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METEOROLOGICAL OFFICE

GUIDE TO PLOTTING PROCEDURES

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Amendment lists will be issued as necessary and they will be numbered consecutively. The incorporation of each amendment list should be recorded in the table below.

Amendment list No.	Amendments made by	Date

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GUIDE TO PLOTTING PROCEDURES

CHAPTER 1

1. Introduction

1.1. This publication succeeds the fourth edition of *Instructions for the preparation of weather maps*, to which it owes much of its form and content.

1.2. Its purpose is to provide guidance on the plotting of all charts and diagrams in general daily synoptic usage in the United Kingdom, and its format, aligned with that of *Handbook of weather messages*,* has been influenced by the need to simplify the updating of parts or sections from time to time without disturbing the whole.

1.3. Most of the codes and plotting symbols are international, developed within the World Meteorological Organization to secure uniformity of practices and procedures throughout the world, with some regional adaptations.

1.4. A list is included for convenience at the end of the *Guide*, of abbreviated meanings of the codes employed, with references to the *Handbook of weather messages* (Codes and specifications). Occasional reference to the *Handbook of weather messages* Part II and Part III is made in the text, and as detailed code specifications are contained only in these two Parts they are required also to provide a fuller comprehension of the data plotted.

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* London, Meteorological Office. Handbook of weather messages. Part II, Codes and specifications, Sixth edition, and Part III, Coding, decoding and plotting, Fifth edition. London, HMSO, 1971.

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CHAPTER 2

2. Decoding surface observations

2.1. The basic object of decoding is to arrive at the original observations as noted by the observer before he coded them. The process must necessarily be carried out in two stages: first, the report must be compared with the symbolic form in order to identify the figures representing the various meteorological elements; second, the appropriate specification tables must be consulted in order to convert the code figures for elements such as present weather, types of cloud, etc., into the original plain-language specifications. When decoding is carried out for the purpose of plotting the observations on a synoptic chart, the second stage is combined with a third operation, namely the selection of the appropriate plotting symbol. In practice the decoder–plotter eliminates the second stage altogether and goes straight from the code figure to the symbol, though knowledge of the meanings of the coded reports can assist this process (and make it more interesting).

2.2. Each code has a number and code name, and its symbolic form includes (a) a preamble, (b) a series of 'universal' groups and (c) a series of supplementary or 'drop-out' groups.

2.2.1. The preamble consists of the code groups $M_iM_iM_jM_j$ YYGG (see Appendix II of *Handbook of weather messages*, Part II) which identify the type of report. In collectives containing, for example, a series of synoptic reports, the preamble MMXX YYGG would appear only once, at the beginning of the series of reports. In reports from ships the call sign of the ship precedes the coded report. In general, ships' call signs consist of four letters but, when on station, ocean weather vessels use a call sign consisting of one figure and two letters, e.g. 4YA.

2.2.2. The universal groups are those which must appear in all reports; they are not subject to regional or national variations. In the symbolic forms the supplementary (drop-out) groups are distinguished from universal groups by being enclosed in brackets. In most cases the first figure of a supplementary group is a fixed indicator figure and such a group may therefore be repeated as necessary.

2.3. There are several sources of possible error in a received report and despite checking and/or amendment procedures, inaccuracies and other mutilations appear from time to time. Continued practice in decoding and plotting leads to a necessary awareness in this respect.

2.3.1. Before plotting begins, the bulletin is scanned for correction groups (identification COR) and any errors indicated thereby corrected in the report. Corrections received after plotting, if not already detected, must then be made to the plot.

2.3.2. Observational errors include the misreading of a barometer or a thermometer by 10 whole units, the temperature, for example, being written as 23 instead of 13, or the pressure as (10)12·8 instead of (10)02·8. A five-unit error is also common. Such errors are usually easy to detect and they should be corrected before plotting, a query sign being put against the reading. Another error to be watched for is the coding of the characteristic of tendency with the wrong sign. This can be checked by a comparison of the barometer reading with the reading three hours earlier, if available.

2.3.3. When a report is received with some groups missing it is often possible to identify the remaining groups by comparison of the entries with those from neighbouring stations. The plotter usually has some idea of what PPP, TT and T_dT_d are likely to be. Also dd cannot exceed 36 except in reports from the U.S.S.R., where 50 is added to dd to indicate an unusually gusty wind. With the aid of such clues the readable part of the report may be decoded, though if it can be established that the first group, containing the station number iii, is missing, it is usually not worth while spending any more time on the report. Missing data that would be reported as a rule, should be plotted as a small x unless another method is prescribed in the following chapters.

2.4. Errors and omissions apart, decoding presents little ambiguity, though care is needed to avoid mistaking a group of the form 99ppp following the $T_dT_d$app group for a special phenomena group. The form 99ppp appears only when pp is coded 99, and ppp is then the barometric tendency in tenths of a millibar. Also identification of the time group in SHIP reports may not be immediately obvious (see 7.3.4.).

2.5. The first group in a synoptic report may consist of either a 5-figure number IIiii or a 3-figure number iii, II being the block number defining an area on the chart in which iii, the station index number, is situated. Generally if the number has three figures only, the report refers to a U.K. station. These station identification groups are made obvious by being transmitted always at the beginning of a new line, and the end of the report is signified thus =. In territorial, sub-regional or regional collective broadcasts, only the first six groups of the SYNOP code are normally given, but the group 7RRjj is included in the European Region at 0600, 1200, 1800 and 0000 GMT, and a supplementary group $2\Gamma_g T_g Es$ is given for a few stations at 0600 or 0900 GMT. Various drop-out groups may be included in some reports but not in others, and special vigilance is needed therefore to identify these and possibly also groups of the form 99ppp (see **2.4.**).

2.6. In teleprinter broadcasts, all groups of the SYNOP code may appear as well as up to four 8-groups and a number of 9-groups. The solidus, /, is used to indicate missing figures.

2.7. Values of temperature and dew-point are plotted in degrees Celsius on charts prepared in British meteorological offices. Wind speeds are reported in knots except for the following countries which report in metres

per second:* German Democratic Republic, Czechoslovakia, Hungary, Poland, Romania, Bulgaria, the U.S.S.R. and China, i.e. certain numbers in block 10, 400 and above in block 11, blocks 12, 15, 20–39 and 50–59. When wind speeds for stations in these countries are plotted the numerical value of 'ff' is doubled to convert it to knots.

Units employed for pressure and tendency (tenths of a millibar) and rainfall (millimetres) are the same for all countries, but either British or metric units may be used for some other elements, e.g. cloud height and visibility. Where there is duplication of units, relevant code tables in *Handbook of weather messages*, Part II, provide a decode in both. Stations report temperatures below −50°C by subtracting 50 from the numerical value.

2.8. Time groups when included should be checked to ensure that the information is plotted on the correct chart.

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* This applies to all meteorological reports (i.e. METAR, SHIP, TEMP, PILOT etc.).

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CHAPTER 3

3. Plotting SYNOP and SYRED reports

3.1. Symbolic form

3.1.1. *SYNOP FM 11-V*

$M_iM_iM_jM_j$ YYGG
IIiii Nddff VVwwW PPPTT $N_hC_LhC_MC_H$ $T_dT_dj_aj_pj_p$ ($6P_oP_oP_oP_o$) (7RRJJ)
($8N_sCh_sh_s$) ($9S_pS_ps_ps_p$) (MONT N′C′H′H′C_t) (supplementary information)

3.1.2. *SYRED*

(GGgg)
iii Nddff VVwwW $8N_sCh_sh_s$ ($OTTT_dT_d$) (supplementary information)

3.2. Plotting model

SYNOP

C_H
N_s/h_sh_s
C_M
N_s/h_sh_s
or
TT N_h/h PPP
VV ww (N) ppa or ppa
T_dT_d C_L W
N_s/h_sh_s
or
N_h/h (only when there is no 8-group)

SYRED

C
N_s/h_sh_s
C
TT N_s/h_sh_s
VV ww (N)
T_dT_d C W
N_s/h_sh_s

3.3. Plotting instructions

3.3.1. *Plotting model.* The technique of plotting is based on a plotting model reproduced above, where the positions of the figures or symbols to be plotted, in relation to the station circle (shown near the centre of the model), are indicated by corresponding letter symbols.

3.3.1.1. With the exception of wind direction and speed (see 3.3.4. and 3.3.4.4.) it is the general practice for all figures and symbols to be plotted parallel to the top and bottom edges of the working chart whilst retaining their positions relative to the station circle as illustrated in Figure 3.1. An exception is made in the case of circumpolar charts, where it is found more convenient to plot parallel to the lines of latitude. Some examples of plotting are shown on pp. 3–10 and 11 (Figures 3.1 and 3.2).

3.3.2. *Locating the station.* Before beginning to plot it is necessary to locate the station on the chart. On Meteorological Office charts the positions of stations are indicated by circles with the national index number, iii, printed alongside. The block number, II, is printed (enclosed in a square) somewhere near the middle of the area to which that block number applies. The boundaries of block areas are shown by pecked lines; in most cases these coincide with national frontiers.

3.3.3. *Use of colour.* International agreements provide for the use of either one or two colours in plotting synoptic data. Meteorological Office practice is to use two colours, red and black, for plotting on working charts, allocated as follows:

Black for total cloud amount, wind direction, wind speed, present weather, weather in past hour, pressure, temperature, form, amount and height of low cloud, form, amount and height of medium cloud, characteristic of barometric tendency (0, 1, 3) and barometric tendency* (positive or zero). (In the case of high-level stations, however, wind direction, wind speed, pressure and temperature are plotted in red.)

Red for dew-point, visibility, past weather, form, amount and height of high cloud, characteristic of barometric tendency (5, 6, 8), barometric tendency* (negative or zero) and nephoscope reports.

3.3.3.1. Some charts, e.g. for facsimile transmission, are plotted in one colour and therefore require additional symbols for the characteristic of barometric tendency. Code figures 2 and 7 are represented by ⁄ and ╲ respectively.

3.3.4. Wind direction is plotted in the form of an arrow shaft which leads from the direction 'dd' towards the centre of the station circle and is terminated at the circle's circumference. Wind direction is invariably plotted relative to the chart meridian. As an aid to plotting, the 360 degrees should first be mentally divided into the four quadrants, giving the directions 90°(east), 180°(south), 270°(west) and 360°(north). Division of each quadrant into thirds gives the intermediate directions (starting from north): 30°, 60°, 120°, 150°, 210°, 240°, 300° and 330°. Further subdivision by three gives the directions at intervals of 10 degrees, as reported in the message.

3.3.4.1. When data are missing, a rectangular frame is drawn enclosing the letter D followed by the value of ff when dd is missing, and the letters DF when both direction and speed are missing (see Table 3.I).

3.3.4.2. When plotting wind directions at stations within one degree of the North or South Pole, the *Handbook of weather messages*, Part II, p. 2–27, should be consulted.

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* See also 3.3.14 and 3.3.15.

3.3.4.3. A wind direction coded as 99, meaning variable, is plotted as a westerly with a cross on the shaft, and wind speed is plotted as usual. U.S.S.R. stations add 50 to the wind direction to indicate gustiness, but this phenomenon is not plotted.

3.3.4.4. The surface wind speed, ff, is represented on charts by feathers and solid pennants, with the full feathers representing 10 knots, the half feathers representing 5 knots and the solid pennants representing 50 knots. The feathers should be at an angle of approximately 120° from the wind shaft, and pennants should be triangles with their base on the wind shaft, as shown in Table 3.I. The feathers are put on the left-hand side as one faces downwind in the northern hemisphere and on the right-hand side as one faces downwind in the southern hemisphere. A calm is represented by a circle surrounding the station circle and concentric with it. If the wind direction is given but the wind speed is missing the shaft of the wind arrow is plotted in accordance with dd and an x is entered at the end of the wind shaft. The entry to be made when the wind speed is available but wind direction is missing is Dff, and when both wind speed and direction are missing, DF, each plotted within a rectangular frame (see Table 3.I).

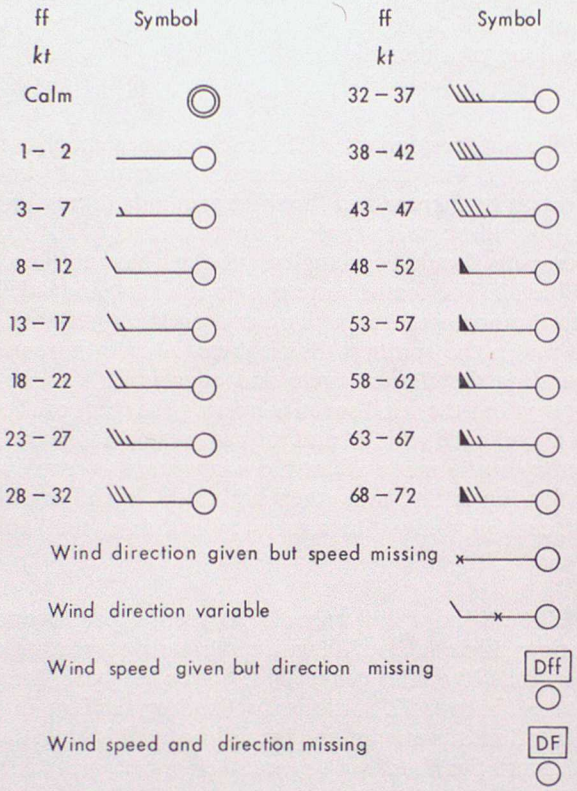
3.3.4.5. If the wind speed exceeds 20 metres per second at certain U.S.S.R. stations, ff is coded as 77, whilst at certain other stations, when the wind speed exceeds 40 metres per second, ff is coded as 88. Maximum gusts may be reported from U.K. stations, prefixed by GST or in Q code, e.g. GST (or QNT) 53 means maximum gust 53 knots. This is plotted as received (see Figure 3.I and the *Handbook of weather messages*, Part III. p. 1–22).

3.3.4.6. In plotting, the wind arrow should be inserted first to allow for any necessary displacements of the other elements from the plotting positions shown in the model. Some examples of plotting with different wind directions are shown in Figure 3.1.

3.3.5. Symbols as reproduced in Tables 3.I, 3.II and 3.III are used for plotting the following elements:

ddff—wind velocity (Table 3.I)
N—total amount of cloud (Table 3.II)
ww—present weather (Table 3.III)
W—past weather (Table 3.II)
C_L—form of low cloud (Table 3.II)
C_M—form of medium cloud (Table 3.II)
C_H—form of high cloud (Table 3.II)
a—characteristic of barometric tendency (Table 3.II) (see 3.3.14.1.)
E—state of ground (Table 3.II) (on supplementary charts)
C—type of cloud (Table 3.II).

TABLE 3.I—SYMBOLS FOR WIND SPEED



3.3.6. Figures as given in the coded message are used for plotting the following elements:

VV—visibility (see 3.3.7)
PPP—pressure
TT—temperature
N_h—amount of low cloud
h—height of low cloud
T_dT_d—dew-point
pp—barometric tendency (see 3.3.15.1.)
N_s—amount of cloud layer or mass
h_sh_s—height of cloud layer or mass.

3.3.7. *Visibility* code figures are plotted in red to the left of the symbol for ww. When the visibility is less than 100 metres, coded as 00, it is the British practice to add the actual visibility at the end of the coded message. For example, 'FOG 40' at the end of the message means that the visibility is 40 metres. If required, this can be plotted as F40 instead of the VV code figures.

TABLE 3.II—SYMBOLS FOR CLOUD, PAST WEATHER, STATE OF GROUND AND CHARACTERISTIC OF BAROMETER TENDENCY

Code figure	N	W	C_L	C_M	C_H	C	E	a
0	○	○				→	□	↗
1	◔	◑	⌒	∠	→	/	⊡	/
2	◔	◐	⌒	∠	→	/	⁘	
3	◑	S / ↑	⌒	∪	→	∪	⊟	✓
4	◑	≡	⌒	∽	/	∠	≋	
5	◕	,	∽	∽	⌐	◿	⁎	↘
6	◕	•	—	✕	/	⊰	⁎	↘
7	◐	*	---	∽	⌐	--	⁎	
8	●	▽	⌒	M	—	⌒	⁎↓ / S	↖
9	⊗	◹	⌒	∽	∽	⌒	⁎↓ / S	
/	⊗							

3.3.8. *Present weather*. Presentation of this symbol, just left of the station circle, is shown in Table 3.III amplified by the following:

(a) 00, 01, 02, 03. The circle shown in the Table is the station circle. The short lines touching the circle may be displaced slightly clockwise if necessary to avoid coincidence with the wind shaft. Symbols for 01, 02, 03 and 05 are normally omitted in U.K. offices.

(b) 07. The alternatives refer to a land station (sand or dust symbol) and a sea or coastal station (wave symbol for spray).

(c) 09, 16, 40. The brackets ( ) are part of the symbol and are included in the plot.

(d) 20 to 29, 91 to 94. The square bracket is in these cases part of the symbol to be plotted as it indicates the occurrence of weather in the hour preceding the time of observation.

(e) 93, 94. The hail and snow symbols are alternatives. The hail symbol is plotted if hail is reported by a 9-group or the word HAIL is added to the report. In case of doubt both symbols are plotted.

TABLE 3.III—PRESENT-WEATHER SYMBOLS

ww	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

(f) 95, 97. The rain and snow symbols are alternatives, and the temperatures will aid the choice. In case of doubt both symbols are plotted.

(g) The rain symbol is a dot about a millimetre in diameter.

(h) The drizzle symbol is a comma whose dot is about half a millimetre in diameter.

(i) The hail symbol is an equilateral triangle.

(j) The shower symbol is an isosceles triangle with the smaller angle at the lowest point.

3.3.9. *Past weather* is plotted in red to the right of the symbol for C_L by use of symbols shown in Table 3.II.

In code figure 3, the symbol for a sandstorm and that for a storm of drifting snow are alternatives. The locality of the station and the reported temperature will normally indicate which symbol should be used. When a sandstorm occurs with a temperature below freezing point, the word SANDSTORM may be added to the message. In case of doubt, both

symbols are plotted. If, with code figure 8 or 9, the words PAST HAIL, SNOW or SLEET are added to the message, the appropriate symbol for hail, snow or sleet is entered above the symbol for W.

If a sequence of phenomena is reported for past weather (through W and special-phenomena groups) the sequence is entered from left to right in order of occurrence.

3.3.10. *Barometric pressure* at mean sea level is plotted as received in black to the right of the symbol for C_M. Some high-level stations report a higher standard-level pressure, and this is plotted in red.

3.3.11. *Temperature* is plotted in whole degrees Celsius in black to the left of the symbol for C_M. Negative values (obtained, when appropriate, by subtracting 50 from TT) are preceded by a minus sign.

3.3.12. *Cloud.* There are two groups in the SYNOP code form for reporting cloud data. The fifth group, $N_hC_LhC_MC_H$, gives essential information about clouds for synoptic purposes while the group (or groups) $8N_sCh_sh_s$ provides amplifying information about cloud which is important for aviation purposes.

3.3.12.1. Depending on the information the user requires from a plotted chart, the fifth group may be used or, if more detailed information is needed, the fifth group combined with the 8-group or groups. In the SYNOP plotting model (see **3.2.**) provision is therefore made for plotting either $N_hC_LhC_MC_H$ alone or combined with 8-groups.

3.3.12.2. The following rules apply when plotting $N_hC_LhC_MC_H$ (see Table 3.II):

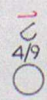
(a) C_L is plotted as a symbol below the station circle in black.
(b) C_M is plotted as a symbol above the station circle in black.
(c) C_H is plotted as a symbol above C_M in red.
(d) If $N_h=0$, $h=9$, N_h and h are not plotted.
(e) If $N_h=1$ to 8, $h=0$ to 8, N_h and h are plotted in black immediately below the C_L symbol, or the station circle when there is no C_L symbol,

e.g.

2553/ as 

and 8042/ as 

(f) If $N_h=1$ to 8, $h=9$, N_h and h are plotted immediately below the C_M symbol, e.g.

40941 as 

and 20977 as 

(g) If $N_h=9$, $h=/$, N_h and h are not plotted.

3.3.12.3. The following rules apply when plotting $N_hC_LhC_MC_H$ combined with the 8-groups ($8N_sCh_sh_s$):

(a) C_L, C_M and C_H symbols are plotted.

(b) If $h_sh_s = 57$ or less, C=6, 7, 8 or 9, N_s and h_sh_s are plotted in black below the C_L symbol, e.g.

88635 as 

(c) If $h_sh_s = 57$ or less, C=3, 4 or 5, N_s and h_sh_s are plotted in black below the station circle when no C_L symbol is present, e.g.

88510 as 

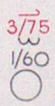
When C_L is present, N_s and h_sh_s are plotted below the C_M symbol in black, e.g.

83708 88510 as 

(d) If $h_sh_s = 58$ or more, C=3, 4 or 5, N_s and h_sh_s are plotted in black below the C_M symbol, e.g.

84360 as 

(e) If C=0, 1 or 2, N_s and h_sh_s are plotted in red below the C_H symbol, e.g.

81360 83075 as 

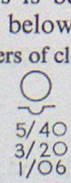
(f) If C=/ and N_s=9, N_s and h_sh_s (the vertical visibility in this case) are plotted in black below the station circle, e.g.

89/01 as 

(g) If C=/, N_s=9 and h_sh_s=//, they are not plotted.

(h) If a second type of cloud of genera C_L is reported by an 8-group when C_L=9, this second type is entered above or below the symbol for cumulonimbus according to whether its base is above or below the base of the cumulonimbus.

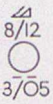
(i) If, when C_L=8, it is known by means of 8-groups that the base of the stratocumulus is below that of the cumulus, the stratocumulus symbol is entered below the cumulus symbol.

Note: When several layers of cloud are reported, they should be plotted in descending order of height, e.g.: 

3.3.12.4. SYRED reports (see **3.1.** and **3.2.**) include the 8-groups but no groups of the form $N_hC_LhC_MC_H$. When these reports are plotted, the N_s/h_sh_s rules in paragraph 3.3.12.3. apply but symbols corresponding to C (Table 3.II) are plotted as appropriate in the positions for C_L, C_M or C_H, e.g.

88630 as 

81815 84365 as 

and 83705 88512 as 

3.3.12.5. MONT. C′ is plotted in the lowest C_L position. N′ is plotted as usual beneath C′ but H′H′ is preceded by the word TOP. C_t is not plotted, e.g.

MONT 47103 

3.3.13. *Dew-point* is entered in whole degrees, in red, immediately to the left of the symbol for C_L. Negative values, obtained when appropriate by subtracting 50 from T_dT_d, are preceded by a minus sign.

3.3.14. *Characteristic of barometric tendency* is plotted as a symbol (taken from Table 3.II) to the right of pp, in black for values 0, 1 and 3, and in red for values 5, 6 and 8. No symbol is plotted when the characteristic is 2, 4 or 7, except in monochromatic plotting when 2 is plotted thus ／ and 7 thus ＼.

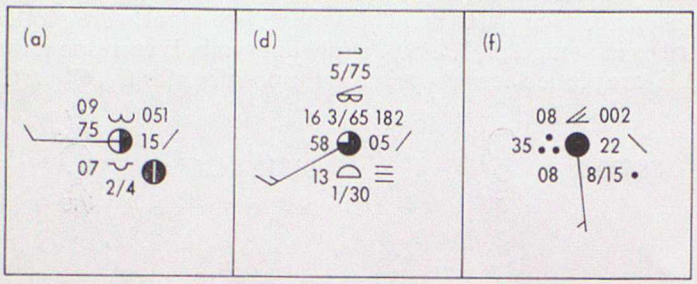
3.3.14.1. This element is j_a in the symbolic form and is symbolized as 'a' in the United Kingdom. When $j_a=9$, pp (see 3.3.15.) refers to elements included by regional agreement (see *Handbook of weather messages*, Part II, p. 1–6).

3.3.15. *Barometric tendency*, pp, is entered in tenths of a millibar as received, to the right of the station circle, in black if the characteristic (see 3.3.14.) is 0, 1, 2, 3 or 4 and in red if 5, 6, 7 or 8. If pp is 99, $T_dT_d$app is followed immediately by 99ppp, giving the tendency ppp in tenths of a millibar, which is plotted instead of pp.

3.3.15.1. This element is j_pj_p in the symbolic form and is symbolized as pp in the United Kingdom (but see *Handbook of weather messages*, Part II, p. 1–6 if $j_a=9$).

3.3.16. *The 9-group.* Although it is not practicable to provide for symbolic representation of all the detailed information provided by the 9-group, the appropriate symbols may be plotted in cases where the 9-group amplifies the present-weather or past-weather figures. For example, if the group 99718 is reported the snow symbol should be inserted above the shower symbol in W=8. If 99713 is reported, with temperature below freezing point, W=3 is plotted as a duststorm and not as a storm of drifting snow.

Monochromatic



Polychromatic

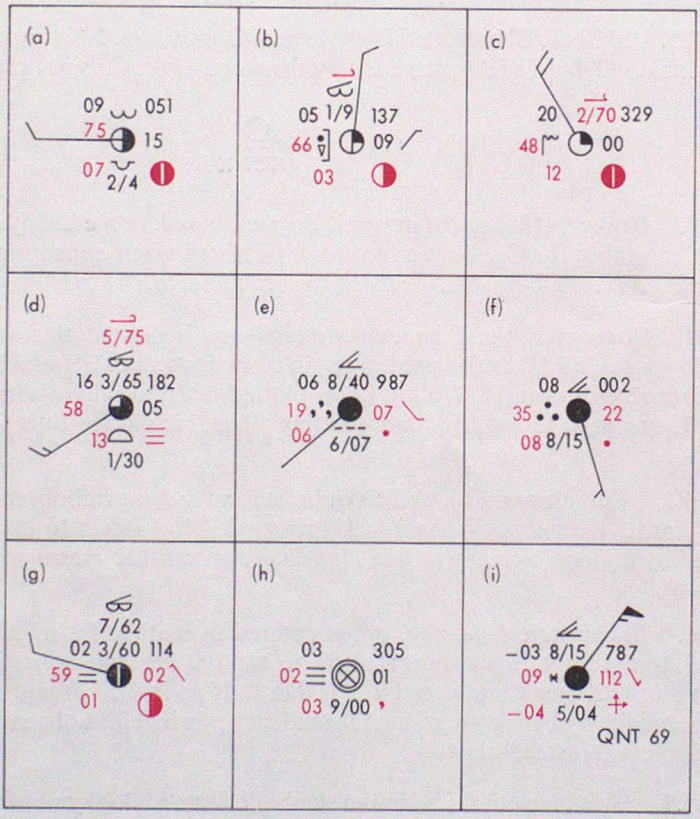


FIGURE 3.1—SYNOP REPORTS PLOTTED

3.3.17. *Examples* (see Figures 3.1. and 3.2.).

Examples plotted from:

No 8-groups

(a) 52712 75032 05109 25430 07215
(b) 30108 66251 13705 10951 03109

With 8-groups

(c)	23319	48042	32920	00908	12400	82270			
(d)	62414	58054	18216	11671	13205	81830	83365	85075	
(e)	82302	19536	98706	6732/	06607	86707	88540		
(f)	81706	35636	00208	8042/	08722	88515			
(g)	72811	59101	11402	7097/	01802	83360	87462		
(h)	90000	02455	30503	9////	03201	89/00			
(i)	80357	09703	78753	5722/	54599	99112	85704	88515	91169

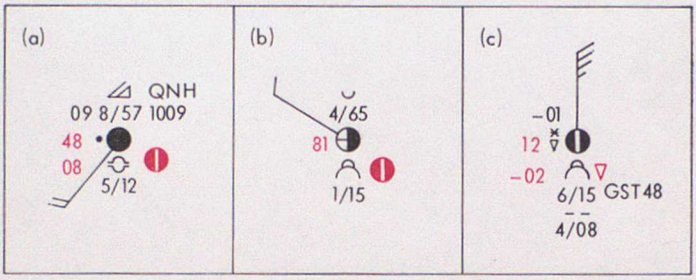


FIGURE 3.2—SYRED REPORTS PLOTTED

Examples plotted from:

(a)	82119	48602	85612	88557	00908	QNH	1009
(b)	53012	81022	81815	84365			
(c)	73636	12858	84708	86815	05152	GST	48

GUIDE TO PLOTTING PROCEDURES

CHAPTER 4

4. Plotting automatic land station reports

4.1. Symbolic form

4.1.1. *FM* 14-*V*

$M_iM_iM_jM_j$ YYGGi_u
IIiii s_ti_RNVh 0ddff 1wwWW $2s_n$TTT
$3s_nT_dT_dT_d$ $4P_oP_oP_oP_o$ 5PPPP $6ap_vp_vp_v$
7RRRt_R $8N_hC_LC_MC_H$

4.2. Plotting model

C_H
C_M
TT·T N_h/h PPP
9V ww (N) $p_vp_vp_v$ or $p_vp_vp_v$
T_dT_d·T_d C_L WW
N_h/h

4.3. Plotting instructions

Automatic land station reports are plotted in the same way and with the same rules as SYNOP and SYRED except as indicated in the following paragraphs.

4.3.1. The symbol i_u, if 0, indicates that units used are m/s and, if 1, that knots are used.

4.3.2. If $s_t = 3$, meaning that wwWW are not measured, these elements are plotted as a black and red dash respectively.

4.3.3. The symbol V gives the horizontal visibility in Code 4300 (*Handbook of weather messages*, Part II, p. 7–9) and is plotted in red, as received, but preceded by the figure 9.

4.3.4. The symbol ww is plotted by using Table 4.I.

4.3.5. The symbol WW is plotted by using Table 4.II.

4.3.6. The symbol s_n, if 0, indicates that TTT is positive or zero and, if 1, that TTT is negative and is plotted with a minus sign.

4.3.8. The remarks regarding temperature relate similarly to dew-point temperature.

TABLE 4.I—PRESENT-WEATHER SYMBOLS FOR AUTOMATIC WEATHER STATION CODES

ww	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

4.3.8.1. The group $3s_nT_dT_dT_d$ may be replaced by 39UUU, the relative humidity of the air, and T_dT_d. T_d is obtained from standard tables.

4.3.9. PPPP is plotted omitting the first digit.

4.3.10. $p_vp_vp_v$ is plotted, omitting the first digit when it is zero, only when the characteristic 'a' is 2 or 7.

TABLE 4.II—PAST-WEATHER SYMBOLS FOR AUTOMATIC WEATHER STATION CODES

WW	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

GUIDE TO PLOTTING PROCEDURES

CHAPTER 5

5. Plotting METAR and SPECI reports

5.1. Symbolic form

5.1.1. *FM* 15-*V*

METAR GGgg

CCCC dddff/$f_m f_m$ { VVVV [$RV_RV_RV_RV_R/D_RD_R$] w'w' [$N_sCCh_sh_sh_s$] or CAVOK

($T'T'/T'_dT'_d$) ($P_HP_HP_HP_H$)

{ TTTTT GGggHR dddff/$f_m f_m$ { VVVV w'w' [$N_sCCh_sh_sh_s$] or CAVOK
or NOSIG

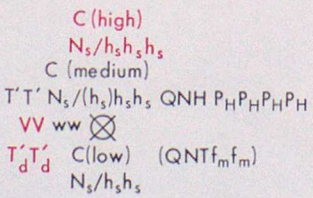
5.1.2. *FM* 16-*V*

SPECI GGgg

CCCC dddff/$f_m f_m$ { VVVV [$RV_RV_RV_RV_R/D_RD_R$] w'w' [$N_sCCh_sh_sh_s$] or CAVOK

{ TTTTT GGggHR dddff/$f_m f_m$ { VVVV w'w' [$N_sCCh_sh_sh_s$] or CAVOK
or NOSIG

5.2. Plotting model



5.3. Plotting instructions

5.3.1. GGgg. As METAR reports are made half-hourly in the United Kingdom it is important to confirm that GGgg is near the time of the chart. SPECI may require to have GGgg plotted if it differs by more than 10 minutes from the chart time.

5.3.2. CCCC. This group gives the station location in ICAO letter code.

5.3.3. f_mf_m. This is plotted as QNT f_mf_m.

5.3.4. VVVV. Up to 5000 m, the first two figures are plotted.
From 6000 to 9000 m, the equivalent VV code (*Handbook of weather messages*, Part II, p. 1–31) is plotted.
If 9999, then '59' is plotted.

5.3.5. w'w'. The code figures are plotted in the symbols given in the ww code (Table 3.III).

5.3.5.1. VVww is replaced by CAVOK when reported.

5.3.6. *Cloud*

5.3.6.1. $N_s/h_sh_sh_s$ is plotted as for SYRED reports (see 3.3.12.3.) by taking account of $h_sh_sh_s$ equivalences with h_sh_s values quoted in the rules. When the first figure of $h_sh_sh_s$ is zero only the next two figures are plotted (i.e. hundreds of feet).

5.3.6.2. CC is reported as a two-letter abbreviation of cloud genus (*Handbook of weather messages*, Part II, p. 1–40) and is plotted with appropriate symbols from the C code (Table 3.II).

5.3.6.3. To indicate that the total amount of cloud (N) is not known, a cross is entered in black through the station circle as when N = / (see Table 3.II).

5.3.7. *Temperature and dew-point* are plotted as in SYNOP (see 3.3.11.) but negative values are indicated in the report with an M.

5.3.8. $P_HP_HP_HP_H$ is plotted as reported, preceded by the letters QNH, but, if zero, the first P_H is not plotted.

5.3.9. TTTTT and subsequent groups are not plotted.

GUIDE TO PLOTTING PROCEDURES

CHAPTER 6

6. Plotting AUTOB, FISOB, MOWOB and POLOB reports

6.1. Symbolic form

AUTOB/FISOB/MOWOB/POLOB NAME OF TOWN OR COMPOUND YYGGgg STATE OF SKY WEATHER VISIBILITY TEMPERATURE(S) STATE OF ROADS.

6.2. Plotting model

GGgg
DB/RST
Vis Wx (S)
DP [R]

6.3. Plotting instructions

6.3.1. YYGGgg. YY is the day of the month. GGgg is the *clock time* of the observation and must be converted to GMT if different.

6.3.2. *State of sky* (S) is one of four words and is plotted within the station circle by using Table 6.I.

6.3.3. *State of roads* (R) is plotted inside a square, from Table 6.I.

TABLE 6.I—SYMBOLS FOR STATE OF SKY AND ROADS FOR AUTOB, ETC. REPORTS

STATE OF			
SKY (S)		ROADS (R)	
CLEAR	◔	DRY	□
FAIR	◑	WET	⊡
CLOUDY	●	ICY	⊟
OBSCURED	⊗	SNOW LYING	⊠

6.3.4. *Weather* (Wx in the model) is reported in plain language and the symbols to be plotted are given in Table 6.II.

6.3.5. *Visibility* is reported in general terms and is plotted from Table 6.III.

TABLE 6.II—WEATHER SYMBOLS FOR AUTOB, ETC. REPORTS

WEATHER

	SLIGHT	MODERATE	HEAVY
RAIN	•	⁘	⁘
SNOW	*	✱	✱
SLEET	⁘	✱	
HAIL	△	▲	
THUNDER	℞	℞	

TABLE 6.III—VISIBILITY SYMBOLS FOR AUTOB, ETC. REPORTS

VISIBILITY

FOG <200 yd	(e.g.)F80 ≡
FOG	01 ≡
POOR	05 ≡
MODERATE	22
GOOD	> 35

Provision is made for plotting FOG with no qualifying value, but if FOG is reported with a distance, this is plotted preceded by F.

6.3.6. *Temperatures* are reported in the sequence dry bulb (DB), wet bulb, screen minimum, road surface (RST), with negative values preceded by M. The dew-point (DP) is obtained from standard tables, and DB, RST and DP are plotted to the nearest whole degree Celsius.

GUIDE TO PLOTTING PROCEDURES

CHAPTER 7

7. Plotting SHIP and SHRED reports

7.1. Symbolic form

7.1.1. *SHIP FM 21-V*

$M_iM_iM_jM_j$
$99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $YYGGi_w$ Nddff $VVwwW$ $PPPTT$ $N_hC_LhC_MC_H$ $D_sv_s$app (7RRjj) ($8N_sCh_sh_s$) ($9S_pS_ps_ps_p$) ($0T_sT_sT_dT_d$) ($1T_wT_wT_wt_T$) ($2I_sE_sE_sR_s$) ($3P_wP_wH_wH_w$ ($d_wd_wP_wH_wH_w$)) (ICE followed by plain language or $c_2KD_i$re) (supplementary information).

7.1.2. *SHIP FM 22-V*

$M_iM_iM_jM_j$
$99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $YYGGi_w$ Nddff $VVwwW$ $PPPTT$ $N_hC_LhC_MC_H$ (D_sv_s///) ($2I_sE_sE_sR_s$) (ICE followed by plain language or $c_2KD_i$re) (supplementary information).

7.1.3. *FM 23-V*

$M_iM_iM_jM_j$
SHRED
$99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $YYGGi_w$ Nddff $VVwwW$ PP/TT (D_sv_s///) ($2I_sE_sE_sR_s$) (ICE followed by plain language or $c_2KD_i$re) (supplementary information).

7.2. Plotting model

SHIP FM 21-V

C_H
N_s/h_sh_s
C_M
N_s/h_sh_s
or
TT(-t_T) N_h/h PPP
VVww (N) ppa
or ppa
T_dT_d C_L W
T_wT_w-T_w N_s/h_sh_s D_sv_s
or or $P_wP_wH_wH_w$
T_sT_s N_h/h $d_wd_wP_wH_wH_w$
(only when there is no 8-group)

SHIP FM 22-V

C_H
C_M
TT N_h/h PPP
VVww (N)
C_L W
N_h/h D_sv_s

SHRED FM 23-V

TT PP-
VVww (N)
W
D_sv_s

7.3. Plotting instructions

7.3.1. The plotting model and the method and rules for plotting are basically similar to those applying to SYNOP reports (see **3.3.**). Departures from the SYNOP treatment are detailed below.

7.3.2. A radio call sign identifying the ship precedes the report, and is plotted in black adjacent to its plotted observation.

7.3.3. *Locating the position.* The latitude and longitude indicate the ship's position, which in the northern hemisphere is west of the Greenwich meridian when Q_c is 7 and east when Q_c is 1. The station circle, about 3 mm in diameter and with its centre at the ship's position, is drawn in black. In the southern hemisphere when Q_c is 3 it indicates east and when 5, west of Greenwich.

7.3.4. GG. To identify the time of observation it may be necessary to subtract 30 or 60 from the reported GG, as follows:

7.3.4.1. Subtract 30 in FM 21-V when $D_s v_s$app is not reported and in FM 23-V when PP/TT is not reported.

7.3.4.2. Subtract 60 in FM 21-V when $N_h C_L h C_M C_H$ and $D_s v_s$app are not reported.

7.3.5. Wind speeds are usually knots but if i_w is 0 or 1 the report is in m/s which are multiplied by 2 to convert to knots before plotting.

7.3.6. $D_s v_s$, the course and average speed made good, are plotted in black by means of an arrow pointing in the direction towards which the ship is moving, with v_s written as received at the arrow head. Stationary ships report 00, which is not plotted.

7.3.7. *Sea temperature.* When $1T_wT_wT_wt_T$ is reported, $T_wT_w \cdot T_w$ is the appropriate plot.

7.3.7.1. An alternative is provided in T_sT_s (the difference between air and sea temperature in half-degrees Celsius). If this is reported as less than 50, it is halved and subtracted from TT to obtain the appropriate plot. If it is reported as greater than 50, indicating that the sea is warmer than the air, 50 is first subtracted, and half the remainder is added to TT. In both cases the plot is in whole degrees with any halves rounded to the nearest odd number.

7.3.8. *Wave formation*

7.3.8.1. Wind waves, $P_wP_wH_wH_w$, whose direction is indicated by the surface wind, are plotted as received in black.

7.3.8.2. Swell waves, $d_wd_wP_wH_wH_w$ are plotted in black with a wavy arrow directed away from their source. d_wd_w gives the direction, and $P_wH_wH_w$ the period and height, which are plotted as received in a convenient position close to the arrow.

If d_wd_w is 00 the arrow is north–south without a head.

If d_wd_w is 99, crossed arrows are drawn, one south-west–north-east and the other south-east–north-west.

When there are no swell waves ($d_wd_wP_wH_wH_w = 00/00$) $P_wH_wH_w$ are not plotted.

If d_wd_w is missing, but $P_wH_wH_w$ are reported, the arrows are crossed as for $d_wd_w = 99$ but the arrow heads are omitted. If P_w also is missing, the plot alongside the arrows is xH_wH_w.

When there is a second swell system, this is plotted beneath the first.

7.3.9. Coded examples of ship's reports follow, illustrating points from the preceding paragraphs. Groups of special interest are printed in bold type, and the plotted examples appear in Figure 7.1.

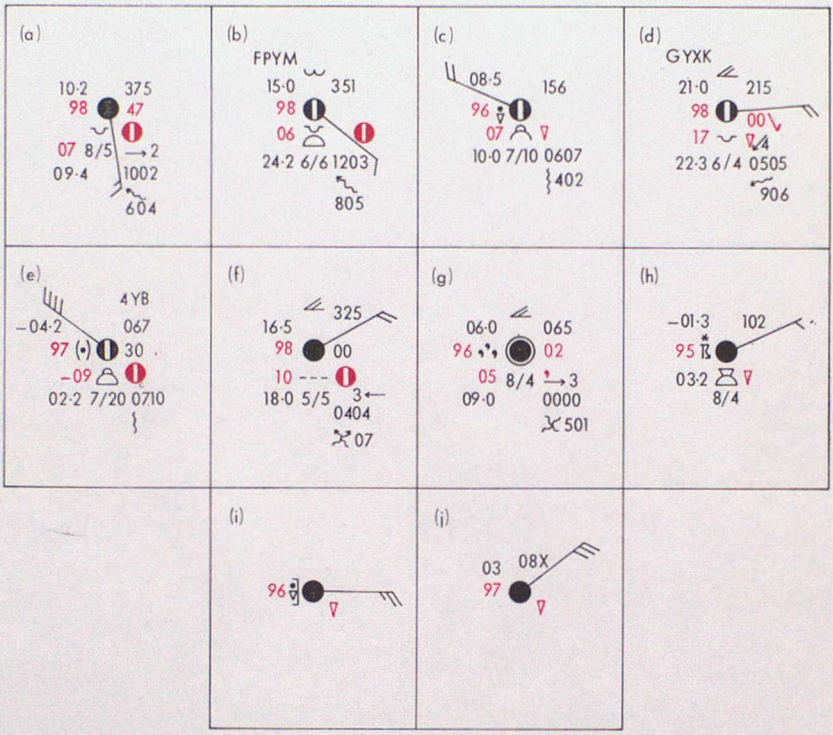


FIGURE 7.1—EXAMPLES OF PLOTTED SHIP REPORTS

FM 21-V is shown in (a)–(g), FM 22-V in (h) and FM 23-V in (i) and (j).

SHIP FM 21-V

(a)	99405	70699	**24121**	81707	98032	37510	855//	22747	**00107**
	10942	31002	11604						
(b) FPYM	99370	70700	**24421**	71306	98022	35115	68630	**06806**	**12420**
	31203	11805							
(c)	99551	10052	**24723**	72918	96808	15608	784//	87810	**05307**
	11005	30607	**00402**						
(d) GYXK	99288	70658	24123	70820	98018	21521	56420	54500	0//17
	12230	30505	08906						
(e) 4YB	99564	70509	24124	73041	97162	06754	72500	00230	87820
	0//59	10222	30710	**00/00**					
(f)	99326	70552	24123	80618	98032	32516	57520	63400	**05310**
	11805	30404	**99/07**						
(g)	99462	71242	24114	80000	96535	06506	**8042/**	23702	0//05
	10900	30000	//**501**						

SHIP FM 22-V

(h)	99648	74012	24123	80705	**95958**	**10251**	894//	10323

SHRED FM 23-V

(i)	99635	70165	**24423**	80924	96258	
(j)	99664	70254	24123	80530	97038	**08/03**

GUIDE TO PLOTTING PROCEDURES

CHAPTER 8

8. Plotting automatic sea station reports

8.1. Symbolic form

8.1.1. *FM* 24-*V*

$M_iM_iM_jM_j$
$YYGGi_u$ $D_sv_sL_aL_aL_a$ $Q_cL_oL_oL_oL_o$ s_ti_RNVh 0ddff 1wwWW $2s_nTTT$ $(3s_nT_dT_dT_d)$ 5PPPP $(6ap_vp_vp_v)$ $(7RRRt_R)$ $(8N_hC_LC_MC_H)$ $(9I_sE_sE_sR_s)$ $(s_nT_wT_wT_wn_w)$ $P_wP_wH_wH_wP_w$ $P_wH_wH_wd_wd_w$ $(P_wP_wH_wd_wd_w)$ CCCC

8.2. Plotting model

C_H
C_M
$TT{\cdot}T\,N_h/h$ PPP
9V ww (N) $p_vp_vp_v$ or $p_vp_vp_v$
$T_dT_d{\cdot}T_d\ C_L$ WW
$T_wT_w{\cdot}T_w\,N_h/h$ $P_wP_wH_wH_w$
$d_wd_wP_wP_wH_wH_w$
$(d_wd_wP_wP_wH_w)$

8.3. Plotting instructions

Rules are the same as for automatic land stations (see **4.3.**) and for ship's reports (see **7.3.**), with the following additions.

8.3.1. The symbol i_u, if 0 or 2, indicates that units used are m/s and, if 1 or 3, that knots are used.

8.3.2. The symbol n_w indicates the number of wave groups that follow (but see *Handbook of weather messages*, Part II, Chapter 7), the first $P_wP_wH_wH_w$ being wind-wave data, which are plotted as usual. Exceptionally, if reported as $//H_wH_w/$ the plot is crossed headless arrows with xH_wH_w written adjacent, as in swell-wave data from ships (see 7.3.8.2.).

8.3.2.1. The final P_w of the wind-wave group commences the predominant swell-wave data, which has two figures H_wH_w for wave height. d_wd_w is plotted as usual, and $P_wP_wH_wH_w$ written, as received, alongside the wavy arrow(s).

8.3.3. CCCC is the station call sign and is plotted in black adjacent to its plotted observation.

GUIDE TO PLOTTING PROCEDURES

CHAPTER 9

9. Plotting light-vessel reports

9.1. Symbolic form

9.1.1. *British*

iii Nddff VVwwW $4TTT_1T_1$ ($1d'_wd'_wP'_wH'_w$) (PPP//) (PPPapp)

9.1.2. *Danish, including Faeroes and Greenland*

iii Nddff VVwwW PPPTT $N_hC_LhC_MC_H$ $OT_sT_sT_dT_d$ $5d_cd_cf_cf_c$

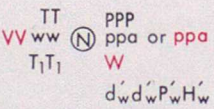
9.1.3. *Dutch*

IIiii Nddff VVwwW PPPTT $N_hC_LhC_MC_H$ $T_dT_d$app $3P_wP_wH_wH_w$ ($d_wd_wP_wH_wH_w$) $4T_zT_zT_z$/

9.1.4. *Swedish*: in SYNOP form (but see 9.3.5.).

9.2. Plotting model

British



The SHIP model (Chapter 7) is used for Danish, Dutch and German reports.

The SYNOP model (Chapter 3) is used for Swedish reports.

9.3. Plotting instructions

9.3.1. All of these reports are located by station number iii.

9.3.2. British reports are plotted to the model shown in paragraph 9.2. Wave data $d'_wd'_wP'_wH'_w$ are plotted by using the same rules as for swell waves in the SHIP code (see 7.3.8.2.), $d'_wd'_w$ having the same meaning as d_wd_w and $P'_wH'_w$ being written as received in a convenient position close to the arrow.

9.3.3. In Danish reports the group $5d_cd_cf_cf_c$ is not plotted.

9.3.4. In Dutch reports $T_zT_zT_z$ has the same meaning as $T_wT_wT_w$.

9.3.5. In Swedish reports a group $4St_xf_xf_x$ is added giving state of sea and maximum wind information. S, Code 3700, is defined in *Handbook of*

weather messages, Part II, Chapter 1, and is translated by using Table 9.I into its equivalent half-metre wave height which is plotted alongside crossed headless arrows as detailed in paragraph 7.3.8.2.; $t_x f_x f_x$ is not plotted.

TABLE 9.I—EQUIVALENTS FOR STATE OF SEA

State of sea S		Approximate mean height in half-metres
0	Calm (glassy)	00
1	Calm (rippled)	00
2	Smooth (wavelets)	01
3	Slight	02
4	Moderate	04
5	Rough	06
6	Very rough	10
7	High	15
8	Very high	20
9	Phenomenal	30

GUIDE TO PLOTTING PROCEDURES

CHAPTER 10

10. Plotting MARID reports

10.1. Symbolic form

MARID $GGL_aL_aL_a$ $L_oL_oL_oT_1T_1$ (Nddff VVwwW)

10.2. Plotting model

VV ww (N)
T_1T_1 GG W

10.3. Plotting instructions

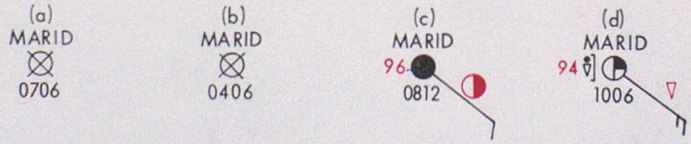
10.3.1. These reports are plotted on the chart of the most appropriate time.

10.3.2. The position is located by latitude and longitude, in degrees and tenths, with 500 added to $L_oL_oL_o$ to indicate west of Greenwich.

10.3.3. T_1T_1 is the sea surface temperature in degrees Celsius.

10.3.4. Nddff VVwwW, when reported, are plotted as in the model above (see also Chapter 3).

10.3.5. *Examples*



(a) MARID 06570 59507
(b) MARID 06510 01504
(c) MARID 12575 01708 81309 96021
(d) MARID 06505 51010 31515 94258

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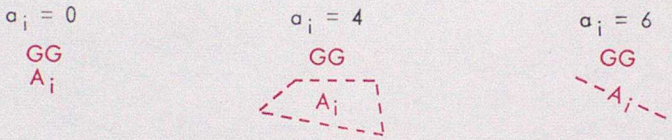
CHAPTER 11

11. Plotting SFLOC reports

11.1. Symbolic form

11.1.1. *FM* 82-*I*
SFLOC 66600/66655 $GGx_4a_iA_i$
$L_aL_aL_oL_ok$ .... $99x_4a_iA_i$ $L_aL_aL_oL_ok$ ....

11.2. Plotting model



11.3. Plotting instructions

11.3.1. These reports are plotted in red on the chart of most appropriate time.

11.3.2. The groups 66600 and 66655 are alternatives indicating the method used to locate the source, and are not plotted.

11.3.3. GG is plotted above the A_i symbol as indicated in the model above.

11.3.4. x_4 indicates the hemisphere, 0 for northern and 1 for southern.

11.3.5. $L_aL_aL_oL_o$ specify in whole degrees the latitude and longitude of the source.

11.3.5.1. k is the latitude and longitude half-degree indicator (see Code 2200 on p. 1–61 of *Handbook of weather messages*, Part II).

11.3.6. a_i determines the area covered by the occurrence.

11.3.6.1. When $a_i=0$, a point source is indicated and the lowest tip of the A_i symbol is plotted at the point located by $L_aL_aL_oL_ok$.

11.3.6.2. When $a_i=4$, an area is indicated and A_i is plotted inside the pecked lines joining points located by $L_aL_aL_oL_ok$.

11.3.6.3. When $a_i = 6$, a line is indicated and A_i is plotted in the middle of the pecked line terminated by $L_aL_aL_oL_ok$.

11.3.7. A_i plotting symbols are shown in Table 11.I.

11.3.8. 99 indicates that data relating to another source follow.

TABLE 11.I—PLOTTING SYMBOLS FOR SFLOC REPORTS

$A_i = 0$	1	2	3	4	5	6	7	8	9
									

GUIDE TO PLOTTING PROCEDURES

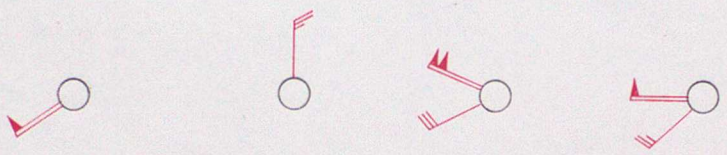
CHAPTER 12

12. Plotting NEPH reports

12.1. Symbolic form

12.1.1. NEPH GGgg iii $Cddv_rv_r$ .....

12.2. Plotting model (See Figure 12.1.)



(a) (b) (c) (d)

FIGURE 12.1—EXAMPLES OF PLOTTED NEPH REPORTS

(a) NEPH 02310
(b) NEPH 33609
(c) NEPH 32510 03020
(d) NEPH 32308 02710

12.3. Plotting instructions

12.3.1. These cloud-movement winds are plotted in red on surface charts, unless upper-air charts are available for an epoch within two hours of the time of observation. In the latter case, reports relating to medium cloud (C=3, 4 or 5) are plotted on the 500-mb chart and those relating to high cloud (C=0, 1 or 2) on the 300-mb chart.

12.3.2. Medium-cloud reports (C=3, 4 or 5) are plotted with a single line indicating direction (dd in tens of degrees), and speed in knots obtained by multiplying v_rv_r by 3.

12.3.3. High-cloud reports (C=0, 1 or 2) are plotted with a double line indicating direction, and speed in knots obtained by multiplying v_rv_r by 5.

12.3.4. Speeds are plotted in the usual way (see Table 3.I).

GUIDE TO PLOTTING PROCEDURES

CHAPTER 13

13. Plotting NUBUK and NUREP reports

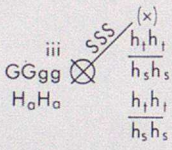
13.1. Symbolic form

13.1.1. NUBUK YGGgg iii ddSSS $1h_th_th_sh_s$ $2h_th_th_sh_s$ .... $n_L//H_aH_a$

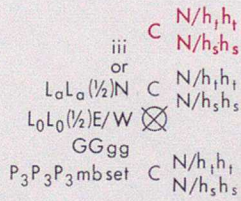
13.1.2. NUREP YGGgg iii (or $L_aL_aL_oL_ok$) $P_3P_3P_3$ $5NCh_th_t$ $6NCh_sh_s$

13.2. Plotting model

NUBUK



NUREP



13.3. Plotting instructions

13.3.1. *NUBUK*

13.3.1.1. These reports of cloud base and top are plotted in black in the margin of the chart of most appropriate time, and identified with the word NUBUK.

13.3.1.2. From the station circle (drawn if not provided), crossed through as for total N=/, a shaft is drawn in the direction dd (tens of degrees) with SSS plotted alongside it, omitting the first (and second) S if zero.

13.3.1.3. h_th_t over h_sh_s are plotted near the end of the shaft, and successive groups are plotted with greater heights above lesser. If n_L is greater than the number of cloud layers reported an x is plotted above the highest.

13.3.1.4. iii GGgg and H_aH_a are plotted in a tidy assembly near the station circle but distinct from the cloud-height information.

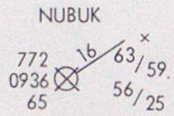
13.3.2. *NUREP* reports are treated in a similar way to NUBUK reports, by using the appropriate model and identity word NUREP, with the following differences.

13.3.2.1. N/h_th_t and N/h_sh_s are always plotted alongside the symbol for C (see Table 3.II) in the position and colour appropriate to the SYNOP (see Chapter 3). N is always plotted because it need not necessarily be the same for both base and top of the cloud.

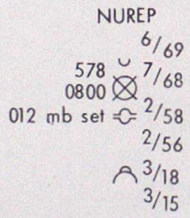
13.3.2.2. iii or L_aL_a ($\frac{1}{2}$)N, L_oL_o ($\frac{1}{2}$)E/W, GGgg and '$P_3P_3P_3$mb set' are plotted in a tidy assembly left of the station circle, k giving the necessary information in half-degrees of latitude and longitude (Code 2200, *Handbook of weather messages*, Part II, p. 1–61).

13.4. Examples

13.4.1. NUBUK 40936 772 05016 16359 25625 3//65



13.4.2. NUREP 30800 578 012 56369 67368 52658 62656 53818 63815



GUIDE TO PLOTTING PROCEDURES

CHAPTER 14

14. Plotting NUBEX and RADOB reports

14.1. Symbolic form

14.1.1. NUBEX YGGgg CCCC XXXX XXXX DDDAA $h_e h_e h_e$dd

14.1.2. RADOB. FM 20-V

Part A Tropical-cyclone part

$M_i M_i M_j M_j$ YYGGg { IIiii or $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$

$4R_wL_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $A_cS_cW_ca_cr_t$ $t_ed_sd_sf_sf_s$
DDDD (sea station call sign)

Part B Significant-feature part

Section 1 $M_iM_iM_jM_j$ YYGGg { IIiii or $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$

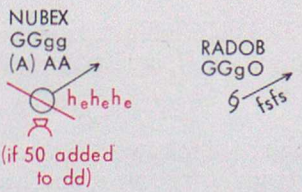
Section 2 $e_tW_eI_ea_eH_e$ bbbrr bbbrr ..... bbbrr $t_ed_sd_sf_sf_s$ /999/
....

Section 3 51515 Code groups to be developed regionally

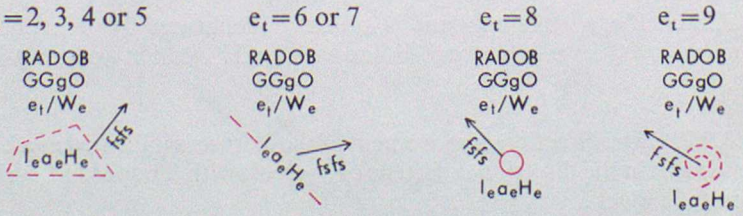
Section 4 61616 Code groups to be developed nationally
DDDD (sea station call sign)

14.2. Plotting model

NUBEX RADOB (Part A)



RADOB (Part B)



14.3. Plotting instructions

14.3.1. *NUBEX*

14.3.1.1. A black station circle is drawn at the position of the centre of the radar echo, defined by XXXX XXXX which are four letters and four figures of the GEOREF (see Figure 14.1).

14.3.1.2. A black arrow is drawn from the station circle in the direction of movement of the echo, DDD (whole degrees), and a red line drawn through and beyond the circle (see **14.2.**) in the direction dd (or dd minus 50, see *Handbook of weather messages*, Part III, paragraph 1.7.6.7.), showing the orientation in tens of degrees of the echo axis.

14.3.1.3. If 50 has been added to dd the symbol for C=9 (Table 3.II) is plotted in red beneath the station circle.

14.3.1.4. $h_e h_e h_e$ is plotted in red to the right of the station circle.

14.3.1.5. The code word NUBEX, GGgg and AA are plotted in black in a tidy assembly above the plot. If AA is 99 the report may be terminated by the word AREA followed by three figures which are then plotted instead of AA.

14.3.2. *RADOB. Part B*

14.3.2.1. The coded description of each significant feature ends with the group /999/.

14.3.2.2. Location of the feature is determined from the azimuth bbb (in whole degrees) and range rr (in 5-km units) from the reporting station.

14.3.2.3. If $e_t=2$, 3, 4 or 5 an area is indicated, and the points bbbrr are located and joined with red pecked lines. $I_e a_e H_e$ are written in black inside the area.

14.3.2.4. If $e_t=6$ or 7 a line is indicated. This is drawn between points bbbrr as a red pecked line and $I_e a_e H_e$ are written in black in the middle of the line.

14.3.2.5. If $e_t=8$ a point is indicated, located by bbbrr. A red station circle is drawn with this point as its centre, and $I_e a_e H_e$ are written in black beneath the circle.

14.3.2.6. If $e_t=9$ a spiral band is indicated, delineated by points bbbrr. This spiral is drawn as a red pecked line with $I_e a_e H_e$ written underneath, in black.

14.3.2.7. The direction of movement of the feature is indicated as a black arrow drawn in the direction $d_s d_s$ (tens of degrees) with the speed $f_s f_s$ written alongside in black.

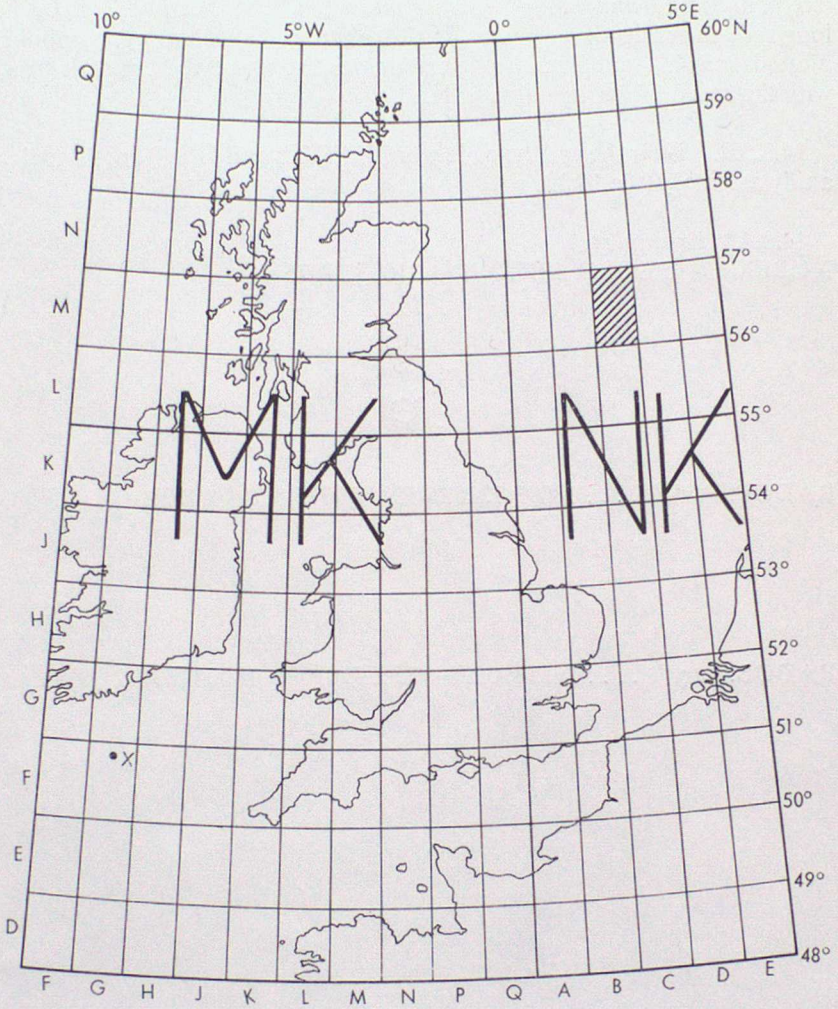


FIGURE 14.1—GEOREF

Location is defined by four letters followed by four figures. The first two letters indicate the area heavily lettered in the Figure. The next two letters indicate the smaller 1-degree box, 'easting' followed by 'northing', e.g. the shaded box in the North Sea is NKCM. The first two figures give minutes 'easting' within the 1-degree box and the second two 'northing', e.g. the spot labelled X north-west of Scilly is 30′ easting and 50′ northing and is defined by MKGF 3050. GEOREF is explained more fully in *Handbook of weather messages*, Part III, Appendix V.

14.3.2.8. The code word RADOB, GGg0 and e_t/W_e are plotted in black in a tidy assembly above and close to the feature.

14.3.3. *RADOB. Part A*

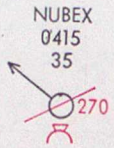
14.3.3.1. $L_aL_aL_a$ following $4R_w$ gives the latitude of the eye of the tropical cyclone in tenths of a degree. In the next group, Q_c is the quadrant

(see p. 1–54 of *Handbook of weather messages*, Part II) and $L_oL_oL_oL_o$ the longitude in tenths of a degree. At the point so defined an eye symbol is plotted (see 14.2.) and from it an arrow in the direction d_sd_s (tens of degrees) with the speed f_sf_s written alongside.

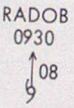
14.3.3.2. Near the eye the code word RADOB and GGg0 are plotted in a tidy assembly (see 14.2.).

14.3.4. *Examples*

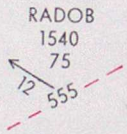
NUBEX 60415 EGRR ABCD 1234 31035 27075



RADOB. Part A 18093 72202 45335 70775 50//6 63608



RADOB. Part B . . . . 19154 03764 75555 09020 18004 33112 /999/



GUIDE TO PLOTTING PROCEDURES

CHAPTER 15

15. Plotting RECCO reports

15.1. Symbolic form

RECCO

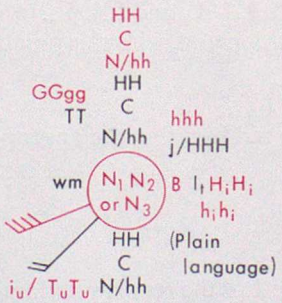
Section 1 (Mandatory) 9xxx9 GGggi$_u$ YQL$_a$L$_a$L$_a$ L$_o$L$_o$L$_o$Bf'$_c$ hhhd$_t$d$_a$ ddfff TTT$_u$T$_u$w mjHHH

Section 2 (Optional) 1k$_n$N$_1$N$_2$N$_3$ ChhHH ChhHH ChhHH 4ddff 5DFSD$_k$ 6W$_s$S$_s$W$_c$D$_w$ 7I$_r$I$_t$S$_b$S$_e$ 7h$_i$h$_i$H$_i$H$_i$ 8d$_r$d$_r$S$_r$0$_e$ 8w$_e$a$_e$c$_e$i$_e$ (17171 followed by FM 36-V) or (71717 followed by FM 36-V)

Section 3 (Optional) 9xxx9 GGggi$_u$ ddfff TTT$_u$T$_u$w mjHHH (4L$_a$L$_a$L$_o$L$_o$) GGggi$_u$ ddfff TTT$_u$T$_u$w mjHHH (4L$_a$L$_a$L$_o$L$_o$) .... etc. .....

(Followed, as appropriate, by SEA-ICE data section).

15.2. Plotting model



15.3. Plotting instructions

15.3.1. These reports are plotted on the chart nearest in time to that of the reports (given by GGgg).

15.3.2. Relevant codes are specified in *Handbook of weather messages*, Part III, Chapter 7.

15.3.3. Table 15.I shows the symbols, and their colours, to be plotted for wm (weather data), B (turbulence), C (cloud) and I$_t$ (icing). For convenience the Beaufort force/knots equivalents are also given in the Table.

15.3.4. i$_u$ governs T$_u$T$_u$ and they are plotted separated by a solidus as indicated in the model (see **15.2.**). When i$_u$ = 0 (meaning T$_u$T$_u$ is not reported) the plot is 0/XX.

TABLE 15.I—RECCO CODES AND PLOTTING SYMBOLS

w \ m	0	1	2	3	4	5	6	7	8	9	Code figure	B	C	I_t	Beaufort force	Knots mean
0											0				1 2	2 5
1											1				3 4	9 13
2											2				5 6	19 24
3											3				7 8	30 37
4											4				9 10	44 52
5											5				11 12	60 68
6											6					or over
7											7					
8											8					
9											9					

15.3.4.1. TT and T_uT_u are plotted in degrees Celsius with a minus sign when necessary.

15.3.5. Q (the octant of the globe, Code 3300, p. 1–54 of *Handbook of weather messages*, Part II), $L_aL_aL_a$ and $L_oL_oL_o$, in degrees and tenths, define the position of the observation and, with this point as centre, a station circle is drawn in red.

15.3.6. B is plotted in red by using the appropriate symbol from Table 15.I.

15.3.7. f'_c is not plotted.

15.3.8. ddfff in Section 1 of the report provides wind direction in tens of degrees and speed in knots, at the height hhh, and is plotted in red by using shaft and feathers (see 3.3.4.).

15.3.9. j governs HHH and they are plotted in black, separated by a solidus.

15.3.10. The largest of the three cloud amounts N_1N_2 and N_3 is plotted in red inside the station circle in the symbolic form shown in Table 3.II.

15.3.11. Cloud data given in the ChhHH groups are plotted in the appropriate colour as indicated in the model, using cloud symbols from Table 15.I.

15.3.12. The 4ddff group provides surface wind data which are plotted in black as in SYNOP reports (see 3.3.4.).

15.3.12.1. The 5-group provides alternative surface wind data, D being direction (Code 0700, p. 1–48 of *Handbook of weather messages*, Part II) and F being Beaufort force, converted before plotting to knots by using Table 15.I. S (sea state) and D_k (swell direction) are not plotted.

15.3.13. All the 6-group information is decoded and written in red in plain language on the right-hand corner of the plot. Self-evident abbreviations may be used.

15.3.14. The 7-group (icing): I_r (rate of icing) is not plotted. The symbol for I_t (type of icing) is plotted as indicated on the model. S_b and S_e, the distances of the beginning and ending of icing are decoded and written in red. The figures h_1h_1 and H_1H_1, given in the second 7-group, are written in red alongside the icing symbol (I_t).

15.3.15. The 9-groups (radar echoes) are not plotted.

15.3.16. The groups following 71717 or 17171 are plotted on a tephigram in exactly the same way as a TEMP message.

15.4. Examples (plotted in Figure 15.1)

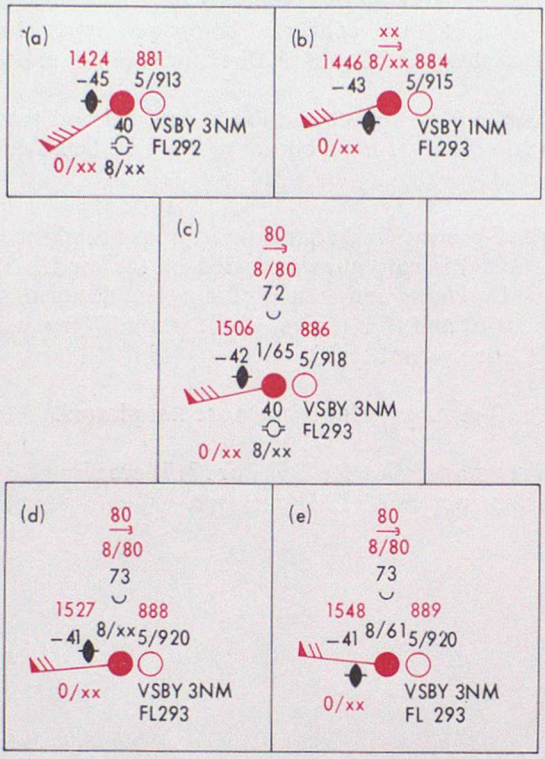


FIGURE 15.1—RECCO EXAMPLES PLOTTED

(a)	97779	14240	10511	35003	88100	23085	95//2	95913	11800	6//40
	VSBY	3NM	FL292							
(b)	97779	14460	10510	30009	88400	25080	93//2	95915	11899	0////
	VSBY	1NM	FL293							
(c)	97779	15060	10511	25004	88600	25078	92//2	95918	13818	6//40
	36572	08080	VSBY	3NM	FL293					
(d)	97779	15270	10510	20004	88800	26068	91//2	95920	12880	3//73
	08080	VSBY	3NM	FL293						
(e)	97779	15480	10506	15004	88900	28068	91//2	95920	12880	36173
	08080	VSBY	3NM	FL293						

GUIDE TO PLOTTING PROCEDURES

CHAPTER 16

16. Plotting CODAR and AIREP reports

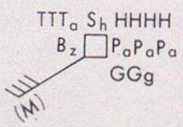
16.1. Symbolic form

16.1.1. *CODAR FM* 41-*IV*

$M_iM_iM_jM_j$ YYGGg
$99L_aL_aL_a\ Q_oL_oL_oL_oL_o\ P_aP_aP_aB_zS_h\ TTT_an_sn_m\ (40L_aL_aL_a\ Q_cL_oL_oL_oL_o)$ ddfff
$(41L_aL_aL_a\ Q_cL_oL_oL_oL_o$ ddfff) .... $(49L_aL_aL_a\ Q_cL_oL_oL_oL_o$
ddfff) (6HHHH)

16.1.2. AIREP has no symbolic form but is an in-flight report in abbreviated 'self-evident' form (see *Handbook of weather messages*, Part II, Chapter 3).

16.2. Plotting model



16.3. Plotting instructions

16.3.1. These reports are plotted in black at the reported position on the chart of most appropriate time and level; alternatively they may be plotted on exclusive aircraft-report charts. A small square is drawn to mark the position (see model).

16.3.2. *CODAR*

16.3.2.1. The identification letters $M_iM_iM_jM_j$ for these aircraft reports are LLXX.

16.3.2.2. The reporting position is defined by $L_aL_aL_a$ and $L_oL_oL_o$, the latitude and longitude in tenths of a degree, Q_c being the quadrant of the globe (Code 3333, Chapter 1 of *Handbook of weather messages*, Part II).

16.3.2.3. GGg, the time of the report in hours and tens of minutes GMT, is plotted as received.

16.3.2.4. n_s and n_m are not plotted but give the numbers of spot and mean winds reported.

16.3.2.5. ddfff gives the wind velocity and is plotted in the usual way with shaft and feathers (see 3.3.4.).

16.3.2.5.1. A mean wind follows a reported position which falls midway between two position reports, and is indicated in the plot with an M alongside the end of the wind shaft. The (mean) time of the observation is proportioned to the nearest 10 minutes.

16.3.2.5.2. A spot wind normally refers to the first position report. Others, if reported, always precede reports of mean winds and follow their own position groups. A spot wind is implied in the plot by omission of the M (mean-wind indicator).

16.3.2.6. $P_aP_aP_a$, the flight-level pressure in plotted as received.

16.3.2.7. B_z, high-level turbulence is plotted left of the position square, according to the following equivalents: 0 ≡ 0, 1 ≡ ∧, 2 ≡ ⩓.

16.3.2.8. S_h governs TT (and HHHH). For S_h=0 plot D+, for 2 plot D−, for 6 plot R and for 4 no plot is needed.

16.3.2.9. TTT_a, air temperature in tenths of degrees Celsius, is preceded by a plus sign if T_a is even and a minus if T_a is odd.

16.3.2.10. HHHH, the D value or the height in decametres of a standard isobaric surface, is introduced by the indicator 6 and is plotted as received, preceded by the decode of S_h (see 16.3.2.8.).

16.3.3. AIREP. The following differences from the treatment of a CODAR report apply to the plotting of an AIREP report.

16.3.3.1. Information to be plotted is extracted from the report by reference to paragraph 3.2. of *Handbook of weather messages*, Part II.

16.3.3.2. Only moderate and severe turbulence are reported, plotted from the following table.

	Moderate	Severe
Turbulence	∧	⩓
Icing	Ψ	Ψ

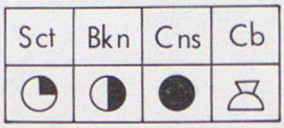
16.3.3.3. Icing is reported and the appropriate symbol is plotted beneath B_z. Only moderate and severe icing are reported, plotted from the previous table.

16.3.3.4. Present weather may be reported and is plotted to the left of B_z by using the most appropriate symbol from the following table.

TS	HAIL	RA	SN	FZR	TDO/WTSPT
ℸ	△	•	×	◉	)(

16.3.3.5. Flight level is reported in hundreds of feet and is plotted as received to the right of the position square, but preceded by the letters FL (see 16.3.4.).

16.3.3.6. Cloudiness is plotted as appropriate above or beneath the position square by using the following equivalents:



with the cloud base and top, both in hundreds of feet, entered respectively beneath and above the cloudiness symbol. If Cb is reported, its symbol is drawn to the left of the cloudiness symbol.

16.3.3.7. Weather radar echoes, if reported, are plotted as nearly as possible in accordance with the NUBEX model (see Chapter 14).

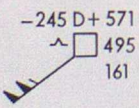
16.3.3.8. All additional plain-language information is abbreviated or symbolized and entered either where the CODAR equivalent belongs or below and close to the plot.

16.3.3.9. When an observation is not accompanied by its time (or mean time) this should be proportioned to the nearest 5 minutes.

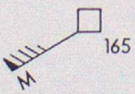
16.3.4. *Examples*

LLXX 14161
99453 70203 49510 24511 22105
41453 70250 24085 60571
14173 99453 70300 51004 26510 27060

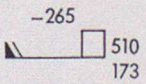
(At 45·3°N 20·3°W)



(At 45·3°N 25·0°W)

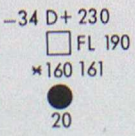


(At 45·3°N 30·0°W)

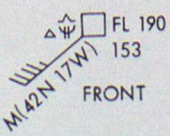


AIREP
GABCD 4320N 2020W 5 1610 FL 190
4450N 2611W ETA CYQX 0020 11HR 20
MS 34 23045 42N 17W SN FRONT
42N 16W CNS BASE 020 TOP 160 PS 230
ICE AND TURB MOD AT FRONT WITH HAIL

(At 43°20′N 20°20′W)



(At 42°N 16°W)



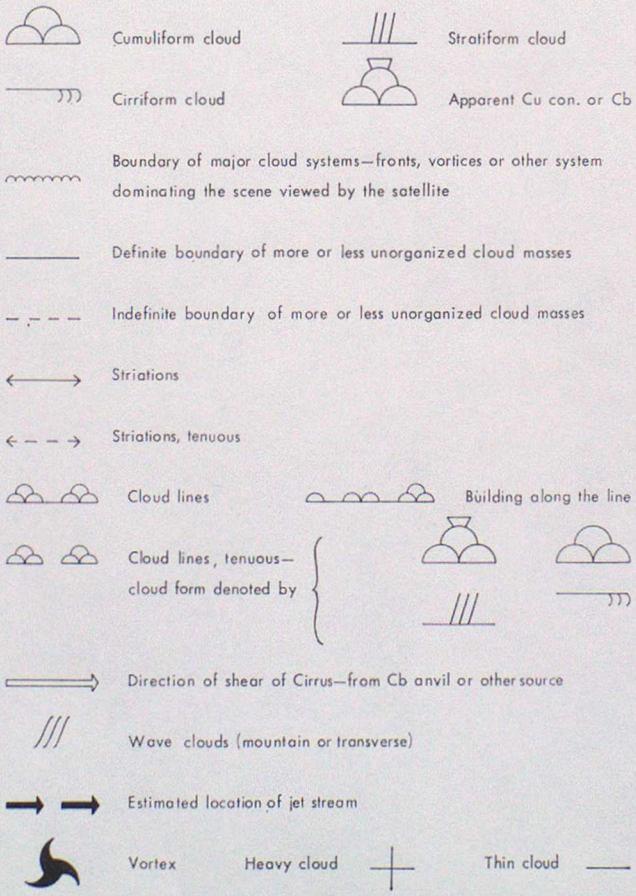
GUIDE TO PLOTTING PROCEDURES

CHAPTER 17

17. Nephanalysis charts

17.1. Analysis of data from satellites is carried out in the Central Forecasting Office (CFO). Pictures from each orbit of the satellite are analysed as soon as they are received in CFO. A nephanalysis chart is issued twice daily on both land-line and radio-facsimile circuits. Each chart contains data from all available orbits up to the time of issue of the chart. The coding convention used by the analyst on the nephanalysis charts is given below and is self-explanatory.

Coding conventions for nephanalyses (facsimile transmissions)



Cloud cells	Size *n. mile*	Open spaces
1	0– 30	6
2	30– 60	7
3	60– 90	8
4	90–120	9

Cloud amount

Open (O)	Less than 20 per cent coverage
Mostly open (MOP)	20–50 per cent coverage
Mostly covered (MCO)	50–80 per cent coverage
Covered (C)	More than 80 per cent coverage

Note: stippling is used to emphasize the area considered by the analyst to be of greatest synoptic significance.

GUIDE TO PLOTTING PROCEDURES

CHAPTER 18

18. Plotting analyses

18.1. Full symbolic form of the International Analysis Code (I.A.C.)

FM 45-IV

Preambles

(a) Surface analysis: 10001 $333x_1x_1$ $0YYG_cG_c$ or
(b) Other analysis: 10001 $333x_1x_1$ $0YYG_cG_c$ $8x_2x_2x_28$ $00x_3x_3x_3$ or
(c) Surface prognosis: 65556 $333x_1x_1$ $0YYG_cG_c$ $000G_pG_p$ or
(d) Other prognosis: 65556 $333x_1x_1$ $0YYG_cG_c$ $000G_pG_p$ $8x_2x_2x_28$ $00x_3x_3x_3$

Analysis or prognosis sections

(a) Pressure systems or topography systems:

99900	(9NNSS)	8 P_tP_cPP / $h_th_ch_ah_a$	yyyyy	(.....)	$(md_sd_sf_sf_s)$
		$(00C_100)$	.....	.....	.....
	$000g_pg_p$	9 P_tP_cPP / $h_th_ch_ah_a$	yyyyy	(.....)	
	$(00C_100)$	.....	.....	.....	
	and/or				
	$000g_pg_p$	7 P_tP_cPP / $h_th_ch_ah_a$	yyyyy	(.....)	$(md_sd_sf_sf_s)$
	$(00C_100)$	.....	.....	.....	.....

(b) Frontal systems:

99911	(9NNSS)	$66F_tF_iF_c$	yyyyy	yyyyy	.....	$(md_sd_sf_sf_s)$
		$(00C_100)$	.....	.....	.....	.....
	$000g_pg_p$	$69F_tF_iF_c$	yyyyy	yyyyy	.....	
	$(00C_100)$	.....	.....	.....	.....	
	and/or					
	$000g_pg_p$	$67F_tF_iF_c$	yyyyy	yyyyy	.....	$(md_sd_sf_sf_s)$
	$(00C_100)$	.....	.....	.....	.....	.....

(c) Isopleth section:

99922	$4e_1uuu$	yyyyy	yyyyy	.....	$(00C_100)$
	.....	.....	.....	.....	.....

(d) Air-mass section:

99933	$33M_hM_sM_t$		yyyyy	yyyyy	.....	$(00C_100)$
	.....		.....	.....	.....	.....

(e) Weather-area section:

99944	$989w_ei$ $988ww$ $987w_sw_s$	yyyyy	yyyyy	.....	$(md_sd_sf_sf_s)$	$(00C_100)$
	.....	.....	.....	.....	.....	.....

(f) Tropical section:

99955	(9NNSS)	$(55T_tT_iT_c)$	(555PP)	$(5555T_i)$	yyyyy	yyyyy
	.....	$(md_sd_sf_sf_s)$	$(00C_100)$			
	.....	.....	.....	.....	.....	.....
		.....	.....			

(g) Cloud section:

99966	$2C_sS_1S_2Z_1$ yyyyy		yyyyy	.....	$(md_sd_sf_sf_s)$	$(00C_100)$
	.....	.....	.....	.....	.....	.....
	$(9CH_bH_bH_b$	$8NH_tH_tH_t$	yyyyy	.....	.....)	
or	$(7CH_bH_bH_b$	$6NH_tH_tH_t$	yyyyy	.....	.....)	

(h) Upper-wind section:

99977	$(000g_pg_p)$	yyyyy	8ddff	7ddff	5ddff	4ddff
			3ddff	2ddff	1ddff	$(00C_100)$
		.....	.....	.....	.....	.....
		.....	.....	.....	.....	.....

(i) Jet-stream section

99988	$9i_jH_jH_jH_j$ yyyyy		$d_jd_jf_jf_jf_j$	$9i_jH_jH_jH_j$	yyyyy	$d_jd_jf_jf_jf_j$
	.....		.....	.....	.....	$(00C_100)$
and/or	$9i_jP_sP_sP_s$	yyyyy	$d_jd_jf_jf_jf_j$	yyyyy	$d_jd_jf_jf_jf_j$	.....
	.....		.....	.....	$(00C_100)$	
and/or	$4e_1uuu$	yyyyy	yyyyy	.....	.....	

(j) Tropopause section:

99999	$4e_1uuu$	(42uuu)	yyyyy	yyyyy	$(00C_100)$
(00000	42uuu	yyyyy	.....	.....	.....)
(.....	.....	.....	.....	.....	.....)

(k) Wave or sea-temperature section:

88800	$77e_2uu$	$(9d_wd_wP_wP_w)$	yyyyy	$(9d_wd_wP_wP_w)$	yyyyy	
		.....	.....	$(9d_wd_wP_wP_w)$	yyyyy	$(00C_100)$
	$000g_pg_p$ $79e_2uu$	$(9d_wd_wP_wP_w)$	yyyyy	$(9d_wd_wP_wP_w)$	yyyyy	.....
		.....	.....	$(9d_wd_wP_wP_w)$	yyyyy	$(00C_100)$
	and/or					
	$000g_pg_p$ $76e_2uu$	$(9d_wd_wP_wP_w)$	yyyyy	$(9d_wd_wP_wP_w)$	yyyyy	.....
		.....	.....	$(9d_wd_wP_wP_w)$	yyyyy	$(00C_100)$

(l) Vertical wind shear section:

88822	44vvv	yyyyy	yyyyy .....
	or		
	444vv	yyyyy	yyyyy .....

(m) Vocabulary section:

77744 ..... Vocabulary groups 44777

(n) Ending:

19191

18.1.1. *Abridged form of I.A.C. (I.A.C. FLEET)*

The following abridged form of code (I.A.C. FLEET) is adopted for marine use:

FM 46-IV

10001 33388* $0YYG_cG_c$ or
65556 33388* $0YYG_cG_c$ $000G_pG_p$
99900 $8P_tP_cPP$ $QL_aL_aL_oL_o$ $(QL_aL_aL_oL_o)$ $md_sd_sf_sf_s$
[$000g_pg_p$ $9P_tP_cPP$ $QL_aL_aL_oL_o$ $(QL_aL_aL_oL_o)$
and/or
$000g_pg_p$ $7P_tP_cPP$ $QL_aL_aL_oL_o$ $(QL_aL_aL_oL_o)$ $md_sd_sf_sf_s$]
99911 $66F_tF_iF_c$ $QL_aL_aL_oL_o$ $QL_aL_aL_oL_o$ ..... $md_sd_sf_sf_s$
[$000g_pg_p$ $69F_tF_iF_c$ $QL_aL_aL_oL_o$ .....
and/or
$000g_pg_p$ $67F_tF_iF_c$ $QL_aL_aL_oL_o$ ..... $md_sd_sf_sf_s$]
99922 44PPP $QL_aL_aL_oL_o$ $QL_aL_aL_oL_o$ .....
99955 $(55T_tT_iT_c)$ (555PP) $QL_aL_aL_oL_o$ $QL_aL_aL_oL_o$ $md_sd_sf_sf_s$.....
99944 $987w_sw_s$ $QL_aL_aL_oL_o$ $QL_aL_aL_oL_o$ .....
88800 $77e_2uu$ $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ .....
.... $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ $(00C_100)$
[$000g_pg_p$ $79e_2uu$ $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ .....
.... $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ $(00C_100)$
and/or
$000g_pg_p$ $76e_2uu$ $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ .....
.... $(9d_wd_wP_wP_w)$ $QL_aL_aL_oL_o$ $(00C_100)$]
77744 ..... Vocabulary groups 44777
19191

18.2. Notes on the structure of the code

18.2.1. The International Analysis Code (see **18.1.**) is made up of a series of sections each of which has a specified symbolic form and each of which is identifiable by means of an indicator group prefixed to the section. The first thing to notice is that all analyses start with the indicator group 10001 and that all prognoses start with the indicator group 65556. Other fixed indicator groups, used to define the contents of sections, are:

---

* Services reporting positions in this message to the nearest half degree use 33300, 33311 or 33322 instead of 33388 for the second group of the message. If groups 33300, 33311 or 33322 are used, group $L_aL_aL_oL_ok$ is substituted for group $QL_aL_aL_oL_o$ in code form.

99900	Pressure systems or topography systems	99955	Tropical section
99911	Frontal systems	99966	Cloud section
99922	Isopleths	99977	Upper-wind section
99933	Air-mass section	99988	Jet-stream section
99944	Weather-area section	99999	Tropopause section

18.2.2. The second group of the preamble is $333x_1x_1$ where x_1x_1 defines the symbolic form of all point-position groups yyyyy appearing in the analyses. For Meteorological Office analyses and prognoses this group takes the form 33300, meaning that point-position groups are in the form $L_aL_aL_oL_ok$ (northern hemisphere). The same form is indicated by $x_1x_1 = 11$ (southern hemisphere) and $x_1x_1 = 22$ (equatorial).

18.2.3. In FLEET synoptic analyses the second group is 33388, indicating that point-positions are defined in the form $QL_aL_aL_oL_o$.

18.3. Plotting instructions

18.3.1. As the object of plotting an analysis or prognosis is to reconstruct the original chart from points whose latitude and longitude are given, the first requirement is a plotting chart graticuled in degrees of latitude and longitude. On most Meteorological Office charts the degree divisions are shown over the oceans but not over the land areas. It is possible to estimate the half-degree points by eye, but a key chart on which the degree divisions over the land are marked in ink will be found a useful aid. The analysis may be plotted either on the actual working chart or on a transparent sheet placed over a comparable chart.

18.3.2. The technique of plotting is very much the same for all types of analyses or prognoses. If the surface analysis is taken as typical, the pressure systems are first plotted; the centre of a low, a high, or a col is marked with a cross, and a trough line or ridge line by a line drawn through the coded points. The letters* indicating the nature and identity of the system are written alongside together with the central pressure, e.g. LC84. In the case of foreign analyses, the reference letter of the system is decoded from NN (in the second group 9NNSS) by putting A for 01, B for 02, etc., and the central pressure is taken from PP (in the third group $8P_tP_cPP$). An arrow is drawn from the centre showing the direction of motion d_sd_s and the estimated speed of movement f_sf_s (in knots).

18.3.2.1. In the case of tropical cyclonic circulations the centre is marked by a special symbol thus:

for a tropical cyclonic circulation with observed or estimated maximum winds of Beaufort force 5 to 11,

for a tropical cyclonic circulation with observed or estimated maximum winds of Beaufort force 12 or more

and if it has a name this is entered alongside for identification.

18.3.3. Fronts,* isobars, isotherms and other isopleths are all plotted by locating the coded point-positions and drawing lines through them. The lines are drawn free-hand with due regard to the discontinuities required at fronts. A closed isopleth (for example, a closed isobar surrounding a low-pressure centre) is indicated by the fact that the last coded point-position is the same as the first. Intermediate isopleths are drawn in by interpolation between the key lines coded in the message. e_1 is specified in Code 1062 (see *Handbook of weather messages*, Part II, p. 5–15), 0 being used for contours, 2 for isotherms, 4 for isobars and 8 for isotachs.

18.3.4. Upper-air analyses and prognoses do not include a 'systems' section, but a centre is indicated when only a single point-position is given following the isopleth group 40HHH. The same statement applies to isotherms and thickness patterns.

18.3.5. Direction and speed of movement of fronts may be indicated in the same way as for pressure centres. Important information derived from the decodes of P_c, m, F_i and F_c may be briefly noted in plain language.

18.3.6. Fronts are marked on the chart in the forms and colours indicated in Table 18.I, column 3. The same method of representation is used on charts drawn independently at the station.

18.3.6.1. A more formal presentation used mostly for monochromatic reproduction is indicated in column 2 of Table 18.I, the projections pointing in the direction of motion of the front. If the front is stationary the projections are drawn alternately on either side of the frontal line.

18.3.7. Weather areas are marked, when called for, in accordance with Table 18.II.

18.3.8. Isopleths on upper-level contour charts are drawn in accordance with Table 18.III.

18.3.8.1. The interval between contours is generally 60 gpm and the lines are numbered in geopotential decametres, e.g. 5280 gpm is labelled 528.

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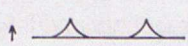
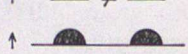
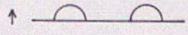
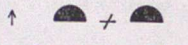
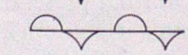
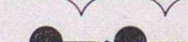
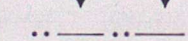
* In domestic teleprinter broadcasts the group 9NNSS is replaced by a two-letter group in the form LA, CB, etc., in which the first letter denotes the nature of the front or system, where:

W = Warm front
C = Cold front
O = Occlusion
F = Front unclassified
H = High
L = Low

The second letter is the identity letter given to the front or system.

TABLE 18.I—FRONTAL AND PRESSURE-FEATURE SYMBOLS

Term	Symbol	
1	2	3
	Formal (monochromatic)	Polychromatic
Cold front at the surface		blue
Cold front above the surface		
Cold-front frontogenesis		
Cold-front frontolysis		
Warm front at the surface		red
Warm front above the surface		
Warm-front frontogenesis		
Warm-front frontolysis		
Occluded front at the surface		purple
Occluded front above the surface		
Quasi-stationary front at the surface		alternate red and blue
Quasi-stationary front above the surface		
Quasi-stationary front frontogenesis		
Quasi-stationary front frontolysis		
Instability line		black
Shear line		
Convergence line		orange
Intertropical convergence zone*		
Intertropical discontinuity		alternate red and green
Axis of trough		black
Axis of ridge		

* *Note:* the separation of the two lines gives a qualitative representation of the width of the zone; the hatched lines may be added to indicate areas of activity.

TABLE 18.II—REPRESENTATION OF WEATHER AREAS

Area of continuous precipitation	Solid shading, or cross hatching, in green (for any areas of precipitation or other phenomena with or without shading, the appropriate W symbol may be distributed over the area.)
Areas of intermittent precipitation	Single hatching in green
Areas of showers	Large shower symbols (of the type to be indicated) distributed over the area
Areas of thunderstorm	Large thunderstorms symbols (of the type to be indicated) distributed over the area
Areas of fog	Solid shading in yellow
Areas of sandstorm or duststorm	Solid shading in brown

TABLE 18.III—REPRESENTATION OF UPPER-AIR CONTOURS

Contour lines	Black full lines
Thickness lines	Black dashed lines
Isotherms	Red dashed or full lines

As an aid to the recognition of certain 1000–500-mb thickness lines it is common practice to colour them according to the following scheme:

5820 m	purple
5640 m	red
5460 m	green
5280 m	blue
5100 m	brown
4920 m	purple
4740 m	red

GUIDE TO PLOTTING PROCEDURES

CHAPTER 19

19. Plotting upper-air reports, charts and diagrams

19.1. Symbolic form

19.1.1. *FM 32-V PILOT: code for use when only upper winds are reported from land stations*

Section 1 Identification groups

$M_iM_iM_jM_j$ YYGGa_4 IIiii

Section 2 Standard isobaric surfaces

44nP_1P_1 or 55nP_1P_1 } ddfff ddfff ....

Section 3 Maximum wind(s)

77$P_mP_mP_m$ or 66$P_mP_mP_m$ } $d_md_mf_mf_mf_m$ ($4v_bv_bv_av_a$)

or

7$H_mH_mH_mH_m$ or 6$H_mH_mH_mH_m$ } $d_md_mf_mf_mf_m$ ($4v_bv_bv_av_a$)

or

77999

Section 4 Fixed regional and/or significant levels

9(or 1)$t_nu_1u_2u_3$ or 8$t_nu_1u_2u_3$ } ddfff ddfff ddfff

....

9(or 1)$t_nu_1u_2u_3$ or 8$t_nu_1u_2u_3$ } ddfff ddfff ddfff

or

21212 $n_0n_0P_0P_0P_0$ $d_0d_0f_0f_0f_0$
$n_1n_1P_1P_1P_1$ $d_1d_1f_1f_1f_1$
....
$n_nn_nP_nP_nP_n$ $d_nd_nf_nf_nf_n$

Section 5 51515, 52525, ... 59595 } Code groups to be developed regionally

Section 6 61616, 62626, ... 69696 } Code groups to be developed nationally

19.1.1.1. PILOT reports are prepared in four parts, each part consisting of two or more of the above sections according to the following scheme.

Part A (Data up to and including 100 mb)
Sections 1, 2 and 3

Part B (Data up to and including 100 mb)
Sections 1, 4, 5 and 6

Part C (Data above 100 mb)
Sections 1, 2 and 3

Part D (Data above 100 mb)
Sections 1, 4, 5 and 6

19.1.2. *FM 33-V PILOT SHIP: code for use when only upper winds are reported from ships*

Section 1 Identification groups
$M_iM_iM_jM_j$ YYGGa_4 99$L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ MMM$U_{La}U_{Lo}$

Sections 2, 3, 4, 5 and 6 have the same content and format as in Code FM 32-V PILOT (see 19.1.1.).

19.1.2.1. PILOT SHIP reports are prepared in four parts, A, B, C and D, as in PILOT reports (see 19.1.1.1.).

19.1.3. *FM 35-V TEMP: full code for upper-air reports from land stations*

Section 1 Identification groups
$M_iM_iM_jM_j$ YYGGI_d IIiii

Section 2 Standard isobaric surfaces
$99P_0P_0P_0$ $T_0T_0T_{a0}D_0D_0$ $d_0d_0f_0f_0f_0$
$P_1P_1h_1h_1h_1$ $T_1T_1T_{a1}D_1D_1$ $d_1d_1f_1f_1f_1$
. . . .
$P_nP_nh_nh_nh_n$ $T_nT_nT_{an}D_nD_n$ $d_nd_nf_nf_nf_n$

Section 3 Tropopause(s) data
$88P_tP_tP_t$ $T_tT_tT_{at}D_tD_t$ $d_td_tf_tf_tf_t$

Section 4 Maximum wind(s) data
$77P_mP_mP_m$ or $66P_mP_mP_m$ $d_md_mf_mf_mf_m$ $(4v_bv_bv_av_a)$
. . . .

Section 5 Significant level(s) with respect to temperature and/or relative humidity
$n_0n_0P_0P_0P_0$ $T_0T_0T_{a0}D_0D_0$
$n_1n_1P_1P_1P_1$ $T_1T_1T_{a1}D_1D_1$
. . . .
$n_nn_nP_nP_nP_n$ $T_nT_nT_{an}D_nD_n$

Section 6 Significant level(s) with respect to wind

21212 $n_0n_0P_0P_0P_0$ $d_0d_0f_0f_0f_0$
$n_1n_1P_1P_1P_1$ $d_1d_1f_1f_1f_1$
....
$n_nn_nP_nP_nP_n$ $d_nd_nf_nf_nf_n$

Section 8 Cloud data

41414 $N_hC_LhC_MC_H$

Section 9 Data in regional code(s)

51515
52525
.....
59595
} Code groups to be developed regionally

Section 10

61616
62626
.....
69696
} Code groups to be developed nationally

19.1.3.1. TEMP reports are prepared in four parts, each part consisting of four or more of the above sections according to the following scheme.

Part A (Data up to and including 100 mb)
Sections 1, 2, 3 and 4

Part B (Data up to and including 100 mb and also regional codes)
Sections, 1, 5, 6, 8, 9 and 10

Part C (Data above 100 mb)
Sections 1, 2, 3 and 4

Part D (Data above 100 mb and also regional codes)
Sections 1, 5, 6, 9 and 10

19.1.4. *FM 36-V TEMP SHIP: full code for upper-air reports from ships*

Section 1 Identification groups

$M_iM_iM_jM_j$ YYGGI_d 99$L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ MMM$U_{La}U_{Lo}$

Sections 2 to 10 inclusive have the same content and format as in Code FM 35-V (see 19.1.3.).

19.1.4.1. TEMP SHIP reports are prepared in four parts as set out in paragraph 19.1.3.1.

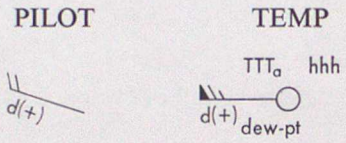
19.1.5. *Notes on the structure of the code*

19.1.5.1. The PILOT and TEMP codes are both divided into four parts. Part A gives the data for standard isobaric surfaces up to and including 100 mb and Part C the data for standard isobaric surfaces at pressures less than 100 mb. Part B gives data for fixed regional and/or significant levels up

to and including 100 mb. Part D gives the data as available for fixed regional and/or significant levels at pressures less than 100 mb.

19.1.5.2. The words TEMP PART . . . or PILOT PART . . . are not transmitted but the parts of the report can be recognized by the four-letter identification group $M_iM_iM_jM_j$ given at the beginning of the report just before $YYGGI_d$ IIiii (or ship's position groups). When M_iM_i=PP, it means PILOT, QQ means PILOT SHIP, TT means TEMP and UU means TEMP SHIP. When M_jM_j=AA, it means Part A, BB means Part B and so on.

19.2. Plotting model



19.3. Plotting instructions

19.3.1. *The contour chart*

19.3.1.1. To plot a given isobaric chart, say that for 700 mb, the observations for that particular level only are needed, and in the case of a report in the TEMP code these are contained in the two groups beginning with $70(P_1P_1)$ (three groups if the wind is given) of Section 2. The only data to be plotted are the height (hhh), temperature (TTT_a), the dew-point (obtained by subtracting D_nD_n from $T_nT_nT_{an}$) and the wind (dd and fff), where all the values refer to 700 mb. All variables are plotted in black in accordance with the model (see **19.2.**).

19.3.1.2. The wind is plotted with shaft and feathers and/or solid pennants, as on surface charts (see Table 3.I). The tens figure of dd is written in black alongside the wind shaft and a plus sign added to the right if a 5-degree accuracy is called for. (See Chapter 2 of *Handbook of weather messages*, Part II, for treatment of ddfff.)

19.3.1.3. TTT_a is positive if T_a is even, and negative if odd.

19.3.1.4. hhh is reported in geopotential metres up to but not including the 500-mb level, and in geopotential decametres at 500 mb and above. hhh is plotted as received.

19.3.1.5. Winds reported in the PILOT code also may be entered on the contour chart by choosing those at heights close to the following approximate equivalents:

Part A

Pressure (mb)	850	700	500	400	300	250	200	150	100
Height (m)	1500	3000	5400	7200	9000	10500	12000	13500	15900

Part C

Pressure (mb)	70	50	30	20	10
Height (m)	18300	20700	23700	26400	30900

19.3.1.6. Certain derived data may be plotted additionally on the contour chart, or on a separate chart if called for, e.g.:

(a) Thickness ($t_t t_t t_t$) between the 100-mb level and the standard isobaric surface (PPP). On the contour chart $t_t t_t t_t$ is plotted in red beneath hhh and the thermal wind drawn in red. If a separate chart is used the model in paragraph **19.2.** is followed, substituting the thermal wind for the wind and $t_t t_t t_t$ for hhh.

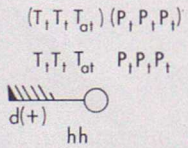
(b) Twelve-hour thickness changes.

19.3.1.7. It is the practice to plot all upper-air data on contour charts as though the balloon rises vertically above the station and provides information instantaneously from all levels. Therefore in drawing contours in fast-moving situations allowances must be made for horizontal motion of the balloon and the passage of time during the ascent.

19.4. The tropopause/maximum-wind chart

19.4.1. This chart is plotted in black in accordance with the model in paragraph 19.4.2. Red may be used for data received after the first analysis has been drawn, and green for data referring to six hours later than the chart time. If no maximum wind is reported (relevant group 77999), DF is drawn in a rectangle above the station circle, and partly missing wind data is plotted similarly in accordance with Table 3.I. The small x is used for missing tropopause data.

19.4.2. *Plotting model*



19.4.3. The maximum wind is found in Part A, Section 3 of the PILOT (SHIP) report and in Part A, Section 4 of the TEMP (SHIP) report, preceded in most cases by the indicator 77 or 7 (see 19.1.5.2. and *Handbook of weather messages*, Part II, Chapter 2). If a maximum wind is reported above 100 mb, this is found in Part C. The wind is plotted in the usual way with shaft and feathers and/or solid pennants. d alongside the shaft is the tens figure of the wind direction with or without the plus sign for 5-degree accuracy (see 19.3.1.2.).

19.4.4. hh is the approximate height of the maximum wind in thousands of feet, converted from whole millibars (indicator 77) or from geopotential decametres (indicator 7). Indicators 66 and 6 respectively show that the maximum wind occurred at the highest level reached, and a bar is drawn in these cases above hh, thus $\overline{\text{hh}}$.

19.4.5. Tropopause data appear in Part A, Section 3 of the TEMP (SHIP) report, and are identified by the figures 88. If a tropopause level is reported above 100 mb this is found in Part C. $P_tP_tP_t$, in whole millibars, and $T_tT_tT_{at}$, in tenths of a degree Celsius, are plotted as received in the positions indicated in the model (19.4.2.) and if multiple tropopauses are reported, indicated by repetition of the 88-groups, the lowest (i.e. the one with the greatest value of $P_tP_tP_t$) is the preferred plot, but the analyst may require a second (higher) level to be plotted above the first (see model).

19.4.6. Dew-point depression and wind data at the tropopause level are not plotted on this chart.

19.5. The tephigram

19.5.1. The TEMP (SHIP) identification group, $M_iM_iM_jM_j$, is examined to determine which part of the report is given, and the position of a ship checked against the position-verification group, $MMMU_{La}U_{Lo}$.

19.5.2. On the appropriate isobar of the tephigram for $P_0P_0P_0$ and for each succeeding value of $P_nP_n(P_n)$ the temperature, TTT_a, is plotted as a dot, the dew-point ($TT \cdot T_a - DD$) as a cross and the height, hhh, when reported, written to the right of the temperature dot. All values in each relevant section are plotted. TTT_a is positive if T_a is even and negative if odd.

19.5.3. The dry-bulb temperature graph is completed by joining the dots with straight lines, care being taken with the drawing, particularly where temperature values change rapidly with height. The dew-point temperatures may be joined by broken straight lines, using similar care.

19.5.4. The box at the top right-hand corner of the tephigram is completed as far as possible from the TEMP report, but thicknesses of layers are obtained by subtraction of heights bounding the layers specified.

19.5.5. As required, wind information for standard levels is entered in the space provided, otherwise the full information including that for significant levels is entered on Metform 2462 (see Chapter 2 of *Handbook of weather messages*, Part II, for treatment of ddfff).

19.5.6. Cloud data (indicator 41414) is entered as required in a convenient part of the tephigram.

19.6. BALTHUM reports

19.6.1. *Symbolic form*

CARDINGTON BALTHUM YYGGgg $P_0P_0T_0T_0T_0$ $T_{d0}T_{d0}T_{d0}f_0f_0$
PPTTT $T_dT_dT_dff$
PPTTT $T_dT_dT_dff$
....

19.6.2. *Plotting instructions*

19.6.2.1. Temperature (TTT) and dew-points ($T_dT_dT_d$) are plotted on a large-scale temperature/pressure graph in a manner similar to that used for TEMP plotting with the following differences.

19.6.2.2. Dew-point temperatures are reported to tenths of a degree Celsius.

19.6.2.3. Wind speed, ff (in knots), is plotted on the appropriate isobar alongside the temperature dot.

19.7. MASTEMP (BALTEMP) reports

19.7.1. *Symbolic form*

M_1M_1 YYG'G'I_L iii $n_ri_rL_rL_rL_r$ $T_rT_rT_rD_rD_r$ $d_rd_rf_rf_rf_r$
$n_1i_1L_1L_1L_1$ $T_1T_1T_1D_1D_1$ $d_1d_1f_1f_1f_1$
. . . .

19.7.2. M_1M_1, if BB, means BALTEMP follows, and if HH, MASTEMP.

19.7.3. Temperatures and dew-points are plotted on a large-scale temperature/pressure (height) graph in a manner similar to that used for tephigrams (see **19.5.**) with the following differences.

19.7.4. I_L if zero, means that levels (LLL) are given in tens of feet, and, if 5, in millibars omitting the thousands figure.

19.7.5. TTT is negative if more than 500, which is therefore subtracted to obtain the value to be plotted.

19.7.6. ddfff is entered as received, at the appropriate level near the temperature dot.

GUIDE TO PLOTTING PROCEDURES

CHAPTER 20

20. Plotting aviation significant weather charts

20.1. These charts are used in flight forecast documentation and are based on the weather forecast for a fixed time over the whole of the chart area.

20.2. Fronts and centres of high and low pressure are shown in the same way as in surface analyses (see Chapter 18), with rounded and/or pointed projections used for fronts (see Table 18.I), but hundreds and thousands figures are given in central pressure values. Movements of features are shown by using arrows and speeds in knots.

20.3. Cloud and weather significant to flight (but not to take-off or landing) are detailed within scalloped lines delineating areas expected to be affected, usually in the order: cloud amount in oktas, type of cloud (Table 20.I), weather (Table 20.II), base and top of the layer involved (in hundreds of feet), and airframe icing (Table 20.II) with its lower and upper limits (in hundreds of feet) if different from the base and/or top of the cloud.

20.4. Abbreviations shown in Table 20.III may also be used when appropriate to the situation.

20.5. Areas of probable clear-air turbulence are delineated with a broken line and detailed by the abbreviation CAT followed by the intensity symbol (Table 20.II) and the base and top of the layer concerned.

TABLE 20.I—CLOUDS

ST =Stratus	SC =Stratocumulus	CU=Cumulus
CB=Cumulonimbus	NS =Nimbostratus	AS =Altostratus

TABLE 20.II—SIGNIFICANT WEATHER

Freezing rain	Marked mountain waves
Tropical revolving storm	Moderate airframe icing
Severe line squall	Severe airframe icing
Hail	Moderate turbulence
Thunderstorm	Severe turbulence
Sandstorm or duststorm	

TABLE 20.III—OTHER ABBREVIATIONS

CLD =Cloud(s)	SCT=Scattered	CAST=Castellanus
CNS =Continuous	OCNL=Occasional(ly)	FRQ=Frequent
LYR =Layer(ed)	BKN=Broken	OVC=Overcast
ISOL =Isolated	EMBD=Embedded	CAT=Clear-air turbulence
	LOC=Locally	

20.6. Example of significant weather chart (See Figure 20.1.)

20.6.1. *Decode of example*

The forecast for 1800 GMT, 8 March shows, starting from the north-west corner of the chart:

(a) Cold front just entering the area.

(b) Warm front moving east at 20 kt.

(c) 8/8 Sc and As with moderate turbulence and icing between flight level (FL) 30 (3000 ft) and 220 (22 000 ft).

(d) Probable moderate clear-air turbulence (CAT) within the broken-line boundary between FL 250 and 380.

(e) England and North Sea area: 6/8 Cu and Sc with moderate turbulence and icing between FL 20 and 100.

(f) North France and Low Countries: 6/8 Cu and Sc with moderate turbulence between FL 20 and 120, and moderate icing between FL 40 and 120. Also isolated Cb with thunderstorm and severe turbulence between FL 20 and 200, and severe icing between FL 40 and 200.

(g) South-east France, west Mediterranean and much of Spain: 4/8 Cu with moderate turbulence between FL 20 and 140, and moderate icing between FL 50 and 140. Also scattered Cb with thunderstorm, hail and severe turbulence between FL 20 and 240, and severe icing between FL 40 and 240.

(h) Biscay and north Spain: 6/8 layered clouds with moderate turbulence and icing between FL 40 and 140, and scattered Cb with thunderstorm, hail and severe turbulence between FL 20 and 240, and severe icing between FL 40 and 240.

(i) Slow-moving low, of central pressure 1004 mb, in Biscay.

Note: All icing refers to airframe icing; FL is flight level in hundreds of feet.

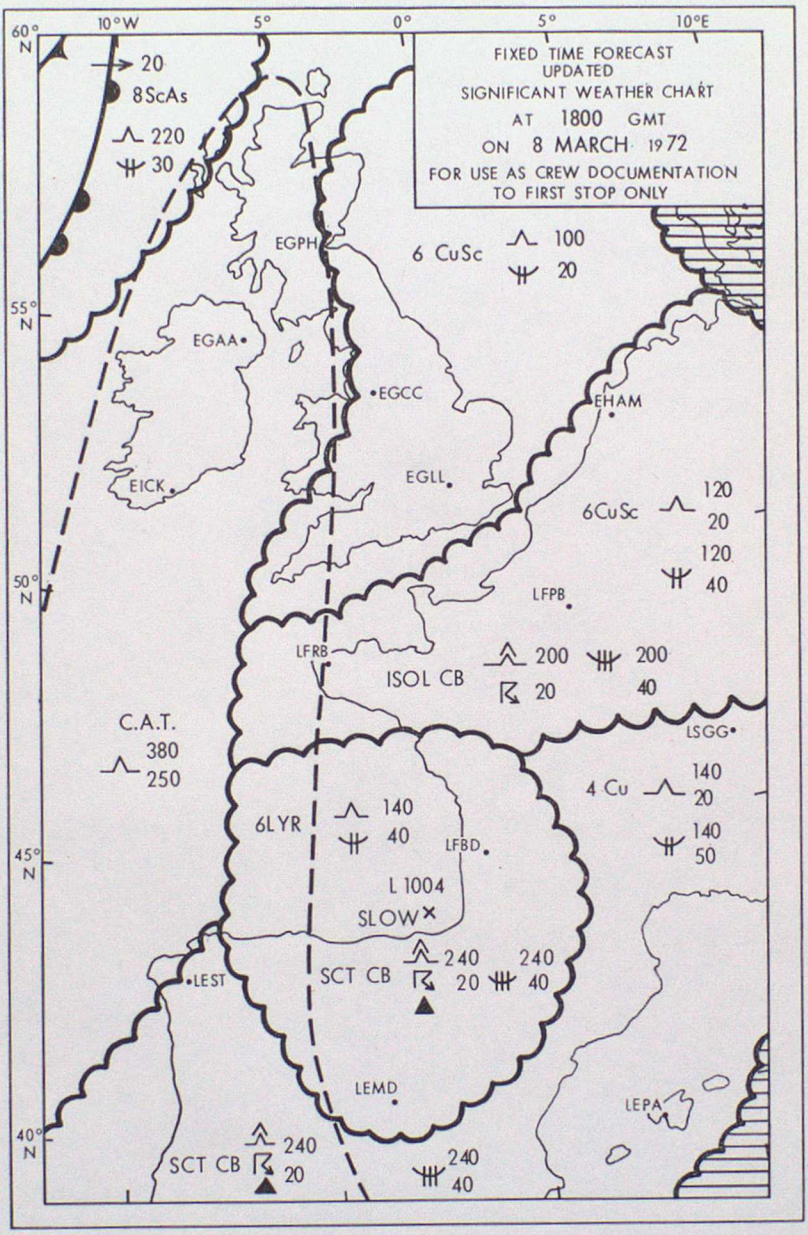


FIGURE 20.1—EXAMPLE OF SIGNIFICANT WEATHER CHART

GUIDE TO PLOTTING PROCEDURES

CHAPTER 21

21. Plotting BATHY reports

21.1. Symbolic form

21.1.1. *BATHY FM 63-V*

Section 1 $M_iM_iM_jM_j$
YYMMJ GGgg/ $Q_cL_aL_aL_aL_a$ $L_oL_oL_oL_oL_o$
($i_u$ddff) ($2s_n$TTT)

Section 2 88888 $z_0z_0T_0T_0T_0$ $z_1z_1T_1T_1T_1$ ..... $z_nz_nT_nT_nT_n$
999zz $z_1z_1T_1T_1T_1$ ..... $z_nz_nT_nT_nT_n$
(00000)

Section 3 ($777i_zi_z$ $Z_0Z_0T_0T_0T_0$ $Z_1Z_1T_1T_1T_1$ ..... $Z_nZ_nT_nT_nT_n$)
DDDD (sea-station call sign)

21.2. Temperatures at various depths are plotted on a grid on form FAX F 31, in which the temperature scale is selected according to the temperature range.

21.3. Plotting instructions

21.3.1. In Section 1 of the report, BATHY is indicated by the use of JJXX for $M_iM_iM_jM_j$.

21.3.2. YY gives the day of the month, MM the month of the year and J the units digit of the year (e.g. 3 = 1973).

21.3.3. In the northern hemisphere, Q_c is 7 for west of Greenwich and 1 for east. Latitude, $L_aL_aL_aL_a$, and longitude, $L_oL_oL_oL_oL_o$, are given in degrees and minutes.

21.3.4. Section 2 of the report is identified by the 88888-group. Temperatures, $T_0T_0T_0$ $T_1T_1T_1$ ... $T_nT_nT_n$, in tenths of a degree Celsius are plotted against depths z_0z_0 z_1z_1 ... z_nz_n, in metres. Negative temperatures have 500 added and this is subtracted before the temperature is plotted, preceded by a minus sign.

21.3.4.1. After the indicator 999, zz gives the number of hundreds of metres of depth to which subsequent values of z_1z_1, etc. must be added to obtain the depth of the corresponding temperatures.

21.3.5. Section 3, not reported from British Ocean Weather Stations except for the final group, DDDD, gives depths at International Association

of Physical Oceanography (IAPO) standard levels. Conversions from code figures, $Z_0Z_0\ Z_1Z_1\ \ldots\ Z_nZ_n$ to depths follow in Table 21.I, the left-hand column being used when the indicator 777 is followed by $i_zi_z=77$, and the right-hand column when $i_zi_z=55$.

TABLE 21.I—DEPTHS OF IAPO STANDARD LEVELS

(Z_0Z_0, $Z_1Z_1\ \ldots\ Z_nZ_n$)

Code figure	Depth *metres*	Code figure	Depth *metres*
00	00	10	1000
01	10	12	1200
02	20	15	1500
03	30	20	2000
05	50	25	2500
07	75	30	3000
10	100	40	4000
15	150	etc.	etc.
20	200		
30	300		
40	400		
50	500		
60	600		
80	800		

APPENDIX I

DATA AND GEOGRAPHICAL DESIGNATORS USED IN ABBREVIATED HEADINGS OF METEOROLOGICAL BULLETINS

A meteorological message comprises a single meteorological bulletin preceded by a starting line
ZCZC
and followed by the end-of-transmission signal
NNNN

A meteorological bulletin is identified by the use of an abbreviated heading in the form
TTAA(ii) CCCC(k) YYGGgg
where

TT = Data designator
AA = Geographical designator
ii = Number used to differentiate two or more bulletins which contain data in the same code and which originate from the same geographical area and have the same originating centre. It is a number of one or two digits (1 to 99)
CCCC = International 4-letter indicator of the station originating or compiling the bulletin (in the case of Bracknell it is EGRR)
k = Letter used (in addition to ii) when required to indicate the content and distribution of the bulletin (e.g. EGRR A shows that a bulletin is to be transmitted to North America. EGRR N shows that a bulletin is to be transmitted on the Main Trunk Circuit)
YY = Day of month
GGgg = Standard time, GMT (for analyses and prognoses standard time of observation on which the analysis or prognosis is based—for other messages the time of origin)

Data designators (TT)

The following are a selection of data designators likely to be met in European transmissions.

A—Analyses

AS = I.A.C./I.A.C. FLEET surface
AU = I.A.C. upper air
AN = Nephanalysis
AR = Radar analysis

C—Climatic data

CS = CLIMAT
CH = CLIMAT SHIP
CU = CLIMAT TEMP
CE = CLIMAT TEMP SHIP

F—Forecasts

FS =I.A.C./I.A.C. FLEET surface
FU =I.A.C. upper air
FT =Aerodrome forecasts—period of validity greater than 12 hours
FC =Aerodrome forecasts—period of validity 12 hours or less

N—Notices

NO =Notices

U—Upper-air data

UP =PILOT/PILOT SHIP (Part A)
UG =PILOT/PILOT SHIP (Part B)
UH =PILOT/PILOT SHIP (Part C)
UQ =PILOT/PILOT SHIP (Part D)
US =TEMP/TEMP SHIP (Part A)
UK =TEMP/TEMP SHIP (Part B)
UL =TEMP/TEMP SHIP (Part C)
UE =TEMP/TEMP SHIP (Part D)
UI =PILOT/PILOT SHIP (Parts A and B)
UY =PILOT/PILOT SHIP (Parts C and D)
UM =TEMP/TEMP SHIP (Parts A and B)
UF =TEMP/TEMP SHIP (Parts C and D)
UT =CODAR
UR =Meteorological Reconnaissance Flight observations
UA =AIREP
UN =Rocketsonde

S—Surface data

SM =SYNOP/SHIP main hours (0000, 0600, 1200, 1800)
SI =SYNOP/SHIP intermediate hours (0300, 0900, 1500, 2100)
SN =SYNOP/SHIP non-standard hours (0100, 0200, 0400, 0500, 0700, 0800, 1000, 1100, 1300, 1400, 1600, 1700, 1900, 2000, 2200, 2300)
SP =SPESH/SPECI
SF =SFAZI/SFLOC/SFAZU
SD =Radar reports
SO =Oceanographic data
ST =Snow depths/ice thickness reports
SX =Miscellaneous

W—Warnings

WH =Hurricane warnings
WS =SIGMET
WT =Tropical cyclone (typhoon) warnings

Geographical designators (AA)

The following table gives a selection of geographical designators likely to be met in European transmissions.

AL = Algeria
AZ = Azores
BU = Bulgaria
BX = Belgium, Luxembourg
BY = Byelorussian S.S.R.
CY = Cyprus
CZ = Czechoslovakia
DD = German Democratic Republic
DL = Federal Republic of Germany
DN = Denmark
EU = Europe
EW = Western Europe
FA = Faeroes
FI = Finland
FR = France
GI = Gibraltar
GL = Greenland
GR = Greece
HU = Hungary
IE = Ireland
IL = Iceland
IY = Italy
JN = Jan Mayen
ML = Malta
MM = Mediterranean
NE = Near East
NL = Netherlands
NO = Norway
OS = Austria
PL = Poland
PO = Portugal
RA = U.S.S.R. (Asia)
RO = Romania
RS = U.S.S.R. (Europe)
SN = Sweden
SP = Spain
SW = Switzerland
SZ = Spitsbergen
TJ = Jordan
TU = Turkey
UK = United Kingdom
UR = Ukrainian S.S.R.
YG = Yugoslavia

APPENDIX II

SYMBOLIC LETTERS AND THEIR MEANING

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
A_c	Accuracy of fix of tropical cyclone centre	0104	1
A_i	Accuracy of fix and repetition rate of atmospherics ..	0139	1
AA	Area covered by cloud*		
a	Characteristic of barometric tendency	0200	1
a_c	Character tendency of the eye	0204	1
a_e	Tendency of echo pattern ..	0235	1
a_i	Distribution of atmospherics	0239	1
a_4	Equipment type indicator ..	0265	2
B	Turbulence (reconnaissance reports and forecasts) ..	0300	4
B_z	High-level turbulence ..	0359	3
bbb	Azimuth in degrees true		
C, C′	Genus (type) of cloud ..	0500	1
C_H	Clouds of genera (types) Ci, Cs, Cc	0509	1
C_L	Clouds of genera (types) Sc, St, Cu, Cb	0513	1
C_M	Clouds of genera (types) Ac, As, Ns	0515	1
C_s	Cloud system	0551	5
C_t	Description of top of the cloud whose base is below the level of a land station	0552	1
C_1	Confidence figure	0562	5
CC	Genus of cloud, abbreviations	0500	1
CCCC	International four-letter location indicator	*ICAO Doc* 7910†	
c_e	Character of echo	RECCO‡	
c_2	Description of kind of ice ..	0663	1

* See *Handbook of weather messages*, Part III, Chapter 1.
† Montreal, International Civil Aviation Organization. Location indicators, 1974.
‡ See *Handbook of weather messages*, Part III, Chapter 7.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
D, D_a, D_K D_s, D_w	Direction (one figure) ..	0700	1
D_i	Bearing of ice edge	0739	1
DD, D_nD_n	Dew-point depression ..	0777	2
D_RD_R	Number of runway for runway visual range		
DDDD	Sea-station call sign		
d_a	Reliability of wind at flight level	RECCO*	
d_t	Type of wind at flight altitude	RECCO*	
dd, d_hd_h, d_jd_j d_md_m, d_rd_r, d_sd_s d_td_t d_wd_w, d_1d_1	Direction in tens of degrees..	0877	2
ddd	Direction in degrees from which wind is blowing		
E	State of ground	0900	1
E_sE_s	Thickness of ice accretion on ships, in centimetres		
e	Orientation of ice edge ..	1000	1
e_t	Characteristics of echo pattern	1052	1
e_1	Type of isopleth	1062	5
e_2	Type of isopleth	1063	5
F	Force of surface wind ..	1100	1
F_c	Character of front	1133	5
F_i	Intensity of front	1139	5
F_m	Force of surface wind ..	1144	4
F_t	Type of front	1152	5
J'_c	Flight conditions (reconnaissance reports)	RECCO*	
ff, f_1f_1, fff $f_hf_hf_h$, $f_mf_mf_m$ $f_nf_nf_n$	Wind speed in knots		
ff	Wind speed: equivalent in knots of Beaufort number	1100	1
f_mf_m	Maximum wind speed in knots		
f_sf_s	Speed in knots of pressure system, front or area		

* See *Handbook of weather messages*, Part III, Chapter 7.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
G_p	Period of time in whole hours		
GG	Time (GMT) to nearest hour		
G_cG_c	Synoptic hour (GMT) of observed data from which chart is prepared		
G_pG_p	Number of hours to be added to G_cG_c to obtain time to which the prognosis refers		
GGgg	Time (GMT) in hours and minutes		
g_pg_p	Number of hours to be added to or subtracted from G_cG_c (chart time) or $G_cG_c + G_pG_p$ to give supplementary information in sections 99900 and 99911, or number of hours to be added to G_cG_c for indicating the time to which the forecast winds in section 99977 refer		
H_e	Height of echo top	1535	1
H_w	Height of waves	1555	1
H'_w	Height of waves	1555 (1963)*	
HH, H_iH_i H_sH_s, hh h_ah_a, h_bh_b h_Bh_B h_fh_f, h_ih_i h_sh_s, h_th_t, h_xh_x	Height of cloud, etc.	1677	1
H_aH_a	Height of top of climb . .	1677	1
H_tH_t	Height of top of cloud . .	1677	1
H_wH_w	Height of waves in units of half a metre		
H′H′	Height of the upper surface of clouds reported by C′ in hectometres		
HHH	Height in thousands, hundreds and tens units (reconnaissance reports)	RECCO†	
$H_bH_bH_b$	Altitude of cloud base in hundreds of metres		

* See *Handbook of weather messages*, Part III, Chapter 1.
† See *Handbook of weather messages*, Part III, Chapter 7.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
$H_tH_tH_t$	Altitude of tops of clouds in hundreds of metres		
HHHH	D-value or height in decametres of nearest standard isobaric surface	CODAR	3
$H_mH_mH_mH_m$	Height of maximum wind		2
h	Height of base of cloud (one figure)	1600	1
h_t	Type of topography system..	3152	5
h_ah_a	Geopotential of constant-pressure surface in geopotential decametres		
hhh	Altitude of aircraft in decametres or hundreds of feet..	RECCO*	
$h_eh_eh_e$	Height of top of radar echo in hundreds of feet		
$h_sh_sh_s$	Height of base of cloud layer whose genus is indicated by CC	1690	1
$h_1h_1h_1$ / $h_2h_2h_2$	Height above MSL in geopotential metres or decametres		
I_e	Intensity of echoes	1735	1
I_r	Rate of icing	RECCO*	
I_s	Source of ice accretion on ships	1751	1
I_t	Type of icing and contrails ..	RECCO*	
II	Block number		
i	Intensity of character of the weather	1800	5
i_e	Intensity of echo	RECCO*	
i_t	Data indicator	MASTEMP	2
i_R	Indicator for inclusion of precipitation group	1819	7
i_u	Wind and instrumentation indicator	1853	7
i_u	Humidity indicator	RECCO*	
i_w	Wind indicator	1855	1
$i_2$zzz	Zone indicator and specifications	1863	4
$i_3$nnn	Supplementary - phenomena indicator and specifications	1864	4
iii	Station number		

* See *Handbook of weather messages*, Part III, Chapter 7.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
J	Units digit of the year		
j	Index pertaining to HHH ..	RECCO*	
jj	Extreme temperature in European Region		
$j_a j_p j_p$	Barometric tendency or alternative		
K	Effect of the ice on navigation	2100	1
k	Indicator used to specify half degrees	2200	1
k_n	Number of cloud layers reported	RECCO*	
$L_a L_a$	Latitude in whole degrees		
$L_o L_o$	Longitude in whole degrees†		
$L_a L_a L_a$	Latitude in degrees and tenths		
$L'_a L'_a L'_a$			
$L_o L_o L_o$	Longitude in degrees and tenths†		
$L_r L_r L_r$	Reference level	MASTEMP	2
$L_o L_o L_o L_o$	Longitude in degrees and tenths‡		
M_h	Continental or maritime character of air mass	2538	5
M_s	Source region of air mass ..	2551	5
M_t	Thermodynamic condition of air mass	2552	5
$M_i M_i$	Code identifier letters ..	2582	Appendix II
$M_j M_j$	Report part identifier letters..	2582	Appendix II
m	Movement indicator figure ..	2600	5
m	Remarks on present weather..	RECCO*	
N, N′, N_h	Fraction of the celestial dome covered by cloud	2700	1
N_1, N_2, N_3			
N_s	Amount of individual cloud layer or mass of genus (type) C	2700	1
NN	Identity number of a front or system		
n	Number of consecutive isobaric surfaces		
n_L	Number of layers		

* See *Handbook of weather messages*, Part III, Chapter 7.
† The hundreds digit is omitted for longitudes 100°–180°.
‡ The hundreds digit is always reported.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
n_m	Number of mean winds reported		
n_r	Reference level	MASTEMP	2
n_s	Number of spot winds reported		
n_v	Number of days for which wind observations are missing		
n_w	Duration of phenomenon ..	658	1
$n_1n_1 \ldots n_nn_n$	Sequence number of the level	TEMP	2
O_e	Orientation of ellipse ..	RECCO*	
$P_c(h_c)$	Character of pressure (or topography) system	3133	5
$P_t(h_t)$	Type of pressure (or topography) system	3152	5
P_w, P'_w	Period of waves	3155	1
PP	Pressure on a constant-level surface in whole millibars		
P_0P_0	Last two figures of pressure in whole millibars		
P_BP_B, P_LP_L P_MP_M, P_fP_f P_iP_i, P_jP_j P_tP_t, P_xP_x P_1P_1, P_2P_2 $P'_mP'_m$	Pressure in tens of millibars		
P_wP_w	Period of waves in seconds		
PPP	Pressure in tenths of a millibar or geopotential in geopotential metres		
$P_aP_aP_a$	Flight-level pressure	CODAR	3
$P_mP_mP_m$	Pressure of maximum wind level in whole millibars		
$P_tP_tP_t$	Pressure at the tropopause in whole millibars		
$P_0P_0P_0$ $P_1P_1P_1$	Barometric pressure in whole millibars		
$P_3P_3P_3$	Last 3 figures of altimeter subscale setting (whole millibars		
PPPP	Pressure in tenths of a millibar		
$P_HP_HP_HP_H$	QNH value in whole millibars		

* See *Handbook of weather messages*, Part III, Chapter 7.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
$P_0P_0P_0P_0$	Pressure at station level in tenths of a millibar		
pp	Barometric tendency		
ppp	Barometric tendency when more than 9·9 mb		
$p_vp_vp_v$	Barometric tendency		
Q	Octant of the globe	3300	1
Q_c	Quadrant of the globe ..	3333	1
R	Runway visual range indicator letter		
R_s	Rate of ice accretion on ships	3551	1
R_w	Wavelength of the radar ..	3555	1
RR	Amount of rainfall	3577	1
RRR	Amount of precipitation during 6 hours preceding the time of observation ..	3590	7
r	Distance to ice edge from ship	3600	1
r_t	Distance between end of outer spiral and centre of tropical cyclone	3652	1
rr	Range in 5-km intervals		
S, S′	State of sea, or of the water surface in an alighting area	3700	1
S_c	Definition of eye of tropical cyclone	3704	1
S_b	Distance to beginning of icing	RECCO*	
S_e	Distance to ending of icing ..	RECCO*	
S_h	Indicator of type of temperature and height data ..	3738	3
S_r	Distance to echo centre in tens of nautical miles	RECCO*	
S_s	Distance of occurrence of W_s	RECCO*	
S_1, S_2	Nature of zones	3762	5
SS	Section of front or pressure system	3777	5
SSS	Horizontal distance from the airfield of the top of the ascent (in nautical miles)		
$S_pS_pS_pS_p$	European Regional code for special phenomena ..	668	1

* See *Handbook of weather messages*, Part III, Chapter 7.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
s_n	Sign of temperature	3845	1
s_t	Type of station and wind/ weather groups indicator ..	3852	7
T_a, T_{a0}, T_{ai} T_{an}, T_{at}	Approximate tenths value and sign of air temperature ..	3931	2
T_c	Characteristics of tropical system	3933	5
T_i	Intensity of tropical system ..	3939	5
T_t	Type of tropical circulation ..	3952	5
TT, T_cT_c T′T′, T_hT_h, T_nT_n T_0T_0, T_pT_p, T_tT_t T_1T_1, T_2T_2, etc.	Air temperature in whole degrees Celsius		
T_dT_d, $T_{d0}T_{d0}$ $T_{dp}T_{dp}$, $T_{d1}T_{d1}$ $T_{d2}T_{d2}$, etc.	Dew-point temperature in whole degrees Celsius		
T_sT_s	Difference between air temperature and sea temperature in half degrees Celsius		
T_uT_u	Humidity in accordance with the code figure for i_u ..	RECCO*	
TTT, $T_0T_0T_0$ $T_rT_rT_r$	Temperature in tenths of a degree Celsius		
$T_wT_wT_w$	Sea surface temperature in tenths of a degree Celsius		
$T_dT_dT_d$ $T_{d0}T_{d0}T_{d0}$	Dew-point in tenths of a degree Celsius		
t_L	Thickness of layer	4013	4
t_R	Duration and time of occurrence of RRR	4019	7
t_T	Tenths figure of air temperature		
t_e	Time interval	4035	1
t_n	Tens digit	PILOT	2
uu	Unit of isopleth values (defined in Code 1063)		5
uuu	Unit of isopleth values (defined in Code 1062)		5
$u_1u_2u_3$	Units digit	PILOT	2

* See *Handbook of weather messages*, Part III, Chapter 7.

Symbols	Meaning	Code Number	*Handbook of weather messages* Part II, Chapter
V	Visibility at surface	4300	4
VV, V_nV_n	Horizontal visibility	4377	1
V_sV_s, V_xV_x			
VVVV	Horizontal visibility in metres		
$V_RV_RV_RV_R$	Runway visual range in metres		
v_s	Speed of ship	4451	1
v_av_a, v_bv_b	Absolute value of vector difference		
v_rv_r	Relative speed of cloud, in radians per hour, determined by the nephoscope		
W	Past weather	4500	1
W_C	Diameter or length of major axis of eye of tropical cyclone	4504	1
W_c	Weather off course	RECCO*	
W_e	Mean diameter of echo, or area of echoes, or mean width of line of echoes	4535	1
W_s	Significant weather changes ..	RECCO*	
WW	Past weather	4675 (revised)	7
w	Present weather	RECCO*	
w_e	Type of weather	4635	5
w_e	Ellipse width or echo diameter in tens of nautical miles (in reconnaissance radar reports)	RECCO*	
ww	Present weather	4677	1
w_sw_s	Significant weather	4683	5
w'w'	Significant present and forecast weather	4678	1
x_4	Hemisphere indicator ..	4865	1
x_1x_1	Indicator of system in which point-position groups are given	4887	5
$x_2x_2x_2$	Indicator for specifying the		
$x_3x_3x_3$	type of analysis	4892	5
Y	Day of the week	4900	1
YY	Day of the month		
Z_1	Nature of evolution of zone S_2	5162	5

* See *Handbook of weather messages*, Part III, Chapter 7.