METEOROLOGICAL OFFICE

FORECASTING TECHNIQUES BRANCH MEMORANDUM No. 5.

TEMPERATURE AND HUMIDITY IN THE LOWEST 3000 FT - EFFECTIVENESS OF CURRENT RADIO-SONDE REPORTING PROCEDURES

by

W.D.S. MCCAFFERY and D.S. GILL

June, 1965

F.T.B.M. 5

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G.3009/SG/6/65/40

Temperature and Humidity in the lowest 3000 ft - effectiveness of current radio-sonde reporting procedures

Summary

Two methods are described by which the results of radio-sonde ascents, as currently reported following British Meteorological Office practice, are compared with more detailed information which can be extracted from the original Cintel record. The comparison was made over the first three minutes of ascent, i.e. approximately the lowest 3000 ft of atmosphere. In one method a special "fine structure" message was computed at four radio-sonde stations and passed to six selected outstations for use in day to day work. The other involved an examination of the original Cintel records for days on which, for example, fog or low stratus had been reported at (or near) a radio-sonde station.

On the majority of occasions, the extra detail obtained by either of these two methods, did not further assist in interpreting routine synoptic observations, nor did they lead to any alteration in forecasts made with presently available techniques. On a number of occasions useful details of the temperature and humidity profiles were obtained.

Introduction

For many purposes in forecasting, a detailed knowledge of the temperature and humidity structure of the lowest 2000 ft or so of the atmosphere would be of considerable help to forecasters. The pilot scheme (now being implemented) to mount instruments at various levels on a high television mast is designed to supply such data and test its general usefulness. A feature of the scheme is that (in principle) the instruments may be interrogated at any time to give, for the immediate vicinity, information which does not have to be modified because of time lag or advection changes.

The British radio-sonde network consists of stations located near coasts consequently, if, in the future, instruments were to be mounted on a number of high masts these are likely to be located in inland areas. It is of some interest, therefore, to discover whether the Cintel record of a radio-sonde ascent can be made to yield, under operational conditions, a temperature and humidity profile showing a finer structure than that obtained in computing the result by current practice and whether any such structure can be of use in short-range forecasting in the neighbourhood of the sounding station.

The Cintel Record

The British radio-sonde employs a wind driven switch to connect in turn the sensing elements for pressure, temperature and humidity, and their associated coils and inductances. Each signal corresponding to one of the three elements is transmitted for a period of four to five seconds with a one second interval between transmissions. (Depending upon wind conditions these times can vary considerably both above and below the nominal). The received signal at the ground is fed into an automatic recording equipment (Cintel). Basically this equipment measures and records the time for 100 cycles of input frequency, this operation being repeated between three and five times for each signal period. The record thus shows about four counts (short vertical lines) in one group for one signal period. Interposed between each signal group there is usually a random noise count which coincides with the 'no-signal' period. This is then followed by another group of counts relating to the signal from the next element switched in by the radio-sonde.

/Figure

Figure 1 shows a section of a Cintel recording: the pressure record (except for a change of scale) always slopes upwards to the left and each group of counts corresponding to a pressure reading is followed first by a signal group for temperature and then by one for humidity. It can be seen that the counts within each group corresponding to pressure indicate the decrease of pressure with height (record slopes upwards to the left) occurring over the four or five seconds of the duration of the signal. Similarly the shape of other groups, at times, indicates rapid changes in temperature or humidity with height. The shape of the group of counts can be used to interpolate temperatures or humidities between those actually recorded and also to fix turning points in the respective traces.

The Cintel equipment is designed to operate to an accuracy of not less than ±0.25 cycles per second which, in the first few thousand feet of the atmosphere, corresponds to an accuracy in pressure, temperature and humidity of one millibar, 0.1°C and one per cent relative humidity respectively. Since the average rate of ascent of a radiosonde is 1200 ft (360m) per minute, and since each element is switched in once in about 15 to 18 seconds, the atmosphere is sampled for each element every 300 to 360 ft. Each sample, in effect, consists of about four discrete measurements of the value of the element spread over a height interval of approximately 90 ft and gives an indication of the change in the value of the element through this height.

The coded radio-sonde report, which is compiled from the Cintel record, includes information on temperature and humidity at standard pressure levels and also at levels where there are significant changes in temperature-lapse or hydrolapse. Instructions to radio-sonde stations result in some smoothing of the curves representing temperature and humidity, the final coded message, when deciphered and plotted on a tephigram, permitting a difference of up to 1°C in temperature and of 10% relative humidity between actual observed values and those interpolated from the tephigram plot.

Work done at Meteorological Office outstations and headquarters

Work at outstations

The outstations which took part in the experiment were:-

Radiosonde Stations	Main Meteorological Offices
Aughton	Manby
Camborne	Pitreavie
Hemsby	Plymouth (Mount Batten)
Shanwell	Preston
	Uxbridge
	Watnall

In addition to the Main Meteorological Offices most of their subsidiary forecasting offices also participated.

At the radiosonde stations the Cintel record for the first three minutes (approximately the first 3000 ft) of each ascent was re-computed after the normal ascent message had been cleared. Slightly revised computational procedures were used resulting in the inclusion in the message of single groups of points lying off the general trend. In addition, when selecting isothermals, inversions and other turning points on the curves for temperature and humidity, a much finer tolerance was used - one-quarter time-unit for both temperature and humidity instead of the normal one time-unit and two time-units respectively. Normal corrections for instrumental lag were applied. These are satisfactory when a profile curve is straight for time intervals substantially greater than two or three times the lag coefficient (λ = 6.4

/secs

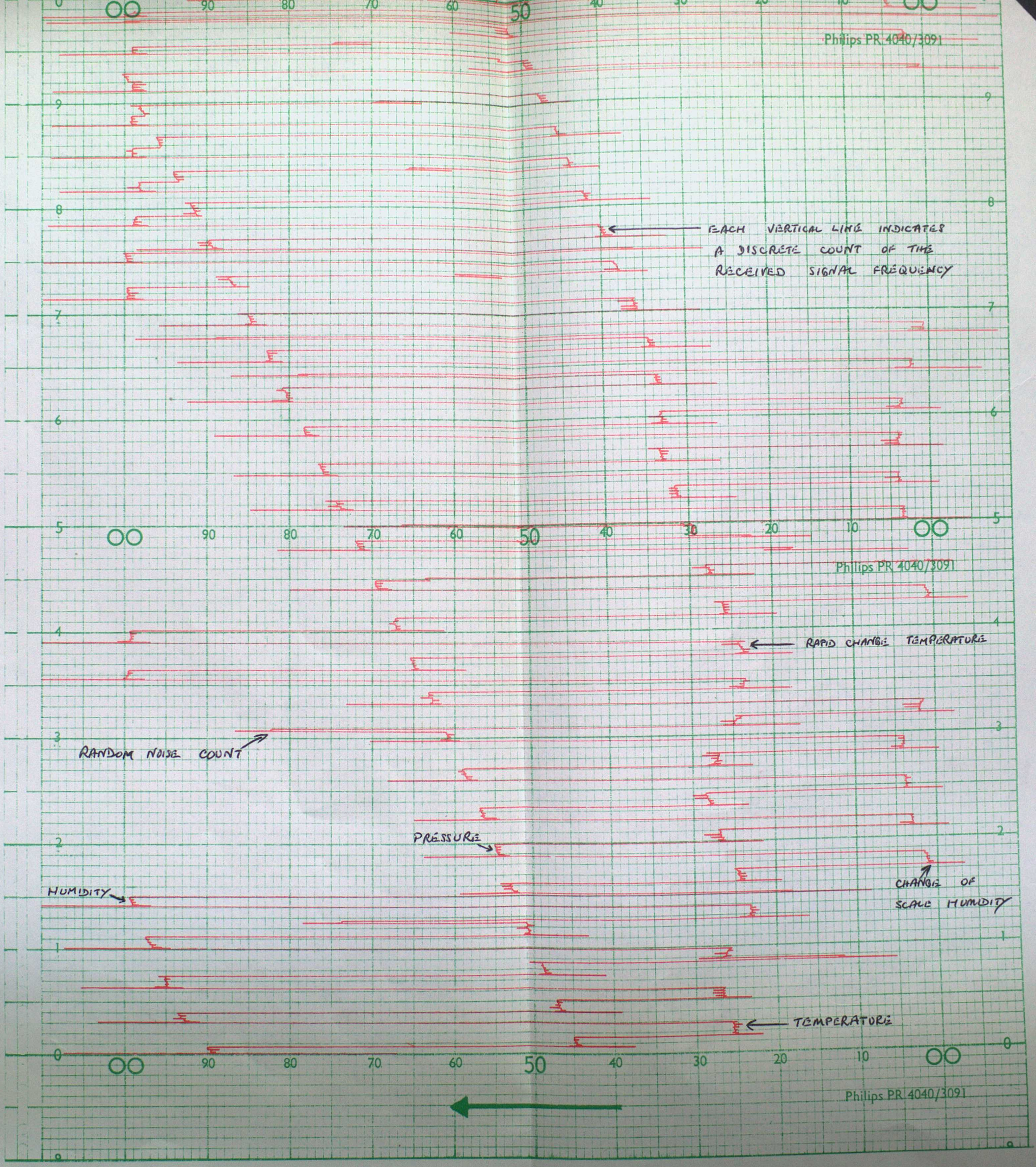


FIG 1. CINTEL RECORD (FIRST 10 MINS OF ASCENT)

secs near the ground for temperature), but less so if changes in the slope of the curve occur more frequently than this. (Corrections allowing for the exponential time change in the recorded measurements of temperature and humidity are not possible under rountine conditions of operation). A fine structure message was then prepared giving the pressure levels of all turning points on the curves of temperature and humidity and the values at those levels of temperature to the nearest 0.25°C and relative humidity to the nearest one per cent. The British radiosonde, in the layer with which we are concerned, measures relative humidity to an accuracy probably between five and ten per cent and temperature to better than 0.4°C. The fine structure message, giving values within these limits, was intended to exploit the known sensitivity of the radiosonde to changes in the lapse rates of temperature and humidity and, in effect, to enable the Cintel plot of the ascent to be transferred as accurately as possible to a tephigram.

At the forecasting outstations, the tephigram plot was first used to attempt to relate details of the ascent to reports of, for example, heights of low cloud at different levels, or the height of stratus cloud top or of fog top, or for an accurate assessment of the freezing level. Secondly the plot was used in forecasting for example fog points, night minimum temperatures or the time of clearance of fog.

Fine structure messages were passed from the radiosonde stations to the selected outstations for a period of two months from the 1st March to 30th April, 1964. Reports then rendered were inconclusive but the majority recommended a longer trial period. This was arranged and ran from 1st October to 31st December, 1964 after which further reports were received from the Senior Meteorological Officers at the six Main Meteorological Offices. Five of these reports were in substantial agreement and are summarised below. The sixth report, from S.Met.O., Manby, is given in full at Annex B.

The opinion of the majority of reporting officers is that the information, whilst having an interest value, has not contributed very much to the solution of forecasting problems. On a few occasions it has been possible to determine the height of the top of stratus clouds and the top of fogs with greater accuracy than would have been possible from the standard ascent, but more often modification of the lower layers of the air mass when travelling from the radio-sonde station to the forecast area have caused doubt as to whether the reported detailed structure could then be considered representative. The relative coarseness of current forecasting techniques was also commented on; for example fog points calculated from the tephigram plots of the standard and fine structure messages from the radiosonde stations were, in general, within one degree C. Since midday ascents have to be modified for maximum temperature and for any change in dew point expected over-night, a tolerance of one degree is acceptable. Similarly a technique for forecasting the time of fog clearance suggests adding five to 15 millibars on to the depth of the fog as determined from a midnight ascent to estimate fog depth at dawn. During the winter months an error of ten millibars in the fog depth can lead to an error of several hours in a forecast of the time of clearance of the fog.

One report suggested that fine structure information, which might be helpful in a few special circumstances, should be available on call to the radiosonde stations by either the Central Forecast Office or a Main Meteorological Office. Another report suggested that the trial period be further extended for some months during the spring and early summer.

/The

The minority report from S.Met.O., Manby, reproduced at Annex B, states that estimates from forecasters of the proportion of occasions on which the fine structure gave useful additional information varied from nil to 50%, but that a fair estimate of the usefulness might be in the region of 20 to 25% of occasions. Some supporting details are given and finally a recommendation that information based on fine-scale criteria up to about 3000 ft should be incorporated into all TEMP messages from UK land stations.

Work at headquarters

From an examination of Daily Weather Reports, occasions of fog, low stratus, and of rain turning to snow were selected and the original Cintel records of ascents made on these occasions were obtained. Altogether, records of 24 ascents were examined and tephigram plots reproduced as accurately as possible, using every group of counts recorded in the first three minutes of the ascent. Normally the temperature for a Cintel count of temperature and the dew point for a Cintel count of humidity were plotted. Corresponding to turning points of the Cintel traces of temperature and humidity, both temperature and dew point were plotted on the tephigram in order to reveal discontinuities of dew point. Corrections for instrument lag were made by the method used operationally at radiosonde stations. The result of each ascent as reported in the Daily Aerological Report (DAR) was entered on the tephigrams (DAR plot) alongside the plot from the Cintel record (Cintel plot).

Comparison of the two plots on each tephigram showed, in general, only marginal changes. Three of the cases examined are discussed in detail at Annex A; some general remarks are given below.

Much of the difference between a DAR plot and the corresponding Cintel plot can be attributed to rounding-off errors in reporting temperature to the nearest degree C and humidity to the nearest five per cent. Further errors may be introduced on occasion because of the use at radiosonde stations of humidity tables; for example with a temperature of 8.5°C and 84% relative humidity, the dew point interpolated from the tables is 7°C while a calculation using the humidity slide rule gives 6.1°C.

The plotting of the 1000 mb standard level data can produce spurious discontinuities at times. An example is shown in Fig. 2b. This arises because of rounding-off errors when real turning points are close to 1000 mb. Unless the turning point (special point in the DAR message) actually occurs at 1000 mb, the omission from the DAR plots of data for this level would normally yield an ascent curve in closer accord with the Cintel plot.

Conclusions

The majority of forecasters taking part in the experiment found that only rarely were significant alterations made to the profiles of temperature and humidity in the first 3000 ft of the atmosphere as a result of the extra detail contained in the "fine structure" messages. The more limited investigation at headquarters, using the original Cintel records, supports this view. Bearing in mind, therefore:

a. the effort required at radiosonde stations, by communications staff and at forecasting offices to compute, transmit and use fine structure messages,

b. the changes in temperature and humidity which occur in the lower layers of the atmosphere as it moves in time and space away from the point of observation,

c. the relative coarseness of forecasting techniques now available,

no change in current radiosonde reporting procedures is recommended at present.

The experiment, however, particularly as detailed in the annexed minority report from S.Met.O., Manby, has indicated that an examination of the fine structure is at times both revealing and useful to the forecaster. The scheme to instrument high masts is intended to supply such data easily, quickly and frequently, (possibly at will). Experience and familiarity with the information provided may lead to improvement in methods of analysing and interpreting such data and in techniques of forecasting, which in turn may then make it worth while to re-examine the encoding procedures at radio-sonde stations.

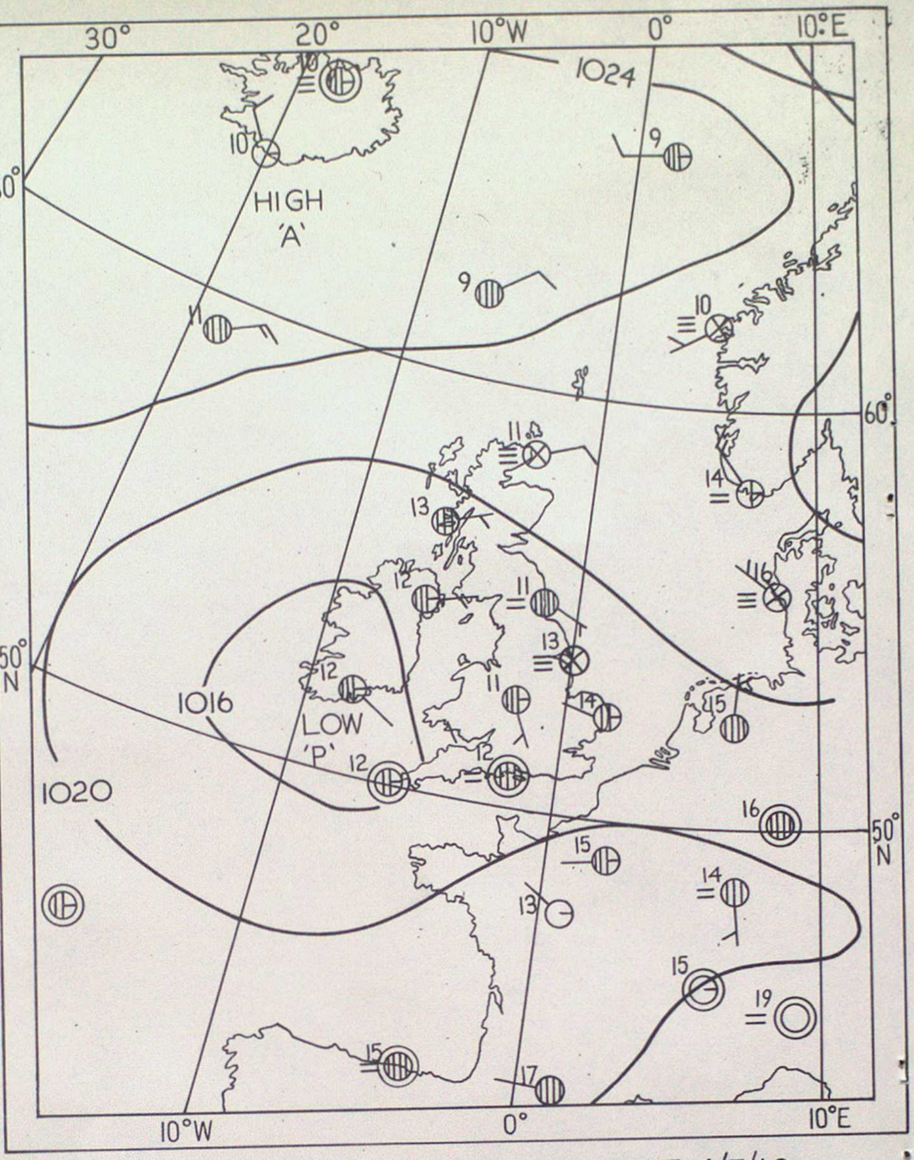


Fig 2a. SYNOPTIC SITUATION 0600 G.M.T 4/7/63.

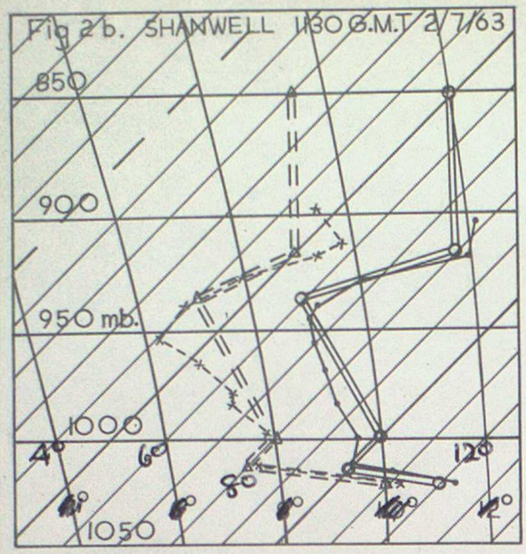


Fig 2b. SHANWELL 1130 G.M.T 2/7/63

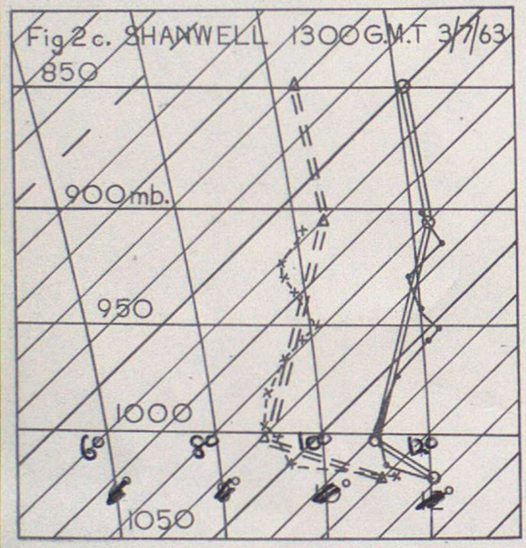


Fig 2c. SHANWELL 1300 G.M.T 3/7/63

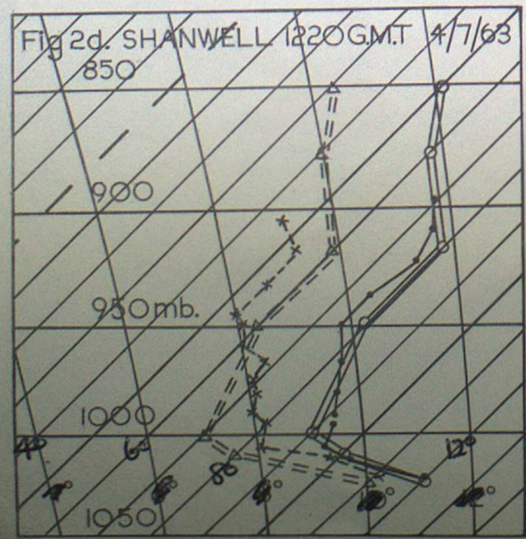


Fig 2d. SHANWELL 1220 G.M.T 4/7/63

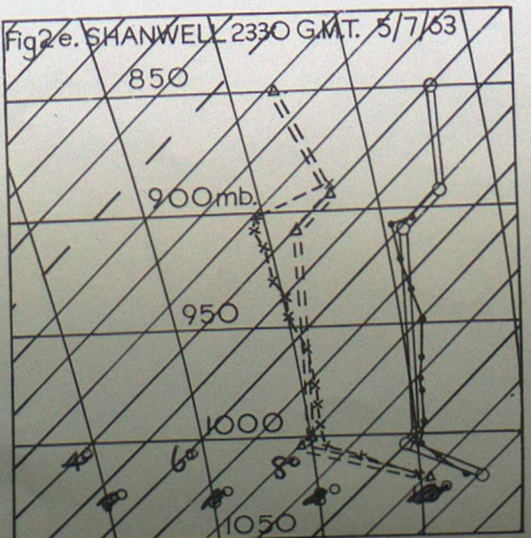


Fig 2e. SHANWELL 2330 G.M.T. 5/7/63

Δ= = =Δ DAR

x— — —x CINTEL

Annex A

Some examples of the comparison between tephigrams prepared from Cintel and DAR records

A case of low stratus

Between 1/7/63 and 5/7/63 easterly winds were maintained over Scotland as a result of a shallow depression remaining stationary to the west-south-west of the British Isles. The synoptic situation is adequately represented by the map for 0600 GMT on 4/7/63 which is shown at Fig. 2a. Stratus persisted at Leuchars for the whole of this period.

Shanwell records for 1130 2/7/63, Fig. 2b

The temperature at 1000 mb (9.6 deg C), given in the DAR report as 10 deg C because of rounding to the nearest whole degree, indicates an isothermal layer between 1013 mb and 1000 mb on the DAR plot only. However, both plots indicate a discontinuity in lapse rate at about 1013 mb (8 mb above the surface), probably associated with 3/8 stratus base 400 ft reported at Leuchars at 1200 GMT. The other cloud reported at this time, 7/8 stratus base 700 ft, can be associated with the discontinuity in lapse rate and hydrolapse on both plots at 1000 mb.

Shanwell records for 1300 3/7/63, Fig. 2c

At this time three layers of stratus were reported at Leuchars, 2/8 at 200 ft, 5/8 at 300 ft and 8/8 at 500 ft. The discontinuity in the lapse rate of the Cintel plot at 1015 mb (4 mb above the surface) may be associated with the broken stratus at 200 ft. while the discontinuity on the DAR plot and the much less marked discontinuity on the Cintel plot at 1002 mb (17 mb above the surface) is probably associated with the 8/8 stratus at 500 ft. There is no indication on the DAR plot of the top of the stratus, but on the Cintel plot an isothermal layer with top at 952 mb, may indicate the top of the stratus. This would lead to the conclusion that the stratus was about 1500 ft thick, which is a considerable thickness for a layer of stratus, but not impossible since the stratus persisted for 6 days in July.

Shanwell records for 1220 4/7/63, Fig. 2d

There were three layers of stratus at Leuchars 3/8 at 100 ft, 5/8 at 200 ft and 8/8 at 300 ft. The lapse rate on the Cintel plot has a discontinuity at 1006 mb (15 mb above the surface) which may be associated with the cloud at 300 ft although the discontinuity is rather high for the reported cloud base. The difference in dew point at 1000 mb between the DAR plot and the Cintel plot is accounted for by the error introduced into the DAR plot as a result of rounding the temperature to the nearest whole degree and the humidity to the nearest 5% in order to use the table in Met.O.510c to calculate the dew point.

Shanwell records for 2330 5/7/63, Fig. 2e

A single layer of 8/8 stratus base 800 ft was reported at Leuchars. There is a discontinuity in lapse rate and hydrolapse on both plots at about 1004 mb (15 mb above the surface). The discontinuity is not in accord with the reported cloud base and would suggest a cloud base between 400 and 500 ft whether the DAR or Cintel plot is used.

/A

A Case of rain turning to snow

The synoptic situation at 0000 GMT on 15/3/64 is illustrated by the chart at Fig. 3a. The depression over north France moved south-eastwards, as a ridge of high pressure developed from the anticyclone over Scandinavia and an easterly airstream spread across southern England. Rain over East Anglia and south-east England turned to snow over East Anglia during the early morning of 15/3/64 and in the London area around midday.

Crawley records for 2330 GMT 14/3/64, Fig. 3b

The temperature curves of the DAR and Cintel plots are within 0.5 deg of each other and the differences in the dew point curves are within the limits which could be expected from rounding-off errors. The ascent was made in air which was too warm for snow to fall below the 850 mb level (approximately 4000 ft).

Hemsby records for 0008 GMT 15/3/64, Fig. 3c

This ascent was made at approximately the same time as the previously discussed one but at Hemsby the colder air had already reached the area and the ascent can be used to estimate the likely downward penetration of snow. The differences between the Cintel and DAR curves are within the limits to be expected from the rounding-off errors introduced in the computation of the DAR record. F. E. Lumb has stated (Met. Mag., January 1963) that "when periods of prolonged frontal precipitation are expected in association with a synoptic situation favourable for the downward penetration of snow, snow will very probably descend at least to the 2.0 deg C wet-bulb level. There is about one chance in four that it will descent below the 2.5 deg C wet-bulb level, and it is very unlikely to reach the 3 deg C wet-bulb level." In this case the 2.0 deg C wet-bulb level was at 993 mb (10 mb above the surface) when calculated from both the Cintel and DAR plots. No increase in the accuracy of a forecast of the level to which snow was expected to penetrate would be obtained in this case by using the Cintel plot.

Crawley records for 1115 GMT 15/3/64 Fig. 3d

This ascent is very similar to the Hemsby ascent at 0008 GMT on 15/3/64. The 2.0 deg C wet bulb level on the DAR plot is at 978 mb (10 mb above the surface) and on the Cintel plot at 981 mb. There is about 100 ft difference in the level of the 2.0 deg C level but this would not significantly affect a forecast of the downward penetration of the snow due to the imprecision present in Lumb's original statement.

A case of fog

During the period 28/9/64 to 30/9/64 a ridge of high pressure extending from an anticyclone centred over the Continent covered most of England and Wales. The situation is illustrated by the chart for 0000 GMT on 29/9/64 shown at Fig. 4a. Fog at London (Heathrow) Airport, London (Gatwick) Airport and Bournemouth (Hurn) Airport was reported on the nights of 28 - 29/9/64 and 29 - 30/9/64.

Crawley records for 2330 GMT 28/9/64, Fig. 4b

There is a slight difference in the depth of the temperature inversion between the Cintel plot and the DAR plot. This is due to the interpretation of the shape of the first group of temperature counts used in preparing the Cintel plot. On the Cintel plot if the hydrolapse discontinuity at 1001 mb is taken as the top of the fog an estimate of the fog clearance temperature is 12.5 deg C and on the DAR plot using the top of the temperature inversion as the fog

/top

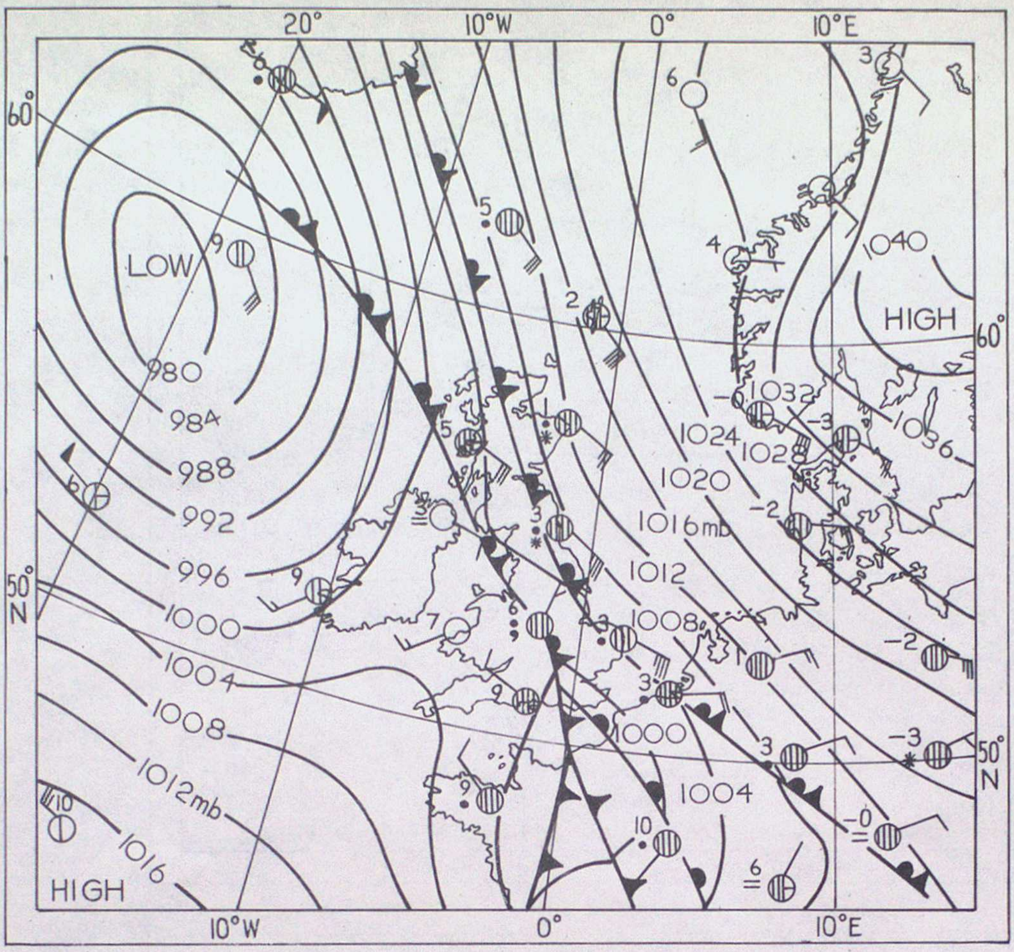


FIG.3a. SYNOPTIC SITUATION 0000 G.M.T. 15/3/64.

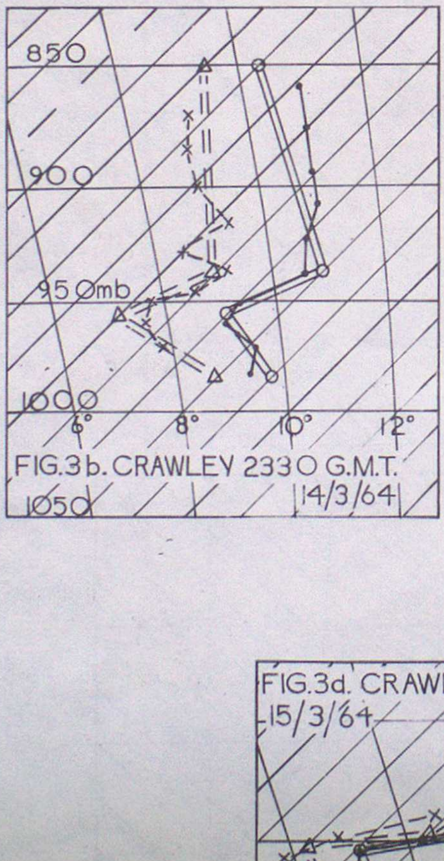


FIG.3b. CRAWLEY 2330 G.M.T. 14/3/64

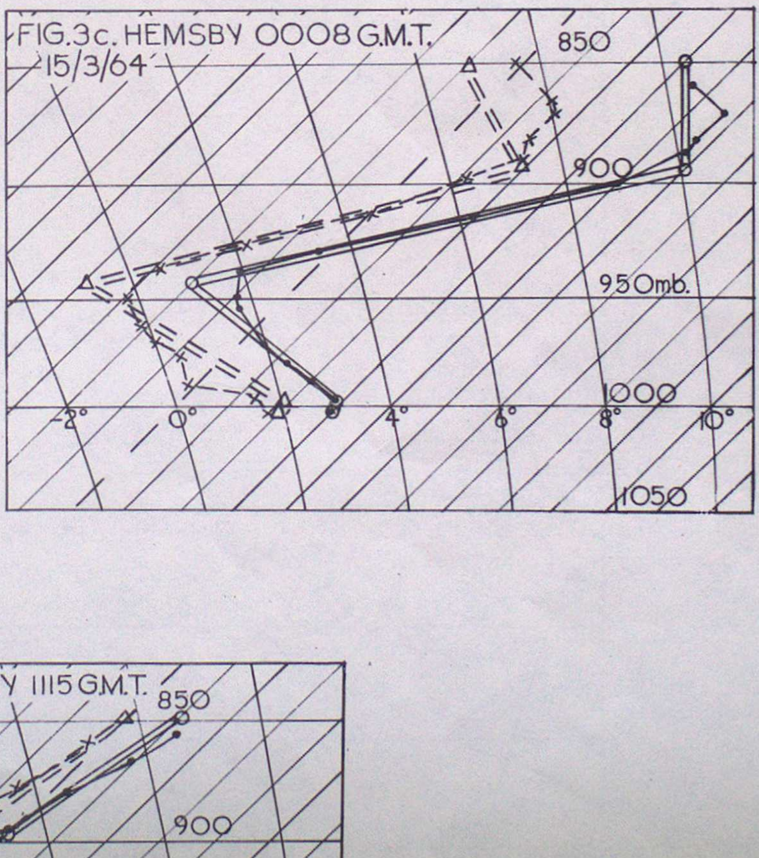


FIG.3c. HEMSBY 0008 G.M.T. 15/3/64

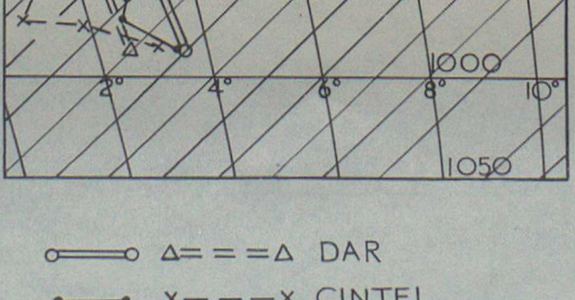
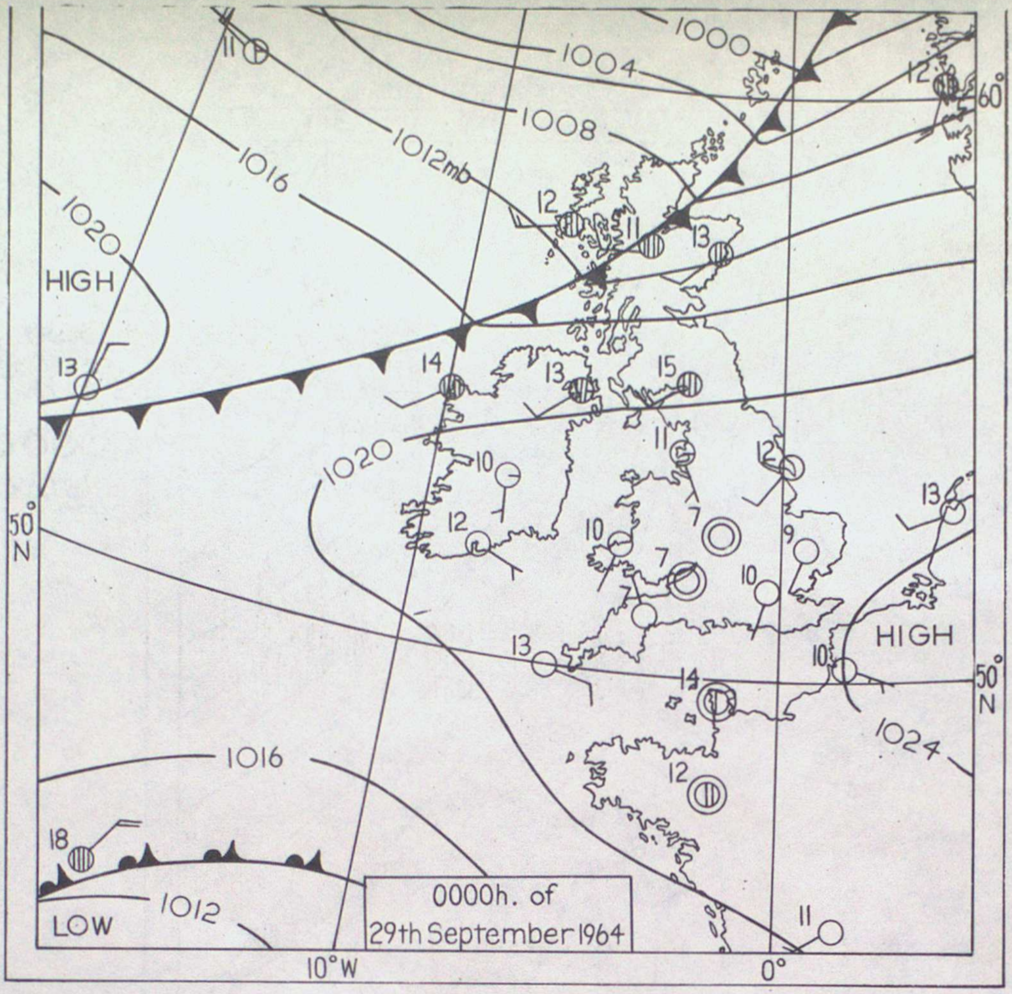


FIG.3d. CRAWLEY 1115 G.M.T. 15/3/64

o═══o Δ= = =Δ DAR

•───• x– – –x CINTEL

Fig.4a



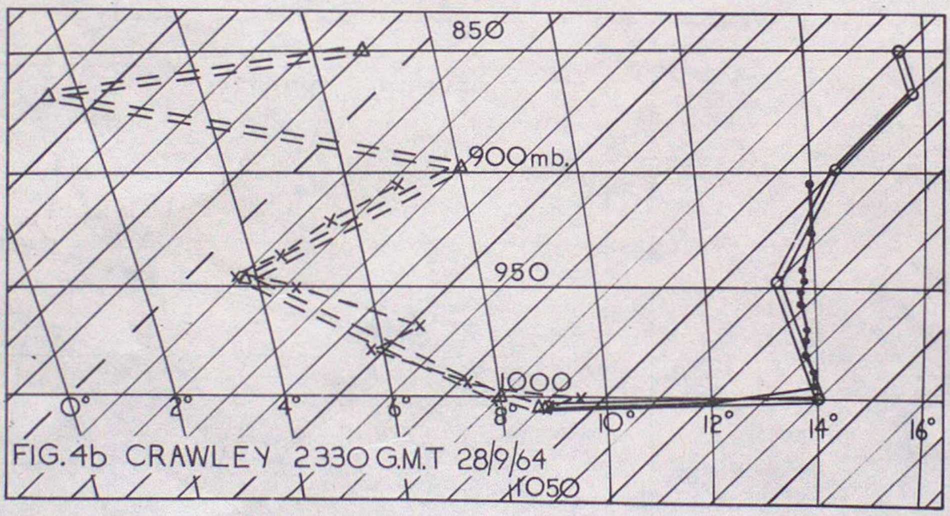


FIG.4b CRAWLEY 2330 G.M.T 28/9/64

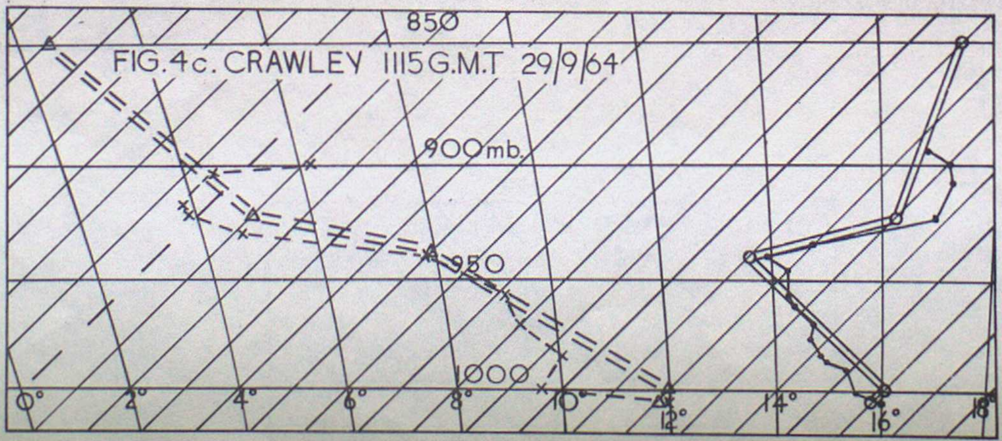


FIG.4c. CRAWLEY 1115 G.M.T 29/9/64

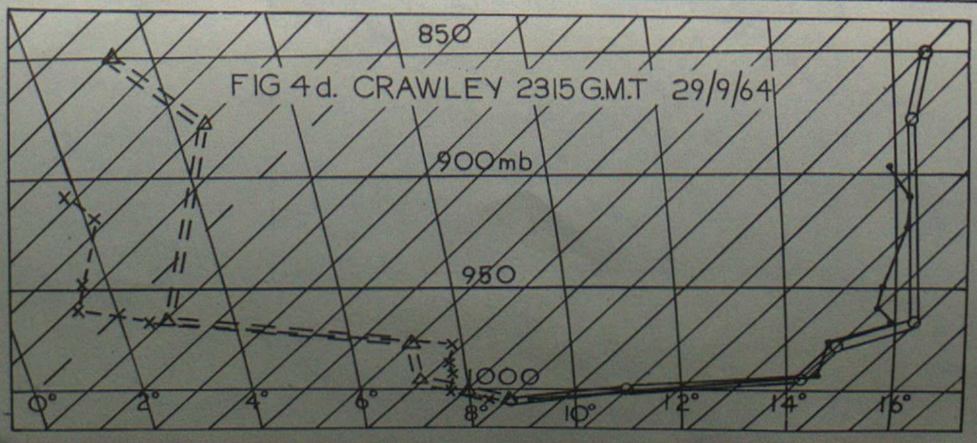


FIG 4d. CRAWLEY 2315 G.M.T 29/9/64

Δ= = =Δ DAR ×— — —× CINTEL

top the estimated fog clearance temperature is 14.5 deg C. Using the 0600 GMT temperature for London (Gatwick) Airport (5 deg C) as the dawn temperature and applying these figures to Barthram's diagrams for assessing the time of fog clearance (Met. Mag., February, 1964) the Cintel plot leads to a forecast of 1015 GMT and the DAR plot to a forecast of 1115 GMT for London (Gatwick) Airport. In fact the fog cleared at London (Gatwick) Airport at 1015 GMT and the temperature at 1020 GMT was 12 deg C.

Crawley records for 1115 GMT 29/9/64, Fig. 4c

During the day only small amounts of cloud were reported. There is a difference in dew point between the two plots at 1000 mb (1001 mb on the Cintel plot) due to a different interpretation of the slope of the humidity counts on the Cintel record. The fog point estimated by Saunders method (Met. Mag., August, 1950) is 7 deg C whether the Cintel plot or the DAR plot is used. In fact fog formed at London (Gatwick) Airport at 2204 GMT and the temperature at 2220 GMT was 7 deg C. The difference in dew point at 900 mb is due to the application of the criteria for reporting special points which is dealt with more fully in the following paragraph.

Crawley records for 2315 GMT 29/9/64, Fig. 4d

There is a slight difference in the depth of the inversion due to the use made of the individual records of temperature in the first Cintel group of temperature counts. In this case, unlike the previous night, there is no indication of the fog top from the dew point curve of either plot, but a first estimation can be made by assuming the fog top coincides with the top of the inversion. This leads to a fog clearance temperature of 15 deg C from both plots and clearance times of 1230 GMT from the DAR plot and 1330 GMT from the Cintel plot. An experienced forecaster would expect this clearance temperature and both these times to be over-estimates because of the dryness of the air immediately above the surface. In fact the fog cleared from London (Gatwick) Airport with a temperature of 12.3 deg C at 0850 GMT, indicating that only a shallow layer of fog had formed overnight.

There is a considerable difference in dew point between the Cintel plot and DAR plot above 960 mb because of the criteria for reporting special points laid down the Met.O.510C para 2.2.4. This requires special points on the humidity trace to be reported only when their omission would lead to an error of more than 10 per cent in relative humidity. At the low humidities present above 960 mb on this ascent the difference between the dew point curves represents a relative humidity difference of less than 10 per cent and is not of significance in forecasting.

Annex B

Report on the experiment at Manby Main Meteorological Office and associated subsidiary forecasting offices

by W. E. Saunders

The Aughton and Hemsby fine structure messages received at Manby were re-issued to associated subsidiary forecasting offices and reports were eventually received from 13 outstations and from staff in Manby M. Met.O.

The method finally adopted for handling the data was to receive the incoming message on a proforma with columns headed:-

PPP TTTT UU DDDD

Entries were made in descending order of values of PPP. This left a number of blank spaces in the TTTT and UU columns. The actual values of TTTT were then plotted on Form 2810B inset, and the missing values of TTTT were interpolated and entered on the proforma. The given values of PPP and UU were then plotted on a graph mounted under perspex, and the missing UU values interpolate and entered on the proforma. The dew points were then computed by slide rule. Finally, the plotting of Form 2810B inset was completed and the PPP TTTT and DDDD data from the proforma was transmitted by teleprinter to Manby outstations in a form ready for immediate plotting and use.

The procedure described above seemed to us to be necessary to make best use of the data, but it is still felt that there is a strong case for radio-sonde stations being asked to compute dew points instead of humidities, and to provide dew points at temperature special points, and temperatures at humidity special points. It must be more economical in time to have this procedure carried out once at a radiosonde station, rather than separately at each M. Met.O., let alone at each outstation.

There was again a wide divergence of view among forecasters as to the usefulness of fine structure data. Estimates of the proportion of occasions on which the fine structure gave useful additional information varied widely in the range NIL - 50%. I get the impression that a fair estimate of usefulness might be in the region 20-25% of occasions. Several stations commented that owing to their distance from the radio-sonde stations, the adjustments which had to be made to both the normal and fine structure ascents for local use often much exceeded the difference between the two ascents.

Some examples of usefulness of the fine structure data are given below:-

At one station, on 20 occasions out of 56 examined, the fine structure showed drier air than the normal ascent in the lowest 500 ft. On 8 of these 20 occasions, the fine structure showed the fog point lower by 1°C or more. At this station there were 6 occasions on which radiation fog actually occurred, and one of the ascents could be used. The arithmetical mean error of the actual fog point, as compared with the forecast fog point from the two ascents, was as follows:-

Normal ascent	0.8°C
Fine structure	0.5°C

In general, inversions were more pronounced on the fine structure, and gave better definition of cloud, fog and haze tops. At one station, where frequent aircraft reports are received, comparisons were made between heights estimated from the normal and fine structure ascents and those reported by aircraft, and the fine structure estimates were always better than those based on the normal ascents.

/On

On one occasion, the fine structure showed the height of freezing level to be about 500 ft higher than given on the normal ascent, and this was of significance in snow forecasting (freezing level height has, of course, recently been shown to be the most useful single snow predictor). It is recommended that information based on fine-scale criteria should be incorporated into all the U.K. land station TEMP messages, up to about 3000 ft, as routine. Use might be made of the fifth figure of the temperature/ dew point groups in the TEMP code, as already done by continental stations.

If the recommendation above is not acceptable, but it is decided instead to make a permanent arrangement for sending a separate bulletin giving the fine structure data, then the following points would require to be considered:-

The messages should give data in the form PPP TTTT DDDD for each special point of either temperature or humidity (the necessary interpolations and computations having been carried out at the radiosonde stations).

Distribution should be to all stations via Channel I (one of the worst features about the trial period has been the arrangement whereby Manby received Hemsby fine structure via Coltishall, Watnall and Binbrook, which lead to delays and transmission errors, so that much time was spent checking the accuracy of data received).

Prompt issue of the 1200 fine structure data would be of great importance, owing to its use in forecasting for the night.

Finally, it is not considered that adoption of these recommendations could be expected to lead to any widespread improvement in forecasting. In the nature of things, too many airfields are well inland and remote from the radio-sonde sites for this to apply. However, there are obvious advantages in using the fine structure criteria at low levels, and this should be adopted in one way or another.

In the station reports, several have stressed the value of Cardington BALTHUM reports. The project for obtaining temperatures from high masts has aroused considerable interest, and it is hoped this will be brought into effect.

Loose Minute

M 28186/64
Copy:AF/M 1129/64

A.D.Met.O(AS)
A.D.Met.O(OC)

Experiment in reporting fine structure in first 3000ft of radiosonde ascent

1. A report on this experiment is now complete and copies are circulated with this minute. Extra copies (A.D.Met.O(AS)6, A.D.Met.O(OC)5 for Met. O.5b) are enclosed as you will no doubt wish outstation staff who participated to see the final report.

2. The main fact to emerge was that although the extra detail reported was useful on occasions, these were not frequent enough to justify a change in current reporting routine. One S.Met.O came to a different conclusion and his report is reproduced in full at Annex B.

J.W.S. Harrower

A.D.Met.O(FT)

2nd. July, 1965

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