

**APPENDIX G**  
**RECCO, HDOB, MINOB, AND TEMP DROP**  
**CODES, TABLES, AND REGULATIONS**

DATE		ORGANIZATION				MISSION IDENTIFIER													
OBSERVATION NUMBER	g	RECCO INDICATOR SPECIFYING TYPE OF OBSERVATION <i>Table 1</i>	g	TIME OF OBSERVATION (Hours and Minutes)  (GMT)	y	DAY OF WEEK SUN-1	L <sub>o</sub>	LONGITUDE DEGREES	h <sub>a</sub>	PRESSURE ALTITUDE OF AIRCRAFT REPORTED TO THE NEAREST DECAMETER	d	WIND DIRECTION AT FLIGHT LEVEL (Tens of deg. true.)	T	TEMPERATURE WHOLE °C	j	INDICATOR			
	x		g		Q	OCTANT <i>Table 3</i>	L <sub>o</sub>	AND TENTHS ( <i>Note 4</i> )	h <sub>a</sub>		d	T	( <i>Note 6</i> )	j	INDEX TO HHH <i>Table 9</i>				
	x		g		L <sub>a</sub>	LATITUDE DEGREES AND TENTHS	L <sub>o</sub>	B	TURBULENCE <i>Table 4</i>		d <sub>t</sub>	f	WIND SPEED AT FLIGHT LEVEL (Knots)	T <sub>d</sub>	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 <sub>a</sub>	AND TENTHS	L <sub>o</sub>	B	FLIGHT COND <i>Table 3</i> ( <i>Note 5</i> )		f <sub>c</sub>	d <sub>a</sub>	METHOD OF OBTAINING WIND <i>Table 7</i>	f	w	P	PRESENT WEATHER ( <i>Note 7</i> <i>Table 8</i> )	H	
	g		i <sub>d</sub>		L <sub>a</sub>	DEW POINT INDICATOR <i>Table 2</i>	L <sub>a</sub>												
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 <sub>n</sub>	NR OF CLOUD LAYERS ( <i>Note 9</i> )	h <sub>s</sub>	ALTITUDE OF BASE	h <sub>s</sub>	ALTITUDE OF BASE	h <sub>s</sub>	ALTITUDE OF BASE	k <sub>n</sub>	NR OF CLOUD LAYERS ( <i>Note 9</i> )	h <sub>s</sub>	ALTITUDE OF BASE	h <sub>s</sub>	ALTITUDE OF BASE	h <sub>s</sub>	ALTITUDE OF BASE
N <sub>s</sub>	AMOUNT OF CLOUDS ( <i>Note 9</i> <i>Table 10</i> )	h <sub>s</sub>	<i>Table 12</i>	h <sub>s</sub>	<i>Table 12</i>	h <sub>s</sub>	<i>Table 12</i>	N <sub>s</sub>	AMOUNT OF CLOUDS ( <i>Note 9</i> <i>Table 10</i> )	h <sub>s</sub>	<i>Table 12</i>	h <sub>s</sub>	<i>Table 12</i>	h <sub>s</sub>	<i>Table 12</i>
N <sub>s</sub>		H <sub>t</sub>	ALTITUDE OF TOP	H <sub>t</sub>	ALTITUDE OF TOP	H <sub>t</sub>	ALTITUDE OF TOP	N <sub>s</sub>		H <sub>t</sub>	ALTITUDE OF TOP	H <sub>t</sub>	ALTITUDE OF TOP	H <sub>t</sub>	ALTITUDE OF TOP
N <sub>s</sub>		H <sub>t</sub>	<i>Table 12</i>	H <sub>t</sub>	<i>Table 12</i>	H <sub>t</sub>	<i>Table 12</i>	N <sub>s</sub>		H <sub>t</sub>	<i>Table 12</i>	H <sub>t</sub>	<i>Table 12</i>	H <sub>t</sub>	<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 (Tens of deg. true.)	W <sub>s</sub>	SIGNIFICANT WEATHER CHANGES <i>Table 14</i>	W <sub>s</sub>	SIGNIFICANT WEATHER CHANGES <i>Table 14</i>	I <sub>r</sub>	RATE OF ICING <i>Table 17</i>	h <sub>i</sub>	ALT OF BASE OF ICING STRATUM ( <i>Note 12</i> <i>Table 12</i> )	d <sub>r</sub>	BEARING OF ECHO CENTER (Tens of Deg. True)	E <sub>w</sub>	ECHO WIDTH OR DIAMETER <i>Table 19</i>	V <sub>i</sub>	INFLIGHT VISIBILITY <i>Table 23</i>
d		S <sub>s</sub>	DISTANCE OF OCCURRENCE OF <i>Table 15</i>	S <sub>s</sub>	DISTANCE OF OCCURRENCE OF <i>Table 15</i>	I <sub>t</sub>	TYPE OF ICING <i>Table 18</i>	h <sub>i</sub>		d <sub>r</sub>		E <sub>i</sub>	LENGTH OF MAJ AXIS <i>Table 19</i>	T <sub>w</sub>	SEA SURFACE TEMPERATURE DEGREES AND TENTHS
f	SURFACE WIND SPEED (Knots) ( <i>Note 10</i> )	w <sub>d</sub>	DISTANT WEATHER <i>Table 16</i>	w <sub>d</sub>	DISTANT WEATHER <i>Table 16</i>	S <sub>b</sub>	DISTANCE TO BEGINNING OF ICING <i>Table 15</i>	H <sub>i</sub>	ALTITUDE OF TOP OF ICING STRATUM ( <i>Note 12</i> <i>Table 12</i> )	S <sub>r</sub>	DISTANCE TO ECHO CENTER <i>Table 19</i>	c <sub>e</sub>	CHARACTER OF ECHO <i>Table 21</i>	T <sub>w</sub>	
f		d <sub>w</sub>	BEARING OF <i>Table 13</i>	d <sub>w</sub>	BEARING OF <i>Table 13</i>	S <sub>b</sub>	DISTANCE TO ENDING OF ICING <i>Table 15</i>	H <sub>i</sub>		O <sub>e</sub>	ORIENTATION OF ELLIPSE <i>Table 20</i>	i <sub>e</sub>	INTENSITY OF ECHO <i>Table 22</i>	T <sub>w</sub>	
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	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	Alto cumulus (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  $h_s h_t H_t H_i H_j$**

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 G-1. Reconnaissance code tables (continued)**

TABLE 16 w<sub>d</sub>

- 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<sub>r</sub>

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

TABLE 18 I<sub>t</sub>

- 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<sub>r</sub>, E<sub>w</sub>, E<sub>l</sub>

- 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<sub>e</sub>

- 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<sub>e</sub>

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

TABLE 22 i<sub>e</sub>

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

TABLE 23 V<sub>i</sub>

- 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<sub>d</sub> YQL<sub>a</sub>L<sub>a</sub>L<sub>a</sub> L<sub>o</sub>L<sub>o</sub>L<sub>o</sub>Bf<sub>c</sub> h<sub>a</sub>h<sub>a</sub>h<sub>a</sub>t<sub>d</sub>d<sub>a</sub>

ddfff TTT<sub>d</sub>T<sub>d</sub>w /jHHH

SECTION TWO (ADDITIONAL)

1k<sub>n</sub>N<sub>s</sub>N<sub>s</sub>N<sub>s</sub> Ch<sub>s</sub>h<sub>s</sub>H<sub>t</sub>H<sub>t</sub> ..... 4ddff

6W<sub>s</sub>S<sub>s</sub>W<sub>d</sub>d<sub>w</sub> 7I<sub>r</sub>I<sub>r</sub>S<sub>b</sub>S<sub>e</sub> 7h<sub>i</sub>h<sub>i</sub>H<sub>i</sub>H<sub>i</sub> 8d<sub>r</sub>d<sub>r</sub>S<sub>r</sub>O<sub>e</sub>

8E<sub>w</sub>E<sub>c</sub>i<sub>e</sub>e 9V<sub>i</sub>T<sub>w</sub>T<sub>w</sub>T<sub>w</sub>

SECTION THREE (INTERMEDIATE)

9XXX9 GGggi<sub>d</sub> YQL<sub>a</sub>L<sub>a</sub>L<sub>a</sub> L<sub>o</sub>L<sub>o</sub>L<sub>o</sub>Bf<sub>c</sub> h<sub>a</sub>h<sub>a</sub>h<sub>a</sub>t<sub>d</sub>d<sub>a</sub>

ddfff TTT<sub>d</sub>T<sub>d</sub>w /jHHH

**Table G-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<sub>d</sub>T<sub>d</sub>. 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<sub>d</sub>. Missing or unknown temperatures are reported as //. When the dew point is colder than -49.4°C, Code T<sub>d</sub>T<sub>d</sub> 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<sub>n</sub> 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<sub>s</sub>.
12. When aircraft encounters icing in level flight, the height at which the icing occurred will be reported for h<sub>i</sub>h<sub>i</sub>. The H<sub>i</sub>H<sub>i</sub> will be reported as //.

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HDOB messages are created automatically by IWRS. Each HDOB consists of 20 lines of HD/HA data. Each HD/HA data line is composed of 30 second averages for each parameter reported, except max wind which is a 10 second average. The highest max wind recorded during the encoding interval is used in the HDOB.

The encoding interval of the HD/HA data lines in the HDOB message is operator adjustable to 30 seconds, 1 minute or 2 minutes. A 30 second encoding interval encodes every HD/HA data line and creates an HDOB every 10 minutes. A 1 minute interval encodes every other HD/HA data line and generates an HDOB every 20 minutes. Likewise, a 2 minute interval encodes every fourth HD/HA data line and generates an HDOB every 40 minutes. Regardless of the encoding interval selected, the highest max wind value since the previous encoded HD/HA data line will be reported in the observation. Samples of each type message is shown below. Each complete message would have 20 data lines.

```
SXXX50 KNHC 040952
AF967 1017A OPAL HDOB 39
 0942. 2643N 08846W 03036 5374 127 106 140 136 112 02680 0000000000
 0943 2641N 08847W 03036 5442 116 116 136 136 120 02612 0000000000
 0943. 2640N 08849W 03065 5521 100 087 140 140 099 02561 0000000000
 0944 2638N 08850W 03028 5591 087 059 186 160 074 02454 0000000000
 0944. 2637N 08850W 03053 5630 097 028 202 158 036 02440 0000000000
 0945 2635N 08850W 03059 5647 197 009 218 148 018 02429 0000000000
```

:

**30-second data interval**

```
SXXX50 KNHC 040952
AF967 1017A OPAL HDOB 39
 0942 2644N 08844W 03039 5333 135 094 138 136 096 02724 0000000000
 0943 2641N 08847W 03036 5442 116 116 136 136 120 02612 0000000000
 0944 2638N 08850W 03028 5591 087 059 186 160 099 02454 0000000000
 0945 2635N 08850W 03059 5647 197 009 218 148 036 02429 0000000000
 0946 2632N 08849W 03028 5632 274 052 226 148 067 02413 0000000000
 0947 2628N 08849W 03057 5488 271 118 194 130 124 02587 0000000000
```

:

**1-minute data interval**

```
SXXX50 KNHC 040952
AF967 1017A OPAL HDOB 39
 0942 2644N 08844W 03039 5333 135 094 138 136 096 02724 0000000000
 0944 2638N 08850W 03028 5591 087 059 186 160 120 02454 0000000000
 0946 2632N 08849W 03028 5632 274 052 226 148 067 02413 0000000000
 0948 2625N 08849W 03050 5378 263 113 172 140 124 02690 0000000000
 0950 2620N 08849W 03047 5268 259 094 142 134 109 02797 0000000000
 0952 2614N 08849W 03044 5217 262 075 162 108 090 02845 0000000000
```

:

**2-minute data interval**

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**Figure G-2. HDOB Description and Sample Messages**

**Table G-3. HDOB Message Format**

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HHMM L<sub>a</sub>L<sub>a</sub>mmH L<sub>o</sub>L<sub>o</sub>L<sub>o</sub>mmH PPPPP DDDD WWW SSS TTT ddd MMM RRRRRR FFFFFFFFFF

- HHMM: The time of observation in hours and minutes (UTC). A period following HHMM indicates a data time of 30 seconds past the minute.
- L<sub>a</sub>L<sub>a</sub>mmH: The latitude of the observation in degrees, minutes and hemisphere (N or S).
- L<sub>o</sub>L<sub>o</sub>L<sub>o</sub>mmH: The longitude of the observation in degrees, minutes and hemisphere (E or W).
- PPPPP: The pressure altitude in meters.
- DDDD: The absolute value of the D-value in meters (a 5 occupies the thousands place if the D-value is negative. For example, -34m is encoded as 5034).
- WWW: The wind direction in degrees, with 0 being true north, increasing clockwise.
- SSS: The wind speed in knots.
- TTT: The air temperature in degrees and tenths Celsius. The tenths digit is even for temperatures at or above 0°C, odd for temperatures below 0°C.
- ddd: The dew point temperature, encoded the same way as air temperature.
- MMM: The maximum wind speed in knots measured during the minute. This is the peak wind speed averaged over a 10-sec period.
- RRRRR: Radar altitude in meters
- FFFFFFFFF: Default status for the MINOB/HDOB data. A "1" indicates the parameter is defaulted (suspect value) or based on a parameter that is defaulted. A "0" indicates the value is not defaulted. The field indicate default for (in order): latitude, longitude, pressure altitude, D-value, wind direction, wind speed, air temperature, dew point, maximum wind speed, radar altimeter.
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MinOb messages are created automatically by the NOAA P-3 Research Aircraft Measurement System (RAMS). Each MinOb message contains one or more lines of flight level data. Each line consists of data parameters, averaged over an operator-selected sample interval (common settings are 30 seconds and 1 minute). The time interval for collecting lines in a block before forming a message for transmission is also selectable, typically 10 or 15 minutes. The message length is based on the operator's selection of sample interval and block length, but will never exceed 3300 characters (approximately 50 lines) due to satellite transmission protocol limits.

Each line is terminated with an ASCII <cr> <cr> <lf> sequence (Hex 0D 0D 0A). The line length is variable, depending on whether the optional Stepped Frequency Microwave Radiometer (SFMR) fields are included (see Table G-4 description). All fields are separated by at least one ASCII blank (Hex 20) as shown in the Table by a \_ symbol.

```

URNT40 KWBC 261950
NOAA3 WX02A BONNIE
194030 3136 07758 6849 +0152 251053 +171 +106 251054 040 005
194100 3138 07758 6847 +0148 247053 +171 +102 249053 040 005
194130 3141 07758 6849 +0146 246053 +166 +106 247053 039 005
194200 3143 07758 6851 +0144 246054 +162 +111 246054 039 004
194230 3145 07758 6849 +0141 246053 +162 +112 246054 999 999
194300 3147 07558 6852 +0134 245053 +160 +114 245053 039 004
194330 3149 07759 6845 +0126 247052 +162 +110 247052 038 000

```

⋮

**30-Second Data Interval (with optional SFMR data)**

Note: Differences from the Air Force HDOB message include the following:

- Time code includes seconds, rather than a period to show 30-second mark
- Latitude and longitude hemispheres are denoted by a minus sign rather than an alphabetic character (N,S,E,W)
- Pressure altitudes and D-values are in feet
- D-value sign is explicit, rather than coded as a leading `5'
- Temperature and dewpoint signs are explicit, rather than making tenths odd/even
- There is no radar altitude or default status
- There may be SFMR data fields

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**Figure G-3. MinOb Description and Sample Message**

**Table G-4. NOAA MinOb Message Format**

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HHMMSS	$L_a L_a L_a mm$ $L_o L_o L_o mm$ $PPPPP$ $\pm DDDD$ $WWWSSS$ $\pm TTT$ $\pm ddd$ $wwwsss$ $sss$ $rrr$
HHMMSS	The time of the observation in hours, minutes and seconds (UTC). All averages (except peak wind) are centered around this time.
$L_a L_a L_a mm$	The latitude of the observation in degrees and minutes. A negative number signifies the Southern hemisphere. There may be leading blanks in the degree subfield; the minutes will always be a two digit numeric (zero filled as required).
$L_o L_o L_o mm$	The longitude of the observation in degrees and minutes. A negative number signifies the Eastern hemisphere. NOTE: This is opposite the normal convention. There may be leading blanks in the degree subfield; minutes will always be a two digit numeric.
PPPPP	The pressure altitude in feet. There may be leading blanks.
$\pm DDDD$	The D-value (Geopotential Altitude - Pressure Altitude) in feet. There will always be a leading sign (+ or -) followed by four numeric characters (leading zeros if required)
WWW	The wind direction in degrees, with 0 being true North, increasing clockwise. There will always be three numeric characters, with leading zeros if required.
SSS	The wind speed in knots. There will always be three numeric characters, with leading zeros if required.
$\pm TTT$	The air temperature in degrees and tenths Celsius. There will always be a leading sign (+ or -) followed by three numeric characters (leading zeros if required). For example, 5.3 C would be coded +053.
$\pm ddd$	The dewpoint temperature, encoded the same way as air temperature.
www	The direction of the peak wind during this interval (30 sec, 1 min, etc.). The peak wind is defined as the maximum 10 second average wind. Format is the same as wind direction above.
sss	The speed of the peak wind in knots. Format is the same as wind speed above.
sss	The wind speed at the surface in knots, as measured by the Stepped Frequency Microwave Radiometer (SFMR). This is an optional field new for 1999, and may be omitted depending on the version of software being run. If omitted, the rain rate field will also be omitted, and the <cr><cr><lf> sequence will occur immediately after the peak wind speed field (no trailing blank). When present, there will be three numeric characters, with leading zeros if required. If the SFMR wind can not be calculated during the sample interval, it (and the rain rate) will be coded as 999.
rrr	The rain rate in mm/hr, as measured by the SFMR. When present (see SFMR wind speed discussion above), there will be three numeric characters, with leading zeros if required. If rain rate can not be calculated it will be coded as 999.

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**Table G-5. TEMP DROP CODE**

EXTRACT FROM: WMO-No. 306 MANUAL ON CODES  
 FM 37-IX 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 <sub>i</sub> M <sub>j</sub> M <sub>k</sub> M <sub>l</sub>	YYGGI <sub>d</sub>	99L <sub>a</sub> L <sub>a</sub> L <sub>a</sub>	Q <sub>c</sub> L <sub>o</sub> L <sub>o</sub> L <sub>o</sub> L <sub>o</sub>	MMMU <sub>L<sub>a</sub></sub> U <sub>L<sub>o</sub></sub>
SECTION 2	99P <sub>o</sub> P <sub>o</sub> P <sub>o</sub>	T <sub>o</sub> T <sub>o</sub> T <sub>ao</sub> D <sub>o</sub> D <sub>o</sub>	d <sub>o</sub> d <sub>o</sub> f <sub>o</sub> f <sub>o</sub> f <sub>o</sub>		
	P <sub>1</sub> P <sub>1</sub> h <sub>1</sub> h <sub>1</sub> h <sub>1</sub>	T <sub>1</sub> T <sub>1</sub> T <sub>a1</sub> D <sub>1</sub> D <sub>1</sub>	d <sub>1</sub> d <sub>1</sub> f <sub>1</sub> f <sub>1</sub> f <sub>1</sub>		
	P <sub>n</sub> P <sub>n</sub> h <sub>n</sub> h <sub>n</sub> h <sub>n</sub>	T <sub>n</sub> T <sub>n</sub> T <sub>an</sub> D <sub>n</sub> D <sub>n</sub>	d <sub>n</sub> d <sub>n</sub> f <sub>n</sub> f <sub>n</sub> f <sub>n</sub>		
SECTION 3	88P <sub>t</sub> P <sub>t</sub> P <sub>t</sub>	T <sub>t</sub> T <sub>t</sub> T <sub>at</sub> D <sub>t</sub> D <sub>t</sub>	d <sub>t</sub> d <sub>t</sub> f <sub>t</sub> f <sub>t</sub> f <sub>t</sub>		
	or				
	88999				
SECTION 4	77P <sub>m</sub> P <sub>m</sub> P <sub>m</sub>	d <sub>m</sub> d <sub>m</sub> f <sub>m</sub> f <sub>m</sub> f <sub>m</sub>	(4v <sub>b</sub> v <sub>b</sub> v <sub>a</sub> v <sub>a</sub> )		
	or				
	66P <sub>m</sub> P <sub>m</sub> P <sub>m</sub>	d <sub>m</sub> d <sub>m</sub> f <sub>m</sub> f <sub>m</sub> f <sub>m</sub>	(4v <sub>b</sub> v <sub>b</sub> v <sub>a</sub> v <sub>a</sub> )		
	or				
	77999				
SECTION 9	51515 (through 59595)	Code groups to be developed <u>regionally</u> .			
SECTION 10	61616 (through 69696)	Code groups to be developed <u>nationally</u> .			

**PART A**

**SECTION 1 - IDENTIFICATION AND POSITION**

M <sub>i</sub> M <sub>j</sub>	Identification letters of the report = XX
M <sub>k</sub> M <sub>l</sub>	Identification letters of the part of the report = AA
YY	Day of the month (GMT). When wind data are included 50 is added to YY.
GG	Actual time of the observation, to the nearest whole hour (GMT).
I <sub>d</sub>	Highest mandatory level for which wind is available. 7=700 mb, 5=500 mb, etc. If flight level is above a standard surface, for example 495, report a 5 for 500 mb in the I <sub>d</sub> group.

*Note the following clarification was approved at the 52d IHC: I<sub>d</sub> will specify in hundreds of mb (Part A) or tens of mb (Part C) the highest mandatory isobaric level for which the wind is reported. For example, in Part A, I<sub>d</sub> = 7 indicates 700 mb, but in Part C, I<sub>d</sub> = 7 indicates 70 mb. I<sub>d</sub> = 0 refers to the 1000 mb level. The surface wind group should always be present.*

(1) The wind group shall be omitted at all levels above the level specified by  $I_d$ , except as noted in (3) and (4) below.

(2) The wind group shall be present at all levels at and below the level specified by  $I_d$ . At levels below that specified by  $I_d$  for which the wind is missing, encode the wind group as "////.".

(3) When the highest mandatory level for which the wind is reported is 250 mb, encode  $I_d$  as 2. If other information is available above 250 mb, encode the 200 mb wind group as "////.".

(4) When the highest mandatory level for which the wind is reported is 150 mb, encode  $I_d$  as 1. If other information is available above 150 mb, encode the 100 mb wind group as "////.".

(5) When no winds are reported for any level, encode  $I_d$  as "/", encode the surface wind group as "////," and omit all wind groups above the surface.

99 Indicator for data on position follow.

$L_a L_a L_a$  Latitude, in tenths of a degree.

$Q_c$  Quadrant of the globe. The earth is divided by the Greenwich meridian and the equator into quadrants. The code figure reported depends on the latitude and longitude of the observation position.

$L_o L_o L_o L_o$  Longitude, in tenths of a degree.

MMM Marsden square. The number of the marsden square for aircraft position at the time of the observation is reported for MMM. Always report three digits for MMM, with zeros reported for the hundreds and tens digits when required. When an observation is within a depicted 10 degree square, report the number of that square. When on an even 10 degree latitude or longitude circle, the marsden square for MMM is obtained by moving in the direction of larger latitude and/or longitude. EXAMPLE: Assuming a position of 18.1N, 131.4W, MMM is 050; assuming a position of 30.0N, 140.0E, MMM is 130. At the equator or on the prime meridian, report the marsden square compatible with the  $Q_c$  reported.

$U_{L_a}$  Units digit in the reported latitude.

$U_{L_o}$  Units digit in the reported longitude.

## SECTION 2 - SURFACE AND STANDARD ISOBARIC SURFACES

99 Indicator for data for the surface level follow.

$P_o P_o P_o$  Pressure of specified levels in whole millibars, thousands digits omitted. ( $P_o P_o P_o$  is always surface level.)

$P_1 P_1$   
 $P_n P_n$  Pressure of standard isobaric surfaces in units of tens of millibars. (1000mbs=00, 925mbs=92, 850mbs=85, 700mbs=70, etc.)

$h_1h_1h_1$	Height of the standard pressure level in geopotential meters or decameters above the surface. Encoded in meters up to but not including 500mbs. Encoded in decameters at and above 500mbs omitting, if necessary, the thousands or tens of thousands digits. Add 500 to hhh for negative 1000mb heights. Report 1000mb groups as 00/// //// when surface pressure is less than 950mbs.
$h_nh_nh_n$	
$T_oT_o$ $T_1T_1$ $T_nT_n$	Tens and units digit of air temperature (not rounded off) in degrees Celsius, at specified levels beginning with surface.
$T_{ao}$ $T_{al}$ $T_{an}$	Approximate tenths value and sign (plus or minus) of the air temperature. Even = plus; Odd = minus.
$D_oD_o$ $D_1D_1$ $D_nD_n$	Dewpoint depression (with respect to water) at standard isobaric surfaces beginning with surface level. When the depression is 4.9C or less encode the units and tenths digits of the depression. Encode depressions of 5.0C through 5.4C as 50. Encode depressions of 5.5C through 5.9C as 56. Dewpoint depressions of 6.0C and above are encoded in tens and units with 50 added. Dewpoint depressions for relative humidities less than 20% are encoded as 80. When air temperature is below -40C report $D_nD_n$ as two solidi.
$d_o d_o$ $d_1 d_1$ $d_n d_n$	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.
$f_o f_o f_o$ $f_1 f_1 f_1$ $f_n f_n f_n$	Wind speed in knots. Hundreds digit is sum of hundreds digit of speed and unit digit of direction, i.e. 295° at 125 kts encoded as 29625. (Notes 1&2)

NOTE: 1. When flight level is just above a standard surface and in the operator's best meteorological judgement, 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 ////.

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/////.

### SECTION 3 - DATA FOR TROPOPAUSE LEVELS

88	Indicator for data for tropopause level(s) follow.
$P_t P_t P_t$	Pressure at the tropopause level reported in whole millibars.
$T_t T_t$	Air temperature in whole degrees Celsius, at the tropopause level.
$T_{at}$	Approximate tenths value and sign (plus or minus) of the air temperature at the tropopause level.
$D_t D_t$	Dew point depression at the tropopause level.
$d_t d_t$	True direction at the tropopause level 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.
$f_t f_t f_t$	Wind speed in knots. Hundreds digit is sum of hundreds digit of speed and unit digit of direction, i.e. 295° at 125 kts encoded as 29625.
88999	Indicator that tropopause data have not been observed.

#### SECTION 4 - MAXIMUM WIND DATA

- 66 Indicator that data for maximum wind level and for vertical wind shear follow when max wind occurs at flight level.
- 77 Indicator that data for maximum wind level and for vertical wind shear follow when max wind level does not coincide with flight level.
- $P_m P_m P_m$  Pressure at maximum wind level in whole millibars.
- $d_m d_m$  True direction from which wind is blowing at the maximum wind level 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.
- $f_m f_m f_m$  Wind speed in knots. Hundreds digit is sum of hundreds digit of speed and unit digit of direction, i.e.  $29\bar{5}^\circ$  at  $\underline{1}25$  kts encoded as  $29\bar{6}25$ .
- 4 Data for vertical wind sheer follow.
- $v_b v_b$  Absolute value of vector difference between max wind and the wind 3000 feet BELOW the level of maximum wind, reported to the nearest knot. Use "/" if missing and 4 group is reported. A vector difference of 99 knots or more is reported with the code figure "99".
- $v_a v_a$  Absolute value of vector difference between max wind and the wind 3000 feet ABOVE the level of maximum wind, reported to the nearest knot. Use "/" if missing and 4 group is reported. A vector difference of 99 knots or more is reported with the code figure "99".
- 77999 Indicator that maximum wind data have not been observed.

#### SECTION 10 - NATIONAL PRACTICES

- 61616 Mission identifier followed by the observation number. (e.g., 61616 NOAA9 0403A CLAUDETTE OB 01)
- 62626 Remarks (e.g., EYEWALL, SST28.2, SFC WND AT 7M)

**CODE FORM:**

**PART B**

- SECTION 1  $M_i M_j M_j M_j$  YYGG/ 99 $L_a L_a L_a$   $Q_c L_o L_o L_o$   $MMMU_{L_a} U_{L_o}$
- SECTION 5  $n_o n_o P_o P_o P_o$   $T_o T_o T_{ao} D_o D_o$   
 $n_1 n_1 P_1 P_1 P_1$   $T_1 T_1 T_{a1} D_1 D_1$   
 $n_n n_n P_n P_n P_n$   $T_n T_n T_{an} D_n D_n$
- SECTION 6 21212  $n_o n_o P_o P_o P_o$   $d_o d_o f_o f_o f_o$   
 $n_1 n_1 P_1 P_1 P_1$   $d_1 d_1 f_1 f_1 f_1$   
 $n_n n_n P_n P_n P_n$   $d_n d_n f_n f_n f_n$
- SECTION 7 31313  $s_r r_a r_a s_a s_a$  8GGgg
- SECTION 9 51515 101 $A_{df} A_{df}$  or  
101 $A_{df} A_{df}$  0 $P_n P_n P'_n P'_n$  or  
101 $A_{df} A_{df}$   $P_n P_n h_n h_n h_n$
- SECTION 10 61616 Repeat national practice encoded in Part A.  
62626 Repeat national practice encoded in Part A.

**PART B**

**SECTION - 1 IDENTIFICATION AND POSITION**

$M_i M_j$  Identification letters of the part of the report = BB.

/ Filler figure for last digit of YYGG group. No wind groups reported for any of the significant isobaric surfaces.

All other groups are the same as reported in Part A - Section 1

**SECTION 5 - DATA FOR SIGNIFICANT TEMPERATURE AND RELATIVE HUMIDITY LEVELS**

$n_o n_o$  Number of level, starting with surface level. Only surface level will be numbered as "00."  
 $n_1 n_1$  When a standard level is also selected as significant, repeat the level in section 5. Encode  
 $n_n n_n$  significant levels to indicate missing data as nn/// ////.

$P_o P_o P_o$  Pressure at specified levels in whole millibars, beginning with surface.  
 $P_1 P_1 P_1$   
 $P_n P_n P_n$

Temperature and humidity data groups are reported in the same manner as the temperature and humidity data in Part A - Section 2.

## SECTION 6 - DATA FOR SIGNIFICANT WIND LEVELS

21212 Data for significant levels with respect to wind follow. Wind data groups are reported in the same manner as the wind data in Part A - Section 2.

## SECTION 7 - SOUNDING SYSTEM INDICATION

31313 Data on sounding system.

$s_r$  Identifies solar and infrared radiation correction. Always report as zero--no correction.  
 $r_a r_a$  Identifies dropsonde/sounding system used. Always report as "96"--descending radiosonde.  
 $s_a s_a$  Identifies tracking technique/status of system used. Reported as "00" or "08."  
"0" - Aircraft system has no windfinding capability.  
"8" - Automatic satellite navigation.

8 Indicator for time of observation.  
GG Actual time of dropsonde launch to the nearest whole hour UTC.  
gg Actual time of dropsonde launch in minutes UTC.

## SECTION 9 - ADDITIONAL DATA GROUPS

101A<sub>df</sub> A<sub>df</sub> Specifications of regional additional data being reported.

0 Group indicator.  
 $P_n P_n$   
 $P'_n P'_n$  Pressure of specified levels in tens of millibars. (1007 mb=01, 945 mb=95, 726 mb=73).

$P_n P_n h_n h_n h_n$  Data reported in the same manner as in Part A - Section 2.

51515 Additional data in regional code follow.

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 a level to termination of the descent. NOTE: When radar altimeter is inoperative and surface reference is used, or if the ARWO advises that geopotential platform data is doubtful, a 10166 is reported for the entire run.

10167 Temperature data are doubtful between the following levels:  $0P_n P_n P'_n P'_n$ . This code figure shall be reported when only 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.

10190 Extrapolated altitude data follows:

1. When the sounding begins within 25mbs below a standard surface, the height of the surface is reported in the format 10190  $P_n P_n h_n h_n h_n$ . 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 B as 10190 30966.

2. 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 in Part B of the code in the format 10190  $P_n P_n h_n h_n h_n$ . 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.

