Sailplane and Glider

The First Journal devoted to Soaring and Gliding

DECEMBER 1952

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Sailplane and Glider

Founded in 1930

and ULTRA LIGHT AIRCRAFT

THE FIRST JOURNAL DEVOTED TO SOARING AND GLIDING

DECEMBER 1952 ★ Vol XX No 12

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COVER PHOTO:

'Moswey IIa' over Davos-Parsenn. Photo by Heimgartner.

Editorial

IT is always interesting to see ourselves, and even the rest of the world, through foreign eyes, which probably explains the popularity of *Sailplane* among foreign soaring enthusiasts. We are fortunate in being supplied with, we believe, almost every soaring magazine in the world, and, with the aid of a corps of willing translators, we manage to get the gist of most of what is in them.

As with our own club magazines, some of the interest is purely local, and some is of world-wide import. Frequently we are able to see that several totally unconnected groups are working on the same problem, and the news of their progress is of interest to the others. At the moment there are several groups working on the problem of reducing the cost of gliding by providing cheaper machines, simpler and requiring less maintenance, and also of cheaper launching methods.

In Gt. Britain, with the existing and traditional methods as a background, we have perhaps gone as far as we can on logical lines, in the direction of reduced costs. By reducing crashery, the cost of repairs has been cut down. This was done by more careful instruction, but it meant the provision of expensive two-seaters. With this of course, and this is equally important if not more so, there came the added skill of the ab initio on his first solo. It takes some 50 two-seater launches now before an ab initio is allowed to go solo, or about 5 hours' flying. Then the 'A' and 'B' come in quick succession, but it might have been a year between the first two-seater flip and the first certificate, owing to the many tasks which the average club member has to undertake to avoid the club having to pay someone else to do them, or not getting them done at all. For example, the London Gliding Club has just bought the 'Sky' which was damaged in Spain when Frank Foster landed in a squall. It is estimated that it will take 600 hours' work to get a C. of A. After that the Club will have a 'Sky' to hire to its members, which might otherwise not have been possible.

This will be a magnificent feat of devotion by the Club Members who accomplish it. But will the knowledge that it has to be done encourage would-be members. We are sorry to have to confess it, but in this country at least, as is shown by the popularity of the A.T.C. Gliding and the British Gliding Clubs in Germany, where everything is or was 'laid on,' there is little difficulty in getting participants. But this gliding is subsidised, or was in Germany.

Now that gliding is for the Germans in Germany again, they are coming up against the same snags as in U.S.A., Australia, S. Africa, and the rest of the world. Discussing this problem, Seff Kunz, writing in *Weltlufthart*, having analysed the lessons learned by the Germans in Spain, states that German gliding can be in the position it was (under National Socialism) where the State paid all, or it can have a State subsidy, or no State help at all. This latter he plainly seems to think is unthinkable, and goes on to argue that International Gliding is now a matter of National prestige, and if National Teams in the Olympics can be subsidised, gliding ought also to be a matter for the State, and the subject of a 'Cultural Subsidy.'

It is true, of course, that some States subsidised their teams at Helsinki, but not the British, or we believe, the Americans. There is no other way by which members of the totalitarian states can go abroad, except under State auspices and so we cannot say anything about their participation in International events. Which looks as if the hands of the Democratic Governments might be forced. But why subsidise only participation in the Games ? Training and equipment are just as important. This was recognised in France where the S.A.L.S., organised both selection, training and participation having previously subsidised the design and manufacture of the machines. Yet the 'Sky' and the 'RJ-5' were both superior to either the 'Horten IV' or the French 'CM-8,' both of which had been designed under official auspices. Which seems to be a bull point for private enterprise, although we are by no means certain that either Fred Slingsby or Richard Johnston would be prepared to begin any new development without official encouragement. Gliding £.s.d., is still a sketchy business, and the rewards are not sufficient to attract capital to the design or manufacture of new gliders.

We see no future from any Government subsidy in the English-speaking countries, and in our view, difficult and unhelpful as this may be, it is better so.

SOARING IN FRANCE

The Splendid Performances of the Fauvel 'AV/36' Tailless Glider

By GUY BORGÉ

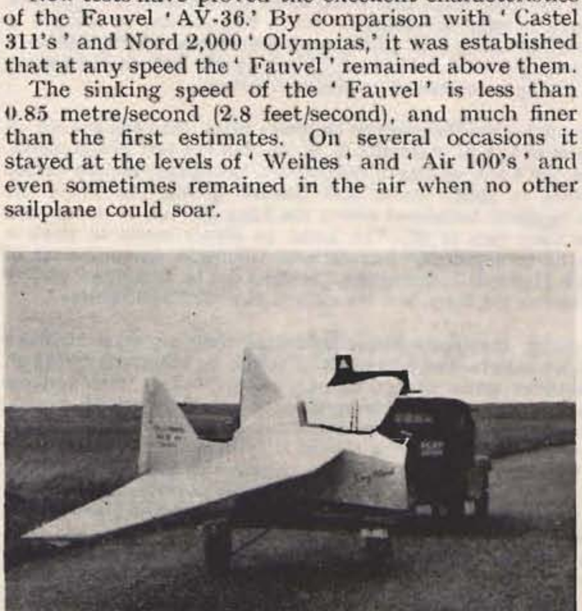
IN a previous number of *Sailplane* I have spoken of the excellent first flights of the new tailless training glider Fauvel 'AV-36.' Since then, several sensational performances have proved the value of the prototype

Eric Nessler, the Great Champion, attained 460 km. (285 miles), a rather unusual distance for a training machine. On the same day, July 23, this year, some excellent performances were made from Chavenay Airfield. A flight of 500 km. (310 miles) in an 'Air 100,' and 480 km. (298 miles) in another 'Air 100.'

Nessler recorded a cruising speed of 71 km./hour (44 miles/hour) and landed at 5.30 p.m. Could he have found thermals after this time, a usual circumstance in the South West country, and he could have improved the French distance records very much. But this distance of 460 km. certainly constitutes an unofficial world record for tailless machines, also remarkable was that it was obtained with a wing having an aspect ratio of only 10.

New tests have proved the excellent characteristics of the Fauvel 'AV-36.' By comparison with 'Castel 311's' and Nord 2,000 'Olympias,' it was established that at any speed the 'Fauvel' remained above them.

The sinking speed of the 'Fauvel' is less than 0.85 metre/second (2.8 feet/second), and much finer than the first estimates. On several occasions it stayed at the levels of 'Weihes' and 'Air 100's' and even sometimes remained in the air when no other sailplane could soar.



On Tow.

An excellent proof of classical flying properties was the distance flight of 50 km. (31 miles) accomplished by young Arnaud Hastoy for his Silver 'C' on the 23rd August, when he made his 4th flight in the machine and no other pilot in any other machine was able to equal this on this day.

To date the 'AV-36' prototype has recorded more than 100 hours of soaring in hands of twenty different pilots, several demonstrations at meetings at The Hague, Ypenburg and Paris, Toussus le Noble, numerous aero-tow retrievings even in rough weather. The trim of the machine is very easy; it was flown without change by pilots ranging from 50 kgs. weight (110 lbs.) to 100 kgs. (220 lbs.). It flew aerobatics in the hands of Nicaise, a Beynes instructor, who was unable to execute stalls or spins; a safe machine for beginners.

The Fauvel 'AV-36' seems to bring a completely new trend to the soaring world. Its elegant solution of economy, safety, smallness, ease of construction, its property of sensational performances will interest many pilots in several countries where it could be built under license in the near future.

THE A.T.C. gliding organisation, with its 49 week-end gliding schools, carries out a yearly average of 100,000 launches, resulting in the award so far this year of 1,200 'A', 800 'B', and 45 'C' certificates. About 500 cadets are under training at one time by officers of the Training Branch of the Royal Air Force Volunteer Reserve and civilian instructors, all of whom are unpaid volunteers.

Association between Jets and Surface Fronts

WHEN warm and cold air masses are brought closely together there are created strong horizontal temperature gradients with which are normally associated fronts and jet streams. Generally speaking, a well-marked (in a thermal sense) surface front is sufficient but not necessary evidence for the existence of a jet stream aloft. Quite strong wind maxima may exist in association with weak surface fronts. This arises by virtue of the fact that strong currents aloft can be produced by broad thermal contrasts over a sufficiently deep layer, whereas the thermal contrast is normally concentrated in a rather narrow band at a well-marked front. The position of the jet-stream axis in relation to frontal surfaces is generally in the uppermost part of the warm troposphere approximately above the intersection of the front with the 500 mb surface, as has been pointed out by several writers (e.g., Palmén 1948). This empirical rule is a fairly good approximation to reality in cases of strong jets and fronts. The rule implies that the jet-stream axis should often be 200 mi to 400 mi behind a surface cold front and 400 mi to 800 mi in advance of a surface warm front. In many cases much greater complexity exists in the relationship between surface fronts and jet streams, as can readily be observed from Figures 14 to 43, which give the estimated positions of the jet-stream axes and surface fronts daily at 1400 GMT in September 1950 in the neighbourhood of the British Isles. The positions of the jet streams were obtained from consideration of the series of cross-sections and the 300 mb charts (available at 6-hourly intervals). Afterwards the surface fronts and 1000 mb contours (copied from the working charts prepared at the Central Forecasting Office, Dunstable) and the jet streams were put on the same charts. It should be mentioned that the thick lines representing the axes of jet streams have generally been terminated where the wind maxima become ill-defined, although in some cases west of the British Isles no stream is indicated simply because of uncertainty in locating it in that region. An indication of the variation of wind speed from one jet to another and at different positions on the same jet is also given in Figures 14 to 43 (the estimates of speed referring to the 300 mb level). Individual jets may be identified from chart to chart by attached letters A, B etc.

Many examples (e.g., Figs. 26 and 39) show jet streams in advance of warm fronts and in the rear of cold fronts in approximately the position that one might expect. In most cases the jets are parallel to the surface fronts only over a limited distance; generally the jets tend to approach that part of the front which is near to the cyclonic centre and to recede from the other end of the front, as in Fig. 26.

Small running waves on a slow-moving cold front affect the associated jet hardly at all. If the wave develops, the jet becomes distorted in sympathy with the increasing amplitude of the wave-like surface disturbance. As the occluding process proceeds the jet tends to weaken in the neighbourhood of the surface centre, perhaps lying almost

(*continued on page 6*)

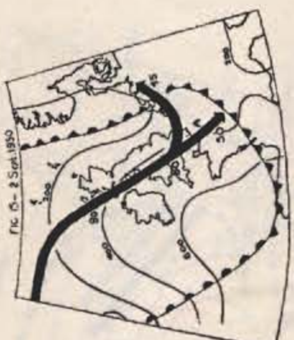


FIG. 15 - 2 Sept 1950


FIG. 17 - 4 Sept 1950


FIG. 19 - 6 Sept 1950


FIG. 14 - 1 Sept 1950


FIG. 16 - 3 Sept 1950

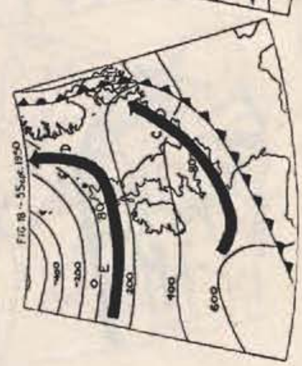


FIG. 18 - 5 Sept 1950

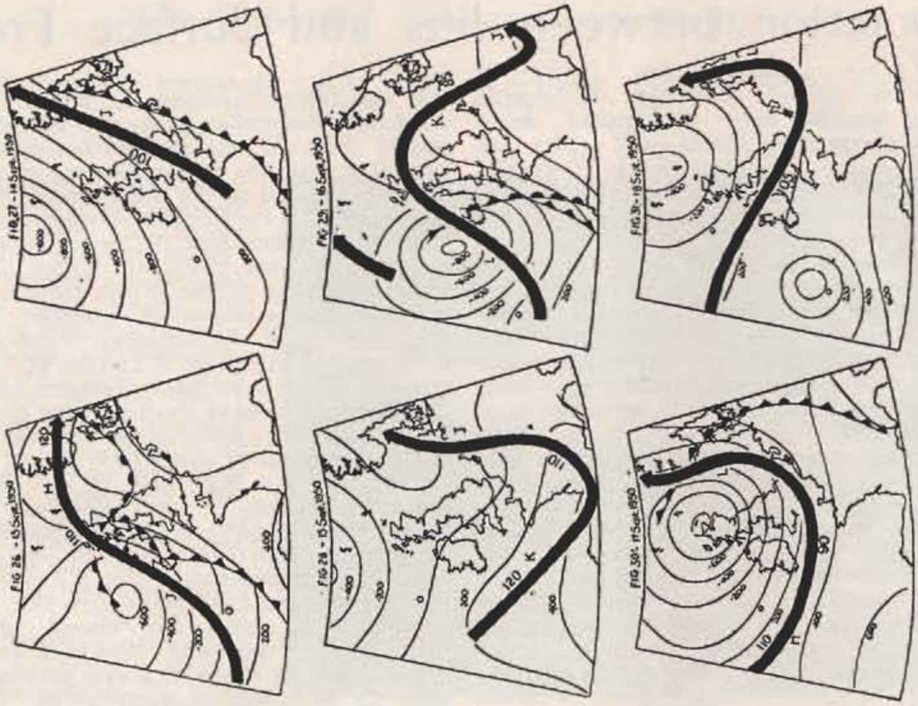
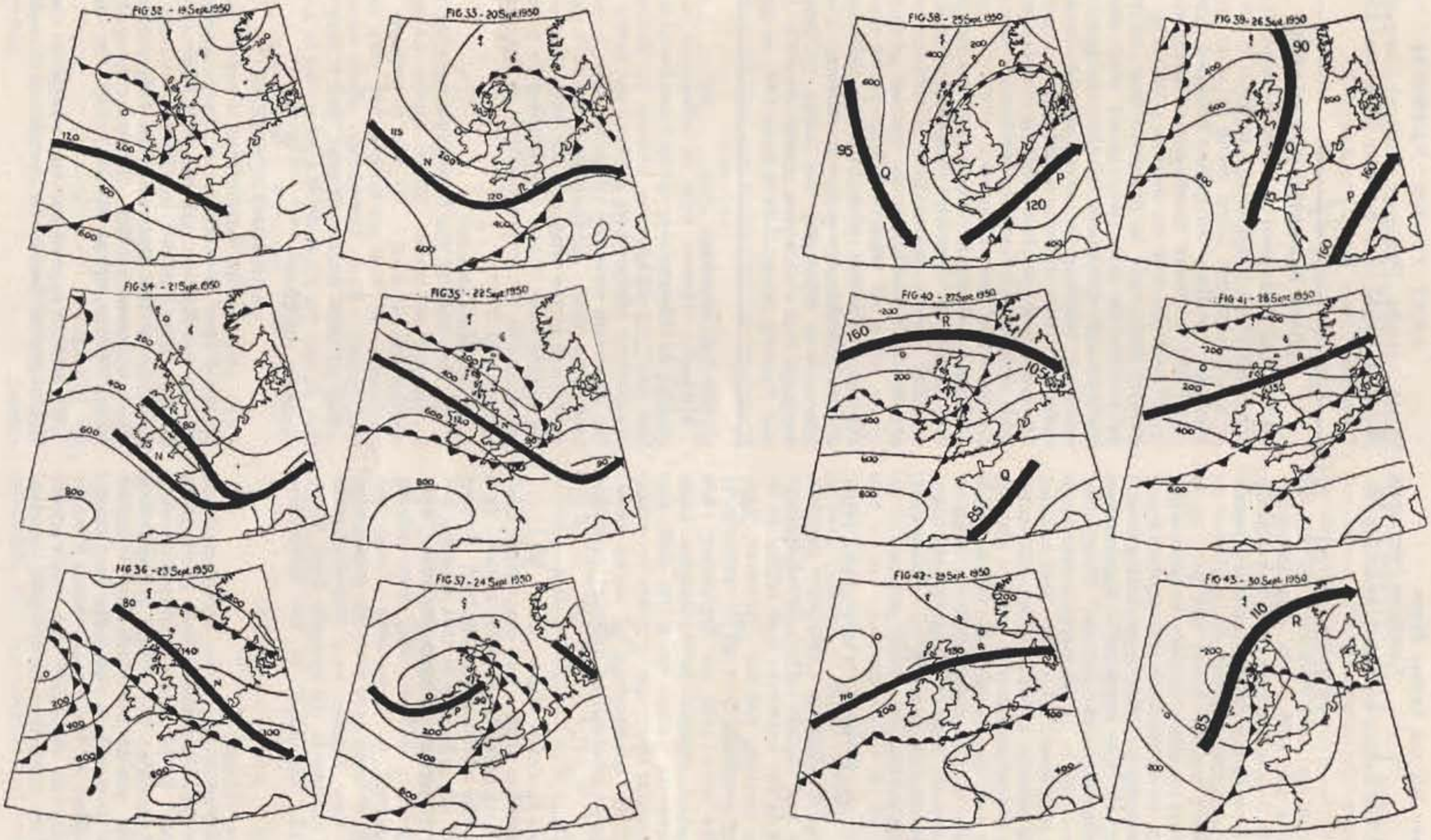


FIG 27 - 14 Sept 1950
FIG 29 - 16 Sept 1950
FIG 31 - 18 Sept 1950
FIG 26 - 13 Sept 1950
FIG 28 - 15 Sept 1950
FIG 30 - 17 Sept 1950


FIG 21 - 8 Sept 1950
FIG 23 - 10 Sept 1950
FIG 25 - 12 Sept 1950
FIG 20 - 7 Sept 1950
FIG 22 - 9 Sept 1950
FIG 24 - 11 Sept 1950



Figures 14 to 43. Association between jets and surface fronts at 1400 GMT each day during September 1950. Fronts indicated in conventional manner. Jet as broad arrow with 300 mb speed in knots at selected points. 1,000 mb contours (ft.) as thin lines. Individual jets identified from chart to chart by letters A, B, etc.

Association between Jets and Surface Fronts

Continued from page 3

perpendicular to the surface occlusion, as in Fig. 40. On other occasions the original jet separates out into two distinct jets—a type c and a type w jet—as in Fig. 37. Warm and cold occlusions, having the character of warm and cold fronts, may sometimes be associated with type w and type c jets respectively.

These remarks are in the nature of broad generalizations. On occasion there appears to be little or no association between surface fronts and jets, as in Fig. 16. This state of affairs is likely to arise when the surface fronts are thermally weak, or when a new strong jet is overtaking an older, degenerating frontal system, as in Fig. 16. The remnants of degenerating jets may also complicate the picture. These complexities are inevitable in an atmosphere essentially dynamic in its behaviour. However, over a short period, say of the order of 12 hr, there is considerable conservatism in the relationship of the jet with its front; and this fact can be of some use in short-range forecasting. For instance, different type w jets may be differently aligned in relation to warm fronts, but a particular relationship, once established, is likely to persist for a short period at least.

SOME POINTS REQUIRING INVESTIGATION

As has been stated in Section 1, this paper purports only to describe and discuss certain broad features of the wind field in the westerlies that appear to be of significance in synoptic practice. However, there are a number of questions (not all of which were suggested by the work with the September 1950 cross-sections) which deserve brief mention here, although firm answers cannot be given with any degree of confidence at this stage. Further investigations, entailing the construction of many cross-sections at frequent intervals in different positions, are called for.

(*a*) *Movement and distortion of jets*

A common tenet is that a jet propogates itself along its length with only slight lateral motion. It is clear that this is only a tendency at the best. Intense jet streams quite often behave in this manner, but there are great deviations in particular cases, with some jets, particularly smaller ones, often moving quite rapidly normal to themselves. Long and nearly straight jet streams have a certain persistency, but ultimately they become very distorted with associated great changes in the synoptic type, which are fundamentally important in the forecasting problem.

(*b*) *Double jets and splitting jets*

Double jets and splitting jets are indubitably real phenomena, but there are some details about them that are not clear. In particular, the type of wind profile near the region of 'difluence' in the flow is uncertain. In the case of jets which have branched off from a parent jet the relative intensity (and change in relative intensity) of the two branches (usually one with cyclonic and the other with anti-cyclonic curvature) may be important in synoptic development.

(*c*) *Effect of subsidence*

Markedly different rates of subsidence in neighbouring air columns may set up a horizontal temperature gradient which may increase or diminish the pre-existing temperature gradient and hence modify the jet-stream structure. It is not clear how important is the effect. An example of the part played by subsidence is the tendency for some type c jets to lag behind cold fronts, possibly due to pronounced subsidence in the troposphere just in the rear of the surface cold front.

(*d*) *Tropopause structure*

The structure of the tropopause near jet streams is complex at times. There appear to be three possibilities at least: (1) the tropopause is discontinuous, (2) it is continuous but very steep, (3) it is 'folded'. There is evidence—albeit inconclusive—that all these states can exist, and it may be that they fit into the life-cycle of a jet stream in a manner requiring elucidation.

ACKNOWLEDGMENT

The above is an extract from a paper 'Structure of the Upper Westerlies; a study of the wind field in the Eastern Atlantic and Western Europe in September, 1950," by R. Murray and D. H. Johnson, of the Meteorological Office, Dunstable, which appeared in the 'Quarterly Journal of the Royal Meteorological Society,' Vol. 78, No. 336, *pp*. 197-199.

We wish to express our appreciation to the Royal Meteorological Society for permission to reprint this extract.

NEXT YEAR'S 'NATIONAL'

THE British National Gliding Championships next year, will be held at Great Hucklow, Derbyshire, from July 25 to August 3.

TOWN PLANNING FOR SOARING

A PROJECT designed by architects Sergei Kadleighi and Peter Horsborough to house 8,000 people in a self-contained town rising in what might be described as three irregular Y-shaped towers to about 450 ft. above Paddington goods-yard station is of great interest to soaring pilots. The longest possible beat would be 360 yards long and it should be possible to slope soar in all wind directions. Mathematical treatment of this obstruction as a source of standing waves should be considerably easier than that of natural and more irregular hills. The peculiar shape of the building complex providing wind shelter to an insolation hot box will also provide London's best thermal source.

Vertical building development of this nature apart from providing 'sure-fire' (American technical term meaning —good, unmistakable, unambiguous) navigational fixes also allows the creation of more open spaces which all pilots who have found themselves looking at an active red ball and the endless expanse of London's chimney pots will welcome. For those interested in examining the design we refer to a brochure *High Paddington*, published by *The Architect and Building News*, Iliffe & Sons, Ltd., at 7/6d.

Reprinted from 'Soaring'

On the Possibility of Soaring on Travelling Waves in the Jetstream

By JOACHIM KUETTNER

Geophysics Research Division, Air Force Cambridge Research Centre

MANY pilots and meteorologists have looked for the possibility of using travelling instead of stationary waves for cross-country flights. Visual observations, and more recently, time lapse pictures have shown that waves of this kind exist. One type of travelling gravitational waves seem to be connected with cold fronts and have been called 'prefrontal waves' by Georgili. In the last year evidence has accumulated that another kind of travelling wave exists which is connected with the jetstream. The following discussion deals with the possibility of travelling 'jetstream waves.' If used by gliders, the full speed of the jetstream could be transformed into ground velocity of the sailplane and the high level of the jetstream (around 30,00C feet) might provide an additional flight range.

The atmospheric jetstream is a relatively narrow, but very long band of high winds imbedded in the general westerly circulation. Its width is only a few hundred miles, its length can reach a few thousand miles, and its position changes from day to day. One of its main features is a strong vertical increase in wind velocity around the 20,000 foot level (near 500 mb) and an even stronger decrease in the substratosphere at about 40,000 feet (200 mb). The core of the jetstream lies usually between 30,000 and 35,000 feet (300 mb) not far from the tropopause, with maximal wind velocities between 100 and 200 knots. Violent weather developments occur frequently in the immediate neighbourhood of the jetstream. The dynamics and structure of the jetstream are not yet well explored.

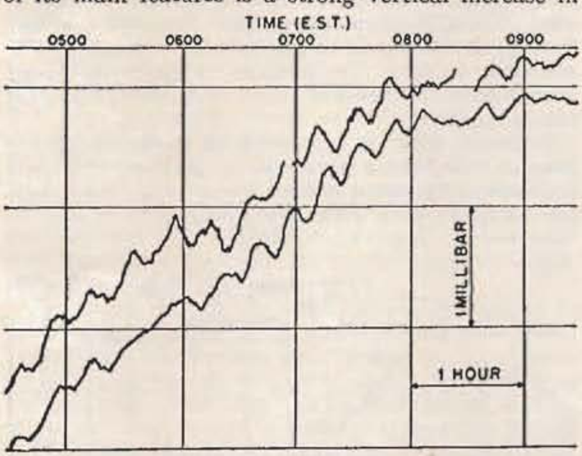


FIG 1.
Microbarograms April 27, 1951
Upper Curve = Watertown, Mass.
Lower Curve = Ipswich, Mass.
Distance Apart = 30 miles.

OBSERVATIONAL EVIDENCE.

The existence of travelling gravitational waves in the jetstream was first suspected when a sailplane flight in the jetstream last year showed similar oscillations in the wind speed as were observed in microbarographic traces taken on the ground under jetstream conditions aloft.

It has been known for a long time that a sensitive barograph shows, almost constantly, atmospheric pressure waves. The amplitude of these oscillations is of the order of 1/10 of a millibar and the period ranges all the way from five minutes to more than one hour. Most frequently observed are periods around ten minutes. However, under certain (rather rare) conditions, one finds a very pronounced type of pressure wave, whose amplitude is three or five times larger than usual and whose period lies generally between twenty and thirty minutes. During the last year the Terrestrial Laboratory of the Air Force Cambridge Research Centre has undertaken an investigation of atmospheric pressure oscillations. Comparison of the microbarograms with synoptic and upper air maps revealed that the described pressure wave is generally connected with a jetstream situation in the high troposphere. As far as we can see now, the existence of the jetstream is necessary (but not a sufficient) condition for the occurrence of these waves. A triangular system of microbarographic stations near Boston will make it possible to determine their wavelengths and propagation speed.

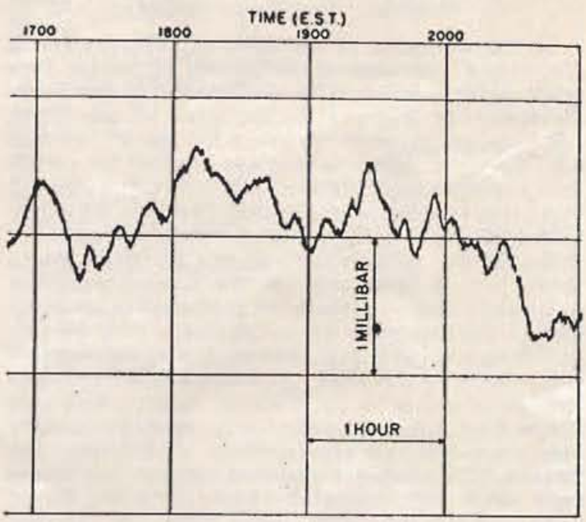


FIG 2
Microbarogram April 12, 1951
Watertown, Mass.

Preliminary results show that, in agreement with visual observations, the pressure waves travel with the jetstream, however with a slower speed. In other words, the waves propagate relative to the jetstream against the wind. The wavelength probably exceeds 20 km.

The period and wavelength indicate that the waves are gravitational in nature, so that oscillations in the vertical as well as in the horizontal component of the wind velocity should be expected. Figures 1 and 2 show examples of this type of microbarographic pressure waves measured near Boston.

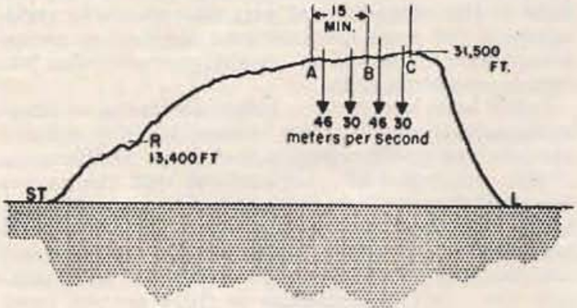


FIG 3

Barogram of Sailplane Flight
2-25-1951 15:30—17:30 *P.S.T.*
J. Kuettner, Bishop, Calif.
Sailplane, ' Pratt-Read,' N63197.

In the afternoon of the 25th of February, 1951, the author encountered oscillations of similar type while flying a sailplane in the leewave of the Sierra Nevada. Fig. 3 shows the barogram of this flight. ' St ' marks the start in tow, ' R ' the release and ' A ' the point when the sailplane hovered for a while over the same spot at about 30,000 feet with zero lift and a true speed of approximately 70 m.p.h. (42 m.p.h. indicated). The airflow was completely laminar at this altitude. After a few minutes the glider began slowly to drift backwards and the forward speed had to be increased. Yet the wind continued to speed up and, at the first arrow on the picture, a true velocity of 110 m.p.h. (65 m.p.h. indicated) was necessary to compensate for the wind. At this speed the sailplane lost altitude due to its increased rate of sink and it was hard not to be pulled into the down draught area where one can lose 10,000 ft. altitude in a few minutes. This difficult situation did not last longer than about eight minutes. Then the wind slowed down continuously until, near point ' B ' on the picture, again a flight speed of 70 m.p.h. (42 m.p.h. indicated) was sufficient. But there was not much time to relax. After ' B ', the whole cycle started over again and at ' C ' the flight had to be terminated because of the late time of day. ' L ' is the landing.

The variation of the vertical wind component is of course over-shadowed by the strong variation in sinking speed of the glider due to the change in flight velocity. Also the varying position with respect to the leewave obscures the time variation of the vertical wind component.

As to the interpretation of this flight, one must recall that the stationary leewave is used here merely as an elevator to lift the glider into the 30,000 foot level. Apparently the oscillations of the wind field travel through the leewave and are measured by the glider pilot while hovering on the standing mountain wave. There he sits like an observer in a chair and watches the windfield from the slope of the leewave. A project of this kind is now being undertaken by Robert Symons. The results are recorded by drift meters and inclinometer and lapse time cameras pointing to the ground and the instrument panel.

The meteorological conditions of this day show that the flight was made at the northern edge of a developing jetstream over southern California. Fig. 4 shows the upper air map about two hours after this flight (0300 world time) at the 30,000 foot level. The solid lines give the windspeed in knots, the dashed lines the height of the 300 mb surfaces (00 = 30,000 ft.). The jetstream analysis was made by our laboratory in Cambridge. The location of the flight (Bishop, Calif.) is marked by a circle. In Fig. 5, twelve hours later, the jetstream has intensified over Arizona with a maximum of over 140 knots. At 40,000 feet a speed of 160 knots was measured.

In connection with a study of the Sierra Wave, the Weather Bureau takes a daily wind measurement with double theodolite at Bishop. Fig. 6 shows the upper winds over Bishop about four hours before the flight. Also the oscillation measured by the sailplane can be seen in this picture. If the wind speed in high levels varies such that after ten minutes the wind in the same level is 50% higher or lower than the one just measured, we have to consider our upper wind data with more reservation. Provided that our flight observation can be generalised, it would appear advisable to draw the isotachs in upper air maps according to the contours rather than after individual wind soundings.

It seems there is no device in existence at the present time which allows us to measure the time variation of the wind in high levels. Since our pibals are always moving vertically, any change of wind is

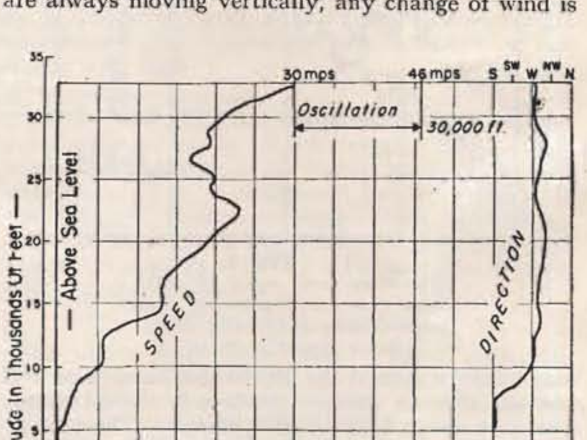


FIG. 6

Winds Aloft (Double Theodolite) at Bishop, Calif.
February 25, 1951—12:40 P.S.T.

interpreted as a change with height rather than a change with time. However, the oscillations of wind velocity with height, as seen on many wind soundings, might be variations of wind with time during the ascent of the balloon. This possibility will affect the interpretation of wind measurements in the forecast of upper winds, especially if the winds are very strong and the upper wind data scarce due to low angles of ascent of the balloon.

It was not difficult to link the observation from the sailplane and from the microbarograms since the periods as well as the upper wind conditions are similar. If the described type of pressure waves is an image of gravitational waves travelling in the jetstream, and if the vertical component of the wave motion is large enough, it should be possible to fly motorless on the jetstream between 20,000 and 40,000 feet over a long distance. Even if the individual waves die out within one hour and if one wave system is 100 miles from the next one, it should be possible to pick them up by a high performance glider, as the range of the sailplane is very large at this altitude. However, until we have gained more quantitative data, the conclusion is speculative that cross-country flights in sailplanes might reach continental dimensions.

The question now arises : Is there a physical base for such a phenomenon and what is the mechanism which produces it ?

PHYSICAL MECHANISM

In the case of the leewaves we know that a permanent pressure disturbance is produced by the mountain ridge and that under all possible waves one wavelength is selected, which propagates with the same speed as the wind but in the opposite direction. For the travelling waves a temporary pressure disturbance or an instantaneous pressure pulse might be sufficient, such as turbulence in a shear zone, frontal convection, etc. Since every pulse can be considered as a super-position of all kinds of waves, our question is : will one wavelength predominate over the others, how will this wave propagate, will it die out or will it grow with time ?

The usual way to approach such a problem is to set up the equations which govern the motion of the atmosphere, to eliminate the different variables with exception of the one in which one is most interested (for sailplane flight, this will be the vertical motion of the air) and to find a differential equation which can be solved under reasonable boundary conditions. Then one tries to interpret this solution from a physical standpoint. However, after having done that, it might be recommendable to report the answer from the other end ; by giving the physical interpretation first it is easier and more interesting to follow the theoretical derivation. We shall try to do that.

Every modern pilot is familiar with the meaning of the word, atmospheric ' stability.' He knows that the stability is determined by the lapse rate, i.e. temperature stratification, and that an unstable atmosphere produces thermal convection, a stable atmosphere either smooth air or wave motions. What he generally does not know is that the lapse rate is only one of several quantities which determine the stability of the atmosphere, although it is the most important one. The other terms which interest us here are dependent on the change of wind with height. We will of course give special attention to those terms when we deal with a jetstream.

If we consider a certain height, and we find that the lapse rate is stable at that elevation but that the windspeed is stronger above and smaller below this level, then this increase of wind with height tends to increase the stability of the atmosphere at the height considered. A decrease of wind with height has a destabilizing effect. However, in general the thermal stability is much more effective than this wind shear term. We neglect it in our consideration.

More important is the curvature of the vertical wind profile or better the rate of change of windshear with height. If a ' positive windshear ' (Positive = wind increasing with height ; negative = wind decreasing with height) is strongly increasing with height (or negative decreasing) it can over-compensate the thermal stability and produce instability. As a consequence convection can develop even in a thermally stable atmosphere. However, we prefer to call that ' turbulence.' On the other hand a decreasing positive windshear (or an increasing negative) might have a strong stabilizing effect. In a typical jetstream profile the curvature changes sign and is of the same order of magnitude as the well known thermal stability. (See Fig. 7).

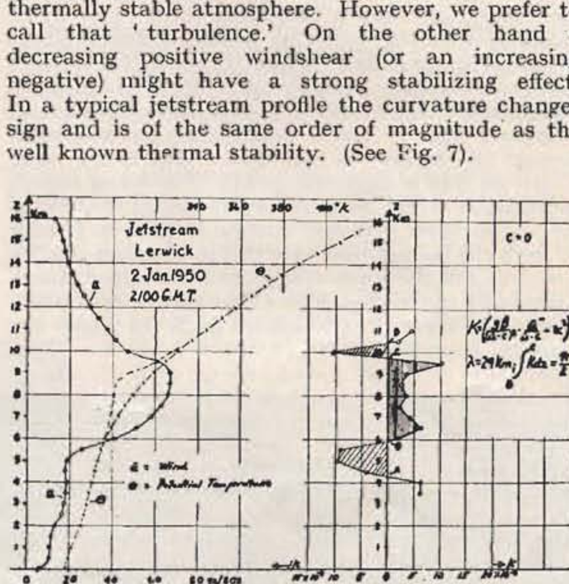


Fig. 7

Structure of jetstream over Lerwick, Jan. 2, 1950, 21:00 world time. Left : wind velocity (circles) and potential temperature (crosses) plotted against altitude. Right : Total stability (K, resp. iK) plotted against altitude for wave velocity $C = 0$.

There is still another effect of the wind on the stability : If we compare two levels with different windspeeds, but with the same lapse rate, we will find that the higher the windspeed the lower the stability, regardless of the windshear terms. Due to this fact and to the large lapse rate in the upper troposphere we find generally a minimum of stability just below the tropopause. However in the jetstream this can be quite different as the curvature of the wind profile cannot be neglected.

As a next step we introduce now a vertical wave motion into the atmosphere which propagates horizontally. It turns out that the stability in a certain level is not the same for different wave length, the general tendency being that the smaller the wave length, the smaller the stability.

Let us consider a wave of a certain horizontal wave length. What happens if a portion of the atmosphere, say a layer between 20,000 and 40,000 feet is stable for this wave length, but is unstable above and beneath this layer ? In a layer with varying stability waves do not propagate only in horizontal direction but also in vertical direction with a vertical speed depending on the varying stability. If a wave created by some disturbance, hits the upper or lower boundary of the stable layer it behaves similarly to a light wave which hits a layer of different density. Dependent on the angle of incidence and the density discontinuity the light is partially or totally reflected. In our case it turns out that the wave is totally reflected at the boundaries, if it arrives there with a certain phase. The wave which is reflected downwards at the upper boundary and the wave which is reflected upwards at the lower boundary combine such that they form a ' standing wave ' (not to be mixed up with the ' standing mountain wave,' which should better be called ' stationary mountain wave '). This wave oscillates between the boundaries and gives the picture of a wave that travels only in horizontal direction, with a speed determined by the total amount of stability in the layer. (For every wave length we find a different speed). The wave cannot penetrate into the unstable layers and is trapped in the stable layer. (Some energy is always leaking through the boundaries). By this mechanism a quick dissipation of the wave energy into the upper atmosphere or by the friction layer at the ground is avoided. The stable layer thus forms a ' duct,' in which the wave is ' bounded.'

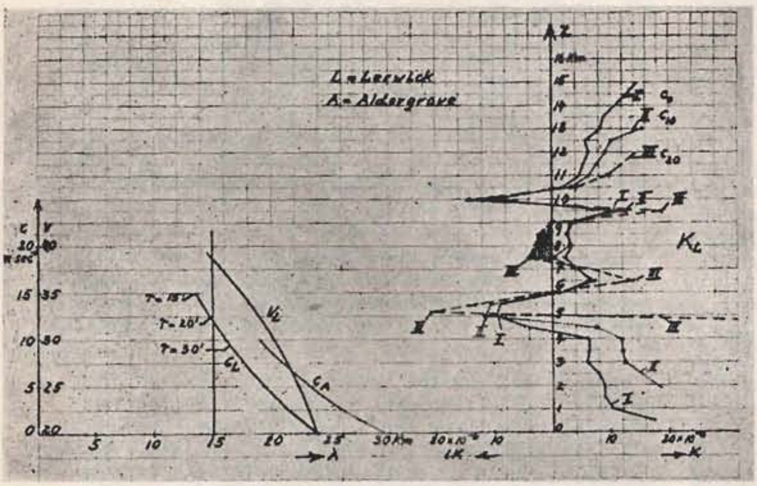


Fig. 8

Wave velocity and stability in a Jetstream. Left : Wave velocity C and group velocity V with respect to ground for Jetstream over Lerwick and over Aldergrove plotted against wave length. Right : Total stability (K, resp. iK) plotted against altitude for wave velocity $C = 0$ (Curve I), $C = 10$ m/sec. (Curve II) and $C = 20$ m/sec. (Curve III) for Jetstream over Lerwick. τ denotes the period of the waves at the ground.

Another problem is how long these waves live, whether they grow or die, whether they are amplified or damped. This portion of the theory deals with the difficult problem of ' dynamic stability ' and is by far more complicated than the first part. It is the true nucleus of the theoretical problem.

Does the jetstream form a ' duct ' in a certain layer of the atmosphere ? The analysis of several jetstream cross sections, which Dr. Riehl and Mr. Newton from the Chicago University were kind enough to loan to the author, gave exactly this result. (Complete cross sections through the jetstream are rather rare). I have already mentioned that one of the characteristic properties of the jetstream is a strong positive windshear zone in the middle troposphere and an even stronger negative shear in the substratosphere. Fig. 7 shows in the left part a cross section through a jetstream over Lerwick. Plotted are the wind velocity $\bar{u}$ and the (potential) temperature θ against altitude. The tropopause is apparently near 9 km (30,000 ft.). One can see the strong curvature of the wind-profile at 5 km and 10 km altitude. On the right side of the picture the stability term (or rather the square root of the total stability) is plotted against altitude. The vertically hatched area is the duct bounded above and below by the diagonally hatched layers. They indicate the unstable layers produced by the two shear zones. The curves vary slightly for different wave lengths, but the position of the duct remains essentially the same.

In the right half of the picture the square root of the stability K is defined. It is composed of the three terms described : (1) the thermal stability (2) the change of windshear with height and (3) the influence of the wavelength.

Note that $\beta = \frac{\theta'}{\theta}$, where the prime denotes differentiation with respect to height and θ = potential temperature, g = gravity, $\bar{u}$ = wind-velocity and c = wavespeed with respect to ground. α is the wave number which is proportional to the reciprocal of the wave length. All three terms are of comparable magnitude. The shape of the duct varies slightly with the wave speed. Fig. 7 shows an example for $c = 0$, and Fig. 8 (right half) 3 examples for wavespeeds $c = 0$ (Curve I), $c = 10$m/sec. (Curve II) and $c = 20$m/sec. (Curve III). At the latter speed the duct splits already into two halves of insufficient size.

The propagation velocity or phase speed of the waves can be calculated by integrating the stability term K over the height of the duct. This integral has to have a certain value, which follows from the phase integral method. Thus every wave length corresponds to a certain propagation speed. (This is our dispersion equation and represents an ' eigenvalue ' problem).

Fig. 8 shows in the left part the relation between wave-length and wavespeed c for 2 different examples of a jetstream in Europe. (L = Lerwick, A = Aldergrove). Also the period τ of the waves is noted in the picture. One sees that it agrees with the range of periods observed in the microbarographic waves and the oscillations encountered in the sailplane. However, since the method used here gives only an approximate solution, no emphasis is put on the numerical result. (V_L denotes the group velocity for Lerwick with respect to the ground).

It seems that the favourable wind-profile is not found in the whole jetstream but only in certain sections, especially near the lateral boundary of the jetstream north and south of the core of a westerly jet. The question arises as to how the air behaves in the unstable layers. If convection starts there, it seems that some kind of a stratospheric ' thermal flight ' should be possible in the upper part of the jetstream. Actually it would not be thermal convection but large scale turbulence. This brings up immediately the question of whether we have here an explanation for the so-called ' clear air turbulence,' which is encountered under jetstream conditions near the tropopause.

Fig. 9 shows what happens if one flies into the unstable layer of the jetstream with a sailplane. On the afternoon of the 19th December, Larry Edgar and the author, in a two-seater glider over the Sierra Nevada ran into an increasing north westerly jetstream of approximately 140 m.p.h. Very strong updraughts carried the sailplane to over 40,000 feet at a temperature of −90°F. Between 34,000 and 39,000 feet severe turbulence was encountered which endangered the structure of the plane. Accelerations up to plus 5 g and minus 2 g were measured. At 36,000 feet the updraught temporarily reached 3,000 ft./min. Fig. 9 shows an evaluation of 6 minutes of film taken of the instrument panel in the glider.

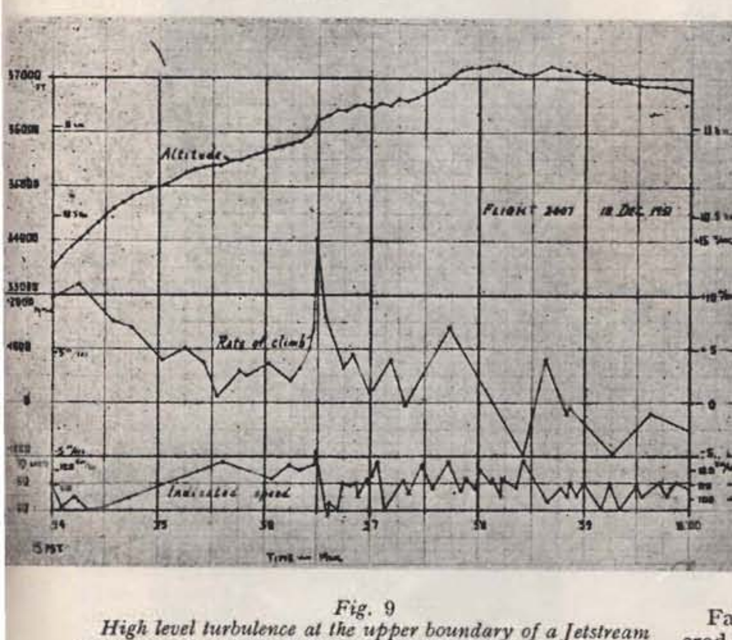


Fig. 9
High level turbulence at the upper boundary of a Jetstream as measured by ' Pratt-Read ' glider (Sierra Wave Project) on Dec. 18, 1951. *Pilot, Larry Edgar; Co-pilot, Joachim Kuettner. Upper curve: altitude vs. time. Middle curve: rate of climb vs. time. Lower curve: indicated speed vs. time. (This was an attempt to fly at constant speed.)*

Fig. 10
Stationary wave cloud with high level turbulence in the Jetstream over 35,000 *ft. on the afternoon of Dec.* 18, 1951. *Taken by Robert Symons looking south from Bishop at the same time the measurements of Fig.* 9 *were being made in the glider. Lower centre shows dark roll cloud; right, Foehn wall over the Sierras.*

During a 1½ minute period the rate of climb at 37,000 ft. changed from 1,400 ft./min. climb to 1,000 ft./min. descent to 800 ft./min. climb and again to 1,000 ft./min. sink. In the final descent the glider had to be flown at almost 90 knots indicated speed, which corresponds to approximately 170 m.p.h. true speed, in order to make progress against the wind in the direction of the airport.

With spoilers full open, a rate of climb of almost 1,000 ft./minute was encountered. This corresponds to a vertical motion of the air of over 4,000 ft. per min. (20 m. per sec.). In the forenoon of this day, the pilots of the Sierra Wave Project, Parker and Robinson, flew the sailplane to over 42,000 feet. Lapse time motion pictures of the high lenticular cloud taken at this time show large wave-like turbulence elements rolling through the standing wave cloud which presents the picture of a wildly surging ocean. See Fig. 10.

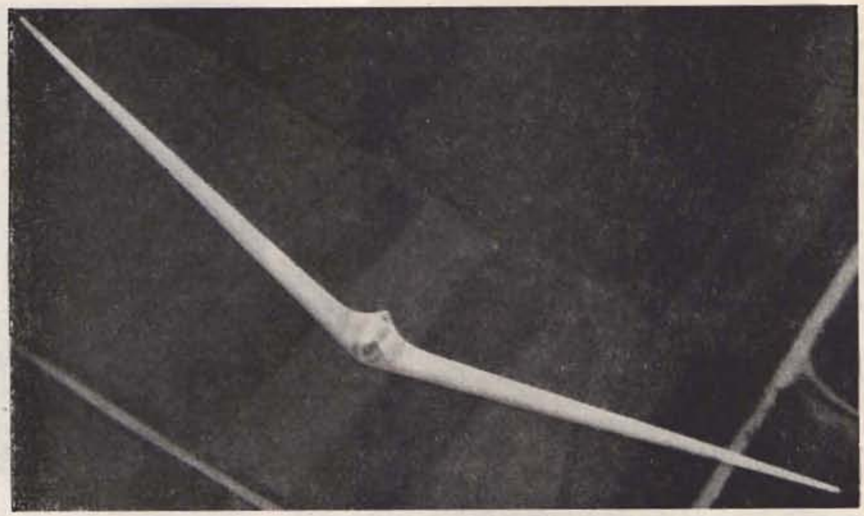
Of course, we have to realise that the combination of a standing mountain wave with a jetstream cannot be generalized. However, the turbulent convection currents near the tropopause exceeded the usual thermal convection in the lower troposphere so strongly that the possibility of flights in the unstable layer of the jetstream must be considered. Whether or not pilot and ship can stand such a strain is another question.

Far more comfortable soaring would be encountered by using the travelling waves in the smooth jetstream duct, provided those waves are of sufficient magnitude. If the right equipment is available, and the problem of navigation can be mastered, motorless flights of more than 1,000 miles appear possible.

From The 'HORTEN IV' To The 'HORTEN VI'

By
Dr. Reimar Horten
(Argentine)

From *Thermik* 1952, No. 3
Translation by
G. S. Neumann.



'Horten VI' in flight near Göttingen; summer 1944.

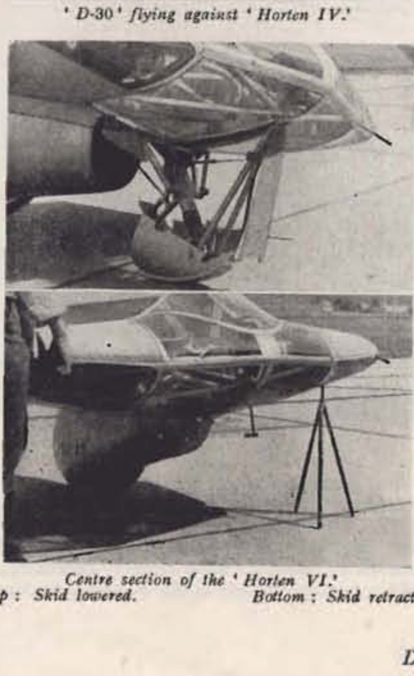
THE prototype of the 'Horten IV' was completed and first flown at Königsberg in summer 1941 (see description in *Flugsport* 1942, No. 4; 1943, Nos. 5 and 6; also *Thermik* 1950, page 143). A gliding angle of 1 in 37 and a minimum sinking speed of 0.50 m./sec. (=1.6 ft./sec.) had been calculated. At that time these values were, and still are, considered to be very good for a high performance sailplane. It was therefore most interesting to see what the flight tests would reveal. Apart from the question of handling characteristics, the main point was to measure the actual performance. It is known to be rather difficult to predict the efficiency of any type of sailplane with accuracy by calculation, and it is no mean task to obtain a speed polar in flight. Moreover, the slightest modification to the completed aircraft may have a great effect on the performance. A most striking example was the testing of the 'Tiny Mite' (see *Thermik* 1951, page 37) the gliding angle of which was brought from 1 in 19.8 to 1 in 26.7 by systematic improvements.

Owing to the war the flight tests on the 'Horten IV' continued till 1945. The most interesting flights are briefly described in the following. For comparison with well-known fuselage planes the 'Horten IV' was flown against the 'Reiher,' 'Weihe,' and 'Condor III' at the gliding site of Trebbin in 1943. For this purpose the sailplanes were flown side-by-side at various speeds, and after a certain time (between 3 and 5 minutes) the resulting altitude difference was estimated. The Horten 'IV' proved greatly superior to the other three designs at any speed. The numerical results of these flights unfortunately got lost. The minimum sinking speeds, which, of course, occur at different airspeeds with each aircraft were also compared. In this respect the 'Horten IV' was again superior to the other three types.

With these flights it was clearly proved for the first time that the tailless principle could be applied with hope of success not only to powered aircraft, and that all predictions declaring the tailless construction altogether unsuitable for a sailplane had been wrong. The flights also showed that the performance of a tailless sailplane could be considerably better that that of the best fuselage planes built in serial production.

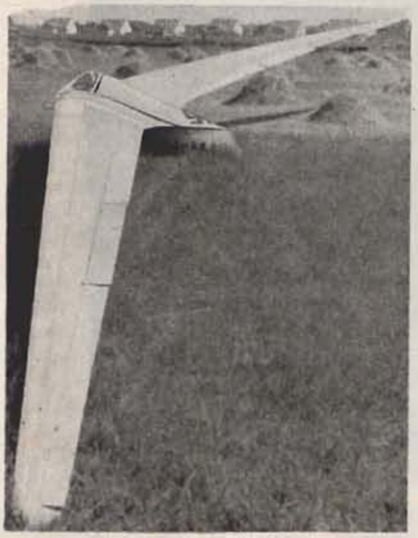
At present the 'D-30' of the Darmstadt Group still seems to be the fuselage plane with the best performance. Its aspect ratio is 33.6, and a best glide of 1 in 37.5 has been measured. It was thought that a comparison with this design would give a

'D-30' flying against 'Horten IV.'



Centre section of the 'Horten VI.'
Top: Skid lowered. Bottom: Skid retracted.

true picture of the merits of the tailless construction. It was also expected that this comparison would produce the speed polar of the 'Horten IV' with great accuracy, since that of the 'D-30' had been most carefully determined. The results of these experiments which were carried out at Darmstadt in 1943 were published in *Mitteilungen Der Flugtechnischen Fachgruppen und Arbeitsgemeinschaften Der D.V.L.*, 1944, No. 1. This publication stated the gliding angle of the 'Horten IV' as 1 in 32, and the minimum sink of both sailplanes was given as 0.55 m./sec. (=1.8 ft./sec.). However, it should be noted that an unfortunate incident caused the 'Horten IV' to do rather badly. The model which was supposed to be used for the comparison tests got damaged before the meeting. The substitute entered had only just been completed and was only conditionally airworthy so that it could not be flown at its best efficiency. Later tests gave a gliding angle of 1 in 34 to 35. This showed once more how useful the tailless principle was for a sailplane. Seeing that a fuselage plane of the most ingenious design with an aspect ratio of 33.6 has a gliding angle of 1 in 37.5, it can certainly be called a great success when almost the same glide is achieved with an aspect ratio of only 21, i.e., less than two-thirds.



'Horten VI,' summer 1944.

However, the performance is not the only factor which determines the value of a sailplane in ordinary use and at competitions. Very often the handling characteristics have to be given first consideration. Unfortunately these properties cannot be expressed in figures as readily as the performance. The utility of a sailplane therefore becomes most apparent on the gliding site where a great number of hours can be flown by various pilots. For this reason efforts were made to get the 'Horten IV' airborne as often as possible. By the end of the war it had been flown for a total of 1,200 hours by about a dozen different pilots. The result may be summarised in Heinz Scheidhauer's words: 'For a future contest I would prefer the 'Horten IV' to any fuselage plane. In performance it is only beaten by the 'D-30' at the outside, and in handling properties it is scarcely excelled by any fuselage plane at all. The blind-flying characteristics are better than those of any other type, and in view of its great strength I am fully confident to take this bird into any cloud. From my experience the 'Horten IV' is the best high performance sailplane which has ever been produced.'

It suggested itself not to stop at the 'Horten IV,' but to improve the performance of this sailplane even further. In principle there are two different ways in which the efficiency can be raised, by increasing the aspect ratio or by reducing the total drag. The second method was employed with the 'Horten IV b,' using laminar flow sections for the whole of the wing (see *Thermik* 1950, page 148). In 1940, however, when the idea of a 'Horten VI' was born, laminar flow sections suitable for sailplanes had not been developed. Therefore only the first method was left, i.e., a radical increase of the aspect ratio. In order to have a convenient basis for a future comparison with the most efficient fuselage plane, the 'D-30', the aspect ratio of this design was chosen, i.e., 33.6. This gave a span of 24.2 metres (=80 ft.). As there was no workshop with experienced metal workers available, wood had to be used for most parts. Only the wing-tips were made of dural and riveted. In 1943 work was started on two models of the 'Horten VI' which were flown at Göttingen in summer, 1944. Comparison flight tests with fuselage planes, especially with the 'D-30,' were planned, but could not be carried out before the end of the war. It was just possible to fly the 'Horten VI' against the 'Horten IV' at Göttingen in March, 1945, when the American forces had already reached

Main spar fitting of the 'Horten VI.'

Kassel. Although there was no time to compute the results of the flights, they showed that the 'Horten VI' was at least as far in advance of the 'Horten IV' as the latter was of the 'Weihe,' 'Reiher,' and 'Condor.' Of course, this does not mean that the 'Horten VI' would stand a better chance in a contest than the 'Horten IV.' The contrary may be the case. A sailplane with such a great span and high wing loading is rather unsuitable for the thermal conditions generally prevailing in Central Europe. The 'Horten VI' was not meant to be a sporting aircraft. It was an instrument of research, in fact, a very expensive one. According to its dimensions it was chiefly designed for wave soaring where penetration is essential. For this purpose oxygen equipment and glove heating were provided.

After the end of the war one of the two completed 'Horten VI' models was burned near Göttingen by members of the occupation forces stationed there. The other one was reported to be at the Northrop works in California.

DESCRIPTION OF THE 'HORTEN VI'

Basically it has the same structure as the 'Horten IV':—The centre section is 5.3 ft. wide, made of steel tubing and covered with plywood. The wooden part of the wing is 27.7 ft. long and covered with fabric; the outer wing is 9.5 ft. long and constructed of dural.

The pilot rests in a prone position in the centre part, with his body in the wing section and his knees and feet inside the fairing of the rear skid (see article 'Prone Flying,' *Thermik* 1951, pp. 5, 16, 29). The front skid is retractable and provided with an oleo-pneumatic shock absorber, the rear skid is faired and has rubber springing.

Four conical pins hold the wooden wing, which is of monospar construction, to the centre section. The spar consists of spruce booms with plastic laminations and three plywood webs and carries the dive-brakes on the top. Two of the three spanwise control surfaces which act as elevators and ailerons at the same time form the trailing edge of the wooden wing.

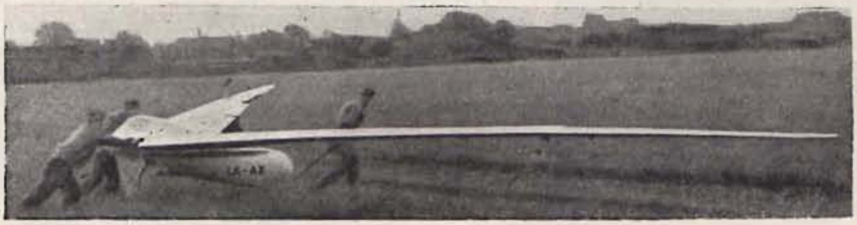
The outer wing is fixed to the wooden part with tongue and box fittings and carries a further control surface as well as the air-brake which replaces the rudder.

Special features: The pilot climbs in from the rear. There is one large panel covering the cockpit which can be released simultaneously with the harness. Only the compass and the turn-and-bank indicator are in a central position; all other instruments are in the leading edge of the wing and can be seen through mirrors. The steerage of the control surfaces is completely internal, exposing no control horns to the airflow, and consists of push

The first and only flights with the 'Horten VI' were carried out just before the end of the war at Göttingen.

rods with ball bearings. There are also automatic joints without detachable parts, adjustable body supports, and elevator trimming.

Data :—	
Span ..	79.4 ft.
Wing area ..	191 sq. ft.
Wing chord at root ..	4.1 ft.
Wing chord at tip ..	8 inches
Sweep back at ¼ chord	16°
Weight empty	715 lb.
Load ..	220 lb.
Wing loading	4.8 lb./sq. ft.
Calculated performance :—	
Minimum sink	1.4 ft./sec.
Sink at 62 m.p.h.	2.64 ft./sec.
Gliding angle	1 in 43



Ground-handling of the 'Horten VI.'

GLIDING IN INDONESIA

By

C. W. A. OYENS, Lieut.-Col. RNAAF,
Member, Neth. Mil. Mission in Indonesia.

IN the young Indonesian Republic there undoubtedly exists a widespread interest in every aspect of aviation. Though there are as yet hardly any organised flying clubs, there is quite a lot of aero-modelling activity, and any plan that might bring aviation nearer to the people is likely to find the support of those who have a 'say' in these matters.

When, late in 1950, the AURI (Indonesian Air-force) decided to establish a training school for technical officers at Andir airfield near Bandung, and the suggestion was made that the cadets—most of whom were totally unfamiliar with aeroplanes—should build a glider as the first part of their practical training, this suggestion was received with approval, or rather with interested anticipation.

It took some time before the necessary materials and tools had been collected but in March, 1951, the first fuselage bulkhead could be glued together in its jig. The choice had been fixed on that good old workhorse among gliders, the 'Grunau Baby,' which is not too difficult to build and yet possesses all the basic constructional features of the average engined aircraft. Another point in favour of the 'Grunau' was that a complete set of drawings of this plane could be secured without great difficulty.

From March, 1951, to the middle of May, 1952, a group of 20 trainees, all of Indonesian nationality, spent 1½ days each week working on this project, and did so with great keenness and enthusiasm. It certainly was not their fault that the estimated building time of one year was exceeded by 1½ months, but some delay was caused by difficulties connected with the supply of essential materials that were not in store at Andir and had to be manufactured expressly for this purpose, such as rubber blocks for support of the skid, special dopes, etc.

On the 19th of May this year the first all-Indonesian glider, after having been christened 'Kampret' (Javanese for 'bat'), made her maiden flight. First test flights were made by auto-tow but soon afterwards the towing car was exchanged for one of the 'Auster Mk. III' aircraft of the AURI. All subsequent launches have been made by aero-tow.

The first demonstration flights, which showed 'Kampret' not only to fly with the same ease as any 'real' aircraft but even to indulge in some mild aerobatics, caused no small excitement among the spectators at the airfield. The general feeling was perhaps best expressed by one aged Indonesian woodworker, who with more skill than faith had helped to assemble the glider, and now remarked: 'This is the first time I really believe she can fly!'

Since then 'Kampret' has totalled over 40 flying hours. The longest flight to date lasted 2 hrs. 42 mins. after release, and included a gain of altitude of 3,100 ft. This flight was commenced in a completely clear sky, in which later some small cumulus developed. The enormous thermals we had half and half expected in this tropical country have not materialised yet—at least not here at Bandung, which is situated on a plateau at 2,200 ft. surrounded by 6,000 ft. mountains, and is often overcast till late in the morning.

Thermal activity definitely seems to be better in the dry season (April-October) than in the wet period, when the hours of sunshine are so much shorter. All in all, the results we have been able to attain so far with only one aircraft are quite encouraging, and one very big asset is that weather conditions not fit for gliding are very rare indeed in this part of the world.

Unfortunately, cross-country flights happen to be somewhat risky at the present time due to the conditions of unrest in the country, so we have to try our hands first at duration and altitude flights. So far, the 'Grunau' has been flown only by a few selected pilots but we hope to start training as soon as three Schweizer '2-22' two-seaters which have been ordered by the AURI in the U.S., have arrived.

Your correspondent believes that building a glider not only provides excellent workshop practice but may serve equally well as an introduction into subjects of a more theoretical nature. Many basic applications of aerodynamic and structural theory can be demonstrated to advantage on a glider or on parts of a glider. In a strength analysis class, for example, we have carried out several strength tests on parts of the 'Grunau.' The accompanying photograph shows a test of the rear part of one of the ribs from the central part of the wing. This part incidentally failed at a triangular load of 120 lbs., which corresponds to a load factor of 7.8 in the 'B'-case (diving at 137 m.p.h.), which is the most severe case for this part. This is 30 per cent better than the factor of 6 required by the British Airworthiness Requirements for this case.

I presume that there are a number of gliding enthusiasts, if not gliding clubs, in Malaya. If so, I would be very much pleased to get in touch with them, so as to exchange views on gliding in tropical countries.

G.C.V. TO HAVE NEW MACHINES FLYING THIS SUMMER.

The fuselage of the Gliding Club of Victoria's new Slingsby 'T.31 B' two-seater is practically complete, and work is progressing with the assembly of the wings.

The club has no training machines flying at present, and a number of trainees are anxiously awaiting test flights so that they may continue their training.

Besides the club-owned 'Grey Grunau' and the privately-owned 'Blue Grunau,' the club hopes to have flying this summer a privately-owned 'Olympia' and a new club 'Grunau Baby II.'

This latter machine was purchased in a semi-completed condition from several of the members who had started it as a private project. The work is being completed by E. Schneider Ltd., of Adelaide.

FÖHNSOARING AT INNSBRUCK

by DR. SIEGFRIED HOHENLEITNER

INNSBRUCK is situated in one of the most favourable alpine areas for Föhn. So far, however, no one really regarded this as a particular advantage of the beautiful town on the banks of the river Inn, as the Föhn causes headaches, fatigue and irritation and allowances are even made for promising students who fail examinations held during a Föhn. If it blows in summer one believes oneself transplanted to the dry desert climate of North Africa, if it blows in winter it spoils the snow for winter sports. In all, no one welcomed this guest from the South until sailplane pilots discovered that there is nothing more marvellous than to soar over the mountains in Föhn.

The South Föhn over the Alps produces a down-current or cascade north of the main ridges of the Alps, which gains appreciable warmth through its descent from 3,500 m. to about 600 m. In order to understand why airstreams descending from the main alpine ridges should produce strong lift at Innsbruck one must examine the geographic position of Innsbruck and the topography of the surrounding mountains. Innsbruck lies in the Inn valley which here is still completely embedded in the mountain ranges and whose main axis lies west/east. The Wipptal originating from the Brennerpass (1,365 m.) about 40 km. to the South joins the widened Inn valley at Innsbruck from the South. The Föhn flows in a broad stream through this indentation in the main alpine ridge and down the furrow of the Wipptal into the Inn valley. As well as this, the Föhn overflows the Stubaier and Zillertaler Alps reaching up to 3,500 m. lying West and East of the Brenner pass.

East of the confluence of the rivers Wipp and Inn there are the mountain ranges of the Patscherkofel (2,300 m.) and Glugenzer (2,679 m.)—both well-known skiing places—over which again the Föhn descends abruptly into the Inn valley. To demonstrate the strength of the down-current, constant height pilot balloons were started from the Patscherkofel during a Föhn. The wind carried them down the North slope as far as Igls (about 900 m.) where they almost touched the ground. All these strong airstreams now meet a formidable new mountain obstacle, the Innsbrucker Nordkette, rising sheer from the Inn valley : this is part of the Karwendel range and follows the river valley for about 15 km. The Nordkette is over 2,500 m. high and shows no indentation lower than 2,100 m. A small proportion of the descending airstream will, admittedly, be diverted to the West into the Upper Inn valley and to the East into the Lower Inn valley. But that only applies to the lower layers. The main stream will ascend on the Nordkette, making it an ideal slope for soaring, being approximately 1,800-2,000 m. high and 15 km. long. Besides, as a rule the speed of the surface wind is approximately 60-80 km. per hour and that of the upper wind 80-100 km. per hour. The lift which forms along the slope is therefore not confined to a narrow space near the slope but covers a depth of several kilometres. Often it seems as if the whole air mass over the entire width of the valley were rising. Experience has shown that the lift extends to a height of about 500 m. beyond the top of the mountains, that is 2,000 m. above the starting point. On the other hand the strong wind and the enormous extent of the whole air stream cause severe turbulence. So flying in a Föhn is not just a steady gliding up and down on a slope but a constant struggle with the turbulent air. Lift of more than 5 m./s., is just as frequent as sink of a similar strength, whereby the changes are quite sudden and unexpected. One therefore naturally does not fly too close to the slope. Experience has shown that severe sink frequently occurs very close to the slope. The irregularity of a Fohn current makes it impossible to give advice as to where the best lift can be found. It may happen that one found very good lift in a certain place, but when one comes back to the same place a few minutes later, that the variometer shows maximum sink.

But usually the lift is so strong that it takes longer to get down than to get up, because the aircraft, with dive brakes fully opened and going at top speed, simply will not sink. A pupil, who was flying for the first time in a Föhn in his excitement never noticed that while being winch launched the dive brakes of his 'Grunau Baby' had accidentally become fully opened, and happily continued soaring up to a height of 2,000 m., with his dive brakes still fully opened.

As the turbulence is particularly strong near the surface, a winch launch puts a great strain on the cable, the sailplane, and the pilot, as well as demanding great skill from the winch driver. The airfield at Innsbruck Kranebitten provides only one direction for take-off, in line with the Inn valley, which is east/west. A winch launch in a South wind would be impossible. But, as already mentioned above, the lower layers of the Föhn are diverted into the direction of the valley. So one can still launch approximately into wind. With increasing height, though, the veering of the wind to South is very noticeable. One must therefore drop a wing during the launch in order to counteract excessive wind drift. From the top of the launch it is very easy to reach the area of lift. The point of release is about 1½ km. from the slope but lift begins already between ½ and 1 km. from the slope itself.

It is almost impossible to do justice to the beauty of soaring in the Alps. Far below us the town of Innsbruck, up and down the river the eye follows the green valley of the Inn, which is spotted with friendly villages and small towns, to our sides the wooded mountain slopes are left behind, we soon reach the tree line, dark green dwarf pines cover the slopes, a hut or a lonely chalet stands on a green pasture, then we look down on desolate screes, steep crags and beyond the Nordkette the rocky peaks of the Karwendel become visible; while to the South the glaciers of the Stubaier Alps glisten between the ragged clouds of the Föhn cascade. We will however have to go higher up till we reach calmer air before we can enjoy the pleasures of this view; otherwise one of the strong gusts will interrupt us suddenly in our contemplation. Quite suddenly an ominous silence descends upon the sailplane, the stick feels so loose as if it had lost all connection with the elevators and the sailplane drops with such speed that all unsecured objects float upwards. But that does not last long, even though the altimeter did unwind. Suddenly the roaring noise is back again, the speedometer indicates 100 and 120 km. per hour and the storm is shaking the wings in a way that makes us involuntarily check the straps of our parachute. But that passes, too, and the main thing is: the variometer again indicates maximum lift. The landing again requires great care as the turbulent eddies increase in frequency near the ground.

Although the flying in a lift near the slope is thus a singular experience for a pilot, it does by no means exhaust the possibilities of the Föhn for soaring at Innsbruck. When a glider pilot talks about a Föhn he is mainly thinking of the High Föhn Wave, which was first discovered in the Riesengebirge, but which occurs in the Alps just the same. In it a sailplane reached over 11,000 m. behind the Grossglockner and occasionally a similar Wave can be observed in the Inn valley near Innsbruck. It is recognisable by a long bank of clouds, stretching from the East to the West over the Inn valley; its windward edge lies approximately over the southern half of the valley. This 'Inn Wave,' which stretches between Innsbruck and Schwaz over a length of 30-40 km., is probably caused by the mountains immediately South of the Inn valley. Its height is between 4,000 and 6,000 m., and must not be mistaken for the Great Föhn Wave, which sometimes extends over the whole length of the eastern Alps and also reaches up to greater heights. The interesting part from a soaring point of view is that one can get into this wave from a winch launch without the more expensive aero-tow. Using the slope lift of the Nordkette and flying southward it is possible to reach the windward side of the lenticular cloud.

In November, 1943, from a bunji launch in about 950 m. at the foot of the Nordkette I reached a height of about 2,400 m. AMSL in a slope lift of the Nordkette; from there I flew to the south to a point below the windward edge of the lenticular cloud and going to and fro between Innsbruck and Schwaz, I gained a height of 4,764 m. Then I got inside the cloud and had to break off the flight because of heavy icing in the ventuary of the ASI and rate of turn indicator. During a strong Föhn this year I watched from a peak in the Northern Karwendel a whole series of 6 smaller lenticular clouds stretching from the Inn valley towards the North.

It does not seem impossible to make one's way to the higher layers by means of this 'lower' Inn Wave. Thus one could get to a very great height from a relatively low starting point which from a winch launch would be at about 900 m. AMSL. Also the fact that the cost is so much smaller for a winch launch than for an aero-tow will facilitate such attempts. Not only flights to great heights but also over long distances along the Alps would thus be made possible. A task which so far has not yet been undertaken would, among others, be a flight to the North into Bavaria. Quite a lot of meteorological problems can be solved by sailplane pilots in liaison with meteorologists. For the origin of the Inn Wave has by no means been explained. It does not appear every time and often it lasts only a few hours, even while the Föhn is still blowing with undiminished strength. The atmospheric conditions for its formation and dissolution are still to be examined, where no doubt sailplane pilots will prove very useful.

In this line there lie new and worthwhile tasks for Austrian glider pilots.

TO THE EARTH BOUND.

Oh now my heart bleeds for you,
All you folks who've never flown.
Never called the sky your own,
Never seen, to wonder at
Sunset from above the clouds.
Nor soared above the gaping crowds
Of earth-bound men—
And laughed out loud.

Though on the ground, *you're* masters,
And I'm a foolish clown
You move in two dimensions,
You stamp and rave and frown
(And most of you would sell
A brother's life for half-a-crown.)
But up above your murkiness,
Your bolts and bars,
Your grime and din
I cavort with the clouds—and grin
To think of you below.
And sliding down a path of blue,
Oh earth-bound, how I pity you.

Anthony Wood.

INTRUDER.

I watch, as from a rocky height,
You slip, fine-etched against the light
Of setting sun; above all things
The graceful power of your wings
Outstretched. So smooth and slow,
Along the wind's high track you go.
Unconscious, in your silent flight
Of how you give me such delight.
Nor do you care
O Lord and Master of the air.

How many of your kind I've slain,
Crashing through your sky domain?
With stench of petrol, fumes and oil,
Controlling wings by aerofoil.
My faith in engines, flaps and wheels,
Gauges, dials, alloys, steels.
Forgive me, Seagull, when I fly
A foul intruder in your sky.

Anthony Wood.

'GRUNAU' PREPARES FOR HIGH ALTITUDE FLYING

The latest issue of *Glidabout*, journal of the Gliding Club of Western Australia, reports that pressure type oxygen equipment (a brain child of 'Anderson and Baird') is now being fitted to a 'Grunau Baby' sailplane which is owned by a syndicate of club members. Installation should be complete shortly.

Len Anderson, a member of the syndicate is also constructing a new barograph with a 0-30,000 ft. range.

It is expected to be completed by Xmas. Len's earlier barograph, after two years' service in the 'Grunau', is now owned by Neville Wynne.

The Gliding Club of W.A. has commenced construction of a hangar at Caversham. It will be large enough to hold two fully rigged gliders and a number of derigged machines. Provision has been made for extensions to enable six fully-rigged sailplanes to be housed.

During the first six months of this year the club flew 86 hrs. 20 mins., from 1,047 auto-tow, and 109 aero-tow launches made on 75 flying days.

Aircraft flown were the 'Laister Kauffman,' 'Kestrel,' 'Grunau Baby,' two 'H 17's,' a nacelled 'primary' and two open 'primaries.'

Tasmanian Club's Work Assures Members of Good Facilities

During the winter, the members of the Gliding and Soaring Club of Tasmania have been clearing tons of stones from their airfield at Tea Tree, near Hobart.

Two runways have been sufficiently cleared for safe operation, and a third will be commenced next winter.

Four large roof trusses were bought recently and all members are getting ready for the erection of the hangar.

Tentative arrangements have been made for the purchase of an Austin tractor for conversion into a semi-mobile winch operating on kerosene. The most noticeable feature being the heavy duty power take-off, on which can be fitted a drum up to 22 inch diameter.

For retrieving the wire the integral gear brake can be used for preventing over-run just by pressing the clutch pedal right in to the limit.

The minimum amount of conversion work plus the fact that arrangements were made for purchase by deposit and the balance within twelve months, makes this a good proposition.

Ample spares are included in the purchase price.

Additional supplies of hard steel wire which have been on order for a year arrived recently, and the winch should be ready for test within 4 to 6 weeks.

The hangar construction and cost will impose a heavy strain on the club's resources, but it is an essential item and is in keeping with the club policy of having good equipment and facilities, so that once flying commences few hold-ups will be encountered from inefficiency or lack of equipment.

—'*Australian Gliding*.'

AERO-TOWS FOR AB-INITIOS?

THE very idea would have been thought Utopian a few years ago, but to-day the question of the introduction of aero-towing as a standard means of launching dual training two-seaters merits serious consideration.

Such a scheme offers brighter prospects for so many aspects of gliding :—More efficient instruction which would be not so long-drawn-out in the elementary stage ; a real reduction in the number of winch-launches required up to 'C' standard, with fewer and less expensive approach and landing accidents ; a diminution of the present-day pressure on that unfortunate, the instructor ; more trainees reaching the soaring stage.

'Say no more,' sighs the sage, 'it's like that legendary advice to a breadless, starving populace : 'eat cake.''

But on considering the present ratio : Time Actually Spent in the Air/Current Cost of Getting There, aero-towing may prove to be relatively inexpensive.

The first phase of instruction would be to tow to 2-3,000 ft., according to conditions, from which heights glides of approximately 10-15 minutes' duration should be obtained. The number of such glides being determined by the individual pupil's aptitude in learning the elementary manoeuvres, including recovery from stalls and incipient spins, and practice in steep turns and continuous circling. The instructor, obviously, would handle take-offs, and landings. The next stage would be a number of winch circuits for winch-launch and landing tuition. Thereafter, on transferring to a single-seat trainer, would follow 'A', 'B', and, shortly, 'C' tests. Up to 'C' could be regarded as the primary stage of instruction, and tuition given as required to Silver 'C' standard.

COSTS COMPARED.

Now massive objections roll up—like cu-nims—that the solo training system has worked well for many years, and that lately the winch-launched dual training system has been better still, and that cheaper forms of instruction cannot be conceived. Well, after several years, recently in what one might call the peripheral field of gliding, I have come to the conclusion that, although the clubs do strive to provide the simplest and most economical training gliders and the cheapest possible *individual* training launches, yet merely to try to amass as many launches as possible—whether slides, hops or circuits—in order to learn to glide, is not necessarily the cheapest and is certainly not the most efficient way of learning. It may be the cheapest way for the pupil who can give every week-end and perhaps even some week-days for a number of months. But it is not cheapest for others whose commitments prevent them sooner or later from giving all their spare time to gliding activities. In fact, from experience I think that one of the main reasons for people giving up is that eventually they find that gliding instruction becomes fantastically expensive. This is the crux of the matter. Over a period, not counting such items as accommodation and meals, etc., on instructional courses, one can easily find that the time actually spent in the air has cost over £1 *per minute*.

Thus aero-towed dual training would be so much cheaper than the existing systems. Without specialised knowledge, of course, one cannot estimate at all accurately the cost of towing, and the idea raises many problems. We know that in experiments in Australia a Tiger Moth has been able to tow off a two-seater sailplane and to climb at 300 ft. per minute. In this crowded country, however, one feels that a higher performance would be necessary; perhaps a minimum of 500 ft. per min. It is interesting to note the experience of the Surrey Club, who recorded in their *Year Book*, 1947-8, that with good team-work, five gliders could be towed to 2,000 ft. by a Cirrus Auster in an hour. Presumably the gliders were high-performance single-seaters.

Suppose, for example, that there is available a tug equal to the task of elevating a 'T.21' two-seater thrice within the hour to the same altitude, or even higher. Making a guess that Club Treasurers would require a combined revenue for the two craft of £5 per hour, the cost per training flight would be 33*s*. 4*d*. Before dismissing this as hopeless, consider for a moment a pupil trained on the solo system. An average trainee may have, say, 18 varied launches, before making a first solo circuit. If he is in motion for one minute and an half per launch, his total experience is only 27 minutes, of which not more than five minutes are actually spent in the air, at the most generous estimate. A further ten circuits may then take him through the 'B' tests, but would not add much more than as many minutes to his flying experience!

It therefore seems a fair surmise that even as few as ten or twelve glides, each of only ten minutes from release of tow, would give a pupil a total of airborne experience which, although minute compared to the requirements of powered flying training, would be so much greater than that of our 'B' stage solo trainee.

OTHER DIRECT ADVANTAGES.

The B.G.A.'s Operational Regulation requiring instruction in stalls and incipient spins could be adequately put into effect. Under the solo system the novice obviously cannot be certain he has a safe flying speed because he has perhaps never experienced a stall and is, of course, urged to avoid one. But just hearing that this mysterious phenomenon can be unhealthy near the ground doesn't add to his confidence or competence.

For almost the first time in gliding history that usually overburdened, harassed and frequently frustrated person, the instructor, would have sufficient 'sky-room' in which to instruct. The organising of other training systems largely prevent him from teaching, except at isolated and infrequent moments.

Up to 'C' standard the number of winch-launches might be reduced by 50 per cent, and the energy otherwise wasted in this direction could be put to more profitable use. The reduction in the number of landings should help to reduce the incidence and cost of approach and landing accidents. The work of the Accidents Analysis Panel of the B.G.A. indicates the large number and heavy expense of such accidents in relation to the annual total.

A larger percentage of clubs' intake of *ab initio* members would get to the soaring stage as instruction to this point would cover a shorter period of time.

SOME SNAGS.

Some clubs have no two-seaters, many sites are unsuitable for aero-towing and few clubs could provide a tug. A joint training scheme between two or more clubs may be a possibility here.

The pundits are bound to say that there isn't a really suitable type of towing aircraft available. This may be so, as one visualises the ideal tug being able to tow relatively slowly with safety and yet have an acceptable rate of climb. It would also be desirable to have a light twin-engined machine with sufficient excess power to be able to gain height on one engine with a two-seater sailplane on tow.

J.R.C.W.

HOME COMMAND GLIDING STANDARDS
A.T.C. AND C.C.F./R.A.F.

Basic Gliding Standard.

Requirements as for B.G.A. 'A' certificate.

Proficiency Gliding Standard.

The cadet is to carry out a total of not less than 25 glider launches, three of which are to be solo circuit flights, one in the opposite direction to the other two flights, and each to be of not less than two minutes duration, followed by a normal landing, touching down and coming to rest within a predetermined level and marked area of 200 yards by 50 yards.

Advanced Gliding Standard.

Following a launch to a height not exceeding 1,500 feet, the cadet is to carry out a solo soaring flight of not less than 15 minutes duration followed by a normal landing, touching down and coming to rest within a predetermined level and marked area of 200 yards by 50 yards.

Notes.

1. It will be seen that any cadet reaching the Proficiency or Advanced Gliding Standard will qualify automatically for the award of the B.G.A. 'B' or 'C' certificate, provided the flights have been observed by a B.G.A. official observer.

2. Cadets who obtain B.G.A. badges may wear them on their uniform.

V.M.F.G. ORDERS SLINGSBY 'T-31 B' TWO-SEATER

THE Victorian Motorless Flight Group has placed an order with Slingsby Sailplanes, in England, for a 'T-31 B' two-seater training sailplane, in kit form.

The machine is now on the water en route to Australia and is expected to arrive in Melbourne this month.

At least five Australian gliding clubs have fitted, or are now fitting, two-way radios to their sailplanes, for local control, and to aid retrieving.

GLIDING IS TOO COSTLY

By Fred Hoinville

GLIDING is too costly! *And*, too complex. To keep the sport alive, we need (yes again), smaller and much cheaper gliders, but we also need simpler and cheaper methods of launching, especially for small clubs.

For large clubs employing ground staff, the winch may be satisfactory, but has grave faults of complexity, immobility, great length of cable required, large handling staff, inaccessibility, heavy cable wear, low launches due to weight of cable, and need for auxiliary vehicles.

Aero-tow is lovely, if you can get it and afford it. Few can outside the fortunate U.S.A.

Auto-tow has the disadvantages of needing a good driveway and much dragging wear and tear on the cable.

I suggest an entirely new approach, combining the best, cheapest and simplest features of winch and auto, where a good driveway is available. My intention is to dispense with the winch and its costly 6,000 feet of scarce cable, retrieving car and large crew, by using just one powerful car, with a cheap, lightweight winding drum mounted on a frame at the rear, clear of the trailer tow hitch. The drum would be fitted with a self-starter motor and at the end of the launch, the driver would operate a switch, the drum would revolve and the cable—only 2,000 feet or so—would be wound in while falling.

The car would then be driven back to the take-off point, the cable connected to the glider and the car would drive off, paying out the cable as it went.

There would be no cable/dragging, less wear and tear. Only one third as much cable would be needed.

Only one piece of equipment would be needed—the car with drum attached, instead of winch and car.

The whole club would always be mobile at a moment's notice and could make visits away from base with ease.

When retrieving on a cross-country, the launching gear would always be taken along and the glider could sometimes be launched instead of dismantled.

Only a very small crew would be needed. Pilot, car driver and wing-tip man—and the latter is not always needed.

Members of the club would not be left stranded at the winch waiting for something to happen.

The equipment would be easy to maintain because it could be taken home, not left at the airfield.

Higher launches would be obtained, due to greater efficiency and less weight of cable.

Less time should be wasted between launches, allowing more launches per day.

The car would be used for transport of club members from the city to the airfield, as well as launching and retrieving.

The cost of car plus drum would be less than winch and car. Cost of cable much less.

The cost per launch should be much less in cash and man hours of maintenance and crew operation.

FOR BEGINNERS

Keep the Ball in the Middle by 'Killjoy'

THERE is one crank in the Club who insists that accuracy in flying is an essential in any pilot. On being interviewed, he imparted the following information on the use of the Ball Type, Slip/Skid Indicator.

If the Ball is not sitting dead centre between the two vertical wires on the instrument, the aircraft is moving sideways (slipping or skidding).

The Ball moves laterally in the same direction as the aircraft.

When turning, if the Ball moves to the outside of the turn, the machine is skidding out. If it moves to the inside of the turn, the machine is slipping in.

Suppose you are making a medium turn and turning at the rate at which you desire, but find yourself slipping in. Since you are turning at the desired rate, the angle of bank is correct—leave it alone. You are slipping in, therefore you have not applied enough rudder. Hold the angle of bank constant and apply more rudder until the Ball is back between the wires. If you are skidding out, all the above conditions hold, but too much rudder has been applied. Therefore keeping the angle of bank constant, take off rudder until the Ball is once more between the wires.

Steep turns are an entirely different matter. After passing 45 degrees of bank an increase in the rate of turn necessitates a large increase in Lift, which must be supplied by backward pressure on the stick, while the rudder ceases to play a part in 'turning' the aircraft. After settling in a steep turn, if you are slipping in, 'bottom rudder' will NOT stop the slip, it will only turn the nose toward the lower wingtip, bring it below the horizon and cause an increase in speed. To stop the slip, MORE BACK PRESSURE on the stick is required, provided that the angle of bank is correct and the nose in the correct position on the horizon. If you are skidding, you have applied too much back pressure for the angle of bank and particular rate of turn. Relax some of the back pressure and the Ball will slide down between the wires again.

How to keep the nose in the correct position relative to the horizon and the angle of bank steady? That's a subject for a further interview.

'AIRFLOW.'

AUSTRALIA

THREE MONTHS' STAY ON AERO-TOWING BAN

G.F.A. secretary Waghorn has announced that the Dept. of Civil Aviation has relaxed its recent blanket ban on aero-towing.

D.C.A. has instructed its Regional staff to give approval for three months to towing installations now in use, provided the installation is safe.

The Department of Civil Aviation placed a temporary ban on aero-towing in Australia, pending approval of the design of tow releases fitted to tug aircraft.

G.F.A. secretary Merv. Waghorn, protested to the Dept. about placing the ban without first consulting or seeking advice from the G.F.A.

He pointed out that the move will severely reduce the flying of several gliding clubs, and will inconvenience others.

He asked D.C.A. for interim approval of existing releases, and in the meantime he is co-operating with Martin Warner, of the G.F.A. technical committee, in a hurried preparation of the necessary drawings and technical data required.—*Australian Gliding.*

CANADA

BUCKINGHAM GLIDING CLUB.

Since last reporting B.G.C. has spent a very busy summer in the air. We have put in some 70 hours for about 300 flights in the '119' and '222.' The '1-19' is still a '1-19' and not a '1-10'—Al Pow's trip to Spain having retarded the conversion work.

We had good representation at the St. Eugene Meet—Brother Hormisdas, Guy Joyce and Lionel Chalifoux staying the whole week and Don and Marjorie Mellisship managing to get in for the two week-ends. The '2-22' proved to be popular again with S.A.C. members, some nice flights being made in it.

Our 2nd Annual Air Show has just been held and turned out to be as successful as last year's. It has provided the wherewithal for us to look around for a third glider—a new '1-19' we hope.

Training has gone forward this year as never before. Six pupils have soloed and four more are ready for solo, three 'C's' have been obtained.

DON MELLISHIP.

TORONTO GLIDING CLUB
Toronto

Apparently the air around Toronto has been perc-o-lating quite pleasantly since June. While so many of us were struggling to find invisible sky hooks at St. Eugene—two self-confessed paupers remained airborne for 6 hrs. 16 mins. aboard the 'L-K' in the vicinity of Buttonville. These 'holidays at home' types were Paul Tingskau and Art Currie.

We are very glad to welcome back the owner of that pink thumb that so many of us saw at St. Eugene—hovering about in the corner of the coloured movie pictures of the International Meet and other Spanish activities—Frank Brame.

It seems best to list the outstanding flights of the present period, so that knowledge of general conditions may be noted. These flights seem to feature Paul Tingskau repeatedly, who has been in action on every flying day this season.

July 27 : ' Loudon,' Paul Tingskou, 5 hrs. 18 mins. Local flying, cloudbase 6,000 ft. Release 1,500 ft., max. alt. 7,950 ft. Take-off 13.27 hrs. Landing 18.45 hrs.

August 3 : ' L-K,' Paul Tingskou/Art Currie, 6 hrs. 16 mins. Take-off 1100 hrs. Landing 17.16 hrs. Cloud 5/10 Cu. Base 5,600 ft. Release 1,600 ft. Low spots : 700 ft. at end of 1st hr., 1,000 ft. at end of 4th hr.

Points to learn—(*a*) Personal comfort needs attention (*b*) Take out Canadian Citizenship before setting records (Paul salutes his Danish compatriot in Vancouver—George Rasmussen).

September 13 : Don Pounder. Take off 16.45 hrs. Landed 17.45 hrs. Silver ' C ' height, 6,600 ft.

September 21 : ' Loudon,' Paul Tingskou. Declared Goal-and-Return—Kitchener. Take-off 12.30 hrs. Clear air and small Cu, wind N.W. 10. Reached Acton (halfway to Kitchener) after 4 hrs—at 3,000 ft. Returned to Buttonville in 1½ hrs. Landed after being airborne for 5 hrs. Remarks : Prefers auto road maps for navigation!

September 28 : ' Loudon,' Paul Tingskou. Declared goal : Kingston. Take-off 12.30 hrs. Wind W.N.W. 15, Cu base 3,500 ft. Reached Oshawa 13.15 hrs., where rain commenced—lift at 2 ft./sec. in rain. Cloud closed in from 7/10 to 9/10 with continuous heavy rain. Flight proceeded with climbs of 1,000 ft. linked by straight glides beneath cloud base of 15 mins. duration. To avoid entering cloud 75 m.p.h. was maintained at zero lift—and 60 m.p.h. was maintained at zero lift with spoilers open. Away from cloud base air was stable. Straight glide from 2,300 ft.—landed some 9 miles east of Belleville at 15.20 hrs. Remarks : Lift too strong beneath Cu Nim cloud. Throughout flight no lift found away from cloud base. Cloud maintained good form until 19.00 hrs. Maybe an extra few minutes circling would have done it. (or really done it a la Cu Nim!)

JOHN SEDDON.

THE FOUR SOARING CLUB, INC.
Hamilton

We of the above are enjoying an enforced period of relaxing, our tow plane has been sold away. We now have the hook on another and are re-working it for C. of A.

Good news is that we are likely to be joined by a Schweizer ' 2-22 ' (with little time on it), a deal is being negotiated by the local cadet wing plus members of the R.C.A.F.V.R. We also have another nucleus of private persons, two from Europe with ' C's ' and sailplane building experience, who wish to complete a ' D.H. Sparrow '—so who knows, 3 gliders next spring.

JOHN WYATT.

SOARING CLUB OF B.C.
Vancouver

Boys did very well in combined U.S.-Canadian Meet at Wenatchee, Washington, on Labour Day week-end. Ralph Coates made a 2 hr. 40 min. flight in the ' L-K ' and Robbie Droz with Bob Buhlert made a 2 hr. 30 min. flight in the ' TG.3 A.' A banquet was held in the local hotel, and was much enjoyed. Pete Bowers and Joe Robertson of the Seattle group acted as hosts, and some eight gliders took part. On Sunday afternoon all eight machines were in the air at once, soaring in powerful currents, six machines going on up in one thermal to heights over 9,000 ft.

The ' TG-3 A ' owned by Peter Van Goen and Bob Buhlert suffered a bad prang at Arlington only a week before this meet, and was repaired in this week—considered a record by all who saw the extensive damage (the machine was set down by Pete in a farmer's field, and hit successively a fence, a tractor and a hay wagon).

Barrie Jeffery has arrived in Vancouver, and plans on making his home here, pending location of a permanent job. He is meanwhile working, on a temporary appointment, as an Instructor in physics at the University of B.C.

Pete van Groen's reputation as a fast expediter of aircraft repairs has spread over the State of Washington, and Pete Bowers recently brought up the ' Baby Bowlus ' to Vancouver, and Pete will tackle rebuilding the broken wing. This is an N.C. machine, with a number of modifications requiring incorporation before it can be licensed and flown.

Bert Hawkey of Creston B.C. was a recent visitor to Vancouver, and was strongly urged to do something about the Schweizer ' 1-19 ' he has not quite completed, which has been stored in a local shop there for some three years. If he does not form a new club, the Vancouver boys have urged him to turn the machine over to them, and they will complete the work, license the ship, and sell it for him.

New members are : George Rasmussen, and Viggs Larsen, formerly of Denmark. FRANK DASHWOOD.

MONTREAL SOARING COUNCIL

Considerable numbers of dignitaries were present at the formal presentation of the Schweizer ' 1-23 ' by the Canadair Recreation Assoc. to the Canadair Soaring Club, on Sept. 27. The sailplane was handed over by Maurice Benoit, president of the Recreation Association, to John D. Agnew, president of the Soaring Club, and was towed to 3,000 ft. with Stefan Brochocki, of Canadair's engineering staff, in the cockpit. After release Stefan gave a spectacular flying exhibition including loops and spins, amazing some of the visitors. The tow was made by Jack Scholefield of the Laurentide Flying Club, using a ' Cessna 170.'

Attending the ceremony were J. L. Blondeau, Dist. Supt. of Air Regulations ; Alan McNaughton, local Member of Parliament ; Mr. Grant, Director of Aircraft Production ; G. Notman, president of Canadair ; J. Neale, vice-president of Canadair and honorary president of the Canadair Soaring Club.

On Saturday, Sept. 27, John Agnew, Bob Miller and Russ Lightbody went to Ottawa and concluded negotiations to take over the entire administration of the St. Eugene Airport for a period of five years.

Soaring clubs which have not been able to lay hands on a ' Tiger Moth ' for towing will be interested to learn that a ' Piper Cub ' has been put to continued use by the Montreal Soaring Council in late weeks for towing the ' Mu,' the ' 1-23,' and the ' 1-19.' It has worked out quite well if the air is not too rough, requiring about 10 min. to reach 1,500 feet.

VERN POPE.

Extracts from " Free Flight "

ROYAL AERO CLUB CERTIFICATES

(Issued under delegation by the B.G.A.) OCTOBER, 1952

CERTIFICATES 'A'	..	138 (15578-15715)
'B'	..	139
'C'	..	32
Silver 'C'		1
Gold 'C'		—

'B' CERTIFICATES

No.	Name.	A.T.C. School or Gliding Club.	Date taken
9407	S. L. Bunting	No. 203 G.S.	20. 9.52
10846	D. W. Braham	Wahn G.C.	5.10.52
10959	J. C. Dinsdale	No. 23 G.S.	30. 6.51
11613	N. R. Phelps	No. 68 G.S.	28. 9.52
12532	M. J. Dines	Cranwell Coll. G.C.	14. 9.52
12817	F. J. Sharratt	No. 43 G.S.	5. 1.52
13604	P. J. Duckworth	No. 168 G.S.	2. 8.52
13950	R. J. Cockerton	No. 125 G.S	17. 8.52
14004	F. W. Blackett	No. 31 G.S.	30. 8.52
14556	B. J. Deakin	No. 43 G.S.	5.10.52
14709	A. W. Martin	No. 82 G.S.	28. 9.52
14710	I. D. Hill	No. 82 G.S.	28. 9.52
14743	A. J. R. Deacon	No. 126 G.S.	12.10.52
14792	W. D. J. Peacock	No. 168 G.S.	22.10.52
14933	R. E. Gays	No. 44 G.S	22. 6.52
15041	G. M. Pendlebury	Fassberg G.C.	24. 8.52
15143	M. A. Khan	R.A.F., Halton	11.10.52
15567	G. McAneny	No. 31 G.S.	24. 8.52
15578	C. Balderson	No. 130 G.S.	3. 8.52
15579	J. Butler	No. 130 G.S.	2. 8.52
15580	J. Fulton	No. 130 G.S.	2. 8.52
15581	A. B. Grainger	No. 130 G.S.	3. 8.52
15582	J. Hopkins	No. 130 G.S.	31. 7.52
15583	L. Saving	No. 130 G.S.	2. 8.52
15584	B. Taylor	No. 130 G.S.	12. 7.52
15585	R. Thorne	No. 130 G.S.	3. 8.52
15586	N. Enkel	No. 125 G.S.	31. 8.52
15587	N. C. McIntosh	No. 2 G.S.	28. 9.52
15588	F. C. McKinley	Bristol G.C.	28. 8.52
15589	J. B. Hooton	No. 49 G.S.	16. 9.52
15590	E. H. Balchin	No. 166 G.S.	29. 8.52
15591	G. F. J. B. Collins	Old Sarum G.C.	24. 8.52
15592	G. E. T. Granter	No. 168 G.S.	31. 7.52
15593	M. W. Jackson	No. 188 G.S.	14. 9.52
15594	A. C. Jamieson	No. 2 G.S.	24. 8.52
15595	J. R. Norbury	No. 2 G.S.	28. 9.52
15596	B. C. Turnbull	Derby & Lancs.	2. 9.52
15597	T. S. Boyce	Cranwell Coll. G.C.	14. 9.52
15598	J. A. Campbell	No. 166 G.S.	28. 8.52
15599	G. L. Wright	No. 188 G.S.	14. 9.52
15600	M. J. G. Dawson	No. 168 G.S.	4. 9.52
15601	A. A. Gillham	No. 130 G.S.	20. 7.52
15602	G. Long	Bristol G.C.	28. 8.52
15603	W. Vant	No. 141 G.S.	28. 9.52
15604	D. A. L. Whitbread	No. 123 G.S.	4.10.52
15605	A. V. Yearsley	Portsmouth N.G.C.	4.10.52
15606	R. A. Duncan	No. 2 G.S.	28. 9.52
15607	E. R. Biggs	No. 125 G.S.	5.10.52
15608	N. D. J. Compton	No. 42 G.S.	1. 8.52
15609	D. J. Fulluck	No. 125 G.S.	5.10.52
15610	J. R. Himsworth	No. 166 G.S.	5.10.52
15611	D. Smithers	No. 168 G.S.	1. 8.52
15612	R. I. Tolson	No. 168 G.S.	31. 7.52
15613	M. Nurrullah	Lahore G.T.U.	24. 8.52
15614	A. Ahmed	Lahore G.T.U.	22. 8.52
15617	G. E. L. Walker	Lahore G.T.U.	29. 8.52
15618	B. Everrett	No. 22 G.S.	17. 6.52
15619	D. F. S. Perrens	Scharfoldendorf G.C.	11. 9.52
15620	A. M. Cranstoun	Hameln G.C.	24. 8.52
15621	J. D. W. Banes	No. 106 G.S.	8. 8.52
15622	A. Money	No. 23 G.S.	5.10.52
15623	B. Docker	Fassberg G.C.	28. 9.52
15624	E. C. Littlejohn	Heron G.C.	4.10.52
15625	J. W. Rotheroe	No. 125 G.S.	5.10.52
15626	R. Binks	H.C.G.I.S.	23. 9.52
15627	J. Burr	No. 130 G.S.	20. 4.52
15628	S. C. Walton	No. 104 G.S.	31. 8.52
15629	J. D. Allpass	No. 42 G.S.	4. 8.52
15630	J. G. Brown	No. 2 G.S.	27. 9.52
15631	R. Haddock	No. 83 G.S.	5.10.52
15632	M. R. Murray	No. 1 G.S.	5.10.52
15633	R. J. Smith	Heron G.C.	4.10.52
15634	D. S. Stewart	No. 2 G.S.	28. 9.52
15635	B. Thaxter	No. 125 G.S.	11.10.52
15636	K. S. G. West	No. 141 G.S.	5.10.52
15637	A. B. Marrs	No. 125 G.S.	5.10.52
15639	A. Robertson	St. Athan G.C.	5.10.52
15640	N. L. Jones	No. 146 G.S.	11.10.52
15641	S. A. Lynch	St. Athan G.C.	8.10.52
15642	C. C. Voller	No. 142 G.S.	12.10.52
15643	T. J. Beetlestone	No. 105 G.S.	4.10.52
15644	N. P. May	No. 168 G.S.	4. 9.52
15646	B. M. Nicholson	Moonrakers G.C.	8.10.52

'B' CERTIFICATES—*continued*

No.	*Name.*	*A.T.C. School or Gliding Club.*	*Date taken*
15647	A. E. Phillips	No. 123 G.S.	11.10.52
15648	M. W. Spencer	No. 43 G.S.	5.10.52
15649	R. A. Cornish	No. 105 G.S.	4.10.52
15650	F. E. Proctor	No. 105 G.S.	11.10.52
15652	N. Luton	No. 166 G.S.	21. 8.52
15653	K. A. G. Phypers	No. 105 G.S.	11.10.52
15655	J. S. S. Lindsay	No. 2 G.S.	28. 9.52
15656	B. A. Reader	Cranwell Coll. G.C.	11.10.52
15657	J. H. S. Howard	Southdown G.C.	5.10.52
15659	C. M. Goodwin	No. 188 G.S.	14. 9.52
15660	J. L. Oswell	No. 42 G.S.	5. 8.52
15661	G. R. Walter	No. 104 G.S.	14. 9.52
15662	J. R. Burfoot	No. 123 G.S.	11.10.52
15663	J. E. Barton	No. 92 G.S.	5.10.52
15664	L. M. Stephenson	Imperial Coll. G.C.	23 3 52
15665	P. P. Jose	No. 82 G.S.	22. 6.52
15666	M. Thompson	No. 23 G.S.	12.10.52
15667	C. L. Groves	No. 104 G.S.	7. 8.52
15668	C. A. P. Gutteridge	Moonrakers G.C.	15.10.52
15669	J. A. C. Hamilton	No. 2 G.S.	24. 8.52
15670	R. Moses	No. 45 G.S.	5.10.52
15671	R. A. Spary	No. 168 G.S.	4. 9.52
15672	D. M. R. Riddell	London G.C.	1. 7 50
15673	A. J. Woodward	No. 130 G.S.	24. 8.52
15675	M. H. F. Petch	No. 44 G.S.	24. 8.52
15676	L. S. Borton	No. 146 G.S.	18.10.52
15677	J. E. Collier	No. 166 G.S.	19.10.52
15678	F. C. Cooke	No. 166 G.S.	20. 7.52
15679	W. M. K. Eastwood	No. 166 G.S.	18. 8.52
15680	C. J. Hyatt	No. 122 G.S.	5.10.52
15681	J. T. Richardson	No. 146 G.S.	12.10.52
15682	J. E. Tootell	No. 122 G.S.	5.10.52
15683	D. B. Spicer	London G.C.	30. 8.52
15684	M. S. J. Baker	No. 87 G.S.	27. 7.52
15685	P. Standley	No. 48 G.S.	5.10.52
15686	T. Whitelaw	No. 31 G.S.	5.10.52
15687	P. Hollingsworth	Scharfoldendorf G.C.	13. 4.52
15688	C. D. Thompson	No. 125 G.S.	4.10.52
15689	J. A. Masters	No. 122 G.S.	5.10.52
15690	U. K. Irshad	R.E.F.C.	18. 9.52
15691	J. Smith	No. 130 G.S.	29. 7.52
15693	G. D. Braham	No. 22 G.S.	3. 8.52
15694	J. E. S. Raymond	R.N.A.S., Culham	26. 8.52
15701	C. Moore	Midland G.C.	11.10.52
15702	N. F. Searle	H.Q. Home Command	8.10.52
15703	G. Aitken	No. 122 G.S.	26.10.52
15704	R. J. Painter	No. 105 G.S.	12.10.52
15705	B. H. Northcott	No. 125 G.S.	26.10.52
15706	R. B. Smith	No. 104 G.S.	26.10.52
15707	W. A. Lake	No. 122 G.S.	17. 8.52
15708	J. F. Marrison	Midland G.C.	11.10.52
15709	C. W. Storr	Hameln G.C.	30. 9.51
15710	M. Stevens	No. 104 G.S.	26.10.52
15711	D. L. Webster	No. 23 G.S.	26.10 52
15714	S. H. B. Samkin	No. 104 G.S.	5.10.52
15715	M. Tubbs	H.C.G.I.S.	31.10.52

'C' CERTIFICATES

89	(Australia) C. A. Patching	Surrey G.C.	16. 9.52
2744	R. N. Whittenbury	No. 125 G.S.	11.10.52
5668	P. Westmoreland	Hameln G.C.	5.10.52
7323	L. Dent	Cranwell Coll. G.C.	16. 8.52
8232	Marianne Smith	Surrey G.C.	20. 4.52
10217	R. A. A. Gale	Cranwell Coll. G.C.	22. 8.52
10708	D. D. Mumby	Cranwell Coll. G.C.	8. 8.52
13034	R. M. Brown	Cranwell Coll. G.C.	8. 8.52
13911	L. R. Preston	No. 130 G.S.	17. 8.52
13631	C. P. Wills	Midland G.C.	27.10.52
13649	O. G. J. Stirling	Deeside G.A.	27.10.51
13899	W. J. D. Murphy	Ulster G.C.	6. 9.52
13977	K. V. Attwater	No. 64 G.S.	23. 8.52
13940	R. A. Lees	Cranwell Coll. G.C.	16. 8.52
14302	C. C. Taylor	Cranwell Coll. G.C.	8. 8.52
14535	D. S. Welsh	Derby & Lancs. G.C.	23. 8.52
14701	J. I. Mille	Cranwell Coll. G.C.	22. 8.52
14866	E. K. Goldthorpe	Derby & Lancs.	23. 8.52
14867	J. H. McKew	Fassberg G.C.	16. 9.52
15027	D. L. Parsons	Cranwell Coll. G.C.	8. 8.52
15206	A. J. A. Hyatt	Wahn G.C.	28. 9.52
15559	P. G. Russell	Derby & Lancs.	5.10.52
15532	L. J. Kentfield	No. 125 G.S.	12.10.52
15619	D. F. Perrens	Scharfoldendorf G.C.	16. 9.52
15620	A. M. Cranstoun	Hameln G.C.	28. 9.52
15672	D. M. R. Riddell	London G.C.	17. 9.50
15675	M. H. F. Petch	No. 44 G.S.	26. 8.52
15683	D. B. Spicer	London G.C.	27. 9.52
15687	P. Hollingsworth	Scharfoldendorf G.C.	31. 5.52
15701	C. Moore	Midland G.C.	25.10.52
15708	J. F. Marrison	Midland G.S.	26.10.52
15709	C. W. Storr	Hameln G.C.	7. 9.52

SILVER 'C'

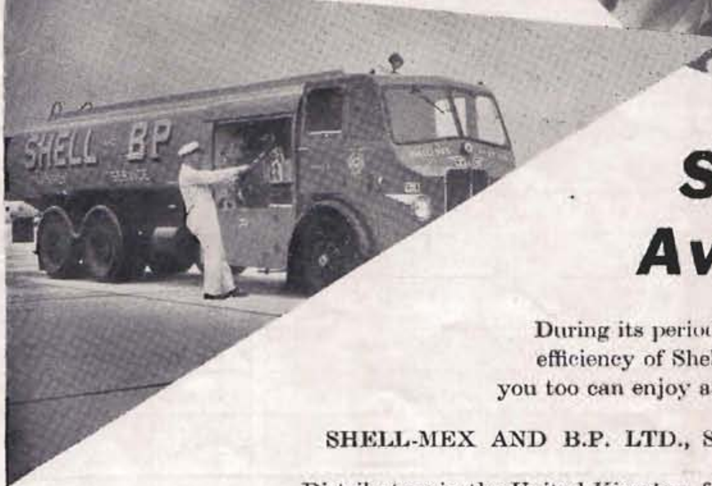
403	J. S. Boyle	Cranwell Coll. G.C.	13. 8.52

The aeroplane

The de Havilland Comet. The first jet airliner ever to enter scheduled service—on the 6,000 mile London-Johannesburg B.O.A.C. route. In service less than three years after its first test flight. Broke many point-to-point speed records during experimental period. Four de Havilland Ghost engines ; span 115′, length 93′.

the pilot

John Cunningham, D.S.O. and 2 bars, O.B.E., D.F.C. and bar, joined de Havilland when 18 years old in 1935. A notable career in R.A.F. from 1940 to 1945 included commanding 85 Squadron (Mosquitoes) 1943-44, and Group Captain Ops. at H.Q. 11 Group. Later service over battle areas after D-day, and against flying bombs. Has worked on the Comet as Chief Test Pilot since the first plywood mock-up days, and has flown hundreds of hours in Comets. Says he has "had very good service from Shell and BP".



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