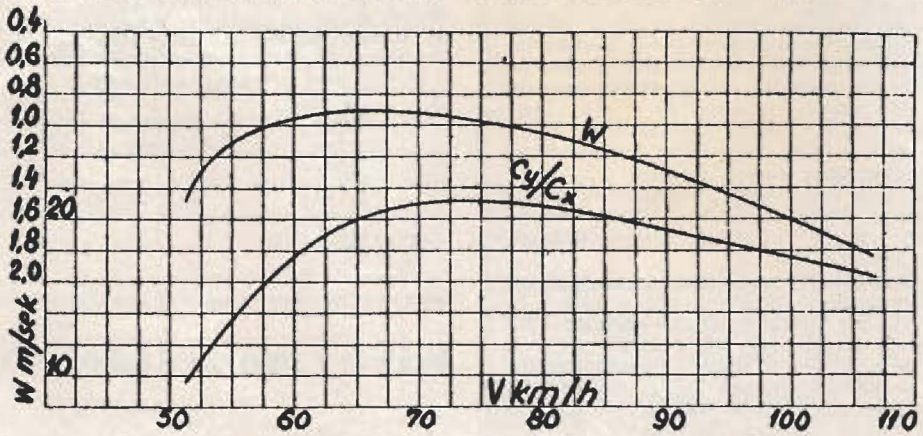
UNSPINNABLE

Among the advantages claimed for the design are that it is unspinnable and has sufficient lateral stability to prevent spiral instability, has good high- and low-speed characteristics, a wide speed-range and small dimensions. The latter factor and its low weight make it easy to transport, which is a great advantage in cross-country flights for which it was primarily designed.

The ' Kaczka ' is a high-wing monoplane of wooden construction. The cantilever monospar wing has the usual torsion box and is fitted with differential slotted ailerons. Rudders are fitted at the wingtips and the wings have pronounced dihedral.

Angle of attachment of the fins can be altered on the ground and the rudders can be made to act as air brakes by both turning outwards when the pilot presses on both pedals simultaneously. The rear end of the fuselage also acts as an air brake by opening out.

All control surfaces, including the ailerons, are of balanced type. The variable-incidence ' tailplane ' is in the extreme nose and carries narrow-chord elevators. The monocoque fuselage has an enclosed cockpit, complete with full blind-flying instruments, and a large ventral skid which runs almost the whole length of the fuselage. (*Continued opposite page*)





'Barrow News and Mail' photo

Right. Miss Wilma Durrand, a polisher employed in the joinery department at Vickers-Armstrong's Barrow-in-Furness shipyard, presents a bouquet to Mrs. Platt, wife of Mr. J. W. Platt, a managing director of the Shell Petroleum Company, Ltd., before the launch of the 31,000 *tons tanker 'World Unity' at Barrow*

QUANTITY PRODUCTION UNLIKELY

The 'Kaczka,' registered 'SP-821,' completed factory trials in April, 1949. Since then it has been exhibited on various occasions, both on the ground and in flight. It is, however, unlikely that a canard type will be produced in quantity in spite of the fact that the 'Kaczka' appears to be a success.

DATA

Span 37 ft. 11½ in., length 13 ft. 1½ in., aspect ratio 13, weight loaded 407 lb., wing loading 3.28 lb./sq. ft. Towing speed in calm air 148.5 m.p.h., in rough air 93.45 m.p.h. Finesse c.20, finesse (estimated) maximum 21, greater than 20 from 39.38 to 47.22 m.p.h. Best gliding speed 46.575—49.6 m.p.h., landing speed 34.15 m.p.h., estimated minimum speed 33.4 m.p.h. Speed at minimum rate of sink 40 m.p.h. Rate of sink less than 3.28 ft./sec. from 35.04 to 47.22 m.p.h. Estimated minimum rate of sink 2.94 ft./sec.

Another unorthodox 'IS' design, the 'IS-6' Nietoperz (Bat) tailless glider was first flown early this year. Details of this type appeared in the September issue of *Sailplane*.

'WORLD UNITY' & MRS. PLATT

''WORLD Unity,' claimed to be the largest tanker built in any British shipyard, and the first of a new class, was launched to-day from Vickers-Armstrongs' shipyard at Barrow-in-Furness.

The launching ceremony was performed by Mrs. Platt, wife of Mr. J. W. Platt, managing director of the Shell Petroleum Company, Limited, and of the Anglo-Saxon Petroleum Company, Limited.'

—*The Times, October* 17.

'In his pocket as he travelled from London to Barrow to-day, Greek shipowner Stavros Niarchos carried a diamond bracelet watch. To-morrow he will present it to Mrs. J. W. Platt, wife of a Shell director, who launches his 31,000-ton tanker, 'World Unity.'' —*Evening Standard, October* 16.

The personality behind the name of Mrs. J. W. Platt is none other than our own Assistant Editor, Veronica Platt, usually called 'Hope.' She has claims however to fame of her own making. Besides being a leading light in gliding in the Argentine for some years and the well-known ambassador of British Gliding to clubs abroad whenever she accompanies her husband on some of his business trips, she plays a prominent part in the Hispanic Council charged with the cementing of good relations between this country and South America. She is the mother of four stalwart sons, all of whom are multi-lingual, the eldest of whom has just announced his engagement to be married and is a member of the Foreign Office.

She herself speaks French and Spanish fluently and at one time could take shorthand in either language. Her presence at any gliding meeting is sure to make it an 'occasion,' for she seems to radiate her energy, charm and high spirits wherever she goes.

Want to Fly Cheaply?

Then you should investigate U.L.A.A.

Group-operated home or factory built ultra light aircraft offer the very cheapest form of non-subsidised private flying. This is what U.L.A.A. is sponsoring, so why not find out more about this rapidly expanding national organisation?

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CANADIAN DISTANCE RECORD

137 MILES IN 5 HOURS

By ALBIE POW

IT all started on the preceding night when Burnie Carris of Elmira, N.Y., asked me to switch gliders with him so that he could take his wife for a flight the next day. Being in a festive mood, it was readily agreed upon and when morning came with sober reality, I found myself sitting in the cockpit of a beautifully finished single place ' LK.' Armchair comfort and a full instrument panel sold me at once.

CAUTIOUS HAND

After a quick exchange of cockpit checks we were underway and soon at 2,000 ft. upwind of the field. Lift was good and cloud base of 3,500 was soon reached. Playing a cautious hand, I commenced to cruise the area in a large circuit of 10 miles before deciding on what to do. A half-hour later found me down to 1,200 and 9 miles west of the field in down air.

With small hope of getting back, I carefully used each patch of lift and slowly edged towards a large cloud under which nestled another ' LK.' Contact was made and in strong lift it needed only a few minutes to reach cloud base of about 4,000. The other ' LK ' was now in cloud and it was not possible to clearly see the registration, but I thought it was my own ' ZBA.' There seemed no reason for my returning to the field so long as my own ship was soaring, so, swinging the nose west, I headed out for a series of cumulus clouds forming a perfect cloud-hopping pattern. London and 50 miles out came easily and quickly, with cloud base and cloud flying in a nearly straight line.

TOUGHER TO WEATHER

The next 30 miles were a little tougher to weather. It was now that I had to decide on which course to take : South-west for Windsor or West to Sarnia. Having had previous sad experience with lake effect, the westerly route was decided upon and it required patient flying and good fortune to see me through.

It was in this area that I encountered very strong lift that lasted for only a few minutes, then disappeared. The procedure was to watch for a cloud starting to form, make a bee-line for it, spiral up to base and wait for another to form in the west. In a short while the cloud would dissipate so that one could not tarry too long in any one spot. This type of flying continued until I was near the St. Clair River and 5 miles south of Sarnia. Altitude was around the 1,800 ft. mark and no lift apparent.

Cruising towards Sarnia and Port Huron good lift was encountered over the oil refineries south of the town and amid fumes and thermals height was rapidly gained.

CROSSING INTO U.S.A.

A quick ' guestimation ' with thumb and finger on a tumbled map told me that Port Huron was short of the 118-mile record of Frank Brame. Here was my chance to convince a certain party just where he stood, so with all respect for international boundaries far below, a crossing was made into the United States at Corunna and Marysville. Progress was made south and west in order to gain as much distance as possible with the first consideration being Selfridge Field, then Detroit Municipal Airport, and then back into Canada at Windsor. There was no turning back and no alternative to landing at other than a Customs Airport or an Airforce Base. I did not care to get too involved in cost and red tape at this point.

Rounding the end of Lake St. Clair, with the last clouds back at Richmond, moist, stable air was encountered coming in from the east. This terminated the soaring and the remainder of the flight was a long straight glide towards Mt. Clements on the edge of Selfridge Field.

CONTINUATION ABANDONED

Arriving over the town at 2,800 and no sign of lift to the south, the idea of continuing the flight was abandoned. Orbiting the airport for signs of life and interception I was rather alarmed to see an ' F-86 ' taking off down wind and coming up towards me like a banshee. However, I was not the object of his attention and he disappeared in seconds. A landing was affected and the glider rolled to a stop close to the control tower and hangars, 137 miles away, and five hours, 10 minutes after take-off.

The reception and fine treatment in the capable hands of Major Norwood deserve a chapter to themselves. To Burnie Carris go my sincere thanks for the use of a wonderful machine and regret for the inconvenience that I caused him.

SOARING IN FRANCE—*continued from page* 267

reminiscent of a tramcar, but the machine's performances appears to be delightful for advanced training, apart from distance flights, because derigging the ' Castel 25 ' is extremely long and complicated.

After the ' Castel 25 ' came the ' Castel Jalon,' a special research two-seater of which a picture and description appeared several years ago in *Sailplane*. Then the ' Castel Mauboussin C.M.7. ' also described in *Sailplane* (March, 1949), built in two slightly different prototypes in 1947 to replace the ' Kranich.'

It became instrumental in breaking several records:

290 Km. (180 miles), in goal flight, by Messrs. Nessler and Braunswick.

400 Km. (248 miles), by Messrs. Nessler and Chabonnat.

425 Km. (263 miles), by Messrs. Nessler and Bourguet.

Gain of 19,500 feet by Mrs. Choisnet and Miss Gueyrel.

(*Continued on page* 281)

WORLD'S FIRST HOME-BUILT
'SCHWEIZER 1-23'

DICK NOONAN, of Winnipeg, Manitoba, rests on the wing of his home-built 'Schweizer 1-23' at Winnipeg Airport after his two-and-a-half hour flight.

He was towed to 2,000 feet by a 'Tiger Moth' and during his flight reached a height of 5,200 feet.

Mr. Noonan has the distinction of being the first person to build a 'Schweizer 1-23' outside the factory. During January this year the jigs were set up in the basement and the construction was completed from February to July. The plans and instructions were provided from the factory.

This is not a new venture for Dick who has been a soaring enthusiast for twenty-five years since, at the age of sixteen, he built and flew his first glider.

C. of A. tests were completed on July 30th—just in time for the Soaring Association of Canada's Annual Contests.



SOARING IN FRANCE—*continued from page 280*

NICE AND EFFICIENT

The 'C.M.7' has achieved some excellent performances and I confess that I do not remember another sailplane so nice and efficient to fly in spite of its dimensions and its weight.

In the 'C.M.7' I was the last pilot in the air at the Beynes Centre, during flights above the Ile de France country, enjoying fast speeds whilst keeping a reasonable sinking speed.

SUPERIOR TO 'KRANICH'

Visibility from the rear seat is excellent, because of the inverted sweepback of the wing, and very superior in any direction to the 'Kranich.'

The fuselage is extremely wide and can carry a respectable amount of freight; I remember the Saint Auban 'C.M.7' carrying 12 complete oxygen bottles and attaining the record weight of 650 kgs. (1,433 lbs.).

But I have noticed a few mistakes. I sum up:

Derigging is the most complicated ever met in a sailplane. It requires a minimum of 12 people, and the operation is timed a minimum of one hour, this minimum being obtained with the 12 people specially trained—and strong enough!

The *Spoilers* do not seem sufficiently large in this craft which has great gliding ratio and is destined for cloud flying by reason of its strength.

The *Construction* of the long hood in one piece with several parts separately opening does not provide a good defense against cold (and certainly against drag). The 'C.M.7' is a nest for the winds, and one acquires the impression of flying in the open air.

The *Comfort* of the seats is not studied with sufficient care. Both occupants are placed on metal seats sliding on rails to adjust the right length, but they seem to me too cramped. At the rear seat, the pedal bars are too widely spaced and there is no control of the spoilers—which only the forward occupant has.

SMALL FAULTS, BUT—

The faults are small in view of the excellent aerodynamical properties of the machine, but they must be corrected in the new 'Castel Mauboussin C.M.71' two-seater. It is derived from the 'C.M.7' but with a straight wing without gull dihedral. The 'C.M.71,' in construction at the Fouga factory, should fly next year, and we think that it will take pride of place over the five excellent two-seaters which have gone before it.

HAVE YOU READ THIS ?

THE Editors and Staff of *Sailplane* send their best wishes for Christmas and the New Year to all our readers at Home and in the other fifty-three countries throughout the world in which our journal circulates.

MANY NEW FEATURES

Beginning with the January issue many new and interesting features and articles will be found in our pages month by month, for the experts and the newcomers to our grand sport, plus many of the regular contributions.

A monthly competition is being arranged for the New Year and details of the first will appear in the January issue with entry forms and details of prizes, etc.

As is well-known to many, *Sailplane and Glider* is not run for private gain, but devoted entirely to the interests of the British Gliding Movement and gliding peoples throughout the world. It is YOUR magazine and YOUR help that we want now.

All we ask is that you spend five minutes completing the following questionaire :—

(1) Are you a regular reader of *Sailplane* ?
(2) Which six features in *Sailplane* do you enjoy most given in order of preference ?
(3) Which story do you vote the Best of the Year ?
(4) If you were Editor what features would you include or omit to make *Sailplane* more interesting to YOU ?

Write your ideas on a postcard and post to :— ' Suggestion,' Sailplane Office, 8, Lower Belgrave Street, London, S.W.1., to reach us not later than January 1st, 1952. Overseas readers—February 1st. Prizes of SIX FREE SUBSCRIPTIONS will be given to those whom, in the opinion of the Judges send in the most valuable suggestions. Prizewinners' names and entries will appear in the February issue.

NEWS FROM EGYPT

THE Egyptian Gliding School have now received their first consignment of Gliders ordered in the U.K. These machines are ' T.21-B's.' The pupils of the school expressed some concern as to ability of the machines to soar owing to their great size. These doubts were soon disposed of when Mr. Swinn took the first machine up to a height of 4,300 feet and some seven miles into the desert, returning with a height of over 2,000 feet, after spending an hour over the town sight-seeing with the machine he landed being airborne for nearly two hours.

Prince Soliman Daoud (uncle to H.M. King Farouk) has been flown in the ' T.21-B ' and was most enthusiastic. Many high-ranking Egyptian Air Force Officers have also received their baptism in Gliding. Already the training programme is under way starting with 40 Signal Corps Boys. The school is now expanding to take on the instruction of students in the Universities and also the various Military Colleges.

Amongst the School's fleet are machines from Hungary, France, Germany, and England, and also including one machine of local manufacture.

A Secretary to the C.F.I. has been appointed, together with a Ground Engineer, and various assistants.

As will be well-known to those persons who have been in Egypt the country is the Mecca of thermals. One is not launched with the hope of getting one, it being rather a question of choosing the best from the many available.

In common with gliding experience in the U.K., the local press have got hold of the fact that an Englishman flies over the town every afternoon in a glider, and twisted it out of its true significance. In order that there should be no further misunderstanding the press are to be given a field day on the 16th of this month.—R. SWINN.

GLIDER MANUFACTURERS IN GERMANY

1. *Wolf Hirth GmbH, Nabern/Teck* Liefert ' Goevier ' Doppelsitzer und ' Kunz-Trainer,' später ist Bau von ' Condor-IV ' und evtl. ' Horten-XV ' vorgeshen.

2. *Segelflugzeugbau Ing. A. Vogt, Peissenberg/Obb.* stellt den Uebungsdoppelsitzer ' Doppelraab ' in Serie her. ' Preis DM 5500.'

3. *Rodas Flugzeugbau GmbH, Holzkirchen/Obb.* betreibt den Serienbau des Leistungsdoppelsitzers ' Mu-13 E ' ' Bergfalke.' ' Preis DM 7200.'

4. *Focke-Wulf GmbH, Bremen* bietet die 'Weihe ' an und will später den ' Kranich-III ' mit Stahlrohrrumpf herausbringen.

5. *Orbis Sport-und Segelflug G.m.b.H., Munster/W.* baut und repariert ' Baby ' und ' SG-38.'

6. *Schleicher, Poppenhausen/Rhon* baut die ' E.S.-49,' einen Ubüngs-Doppelsitzer von Edmund Schneider.

7. *Segelflugzeugbau Schindler, Sulsdorf, Krs. Konigshofen/Grabfeld* bietet ' Baby-III ' für 'DM 3590' an.

8. *Klemm-Technik, Boblingen/Wttbg* will Fertigung von Flügel-und Leitwerkholmen für ' SG-38 ' und ' Baby II/III ' aufnehmen.

170,000 WEATHER REPORTS SOLD AT SOUTH BANK EXHIBITION

DURING the five months in which the meteorological exhibit and the live forecasting unit was open in the Dome of Discovery at the South Bank Festival of Britain Exhibition, about 170,000 copies of the souvenir weather report and forecast, specially prepared and reproduced on the spot, were sold to the public, while thousands of people had the opportunity of informal discussions with the Duty Forecaster on meteorological topics and current weather forecasts.



"Shell Aviation News" Photo.

Long Distance Light Aircraft Record

THE recent non-stop flight from Paris to Rabat, Morocco, by Monsieur Rebillon, flying in a 'Minicab,' has created a new world distance record for light aircraft in the FAI, Category 1 (under 500 kg. all-up weight). The distance in a straight line from Paris to Rabat is 1,826 km., which is nearly twice the distance of the previous record of 945 km. set up by A. Van Cotthen in a 'Tipsy Belfair' in August, 1950.

The 'Minicab' is one of the smallest of the ultra-light aircraft now being produced in France and is manufactured by the Constructions Aeronautiques du Bearn. It normally accommodates two persons, sitting side-by-side, and is powered by a 65 Cv. Continental engine. Cruising speed is about 190 k.p.h. (118 m.p.h.) with a fuel consumption of 9 litres per 100 km. (2 I.G. per 62 miles), and maximum range without additional fuel reserves is 750 km. (560 miles).

Monsieur Rebillon installed a supplementary fuel tank in place of the passenger seat and waited for favourable weather over one of the three routes selected : Paris to Morocco, Paris to Sweden, and Paris to Italy. Finally, on 24th July, he received a report that conditions would be suitable the following day for a flight to Morocco.

Take-off was at 05.40 on 25th July from Toussus-le-Noble, and the flight was made via Bordeaux, Biarritz and Gibraltar. A cruising speed of 183 k.p.h. (113 m.p.h.) was averaged over the flight, which took approximately ten hours. Fuel consumption was 167 litres (38 I.G.) and the aircraft had less than three litres of fuel left when it landed at Rabat-Sale airfield. On the return journey on 27th July, the pilot flew non-stop from Rabat to Perpignan, a distance of 1,400 km. (850 miles). Monsieur Rebillon, who is 50, intends to make an attempt in the same aircraft to break the present records for closed circuit flights over 100, 500 and 1,000 km.

—*'Shell Aviation News.'*

Soviet Gliding Contests

By R. A. G. STUART

THE 17th All-Union Gliding Competitions of the U.S.S.R. were held at Kaluga in June. The competitions proper were preceded by an air display opened by banner-flying aircraft.

After the fly-past of these aircraft, there was a brilliant aerobatic display by Heroine of the Soviet Union, M. Chechneva, followed by parachute jumping by members of the Chkalov Central Moscow Aeroclub and by a glider display.

Then came the competitions proper, in which the first event was a spot-landing competition from 300m. height. All pilots used the 'A-9' glider and the winner was V. Melyushin from Vologda with 47 points, with P. Borisova from Ulyanovsk second. She gained 46.8 points.

In the technique of pilotage competition the victor was S. Anokhin with 50 points, full marks. The competition for accurate estimation of time of landing and for the landing itself was won by the team of the Chkalov Central Aeroclub (Moscow), consisting of Anokhin, Kuzakov and Chubukov. Anokhin took first place in the competition with 50 points out of 50, while the Ukrainian pilots Ruditskii and Veretennikov were 2nd and 3rd respectively with 49.25 and 49 points.

Race over a 100-km. triangular closed circuit was won by N. Loginov of the Central Bielo-Russian Aeroclub with a time of 5 hours.

NOTABLE DISTANCE

A notable distance flight was that of V. Ilchenko who flew 500 km. and landed near Kirsanov in the Tambov region. He was flying an 'A-9'

Competitions closed on June 9 and the victors were the team from the Moscow region. Ilchenko became the champion glider pilot of the U.S.S.R. and it was also he who was responsible for the success of the Moscow team, whose instructor and captain he was.

500 MILES IN 'GRUNAU' IN ONE DAY

By BOB MULLER

This is an interesting story of a combined 'Tiger Moth-Grunau' cross-country delivery flight from Sydney, Australia to Toowoomba—a distance of 520 miles. It was accomplished by three members of the Hinkler Soaring Club in phenomenal conditions—and what if they did get stuck in the mud 15 miles short of their goal and had to finish the delivery next day—its a 'Record' anyway

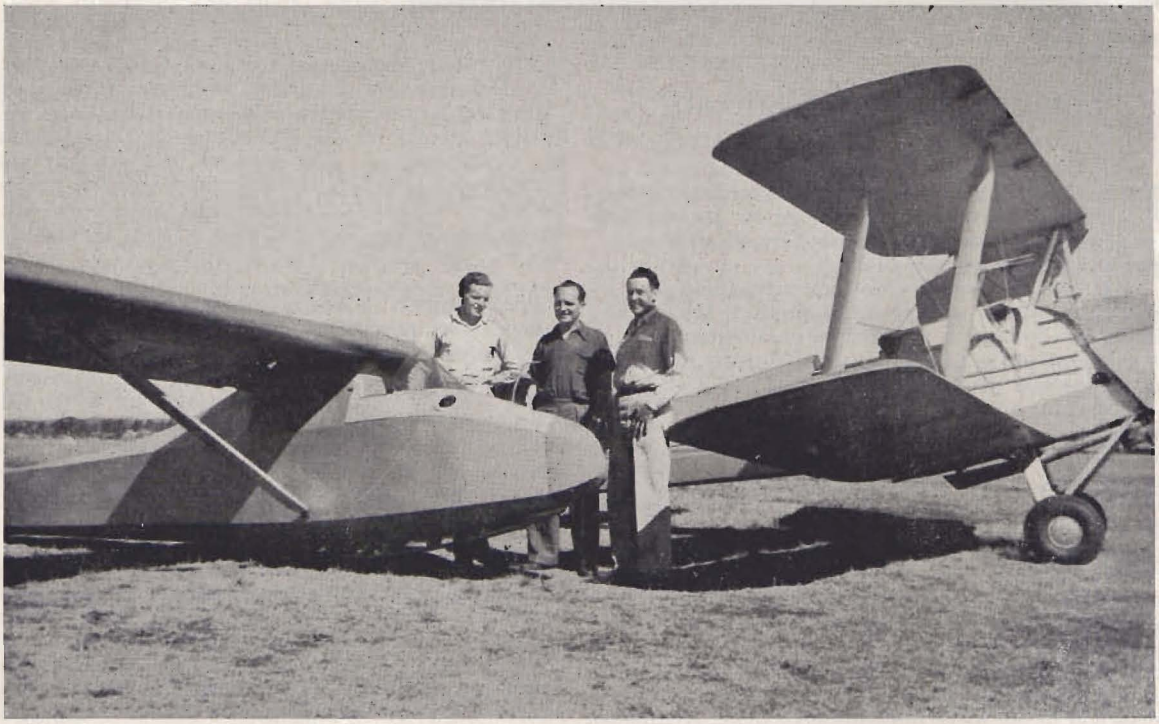
FIVE hundred miles in one day in a 'Grunau Baby' is a lot of sitting, even when spread over the posteriors of two pilots.

To that thought add a vision of a bump a second and an obstacle of 5,000 cubic miles of bushfire smoke, and you have the story of an Australian long distance aero-tow, so nearly completed in one day.

It was a combined 'Tiger Moth-Grunau' cross-country that struck too many thermals for real comfort, the tow being a delivery flight from Sydney to Toowoomba, in Queensland, a distance of 520 miles.

And we who did it had to pick a day when it would have been almost possible to soar the distance without benefit of 'Tiger'! Also we had to pick a time when bushfires raged unchecked for hundreds of miles along our route.

It was made for the most part in violently turbulent air, excellent for soaring, but exhausting in towed flight, by three pilots of the Hinkler Soaring Club, Sydney, one flying the tug throughout, the other two alternating in the glider between each refuelling stop. Pilots were Fred Hoinville, Bob Krick and myself.



Left to right: Bob Muller, Bob Krick and Fred Hoinville

Fred Hoinville, President of the Hinkler Club, and Australia's first 'Gold C,' towed in his educated Tiger Moth 'Brogla.' Fred, and smoke-writing 'Brolga' are known throughout Australia's eastern States as an aerobatic team that steals the show at every air pageant. Fred also holds the Australian distance record for soaring flight—221 miles.

Bob Krick, Hinkler Club instructor, and I, who came to the club a year ago from the Adelaide Soaring Club, in South Australia, flew the 'Grunau.' At each refuelling stop one (*continued on page* 286)

SALISBURY CLUB'S ALTITUDE RECORD

SALISBURY Gliding Club's 'T.31' two-seater, the only machine of its type in Central and South Africa, created an unofficial Rhodesian altitude record of 9,400 ft. (4,400 ft. gained), when it was test flown on August 12th by Chief Instructor Derek Lane.

News appeared in our September issue, with photograph, of this aircraft under construction. In January this year the club imported a 'T.31' kit, fuselage only, as they had wings available from a 'Tutor.' Three months saw the machine completed.

Lane dispensed with the preliminary hops and took her up solo to a full launch, 600 ft. and did a perfect circuit and landing, and no snags were reported. This was repeated with two up and again a perfect circuit and landing.

On the third launch, again 600 ft. he caught a thermal and got away to a height of 9,400 ft., which is a gain of 4,400 ft. above the airfield. He was up for 30 mins. in which he did tight turns, stall turns, stalls and deliberate spins so that the machine had a thorough workout, and there were no snags of any sort. The flight was deliberately curtailed due to the large number awaiting flights.

WE hear that the Mississippi State College have a 'TG-3A' fitted as a research sailplane for boundary layer control studies.

August Raspet says: 'At present we have the flow over the top of the wing laminar back to 88% with a very small amount of suction. If this were also done to the bottom the drag of the wing would be about one-third of the drag of a smooth wing or about one-sixth of the drag of a standard construction wing. The glide ratio of a 'TG-3A' with laminar control would be 34 and the high speed phenomonal.

FOR SALE

TWO pairs of 'Cadet' wings; one set of 4 struts; one tail unit; £90 the lot. Two nacelled 'Daglings,' £60 each. One open 'Dagling,' brand new, uncovered, £45.—London Gliding Club, Dunstable Downs. Tel.: Dunstable 419.

'KIRBY KADET,' in excellent condition, Re-covered last year, fitted with wheel and altimeter and A.S.I. C. of A. expires April, 1952. Must sell urgently. £140 or near offer. Chowles and Nelson Barograph £10. Air Driven Turn and Banks low consumption 1.5 in. mercury £5.

Box 275.

PRIMARY 'EON' (1948) in good condition. £130. Current C. of A. Can be test flown on application to Hon. Sec., R.E. Flying Club, S.M.E., Chatham.

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Cash with orders, please.

500 MILES IN 'GRUNAU'—*continued from page 284.*

climbed thankfully out of the glider and into the front seat of the Tiger for a rest, while the other took over the stick-stirring on the end of the towline.

Most of the tow took place on September 27th, when the sailplane and tug landed only 15 miles short of the goal, and then only because the Tiger's fuel ran low.

There were three planned refuelling stops along the route, which lay over long stretches of uninviting timber country, and a mountain chain. Head winds and bushfire smoke caused the unpremeditated stop at Cambooya.

EQUIPMENT

Some details of the equipment and towing technique might be interesting. The rope was 160 feet of 7/16 diameter manilla, with steel rings, and *no* weak link. Experience showed a longer rope had a greater tendency to develop slack and form loops when towing in rough air. Twin flex was threaded through the rope to provide inter-com. between the tug and glider. Releases were Otfur type, with the over-rides locked. The inter-com. wiring was connected at towplane and glider by a telephone plug and jack, which pulled apart under very light pressure. We hadn't a chance to test the inter-com. in the air so agreed on a simple system of hand signals, which paid off, because we couldn't hear the inter-com. properly over the Tiger noise.

We flew the glider in what we call the ' low tow ' position all the way—well below the Tiger's slip-stream. This method of towing is becoming increasingly popular in Australia. We find it the safest and easiest on both tug and glider pilots. Even with the Tiger sitting two to three spans above the horizon there is no downward pull on its tail. Towing speed was 65 m.p.h. indicated, which gave a true airspeed of up to 73 m.p.h. at 6,000 feet, which was our ceiling.

Take-off was from Bankstown aerodrome, 14 miles from the heart of Sydney, into a gentle south-west wind, at 6.30 a.m.

The Department of Civil Aviation made the way easy for us by giving all the help and co-operation it could, and allowing the Tiger to fly higher than the usual 1,500 feet level reserved for lightplanes on cross-country.

With Bob Krick in the ' Grunau ' we climbed away over Sydney Harbour—and Sydney's proudest possession—the Bridge, with the early morning sun slanting through the haze.

At 4,000 feet on a northward course we flew almost above the coastline in still smooth air.

EMERGENCY LANDINGS CHECKED

We were able to admire the beauty of the Pacific Ocean rolling in to the sandy beaches alternating with stretches of rock-bound coast as we mentally checked glide angles to aerodromes and emergency landing fields.

Bob Krick, in the ' Grunau,' wasn't wearing gloves or flying boots, and his appreciation of the scenery began to wane under a gradually increasing deep freeze.

Newcastle appeared below—75 miles in 50 minutes, a ground-speed of 90 miles an hour, and Bob decided to hang on rather than land for more clothing.

Then cloud cover began to build up over the coastal ranges, whence our course took us, but it wasn't too low, so we decided against a long diversion around the coast. At 7.45, over the first of the hilly country the turbulence started, and we rode rough slope lift for the next half-hour.

At 8.15 we reached the first refuelling point, Gloucester, but we didn't need any fuel for the next stage—the Tiger had a 12-gallon long-range tank. The aerodrome made a better cow pasture than landing field, and the cows realised it.

We buzzed the strip in the Tiger to clear them off it, and Bob dodged down through the thermals already going up, to land at 8.25. We were well ahead of schedule.

A FARMER'S HELP

With all the questions and answers it took us an hour to get out of that field. ' I was now in the ' Grunau ' and almost provided a real Roman holiday for the spectators. The farmer who had been briefed in the art of wing-tip holding just would not let go, and he slewed the ' Grunau ' round so far it was touch and go. But we went.

A 9.30 take-off and the thermals were really going up now. Cloud cover was about seven-tenths, with strong lift under every cloud. But the ' downs ' between clouds were stronger, and the overloaded Tiger couldn't climb into the smooth air above.

Then we swam into still air as we crossed the coastline and flew along once more a mile out to sea.

Ten minutes of this and the triangular strips of Coffs Harbour were 5,000 feet below. I cast the ' Grunau ' off and found I was in no sink, even maintaining a 65 airspeed—and this a half mile out to sea.

A couple of wide circuits in the ' Grunau ' at 70 miles an hour, a D.C.3 approach down the strip, touching down half-way along it, to roll gently onto the taxi-way in front of the hangar. We had passed the half-way mark of the flight by 11.30.

We were away ahead of schedule, and decided we could make the trip in one day.

We got off at Coffs Harbor at 12.40, and set course for Casino. The first five miles we were in strong ' down,' and our ceiling was 2,000 feet. We headed inland once more, still on a northerly course, and hit the thermals. But real thermals. The first three took us straight to cloudbase at 5,000 just by flying straight through them, and the battle was really on.

BUSHFIRES AND THERMALS

Bushfires burning along hundreds of miles of the coastal ranges spread a thick haze and started thermals any soaring pilot would give a week's pay to encounter. It must have been the best soaring day of the year.

In the front seat of the Tiger I offered up a little prayer of thanks that it wasn't me back there, getting that pounding.

Bob probably could have cast off and soared the next 100 miles without circling, but we were in a hurry—and if you did come unstuck the ground below was rough and uninviting.

Casino appeared through the haze an hour and a

half after leaving Coffs Harbor—110 miles—and the Tiger landed. The ' Grunau ' stayed up another 25 minutes.

IT COULDN'T GET DOWN THROUGH THE THERMALS

Bob looped, stall turned, sideslipped ; once he was circling in a vertical turn at 65 miles an hour, with the green ball showing 10 feet a second up. Eventually he found a down, circled in it, and came in for a spot landing.

We didn't need any petrol, we thought, so changed pilots in the ' Grunau,' and started another take-off. In the bumps the ' Grunau ' wing got down in the slip-stream, wouldn't lift, so I cast off at 20 feet and landed at the far end of the grass strip.

Fred in the Tiger dropped the rope, landed, and we took off again in the opposite direction. A crowd of spectators who had started off down the field to see what was wrong hadn't got 200 yards before the tow was under way again, with an aerodrome groundsman acting as wing-tip holder.

We climbed over the fence at 3 p.m. on the last stage of the flight. This took us westward across the Great Dividing Range, then northwards to Toowoomba.

It also took us across the roughest country along our route and through the worst bushfire area.

SMOKE BECAME A MENACE

We climbed to 6,000 feet above an inversion which stopped the smoke, but didn't stop the thermals. Clouds were still forming 1,000 above us as we pushed over the smoke. It was as dense as a cu cloud in its worse patches, impossible to see the ground through it. It was too dense to fly through, and too dangerous to fly over it without visibility, so we edged back and forth, seeking the thinner areas where there was a view of the ground and the widely separated forced landing fields.

An hour after take-off from Casino, Warwick aerodrome was ' somewhere down there in the smoke,' and we set course for Toowoomba, now heading north-west, only 55 miles to go.

But now there was a headwind, our ground-speed was little better than 50 m.p.h.

As the sun sank lower the bumps smoothed out and the air became calmer.

That should be Toowoomba over there on the horizon, but is it ? Or is it merely deceptive shadows cast by a sinking sun ? The Tiger's fuel gauge is getting low. If it isn't Toowoomba we will arrive there with no fuel. Whereas just under us is a beautiful big field.

So at 5 p.m. Fred rocked his wings, pointed down at the field. I unhooked at 400 feet—actually 1,900 on the altimeter, still set at sea level, picked the wind direction from the dry grass on the edge of the field, and landed. The growing barley didn't give any sort of wind indication at all.

Also it didn't give the ' Grunau ' a chance to run very far. It was knee high, growing in soft ground. This area had had its first rain in months only a day before, and the surface was sodden.

The Tiger landed alongside, we got fuel from a farmer, and tried to take off again. But the tug couldn't shift the ' Grunau,' even from the skid, with the undercarriage removed. So we hurriedly pegged everything down, rang air traffic control, and our Toowoomba hosts.

15 MILES SHORT OF GOAL

We explained that we had landed—15 miles short of our goal.

Dr. Mervyn Hall, President of the Toowoomba Soaring Club, drove us to Toowoomba for the night, and back again next morning to extricate the machines.

We put the small skid wheel back on the ' Grunau,' and carried it out of the field into the main road.

The road had wide grass verges, and telephone lines down only one side, and made a perfect airstrip for the take-off, with Bob Krick again flying the ' Grunau.'

Twelve minutes later we flew over Toowoomba at the end of a tow that was so interesting we would even do it again—in similar conditions.

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"B" .. 96
"C" .. 19
Silver "C" —
Gold "C" —

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5847	Kenneth J. Mayes	No. 104 G.S.	13.10.51
9329	James R. Clinkscales	R.A.F. Detling	5.10.51
9599	Barrie M. Hawtin	No. 44 G.S.	9. 9.51
11735	Roger E. Kettle	No. 45 G.S.	9. 7.50
12555	John D. Kape	No. 126 G.S.	29. 9.51
12665	Brian W. Woods	No. 203 G.S.	2. 9.51
12721	Derel Marriott	No. 130 G.S.	23. 9.51
13788	Alan Robins	No. 122 G.S.	30. 9.51
12804	Terence E. Crane	No. 92 G.S.	22. 7.51
12888	Brian N. Keeley	No. 168 G.S.	17. 8.51
13029	Victor J. Nickson	No. 44 G.S.	28.10.51
13030	James C. Harvey	No. 203 G.S.	7.10.51
13135	James T. Turner	No. 48 G.S.	14.10.51
13159	Paul A. S. Langston	No. 126 G.S.	29. 9.51
13208	Alan MacDonald	London G.C.	15. 7.51
13227	John D. Edwards	No. 23 G.S.	14.10.51
13321	Peter Kemp	No. 122 G.S.	14.10.51
13335	Trevor Hurrell	No. 89 G.S.	30. 9.51

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13483	Kenneth Johnson	No. 183 G.S.	7.10.51
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13559	John E. Talbot	No. 126 G. S.	15. 7.51
13824	William T. Erwin	Shorts G.C.	30. 9.51
13837	Robert J. Kenyon	No. 125 G.S.	14.10.51
13889	Alastair V. Arnold	Cambridge U.G.C.	12. 9.51
13890	Jeffrey R. Chadwick	No. 168 G.S.	17. 8.51
13891	John Cocke	No. 42 G.S.	6. 8.51
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13897	Peter V. Grime	No. 23 G.S.	16. 9.51
13898	Gordon P. M. Clift	Army G.C.	29. 9.51
13899	William J. D. Murphy	Surrey G.C.	10. 8.51
13900	Adrian Nicolson	No. 2 G.S.	30. 9.51
13901	David H. G. Thomas	No. 42 G.S.	7. 8.51
13907	Alan Kennedy	No. 125 G.S.	14.10.51
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