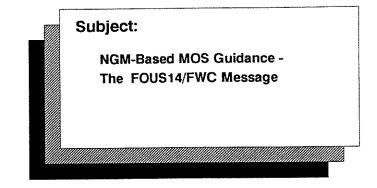
National Weather Service Office of Meteorology

Technical Procedures Bulletin

Series No. 408



Program Requirements and Development Division, Silver Spring, MD 20910

SIGNIFICANT CHANGE FROM LAST BULLETIN ON THIS SUBJECT NO. 387 September 18, 1992 W/OSD21:JPD

This Technical Procedures Bulletin (TPB), written by J. Paul Dallavalle, John S. Jensenius, Jr., and Stephen A. Gilbert of the Techniques Development Laboratory, describes the contents of the FOUS14 (AFOS category FWC) message.

The FOUS14 message (FWC) contains forecasts of the max/min temperature; surface temperature and dew point; opaque cloud cover; surface wind direction and wind speed; PoP for 6- and 12-h periods; quantitative precipitation for 6- and 12-h periods; probability of thunderstorms and the conditional probability of severe thunderstorms for 6- and 12-h periods; conditional probability of precipitation type (freezing, snow, or liquid) and a corresponding category; snow amount; and categories of ceiling height, visibility, and obstruction to vision. Guidance is provided for projections of 6 to 60 hours for most weather elements. All messages are for stations in the contiguous United States. The FOUS14 product is prepared daily for dissemination at approximately 0400 and 1600 UTC for the 0000 and 1200 UTC forecast cycles, respectively.

A sample message for Washington, DC (DCA) based on the 0000 UTC cycle on March 6, is used throughout the TPB to discuss the various forecast elements in detail. Each section begins with the portion of the message being discussed, preceded by the message heading to enhance readability. A one-page reference card for the FOUS14 message is included with the TPB.





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Chief Services Develo

Chief, Services Development Branch



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NGM-BASED MOS GUIDANCE - THE FOUS14/FWC MESSAGE

by J. Paul Dallavalle, John S. Jensenius, Jr., and Stephen A. Gilbert

1. INTRODUCTION

In May 1987, the National Weather Service (NWS) implemented the first statistical guidance package (Jensenius et al., 1987) designed for application to the Nested Grid Model (NGM) (Phillips, 1979; Tuccillo and Phillips, 1986; Hoke et al., 1989). The equations used to produce the guidance were developed at the Techniques Development Laboratory (TDL) by using a modified perfect prog technique (Erickson, 1988). In July 1989, a new NGM-based Model Output Statistics (MOS) (Glahn and Lowry, 1972) package (Jacks et al., 1990a; 1990b) replaced the perfect prog system; MOS forecasts were produced for maximum/minimum (max/min) temperature, probability of precipitation (PoP), cloudiness, and wind. This NGM-based MOS package is being enhanced to include forecasts for additional weather elements and for additional stations. For users external to the NWS, the NGMbased MOS forecasts are issued with the bulletin heading FOUS14 KWBC (hereafter referred to as FOUS14). For NWS forecasters, the NGM-based MOS guidance package is disseminated on the AFOS communications system under the FWC category (hereafter referred to as FWC).

This Technical Procedures Bulletin (TPB) describes the contents of the new, complete FOUS14/FWC message. Where appropriate, we refer the interested reader to other documents for details about the development of the equations used to produce the guidance. At the time this TPB was written, TDL had not finished developing all the required forecast equations. Thus, in some cases, technical documentation was not yet available. Documentation will be issued as new equations are developed and implemented.

The FOUS14 message (FWC) contains forecasts of max/min temperature; time-specific surface temperature and dew point; opaque cloud cover; surface wind direction and wind speed; PoP for 6- and 12-h periods; quantitative precipitation for

6- and 12-h periods; probability of thunderstorms and the conditional probability of severe thunderstorms for 6- and 12-h periods; conditional probability of precipitation type (freezing, snow, or liquid) and a corresponding category; snow amount; and categories of ceiling height, visibility, and obstruction to vision. Guidance is provided for projections of 6 to 60 hours for most weather elements. All messages are for stations in the contiguous United States. Note that some part-time stations do not have forecasts for all weather elements and/or projections due to lack of developmental data. The FOUS14 product is prepared daily for dissemination at approximately 0400 and 1600 UTC for the 0000 and 1200 UTC forecast cycles, respectively.

Figure 1 gives an example of the FOUS14 issued for the 0000 UTC forecast cycle during the period of September 16 through May 15. Figure 2 gives an example of the message issued for the 1200 UTC forecast cycle during the period of May 16 through September 15. Note that the message does not contain forecasts of snow and precipitation type for the latter period. Note, too, that snow and precipitation type forecasts are never issued for certain stations in California and Florida.

2. MESSAGE FORMAT AND LINE-BY-LINE SAMPLE MESSAGE

The FOUS14 message shown in Figure 1 for Washington, D.C., is based on the 0000 UTC cycle on March 6. In the following sections, the various forecast elements are discussed in detail; similar elements, such as temperature and dew point, have been grouped together for convenience. Each section begins with the portion of the message being discussed, preceded by the message heading to enhance readability.

A one-page summary of the FOUS14 message is given at the end of this TPB, and will also be available and distributed to TPB subscribers as a detached reference card.

a. Message Heading

The message heading shown above (see Figure 1 also) identifies the station for which the guidance is valid, the forecast cycle, and the day and hour for which the forecasts are valid. Note that the heading is transmitted with each station's message. In this example, the FOUS14 is for Washington, D.C. (DCA). All stations are identified by a three-character site identifier (see the Appendix for a complete list of stations). The characters adjacent to the site location identifier (in this instance, ESC) identify the NWS Regions to which the product is transmitted on the AFOS network. The characters of "E", "S", "C", and "W" denote the Eastern, Southern, Central, and Western Regions, respectively. One or more of these letters may appear for any station since a message can be routed to more than one region.

The "NGM MOS GUIDANCE" on the same line as the site location identifier indicates the contents of the message. The date of the forecast cycle for which the message is issued follows this information. The form of mm/dd/yy is used, where mm is the month (1 through 12), dd is the day (1 through 31), and yy is the last two digits of the year. The forecast cycle is identified by 0000 or 1200 UTC. In the above example, the MOS guidance for DCA is based on the 0000 UTC forecast cycle of the NGM on March 6, 1991.

The DAY and HOUR lines denote the date and hour (UTC) at which the forecasts are valid. The DAY line indicates both the month and day of month. Note that the month is denoted by the standard three or four letter abbreviation, as necessary. For temperature, dew point, clouds, wind direction and speed, precipitation type, celling height, visibility, and obstruction to vision, the date and hour denote the specific time that the forecasts are valid. For PoP, quantitative precipitation, snow amount, thunderstorms, and severe thunderstorms, the time indicates the end of the period over which the forecasts are valid. For max/min temperature, the date group gives

only the approximate ending time of the daytime and nighttime periods for which the max and min temperature guidance, respectively, are valid.

b. MX/MN - Maximum/Minimum Temperature Forecasts

NMCFWCDCA
FOUS14 KWBC 060357
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC
DAY /MAR 8 /MAR 7 /MAR 8
HOUR 08 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
MX/MN 59 39 54 24

The max/min surface temperature forecasts are displayed for projections of 24, 36, 48, and 60 hours after the initial data time (0000 or 1200 UTC). Although the MX/MN forecasts are presented at consecutive 12-h intervals, each forecast is actually valid for a daytime or nighttime period. For the NGM-based MOS guidance, daytime is defined as 7 a.m. to 7 p.m. Local Standard Time (LST). Nighttime is defined as 7 p.m. to 8 a.m. LST. Note that the extra hour in the nighttime definition is intended to capture the minimum temperatures observed near sunrise during the winter. Thus, the valid date in the appropriate column of the DAY and HOUR lines must be converted by the forecaster to his/her local date. This local date then denotes the appropriate daytime or nighttime for the max or min temperature forecast. For the 0000 UTC forecast cycle, the temperatures are shown in MX/MN order and are valid for today's max, tonight's min, tomorrow's max, and tomorrow night's min. For the 1200 UTC cycle, the temperatures are shown in MN/MX order and are valid for tonight's min, tomorrow's max, tomorrow night's min, and the day after tomorrow's max. Each temperature forecast is presented in whole degrees Fahrenheit and three characters are allowed. A missing forecast is indicated by 999. For further information on the max/min guidance, see TPB No. 406 (Jacks and Dallavalle, 1992).

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c. TEMP - Surface Temperature and DEWPT- Surface Dew Point Forecasts

NMCFWCDCA

FOUS14 KWBC 060357
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC
DAY/MAR 6 //MAR 7 //MAR 8
HOUR 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
TEMP 37 34 33 38 45 53 52 49 46 43 40 42 47 51 42 39 35 30 24

DEWPT 27 28 28 30 32 36 40 38 41 41 37 33 28 27 25 21 20 19 19

Time-specific surface temperature and dew point forecasts are valid every 3 hours from 6 to 60 hours after 0000 and 1200 UTC. These forecasts are valid at 0600, 0900,..., 2100, 0000 UTC, and so forth. Each temperature and dew point forecast is presented in whole degrees Fahrenheit; a missing forecast is indicated by 999. Note that only three characters are available for the temperature and dew point forecasts, so that two consecutive forecasts of 100 degrees or more (or -10 degrees or less) will appear with no spaces between them. TPB No. 406 contains more details regarding the 3-h surface temperature and dew point guidance.

d. CLDS - Opaque Cloud Amount Categorical Forecasts

Forecast categories of opaque cloud cover (see the following table) are available in plain language for projections at 3-h intervals from 6 to 60 hours after the initial data times (0000 and 1200 UTC). All forecasts are valid for specific times (i.e., 0600, 0900, 1200 UTC, and so forth). Two characters identify the category (CL - clear; SC - scattered; BK - broken; OV - overcast); a missing forecast is denoted by XX. TPB No. 387 gives information about the NGM-based MOS cloud forecasts. Note that the cloud forecasts for the 9-, 15-, 21-, 27-, 33-, 39-, 45-, 51-, and 57-h projections will not be available until the spring of 1993.

Opaque Cloud Cover Categories

CL - 0 tenths of opaque clouds;

SC - 1 to 5 tenths of opaque clouds;

BK - 6 to 9 tenths of opaque clouds;

OV - 10 tenths of opaque clouds or totally obscured;

XX - missing.

e. WDIR - Surface Wind Direction and WSPD - Surface Wind Speed Forecasts

NMCFWCDCA
FOUS14 KWBC 060357
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC
DAY MAR 6 /MAR 7 /MAR 8
HOUR 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
WDIR 26 18 08 12 14 14 15 18 24 27 28 29 29 29 33 01 02 00
WSPD 01 04 06 10 11 12 16 18 13 15 12 20 24 22 14 12 14 08 00

Surface wind direction and speed forecasts are given at 3-h intervals for projections of 6 to 60 hours after the initial data times (0000 and 1200 UTC). These are forecasts of 1-minute average winds at specific times throughout each day (i.e., 0600, 0900, 1200 UTC, and so forth). The wind direction is given in tens of degrees and varies from 01 (10 degrees) to 36 (360 degrees). The wind speed is given in knots; the maximum speed allowed in the message is 98 knots. A calm wind is denoted with both direction and speed of 00 (0000). Missing forecasts are denoted by 99 for both direction and speed. TPB No. 399 (Miller, 1992) gives more details on the wind forecasts.

f. POP06 - Probability of Precipitation (PoP) in a 6-h period and POP12 - Probability of Precipitation in a 12-h period

The POP06 and POP12 forecasts are for the probability of 0.01 inches or more of liquidequivalent precipitation occurring during a 6-h and 12-h period, respectively. The 6-h PoP's are valid for intervals of 6-12, 12-18, 18-24, 24-30, 30-36, 36-42, 42-48, 48-54, and 54-60 hours after the initial data times (0000 and 1200 UTC). The 12-h PoP's are valid for intervals of 12-24, 24-36. 36-48, and 48-60 hours after the initial data times (0000 and 1200 UTC). In the message, the forecast values are displayed under the ending time of the period. The probability is given to the nearest percent. Values range from 0 to 100%. A missing forecast is indicated by 999. The TPB describing the PoP system is currently in preparation.

g. QPF - Quantitative Precipitation Forecasts

Guidance for liquid-equivalent precipitation amount accumulated during a specified period is presented in categorical form. Forecasts for 6-h periods are displayed to the left of the diagonal. These forecasts are available for projections of 6-12, 12-18, 18-24, 24-30, 30-36, 36-42, 42-48, 48-54, and 54-60 hours after the initial data time (0000 and 1200 UTC). Forecasts for 12-h periods are displayed to the right of the diagonal. The 12-h forecasts are available for projections of 12-24, 24-36, 36-48, and 48-60 hours after 0000 or 1200 UTC. In the message, the forecasts are displayed beneath the hour indicating the end of the period. The QPF guidance is a categorical forecast of liquid-equivalent precipitation equalling or exceeding certain specified amounts in the 6- or 12-h periods. The categories are as follows:

OPF Categories

- 0 = no precipitation expected;
- 1 = 0.01 0.09 inches;
- 2 = 0.10 0.24 inches;
- 3 = 0.25 0.49 inches;
- 4 = 0.50 0.99 inches:
- 5 = > 1.00 inches for 6-h QPF; 1.00 - 1.99 inches for 12-h QPF;
- 6 = unavailable for 6-h QPF;
- ≥ 2.00 inches for the 12-h QPF; 9 = no forecast available.

At this time, a TPB is unavailable for the QPF.

h. TSV06 - Thunderstorm and Severe Storm Probabilities for 6-h periods and TSV12 - Thunderstorm and Severe Storm Probabilities for 12-h periods

Forecasts of the probability of a thunderstorm occurring during a 6-h (12-h period for TSV12) period are displayed to the left of the diagonal and

the conditional probability of severe thunderstorms occurring during the same 6-h (12-h period for TSV12) period is displayed to the right of the diagonal. As with POP06, both the 6-h thunderstorm and severe thunderstorm probabilities (TSV06) are available for periods of 6-12, 12-18, 18-24, 24-30, 30-36, 36-42, 42-48, 48-54, and 54-60 hours after 0000 or 1200 UTC. Similarly, for TSV12, both the thunderstorm and severe thunderstorm probabilities are available for periods of 6-18, 18-30, 30-42, and 42-54 hours after 0000 or 1200 UTC. In the message, the forecasts are displayed beneath the ending hour of the appropriate period. The thunderstorm probability forecasts are given to the nearest whole percent and range from 0 to 100%; a missing forecast is denoted by 999. The conditional severe thunderstorm probabilities are given to the nearest whole percent and range from 0 to 98%; a missing forecast is indicated by 99. Forecasts of both thunderstorms and severe thunderstorms are available year-round.

In developing the thunderstorm and severe storm probability equations, the occurrence of thunderstorms was defined by combining reports from surface hourly observations, radar echo intensity values from Manually Digitized Radar (MDR) data, and reports from spotter networks in the National Severe Storms Forecast Center (NSSFC) Severe Local Storms (SELS) logs. A radar echo at Video Integrator and Processor level 3 (VIP3) or greater was chosen to indicate the occurrence of a thunderstorm. Since MDR reports are for grid blocks approximately 47 km on a side and since a station seldom sits at the mid-point of a block, we defined the radar reporting area for a station as a 3 by 3 array of blocks with the station located in the interior block. Thus, a station report of a thunderstorm, an MDR report of VIP3 or greater within a station's area, or a SELS log report within a station's area indicated a thunderstorm occurrence. The reports were then accumulated over the appropriate 6-h (or 12-h for TSV12) period. Similarly, a severe thunderstorm (conditional, of course, upon a thunderstorm occurring) was defined by a station report in the hourly observation or a SELS log report within the station's area. TPB No. 407 (Bower, 1992) provides additional information about this product. Note that the thunderstorm

probabilities indicate the likelihood of a thunderstorm within a station's <u>area</u>. The PoP indicates the likelihood of precipitation at a specific <u>station site</u>. Thus, for the same weather event, the thunderstorm probability can exceed the PoP.

i. PTYPE - Precipitation Type Forecasts (Conditional)

NMCFWCDCA
FOUS14 KWBC 060357
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC
DAY /MAR 6 /MAR 7 /MAR 8
HOUR 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
PTYPE S S S S R R R R R R R R R R R S Z

The PTYPE guidance in the message gives the forecast precipitation type (if precipitation occurs) for specific times 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 42, 48, 54, and 60 hours after the initial hour of 0000 or 1200 UTC. The forecast is indicated by one character, where "Z" represents freezing precipitation (freezing rain, freezing drizzle, ice pellets (sleet), or any of these elements mixed with other precipitation types), "S" represents snow (snow, snow grains, snow pellets, or snow showers), and "R" represents liquid precipitation (rain, drizzle, or a mixture of rain or drizzle with snow). A missing forecast is denoted by "X". The precipitation type guidance is transmitted only during the period of September 16 -May 15. The TPB describing this product is currently in preparation.

j. POZP - Probability of Freezing Precipitation (Conditional) and POSN - Probability of Snow (Conditional)

NMCFWCDCA
FOUS14 KWBC 060357
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC
DAY MAR 8
HOUR 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
POZP 8 10 12 6 0 0 0 0 0 0 1 3 0 2 24 35
POSN 65 67 70 48 41 14 11 13 15 16 20 9 16 50 42

Conditional probability of freezing precipitation (given that precipitation is occurring) and conditional probability of snow (given that precipitation is occurring) forecasts are available for specific times 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 42, 48, 54, and 60 hours after 0000 and 1200 UTC. Freezing precipitation is defined as the occurrence of freezing rain or drizzle, ice pellets (sleet),

or any mixture of freezing rain, drizzle, or ice pellets with other precipitation types. Snow is defined as the occurrence of a pure snow event, that is, snow, snow showers, snow grains, or snow pellets or any combination of those elements. Snow mixed with rain is considered a liquid precipitation event. The probabilities are given to the nearest whole percent, and values range from 0 to 100%. Missing values are indicated by 999. These probabilities are used in producing the categorical PTYPE forecast described in Section 2.i. The POZP and POSN guidance are transmitted only during the period of September 16 - May 15. The TPB describing this product is currently in preparation.

While that the conditional probability of liquid precipitation is not given in the message, note that the three conditional probabilities (freezing, frozen, and liquid), add to 100%.

k. SNOW - Snow Amount Categorical Forecasts

NMCFWCDCA
FOUS14 KWBC 060357
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC
DAY/MAR 6 /MAR 7 /MAR 8
HOUR 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
SNOW 0/ 0/ 0/ 0/1 0/ 0/0 0/ 0/0 0/ 0/0 0/

Categorical forecasts of snow amount are available in the message for both 6- and 12-h periods. The categorical forecasts of snow amount falling in 6-h periods are given to the left of the diagonal; forecasts are valid for 6-h periods ending 12, 18, 24, 30, 36, 42, 48, 54, and 60 hours after 0000 or 1200 UTC. The categorical forecasts for snow amount in 12-h periods are displayed to the right of the diagonal; forecasts are valid for 12-h periods ending 24, 36, 48, and 60 hours after 0000 or 1200 UTC. The categories are denoted as follows:

Snow Amount Categories

- 0 = no snow expected;
- 1 = a trace to < 2 inches expected;
- 2 = 2 inches or more (6-h forecast);
 - 2 to < 4 in. (12-h forecast);
- 4 = unavailable for 6-h forecast;
 - 4 to < 6 in. (12-h forecast);
- 6 = unavailable for 6-h forecast; 6 inches or more (12-h forecast);
- 9 = no forecast available.

Forecasts are disseminated only for the period of September 16 - May 15. A TPB will be forthcoming when the guidance equations are completed.

I. CIG - Ceiling Height Categorical Forecasts

```
NMCFWCDCA
FOUS14 KWBC 060357
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC
DAY /MAR 6 /MAR 7 /MAR 8
HOUR 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
CIG 4 5 4 4 5 6 7 6 3 2 1 5 6
```

Forecasts of seven categories of ceiling height (see the following table) are available for specific times 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 42, and 48 hours after 0000 and 1200 UTC. The forecasts are displayed beneath the time of the day for which they are valid. Values of 1 through 7 are allowed for the categorical guidance; a value of 9 denotes a missing forecast. The categories are as follows:

Ceilina Height Categories

- 1 = < 200 feet;
- 2 = 200 400 feet:
- 3 = 500 900 feet:
- 4 = 1000 3000 feet;
- 5 = 3100 6500 feet:
- 6 = 6600 12,000 feet;
- 7 = > 12,000 feet;
- 9 = no forecast available.

The categorical guidance is prepared by using probability forecasts of the same categories. The TPB describing the celling height guidance is currently in preparation.

m. VIS - Visibility Categorical Forecasts

Forecasts of five categories of visibility (see the following table) are available for specific times 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 42, and 48 hours after 0000 and 1200 UTC. The forecasts are displayed beneath the time of the day for which they are valid. Values of 1 through 5 are allowed for the categorical guidance; a value of 9 denotes a missing forecast. The categories are as follows:

Visibility Categories

- 1 = < 1/2 mile:
- 2 = 1/2 7/8 miles;
- 3 = 1 23/4 miles;
- 4 = 3 5 miles;
- 5 = > 5 miles;
- 9 = no forecast available.

The categorical guidance is prepared by using probability forecasts of the same categories. The TPB describing the visibility guidance will be prepared when the forecast equation development is completed.

n. OBVIS - Obstruction to Vision Categorical Forecasts

Forecasts of three categories of obstruction to vision (see the following table) are available for specific times 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 42, and 48 hours after 0000 and 1200 UTC. The forecasts are displayed in plain language beneath the time of the day for which they are valid. The categories are denoted by the letters "F", "H", and "N"; a value of "X" denotes a missing forecast. The categories are as follows:

Obstruction to Vision Categories

F = fog or ground fog expected;

H = haze expected;

N = neither fog nor haze are expected;

X = no forecast available.

The categorical guidance is prepared by using probability forecasts of the same categories. The TPB describing the obstruction to vision guidance will be prepared when the forecast equation development is completed. Note that in the equation development, cases of fog were included in the sample whether or not precipitation occurred. Lower visibilities caused exclusively by precipitation occurrence are not predicted by this guidance.

3. AVAILABILITY

The FOUS14 message (FWC product) is produced twice daily at around 0400 and 1600 UTC. The products are disseminated to the AFOS network (regionally addressed; see the Appendix for details), to the Family of Service's Domestic Data Service, and to the FAA Weather Message Switching Center. The actual receipt time by the user may lag the production time substantially, particularly during peak traffic hours when many products are being transmitted by the NWS Telecommunications Gateway.

At an AFOS site, an FWC product may be displayed by typing FWCxxx and pressing "ENTER" (where xxx represents the three letter site location identifier). Note that the product header is automatically attached to the station's message. The Appendix lists stations for which FWC quidance is available.

4. STATION LIST

At this time, the FOUS14 (FWC) is available for the stations listed in the Appendix. The site location identifier, regional AFOS routing, and latitude and longitude of each station are also provided in the Appendix.

5. REFERENCES

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NMCFWCDCA
FOUS14 KWBC 060357
DCA ESC
         NGM MOS GUIDANCE
                              3/06/91 0000 UTC
DAY /MAR
           6
                          /MAR
                                                    /MAR
                                                           8
HOUR
       06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12
MX/MN
                          59
                                       39
TEMP
       37 34 33 38 45 53 52 49 46 43 40 42 47 51 42 39 35 30 24
DEWPT
       27 28 28 30 32 36 40 38 41 41 37 33 28 27 25 21 20 19 19
       OV OV OV OV OV OV OV OV OV BK BK BK SC SC SC CL CL CL
CLDS
WDIR
       26 18 08 12 14 14 15 18 24 27 28 29 29 29 29 33 01 02 00
       01 04 06 10 11 12 16 18 13 15 12 20 24 22 14 12 14 08 00
WSPD
POP06
                          46
                                85
                                       62
                                                                 8
POP12
                          49
                                       91
                                                    R
                                                                19
OPF
                  0/
                         1/1
                               3/
                                      2/4
                                            0/
                                                  0/0
                                                        0/
                                                               0/0
TSV06
                 3/ 0
                           1
                              5/ 1
                                     6/ 2 16/ 3 11/ 1
                                                        8/ 0
                                                              0/0
TSV12
                  4/ 0
                              8/1
                                          21/4
                                                        9/1
PTYPE
        S
           SS
                 S
                    S
                       R
                           R
                              R
                                R
                                    R
                                       R
                                              R
                                                    R
                                                          S
                                                                 7.
POZP
        8 10 12
                 6
                    0
                       0
                           0
                              Ω
                                 0
                                    1
                                       3
                                              0
                                                    2
                                                                35
                                                         24
POSN
       65 67 70 48 41 14 11 13 15 16 20
                                              9
                                                   16
                                                         50
                                                                42
SNOW
            0/
                  0/
                         0/1
                                            0/
                               0/
                                     0/0
                                                  0/0
                                                        0/
                                                               0/0
CIG
           5
                    5
              4
                 4
                        6
                           7
                              6 3
                                    2 1
                                              5
                                                    6
VIS
        3
           4
              3
                 5
                    5
                       5
                           5
                              4
                                 2
                                    2
                                       1
                                              3
                                                    4
OBVIS
        H
           H
              H
                 N
                    N
                       N
                           N
                              F
                                 F
                                    F
                                       F
                                              H
                                                    N
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Figure 1. Sample FOUS14 message for Washington, D.C. (DCA) for the 0000 UTC cycle on March 6, 1991. (Same message was used in the line-by-line explanations given in Section 2.)

```
NMCFWCLIZ
FOUS14 KWBC 021557
LIZ E
          NGM MOS GUIDANCE
                              6/02/92 1200 UTC
DAY /JUNE 2 /JUNE 3
                                       JUNE 4
HOUR
       18 21 00 03 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00
MN/MX
                          52
                                      71
                                                   48
TEMP
       61 63 59 56 55 53 57 63 68 69 63 57 53 49 52 58 62 63 59
DEWPT
       52 51 51 50 49 49 51 51 48 46 46 43 42 40 40 39 38 37 39
       BK SC SC SC CL SC BK BK OV OV SC BK BK BK BK SC SC BK BK
CLDS
WDIR
       34 33 32 27 21 21 23 26 28 30 32 33 34 34 35 31 30 33 01
WSPD
       07 05 02 02 05 06 09 13 16 13 09 04 03 03 01 03 06 03 04
POP06
             11
                    6
                           9
                                27
                                      60
                                            20
                                                   17
                                                               35
POP12
                          11
                                      72
                                                   22
                                                               41
                  0/
QPF
                               2/
                         0/0
                                     2/4
                                           1/
                                                  1/1
                                                        1/
                                                              1/2
TSV06
           6/ 0
                 0/0
                              6/ 0 10/ 0
                        0/0
                                          0/0
                                                       4/ 0 10/ 0
                 6/ 0
                              7/0
                                         10/ 0
TSV12
                                                       5/ 2
CIG
                 7
                    7
                       7
                           7
                                 4
                                    3
                                       7
                                                    5
                              6
                                             4
VIS
           4
              5
                 5
                    5
                       5
                          5
                                    4
                                                    2
OBVIS
        H
           H N
                 N
                    N
                       N N
                             N
                                 H
                                    H
                                      H
                                             F
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Figure 2. Sample FOUS14 message for Loring Air Force Base, Maine (LIZ) for the 1200 UTC cycle on June 2, 1992.

TPB 408 - APPENDIX

LIST OF FOUS14 (FWC) STATIONS (UPDATED)

The following table shows the 565 stations (in alphabetical order, by location identifier) contained in FOUS14 KWBC (AFOS category FWC). Latitude and longitude are in degrees and minutes. AFOS routing is indicated by the appropriate letter(s), as defined in Section 2.a. Non-AFOS users receive a collective of all 565 stations. Stations in bold were added to FOUS14 KWBC in August 1995.

ID	NAME	<u>LAT</u>	LON	<u>AFO</u>	s RO	UTIN	3
ABE	Allentown, PA	40.39	75.26	E	C		
ABI	Abilene, TX	32.25	99.41	E		S	
	Abliene, in Albuquerque, NM	35.03	106.37		C	S	
ABQ ABR	Aberdeen, SD	45.27	98.26		С		
ABY	Albany, GA	31.32	84.11	E		S	
ACK	Nantucket, MA	41.15	70.04	E			
ACT	Waco, TX	31.37	97.13	E		s	
ACV	Arcata, CA	40.59	124.06				W
ACY	Atlantic City, NJ	39.27	74.34	E		•	
ADM	Ardmore, OK	34.18	97.01		Ç	S	
AEX	England AFB, LA	31.19	92.33			S	
AGC	Allegheny Co. Apt., PA	40.21	79.56	E			
AGR	Avon Pk. Gun Range, FL	27.39	81.20			S	
AGS	Augusta, GA	33.22	81.58	E		S	
AHN	Athens, GA	33.57	83.19	E		S	
AKO	Akron, CO	40.10	103.13		C		
ALB	Albany, NY	42.45	73.48	E	C		
ALI	Alice, TX	27.44	98.02			S	
ALO	Waterloo, IA	42.33	92.24		С		
ALS	Alamosa, CO	37.27	105.52		C	S	
ALW		46.06	118.17	٦			W
AMA	Amarillo, TX	35.14	101.42		C	'S	
AMG		31.32	82.31	E		S	
ANB	Anniston, AL	33.35	85.51			S	
AND	Anderson, SC	34.30	82.43	E	_	S	
OOA	Altoona, PA	40.18	78.19	E	C		
APN	Alpena, MI	45.04	83.34	E	C		
AQQ	Apalachicola, FL	29.44	85.02			S	
ART	· · · · · · · · · · · · · · · · · · ·	44.00	76.01	E		٠.	T.7
AST		46.09	123.53	_	_		W
ATL		33.39	84.26	E	C	S	
WTA	•	44.16	88.31		C		
YTA	- -	44.55	97.09		С		
AUG		44.19	69.48	E		_	
AUS	_	30.18	97.42		,,,,	S	
AUW		44.55	89.37		С	s	
AVL	Asheville, NC	35.26	82.33	E		۵	

ID	NAME	LAT	LON	AFO:	s RO	UTING	3
AVP	Scranton, PA	41.20	75.44	E			
AXN	Alexandria, MN	45.52	95.23		C		
AYS	Waycross, GA	31.15	82.24	E		S	
BAB	Beale AFB, CA	39.08	121.26	-			W
BAF	Westfield, MA	42.10	72.43	E			
BCE	Bryce Canyon, UT	37.42	112.09		C	S	W
BDL	Hartford, CT	41.56	72.41	E			
BDR	Bridgeport, CT	41.10	73.08	E			
BFD	Bradford, PA	41.48	78.38	E			
BFF	Scottsbluff, NE	41.52	103.36		C		
BFL	Bakersfield, CA	35.25	119.03			S	W
BGM	Binghamton, NY	42.13	75.59	E			
BGR	Bangor, ME	44.48	68.49	E			
BHM	Birmingham, AL	33.34	86.45	E	C	S	
BID	Block Isl., RI	41.10	71.35	Ε.			
BIH	Bishop, CA	37.22	118.22				W
BIL	Billings, MT	45.48	108.32		C		W
BIS	Bismarck, ND	46.46	100.45		C	S	W
BIX	Kessler AFB, MS	30.25	88.55			S	
BJI	Bemidji, MN	47.30	94.56		С		
BKE	Baker, OR	44.50	117.49				W
BKW	Beckley, WV	37.47	81.07	E			
BLF	Bluefield, WV	37.18	81.13	E			
BLH	Blythe, CA	33.37	114.43				W
BLI	Bellingham, WA	48.48	122.32				W
BLU	Blue Canyon, CA	39.17	120.42				W
BNA	Nashville, TN	36.07	86.41	E	C	S	
BNO	Burns, OR	43.35	118.57				W
BOI	Boise, ID	43.34	116.13		C	S	W
BOS	Boston, MA	42.22	71.02	E	C	S	
BPI	Big Piney, WY	42.34	110.06		C		W
BPT	Port Arthur, TX	29.57	94.01			S	
BRD	Brainerd, MN	46.24	94.08	=	C		
BRL	Burlington, IA	40.47	91.07		C		
BRO	Brownsville, TX	25.54	97.26			S .	
BTM	Butte, MT	45.57	112.30				W
BTR	Baton Rouge, LA	30.32	91.09		•	s	
BTV	Burlington, VT	44.28	73.09	E		•	
BUF	Buffalo, NY	42.56	78.44	E	C	•	
BUR	Burbank, CA	34.12	118.22				W
BVE	Boothville, LA	29.20	89.24			S	
BWG	Bowling Green, KY	36.58	86.26	E	C	s	
BWI	Baltimore, MD	39.11	76.40	E		٠	
BYH	Blytheville AFB, AR	35.58	89.57		C	S	
BYI	Burley, ID	42.32	113.46				W
BZN	Bozeman, MT	45.47	111.09				W
CAE	Columbia, SC	33.57	81.07	E	C ·	S	
CAG	Craig, CO	40.30	107.32		C		

·TD	NAME	LAT		<u>LON</u>		<u>AFO</u>	S RO	UTIN	<u>G</u>
ID	NATE								
		•							
CAK	Akron-Canton, OH	40.55		81.26		E			
CAO	Clayton, NM	36.27		103.09			С	S	
CAR	Caribou, ME	46.52		68.01		\mathbf{E}			
CBM	Columbus AFB, MS	33.39		88.27		•		S	
CDC	Cedar City, UT	37.42		113.06			C.	S	W
CDR	Chadron, NE	42.50		103.05			С		
CDS	Childress, TX	34.26		100.17				S	
CEF	Westover AFB, MA	42.12		72.32		E			
CHA	Chattanooga, TN	35.02		85.12		E		S	
CHO	Charlottesville, VA	38.08		78.27	•	E			
	Charleston, SC	32.54	•	80.02	•	E		s	
CHS		41.53		91.42			C		
CID	Cedar Rapids, TA	37.00		89.10			С	S	
CIR	Cairo, IL	39.17		80.14		E			
CKB	Clarksburg, WV	32.54		87.15				S	
CKL	Centreville, AL	41.24		81.51		E	С		
CLE	Cleveland, OH	30.35		96.22				S	
CLL	College Station, TX			80.56		E		s	
CLT	Charlotte, NC	35.13 40.00		82.53		E	С	-	
CMH	Columbus, OH			88.17		_	C		
CMI	Champaign, IL	40.02		97.39			· C	s	
CNK	Concordia, KS	39.33		104.16				s	
CNM	Carlsbad, NM	32.20		95.29			С	S	
CNU	Chanute, KS	37.40					C	~	
COD	Cody, WY	44.31		109.01		E	. •		
CON	Concord, NH	43.12		71.30		Ð	С	s	W
COS	Colorado Springs, CO	38.49		104.43			٠.	S	. •
COT	Cotulla, TX	28.27		99.13			C	S	
COU	Columbia, MO	38.49		92.13			C	٥	W
CPR	Casper, WY	42.55	•	106.28			_	S	**
CRP	Corpus Christi, TX	27.46		97.30		173	C	٦	
CRW	Charleston, WV	38.22		81.36		E		s	
CSG	Columbus, GA	32.31		84.56				S	
CSM	Clinton, OK	35.21		99.12					
CSV	Crossville, TN	35.57		85.05				S	W
CTB	Cutbank, MT	48.36		112.22					71
CTY	Cross City, FL	29.37		83.06		_	· _	S	
CVG	Covington, KY	39.03		84.40		E	С	_	
CVS	Cannon AFB (Clovis), NM	34.23		103.19				S	
CXY	Harrisburg, PA	40.13		76.51		E	-		
CYS	Cheyenne, WY	41.09		104.49			С		W
DAB	Daytona Beach, FL	29.11		81.03				S	
DAG	Daggett, CA	34.52		116.47	•				W
DAL	Dallas, TX	32.51		96.51				S	
DAN	Danville, VA	36.34		79.20		E			
DAY	Dayton, OH	39.54		84.12		E	C		
DBQ	Dubuque, IA	42.24		90.42			C		
DCA		38.51		77.02		E	С	S	
DDC	Dodge City, KS	37.46		99.58			C	S	
2/1/	pougo oroji, in								

			•				
<u>ID</u>	NAME	LAT	LON	AF	OS RO	<u> </u>	<u>IG</u>
	•						
DEN	Denver, CO	39.45	104.52		С	S	W
DFW	Dallas-Ft. Worth, TX	32.54	97.02	E	С	S	
DHN		31.19	85.27		Ţ.,	s	
DHT	Dalhart, TX	36.01	102.33			s	
DLH	Duluth, MN	46.50	92.11	E	C	_	
DLS	The Dalles, OR	45.37	121.09		•		W
DMA	Davis-Monthan AFB, AZ	32.10	110.53			s	W
DMN	Deming, NM	32.15	107.42			S	
DOV	Dover AFB, DE	39.08	75.28	E			
DRA	Mercury, NV	36.37	116.01	.22			W
DRT	Del Rio, TX	29.22			:	s	14
DSM	-		100.55		~	۵	
DTW	Des Moines, IA	41.32	93.39	777	C		
	Detroit, MI	42.14	83.20	E	C	_	*.*
DUG	-	31.27	109.36	, _		S	W
DUJ	Du Bois, PA	41.11	78.54	E			
DVD	Camp David, MD	39.39	77.28	E			
DXR	Danbury, CT	41.22	73.29	E			
DYR	Dyersburg, TN	36.01	89.24		·C	S	
EAT	Wenatchee, WA	47.24	120.12				W
EAU	Eau Claire, WI	44.52	91.29		С		
ECG	Elizabeth City, NC	36.16	76.11	B			
EED	Needles, CA	34.46	114.37				W
EHA	Elkhart, KS	37.00	101.53		C	S	
EKA	Eureka, CA	40.48	124.10				W
EKN	Elkins, WV	38.53	79.51	E			
EKO	Elko, NV	40.50	115.47				W
ELD	El Dorado, AR	33.13	92.48			S ·	
ELM	Elmira, NY	42.10	76.54	E			
ELP	El Paso, TX	31.48	106.24			S	
ELY	Ely, NV	39.17	114.51				W
EMP	Emporia, KS	38.20	96.12		С		
END	Vance AFB, OK	36.21	97.55		C	S	
ENV	Wendover, UT	40.44	114.02				W
EPH	Ephrata, WA	47.19	119.31				W
ERI	Erie, PA	42.05	80.11	E			
ESF	Alexandria, LA	31.23	92.18	-		s	
EUG	Eugene, OR	44.07	123.13			-	W
EVV	Evansville, IN	38.03	87.32		С		. **
EWN	New Bern, NC	35.05	77.03	E	·		
EWR	Newark, NJ	40.42	74.10	E	•		
EYW	Key West, FL	24.33	•				
E74	Safford, AZ		81.45		٠	S S	Ta7
		32.49	109.41		~	5	W
FAR	Fargo, ND	46.54	96.48		C		W
FAT	Fresno, CA	36.46	119.43	-			W
FAY	Fayetteville, NC	35.00	78.53	E			
FCA	Kalispell, MT	48.18	114.16				W
FDY	Findlay, OH	41.01	83.40	E	_	_	
FLG	Flagstaff, AZ	35.08	111.40		C	S	W

<u>ID</u>	NAME	<u>LAT</u>	LON	AFC	S RO	UTIN	<u>G</u>
FLL	Fort Lauderdale, FL	26.04	80.09			S	
FLO	Florence, SC	34.11	79.43	E		S	
FMH	Otis AFB, MA	41.39	70.31	E		,	
FMN	Farmington, NM	36.45	108.14		С	S	W
FMY	Ft. Myers, FL	26.35	81.52			S	
FNT	Flint, MI	42.58	83.44		C		
FOD	Fort Dodge, IA	42.33	94.11		C		
FOK	Westhampton Beach, NY	40.51	72.38	E			
FSD	Sioux Falls, SD	43.34	96.44		С		W
FSI	Fort Sill, OK	34.39	98.24			S	
FSM	Fort Smith, AR	35.20	94.22	E.	C	S.	
FWA	Fort Wayne, IN	41.00	85.12	E	C		
FWH	Carswell AFB, TX	32.47	97.26			S	
FYV	Fayetteville, AR	36.00	94.10			S	
GAG	Gage, OK	36.18	99.46		C	S	
GCC	Gillette, WY	44.21	105.32		C		
GCK	Garden City, KS	37.56	100.43		C	s	
GDP	Guadalupe Pass, TX	31.50	104.48			S	
GEG	Spokane, WA	47.38	117.32				W
GFK	Grand Forks, ND	47.57	97.11		С		
	Glens Falls, NY	43.21	73.37	E			
GFL	Longview, TX	32.23	94.43			S	
GGG	Glasgow, MT	48.13	106.37		C		W
GGW	Grand Junction, CO	39.07	108.32		С	s	W
GJT	Goodland, KS	39.22	101.42		C	s.	
GLD	Greenville, MS	33.29	90.59			s	
GLH	Galveston, TX	29.16	94.52			S	
GLS	Gainesville, FL	29.41	82.16			S	
GNV		41.20	72.03	B			
GON	Groton, CT	30.24	89.04			S	
GPT	Gulfport, MS	44.29	88.08	E	C		
GRB	Green Bay, WI	47.05	122.35				W
GRF	Fort Lewis, WA Grand Island, NE	40.58	98.19		C		
GRI	Robert Gray AAF, TX	31.04	97.50			s	
GRK	Grand Rapids, MI	42.53	85.31		C		
GRR	-	35.20	77.58	E			
GSB	Seymour Johnson AFB, NC	36.05	79.57	E			
GSO	Greensboro, NC	34.54	82.13	E		s	
GSP	Greenville-Spart., SC	44.03	75.44	E			
GTB	Fort Drum, NY	47.29	111.22	_	С		W
GTF	Great Falls, MT		108.47			Ś	W
GUP	Gallup, NM	35.31 40.39	86.09		С		
GUS	Grissom AFB, IN		90.05			s	
GWO	Greenwood, MS	33.30	75.33	E			
HAT	Cape Hatteras, NC	35.16	99.03			s	
HBR	Hobart, OK	35.00	99.10			s	
HDO	Hondo, TX	29.21	92.51		С	_	
HIB	Hibbing, MN	47.23	81.23	E		s	
HKY	Hickory, NC	35.45	(√			_	

<u>ID</u>	NAME	<u>LAT</u>	LON	AF	OS RO	NITUC	<u>IG</u>
HLC	Hill City, KS	39.23	99.50		C	÷	:
HLN	_	46.36	112.00		С		W
HMN		32.51	106.06			s	
HMS	Hanford, WA	46.34	119.36				W
HOB	Hobbs, NM	32.41	103.12			s	
HON	Huron, SD	44.23	98.13		С		W
HOP	Ft. Cambell, KY	36.40	87.30	E	C.	S	
HOT	Hot Springs, AR	34.29	93.06			s	
HOU	Houston/Hobby Apt., TX	29.39	95.17			S	
HPN	White Plains, NY	41.04	73.43	E		•	
HQM	Hoquiam, WA	46.58	123.58				W
HRO	Harrison, AR	36.16	93.09		С	s	
HRT	Hurlburt Field, FL	30.31	86.18			S	•
HST	Homestead AFB, FL	25.29	80.23			S	
HSV	Huntsville, AL	34.39	86.46			S	
HTL	Houghton Lake, MI	44.22	84.41		C		
HTS	Huntington, WV	38.22	82.33	E			
HUF	Terre Haute, IN	39.27	87.18		C		
HUL	Houlton, ME	46.08	67.47	E			
HVN	New Haven, CT	41.16	72.53	E	•		
HVR	Havre, MT	48.33	109.46		C		W
IAD	WashDulles, VA	38.57	77.27	E			
IAG	Niagara Falls, NY	43.06	78.57	E			
IAH	Houston, TX	29.58	95.21			S	
ICT	Wichita, KS	37.39	97.25		C	S	
IDA	Idaho Falls, ID	43.31	112.04	•	,		W
IGM	Kingman, AZ	35.16	113.57				W
ILG	Wilmington, DE	39.40	75.36	E			
ILM	Wilmington, NC	34.16	77.55	E			
IND	Indianapolis, IN	39.44	86.17	E	С		
INL	Interntnl. Falls, MN	48.34	93.23		C		
INT	Winston-Salem, NC	36.08	80.14	E			
INW	Winslow, AZ,	35.01	110.44		C	s	W
IPL	Imperial, CA	32.50	115.34				W
IPT	Williamsport, PA	41.15	76.55	E			
IRK	Kirksville, MO	40.06	92.33		C		
ISN	Williston, ND	48.11	103.38		C		W
ISP	Islip, NY	40.47	73.06	E			
ITH	Ithaca, NY	42.29	76.28	E			
JAC	Jackson, WY	43.36	110.44		C		W
JAN	Jackson, MS	32.19	90.05		С	S	
JAX	Jacksonville, FL	30.30	81.42	E		S	
JBR	Jonesboro, AR	35.50	90.39		C	S	
JCT	Junction, TX	30.30	99.45			s	
JDN	Jordan, MT	47.20	106.50				W
JFK	New York-Kennedy, NY	40.39	73.47	E	С		
JHW	Jamestown, NY	42.09	79.15	E			
JKL	Jackson, KY	37.36	83.19	E	C		

ID	NAME	<u>LAT</u>	LON	<u>AFO</u>	S RO	UTIN	<u>G</u>
_							•
		27 10	94.30		С	s	
JLN	Joplin, MO	37.10	78.50	E	•	-	
JST	Johnstown, PA	40.19	86.56	Ð	С		
LAF	Lafayette, IN	40.25	82.03		_	s.	
LAL	Lakeland, FL	28.00	84.36		С	_	
LAN	Lansing, MI	42.47			C		
LAR	Laramie, WY	41.19	105.41		•		W
LAS	Las Vegas, NV	36.05	115.10		С		W
LAX	Los Angeles, CA	33.56	118.24	T.	C	S	**
LBB	Lubbock, TX	33.39	101.49	E	C	5	
LBF	North Platte, NE	41.08	100.41		<u> </u>	s	
LCH	Lake Charles, LA	30.07	93.13			5	
LEB	Lebanon, NH	43.38	72.19	E	С	S	
LEX	Lexington, KY	38.02	84.36	E	C	۵	
LFI	Langley AFB, VA	37.05	76.21	E			
LFK	Lufkin, TX	31.14	94.45	E		S	
LFT	Lafayette, LA	30.12	92.00		_	S	
LGA	Laguardia Airport, NY	40.46	73.54	E	C		
LGB	Long Beach, CA	33.49	118.09			_	W
LHX	La Junta, CO	38.03	103.31		С	S	
LIT	Little Rock, AR	34.44	92.14		C	S	
LIZ	Loring AFB, ME	46.57	67.53	\mathbf{E}			
LMT	Klamath Falls, OR	42.09	121.44				W
LND	Lander, WY	42.49	108.44		С		W
LNK	Lincoln, NE	40.51	96.45		С		
LOL	Lovelock, NV	40.04	118.33				W
LOZ	London, KY	37.05	84.05	E	C	S	
LRD	Laredo, TX	27.32	99.28			S	
LRF	Little Rock AFB, AR	34.55	92.09			S	
LSE	La Crosse, WI	43.52	91.15		C ·		
LSV	Nellis AFB, NV	36.15	115.02				W
LTS	Altus AFB, OK	34.39	. 99.16			S	
LVS	Las Vegas, NM	35.39	105.09		-	S	-
LWS	Lewiston, ID	46.23	117.01		٠.		·W
LWT	Lewistown, MT	47.03	109.27	•			W
LYH	Lynchburg, VA	37.20	79.12	E			
MAF	Midland, TX	31.57	02.11			S	
MCB	Mccomb, MS	31.11	90.28			S	
MCI	Kansas City, MO	39.19	94.43		С	s	
MCK	McCook, NE	40.13	100.35		C		
	Macon, GA	32.42	83.39	E			s
MCN		28.26	81.19			s	
MCO	Orlando Hern. Apt., FL Mason City, TA	43.09	93.20		С		
MCW	-	40.12	76.46	E	-		
MDT	Harrisburg Intl., PA		87.45	***	C		
MDW	Chicago-Midway, IL	41.47	88.45		_	s	
MEI	Meridian, MS	32.20	90.00	E	С	S	
MEM	Memphis, TN	35.03		نند		_	W
MER	Castle AFB, CA	37.22	120.34	E			**
MFD	Mansfield, OH	40.49	82.31	£			

ID	NAME	<u>LAT</u>	LON	<u>AFC</u>	S RO	UTIN	<u>G</u>
MFE	Mcallen, TX	26.11	98.14			s	
MFR	Medford, OR	42.22	122.52			U	W
MGM	· · ·	32.18	86.24	E	d	s	"
MGW	Montgomery, AL	32.16	79.55	E	C	U	
MHK	Morgantown, WV Manhattan, KS	39.09	96.40	15	С		
MHS		41.19	122.19		~		W
MIA	Mt. Shasta, CA Miami, FL	25.49	80.17		C	s	,,
MIV	Millville, NJ	39.22	75.04	В	_		
MI1		42.30	115.30	. 15			W
	Saylor Creek AFB, ID		94.36		C	s	71
MKC	Kansas City Dwntwn., MO	39.07	94.36 87.54	E	C	.	
MKE	Milwaukee, WI	42.57		E	C		
MKG	Muskegon, MI	43.10	86.14	15	C		
MKL	Jackson, TN	35.36	88.55			s s	
MLB	Melbourne, FL	28.06	80.38		_		
	Mcalester, OK	34.53	95.47		С	s	Y.T
MLD	Malad City, ID	42.10	112.19		~		W
MLI	Moline, IL	41.27	90.31	V.	C		T.T
MLS	Miles City, MT	46.25	105.54	•	С		W
MLU	Monroe, LA	32.31	92.03			S	
MOB	Mobile, AL	30.41	88.15			S	
MOT	Minot, ND	48.16	101.17	-	С		
MPV	Montpelier, VT	44.12	72.34	E	_		
MQT	Marquette, MI	46.32	87.33	E	С		
MRB	Martinsburg, WV	39.24	77.59	E			
MRF	Marfa, TX	30.22	104.01			s	
MRY	Monterey, CA	36.35	121.51				W
MSL	Muscle Shoals, AL	34.45	87.37			S	
MSN	Madison, WI	43.08	89.20		C		
MSO	Missoula, MT	46.55	114.05		C		W
MSP	Minneapolis, MN	44.53	93.13		C		
MSS		44.56	74.51	E			
MSY	New Orleans, LA	29.59	90.15	,	C	s	•
MTN	Glenn Martin Apt., MD	39.20	76.25	E			
MUO	Mountain Home AFB, ID	43.03	115.52				W
HWM	Moses Lake, WA	47.12	119.19			•	W
MXF	Maxwell AFB, AL	32.23	86.22		٠.	S	
MYL	McCall, ID	44.53	116.06				W
MYR	Myrtle Beach AFB, SC	33.41	78.56	E			
NBC	Beaufort MCAS, SC	32.29	80.43	E		S	
NBU	Glenview NAS, IL	42.05	87.49		C	•	
NCA	Jacksonville MCAS, NC	34.42	77.26	E		•	
NEL	Lakehurst NAS, NJ	40.02	74.19	E			
NFG	Camp Pendleton, CA	33.18	117.21				W
NFL	Fallon NAS, NV	39.25	118.42				W
NGP	Corpus Christi NAS, TX	27.42	97.17			S	
NHK	Patuxent River NAS, MD	38.17	76.24	E			
NHZ	Brunswick NAS, ME	43.53	69.56	E			
NID	China Lake NAS, CA	35.41	117.41				W

<u>ID</u>	NAME	<u>LAT</u>	LON	<u>AFO</u>	S RO	UTING	<u> </u>
	T-lumille MAC EI	30.14	81.41			s	
NIP	Jacksonville NAS, FL	28.22	97.40	,		S	
NIR	Chase Field NAS, TX	34.51	76.53	E			
NKT	Cherry Point MCAS, NC	32.52	117.09	-			W
NKX	Miramar NAS, CA	30.21	87.19			S	
NPA	Pensacola NAS, FL	_27.30	97.49			S	
NQI	Kingsville NAS, TX	30.24	81.25			S	
NRB	Mayport NAS, FL	30.43	87.01			s	
NSE	Whiting Field NAS, FL		119.27				W
NSI	San Nicholas Is., CA	33.15	119.07				W
NTD	Point Mugu NAS, CA	34.07	76.02	E			
NTU	Oceana NAS, VA	36.49	122.39	_			W
NUW	Whidbey Island NAS, WA	48.21	75.08	E			
NXX	Willow Grove NAS, PA	40.11	77.18	E			
NYG	Quantico MCAS, VA	38.30	81.53	4.4		s	
NZC	Cecil Field NAS, FL	30.13		E	•	_	
NZW	South Weymouth NAS, MA	42.09	70.56	17.3			W
OAK	Oakland, CA	37.44	122.12		С		••
OFK	Norfolk, NE	41.59	97.26		C	s	
OKC	Oklahoma City, OK	35.24	97.36		C	5	W
OLM	Olympia, WA	46.58	122.54				71
AMO	Omaha, NE	41.18	95.54		С		W
ONT	Ontario, CA	34.03	117.37	_	_		W
ORD	Chicago-O'Hare, IL	41.59	87.54	E	C		
ORF	Norfolk, VA	36.54	76.12	E			
ORH	Worcester, MA	42.16	71.52	E			
OTH	North Bend, OR	43.25	124.15		_		W
OTM	Ottumwa, IA	41.06	92.27		C		
OZR	Ft. Rucker, AL	31.16	85.43			s .	
PAE	Everett, WA	47.55	122.17				W
PAH	Paducah, KY	37.04	88.46		C	_	
PAM	Tyndall AFB, FL	30.04	85.35			S	
PBF	Pine Bluff, AR	34.10	91.56			S	
PBG	Plattsburgh AFB, NY	44.39	73.28	E			
PBI	West Palm Beach, FL	26.41	80.07			S	
PDT	Pendleton, OR	45.41	118.51				W
PDX	Portland, OR	45.36	122.36		C		W
PGA	Page, AZ	36.56	111.27			S	W
PHL	Philadelphia, PA	39.53	75.15	E	C		
PHX		33.26	112.01		C	S	M
PIA	Peoria, IL	40.40	89.41		С		
PIB	Laurel/Hattiesburg, MS	31.28	89.20			S	
PIH	Pocatello, ID	42.55	112.36		C		W
PIR	Pierre, SD	44.23	100.17		C		W
PIT	Pittsburgh, PA	40.30	80.13	E	Ç		
PKB	Parkersburg, WV	39.21	81.26	E			
PNC	Ponca City, OK	36.44	97.06			S	
PNC	Pensacola, FL	30.28	87.12			S	
	Ft. Polk AAF, LA	31.03	93.11			S	
POE	FL. FUIR AMF, IM		- 2				

<u>ID</u>	NAME	LAT	LON	<u>AFO</u>	S RO	<u>UTİN</u>	[43
POM	Pomona, CA	34.03	117.45				W
POU	Poughkeepsie, NY	41.38	73.53	E			
PRB	Paso Robles, CA	35.40	120.38				W
PRC	Prescott, AZ	34.39	112.26			S	W
PSB	Philipsburg, PA	40.53	78.05	E			
PSC	Pasco, WA	46.16	119.07			è	W
PSM	Pease AFB, NH	43.05	70.49	E			
PSP	Palm Springs, CA	33,50	116.30				W
PSX	Palacios, TX	28.43	96.15			S	
PUB	Pueblo, CO	38.17	104.31		C	S	
PUC	Price, UT	39.37	110.45			S	W
PVD	Providence, RI	41.44	71.26	E			
PWM	Portland, ME	43.39	70.19	E	C		
P07	Sanderson, TX	30.10	102.25			s	
P28	Medicine Lodge, KS	37.18	98.35	•	С	s	
P35	Spickard, MO	40.15	93.43		c		
P38	Caliente, NV	37.37	114.31		_		W
P60	Yellowstone, WY	44.33	110.25		С		W
P69	Elk City, ID	45.49	115.26		_		W
P88	Rome, OR	42.50	117.53				W
RAP	Rapid City, SD	44.03	103.04		С		W
RBL	Red Bluff, CA	40.09	122.15		•		W
RDD	Redding, CA	40.30	122.18				W
RDM	Redmond, OR	44.16	121.09				W
RDU	Raleigh-Durham, NC	35.52	78.47	E	С		•••
REE	Reese AFB, TX	33.36	102.03	124		S	
RFD	Rockford, IL	42.12	89.06	•	C		
RIC	Richmond, VA	37.30	77.20	E	C		
RIV	March AFB, CA		· · · · · · · · · · · · · · · · · · ·	E			W
RIW	· · · · · · · · · · · · · · · · · · ·	33.54	117.15		C		**
	Riverton, WY	43.03	108.27	-	C C		W
RKS	Rock Springs, WY	41.36	109.04	773	C		W
RME	Griffiss AFB, NY	43.14	75.24	E			
RMG	Rome, GA	34.21	85.10		_	S	7.7
RNO	Reno, NV	39.30	119.48		C		W
ROA	Roanoke, VA	37.19	79.58	E	С		•
ROC	Rochester, NY	43.07	77.40	E		_	
ROW	Roswell, NM	33.18	104.32		. ~	S	
RSL	Russell, KS	38.52	98.49		.C	S	
RST	Rochester, MN	43.55	92.30		C		
RWF	Redwood Falls, MN	44.33	95.05		C		
RWL	Rawlins, WY	41.48	107.12		C		
SAC	Sacramento, CA	. 38.31	121.30			٠	W
SAF	Santa Fe, NM	35.37	106.05			S	
SAN	San Diego, CA	32.44	117.10				W
SAT	San Antonio, TX	29.32	98.28		C	S	
SAV	Savannah, GA	32.08	81.12	E	_	S	
SAW	Gwinn, MI	46.21	87.24		C		
SBA	Santa Barbara, CA	34.26	119.50				W

				•			
ID	NAME	LAT	LON	AFO	S RO	UTING	3
<u> 117</u>	IVAITI			:			
~~~	37 3772 03	34.06	117.14	**			W
SBD	Norton AFB, CA	41.42	86.19	E	C		
SBN	South Bend, IN	*	120.38				W
SBP	San Luis Obispo, CA	35.14	75.30	E			
SBY	Salisbury, MD	38.20	121.15				W
SCK	Stockton, CA	37.54	85.44	E	C	s	
SDF	Louisville, KY	38.11	•		C		W
SEA	Seattle-Tacoma, WA	47.27	122.18		C	s	••
SEP	Stephenville, TX	32.13	98.11			5	W
SFO	San Francisco, CA	37.37	122.23		C	α.	¥¥
SGF	Springfield, MO	37.14	93.23		C	S	w. <del></del>
SHR	Sheridan, WY	44.46	106.58		С	_	W
SHV	Shreveport, LA	32.28	93.49	E		S	
SJC	San Jose, CA	37.22	121.55				W
SJT	San Angelo, TX	31.22	100.30	E		S	
SKA	Fairchild AFB, WA	47.38	117.39				W
SLC	Salt Lake City, UT	40.46	111.58		C	S	W
SLE	Salem, OR	44.55	123.00				W
	Salina, KS	38.48	97.39		С		
SLN	-	47.17	121.20				W
SMP	Stampede Pass, WA	34.54	120.27		,		W
SMX	Santa Maria, CA		117.53	•			W
SNA	Santa Ana, CA	33.40	121.36	•			W
SNS	Salinas, CA	36.40			C		
SNY	Sidney, NE	41.06	102.59		C		
SPI	Springfield, IL	39.50	89.40	E	C	s	
SPS	<del></del>	33.58	98.29	E.		S	
SRQ	Sarasota/Bradenton, FL	27.24	82.33			3	
SSC	Shaw AFB, SC	33.58	80.29	E		-	
SSI	Brunswick, GA	31.09	81.23	E	_	S	
SSM	Sault Ste. Marie, MI	46.28	84.22	E	C		
STC	St. Cloud, MN	45.33	94.04		C	_	
STJ	St. Joseph, MO	39.46	94.55		C	S	
STL	St. Louis, MO	38.45	90.23		C	S	
STS	Santa Rosa, CA	38.31	122.49			•	W
SUN	Hailey, ID	43.30	114.18				W
SUU	Travis AFB, CA	38.16	121.56				W
SUX	Sioux City, IA	42.24	96.23		С		
	Newburgh, NY	41.30	74.06	E			
SWF	Sexton Summit, OR	42.37	123.22				W
SXT		43.07	76.07	E			
SYR		38.43	93.33		C.		
SZL			104.20		С	S	
TAD		37.15	103.36		Ċ	s	
TCC	Tucumcari, NM	35.11			_	s	
TCL		33.14	87.37				W
TCM		47.09	122.29			S	**
TCS	Truth or Cons., NM	33.14	107.16	***		ې	
TEB	Teterboro, NJ	40.51	74.03	E			
TLH		30.23	84.22	-	_	S	
TOL	Toledo, OH	41.36	83.48	E	С		

ID	NAME	<u>LAT</u>	LON	<u>AFO</u>	S RO	UTIN	3
mon.	Manalas VC	39.04	95.38		С	s	
TOP	Topeka, KS	27.58	82.32		_	S	
TPA	Tampa, FL					U	W
TPH	Tonopah, NV	38 04	117.05 82.24	E		S	•
TRI	Bristol, TN	36.29		·10		,0	W
TRK	Truckee, CA	39.19	120.08				M.
TRM	Thermal, CA	33.38	116.10				W
TTD	Troutdale, OR	45.33	122.24			c	**
TTS	Titusville, FL	28.36	80.41		~	S	
TUL	Tulsa, OK	36.12	95.54		C .	ន	
TUP	Tupelo, MS	34.16	88.46				W
TUS	Tucson, AZ	32.07	110.56	·	~	S	W
TVC	Traverse City, MI	44.44	85.35		C		
TVL	South Lake Tahoe, CA	38.54	120.00				W
TWF	Twin Falls, ID	42.29	114.29			_	W
TXK	Texarkana, AR	33.27	94.00		С	S	
TYR	Tyler, TX	32.22	95.24			S	
TYS	Knoxville, TN	35.49	83.59	E		s	
UCA	Utica, NY	43.09	75.23	E			
UCC	Yucca Flat, NV	36.57	116.03				W
UIL	Quillayute, WA	47.57	124.33			•	W
UIN	Quincy, IL	39.56	91.12		C		
UKI	Ukiah, CA	39.08	123.12				M
UNV	State College, PA	40.51	77.51	E			
<b>U</b> 15	Challis, ID	44.31	114.13				W
<b>U28</b>	Green River, UT	39.00	110.09			S	W
VCT	Victoria, TX	28.51	96.55			S	
VCV	George AFB, CA	34.35	117.23			S	W
VLD	Valdosta, GA	30.47	83.17	E		S	
VNY	Van Nuys, CA	34.13	118.29				W
VPS	Eglin AFB, FL	30.29	86.31			S	
VRB	Vero Beach, FL	27.39	80.25			S	
VTN	Valentine, NE	42.52	100.33		C		
WAL	Wallops Island, VA	37.56	75.28	E			
WJF	Lancaster, CA	34.44	118.13			S	W
WMC	Winnemucca, NV	40.54	117.48				W
WRI	McGuire AFB, NJ	40.01	74.36	B			
YKM	Yakima, WA	46.34	120.32				W
YNG	Youngstown, OH	41.16	80.40	E			
YUM	Yuma, AZ	32.40	114.36	_		s	W
Y26	Mobridge, SD	45.32	100.26		C	-	•••
ZUN	Zuni, NM	35.06	108.48			s	W
ZZV	Zanesville, OH	39.57	81.54	E		~	
	St. Johnsbury, VT		72.01	E			
1V4	<b>=</b> ·	44.25	69.33	E			
3B1	Greenville, ME	45.28		ш	C		
301	Lamoni, IA	40.37	93.56		C		
3SE	Spencer, IA	43.10	95.09		C		W
40M	Omak, WA	48.26	119.32	te	C	c	W
513	Pikeville, KY	37.29	82.31	E	С	S	

# INTERPRETATION OF THE NGM-BASED MOS FORECAST MESSAGE (FWC - FOUS14)

	- Bulletin Header.			
FOUS14 RWBC 060357		Tration Douting	dodel Initial Date and 1	Time (UTC) .
DCA ESC NGM MOS GUIDANCE 3/06/91 0000 UTC	- Message Identific	Message Identification [oracion, nouthing, nou		
	- Valid Month and Day (UTC).	ay (UTC).		
HOUR 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 03 06 09 12	- Valid Hour (UTC).			
4	- Maximum or minimum temperature	m temperature for daytime.	e for daytime/nighttime period ("F).	
37 34 33 38 45 53	- Temperature at sp	at specified time (°F).		
T 27 28 28 30 32 36 40 38 41	- Dew point temperature at spec	ture at specified time (°F).	3.	
OV OV OV OV	- Opaque cloud cover forecast f	r forecast for specified :	or specified time (see below).	
26 18 08 12 14 14 15 18 24 27 28 29	- Wind direction ( x 10 =	x 10 = compass direction)	compass direction) for specified time.	
01 04 06 10 11	- Wind speed (kts)	for specified time.		
4 9 46 85 62 3 7	- Probability of pr	precipitation for 6-h perio	for 6-h period ending at specified time.	me.
49 91	- Probability of pr	precipitation for 12-h peri	for 12-h period ending at specified time.	ime.
n/ o/ 1/1 3/ 2	- Precipitation amount forecast		for 6- and 12-h periods (see below).	,
06 2/03/04/15/16	- Thunderstorm/cond	Thunderstorm/conditional severe T-storm probs. for 6-h periods ending at time.	obs. for 6-h periods end	ling at time.
	- Thunderstorm/cond	Thunderstorm/conditional severe T-storm probs. for 12-h periods ending at time.	obs. for 12-h periods en	iding at time.
PTYPE S S S S R R R R R R R S Z	- Conditional prec	precipitation type forecast for specified time (see below).	r specified time (see be	stow).
POZP 8 10 12 6 0 0 0 0 0 1 3 0 2 24 35	- Conditional prob	probability of freezing precip. or ice pellets, if precipitating.	or ice pellets, it pre	ecipitating.
POSN 65 67 70 48 41 14 11 13 15 16 20 9 16 50 42	- Conditional prob	probability of snow for specified time, if precipicating.	ied time, if precipicati	LIAS.
SNOW 0/ 0/ 0/1 0/ 0/0 0/ 0/0 0/ 0/0	- Snow amount for	for 6- and 12-h periods (see below).	eLow).	
CIG 45445676321 5 6	- Ceiling height for	forecast for specified time (see below).	(see below).	
VIS 3 4 3 5 5 5 5 4 2 2 1 3 4	- Visibility forec	forecast for specified time (see below).	e below).	
SI	- Obstruction to V	vision forecast for specifi	st for specified time (see below).	
CLDS QPF format "A/B" SNOW fo	format "A/B" Value for 6-h period	# < 200 ft.	$\frac{\text{VIS}}{1 = < 1/2 \text{ miles}}$	OBVIS H = Haze
- Scattered $0 = no precipation = 0.01 = 0$	= no snow = trace - < 2 inches		$3 = 1 - 2 \frac{3}{4} \text{ miles}$	tt.
0.10 - 0.24 inches	2 inches	= 1000 - 3000 ft.	4 # 3 - 5 miles	or tog
$3 = 0.20 = 0.99$ inches $0 = \sqrt{a}$	0 = no snow	= 6600 - 12000 ft.	•	
= ≥ 1.00 inches	# trace -	7 = > 12000 ft.	•	
Liquid B - Value fo	= 2 - < 4 inches			
Ice pellets 1 = 0.01 - 0.09 inches 6	6 inch			
S = Snow $2 = 0.10 = 0.24$ inches $3 = 0.25 = 0.49$ inches				
.50 - 0.99				
5 = 1.00 - 1.99 inches 6 = 2.00 inches				

