APPENDIX K

RECCO, HDOB, AND TEMP TROP

CODES, TABLES, AND REGULATIONS

DATE   **ORGANIZATION**   **MISSION IDENTIFIER**

NUMBER	9		g		Y	DAY OF WEEK SUN-1	L_o	LONGITUDE DEGREES	h_a	PRESSURE ALTITUDE OF	d	WIND DIRECTION AT FLIGHT LEVEL (Tens of deg. true.)	T	TEMPERATURE WHOLE $^\circ C$ (Note 6)	I	INDICATOR
	X	RECCO INDICATOR SPECIFYING TYPE OF OBSERVATION	G	TIME OF OBSERVATION (Hours and Minutes) (GMT)	Q	OCTANT Table 3	L_o	AND TENTHS (Note 4)	h_a	AIRCRAFT REPORTED TO THE NEAREST DECAMETER	d		T		J	INDEX TO HHH Table 9
	X		g		L_a	LATITUDE DEGREES	L_o		h_a		f	WIND SPEED AT FLIGHT LEVEL	T_d	DEW POINT WHOLE $^\circ C$ (Note 6)	H	GEOPOTENTIAL HEIGHT/ D-VALUE
OBSERVATION	X	Table 1	g		L_a	AND	8	TURBULENCE Table 4	d_t	TYPE OF WIND Table 5	f		T_d		H	OR SLP PER INDEX j
	9		I_d	DEW POINT INDICATOR Table 2	L_a	TENTHS	f_c	FLIGHT COND Table 3 (Note 5)	d_a	METHOD OF OBTAINING WIND Table 7	f	(Knots)	w	PRESENT WEATHER (Note 7 Table 8)	H	(Note 8)
	1		**2**		**3**		**4**		**5**		**6**		**7**		**8**	

REMARKS

TYPE AIRCRAFT   **CALL SIGN**   **METEOROLOGIST**

1	INDICATOR	c	CLOUD TYPE Table 11	c	CLOUD TYPE Table 11	c	CLOUD TYPE Table 11	1	INDICATOR	c	CLOUD TYPE Table 11	c	CLOUD TYPE Table 11	c	CLOUD TYPE Table 11
k_n	NR OF CLOUD LAYERS (Note 9)	h_s	ALTITUDE OF BASE	h_s	ALTITUDE OF BASE	h_s	ALTITUDE OF BASE	K_n	NR OF CLOUD LAYERS (Note 9)	h_s	ALTITUDE OF BASE	h_s	ALTITUDE OF BASE	h_s	ALTITUDE OF BASE
N_s	AMOUNT OF CLOUDS	h_s	Table 12	h_s	Table 12	h_s	Table 12	N_s	AMOUNT OF CLOUDS	h_s	Table 12	h_s	Table 12	h_s	Table 12
N_s	(Note 9) Table 10	H_t	ALTITUDE OF TOP	H_t	ALTITUDE OF TOP	H_t	ALTITUDE OF TOP	N_s	(Note 9) Table 10	H_t	ALTITUDE OF TOP	H_t	ALTITUDE OF TOP	H_t	ALTITUDE OF TOP
N_s		H_t	Table 12	H_t	Table 12	H_t	Table 12	N_s		H_t	Table 12	H_t	Table 12	H_t	Table 12
	9		**10**		**11**		**12**		**13**		**14**		**15**		**16**

REMARKS

RECCO RECORDING WORKSHEET

4	INDICATOR	6	INDICATOR (Note 11)	6	INDICATOR (Note 11)	7	INDICATOR	7	INDICATOR	8	INDICATOR	8	INDICATOR	9	INDICATOR
d	DIRECTION OF SFC WIND	W_s	SIGNIFICANT WEATHER CHANGES Table 14	W_s	SIGNIFICANT WEATHER CHANGES Table 14	I_r	RATE OF ICING Table 17	h_i	ALT OF BASE OF ICING STRATUM (Note 12)	d_r	BEARING OF ECHO CENTER	E_w	ECHO WIDTH OR DIAMETER Table 19	V_i	INFLIGHT VISIBILITY Table 23
d	(Tens of deg. true)	S_s	DISTANCE OF OCCURENCE OF We Table 15	S_s	DISTANCE OF OCCURENCE OF We Table 15	I_t	TYPE OF ICING Table 18	h_i	(Note 12) Table 12	d_r	(Tens of Deg. True)	E_l	LENGTH OF MAJ AXIS Table 19	T_w	SEA SURFACE TEMPERATURE
f	SURFACE WIND	w_d	DISTANT WEATHER Table 16	w_d	DISTANT WEATHER Table 16	S_b	DISTANCE TO BEGINNING OF ICING Table 15	H_i	ALTITUDE OF TOP OF ICING STRATUM	S_r	DISTANCE TO ECHO CENTER Table 19	c_e	CHARACTER OF ECHO Table 21	T_w	DEGREES AND TENTHS
f	SPEED (knots) (Note 10)	d_w	BEARING OF w_d Table 13	d_w	BEARING OF w_d Table 13	S_a	DISTANCE TO ENDING OF ICING Table 15	H_i	(Note 12) Table 12	O_e	ORIENTATION OF ELLIPSE Table 20	I_e	INTENSITY OF ECHO Table 22	T_w	
	17		**18**		**19**		**20**		**21**		**22**		**23**		**24**

REMARKS

Figure K-1. Reconnaissance Code Recording Form

Table K-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 tem -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	Northern
1	90° W - 180°	Northern
2	180° - 90° E	Northern
3	90° - 0° E	Northern
4	Not Used	
5	0° - 90° W	Southern
6	90° W - 180°	Southern
7	180° - 90° E	Southern
8	90° - 0° E	Southern

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   Altocumulus (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 $h_s h_s H_t H_t h_i h_i H_i H_i$
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 $S_b S_e S_s$
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 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)

$9XXX9 \ GGggi_d \ YQL_aL_aL_a \ L_oL_oL_oBf_c \ h_ah_ah_ad_td_a$

$ddfff \ TTT_dT_dw \ /jHHH$

SECTION TWO (ADDITIONAL)

$1k_nN_sN_sN_s \ Ch_sh_sH_tH_t \ ..... \ ..... \ 4ddff$

$6W_sS_sW_dd_w \ 7I_rI_tS_bS_e \ 7h_ih_iH_iH_i \ 8d_rd_rS_rO_e$

$8E_wE_lc_ei_e \ 9V_iT_wT_wT_w$

SECTION THREE (INTERMEDIATE)

$9XXX9 \ GGggi_d \ YQL_aL_aL_a \ L_oL_oL_oBf_c \ h_ah_ah_ad_td_a$

$ddfff \ TTT_dT_dw \ /jHHH$

Table K-2. Reconnaissance Code Regulations.

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.

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.

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."

4. The hundreds digit of longitude is omitted for longitudes from $100°$ to $180°$.

5. Describe conditions along the route of flight actually experienced at flight level by aircraft.

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".

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.

8. When j is reported as a /, HHH is encoded as ///.

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.

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."

11. Significant weather changes which have occurred since the last observation along the track are reported for W_s.

12. When aircraft encounters icing in level flight, the height at which the icing occurred will be reported for $h_i h_i$. The H_iH_i will be reported as //.

THE HDOB MESSAGE

The HDOB message is used to transmit High-Density/High-Accuracy (HD/HA) meteorological data from winter storm reconnaissance aircraft. These are created automatically by the system software. Each message consists of a communications header line (Table J-3), a mission/ob identifier line (Table J-4), and 20 lines of HD/HA data (Table J-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 J-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 URPN15...):

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

URPN15 KNHC 040849
AF301 15WSC TRACK 21          HDOB 12 20100204
083930 5414N 14710W 3002 08759 4603 -540 +/// 231026 027 /// /// 05
084000 5411N 14709W 3003 08758 4603 -540 +/// 232026 026 004 002 05
084030 5409N 14708W 3003 08759 4604 -540 +/// 233027 027 001 003 05
084100 5406N 14708W 3003 08760 4605 -540 +/// 234026 027 005 003 05
.
.
.
084630 5338N 14659W 3003 08766 4611 -545 +/// 236027 027 /// /// 05
084700 5336N 14658W 3003 08767 4611 -545 +/// 237028 028 005 002 05
084730 5333N 14657W 3003 08766 4611 -545 +/// 236026 027 004 002 05
084800 5331N 14657W 3003 08767 4611 -542 +/// 234025 026 000 004 05
084830 5328N 14656W 2975 08825 4607 -544 +/// 232024 025 001 003 05
084900 5326N 14655W 2933 08919 4605 -548 +/// 232025 025 003 003 05
$$
```

Figure K-2. HDOB Description and Sample Message

Table K-3. Communications Headers for HDOB Messages

NODE	AWIPS ID	WMO HEADER	OCEAN BASIN
MIA	AHONT1	URNT15 ….	Atlantic
MIA	AHOPN1	URPN15 ….	East and Central Pacific
MIA	AHOPA1	URPA15 ….	West Pacific

Table K-4. Mission/Ob Identifier Line Format for HDOB Messages

A sample mission/ob identifier line is given below (beginning with AF301...), followed by a description of the parameters.

```
0         1         2         3         4         5         6         7
0123456789012345678901234567890123456789012345678901234567890123456789 0
----------------------------------------------------------------------
IIIIIIIIIIIIIIIIIIIIIIIIIIIIII HDOB NN YYYYMMDD

AF301 15WSC TRACK 21           HDOB 12 20100204   ← example
```

III...III: Mission identifier, as determined in Chapter 2, paragraph 2.5.7

NN: Observation number (01-99), assigned sequentially for each HDOB message during the flight. This sequencing is independent of the numbering of other types of messages (RECCO, DROP, etc.), which have their own numbering sequence.

YYYYMMDD: Year, month, and day of the first HD/HA data line of the message.

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

```
0         1         2         3         4         5         6         7
01234567890123456789012345678901234567890123456789012345678901234567890
---------------------------------------------------------------------
hhmmss LLLLH NNNNNW PPPP GGGGG XXXX sTTT sddd wwwSSS MMM KKK ppp FF
084030 5409N 14708W 3003 08759 4604 -540 +/// 233027 027 001 003 05
```

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.

NNNNNH: 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 K-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 aircraft. See Figure J-3 for an example TEMP DROP message for winter storm operations.

CODE FORM:

PART A

SECTION 1 $M_iM_iM_jM_j$ $YYGGI_d$ $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$

SECTION 2 $99P_oP_oP_o$ $T_oT_oT_{ao}D_oD_o$ $d_od_of_of_of_o$

                 $P_1P_1h_1h_1h_1$ $T_1T_1T_{a1}D_1D_1$ $d_1d_1f_1f_1f_1$

                 $P_nP_nh_nh_nh_n$ $T_nT_nT_{an}D_nD_n$ $d_nd_nf_nf_nf_n$

SECTION 3 $88P_tP_tP_t$ $T_tT_tT_{at}D_tD_t$ $d_td_tf_tf_tf_t$
                 or
                 88999

SECTION 4 $77P_mP_mP_m$ $d_md_mf_mf_mf_m$ $(4v_bv_bv_av_a)$
                 or
                 $66P_mP_mP_m$ $d_md_mf_mf_mf_m$ $(4v_bv_bv_av_a)$
                 or
                 77999

SECTION 10   31313

                 51515 $101A_{df}\,A_{df}$ $0P_nP_nP'_nP'_n.$
                       or
                       $101A_{df}\,A_{df}$ $P_nP_nh_nh_nh_n$
                 61616

                 62626

PART B

SECTION 1 $M_iM_iM_jM_j$ $YYGG8$ $99L_aL_aL_a$ $Q_cL_oL_oL_o$ $MMMU_{La}U_{Lo}$

SECTION 5 $n_on_oP_oP_oP_o$ $T_oT_oT_{ao}D_oD_o$

                 $n_1n_1P_1P_1P_1$ $T_1T_1T_{a1}D_1D_1$

                 $n_nn_nP_nP_nP_n$ $T_nT_nT_{an}D_nD_n$

SECTION 6   21212 $n_on_oP_oP_oP_o\ d_od_of_of_of_o$

                 $n_1n_1P_1P_1P_1$ $d_1d_1f_1f_1f_1$

                 $n_nn_nP_nP_nP_n$ $d_nd_nf_nf_nf_n$

SECTION 7   31313 $s_rr_ar_as_as_a$ $8GGgg$

SECTION 9   51515 $101A_{df}\,A_{df}$ or

K-10

$$101A_{df}A_{df} \quad 0P_nP_nP'_nP'_n. \quad \text{or}$$

$$101A_{df}A_{df} \quad P_nP_nh_nh_nh_n$$

SECTION 10   61616

                   62626

PART ALPHA (A)

IDENTIFICATION LETTERS: M_JM_J

Identifier: M_JM_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: $99L_aL_aL_a$

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

LONGITUDE: $Q_cL_oL_oL_oL_o$

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

MARSDEN SQUARE: $MMMU_{la}U_{lo}$

Identifier: MMM - Marsden square.
Identifier: $U_{la}U_{lo}$ – Units digits in the reported latitude and longitude.

SEA LEVEL PRESSURE: $99P_0P_0P_0 \quad T_0T_0T_0D_0D_0 \quad d_0d_0f_0f_0f_0$

Identifier: 99 – Indicator for data at the surface level follows
Identifier: $P_0P_0P_0$ – Indicator for pressure of specified levels in whole millibars (thousands digit omitted)
Identifier: $T_0T_0T_0$ – Tens and digits of air temperature (not rounded off) in degrees Celsius, at specified levels beginning with surface.
Identifier: D_0D_0 – Dewpoint depression at standard isobaric surfaces beginning with surface level.

<div align="center">NOTE</div>

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 then 20% are encoded as 80. When air temperature is below –40C report D_nD_n as //.

Identifier: d_0d_0 – 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: $f_0f_0f_0$ – Wind speed in knots. Hundreds digit is sum of speed and unit digit of direction, i.e. 29<u>5</u>° at 125 knots encoded as 29<u>6</u>25.

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

<div align="center">K-11</div>

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 ($d_o d_o f_o f_o f_o$) will be included in the report; when the corresponding wind data are not available, the group will be encoded as /////.

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

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

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

Identifier: **88** – Indicator for Tropopause level follows
Identifier: $P_t P_t P_t$ – Pressure at the tropopause level reported in whole millibars. Report $88P_n P_n P_n$ 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: $d_t d_t f_t f_t f_t$ - Same wind encoding procedures apply.

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

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

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

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 $0P_n P_n P_n P_n$

Identifier: **51515** – Additional data in regional code follow
Identifier: **10166** – Geopotential data are doubtful between the following levels $0P_n P_n P_n P_n$. 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 $99P_0P_0P_0$ ///// and in Part B as $00P_0P_0P_0$ /////. 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, the letter "E" identifies the Eastern Pacific, and the letter "W" indentifies the Western Pacific.

> If an operational winter storm mission: the first two numbers identify the sequential number of the mission being flown in the given basin (Atlantic or Pacific), followed by the letters "WS" to signify a winter storm mission. The last character again identifies the basin flown. The track number designation would replace "TRAIN." EXAMPLE: AF300 06WSA TRACK64 – Aircraft tail number 5300, sixth Atlantic basin winter storm flight of the season, and along track WSRP-A64.

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.
Identifier: **REL XXXXNXXXXXW hhmmss** – Release location of the sonde and the release time.
Identifier: **SPG XXXXNXXXXXW hhmmss** - Impact location of the sonde based on its last GPS position and the splash time.
Identifier: **SPL XXXXNXXXXXW hhmm** - 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 NWSOP).
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 ddfff bbbttt** - The Deep Layer Mean wind. It is the average wind over the depth of the sounding. Where ddfff 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 ddfff zzz** - Average wind over the lowest available 150 m of the wind sounding. Where ddfff is the mean wind over the 150 m layer centered at zzz m.

PART ALPHA (B)

DATA FOR SIGNIFICANT TEMPERATURE AND RELATIVE HUMIDITY LEVELSSIGNIFICANT ISOBARIC LEVELS:
$n_0n_0P_0P_0P_0$ $T_0T_0T_0D_0D_0$

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 wind finding.

LATTITUDE: $99L_aL_aL_a$ (Same as Part A)

LONGITUDE: $Q_cL_oL_oL_oL_o$ (Same as Part A)

MARSDEN SQUARE: $MMMU_{la}U_{lo}$ (Same as Part A)
SEA LEVEL PRESSURE: $n_0n_0P_0P_0P_0$ $T_0T_0T_0D_0D_0$

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

Identifier: $P_0P_0P_0$ – Indicator for pressure of specified levels in whole millibars (thousands digit omitted)

Identifier: $T_0T_0T_0$– Tens and digits of air temperature (not rounded off) in degrees Celsius, at specified levels beginning with surface.

Identifier: D_0D_0 – 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: $n_0n_0P_0P_0P_0$ $d_od_of_of_of_o$

Identifier: n_0n_0 – Number of level starting with surface level. Only surface will be numbered as **"00".**

Identifier: $P_0P_0P_0$ – Pressure at specified levels in whole millibars.

Identifier: d_od_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: $f_of_of_o$ – Wind speed in knots. Hundreds digit is sum of speed and unit digit of direction, i.e. 295̲° at 125 knots encoded as 29̲6̲25.

Same notes in Part A apply.

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

```
UZPN13 KWBC 040142
XXAA  54012 99515 71512 19611 99006 03456 26025 00045 02856 26528
92669 03331 26033 85331 09128 26539 70805 19150 26549 50522 37343
24562 40673 46776 23072 30862 49186 25561 25981 47786 25557 20129
47586 26053 88363 50376 24075 77456 23579 42311
31313 09608 80117
51515 10190 15319
61616 NOAA9 41WSC TRACK16      OB 15
62626 SPL 5158N15090W 0133 MBL WND 25531 AEV 20801 DLM WND 25051
005154 WL150 26530 082 REL 5150N15125W 011733 SPG 5158N15090W 013
259 =
XXBB  54018 99515 71512 19611 00006 03456 11868 07915 22850 09128
33831 10550 44816 11529 55807 11564 66794 12360 77780 13174 88762
14362 99750 14964 11691 20145 22607 28134 33558 30934 44504 36935
55479 38578 66358 50576 77322 48986 88217 48386 99184 47386 11154
46363
21212 00006 26025 11987 26032 22967 25031 33913 26032 44850 26539
55749 27551 66595 26048 77456 23579 88402 23072 99273 26059 11258
25054 22207 25564 33198 26050 44175 26060 55162 26046 66154 26060
31313 09608 80117
51515 10190 15319
61616 NOAA9 41WSC TRACK16      OB 15
62626 SPL 5158N15090W 0133 MBL WND 25531 AEV 20801 DLM WND 25051
005154 WL150 26530 082 REL 5150N15125W 011733 SPG 5158N15090W 013
259 =
```