

APPENDIX G

RECCO, HDOB, AND TEMP DROP

CODES, TABLES, AND REGULATIONS

(Incorporated Change 1 on August 24, 2012 for Page G-14)

DATE		ORGANIZATION				MISSION IDENTIFIER												
OBSERVATION NUMBER	9	RECCO INDICATOR SPECIFYING TYPE OF OBSERVATION <i>Table 1</i>	Q	TIME OF OBSERVATION (Hours and Minutes) (GMT)	Y	DAY OF WEEK SUN-1	L _o	LONGITUDE DEGREES AND TENTHS <i>(Note 4)</i>	h _a	PRESSURE ALTITUDE OF AIRCRAFT REPORTED TO THE NEAREST DECAMETER	d	WIND DIRECTION AT FLIGHT LEVEL <i>(Tens of deg. true.)</i>	T	TEMPERATURE WHOLE °C <i>(Note 6)</i>	/	INDICATOR INDEX TO WHH <i>Table 9</i>		
	X		Q		OCTANT <i>Table 3</i>	L _o	h _a		d		T							
	X		g		L _a	LATITUDE DEGREES AND TENTHS	L _o		h _a		f		T _d		DEW POINT WHOLE °C <i>(Note 6)</i>		H	GEOPOTENTIAL HEIGHT/D-VALUE OR SLP PER INDEX <i>(Note 8)</i>
	X		g		L _a	B	TURBULENCE <i>Table 4</i>		d _t		f		T _d		H			
	9		i _d		L _a	f _c	FLIGHT COND <i>Table 3</i> <i>(Note 5)</i>		d _a		f		w		PRESENT WEATHER <i>(Note 7</i> <i>Table 8)</i>		H	
1		2		3		4		5		6		7		8				
REMARKS																		

TYPE AIRCRAFT				CALL SIGN				METEOROLOGIST							
1	INDICATOR	C	CLOUD TYPE <i>Table 11</i>	C	CLOUD TYPE <i>Table 11</i>	C	CLOUD TYPE <i>Table 11</i>	1	INDICATOR	C	CLOUD TYPE <i>Table 11</i>	C	CLOUD TYPE <i>Table 11</i>	C	CLOUD TYPE <i>Table 11</i>
k _n	NR OF CLOUD LAYERS <i>(Note 9)</i>	h _a	ALTITUDE OF BASE	h _a	ALTITUDE OF BASE	h _a	ALTITUDE OF BASE	K _n	NR OF CLOUD LAYERS <i>(Note 9)</i>	h _a	ALTITUDE OF BASE	h _a	ALTITUDE OF BASE	h _a	ALTITUDE OF BASE
N _a	AMOUNT OF CLOUDS <i>(Note 9)</i> <i>Table 10</i>	h _a	<i>Table 12</i>	h _a	<i>Table 12</i>	h _a	<i>Table 12</i>	N _a	AMOUNT OF CLOUDS <i>(Note 9)</i> <i>Table 10</i>	h _a	<i>Table 12</i>	h _a	<i>Table 12</i>	h _a	<i>Table 12</i>
N _t	ALTITUDE OF TOP	H _t	<i>Table 12</i>	H _t	<i>Table 12</i>	H _t	<i>Table 12</i>	N _t	ALTITUDE OF TOP	H _t	<i>Table 12</i>	H _t	<i>Table 12</i>	H _t	<i>Table 12</i>
N _t		H _t	<i>Table 12</i>	H _t	<i>Table 12</i>	H _t	<i>Table 12</i>	N _t		H _t	<i>Table 12</i>	H _t	<i>Table 12</i>	H _t	<i>Table 12</i>
9		10		11		12		13		14		15		16	
REMARKS															

RECCO RECORDING WORKSHEET															
4	INDICATOR	6	INDICATOR <i>(Note 11)</i>	6	INDICATOR <i>(Note 11)</i>	7	INDICATOR	7	INDICATOR	8	INDICATOR	8	INDICATOR	9	INDICATOR
d	DIRECTION OF SFC WIND <i>(Tens of deg. true)</i>	W _s	SIGNIFICANT WEATHER CHANGES <i>Table 14</i>	W _s	SIGNIFICANT WEATHER CHANGES <i>Table 14</i>	I _r	RATE OF ICING <i>Table 17</i>	h _i	ALT OF BASE OF ICING STRATUM <i>(Note 12)</i> <i>Table 12</i>	d _r	BEARING OF ECHO CENTER <i>(Tens of Deg. True)</i>	E _w	ECHO WIDTH OR DIAMETER <i>Table 19</i>	V _i	INFLIGHT VISIBILITY <i>Table 23</i>
d		S _s	DISTANCE OF OCCURRENCE OF W _s <i>Table 15</i>	S _s	DISTANCE OF OCCURRENCE OF W _s <i>Table 15</i>	I _t	TYPE OF ICING <i>Table 18</i>	h _i		d _r		E _i	LENGTH OF MAJ AXIS <i>Table 19</i>	T _w	SEA SURFACE TEMPERATURE DEGREES AND TENTHS
f	SURFACE WIND SPEED <i>(Note 10)</i>	w _d	DISTANT WEATHER <i>Table 16</i>	w _d	DISTANT WEATHER <i>Table 16</i>	S _b	DISTANCE TO BEGINNING OF ICING <i>Table 15</i>	H _i	ALTITUDE OF TOP OF ICING STRATUM <i>(Note 12)</i> <i>Table 12</i>	S _r	DISTANCE TO ECHO CENTER <i>Table 19</i>	C _e	CHARACTER OF ECHO <i>Table 21</i>	T _w	
f		d _w	BEARING OF W _d <i>Table 13</i>	d _w	BEARING OF W _d <i>Table 13</i>	S _e	DISTANCE TO ENDING OF ICING <i>Table 15</i>	H _i		O _e	ORIENTATION OF ELLIPSE <i>Table 20</i>	I _e	INTENSITY OF ECHO <i>Table 22</i>	T _w	
17		18		19		20		21		22		23		24	
REMARKS															

Figure G-1. Reconnaissance Code Recording Form

Table G-1. Reconnaissance Code Tables

TABLE 1 XXX

- 222 Sec One Observation without radar capability
- 555 Sec Three (intermediate) observation with or without radar capability
- 777 Sec One Observation with radar capability

TABLE 2 i_d

- 0 No dew point capability/acft below 10,000 meters
- 1 No dew point capability/acft at or above 10,000 meters
- 2 No dew point capability/acft below 10,000 meters and flight lvl temp - 50°C or colder
- 3 No dew point capability/acft at or above 10,000 meters and flight lvl temp -50°C or colder
- 4 Dew point capability/acft below 10,000 meters
- 5 Dew point capability/acft at or above 10,000 meters
- 6 Dew point capability/acft below 10,000 meters and flight lvl temp - 50°C or colder
- 7 Dew point capability/acft at or above 10,000 meters and flight lvl temp - 50°C or colder

TABLE 3 Q

- | | |
|----------------|-----------------|
| 0 0° -90° W | <u>Northern</u> |
| 1 90° W - 180° | <u>Northern</u> |
| 2 180° - 90° E | <u>Northern</u> |
| 3 90° - 0° E | <u>Northern</u> |
| 4 Not Used | |
| 5 0° - 90° W | <u>Southern</u> |
| 6 90° W - 180° | <u>Southern</u> |
| 7 180° - 90° E | <u>Southern</u> |
| 8 90° - 0° E | <u>Southern</u> |

TABLE 4 B

- 0 None
- 1 Light turbulence
- 2 Moderate turbulence in clear air, infrequent
- 3 Moderate turbulence in clear air, frequent
- 4 Moderate turbulence in cloud, infrequent
- 5 Moderate turbulence in cloud, frequent
- 6 Severe Turbulence in clear air, infrequent
- 7 Severe Turbulence in clear air, frequent
- 8 Severe Turbulence in cloud, infrequent
- 9 Severe Turbulence in cloud, frequent

TABLE 5 f_c

- 0 In the clear
- 8 In and out of clouds
- 9 In clouds all the time (continuous IMC)
- / Impossible to determine due to darkness or other cause

TABLE 6 d_t

- 0 Spot of Wind
- 1 Average wind
- / No wind reported

TABLE 7 d_a

- 0 Winds obtained using doppler radar or inertial systems
- 1 Winds obtained using other navigation equipment and/or techniques
- / Navigator unable to determine or wind not compatible

TABLE 8 w

- 0 Clear
- 1 Scattered (trace to 4/8 cloud coverage)
- 2 Broken (5/8 to 7/8 cloud coverage)
- 3 Overcast/undercast
- 4 Fog, thick dust or haze
- 5 Drizzle
- 6 Rain (continuous or intermittent precip - from stratiform clouds)
- 7 Snow or rain and snow mixed
- 8 Shower(s) (continuous or intermittent precip - from cumuliform clouds)
- 9 Thunderstorm(s)
- / Unknown for any cause, including darkness

TABLE 9 j

- 0 Sea level pressure in whole millibars (thousands fig if any omitted)
- 1 Altitude 200 mb surface in geopotential decameters (thousands fig if any omitted)
- 2 Altitude 850 mb surface in geopotential meters (thousands fig omitted)
- 3 Altitude 700 mb surface in geopotential meters (thousands fig omitted)
- 4 Altitude 500 mb surface in geopotential decameters
- 5 Altitude 400 mb surface in geopotential decameters
- 6 Altitude 300 mb surface in geopotential decameters
- 7 Altitude 250 mb surface in geopotential decameters (thousands fig if any omitted)
- 8 D - Value in geopotential decameters; if negative 500 is added to HHH
- 9 Altitude 925 mb surface in geopotential meters
- / No absolute altitude available or geopotential data not within ± 30 meters/4 mb accuracy requirements

TABLE 10 N_s

- 0 No additional cloud layers (place holder)
- 1 1 okta or less, but not zero (1/8 or less sky covered)
- 2 2 oktas (or 2/8 of sky covered)
- 3 3 oktas (or 3/8 of sky covered)
- 4 4 oktas (or 4/8 of sky covered)
- 5 5 oktas (or 5/8 of sky covered)
- 6 6 oktas (or 6/8 of sky covered)
- 7 7 oktas or more but not 8 oktas
- 8 8 oktas or sky completely covered
- 9 Sky obscured (place holder)

TABLE 11 C

- 0 Cirrus (Ci)
- 1 Cirrocumulus (Cc)
- 2 Cirrostratus (Cs)
- 3 Altopcumulus (Ac)
- 4 Altostratus (As)
- 5 Nimbostratus (Ns)
- 6 Stratocumulus (Sc)
- 7 Stratus (St)
- 8 Cumulus (Cu)
- 9 Cumulonimbus (Cb)
- / Cloud type unknown due to darkness or other analogous phenomena

TABLE 12 h_sh_sH_tH_th_ih_iH_iH_i

- 00 Less than 100
- 01 100 ft
- 02 200 ft
- 03 300 ft
- etc, etc
- 49 4,900 ft
- 50 5,000 ft
- 51-55 Not used
- 56 6,000 ft
- 57 7,000 ft
- etc, etc
- 79 29,000 ft
- 80 30,000 ft
- 81 35,000 ft
- 82 40,000 ft
- etc, etc
- 89 Greater than 70,000 ft
- // Unknown

TABLE 13 d_w

- | | |
|-------------|------------------|
| 0 No report | 5 SW |
| 1 NE | 6 W |
| 2 E | 7 NW |
| 3 SE | 8 N |
| 4 S | 9 all directions |

TABLE 14 W_s

- 0 No change
- 1 Marked wind shift
- 2 Beginning or ending or marked turbulence
- 3 Marked temperature change (not with altitude)
- 4 Precipitation begins or ends
- 5 Change in cloud forms
- 6 Fog or ice fog bank begins or ends
- 7 Warm front
- 8 Cold Front
- 9 Front, type not specified

TABLE 15 S_bS_eS_s

- 0 No report
- 1 Previous position
- 2 Present position
- 3 30 nautical miles
- 4 60 nautical miles
- 5 90 nautical miles
- 6 120 nautical miles
- 7 150 nautical miles
- 8 180 nautical miles
- 9 More than 180 nautical miles
- / Unknown (not used for S_s)

Table G-1 (continued). Reconnaissance Code Tables

TABLE 16 w_d

- 0 No report
- 1 Signs of a tropical cyclone
- 2 Ugly threatening sky
- 3 Duststorm or sandstorm
- 4 Fog or ice fog
- 5 Waterspout
- 6 Cirrostratus shield or bank
- 7 Altostratus or altocumulus shield or bank
- 8 Line of heavy cumulus
- 9 Cumulonimbus heads or thunderstorms

TABLE 17 I_r

- 7 Light
- 8 Moderate
- 9 Severe
- / Unknown or contrails

TABLE 18 I_t

- 0 None
- 1 Rime ice in clouds
- 2 Clear ice in clouds
- 3 Combination rime and clear ice in clouds
- 4 Rime ice in precipitation
- 5 Clear ice in precipitation
- 6 Combination rime and clear ice in precip
- 7 Frost (icing in clear air)
- 8 Nonpersistent contrails (less than 1/4 nautical miles long)
- 9 Persistent contrails

TABLE 19 S_r, E_w, E_l

- 0 0NM 5 50NM
- 1 10NM 6 60-80NM
- 2 20NM 7 80-100NM
- 3 30NM 8 100-150NM
- 4 40NM 9 Greater than 150NM
- / Unknown

TABLE 20 O_e

- 0 Circular
- 1 NNE - SSW
- 2 NE - SW
- 3 ENE - WSW
- 4 E - W
- 5 ESE - WNW
- 6 SE - NW
- 7 SSE - NNW
- 8 S - N
- / Unknown

TABLE 21 c_e

- 1 Scattered Area
- 2 Solid Area
- 3 Scattered Line
- 4 Solid Line
- 5 Scattered, all quadrants
- 6 Solid, all quadrants
- / Unknown

TABLE 22 i_e

- 2 Weak
- 5 Moderate
- 8 Strong
- / Unknown

TABLE 23 V_i

- 1 Inflight visibility 0 to and including 1 nautical mile
- 2 Inflight visibility greater than 1 and not exceeding 3 nautical miles
- 3 Inflight visibility greater than 3 nautical miles

RECCO SYMBOLIC FORM

SECTION ONE (MANDATORY)

9XXX9 GGgg_d YQL_aL_aL_a L_oL_oL_oBf_c h_ah_ah_ad_td_a

ddfff TTT_dT_d^w /jHHH

SECTION TWO (ADDITIONAL)

1k_nN_sN_sN_s Ch_sh_sH_tH_t 4ddff

6W_sS_sW_dd_w 7I_rI_tS_bS_e 7h_ih_iH_iH_i 8d_rd_rS_rO_e

8E_wE_ic_ei_e 9V_iT_wT_wT_w

SECTION THREE (INTERMEDIATE)

9XXX9 GGgg_d YQL_aL_aL_a L_oL_oL_oBf_c h_ah_ah_ad_td_a

ddfff TTT_dT_d^w /jHHH

Table G-2. Reconnaissance Code Regulations

<p>1. At the time of the observation the aircraft observing platform is considered to be located on the axis of a right vertical cylinder with a radius of 30 nautical miles bounded by the earth's surface and the top atmosphere. Present weather, cloud amount and type, turbulence, and other subjective elements are reported as occurring within the cylinder. Flight level winds, temperature, dew point, and geopotential values are sensed or computed and reported as occurring at the center of the observation circle. Radar echoes, significant weather changes, distant weather, and icing are phenomena that may also be observed/reported. Code groups identifying these phenomena may be reported as necessary to adequately describe met conditions observed.</p> <p>2. The intermediate observation (Section Three) is reported following Section One (or Section Two if appended to Section One) in the order that it was taken.</p> <p>3. Plain language remarks may be added as appropriate. These remarks follow the last encoded portion of the horizontal or vertical observation and will clearly convey the intended message. Vertical observations will not include meteorological remarks. These remarks must begin with a letter or word-e.g. "FL TEMP" vice "700 MB FL TEMP." The last report plain language remarks are mandatory, i.e., "LAST REPORT. OBS 01 thru 08 to KNHC, OBS 09 and 10 to KBIX."</p> <p>4. The hundreds digit of longitude is omitted for longitudes from 100° to 180°.</p> <p>5. Describe conditions along the route of flight actually experienced at flight level by aircraft.</p> <p>6. TT, T_dT_d. When encoding negative temperatures, 50 is added to the absolute value of the temperature with the hundreds figure, if any, being omitted. A temperature of -52°C is encoded as 02, the distinction between -52°C and 2°C being made from i_d. Missing or unknown temperatures are reported as //. When the dew point is colder than -49.4°C, Code T_dT_d as // and report the actual value as a plain language remark - e.g. "DEW POINT NEG 52°C".</p> <p>7. When two or more types of w co-exist, the type with the higher code figure will be reported. Code Figure 1, 2 and 3 are reported based on the total cloud amount through a given altitude, above or below the aircraft, and when other figures are inappropriate. The summation principle applies only when two or more cloud types share a given altitude.</p>	<p>8. When j is reported as a /, HHH is encoded as ///.</p> <p>9. If the number of cloud layers reported exceeds 3, k_n in the first 1-group reports the total number of cloud layers. The second 1-group reports the additional number of layers being reported exclusive of those previously reported. In those cases where a cloud layer(s) is discernible, but a descriptive cloud picture of the observation circle is not possible, use appropriate remarks such as "Clouds Blo" or "As Blo" to indicate the presence of clouds. In such cases, coded entries are not made for group 9. The sequence in which cloud amounts are encoded depends upon type of cloud, cloud base, and vertical extent of the cloud. The cloud with the largest numerical value of cloud type code (C) is reported first, regardless of coverage, base, or vertical extent. Among clouds of the same cloud type code, sharing a common base, the cloud of greatest vertical extent is reported first. The summation principle is not used; each layer is treated as though no other clouds were present. The total amount of clouds through one altitude shared by several clouds will not exceed 8 oktas. Only use code figure 0 as a place holder when you can determine that no additional cloud layers exist. In case of undercast, overcast, etc., use code figure 9 as a placeholder.</p> <p>10. Due to limitations in the ability to distinguish sea state features representative of wind speeds above 130 knots, surface wind speeds in excess of 130 knots will not be encoded. Wind speeds of 100 to 130 knots inclusive will be encoded by deleting the hundreds figure and adding 50 to dd. For wind speeds above 130 knots, dd is reported without adding 50 and ff is encoded as // with a plain language remark added, i.e., "SFC WIND ABOVE 130 KNOTS."</p> <p>11. Significant weather changes which have occurred since the last observation along the track are reported for W_s.</p> <p>12. When aircraft encounters icing in level flight, the height at which the icing occurred will be reported for h_ih_i. The H_iH_i will be reported as //.</p>
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THE HDOB MESSAGE

The HDOB message is used to transmit High-Density/High-Accuracy (HD/HA) meteorological data from hurricane reconnaissance aircraft. These are created automatically by the system software. Each message consists of a communications header line (Table G-3), a mission/ob identifier line (Table G-4), and 20 lines of HD/HA data (Table G-5).

Within an HDOB message, the time interval (resolution) between individual HD/HA observations can be set by the operator to be 30, 60, or 120 seconds. However, regardless of the time resolution of the HD/HA data, the meteorological parameters in the HDOB message always represent 30-second averages along the flight track (except for certain peak values as noted in Table G-5).

The nominal time of each HD/HA record is the midpoint of the 30-second averaging interval. This means that an HD/HA record at time t will include data measured at time $t+15$ seconds. For purposes of determining peak flight-level and SFMR winds, the encoding interval begins 15 seconds after the nominal time of the last HD/HA record and ends 15 seconds after the nominal time of the record being encoded.

A sample HDOB message is given below (message begins with URNT15...):

```

0           1           2           3           4           5           6           7
01234567890123456789012345678901234567890123456789012345678901234567890
-----
URNT15 KNHC 281426
AF302 1712A KATRINA           HDOB 41 20050928
142030 2608N 08756W 7093 03047 9333 +192 +134 133083 089 080 /// 00
142100 2609N 08755W 7091 03054 9330 +166 +146 133106 115 103 /// 00
142130 2610N 08754W 7058 03040 9295 +134 +134 135121 124 111 /// 00
142200 2611N 08753W 7037 03060 9291 +124 +124 138129 136 122 /// 00
.
.
.
142230 2612N 08752W 7010 03057 9282 +102 +102 141153 166 148 /// 00
142300 2612N 08751W 7042 03010 9293 +088 +083 133159 164 147 /// 00
142330 2613N 08750W 6999 03064 9279 +088 +088 138158 161 144 /// 00
142400 2614N 08749W 7005 03046 9281 +080 +080 138155 158 142 /// 00
142430 2614N 08748W 6998 03048 9278 +078 +078 138151 153 137 /// 00
142500 2615N 08747W 7002 03048 9279 +084 +084 140146 148 133 /// 00
$$

```

Figure G-2. HDOB Description and Sample Message

Table G-5. HD/HA Data Line Format for HDOB Messages

0	1	2	3	4	5	6	7
0	1	2	3	4	5	6	7
01234567890123456789012345678901234567890123456789012345678901234567890							

hhmmss	LLLLH	NNNNH	PPPP	GGGGG	XXXX	sTTT	sddd
142230	2612N	08752W	7010	03057	9282	+102	+102
						141153	166 148
							/// 00

hhmmss: Observation time, in hours, minutes and seconds (UTC). The observation time is the midpoint of the 30-s averaging interval used for the record's meteorological data.

LLLLH: The latitude of the aircraft at the observation time in degrees (LL) and minutes (LL). The hemisphere (H) is given as either N or S.

NNNNH: The longitude of the aircraft at the observation time, in degrees (NNN) and minutes (NN). The hemisphere (H) is given as either E or W.

PPPP: Aircraft static air pressure, in tenths of mb with decimal omitted, at the observation time. If pressure is equal to or greater than 1000 mb the leading 1 is dropped.

GGGGG: Aircraft geopotential height, in meters, at the observation time.

XXXX: Extrapolated surface pressure or D-value (30-s average). Encoded as extrapolated surface pressure if aircraft static pressure is 550.0 mb or greater (i.e., flight altitudes at or below 550 mb). Format for extrapolated surface pressure is the same as for static pressure. For flight altitudes higher than 550 mb, **XXXX** is encoded as the D-value, in meters. Negative D-values are encoded by adding 5000 to the D-value. **///** indicates missing value.

s: Sign of the temperature or dew point (+ or -).

sTTT: The air temperature in degrees and tenths Celsius, decimal omitted (30-s average). **///** indicates missing value.

sddd: The dew point temperature, in degrees and tenths Celsius, decimal omitted (30-s average). **///** indicates missing value.

www: Wind direction in degrees (30-s average). North winds are coded as 000. **///** indicates missing value.

SSS: Wind speed, in kt (30-s average). **///** indicates missing value.

MMM: Peak 10-second average wind speed occurring within the encoding interval, in kt.

/// indicates missing value.

KKK: Peak 10-second average surface wind speed occurring within the encoding interval from the Stepped Frequency Microwave Radiometer (SFMR), in kt. /// indicates missing value.

ppp: SFMR-derived rain rate, in mm hr^{-1} , evaluated over the 10-s interval chosen for KKK. /// indicates missing value.

FF: Quality control flags.

First column indicates status of positional variables as follows:

- 0 All parameters of nominal accuracy
- 1 Lat/lon questionable
- 2 Geopotential altitude or static pressure questionable
- 3 Both lat/lon and GA/PS questionable

Second column indicates status of meteorological variables as follows:

- 0 All parameters of nominal accuracy
 - 1 T or TD questionable
 - 2 Flight-level winds questionable
 - 3 SFMR parameter(s) questionable
 - 4 T/TD and FL winds questionable
 - 5 T/TD and SFMR questionable
 - 6 FL winds and SFMR questionable
 - 9 T/TD, FL winds, and SFMR questionable
-

Table G-6. TEMP DROP CODE

EXTRACT FROM: WMO-No. 306 MANUAL ON CODES

FM 37-X Ext. TEMP DROP: Upper-level pressure, temperature, humidity and wind report from a sonde released by carrier balloons or aircraft. See Figure G-3 for an example TEMP DROP message for tropical cyclone operations.

CODE FORM:

PART A

SECTION 1 $M_i M_i M_j M_j$ $YYGGI_d$ $99L_a L_a L_a$ $Q_c L_o L_o L_o$ $MMM U_{L_a} U_{L_o}$

SECTION 2 $99P_o P_o P_o$ $T_o T_o T_{a0} D_o D_o$ $d_o d_o f_o f_o f_o$

$P_1 P_1 h_1 h_1 h_1$ $T_1 T_1 T_{a1} D_1 D_1$ $d_1 d_1 f_1 f_1 f_1$

$P_n P_n h_n h_n h_n$ $T_n T_n T_{an} D_n D_n$ $d_n d_n f_n f_n f_n$

SECTION 3 $88P_t P_t P_t$ $T_t T_t T_{at} D_t D_t$ $d_t d_t f_t f_t f_t$
or
88999

SECTION 4 $77P_m P_m P_m$ $d_m d_m f_m f_m f_m$ $(4v_b v_b v_a v_a)$
or
 $66P_m P_m P_m$ $d_m d_m f_m f_m f_m$ $(4v_b v_b v_a v_a)$
or
77999

SECTION 10 31313

51515 $101A_{df} A_{df}$ $0P_n P_n P'_n P'_n$
or

$101A_{df} A_{df}$ $P_n P_n h_n h_n h_n$
61616

62626

PART B

SECTION 1 $M_i M_i M_j M_j$ $YYGG8$ $99L_a L_a L_a$ $Q_c L_o L_o L_o$ $MMM U_{L_a} U_{L_o}$

SECTION 5 $n_o n_o P_o P_o P_o$ $T_o T_o T_{a0} D_o D_o$

$n_1 n_1 P_1 P_1 P_1$ $T_1 T_1 T_{a1} D_1 D_1$

$n_n n_n P_n P_n P_n$ $T_n T_n T_{an} D_n D_n$

SECTION 6 21212 $n_o n_o P_o P_o P_o$ $d_o d_o f_o f_o f_o$

$n_1 n_1 P_1 P_1 P_1 \quad d_1 d_1 f_1 f_1 f_1$
 $n_n n_n P_n P_n P_n \quad d_n d_n f_n f_n f_n$
 SECTION 7 31313 $s_r r_a s_a s_a \quad 8GGgg$
 SECTION 9 51515 $101A_{df} A_{df} \quad \text{or}$
 $101A_{df} A_{df} \quad 0P_n P_n P'_n P'_n \quad \text{or}$
 $101A_{df} A_{df} \quad P_n P_n h_n h_n h_n$
 SECTION 10 61616
 62626

PART ALPHA (A)

IDENTIFICATION LETTERS: $M_j M_j$

Identifier: $M_j M_j$ - Identifier for Part A of the report.

DATE/TIME GROUP: $YYGGI_d$

Identifier: **YY** - Date group
 Identifier: **GG** - Time group
 Identifier: **I_d** - The highest mandatory level for which wind is available.

LATTITUDE: $99L_a L_a L_a$

Identifier: **99** – Indicator for data on position follows.
 Identifier: $L_a L_a L_a$ – Latitude in tenths of degrees

LONGITUDE: $Q_c L_o L_o L_o$

Identifier: **Q_c** – The octant of the globe.
 Identifier: $L_o L_o L_o$ – Longitude in tenths of degrees

MARSDEN SQUARE: $MMU_{1a} U_{1o}$

Identifier: **MMM** - Marsden square.
 Identifier: $U_{1a} U_{1o}$ – Units digits in the reported latitude and longitude.

SEA LEVEL PRESSURE: $99P_0 P_0 P_0 \quad T_0 T_0 T_0 D_0 D_0 \quad d_0 d_0 f_0 f_0$

Identifier: **99** – Indicator for data at the surface level follows
 Identifier: $P_0 P_0 P_0$ – Indicator for pressure of specified levels in whole millibars (thousands digit omitted)
 Identifier: $T_0 T_0 T_0$ – Tens and digits of air temperature (not rounded off) in degrees Celsius, at specified levels beginning with surface.
 Identifier: $D_0 D_0$ – Dewpoint depression at standard isobaric surfaces beginning with surface level.

NOTE

When the depression is 4.9C or less encode the units and tenths digits of the depression. Encode depressions of 5.0 through 5.4C as 50. Encode depressions of 5.5C through 5.9C as 56. Dew point

depressions of 6.0 and above are encoded in tens and units with 50 added. Dew point depressions for relative humidities less than 20% are encoded as 80. When air temperature is below -40C report $D_n D_n$ as //.

Identifier: $d_o d_o$ – True direction from which wind is blowing rounded to nearest 5 degrees. Report hundreds and tens digits. The unit digit (0 or 5) is added to the hundreds digit of wind speed.

Identifier: $f_o f_o f_o$ – Wind speed in knots. Hundreds digit is sum of speed and unit digit of direction, i.e. 295° at 125 knots encoded as 29625.

NOTE: 1. When flight level is just above a standard surface and in the operator's best meteorological judgment, the winds are representative of the winds at the standard surface, then the operator may encode the standard surface winds using the data from flight level. If the winds are not representative, then encode /////.

NOTE: 2. The wind group relating to the surface level ($d_o d_o f_o f_o$) will be included in the report; when the corresponding wind data are not available, the group will be encoded as /////.

STANDARD ISOBARIC SURFACES : $P_1 P_1 h_1 h_1 h_1 T_1 T_1 T_1 D_1 D_1 d_1 d_1 f_1 f_1$

Identifier: $P_1 P_1$ – Pressure of standard isobaric surfaces in units of tens of millibars.

(1000 mbs = 00, 925mbs = 92, 850mbs = 85, 700mbs = 70, 500mbs = 50, 400mbs = 40, 300mbs = 30, 250mbs = 25).

Identifier: $h_1 h_1 h_1$ – Heights of the standard pressure level in geopotential meters or decameters above the surface. Encoded in decameters at and above 500mbs omitting, if necessary, the thousands or tens of thousands digits. Add 500 to hhh for negative 1000mb or 925mb heights. Report 1000mb group as 00// ///// ///// when pressure is less than 950mbs.

Identifier: $T_1 T_1 T_1 D_1 D_1$ – Same temperature/dew point encoding procedures apply to all levels.

Identifier : $d_1 d_1 f_1 f_1$ – Same wind encoding procedures apply to all levels.

DATA FOR TROPOPAUSE LEVELS: 88 $P_t P_t P_t T_t T_t T_t D_t D_t d_t d_t f_t f_t$

Identifier: 88 – Indicator for Tropopause level follows

Identifier: $P_t P_t P_t$ – Pressure at the tropopause level reported in whole millibars. Report 88 $P_n P_n P_n$ as 88999 when tropopause is not observed.

Identifier: $T_t T_t T_t D_t D_t$ – Same temperature/ dew point encoding procedures apply.

Identifier: $d_t d_t f_t f_t$ - Same wind encoding procedures apply.

MAXIMUM WIND DATA: 77 $P_n P_n P_n d_n d_n f_n f_n 4v_b v_b v_a v_a$

Identifier: 77 – Indicator that data for maximum wind level and for vertical wind shear follow when max wind does not coincide at flight. If the maximum wind level coincides with flight level encode as 66

Identifier: $P_n P_n P_n$ – Pressure at maximum wind level in whole millibars.

Identifier: $d_n d_n f_n f_n$ - Same wind encoding procedures apply.

VERTICAL WIND SHEAR DATA: 4 $v_b v_b v_a v_a$

Identifier: 4 – Data for vertical wind shear follow.

Identifier: $v_b v_b$ – Absolute value of vector difference between max wind and wind 3000 feet BELOW the level of max wind, reported to the nearest knot. Use “//” if missing and a 4 is reported. A vector difference of 99 knots or more is reported with the code figure “99”.

Identifier: $v_a v_a$ – Absolute value of vector difference between max wind and wind 3000 feet above the level of max wind, reported to the nearest knot. Use “/” if missing and a 4 is reported. A vector difference of 99 knots or more is reported with the code figure “99”.

SOUNDING SYSTEM INDICATION, RADIOSONDE/ SYSTEM STATUS, LAUNCH TIME:

31313 $s_r r_a r_a s_a s_a$ **8GGgg**

Identifier: $s_r r_a r_a s_a s_a$ - Sounding system indicator, radiosonde/ system status: $s_a r_a r_a s_a s_a$

Identifier: s_a - Solar and infrared radiation correction (**0** – no correction)

Identifier: $r_a r_a$ – Radiosonde/sounding system used (**96** – Descending radiosonde)

Identifier: $s_a s_a$ – Tracking technique/status of system used (**08** – Automatic satellite navigation)

Identifier: **8GGgg** – Launch time

Identifier: **8** – Indicator group

Identifier: **GG** – Time in hours

Identifier: **gg** – Time in minutes

ADDITIONAL DATA GROUPS: 51515 101XX 0P_nP_nP_nP_n

Identifier: **51515** – Additional data in regional code follow

Identifier: **10166** – Geopotential data are doubtful between the following levels 0P_nP_nP_nP_n. This code figure is used only when geopotential data are doubtful from one level to another.

Identifier: **10167** – Temperature data are doubtful between the following levels 0P_nP_nP_nP_n. This code figure shall be reported when only the temperature data are doubtful for a portion of the descent. If a 10167 group is reported a 10166 will also be reported. EXAMPLE: Temperature is doubtful from 540mbs to 510mbs. SLP is 1020mbs.

The additional data groups would be : 51515 10166 00251 10167 05451.

Identifier: **10190** – Extrapolated altitude data follows:

When the sounding begins within 25mbs below a standard surface, the height of the surface is reported in the format **10190 P_nP_nh_nh_nh_n**. The temperature group is not reported. EXAMPLE: Assume the release was made from 310mbs and the 300mb height was 966 decameters. The last reported standard level in Part A is the 400mb level. The data for the 300mb level is reported in Part A and B as 1019030966.

When the sounding does not reach surface, but terminates within 25mbs of a standard surface, the height of the standard surface is reported in Part A of the code in standard format and also at the end of Part A and Part B of the code in the format as **10190 P_nP_nh_nh_nh_n**.

EXAMPLE: Assume termination occurred at 980mbs and the extrapolated height of the 1000mb level was 115 meters. The 1000mb level would be reported in Part A of the code as 00115 //// //// and in Part B as 10190 00115.

Identifier: **10191** – Extrapolated surface pressure precedes. Extrapolated surface pressure is only reported when the termination occurs between 850mbs and the surface. Surface pressure is reported in Part A as 99P₀P₀P₀ //// and in Part B as 00P₀P₀P₀ ////. When surface pressure is extrapolated the 10191 group is the last additional data group reported in Part B.

AIRCRAFT AND MISSION IDENTIFICATION: 61616 AFXXX XXXXX XXXXX OB X

Identifier: **61616** – Aircraft and mission identification data follows.

Identifier: **AFXXX** – The identifier AF for U.S. Air Force and the last three digits of the aircraft’s tail number.

Identifier: **XXXXX XXXXX** – The identifier for the type of mission being flown.

If a training mission the mission identifier is **WXWXA TRAIN**. The fifth letter “A” is the only character that could possibly change. The “A” indicates that the flight originated in the Atlantic basin. The letter “C” identifies the Central Pacific area, and the letter “E” identifies the Eastern Pacific.

If an operational storm mission: the first two numbers Identifier the number of times an aircraft has flown this system and the second two numbers Identifier the system number. The last character

again identifies the basin flown. The name of the storm would replace TRAIN.
EXAMPLE: AF968 0204A MARIE – Aircraft number 50968, this was the second flight into this system and the system was the fourth of the season. The system reached tropical storm strength and was named MARIE.

Identifier: **OB 14** – The observation (both vertical and horizontal) number as transmitted from the aircraft.

NATIONALLY DEVELOPED CODES: 62626

Identifier: **62626** – This is the remarks section. Only the remarks EYE, EYEWALL XXX, MXWNBND, or RAINBAND will be used. If the remark EYEWALL is used it will be followed by the octant (degrees) sonde is located relative to eye center. Example: If the sonde is released in the NE quad of the storm, XXX is 045.

~~Identifier: **REL XXXXNXXXXXW hhmss** – Release location of the sonde and the release time.~~

Identifier: **REL XXXXNXXXXXW hhmss** - the time and location of the highest (in altitude) wind reported in the tempdrop message

~~Identifier: **SPG XXXXNXXXXXW hhmss** – Impact location of the sonde based on its last GPS position and the splash time.~~

Identifier: **SPG XXXXNXXXXXW hhmss** - the time and location of the lowest (in altitude) wind reported in the tempdrop message.

Identifier: **SPL XXXXNXXXXXW hhm** - Impact location of the sonde based on its last GPS position and the splash time. (SPL has less precision than SPG and may be removed in the next version of the NHOP).

Identifier: **LAST WND XXX** - Height of the last reported wind. If a surface wind is reported the Last Wind remark is omitted. XXX will never be less than 13 meters

Identifier: **MBL WND dddff** - The mean boundary level wind. The mean wind in the lowest 500 meters of the sounding

Identifier: **AEV XXXXX** - This is the software version being used for the sounding.

Identifier: **DLM WND dddff bbbttt** - The Deep Layer Mean wind. It is the average wind over the depth of the sounding. Where dddff is the wind averaged from the first to the last available wind (these would correspond to the first and last significant levels for wind); ttt is the pressure at the top of the layer, and bbb is the pressure at the bottom of the layer (in whole mbs, with thousands digit omitted).

Identifier: **WL150 dddff zzz** - Average wind over the lowest available 150 m of the wind sounding. Where dddff is the mean wind over the 150 m layer centered at zzz m.

PART ALPHA (B)

DATA FOR SIGNIFICANT TEMPERATURE AND RELATIVE HUMIDITY LEVELS SIGNIFICANT ISOBARIC LEVELS:

n₀n₀P₀P₀P₀ T₀T₀T₀D₀D₀

IDENTIFICATION LETTERS: M_JM_J

Identifier: **M_JM_J** - Identifier for Part B of the report.

DATE/TIME GROUP: YYGG8

Identifier: **YY** - Date group

Identifier: **GG** - Time group

Identifier: **8** - Indicator for the use of satellite navigation for windfinding.

LATTITUDE: 99L_aL_aL_a (Same as Part A)

LONGITUDE: Q_cL₀L₀L₀ (Same as Part A)

MARSDEN SQUARE: MMMU_{1a}U_{1o} (Same as Part A)

SEA LEVEL PRESSURE: n₀n₀P₀P₀P₀ T₀T₀T₀D₀D₀

Identifier: **nono** – Indicator for number of level starting with surface level. Only surface will be numbered as “00”.

Identifier: **P₀P₀P₀** – Indicator for pressure of specified levels in whole millibars (thousands digit omitted)
 Identifier: **T₀T₀T₀** – Tens and digits of air temperature (not rounded off) in degrees Celsius, at specified levels beginning with surface.
 Identifier: **D₀D₀** – Dewpoint depression at standard isobaric surfaces beginning with surface level. Encoded the same as Part A.

FOR STORM DROPS ONLY. If SLP is less than 950mb encode the 1000mb group as 00/// //// // ///. When the SLP is between 950mb and 999mb encode 1000mb as 00PoPoPo //// // /// (500 meters are added to height below surface).

DATA FOR SIGNIFICANT WIND LEVELS: n₀n₀P₀P₀P₀ d₀d₀f₀f₀

Identifier: **n₀n₀** – Number of level starting with surface level. Only surface will be numbered as “00”.
 Identifier: **P₀P₀P₀** – Pressure at specified levels in whole millibars.
 Identifier: **d₀d₀** – True direction from which wind is blowing rounded to nearest 5 degrees. Report hundreds and tens digits. The unit digit (0 or 5) is added to the hundreds digit of wind speed.
 Identifier: **f₀f₀f₀** – Wind speed in knots. Hundreds digit is sum of speed and unit digit of direction, i.e. 295° at 125 knots encoded as 29525.

Same notes in Part A apply.

31313, 51515, 61616, 62626 – Repeated from Part A.

FIGURE G-3. EXAMPLE TEMP DROP MESSAGE FOR TROPICAL CYCLONES

```
UZNT13 KNHC 080839
XXAA 58088 99192 70803 04590 99964 21676 20581 00814 //// ////
92359 20476 22611 85085 18876 24614 88999 77999
31313 09608 80747
51515 10190 70752
61616 AF302 0617A PALOMA    OB 16
62626 EYEWALL 225 SPL 1925N08021W 0750 MBL WND 22112 AEV 20800 DL
M WND 23107 964833 WL150 21611 079 REL 1920N08030W 074700 SPG 192
6N08021W 075012 =
XXBB 58088 99192 70803 04590 00964 21676 11850 18876 22811 18476
33760 19677 44739 21077 55719 23261 66701 11430
21212 00964 20581 11963 20585 22960 20604 33958 21120 44955 21626
55949 22107 66939 22621 77933 22614 88917 22611 99900 23099 11874
23604 22867 24098 33864 24100 44859 24117 55850 24614 66701 26123
31313 09608 80747
51515 10190 70752
61616 AF302 0617A PALOMA    OB 16
62626 EYEWALL 225 SPL 1925N08021W 0750 MBL WND 22112 AEV 20800 DL
M WND 23107 964833 WL150 21611 079 REL 1920N08030W 074700 SPG 192
6N08021W 075012 =
```
