BY ORDER OF THE SECRETARY OF THE AIR FORCE

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Weather

★ *METEOROLOGICAL CODES*

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This manual implements Air Force Policy Directive (AFPD) 15-1, *Atmospheric and Space Environmental Support*; the United States Air Force (USAF) coding practices for the *World Meteorological Organization (WMO) Aerodrome Forecast Code, FM 51,* and other codes that are not covered in the *WMO Manual on Codes No. 306.* It provides encoding instructions for weather codes mandated for use by Air Force Weather (AFW) units. It applies to all US Air Force organizations, all Department of Defense Air Force civilians, and those personnel providing weather support under contract to the Air Force or its subordinate commands who encode and disseminate terrestrial and space weather information for US Air Force and US Army operations. Consult cited policy directives, instructions, manuals, and applicable supplements for specific policies, procedures, and requirements, as these directives are periodically updated to reflect current support requirements. Check the appropriate Air Force Index to determine currency of cited publications. Send comments, suggested changes, or improvements through channels to HQ AFWA/XOPS, 106 Peacekeeper Dr, Ste 2N3, Offutt AFB NE 68113-4039. Major Commands (MAJCOMs), Field Operating Agencies (FOAs), and Direct Reporting Units (DRUs) send one copy of supplements to HQ AFWA/XOPS and one copy to HQ USAF/XOWP, 1490 Air Force Pentagon, Washington DC 20330-1490 for coordination. Other commands send one copy of supplements to the next higher headquarters for coordination. Maintain and dispose of all records created as a result of prescribed processes in accordance with Air Force Manual (AFMAN) 37, 139, *Records Disposition Schedule.*

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

The codes in this manual are those mandated for use by AFW units. This manual incorporates the space observation codes contained in the AFMAN 15-162, *Space Weather Observations*, which will be rescinded when this manual is published. It also includes the Forward Area Lim ited Observing Program (FALOP) Code. The following codes were removed from this manual: National Weather Service (NWS) Forecast Codes; US Navy and Marine Corps TAF Code; Synoptic Code, Marine Reporting Station Code, Canadian Autostation Observation Codes; and NATO Codes. AFW units can access these codes and other reference codes at the Air Force Weather Agency (AFWA) Field Support Division (AFWA/XOP) webpage located on the AFWA home page.

Chapter 1

AIR FORCE WEATHER (AFW) AERODROME FORECAST (TAF) CODE

1.1. General. This chapter gives instructions for encoding AFW Aerodrome Forecasts (TAFs). AFW units specify, amend, and disseminate TAFs in accordance with AFMAN 15-129, *Aerospace Weather Operations – Processes and Procedures*.

1.1.1. Unless otherwise specified, forecast elements in the main body of the forecast text (clouds, weather, wind, etc.) apply to the area within a 5 statute mile (8,000 meters) radius of the center of the aerodrome. See paragraph 1.3.4.4.2.1. for weather in the "vicinity" (between 5 statute miles/8000 meters and 10 statute miles/16 kilometers) of the aerodrome center.

1.1.2. Forecast elements represent the most probable conditions expected during the forecast period and in the forecast area. Times of occurrence or changes (as indicated by GGG_eG_e or GGgg) represent specific times when conditions are expected to occur.

1.2. Code Format. The Operational Weather Squadrons (OWSs) and other applicable AFW units issue TAFs based on the USAF coding practices of the WMO Aerodrome Forecast Code, FM 51, which is based on the Aviation Routine Weather Report (METAR) code (see AFMAN 15-111, *Surface Weather Observations*). Definitions and coding conventions for construction of w'w' groups (Table 1.2) are found in AFMAN 15-111.

1.3. TAF Encoding.

1.3.1. TAF Code Format. Use the following format for encoding TAFs:

MESSAGE HEADING

CCCC TAF (AMD, COR, RTD, or AMD COR) $YYG_1G_1G_2G_2$ $dddffGf_mf_mKT$

VVVV w'w' $N_sN_sN_sh_sh_sh_sCC$ or $VVh_sh_sh_s$ or SKC ($WSh_xh_xh_x$/dddfffKT or

WSCONDS) ($6I_ch_ih_ih_it_L$) ($5Bh_Bh_Bh_Bt_L$) $QNHP_1P_1P_1P_1INS$ (Remarks)

TTTTT GGG_eG_e or TTGGgg $dddffGf_mf_mKT$…same as above…(Remarks)

$T(M)T_FT_F/G_FG_FZ$ $T(M)T_FT_F/G_FG_FZ$ AMD, COR, or AMD COR GGgg

(Limited-Duty Location Remarks).

1.3.1.1. Groups in parentheses are used only as condition exists or as required.

1.3.1.2. The forecast maximum/minimum temperature groups $T(M)T_FT_F/G_FG_FZ$ will be entered on the last line of the TAF before the forecast modifier and time (e.g., COR 1615, AMD 1232, AMD COR 1815).

1.3.1.3. The icing and/or turbulence group is entered only when required by paragraphs 1.3.4.7 and 1.3.4.8.

1.3.1.4. NTFS/AMIS software does not currently support placement of the Non-Convective Low-Level Wind Shear ($WSh_xh_xh_x$/dddfffKT or WSCONDS) group in the body of the forecast. Until the NTFS/AMIS software is upgraded, units will place the $WSh_xh_xh_x$/dddfffKT or WSCONDS in the remarks section.

1.3.2. Example TAF. The following is an AFW TAF example for Scott AFB, IL with explanations and definitions of the code format:

KBLV TAF 011616 03008KT 0800 PRFG FEW000 BKN005 BKN012 QNH3001INS FG FEW000

TEMPO 1821 14012G18KT 3200 -SN BLSN FEW000 OVC006 620065 SN FEW000

FM2146 15012G20KT 9999 NSW SCT030 QNH2992INS

BECMG 2324 15012G20KT 3200 -SN BLSN FEW000 OVC004 620046 QNH2983INS SN FEW000

TEMPO 0103 13015G25KT 0200 -FZDZ FG VV001 660001 650109 T00/08Z TM02/18Z;

1.3.2.1. The forecast is for Scott AFB, IL (KBLV), valid from 011600Z to 021600Z. The initial conditions (1600Z to 2146Z) are for winds from 030 degrees at 8 knots, visibility 800 meters in partial fog; sky cover is few (either a surface-based partial obscuration or a layer at or lower than 50 feet), sky is broken (ceiling) at 500 feet and 1,200 feet. The lowest altimeter setting between 011600Z and 012146Z will be 30.01 inches of mercury. There is a fog-induced surface-based partial obscuration from 1/8 to 2/8 coverage.

1.3.2.2. Between 011800Z and 012100Z, conditions will vary temporarily (frequently but for short periods) to winds from 140 degrees at 12 knots gusting to 18 knots, visibility 3,200 meters in light snow and blowing snow; sky cover is few (either a surface-based partial obscuration or a layer at or lower than 50 feet), overcast at 600 feet (the ceiling), and light rime icing from 600 to 5,600 feet above ground level (AGL). There is a snow-induced surface-based partial obscuration from 1/8 to 2/8 coverage.

1.3.2.3. Beginning at 012146Z, conditions will change to wind from 150 degrees at 12 knots gusting to 20 knots; visibility greater than 9,000 meters, no significant weather, sky cover scattered at 3,000 feet and the minimum altimeter setting from 012146Z until 012400Z will be 29.92 inches of mercury.

1.3.2.4. Between 012300Z and 012400Z, conditions will become wind from 150 degrees at 12 knots gusting to 20 knots; visibility 3,200 meters in light snow and blowing snow, sky cover is few (either a surface-based partial obscuration or a layer at or lower than 50 feet), sky is overcast at 400 feet. There will be light rime icing from 400 to 6,400 feet AGL and the lowest altimeter setting from 020000Z until 021600Z will be 29.83 inches of mercury. There is a snow-induced surface based partial obscuration from 1/8 to 2/8 in coverage.

1.3.2.5. Between 020100Z and 020300Z, conditions will vary temporarily to winds from 130 degrees at 15 knots gusting to 25 knots, visibility 200 meters with light freezing drizzle and fog, sky totally obscured with vertical visibility 100 feet. There is also moderate icing (clear) in precipitation from surface to 1,000 feet AGL and moderate icing in cloud (rime) from 1,000 feet AGL up to 10,000 feet AGL. The forecast maximum temperature is 0°C at 0800Z and the forecast minimum temperature is forecast minus 2°C at 1800Z.

1.3.3. Example Corrected (COR) TAF. The following is an example of a corrected (COR) forecast for Ramstein AB, Germany:

ETAR TAF COR 011515 28012G25KT 8000 -RASN SCT006 BKN015 OVC020 620208 540009 QNH2960INS

BECMG 1819 27012KT 9999 NSW SCT015 BKN020 620208 540009 QNH2965INS T04/11Z T00/16Z COR 1615;

1.3.3.1. The forecast is for Ramstein AB, Germany (ETAR), valid from 011500Z to 021500Z. The initial conditions (011500Z to 011900Z) are for winds from 280 degrees at 12 knots gusting to 25 knots, visibility 8,000 meters in light rain and snow, sky cover is scattered at 600 feet, broken at 1,500 feet, and overcast at 2,000 feet. There will be light rime icing in cloud between 2,000 and 10,000 feet AGL and light to moderate in cloud turbulence from surface to 9,000 feet AGL. Lowest altimeter setting from 011500Z to 011900Z will be 29.60 inches of mercury.

1.3.3.2. Between 011800Z and 011900Z, the initial condition will change gradually to winds from 270 degrees at 12 knots, visibility more than 9,000 meters; no significant weather, sky cover scattered at 1,500 feet and broken at 2,000 feet. Icing and turbulence will remain as forecast by the initial condition, and the lowest altimeter setting from 011900Z to 021500Z will be 29.65 inches of mercury. The forecast maximum temperature is 4°C at 1100Z and the forecast minimum temperature is forecast 0°C at 1600Z. This is a corrected forecast, with the correction issued at 1615Z.

1.3.4. Specification of Symbolic Letters.

1.3.4.1. Message Heading (CCCC TAF [AMD, COR, RTD, or AMD COR] $YYG_1G_1G_2G_2$). The message heading consists of:

1.3.4.1.1. Location identifier (CCCC).

1.3.4.1.2. Message identifier of TAF.

1.3.4.1.3. Modifiers as required.

1.3.4.1.3.1. AMD - Modifier for an amended TAF.

1.3.4.1.3.2. COR - Modifier for a corrected TAF.

1.3.4.1.3.3. RTD - Modifier for a TAF filed past its schedule time.

1.3.4.1.3.4. AMD COR – Modifier for a correction to a TAF amendment.

1.3.4.1.4. Valid Period ($YYG_1G_1G_2G_2$). The valid period consists of the current day of the month and the 24-hour period of the forecast (two-digit beginning time and two-digit ending time in whole hours), except for amended TAFs. All times are in Coordinated Universal Time (UTC). For TAF groups starting and stopping at midnight UTC, use 00 and 24 respectively to indicate the appropriate valid times. Amended TAFs are valid from the current hour to the ending hour of the original TAF. For example, if the current time is 1640Z, the amended time would be 16Z; if the current time is 2110Z, the amended time would be 21Z. If the 031818Z TAF is amended at 2131Z, the valid period would be 032118Z. The exact time of the amendment will be indicated in the TAF remarks **(See paragraph 1.3.5.5)**.

1.3.4.2. Wind Group ($dddffGf_mf_mKT$). Surface wind direction, speed and gusts, if any.

1.3.4.2.1. Wind direction (ddd). Forecast true wind direction (from which wind is blowing) to the nearest 10 degrees. If direction will vary more than 60 degrees, encode the "prevailing" direction for "ddd" and append the limits of variability to remarks (e.g., "WND 270V350"). Although a direction should be forecast whenever determined, there may be situations in which a "prevailing" direction cannot be forecast; in these rare cases, "VRB" may be encoded for "ddd."

1.3.4.2.1.1. When wind will be calm, encode dddff as "00000."

1.3.4.2.1.2. When wind speed will be 6 knots or less and a direction cannot be determined, encode dddff as "VRBff."

1.3.4.2.1.3. When wind speed will be more than 6 knots, do not use "VRB" for "ddd" unless the situation involves air-mass thunderstorm activity during which a "prevailing" wind direction cannot be forecast with confidence. When it is possible to forecast the peak gust direction, but not the "prevailing" direction, encode the wind group as $VRBffGf_mf_mKT$ and append the probable peak gust direction to remarks (e.g., "GST DRCTN 250").

1.3.4.2.2. Wind Speed (ff). Mean forecast wind speed in whole knots. When speed is equal to or greater than 100 knots, use three digits.

1.3.4.2.3. Gusts (Gf_mf_m). Forecast speed or gusts, in whole knots. Encode gusts when they will exceed a mean speed (ff) of 10 knots or more, by 5 knots or more. Encode gusts of 100 knots or more in three digits.

1.3.4.2.4. KT. Unit indicator for wind speed in knots.

1.3.4.3. Visibility Group (VVVV). Forecast "prevailing" visibility in meters, rounded down to the nearest reportable value from Table 1.1. Include weather and/or an obscura tion (w'w') whenever visibility is forecast as 9 kilometers (9,000 meters) or less. If visibility will alternate frequently from one significant value to another, describe the situation with a TEMPO group; do not use variable visibility remarks.

Table 1.1. Visibility (VVVV).

Statute Miles	Meters	Nautical Miles	Statute Miles	Meters	Nautical Miles
0	0000	0.00	1 3/8	2,200	1.2
1/16	0100	0.05	1 1/2	2,400	1.3
1/8	0200	0.10	1 5/8	2,600	1.4
3/16	0300	0.15	1 3/4	2,800	1.5
1/4	0400	0.20	1 7/8	3,000	1.6
5/16	0500	0.25	2	3,200	1.7
3/8/	0600	0.30	-	3,400	1.8
-	0700	0.40	2 1/4	3,600	1.9
1/2	0800	0.45	-	3,700	2.0
-	0900	0.50	2 1/2	4,000	2.2
5/8	1,000	0.55	2 3/4	4,400	-
-	1,100	0.60	-	4,500	2.4
3/4	1,200	-	-	4,700	2.5
-	1,300	0.70	3	4,800	2.6
7/8	1,400	-	-	5,000	2.7
-	1,500	0.80	4	6,000	3.0
1	1,600	-	-	7,000	4.0
-	1,700	0.90	5	8,000	4.3
1 1/8	1,800	1.00	6	9,000	5.0
1 1/4	2,000	1.10	7 and above	9,999	6.0 and above

1.3.4.4. Forecast Weather and Obscuration Group (w'w'). Forecast weather and obscuration definitions for construction of w'w' groups (Table 1.2) are found in AFMAN 15-111.

Table 1.2. Weather (w'w') Group Code.

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY	**DESCRIPTOR**	**PRECIPITA-TION**	**OBSCURA-TION**	**OTHER**
1	**2**	**3**	**4**	**5**
- Light Moderate + Heavy (well-developed in the case of dust/sand whirls, dust devils and tornadoes or waterspouts) **VC** In the Vicinity	**MI** Shallow **PR** Partial (covering part of the aerodrome) **BC** Patches **DR** Low Drifting **BL** Blowing **SH** Shower(s) **TS** Thunderstorm **FZ** Freezing (Super-cooled)	**DZ** Drizzle **RA** Rain **SN** Snow **SG** Snow Grains **IC** Ice Crystals (Diamond Dust) **PL** Ice Pellets **GR** Hail **GS** Small Hail and/or Snow Pellets	**BR** Mist **FG** Fog **FU** Smoke **VA** Volcanic Ash **DU** Widespread Dust **SA** Sand **HZ** Haze **PY** Spray	**PO** Well-developed Dust/Sand Whirls **SQ** Squalls **FC** Funnel cloud(s) (Tornado or Waterspout) **SS** Sandstorm **DS** Duststorm

1.3.4.4.1. The predominant forecast weather (w'w') groups will be constructed by considering Table 1.2, columns one to five in sequence. That is intensity/proximity, followed by description, followed by precipitation type (two precipitation types can be used in the same w′w′ group), obscuration, or other weather phenomena (e.g., +SHRA is heavy showers of rain, +TSRAGR is thunderstorms, heavy rain, and hail; –RASN is light rain and snow; TS is thunderstorm without precipitation).

1.3.4.4.1.1. Only one w'w' group is normally included in any one forecast period unless one group will not adequately describe the forecast situation. Limit w'w' to three groups. When more than three w'w' groups apply to a situation, select and encode the three w'w' that are most significant to aircraft operations.

1.3.4.4.1.2. FC (Funnel Cloud) takes precedence over all other w′w′ groups and will always be forecast as "at the station" and **not** in the vicinity.

1.3.4.4.2. The proximity qualifier VC (in the vicinity) is used to forecast weather phenomena occurring between 5 statute miles/8000 meters to 10 statute miles/16 kilometers from the center of the aerodrome.

1.3.4.4.2.1. VC may be encoded in combination with thunderstorms (TS), showers (SH), fog (FG), blowing snow (BLSN), blowing dust (BLDU), blowing sand (BLSA), well-developed dust/sand whirls (PO), sandstorm (SS), and duststorm (DS). VC will be placed before (no space) the precipitation, obscuration, or other weather phenomena entry (i.e., VCSH, VCPO). Intensity qualifiers will not be encoded with VC. Forecast weather in the vicinity will be the last entry in the weather (w'w') group.

1.3.4.4.3. When a predominant forecast condition with an encoded w'w' group is followed by a change group (BECMG or FM) without a w'w' group, encode the change group w'w' as "NSW" (no significant weather) to indicate that significant weather is no longer expected. This includes weather forecast in the vicinity (e.g., VCSH was included in a previous group, is expected to end).

1.3.4.4.4. Forecast Volcanic Ash (VA) regardless of restrictions to visibility.

1.3.4.4.5. Squall. When a squall (SQ) is forecast as weather phenomena (Table 1.2), ensure the forecast wind speed and gust meet squall definition criteria **(See Attachment 1)**.

1.3.4.5. Cloud and Obscuration Group ($N_sN_sN_sh_sh_sh_sCC$). Report as often as necessary to indicate all forecast cloud layers. Arrange groups in ascending order of cloud bases (i.e., lowest base first). Encode "SKC" to forecast clear skies.

1.3.4.5.1. Cloud Amount ($N_sN_sN_s$). The cloud amount will be given as sky clear (no clouds); few (trace to 2/8ths); scattered (3/8ths to 4/8ths); broken (5/8ths to 7/8ths); or overcast (8/8ths). The three-letter abbreviations "SKC," "FEW," "SCT," "BKN," and "OVC" are followed, without a space, by the height of the base of the cloud layer (mass) $h_sh_sh_s$. The summation principle applies. This principle states that the sky cover at any level is equal to the summation of the sky cover of the lowest layer, plus the additional sky cover at all successively higher layers, up to and including, the layer being considered. No layer can be assigned a sky cover less than a lower layer.

1.3.4.5.1.1. When the sky will be totally obscured, encode $VVh_sh_sh_s$, where "VV" is the indicator and $h_sh_sh_s$ is the vertical visibility in hundreds of feet.

1.3.4.5.2. Ceiling Height. A ceiling is defined as the height above the earth's surface of the lowest layer reported as broken or overcast; or the vertical visibility into an indefinite ceiling. All layers and obscuring phenomena are considered to be opaque. Therefore, a ceiling remark in the TAF is not needed.

1.3.4.5.3. Indefinite Ceiling ($VVh_sh_sh_s$). The vertical "visibility" measured in feet, into a surface-based total obscuration, which hides the entire celestial dome (8/8ths).

1.3.4.5.4. Surface-Based Partial Obscuration. When forecasting a surface-based partial obscuration, encode as "FEW000", "SCT000", or "BKN000" as appropriate to indicate a surface-based partial obscuration. Code as a remark the obscuring phe nomena and the applicable layer. For example, "FG SCT000" would indicate the w'w' weather element causing the obscuration is caused by fog and layer amount is "SCT". Include the amount of partial obscuration in your sky cover summation computation. Surface-based partial obscurations cannot be considered a ceiling, but may be included in the summation principle when combined with cloud layers to form a ceiling.

1.3.4.5.5. Variable Sky Condition. If two or more significant sky conditions will alternate frequently from one to the other, describe the situation with a TEMPO group; do not use variable sky condition remarks.

1.3.4.5.6. Height of Cloud Base ($h_sh_sh_s$). Forecast the height of the base of each sky cover layer in hundreds of feet AGL using the reportable layers defined in Table 1.3.

Table 1.3. Reportable Cloud Layers.

Range of Height Values (feet)	Reportable Increments (feet)
$\leq$ 50 feet	Round down to 000 feet
> 50 feet but $\leq$ 5,000 feet	To the nearest 100 feet
> 5,000 feet but $\leq$ 10,000 feet	To the nearest 500 feet
> 10,000 feet	To the nearest 1,000 feet

1.3.4.5.7. Cloud Type (CC). The only cloud type included in the aerodrome forecast is cumulonimbus (CB); when appropriate, the contraction CB follows cloud or obscuration height (h_sh_sh) without a space.

1.3.4.5.7.1. The cloud or obscuration group will include a forecast cloud type of cumulonimbus (CB) whenever a thunderstorm is included in the significant weather group. This includes forecasts for thunderstorms in the vicinity (i.e., VCTS). The following example shows the use of the CB contraction:

CCCC TAF 101616Z 24025G35KT 0800 TSRA BKN035CB OVC080 QNH2978INS
BECMG 1718 27010G15KT 9999 VCTS FEW040CB SCT080 QNH2989INS
BECMG 1920 31012KT 9999 NSW SCT080 QNH2995INS T14/22Z T09/13Z

1.3.4.6. Non-Convective Low-Level Wind Shear Group (WS$h_xh_xh_x$/dddfffKT or WSCONDS). Use this group only to forecast wind shear not associated with convective activity from the surface up to and including 2,000 feet AGL. Wind shear is a potentially hazardous problem for aircraft preparing for approach to, or take-off, from aerodromes. Include forecasts of non-convective wind shear on an as-needed basis to focus the attention of the pilot on existing or expected wind shear problems. To indicate wind shear when complete information cannot reliably forecast with high confidence, use "WSCONDS". Omit this group when no low-level wind shear is forecast.

1.3.4.6.1. Non-convective low-level wind shear forecasts will be encoded in the following format:

1.3.4.6.1.1. WS. Low-level wind shear group indicator.

1.3.4.6.1.2. $h_xh_xh_x$. Forecast height of the wind shear in hundreds of feet AGL.

1.3.4.6.1.3. ddd. Forecast wind direction, in tens of degrees true, above the indicated height. VRB will not be used in the non-convective low-level wind shear forecast group.

1.3.4.6.1.4. ff. Forecast wind speed, in knots, of the forecast wind above the indicated height.

1.3.4.6.1.5. KT. Unit indicator for wind speed in knots.

1.3.4.6.1.6. WSCONDS. Optional, less specific, low-level wind shear indicator.

1.3.4.6.2. Non-convective low-level wind shear forecasts will be included in the TAF, when expected, as the last group (i.e., after the cloud forecast) in the initial forecast period or in a FM or BECMG group. Once included in the forecast, the wind shear group remains the prevailing condition until the next FM or BECMG group or until the end of the forecast valid period if there are no subsequent FM or BECMG groups. Forecasts for non-convective low-level wind shear will not be included in TEMPO groups.

1.3.4.6.3. The following is an example of a TAF containing a non-convective low-level wind shear forecast.

CCCC TAF 011616 03008KT 0800 PRFG FEW000 BKN005 BKN012 WS015/12035KT QNH3001INS FG FEW000

TEMPO 1820 14012G18KT 3200 -SN BLSN FEW000 OVC006 620065 SN FEW000

FM2146 15012G20KT 9999 NSW SCT030 QNH2992INS

BECMG 2324 15012G20KT 3200 -SN BLSN FEW000 OVC004 620046 QNH2983INS SN FEW000 TM01/19Z TM04/11Z

1.3.4.6.3.1. In this TAF, non-convective low-level wind shear is forecasted at 1,500 feet from 120 degrees at 35 knots from 1600Z until the beginning of the next FM group at 2146Z.

1.3.4.7. Icing Group ($6I_ch_ih_ih_it_L$). Forecast icing group, used to forecast icing not associated with thunderstorms (thunderstorm forecasts imply moderate or greater icing). Repeat as necessary to indicate multiple icing layers. Omit when no icing is forecast. Format icing groups as:

1.3.4.7.1. 6. Icing group indicator.

1.3.4.7.2. I_c. Type of icing from Table 1.5. When more than one type is expected within the same layer, encode the highest code figure.

1.3.4.7.3. $h_ih_ih_i$. Height of base of icing layer in hundreds of feet AGL (Table 1.4).

1.3.4.7.4. 1.3.4.7.4. t_L. Thickness of the icing layer in thousands of feet from Table 1.6. When a layer is forecast to be thicker than 9,000 feet, repeat the icing group so that the base of the layer expressed by the second group coincides with the top layer given by the first group **(See Note)**.

1.3.4.8. Turbulence group (5B$h_Bh_Bh_Bt_L$). Forecast turbulence group, used only to forecast turbulence not associated with a thunderstorm (thunderstorms already imply severe or extreme turbulence). Turbulence forecasts apply to category II (CAT II) aircraft. Omit when no turbulence is forecast. Format turbulence groups as:

1.3.4.8.1. 5. Turbulence group indicator.

1.3.4.8.2. B. Turbulence type and intensity from Table 1.7.

1.3.4.8.3. $h_Bh_Bh_B$. Forecast height of the turbulence layer in hundreds of feet AGL (Table 1.4).

1.3.4.8.4. t_L. Thickness of the turbulence layer in thousands of feet from Table 1.6. When a layer is forecast to be thicker than 9,000 feet, repeat the turbulence group so that the base of the layer expressed by the second group coincides with the top layer given by the first group **(See Note)**.

Note: Icing and turbulence forecasts are for phenomena not associated with thunderstorm activity, from surface to 10,000 feet AGL. Forecasters may address the areas above 10,000 feet MSL provided the forecast in the TAF is consistent with turbulence products of the theater Operational Weather Squadron (OWS) and/or AFWA (DSN 271-7251). Priorities permitting, coordinate any deviations from the OWS/AFWA forecast of moderate or greater intensity.

Table 1.4. Height of Lowest Level of Turbulence ($h_Bh_Bh_B$)/Icing ($h_ih_ih_i$).

Code Figure	Meters	Feet
000	<30	<100
001	30	100
002	60	200
003	90	300
004	120	400
005	150	500
006	180	600
007	210	700
008	240	800
009	270	900

Code Figure	Meters	Feet
010	300	1,000
011	330	1,100
Etc.	Etc.	Etc.
099	2,970	9,900
100	3,000	10,000
110	3,300	11,000
120	3,600	12,000
Etc.	Etc.	Etc.
990	29,700	99,000
999	30,000 or more	100,000 or more

Table 1.5. AFW Icing Type (I_c).

Code Figure	Type of Icing
0	Trace icing
1	Light icing (mixed)
2	Light icing in cloud (rime)
3	Light icing in precipitation (clear)
4	Moderate icing (mixed)
5	Moderate icing in cloud (rime)
6	Moderate icing in precipitation (clear)
7	Severe icing (mixed)
8	Severe icing in cloud (rime)
9	Severe icing in precipitation (clear)

Table 1.6. Thickness of Turbulence/Icing Layers (t_L).

Code Figure	Thickness
1	1,000 feet
2	2,000 feet
3	3,000 feet
4	4,000 feet
5	5,000 feet
6	6,000 feet
7	7,000 feet
8	8,000 feet
9	9,000 feet

Table 1.7. Turbulence Type/Intensity (B).

Code Figure	Turbulence Type and Intensity
0	None
1	Light Turbulence
2	Moderate Turbulence in clear air, occasional.
3	Moderate Turbulence in clear air, frequent.
4	Moderate Turbulence in cloud, occasional.

Code Figure	Turbulence Type and Intensity
5	Moderate Turbulence in cloud, frequent.
6	Severe Turbulence in clear air, occasional.
7	Severe Turbulence in clear air, frequent.
8	Severe Turbulence in cloud, occasional.
9	Severe Turbulence in cloud, frequent.
X	Extreme Turbulence
NOTE: Occasional is defined to occur less than 1/3 of the time.	

1.3.4.9. Lowest Altimeter group (QNH$P_1P_1P_1P_1$INS). Lowest altimeter setting expected (in inches of mercury) during the initial forecast period and in each Becoming (BECMG) and From (FM) change group. Do not include "QNH" in Temporary (TEMPO) groups. Format the altimeter group as:

1.3.4.9.1. QNH. Altimeter setting in inches of mercury indicator.

1.3.4.9.2. $P_2P_2P_2P_2$. Forecast lowest altimeter setting.

1.3.4.9.3. INS. Units indicator for inches of mercury.

1.3.5. TAF Remarks. For weather and obscurations use the alphabetic abbreviations in Table 1.2. Use FAAO 7340.1, *Federal Aviation Administration Order, Contractions*, for all others. Relate operationally significant forecast elements to geographical features whenever possible (e.g., "FG OVR RIVER E"). Start/end times for conditions described in remarks are permitted (e.g., "SHRA OMTNS E 14-19"). Do not add a "Z" to these times. The Forecast Maximum and Minimum Temperature groups (T [M] T_FT_F/G_FG_FZ) are the only remark allowed adding a "Z" in the remarks section. Ensure start/end times are not confused with other numerical values. Do not use the terms "OCNL", "VC", or "CB" in remarks. The remarks section will not be used as a substitute for a BECMG or TEMPO group. Encode remarks in the following order of entry:

1.3.5.1. Non-Convective Low-Level Wind Shear. If the unit's version of the NTFS/AMIS software does not support placement of the Non-Convective Low-Level Wind Shear (WS$h_xh_xh_x$/dddfffKT or WSCONDS) group in the body of the forecast, encode the wind shear forecast as the first remark.

1.3.5.2. Surface Based Partial Obscuration. (See paragraph 1.4.4.5.4.)

1.3.5.3. Forecast Maximum and Minimum Temperature groups (T [M] T_FT_F/G_FG_FZ). This group provides a mechanism to forecast a two-digit temperature (T_FT_F: whole degrees Celsius) in the TAF code for specific times. Units encode the forecast maximum (first entry) and minimum temperature (last entry) for the valid period of the TAF. In addition, units may add additional temperature groups based on operational significance. Format temperature groups as:

1.3.5.3.1. T. Temperature remark indicator.

1.3.5.3.2. T_FT_F. The forecast temperature in whole degrees Celsius (C). Precede temperatures between +9°C and -9°C with a "0"; precede temperatures below 0°C by the letter "M" (for minus).

1.3.5.3.3. G_FG_F. The valid time to the nearest whole hour UTC of the temperature forecast.

1.3.5.3.4. Z. Abbreviation for Coordinated Universal Time (UTC).

1.3.5.3.5. Example maximum/minimum temperature groups:

T17/21Z T08/12Z - forecast maximum temperature is 17°C at 2100Z and forecast minimum temperature is 8°C at 1200Z.

T00/18Z TM09/07Z - forecast maximum temperature is 0°C at 1800Z and forecast minimum temperature is minus 9°C at 0700Z.

1.3.5.4. DENEB. Units with a fog dispersal capability, include in remarks, "DENEB" and a statement of expected dispersal results (i.e., post dispersal ceiling and visibility) whenever the forecast text includes visibility restrictions due to fog (e.g., "DENEB SCT010 4,800 BR"). The main text of the TAF will reflect expected conditions without regard to dispersal activities.

1.3.5.5. AMD, COR, or AMD COR GGgg. Append this group to identify an amended TAF (AMD), a corrected TAF (COR), or a corrected TAF amendment (AMD COR). The GGgg is the time (UTC) the amendment or correction was issued (encode without a "Z"). Issue amendments for the entire remaining period of the TAF. When issuing a correction, repeat the entire text (as corrected) of the original TAF.

1.3.5.5.1. The AMD, COR, or AMD COR indicators can be used individually or together. For example, the last entry of a 011212 TAF amended at 011410 would be AMD 1410. The last entry of a TAF correction issued at 011420 to a TAF amendment issued at 011410 would be AMD COR 1420. **Note:** If AMD, COR, or AMD COR are used with the remark LAST NO AMDS AFT YYGG NEXT YYGG, the modifier and time will be entered before the remark. Example: AMD 1830 LAST NO AMDS AFT 0120 NEXT 0511.

1.3.5.6. Limited-Duty Location Remarks. Include one of the following remarks in the TAF for limited-duty locations (i.e., less than 24-hour per day operations). The "YY" is the day of the month UTC and "GG" is the time to the nearest whole hour UTC. See AFMAN 15-129, Chapter 2, for instructions on the use of limited-duty TAF remarks.

1.3.5.6.1. LAST NO AMDS AFT YYGG NEXT YYGG.

1.3.5.6.2. LIMITED METWATCH YYGG TIL YYGG.

1.3.5.6.3. AUTOMATED SENSOR METWATCH YYGG TIL YYGG.

1.3.6. Change Groups (TTTTT). Use BECMG GGG_eG_e, TEMPO GGG_eG_e, and FMGGgg change groups to indicate changes from the predominant forecast condition at some intermediate hour time (GGgg) or during a specified period between hours (GG to G_eG_e). TEMPO groups may be used to forecast a change in any or all forecast groups and will be followed by a description of all the elements (except non-convective low-level wind shear and QNH groups), for which a change is forecast to occur intermittently from GG to G_eG_e. FM change groups must include all encoded elements. Start a new line of text for each change group. Several change groups may be encoded to properly identify the forecast conditions. To keep the forecast intent clear and unambiguous, the use of change groups should be done with care and kept to changes which are operationally significant to airfield operations. Overlapping of forecast periods should be avoided. Use caution when using too many BECMG and TEMPO change groups between FMGGgg groups. In order to avoid confusion, keep the intent of the forecast simple.

1.3.6.1. From (FMGGgg). The time indicator TTGGgg in the form of FMGGgg will be used to indicate the beginning of a self-contained part of the forecast indicated by the four-digit time "GGgg." When the group FMGGgg is used, all forecast conditions preceding this group are superseded by the condition forecast in this group. This forecast line shall contain all elements of a predominate forecast line. For example, if the TAF period is 0909 and a change is forecast at 1420 UTC, the entry "FM1420" shall be encoded. The elements entered on this line are in effect from 1420 UTC to the end of the forecast period, 0900 UTC. While the use of a four-digit time in whole hours (e.g., 1600) remains acceptable, a forecast and amending events may require a higher time resolution. In this case, forecast minutes should be used. Four-digit resolution will only be used in this FMGGgg group.

1.3.6.2. Becoming (BECMG). The change-indicator group TTTTT GGG_eG_e in the form of BECMG GGG_eG_e will be used to indicate a change to forecast prevailing conditions expected to occur at either a regular or irregular rate at an unspecified time within the period defined by a two-digit beginning time (GG) and a two-digit ending time (G_eG_e) in whole hours. The time period described by a BECMG group will usually be for one hour and never exceed two hours. This change to the predominant conditions will be followed by a description of all elements for which the change is forecast. The forecast conditions encoded after the BECMG GGG_eG_e group are those elements expected to prevail from the ending time of this change group (G_eG_e) to the ending time of the forecast period (G_2G_2) as indicated by the valid time of the TAF. When using the BECMG group to forecast a change in one or more elements, the entire element(s) must be repeated. For example, if the BECMG group was used to forecast a decrease in the ceiling and all other forecast layers were expected to remain the same, the entire cloud code group must be repeated, not just the ceiling layer.

1.3.6.3. Temporary (TEMPO). The change-indicator group TTTTT GGG_eG_e in the form of TEMPO GGG_eG_e group will be used to indicate temporary fluctuations to the forecast meteorological conditions. Conditions described by the TEMPO group will last less than one hour and cover less than half of the period indicated by the time GG to G_eG_e. Exception: Units will allow 1 hour 15 minutes for thunderstorms. The extra 15 minutes provide for the 15-minute period between the time thunder is last heard and the time the thunderstorm is officially ended. If conditions forecast in the TEMPO group last or are expected to last more than half of the period indicated by the time GG to G_eG_e, then the temporary condition will be considered to be predominant and entered in the initial forecast period or following a FMGGgg or BECMG group.

Chapter 2

PILOT WEATHER REPORT (PIREP) CODE

2.1. General. This chapter contains instructions for encoding pilot weather reports (PIREPs) in a standard format to facilitate processing, transmission, storage, and retrieval of reports of in-flight weather occurrences. Procedures for requesting, recording, and disseminating PIREPs are defined in AFMAN 15-129.

2.2. PIREP Code Definitions.

2.2.1. PIREP. A report of meteorological phenomena encountered by aircraft in flight.

2.2.2. Text Element Indicator (TEI). A two-letter contraction with virgule used in the standard PIREP message to identify the elements being reported.

2.2.3. NAVAID. An electronic navigation aid facility, specifically limited to VHF Omni-Directional Radio Range (VOR), or combined VHF Omni-Directional Radio Range/Tactical Air Navigation (VORTAC) facilities.

2.3. Encoding PIREPS. Place the appropriate data received from a pilot either in the air or on the ground, or from a reliable source on the ground, in a standard format for dissemination. Each report will:

2.3.1. Identify the type of report and each element in the report by a TEI.

2.3.2. Include, as a minimum, the transmitting unit, entries for message type, location, time, flight level, type of aircraft, and at least one other element.

2.3.3. Describe location with reference to a VHF NAVAID or the four-letter airport identifier.

2.3.4. Use only authorized contractions and aircraft designators, listed FAAO 7350.7, *Federal Aviation Administration Order, Location Identifiers*, FAAO 7340.1, *Federal Aviation Administration Order, Contractions* and authorized four-letter location identifiers. Where plain language is called for, authorized contractions and abbreviations should be used. However, in no case should an essential remark be omitted due to lack of readily available contractions.

2.3.5. Omit TEIs for unreported or unknown elements other than those in paragraph 2.3.2. If one of the required TEIs is unknown, enter "UNKN" for that element.

2.3.6. Correcting a PIREP. To correct an original PIREP, add 1 minute to the initial Time group (/TM_GGgg) and add a remark (e.g., COR 1814) when the correction is transmitted as the last entry in the Remarks section.

2.4. PIREP Code Breakdown.

Figure 2.1. PIREP Format.

CCCC (transmitting unit) **UUA** or **UA_/OV**_(location)/**TM**_(time)/**FL(**flight level)/**TP**_(type of aircraft)/SK_(sky cover)/WX_(weather)/TA_(temperature)/ WV_(winds)/TB_(turbulence)/IC_(icing)/RM_(remarks) (COR GGgg) **Note:** Areas in **bold** indicate MANDATORY entries, plus one other element.

Note: Each TEI is preceded by a virgule ("/") and, except for flight level, followed by a space. The underline symbol ("_") is used for illustration purposes only to indicate a required space. In the individual TEI sections that follow, the information enclosed in parentheses depict the format of optional entries.

2.4.1. Message Type (UUA or UA). Indicates that an urgent (UUA) or routine (UA) pilot report follows. Use UUA whenever any of the following are reported:

2.4.1.1. Tornado/waterspout (+FC) or funnel cloud (FC).

2.4.1.2. Thunderstorms (see note below).

2.4.1.3. Tropical cyclones.

2.4.1.4. Squall line.

2.4.1.5. Severe icing.

2.4.1.6. Severe or extreme turbulence, including Clear Air Turbulence (CAT).

2.4.1.7. Mountain wave turbulence.

2.4.1.8. Widespread dustorm and sandstorm.

2.4.1.9. Low-Level Wind Shear (LLWS). When the fluctuation in airspeed is 10 knots or more.

2.4.1.10. Hail (GR or GS).

2.4.1.11. Volcanic eruption and/or ash (VA) when reported by any source, in the air or on the ground.

2.4.1.12. Any condition that, in the judgment of the person entering the PIREP into the system, would present an extreme hazard to flight.

Note: The requirement for thunderstorms refers to the occurrence of an area of widespread activity, thunderstorms along a line with little or no space between individual storms, or thunderstorms embedded in cloud layers or concealed by haze. It does not refer to isolated or scattered thunderstorms not embedded in clouds or concealed in haze.

2.4.2. Location (/OV). After the TEI, describe the point at which, or the line along which, the reported phenomenon or phenomena occurred by reference to a VHF NAVAID(s) or an airport using the four-letter location identifier. **Note:** Some weather processing systems may drop the leading "K," "P," or "H" on the location identifier and display only the three-letter identifier. If appropriate, the identifier is followed by the radial bearing and distance from the NAVAID. Using three digits each, indicate the magnetic bearing direction in degrees followed by the distance in nautical miles.

2.4.2.1. **FORMAT: /OV_LOC/AIRPORT or NAVAID(RRRDDD)(-AIRPORT or NAVAID(RRRDDD).**

2.4.2.2. LOC/AIRPORT or NAVAID is the four-letter location identifier for the airport or four-letter identifier for the VHF NAVAID. RRR and DDD are the magnetic bearing and distance from the location, respectively. Notice the lack of a space between location and RRRDDD and also before and after the hyphen when two AIRPORTS/NAVAIDs are reported. Do not use contractions such as "DURGC" or statements such as "AT TOP OF CLIMB" in this field. These may be added as Remarks (/RM). A further explanation of distance, reference an airport, may be added in remarks, such as "MDW 10E." See Table 2.1. for examples of encoding locations.

Table 2.1. Location Examples.

Pilot Reports Location as:	Encode as:
Over Kennedy, New York Airport	/OV_KJFK
5 miles east of Philadelphia, Pennsylvania Airport	/OV_KMXE107025/RM_PHL_5E or, /OV_KPHL090005
Departing Hannibal, MO	/OV_KHAE
Along route from St. Louis to Kansas City, MO	/OV_KSTL-KMKC
10 miles southwest of Reno, Nevada Airport	/OV_KFMG233016/RM_RNO_10SW or, /OV_KRNO225010
30 miles east of St. Louis VORTAC to 15 miles northeast of Kansas City VORTAC	/OV_KSTL090030-KMKC045015

2.4.3. Time (/TM_GGgg). Enter the UTC time, GGgg, in hours and minutes, as given by the pilot, when the reported phenomenon was (or phenomena were) encountered or occurred. If a span of time is reported, encode the midpoint; for example, if the report is for "1845Z to 1935Z", encode the midpoint, 1910Z as "1910."

2.4.4. Flight Level (/FLHHH(-HHH). Enter the aircraft's altitude (flight level), HHH, in hundreds of feet above mean sea level (MSL) when the phenomenon was or phenomena were first encountered, or if the altitude is unknown, enter UNKN. If an aircraft was climbing or descending, enter the appropriate contraction (DURC or DURD) in the remarks section. Unless stated, all heights are considered MSL (i.e., /RM DURC OVC005-020 AGL, /RM

DURD MOD TB 010-040 AGL). If the condition was encountered within a layer, enter the altitude range of the layer within the appropriate phenomenon TEI or in remarks. There is no space between the "FL" TEI and the altitude. **Note:** It is the responsibility of the PMSV operator to distinguish low-level MSL heights, versus low-level AGL heights, when gathering data from the pilot.

2.4.5. Type of Aircraft (/TP_AAAA or /TP_UNKN). If the type of aircraft is unknown, enter UNKN; otherwise enter the aircraft type designator (i.e., B737, F4, etc). The proper coding of this TEI is critical for the accurate interpretation and utilization of PIREPs, in particular those of icing or turbulence. FAAO 7340.1, *Federal Aviation Administration Order, Contractions, Chapter Five*, "*Aircraft Type Designators*" provides all recognized aircraft designators for use in PIREPs as agreed to between the FAA and ICAO. The type designators are limited to four alphanumeric characters.

2.4.6. Sky Cover (/SK). A PIREP may include the Sky Cover TEI. Enter the sky condition followed by heights of bases, and applicable, "-TOP" followed by the height of the tops. For each layer, enter the heights of clouds in hundreds of feet above mean sea level (MSL) in three digits and use the cloud cover contractions SKC, FEW, SCT, BKN, or OVC. If cloud cover amounts range between two values, separate the contractions with a hyphen and no spaces (e.g., BKN-OVC). Indicate unknown heights by using UNKN. If the pilot reports he/she is in clouds, enter OVC, and in remarks enter "IMC." When more than one layer is reported, separate layers by a virgule ("/"). **Note:** There are no spaces between cloud cover contractions and heights.

2.4.6.1. **FORMAT:/SK_$N_sN_sN_s$(-$_sN_sN_sN_s$)$h_bh_bh_b$(-TOP$h_th_th_t$)/$N_sN_sN_s$(-$_sN_sN_sN_s$)$h_bh_bh_b$, etc.**

2.4.6.2. $N_sN_sN_s$ is the three-letter contraction for the amount of cloud cover, $h_bh_bh_b$ is the height of the base of a layer of clouds in hundreds of feet, and $h_th_th_t$ is the height of the top of the layer in hundreds of feet and is indicated as "TOP" and the height $h_th_th_t$. Thus, the code form for cloud amount, base, and tops becomes $N_sN_sN_sh_bh_bh_b$-TOP$h_th_th_t$.

2.4.6.3. Examples:

/SK_OVC100-TOP110
/SK_OVC065-TOPUNKN/RM IMC
/SK_SCT-BKN050-TOP100
/SK_BKN-OVCUNKN-TOP060/BKN120-TOP150/SKC
/SK_OVC015-TOP035/OVC230-TOPUNKN
/SK_FEW030-TOPUNKN
/SK_SKC
/SK_OVCUNKN-TOPS085

2.4.7. Weather (/WX). PIREPs may include flight visibility and/or flight weather in this TEI.

2.4.7.1. Flight Visibility (FV). If reported by the pilot, flight visibility will be the first entry in the "/WX" TEI. Enter it as FV followed immediately (no space) by the two-digit visibility value rounded, if necessary, to the nearest whole statute mile (SM). When a flight visibility value is reported, append "SM" to the value (e.g., FV03SM). Use FV99SM to enter a report of unrestricted flight visibility. Overseas units using metric system visibility values will encode in kilometers. Encode unrestricted visibility as FV99.

2.4.7.2. When the visibility value being rounded down becomes operationally significant, consider adding a clarifying comment in the "remarks" section. For example, a report of 1/2 SM (above airfield minimums) visibility would be rounded down and reported as FV00SM (below minimums); append in remarks the comment "IN FLT VIS 1/2 SM." Leave out if unknown or not reported.

2.4.7.3. Weather. Enter one or more of the listed weather types in Table 2.2, using the appropriate METAR contraction.

Table 2.2. PIREP Flight Weather Contractions.

WEATHER	METAR Encode
Funnel Cloud **(See Note 1)**	FC
Tornado/Waterspout **(See Note 1)**	+FC
Thunderstorm	TS
Fog (visibility < 5/8 SM or 1000 meters)	FG
Mist (visibility ≥ to 5/8 SM or 1000 meters)	BR
Rain/Rainshowers	RA/SHRA
Drizzle	DZ
Squall	SQ
Freezing Rain	FZRA
Freezing Drizzle	FZDZ
Hail 1/4 inch diameter or larger **(See Note 2)**	GR
Hail Shower **(See Note 2)**	SHGR
Small Hail/Snow Pellets (< 1/4 inch diameter)	GS
Small Hail Showers/Snow Pellet Showers	SHGS
Ice Pellets/Ice Pellet Showers	PL/SHPL
Snow/Snow Showers	SN/SHSN
Drifting Snow	DRSN
Blowing Snow	BLSN
Snow Grains	SG
Dust	DU
Drifting Dust	DRDU
Blowing Dust	BLDU
Duststorm	DS
Sand	SA
Drifting Sand	DRSA
Blowing Sand	BLSA

WEATHER	METAR Encode
Sandstorms	SS
Well Developed Dust/Sand Whirls	PO
Haze	HZ
Smoke	FU
Volcanic Ash	VA
Spray	PY

Notes:
1. FC is entered in the /WX TEI and FUNNEL CLOUD is spelled out in the /RM TEI. +FC is entered in the /WX TEI and TORNADO or WATERSPOUT is spelled out in the /RM TEI.
2. If the size of hail is known, enter in 1/4 inch increments in the /RM TEI.

2.4.7.3.1. If more than one form of precipitation is combined in the report, report the dominant type first. The proximity qualifier “VC” (vicinity) may be used in combination only with the abbreviations “TS”, “FG”, “SH”, “PO”, “BLDU”, “BLSA”, and “BLSN.” Indicate intensity (“-” for light, no qualifier for moderate, and “+” for heavy) with precipitation types, except ice crystals and hail, including those associated with a thunderstorm and those of a showery nature. Encode tornadoes and waterspouts as “+FC.” Do not ascribe intensity to obscurations of blowing dust, blowing sand, and blowing snow. Only ascribe moderate or heavy intensity to duststorms and sandstorms.

2.4.7.4. Enter weather layers (i.e., fog, haze, smoke or dust) with the base and/or top of the layer, if reported, encoded in the same manner as cloud cover in the /SK TEI (e.g., FU002-TOP030). If more than one type of weather is reported, report the types in the following order: (1) Tornado, Funnel Cloud, or Waterspout, (2) Thunderstorm with or without associated precipitation, (3) Weather phenomena in order of decreasing predominance (i.e., the most dominant reported first). Use separate groups for each type of weather or thunderstorm, and report no more than three groups in one PIREP. Coding present weather and the use of qualifiers/descriptors is based on Federal Meteorological Handbook 1 (FMH-1), *Surface Weather Observations and Reports.* Further details are in AFMAN 15-111, *Surface Weather Observations.*

2.4.7.4.1. **FORMAT: /WX_(FVvvSM_)ww(_ww)(_ww).** The “vv” is the two-digit flight visibility value and “ww” is the variable length encoded flight weather.

2.4.7.4.2. Examples:

/WX_FV02SM_BR_FU020-TOP030 -- In remarks: /RM BR-TOP009
/WX_FV00SM_+TSRAGR
/WX_FV99SM
/WX_FV02SM_VA330
/WX_+FC -- In remarks: /RM TORNADO, or WATERSPOUT
/WX_BCFG_VC_W -- (Decoded: Patches of fog between 5 and 10 SM of the report location to the west)

2.4.8. Temperature (/TA). If the outside air temperature is reported, encode it using two digits in whole degrees Celsius. Prefix sub-zero temperatures with an "M"; for example, a temperature of –2°C is encoded /TA_M02. If the aircrew reports an uncorrected TA, append the remark, /RM TA IS UNCORRECTED. 00°C is a positive number.

2.4.8.1. **FORMAT: /TA_(M)T'T'**. "T'T'" is the two-digit temperature value in whole degrees Celsius.

2.4.9. Wind Direction and Speed (/WV). If reported, encode the wind direction from which the wind is blowing in tens of degrees using three digits. Directions less than 100 degrees are preceded by a "0." For example, a wind direction of 90 degrees is coded as 090. Enter the wind speed (spot wind) as a two- or three-digit group immediately following the wind direction. Encode the speed in whole knots using the hundreds digit (if not zero) and the tens and units digits. The wind group always ends with "KT" to indicate that winds are reported in knots. Speeds of less than 10 knots are encoded using a leading zero. For example, a wind speed of 8 knots is encoded 08KT. A wind speed of 112 knots is encoded 112KT.

2.4.9.1. **FORMAT: /WV_dddff(f)KT.** The ddd is the three-digit true direction, in whole degrees, from which the wind is blowing; and ff(f) is the wind speed in knots, followed by KT.

2.4.9.2. Examples:

/WV 26030KT -- (Decoded: Wind 260 degrees at 30 knots)
/WV 080110KT -- (Decoded: Wind 080 degrees at 110 knots)

2.4.10. Turbulence (/TB). If reported, intensity, type, and altitude of turbulence are entered as follows:

2.4.10.1. Intensity. This is the first element reported after the space following the TEI. The reportable intensities are LGT, MOD, SEV, and EXTRM. HVY is not a reportable intensity. Enter a range or variations in intensity as two values separated by a hyphen (e.g., MOD-SEV). If turbulence was forecast at any level, but none was encountered, enter NEG in the /TB TEI.

2.4.10.2. Type. May be blank, or enter either "CAT" or "CHOP," if reported by the pilot. CAT is Clear Air Turbulence. This type of turbulence is encountered in air where no clouds are present and is commonly applied to high-level turbulence associated with wind shear, often in the vicinity of the jet stream. CAT intensity may be light, moderate, severe, or extreme. CHOP turbulence causes rapid and somewhat rhythmic jolts or bumpiness without appreciable changes in altitude or attitude and may be indicated as either light or moderate. Never report CHOP as severe or extreme.

2.4.10.3. Altitude. Enter the reported turbulence altitude only if it differs from the value reported in /FL, or is reported as a layer with defined or undefined boundaries. When entering a layer, use a hyphen between height values. Undefined lower and higher boundary limits are entered as BLO or ABV. Use a virgule to separate two or more layers of turbulence.

2.4.10.4. **FORMAT: /TB_III(-III)(_CAT or CHOP_)_($h_bh_bh_b$-$h_th_th_t$)/III(-III) etc**. The III is the intensity of the turbulence and CAT or CHOP are the only two entries for type of turbulence permitted. The $h_bh_bh_b$ group is the base of the turbulence layer, if defined, or BLO or ABV, if undefined; and $h_th_th_t$ is the top of a defined layer or the boundary of an undefined layer.

2.4.10.5. Examples:

/TB_EXTRM_350
/TB_MOD-SEV_BLO_080
/TB_LGT_035
/TB_LGT-MOD_CHOP_310-350
/TB_NEG
/TB_ NEG_220-280/MOD_CAT_ABV

2.4.11. Icing (/IC). Enter reports of icing using the same format to report turbulence (i.e., intensity, type, and altitude(s) of icing conditions).

2.4.11.1. Intensity. Enter TRACE, LGT, MOD, SEV, or ranges covering two values separated by a hyphen. HVY is not a reportable intensity. If icing was forecast at any level, but none was encountered, enter NEG in the /IC TEI.

2.4.11.2. Type. Enter the reported icing types: RIME, CLR (Clear), or MXD (Mixed).

2.4.11.2.1. RIME - Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

2.4.11.2.2. CLR (Clear) - Glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets.

2.4.11.2.3. MXD (Mixed) - A combination of rime and clear icing.

2.4.11.3. Altitude. Enter the reported icing altitude only if it differs from the value reported in /FL, or is reported as a layer with defined or undefined boundaries. When entering a layer, use a hyphen between height values. Undefined lower and higher boundary limits are entered as BLO or ABV. Use a virgule ("/") to separate two or more layers of icing.

2.4.11.4. **FORMAT. /IC_III(-III)_(type)_($h_bh_bh_b$-$h_th_th_t$)/III(-III)_etc.** The III is the intensity of the icing; type is one of the three listed icing types; $h_bh_bh_b$ is the base of the icing layer, if defined, or BLO or ABV, if undefined; and $h_t h_t h_t$ is the top of a defined layer or the boundary of an undefined layer.

2.4.11.5. Examples:

/IC_TRACE_RIME
/IC_LGT-MOD_RIME_085
/IC_MOD_MXD_035-070
/IC_LGT_CLR_015-045/SEV_CLR_ABV_075
/IC_NEG

2.4.12. Remarks (/RM). Data or phenomena following this TEI are considered significant; however, they either do not fit in any previously reported TEI or they further define entries reported in other TEIs. Correction remarks will be entered as the last entry. The following phenomena may be reported when encountered by pilots. Enter heights only if they differ from /FL.

2.4.12.1. Wind Shear. Low-Level Wind Shear (LLWS) is indicated by rapid air speed fluctuations within 2,000 feet of the earth's surface. When the fluctuation in airspeed is 10 knots or more, the report is classified as an urgent (UUA) PIREP. When LLWS is a reason for issuing an Urgent PIREP, or whenever it is included as an element in any PIREP, enter LLWS as the first remark immediately after the /RM TEI, (i.e., /RM LLWS_-15KT_SFC-003_DURC_RY22_JFK. LLWS may be reported as -, +, or +/-, depending on the effect of the phenomena on the aircraft. If the location of the LLWS encounter is different from the /OV or /FL TEI, then include this information in remarks using the same format(s).

2.4.12.2. FUNNEL CLOUD, TORNADO, and WATERSPOUT. Enter the appropriate term followed by the direction of movement, if reported.

2.4.12.3. Thunderstorm. Enter areal coverage descriptions (ISOLD, FEW, SCT, NMRS), or if storms are reported in a line, enter description (LN, SCT LN, BKN LN, SLD LN), if known. Follow the areal coverage description with the contraction TS, the location and movement of storms, and type of lightning, if known.

2.4.12.4. Lightning. Enter frequency (OCNL, FRQ, CONS), followed by lightning type (e.g., OCNL LTGIC, FRQ LTGCCCA, CONS LTGICCG, FRQ LTGCA) or combinations, as reported by the pilot.

2.4.12.5. Electric Discharge. Enter "DISCHARGE" followed by altitude.

2.4.12.6. Contrails. Enter "CONTRAILS" followed by their height if different from the /FL height.

2.4.12.7. Cloud Reports. Report heights of bases and tops encountered in /SK TEI. The remarks section is used for clouds that can be seen but were not encountered during flight, such as CS W, OVC BLO, SCT-BKN ABV, TS E MOV NE, etc.

2.4.12.8. Language/Terminology. The pilot may report some information in non-standard or unencodable terminology, such as very rough or bumpy. If specified phraseology is not adequate, use plain language to enter a description of the phenomena as clearly and concisely as possible. Appropriate remarks made by the pilot that do not fit in any TEI may also be included in remarks section. Some remarks that fall into this category are DURC, DURD, RCA, TOP, TOC, or CONTRAILS.

2.4.12.9. Volcanic Eruption. Indicate Volcanic Eruption in the remarks section of an Urgent PIREP. (Volcanic ash alone is considered weather phenomena and is included in /WX TEI.) In a report of volcanic activity, include as much information as possible, such as the name of the volcano/mountain, time of observed eruption (if different from /TM entry), location, and any ash cloud observed with the direction of the ash cloud movement. If the report is received from other than a pilot in the air or on the ground, enter aircraft "UNKN," flight level "UNKN," and indicate in Remarks that the report is "UNOFFICIAL."

2.4.12.10. PIREP Source. For further identification of the source of a PIREP, the aircraft identification, call sign, or registration number may be added to the Remarks.

2.4.12.10.1. The facility encoding the PIREP may be added to the end of the remarks, e.g., "ZLA CWSU."

2.5. PIREP Examples:

2.5.1. Clear-Air Turbulence. At 2200Z, a Boeing 757-200 pilot reports severe clear-air turbulence between 35,000 and 39,000 feet over Toledo.

CCCC UUA/OV_KTOL/TM_2200/FLUNKN/TP_B757/TB_SEV_CAT_350-390

2.5.2. Duststorms or Sandstorms. At 0750Z, a pilot reports a duststorm 35 miles northeast of Midland, Texas, flying at 4,000 feet with a visibility of 3/4 of a mile.

CCCC UUA/OV_KMAF045035/TM_0750/FL040/TP_UNKN/WX_FV01SM_DS

2.5.3. Electric Discharge. A military pilot flying a Lockheed Orion between Richmond, Virginia, and Washington, D.C., reports at 2120Z that the aircraft experienced an electrical discharge 20 miles south of Washington at an altitude of 5,000 feet.

CCCC UA/OV_KDCA180020/TM_2120/FL050/TP_P3/RM_DISCHARGE

2.5.4. Estimate. At 1630Z, a pilot of a Cessna 172 reports a duststorm 20 miles west of Kansas City, Missouri headed for the airport. The visibility at 3,500 feet is 10 miles. The pilot estimates the duststorm will reach the airport within 45 minutes.

CCCC UUA/OV_KMKC270020/TM_1630/FL035/TP_C172/WX_FV_10SM_DS/ RM DUSTSTORM_MOV090_EST_KMKC1715

2.5.5. Smoke Layer. At 1500Z, a pilot of a DeHavilland 7 reports that there is a smoke layer from 2,000 to 6,500 feet over the field at Pittsburgh.

CCCC UA/OV_KPIT/TM_1500/FLUNKN/TP_DH7/WX_FU020-065

2.5.6. Hail. At 2217Z, the pilot of a Fairchild F27 reports moderate hail, 1/2" in diameter, 10 miles south of Omaha, Nebraska, at an altitude of 3,500 feet.

CCCC UUA/OV_KOMA180010/TM_2217/FL035/TP_FA27/WX_GR/RM_HLSTO 1/2

2.5.7. Icing and Corrected Icing PIREP. At 1500Z, the pilot of a Seneca reports severe rime icing was encountered 5 to 20 miles north of Eugene, Oregon, at 2,000 feet.

CCCC UA/OV_KEUG360005-360020/TM_1500/FL020/TP_PA34/IC_MOD_RIME

CCCC UUA/OV_KEUG360005-360020/TM_1501/FL020/TP_PA34/ IC_SEV_RIME/RM_COR 1510

Note: The second PIREP issued was transmitted at 1510Z to correct the report from moderate rime to severe rime icing. Notice this phenomenon changed the message to become an urgent versus routine message.

2.5.8. Cloud Cover. At 0000Z, the pilot of a Shorts 360 reports broken clouds between 3,600 feet and 6,600 feet, 6 miles SE of Honolulu. At 7,000 feet the pilot is between layers with an over cast deck above.

CCCC UA/OV_PHNL135006/TM_0000/FL070/TP_SH36/SK_BKN036-TOP066/UNKN_OVC_ABV

2.5.9. Thunderstorm. At 2224Z, a pilot reports an area of thunderstorms 45 miles NW of Dodge City in a north-south direction. Broken TCU cloud bases are at 3,000 feet with the layer tops at 15,000 feet and TS tops at 32,000 feet. Occasional cloud to cloud and cloud to ground lightning is observed. Type of aircraft is a McDonnell-Douglas DC-9/80.

CCCC UUA/OV_KDDC315045/TM_2224/FLUNKN/TP_MD8/SK_BKN030-TOP150/WX_TS/RM_LN_TS_N-S_OCNL_LTGCCCG_TS_TOPS_320

Note: In this example, the person entering the PIREP into the system considered the thunderstorm conditions significant enough to present an extreme hazard to flight. The PIREP was entered as an Urgent report using the UUA message type.

2.5.10. Tornado. At 2314Z, a pilot 35 miles north of Champaign, Illinois reports a tornado moving east northeast. The cloud layer is broken with bases at 3,000 feet. The tornado is observed to be making intermittent contact with the ground.

CCCC UUA/OV_KCMI360035/TM_2314/FLUNKN/TP_UNKN/SK_BKN030/ WX_+FC/RM_TORNADO_MOV_ENE_INTER_CTC_WITH_GND

2.5.11. Turbulence (not clear air). At 1850Z, the pilot of a Convair 580 flying at 10,000 feet through Donner Summit Pass reports to Reno, Nevada, that light turbulence is being encountered.

CCCC UA/OV_KRNO250035/TM_1850/FL100/TP_CV58/TB_LGT/ RM_DONNER_SUMMIT_PASS

2.5.12. Wind. At 1445Z, the military pilot of an OV1 Mohawk encountered an 82-knot wind 30 miles west of Bismarck at 6,000 feet MSL, true wind direction 80 degrees.

CCCC UA/OV_KBIS270030/TM_1445/FL060/TP_OV1/WV_08082KT

2.5.13. Volcanic Eruption and/or Ash. At 2010Z, the pilot of a McDonnell Douglas DC10 at 37,000 feet, 75 miles Southwest of Anchorage, reports Mt. Augustine erupted at 2008Z. The pilot also reports an ash cloud 40 miles south of the volcano, moving south-southeast.

CCCC UUA/OV_PANC240075/TM_2010/FL370/TP_DC10/WX_VA/ RM_VOLCANIC_ERUPTION_2008Z_MT_AUGUSTINE_ASH_40S_MOV_SSE

Note: A report of volcanic eruption/volcanic ash may be received from any source. If the source is other than a pilot in the air or on the ground, the remark section will begin with “UNOFFICIAL.”

Chapter 3

AIR REPORT (AIREP) CODE

3.1. General. This chapter contains instructions for encoding air reports (AIREPs) in a standard format to facilitate processing, transmission, storage, and retrieval of reports of in-flight weather occurrences. Procedures for requesting, recording, and disseminating AIREPS are defined in AFMAN 15-129.

3.2. AIREP Definition. An AIREP is an in-flight evaluation usually made over areas where weather information is limited or nonexistent (for example, over an ocean).

3.3. AIREP/Debrief Format. Figure 3.1. illustrates an example of the standard AIREP format including debrief information, when reported, are always transmitted with the AIREPs. Communications systems such as NTFS/AMIS will automatically encode the AIREP into the standard format.

Figure 3.1. Example AIREP/Debrief Format.

AIREP Format

CCCC(transmitting unit) ***ARP or ARS***(AIREP type) ***MA00456***(aircraft ID) ***5441N***(lat) ***17212E***(long) ***1830***(time) ***F310***(flight level) ***M50***(temp) ***222***(weather code) ***31075***(spot wind) ***TURB MOD C5***(supplementary information)

Debrief Format

PHIK(departure) ***KSUU***(destination) ***0100***(take off time) ***0630***(arrival time) ***FWF P55***(forecast wind factor) ***AWF P70***(actual wind factor) ***FL330/350***(flight levels) ***CFPI 00710524.9***(computer flight plan number)

Note: If information is not available for a square on the AF Form 72, Air Report (AIREP) transmit a virgule (/) for that entry.

3.4. AIREP Code. Table 3.1. provides the code breakdown for an AIREP.

Table 3.1. AIREP Code Breakdown.

AIREP Code Breakdown	
CCCC	ICAO of transmitting unit.
AIREP Type	ARP (Routine AIREP) or ARS (Special AIREP). Will precede all AIREP text. See Table 3.6. for ARS conditions.
Aircraft Number	Reported as a seven-character group. The identifier will be a combination of numbers and letters.
Latitude	Four figures indicating the latitude of the aircraft to the nearest minute followed by the letter N (North) or S (South).
Longitude	Five figures indicating the longitude of the aircraft to the nearest minute followed by the letter E (East) or W (West).
UTC Time	Four figures depicting time to the nearest minute. For AIREP corrections, add one minute to the actual time.

AIREP Code Breakdown	
Flight Level	A four-character group (the letter F followed by three figures), representing the aircraft altitude in hundreds of feet (e.g., F370).
Temperature	Two figures indicating the temperature in whole degrees Celsius preceded by "P" (plus) or "M" (minus).
Weather	Three-figure code for H-Hazard Code (Table 3.3.), W-Weather Code (Table 3.4.), and FC-Flight Condition Code (Table 3.5.).
Spot Wind	A five-figure wind group. The first two figures indicate true wind direction in tens of degrees. The last three figures indicate wind speed to the nearest knot. In the following code: DD = True wind direction at current position; SSS = Wind speed at current position.
Supplementary Information	Includes aircraft type when turbulence is reported in the weather group. Air refueling may also be included by indicating "AR", followed by one letter to indicate use of track and one figure to indicate visibility (See Table 3.7.). To correct an AIREP, add 1 minute to the initial time and add a remark (e.g., COR 1814) when the correction is transmitted as the last entry.
Note: Reports that have not been edited may include next position data information after the flight level in the following format: Five-character latitude group, six-character longitude group, and a four-figure arrival time group. **This data IS NOT transmitted by reporting stations.**	

3.5. Debrief Remarks. Certain aircraft will provide debrief remarks on the backside of the AF Form 72. Transmit the debrief information with the AIREPs. Table 3.2. provides the code breakdown for a debriefing.

Table 3.2. Debrief Breakdown.

Debrief Breakdown	
CCCC CCCC	ICAO (Departure) - ICAO (Destination).
GGgg GGgg	Time (UTC) of actual take-off and arrival at destination.
FWF	Forecast wind factor, Negative = M, Positive = P.
CFP FL LVLs	Enroute flight levels from CFP (if provided).
AWF	Actual wind factor, Negative = M, Positive = P.
RWF	Revised wind factor, Negative = M, Positive = P (if provided).
ACFT TYPE	Not needed if reported elsewhere.
Actual FL LVLs	Actual enroute flight levels flown.
CFPI	Computer flight plan indicator (number).

3.6. AIREP and AIREP with Debrief Examples.

3.6.1. Example AIREP from AF Form 72.

3.6.1.1. Recorded by aircrew on AF Form 72 as:

MA00153 4951N 05010W 0510 F350 5052N 06012W 0705 M48 147 26030 C5 TS TOPS 450

3.6.1.2. Transmitted as:

CCCC ARS MA00153 4951N 05010W 0510 F350 M48 147 26030 C5 TS TOPS 450

Note: This AIREP was transmitted as a Special AIREP (ARS) because the aircrew verbally reported the thunderstorm activity as covering a widespread area.

3.6.2. Example AIREP with a Debriefing from AF Form 72.

3.6.2.1. Recorded by aircrew on AF Form 72 as:

MA00146 4949N 03000W 0204 F370 5040N 02045W 0249 M55 221 03069 ARG3 KC135 KDOV EDAR 07/0030Z 07/0627Z CFPI 00710521.9Z FWF 25 270/330 AWF 33 290/330

3.6.2.2. Transmitted as:

EDAR ARP MA00146 4949N 03000W 0204 F370 M55 221 03069 ARG3 KC135 KDOV EDAR 0030 0627 FWF P25 270/330 AWF P33 FL290/330 CFPI 00710521.9

Table 3.3. AIREP Hazards (H).

Code Figure	Explanation
0	None
1	Light Turbulence
2	Moderate Turbulence
3	Severe Turbulence
4	Extreme Turbulence
5	Trace of Icing
6	Light Icing
7	Moderate Icing
8	Severe Icing
9	Hail

Table 3.4. AIREP Weather (W).

Code Figure	Explanation
0	Clear
1	Scattered Clouds
2	Broken Clouds
3	Continuous Layers
4	Lightning
5	Drizzle
6	Continuous Rain
7	Continuous Snow
8	Rain or Snow Showers
9	Thunderstorms

Table 3.5. AIREP Flight Conditions (FC).

Code Figure	Explanation
0	Clear
1	Above Clouds (tops less than 10,000 ft)
2	Above Clouds (tops 10,000 to 18,000 ft)
3	Above Clouds (tops over 18,000 ft)
4	Below Clouds (bases less than 10,000 ft)
5	Below Clouds (bases 10,000 to 18,000 ft)
6	Below Clouds (bases above 18,000 ft)
7	Between Broken or Overcast Layers
8	In Clouds
9	In and Out of Clouds

Table 3.6. Meteorological Conditions Requiring Special AIREP (ARS).

Thunderstorms (see note)	Severe Icing
Tropical Storm	Severe or Extreme Turbulence
Squall Line	Mountain Wave Turbulence
Hail	Widespread Sandstorm
Widespread Duststorm/Sandstorm	Volcanic Eruption or Ash Cloud

Note: The requirement for thunderstorms refers to the occurrence of an area of widespread activity, thunderstorms along a line with little or no space between individual storms, or thunderstorms embedded in cloud layers or concealed by haze. It does not refer to isolated or scattered thunderstorms not embedded in clouds or concealed in haze.

Table 3.7. Aerial Refueling (AR) Code.

Use of Track		Visibility	
Word	**Code Figure**	**Nautical Miles**	**Code Figure**
Good	G	3+	3
Fair	F	1-3	2
Poor	P	0-1	1
Unusable	U	-	0

Note: Use indicator “AR” plus one letter and one number, plus aircraft type (e.g., AR F3 C5).

Chapter 4

SOLAR OPTICAL CODES

4.1. MANOP Heading (Manual Operations). The MANOP heading is used in the transmission of routine and event-level messages.

Line 1 MMMMMM SSSS DDHHmm or 555555

Line 1	MMMMMM	MANOP header: (**See Note 1**)	
		SXXX(_ _)	event-level message
		AXXX(_ _)	routine message
		NWXX60	end of day summary
	SSSS	Solar Observatory ICAO:	
		APLM	-Learmonth Solar Observatory
		K7OL	-Sagamore Hill Solar Observatory
		TJFF	-Ramey Solar Observatory
		KHMN	-Holloman Solar Observatory
		PHFF	-Palehua Solar Observatory
		LISS	-San Vito Solar Observatory
	DDHHmm	DD	-Day of month (corresponding with HHmm)
		HHmm	-Hour and minute (GMT) (**See Note 2**)
	555555	Dummy date/time group (GMT) (**See Note 3**)	

Notes:

1. Examples are those primarily used by the Solar Observatories.

2. Fixed file times will use DDHHmm format.

3. 555555, when used, will automatically be updated to current date and time by the AWN.

4.2. Solar Flare Code (FLARE). Use this code to make event-level or routine reports of solar flares as observed with an optical telescope viewing at a wavelength of 6563A (Hydrogen-alpha).

Line 1 MANOP heading
Line 2 FLARE
Line 3 IIiii YMMDD 3//nn
Line 4 11111 qSJJJ GGggL QXXYY TIBcc GGggL 7AAAA GGggL 9NNNN FBBbb
Line 4a 22222 IBGgg 7AAAA 99999

Line 1	MANOP heading		
Line 2	FLARE	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of the year

		MM	-Number of the month
		DD	-Day of the month (corresponding to flare start time; **See Note 1)**
	3//nn	3	-Numerical filler (3rd group)
		//	-Fillers
		nn	-Number of data lines in this message
Line 4	11111	Data line indicator (**See Note 1**)	
	qSJJJ	q	-Quality of the observation coded according to: 1 -Very poor 2 -Poor 3 -Fair 4 -Good 5 -Excellent
		S	-Status of the report coded according to: 1 -Preliminary estimate 2 -Final report 3 -Correction 4 -Deletion (**See Note 2**)
		JJJ	-Local flare serial number assigned independently by each observatory (normally assigned sequentially by GMT day).
	GGggL	GGgg	-Start time (or time flare was initially observed). Record hour and minute, GMT.
		L	-Time label coded according to: 1 -Exact start time 2 -Flare in progress at GGgg (Begin time not observed; flare began before GGgg)
	QXXYY	Q	-Quadrant location of the flare coded according to: 1 -Northeast 2 -Southeast 3 -Southwest 4 -Northwest
		XX	-Central Meridian Distance of the flare (whole degrees)
		YY	-Latitude of the flare (whole degrees)
	TIBcc	T	-Method or type of observation coded according to: 1 -Visual 2 -Not Used 3 -Solar Radio Burst Locator (SRBL) 4 -Electronic
		I	-Flare Importance determined by International Astronomical Union standards and coded according to: 0 -Subflare 1 -Importance One 2 -Importance Two 3 -Importance Three 4 -Importance Four
		B	-Flare brightness coded according to: 7 -Faint

		8	-Normal
		9	-Brilliant
	c	-First flare characteristic coded according to:	
		0	-Visible in white light
		1	-Greater than or equal to 20 percent umbral coverage
		2	-Parallel ribbon
		3	-Associated Loop Prominence (LPS)
		4	-Y-shaped ribbon
		5	-Several eruptive centers
		6	-One or more brilliant points
		7	-Associated high speed Dark or Bright Surge on Disk DSD or BSD)
		8	-Flare followed the Disappearance of a Solar Filament (DSF) in the same region
		9	-H-alpha emission greater in the blue wing than in the red wing
		/	-Filler or not applicable
	c	-Second flare characteristic coded according to the preceding table. (**Note:** The table lists flare characteristics in descending order of importance.)	
GGggL	GGgg	-Time of the maximum brightness of the flare (hour and minutes, GMT)	
	L	-Time label coded according to:	
		1	-Exact time of maximum brightness
		2	-Time of area measurement (since the time of maximum brightness was not observed)
7AAAA	7	-Numerical filler (7th group)	
	AAAA	-Corrected flare area in millionths of the solar hemisphere at time of maximum brightness. Use zero(s) as fill.	
GGggL	GGgg	-End time (or time flare was last observed). Record hour and minute, GMT. **Note:** If coded message is transmitted before the flare has ended (preliminary report), encode ///// for GGggL.	
	L	-Time label coded according to:	
		1	-Exact end time
		2	-Flare in progress at GGgg (end time not observed; flare ended after GGgg)
9NNNN	9	-Numerical filler (9th group)	
	NNNN	-SEC region number; use //// filler when number not known.	
FBBbb	F	-Flare threshold expressed as a bin value, i.e., the minimum brightness bin value which must have a corrected area of at least 10 millionths of the solar hemisphere to declare sampled activity a flare. Report only the ones unit (e.g., a value of "6" indicates flare threshold = 16). Report "/" if data not available.	
	BB	-Flare brightness level, expressed as a bin value, used to categorize the flare as faint, normal, or brilliant. (**Note:** The corrected area in this brightness bin, added to the area in all bins of	

			greater brightness, must be at least 10 millionths of the solar hemisphere.) Report "//" if data not available.
		bb	-Maximum flare brightness, expressed as a bin value, detected in the sampled activity without regard to the amount of flare area in that bin. Report "//" if data not available.
Line 4a	22222	Data continuation line indicator (**See Note 3**)	
	IBGgg	I	-Secondary flare importance coded according to: 0 -Subflare 1 -Importance One 2 -Importance Two 3 -Importance Three 4 -Importance Four
		B	-Secondary flare brightness coded according to: 7 -Faint 8 -Normal 9 -Brilliant
		Ggg	-Time of the secondary maximum brightness of the flare (last digit of hour and minutes, GMT)
	7AAAA	7	-Numerical filler
		AAAA	-Secondary corrected flare area in millionths of the solar hemisphere
	99999	End of data indicator (include at end of last data line)	

Notes:

1. Do not include data for more than one GMT day in a single message. Repeat lines 4 and 4a as often as necessary. Include data for only one flare on a single data line 4 or 4a.

2. If a preliminary event-level flare is transmitted in error (e.g., not occurring or not event-level), immediately transmit a deletion using the event header (SXXX_ _, where _ _ is the specific numeric designator for each site) and the deletion code “4”, and attach a short PLAIN message stating the event was transmitted in error.

3. Use line 4a to report other flare maxima (if applicable); use the IBGgg and 7AAAA groups as often as necessary, however, use no more than four secondary maxima on a single line 4a. Use the data encoded in groups TIBcc GGggL 7AAAA in line 4 to identify the largest, most energetic maximum. Use the cc, Flare Characteristics, in the TIBcc group in line 4 to describe the most significant maximum. Report secondary maxima in line 4a in chronological sequence irrespective of the time of the largest, most energetic maximum.

4.3. Solar Disk and Limb Activity Summary Code (DALAS). Use this code to make event-level and routine reports of activity on the solar disk and/or limb with an optical telescope viewing at a wavelength of 6563Å (Hydrogen-alpha).

Line 1 MANOP heading
Line 2 DALAS

Line 3 IIiii YMMDD 3//nn
Line 4 11111 qSJJJ EEIRR GGggs GGgge TBRAA 9NNNN QXXYY QXXYY QXXYY
Line 4a 22222 WWW/D 3qFFF 99999

Line 1	MANOP heading		
Line 2	DALAS	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of the year
		MM	-Number of the month
		DD	-Day of the month (corresponding to activity start time; **See Note 1**)
	3//nn	3	-Numerical filler (3rd group)
		//	-Fillers
		nn	-Number of data lines in this message
Line 4	11111	Data line indicator (**See Note 1**)	
	qSJJJ	q	-Quality of observation coded according to: 1 -Very poor 2 -Poor 3 -Fair 4 -Good 5 -Excellent
		S	-Status of the report coded according to: 1 -Preliminary estimate 2 -Final report 3 -Correction 4 -Deletion
		JJJ	-Local activity serial number assigned independently by each observatory (normally assigned sequentially by GMT day)
	EEIRR	EE	-Type of activity coded according to: 01 -ASR Active Surge Region (less than 0.15 solar radius) 02 -APR Active Prominence Region 03 -Not Used 04 -BSL Bright Surge on Limb (0.15 solar radius or greater) 05 -EPL Eruptive Prominence on Limb 06 -LPS Loop Prominence System (limb or disk) 07 -SPY Spray 08 -AFS Arch Filament System 09 -ADF Active Dark Filament 10 -DSF Disappearing Solar Filament (**See Note 2**) 11 -DSD Dark Surge on Disk 12 -BSD Bright Surge on Disk
		I	-Index of activity. A subjective estimate of the level of activity for APR, EPL, ADF, or DSF activity, coded according to:

		1 -Active. Prominence fluctuates in brightness or changes shape. Filament varies in darkness, changes shape, or moves.
		2 -Non-Eruptive. Prominence or filament disappears, but does not erupt. Represents dissipation in place.
		3 -Eruptive. Prominence or filament erupts; filament shows strong Doppler shift.
		/ -Not applicable. Use for other types of disk and limb activity.
	RR	-For limb activity: radial extent above the limb expressed in hundredths of the solar radius. For disk activity: encode heliographic extent (i.e., length) in whole degrees. For combined limb and disk activity: encode radial extent from the feature's point of origin to the outermost extent of the feature, expressed in hundredths of the solar radius. If the location is unclear, use plain language remarks to specify limb or disk activity.
GGggs	GGgg	-Start time (or time activity was initially observed). Record hour and minute, GMT.
	s	-Time qualifier coded according to:
		1 -Exact start time
		2 -In progress; activity started before GGgg
		3 -Activity started after GGgg (for features, which disappear, but start time was not observed, report time last observed and this time qualifier).
GGgge	GGgg	-End time (or time activity was last observed). Record hour and minute, GMT. **Note:** If coded message is transmitted before the activity ended (preliminary report), encode ///// for GGgge.
	e	-Time qualifier coded according to:
		1 -Exact end time
		2 -Activity ended before GGgg (for features, which disappear, but exact end time not observed, report time absence was first noticed and this time qualifier)
		3 -Activity ended after GGgg (end time not observed, activity was still in progress at GGgg)
TBRAA	T	-Method or type of observation coded according to:
		1 -Visual
		2 -Not Used
		3 -Not Used
		4 -Electronic
	B	-Observed amount of Doppler shift in blue wing in tenths of Angstroms
	R	-Observed amount of Doppler shift in red wing in tenths of Angstroms.
	Note:	/ -indicates not measured or not applicable
		0 -indicates no shift
		9 -indicates shifts equal to or greater than 0.9 Angstroms

		AA	-Associated remarks. Use // as a filler or use any combination of the following:
			1 -Flare associated
			2 -Brilliant intensity emission for at least one-third of the time
			3 -Normal intensity emission for at least one-third of the time
			0 -No other effects
	9NNNN	9	-Numerical filler
		NNNN	-SEC region number. Use //// if not applicable.
	QXXYY	Q	-Quadrant location of activity coded according to: (**See Note 3**)
			1 -Northeast
			2 -Southeast
			3 -Southwest
			4 -Northwest
		XX	-Central Meridian Distance in whole degrees
		YY	-Latitude of the activity in whole degrees
Line 4a	22222	Data continuation line indicator (permitted only for AFS, ADF, and DSF, mandatory for DSF).	
	WWW/D	WWW	-The mean width of the filament in tenths of a degree (WW.W). Generally reported to the nearest half degree.
		/	-Filler
		D	-Density. A subjective estimate of the filament's density coded according to:
			1 -Faint
			2 -Normal
			3 -Dark
	3qFFF	3	-Numerical filler (3rd group)
		q	-Quality. The observability of the filament's fine structure coded according to:
			0 -Fine structure unobservable
			1 -Fine structure barely visible
			2 -Fine structure apparent
			3 -Fine structure distinctive
		FFF	-Fine structure angle. Report whole degrees measured clockwise from the filament's orientation. Encode as /// if the quality is unobservable (q = 0).
	99999	End of data indicator (include at end of last data line)	

Notes:

1. Do not include data for more than one GMT day in a single message. Repeat lines 4 and 4a as often as necessary. Include data for only one phenomenon on a single data line 4 or 4a.

2. For filaments which disappear overnight: Report the last time the filament was observed as the DSF start time, with a time qualifier of s = 3, "Activity started after GGgg"; and the time the

filament was first observed to be absent as the DSF end time, with a time qualifier of e = 2, "Activity ended before GGgg". Coordination with other observatories to narrow this time period is permitted. Report the location of the DSF as its position at the time the filament was last visible. As with all other DALAS messages, the date of the message (DD) must correspond to the activity start time. If the period between activity start and end exceeds 24 hours, the DALAS code can't be used to report the overnight DSF. Instead, report all relevant information about the DSF in a scheduled or unscheduled PLAIN language message.

3. DALAS features equal to or less than 5 degrees in length may be reported with only one QXXYY group located by the centroid. As needed, up to three QXXYY groups may be used to indicate the two end points and one intermediate point. If more than three QXXYY groups are required to adequately describe a filament, either report the additional groups in an appended plain language message or divide the filament into sections and report them in separate DALAS messages.

4.4. Sunspot Code (SPOTS). Use this code to make routine reports of sunspots as observed with an optical telescope viewing in integrated (white) light. **(See Note 1)**

Line 1 MANOP heading
Line 2 SPOTS
Line 3 IIiii YMMDD 3GGgg 4Tqnn
Line 4 11111 2SJJJ QXXYY LLAAA //NNN 6ZPCM 9NNNN 99999

Line 1	MANOP heading		
Line 2	SPOTS	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of the year
		MM	-Number of the month
		DD	-Day of the month (corresponding to the GGgg time group)
	3GGgg	3	-Numerical filler (3rd group)
		GGgg	-Time of the observation midpoint (hour and minutes, GMT)
	4Tqnn	4	-Numerical filler (4th group)
		T	-Method or type of observation coded according to: 1 -Visual 2 -Not Used 3 -Projection 4 -Electronic
		q	-Quality of the observation coded according to: 1 -Very poor 2 -Poor 3 -Fair 4 -Good 5 -Excellent 6 -No observation, weather causes 7 -No observation, equipment problem

			8 -No observation, other causes
		nn	-Number of data lines contained in this message
Line 4	11111	Data line indicator (**See Notes 1 and 2**)	
	2SJJJ	2	-Numerical filler (2nd group)
		S	-Status of the report coded according to: 1 -Preliminary estimate 2 -Final report 3 -Correction 4 -Deletion
		JJJ	-Local sunspot group number assigned independently by each observatory (not necessarily reported in sequential order within a SPOTS message)
	QXXYY	Q	-Quadrant location of the sunspot group coded according to: 1 -Northeast 2 -Southeast 3 -Southwest 4 -Northwest
		XX	-Central Meridian Distance of the sunspot group (whole degrees)
		YY	-Latitude of the sunspot group (whole degrees)
	LLAAA	LL	-Heliographic extent (i.e., length) of the sunspot group (in whole heliographic degrees). The heliographic extent is defined as the distance between the most extreme edges of the two most widely separated spots, measured along the group's major axis, which may not necessarily be parallel to the latitude lines. (Previously referred to as longitudinal extent.)
		AAA	-Corrected total area of the sunspot group in tens of millionths of the solar hemisphere. (Example: For 20 millionths, encode 002.)
	//NNN	//	-Fillers
		NNN	-Number of distinct umbra in the sunspot group. Use zero(s) as fill. (Example: Two distinct sunspots are observed. One spot has a single umbra, while the other has three umbra within the same penumbra. Encode 004.)
	6ZPCM	6	-Numerical filler (6th group)
		Z	-Sunspot Class (based on modified Zurich evolutionary sequence) according to: 1 A -Unipolar; no penumbra; length (normally) less than 3 heliographic degrees 2 B -Bipolar; no penumbra; length (normally) 3 degrees or greater 3 C -Bipolar; penumbra on only one pole 4 D -Bipolar; penumbra on both poles; length less than or equal to 10 degrees 5 E -Bipolar; penumbra on both poles; length greater than10, but less than or equal to 15 degrees

		6	F	-Bipolar; penumbra on both poles; length greater than 15 degrees
		7	H	-Unipolar; with penumbra
	P	-Penumbral Class (based on largest penumbra) according to:		
		0	x	-No penumbra
		1	r	-Rudimentary penumbra
		2	s	-Small symmetric penumbra
		3	a	-Small asymmetric penumbra
		4	h	-Large symmetric penumbra
		5	k	-Large asymmetric penumbra
	C	-Sunspot Distribution within the group according to:		
		/	x	-Single spot or unipolar spot group
		7	o	-Open distribution
		8	i	-Intermediate distribution
		9	c	-Compact distribution
	M	-Magnetic classification coded according to:		
		1		-Alpha
		2		-Beta
		3		-Beta-gamma
		4		-Gamma
		5		-Beta-delta
		6		-Beta-gamma-delta
		7		-Gamma-delta
9NNNN	9	-Numerical filler		
	NNNN	-SEC region number. Use //// if not applicable.		
99999	End of data indicator (include at end of last data line)			

Notes:

1. When observations reveal no sunspots on the solar disk, transmit a truncated SPOTS report to indicate that observations were possible but no sunspots were visible. This truncated report includes all data through line 3 of the SPOTS code. A typical example of this message is:

```
AXXX63 APLM DDGGgg
SPOTS
IIiii YMMDD 3GGgg 4Tqnn 99999
```

For a "fair" quality observation by projection technique with no visible sunspots, the 4Tqnn group would be encoded 43300.

2. Repeat line 4 as often as necessary. Include data for only one sunspot group on a single data line.

4.5. Histogram History Code (HSTRY). This code is used to make routine, automated reports of videometer box data for selected solar regions of interest. Messages contain brightness and uncorrected area data for each minute of the previous hour.

Line 1	MANOP heading
Line 2	HSTRY
Line 3	IIiii YMMDD 3//nn
Line 4	RRRR/ HHMM/ PPABC PPABC ....
Line 4a	PPABC PPABC 99999

Line 1	MANOP heading		
Line 2	HSTRY	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of the year
		MM	-Number of the month
		DD	-Day of the month (corresponding to the HHMM time group)
	3//nn	3	-Numerical filler (3rd group)
		//	-Fillers
		nn	-Number of data lines
Line 4	RRRR/	SEC region number	
	HHMM/	Hour and minute of first data group (GMT)	
	PPABC	PP	-Peak brightness (tens of percent of the quiet sun)
		ABC	-Plage area (A.B x 10^C millionths of the solar hemisphere)
Line 4a	PPABC	As defined in line 4. Repeat group as necessary to code all data.	
	99999	End of data indicator (include at end of last data line).	

Note: There are 60 PPABC groups in a routine message, one for each minute of the hour. If data are not available for that minute, ///// is encoded. If data are not available for the region, no message is transmitted. Repeat line 4 for multiple region messages.

4.6. Videometer Box Dimension Outline (BXOUT). This code is used by observatories equipped with the AN/FMQ-7 solar optical telescope to report videometer box size and position information.

Line 1	MANOP heading
Line 2	BXOUT
Line 3	IIiii YMMDD 3//nn
Line 4	BOX CENTER REGION CENTER
Line 5	RGN HIGH WIDE P-ANGL RV LAT LON P-ANGL RV LAT LON SEQ
Line 5a	RRRR HHHH WWWW SP.PPP R.RRR TTT NNN DDD.D R.RRR YYY XXX VV/N
Line 6	TIME: SSSSSSSSS.SS (DDD HHMM:SS) 99999

Line 1	MANOP heading		
Line 2	BXOUT	Data Identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of the year
		MM	-Number of the month
		DD	-Day of the month (corresponding to the time in line 6)

	3//nn	3	-Numerical filler (3rd group)
		//	-Fillers
		nn	-Number of data lines
Line 4	BOX CENTER		-Column header for box center information
	REGION CENTER		-Column header for region center information
Line 5	RGN		-Column header for Region ID
	HIGH		-Column header for height dimension of videometer box
	WIDE		-Column header for width dimension of videometer box
	P-ANGL		-Column header for position-angle of center of videometer box
	RV		-Column header for radius vector to center of the videometer box
	LAT		-Column header for heliographic latitude at center of videometer box
	LON		-Column header for heliographic longitude at center of videometer box
	P-ANGL		-Column header for geocentric position angle to center of region
	RV		-Column header for radius vector to region center
	LAT		-Column header for heliographic latitude at region center
	LON		-Column header for heliographic longitude at region center
	SEQ		-Column header for identifying region observing sequence position
Line 5a	RRRR		-SEC (or locally defined) region number (**See Note**)
	HHHH		-Height of videometer box (arc seconds)
	WWWW		-Width of videometer box (arc seconds)
	SP.PPP	S	-Sign of the position angle (M=negative, blank=positive)
	P.PPP		-Value of the position angle (radians) to box center
	R.RRR		-Value of the radius vector to box center
	TTT		-Heliographic latitude at box center (e.g., N32)
	NNN		-Heliographic longitude at box center (e.g., W60)
	DDD.D		-Geocentric position angle to center of region (degrees)
	R.RRR		-Value for the radius vector to region center
	YY		-Heliographic latitude at region center
	XX		-Heliographic longitude at region center
	VV/N	VV	-Observing subsequence identifier (transmit "//" if not used)
		/	-Filler
		N	-Position in the subsequence (transmit "/" if not used)
Line 6	TIME:		-Header for time of the data
	SSSSSSSSS.SS		-Time of data in seconds since start of the year (GMT)
	DDD		-Day of the data (Julian Date)
	HHMM:SS		-Hour, minute, and second of the data (GMT)
	99999	End of data indicator (include at end of last data line).	

Note: Repeat line 5a as often as necessary to include all videometer boxes. (Height refers to television screen used to display image of the sun, not to height above a point on the sun.)

Chapter 5

SOLAR RADIO CODES

5.1. Discrete Solar Radio Burst Code (BURST). Use this code to make event-level or routine reports of impulsive, solar radio bursts as measured on a discrete (fixed) frequency radiometer.

Line 1	MANOP heading
Line 2	BURST
Line 3	IIiii YMMDD 3ppnn
Line 4	11111 qSLJJ FFabp Tuabp GGbbt GGmmt 7abpp GGeet 9abpp 99999

Line 1	MANOP heading			
Line 2	BURST	Data identifier, alphabetic character		
Line 3	IIiii	II	-World Meteorological Organization block number	
		iii	-World Meteorological Organization station number	
	YMMDD	Y	-Last digit of the year	
		MM	-Number of the month	
		DD	-Day of the month (corresponding to burst start time; **See Note 1**)	
	3ppnn	3	-Numerical filler (3rd group)	
		pp	-Highest power of p in the following FFabp peak flux groups **(See Note 2)**	
		nn	-Number of data lines in this message	
Line 4	11111	Data line indicator **(See Note 1)**		
	qSLJJ	q	-Quality of the data coded according to:	
			0	-Origin of burst uncertain, possible Radio Frequency Interference (RFI)
			1	-Uncertain data due to interference from a solar noise storm or RFI
			2	-Uncertain data due to equipment problem, weather, or antenna shadowing
			3	-Good data, manual reduction
			4	-Good data, automatic reduction
		S	-Status of the report coded according to:	
			1	-Preliminary estimate
			2	-Final report
			3	-Correction
			4	-Deletion **(See Note 3)**
		L	-Time qualifier coded according to **(See Note 4)**:	
			0	-Times correct as reported
			1	-Start uncertain
			2	-Peak uncertain
			3	-Start and peak uncertain
			4	-End uncertain
			5	-End and peak uncertain

	JJ	-Local burst serial number assigned independently by each observatory (normally assigned sequentially by GMT day) **(See Notes 5 and 6)**
FFabp	FF	-Frequency indicator coded according to: 00- -Less than 150 MHz 11 -150 to 299 MHz (Used for 245 MHz) 22 -300 to 499 MHz (Used for 410 MHz) 33 -500 to 999 MHz (Used for 610 MHz) 44 -1,000 to 1,999 MHz (Used for 1,415 MHz) 55 -2,000 to 3,999 MHz (Used for 2,695 MHz) 66 -4,000 to 7,999 MHz (Used for 4,995 MHz) 77 -8,000 to 11,999 MHz (Used for 8,800 MHz) 88 -12,000 to 19,999 MHz (Used for 15,400 MHz) 99 -20,000 MHz or greater
	ab	-First two significant figures of the peak flux value observed at a frequency within the range indicated by FF **(See Note 7)**
	p	-Power of 10 applied to "a.b" to give the peak flux value in standard solar flux units (sfu) **(See Note 7)**
TUabp	T	-Spectral class according to: 0 -Not classified 9 -Castelli-U **(See Note 8)**
	U	-Type of burst according to: 1 -NOISE STORM or FLUCTUATIONS 2 -GRADUAL RISE AND FALL (non-impulsive) 3 -IMPULSIVE (less than 500 sfu) **(See Note 9)** 4 -COMPLEX (less than 500 sfu) **(See Note 9)** 5 -GREAT BURST (500 sfu or greater) 6 -COMPLEX GREAT (500 sfu or greater)
	ab	-First two significant figures of mean flux value **(See Note 7)**
	p	-Power of 10 applied to "ab" to give the mean flux value in standard sfu units **(See Note 7)**
GGbbt		-Start time (or time burst was initially observed). Record hour, minute, and tenth of minute, GMT; if the start time is unknown or uncertain, use "/" for tenth of minute.
GGmmt		-Time of the burst maximum. Record hour, minute, and tenth of minute, GMT; if the maximum time is unknown or uncertain, use "/" for tenth of minute. In preliminary reports, this peak is only a provisional value.
7abpp	7	-Numerical filler (7th group)
	ab	-First two significant figures of the integrated flux value from start of burst to time of burst maximum **(See Note 10)**
	pp	-Power of 10 applied to "a.b" to give integrated flux value in standard sfu-sec units **(See Note 10)**
GGeet		-End time (or time burst was last observed). Record hour, minute, and tenth of minute, GMT; if the end time is unknown or uncertain, use "/" for tenth of minute. **Note:** If coded message

		is transmitted before the burst has ended (preliminary report), encode ///// for GGeet.
9abpp	9	-Numerical filler (9th group)
	ab	-First two significant figures of the integrated flux value from start of burst to end of burst **(See Note 10)**
	pp	-Power of 10 applied to "a.b" to give integrated flux value in standard sfu-sec units **(See Note 10)**
99999	End of data indicator (include at end of last data line)	

Notes:

1. Do not include data for more than one GMT day in a single message. Repeat line 4 as often as necessary. Include data for only one frequency on a single data line.

2. The pp indicator in line 3 is a safeguard should any of the p values be garbled in lines 4. Repeat the highest p value assigned to any of the peak fluxes of the FFabp groups as pp in line 3. For example, if highest p value equals 2, then pp is encoded as 22.

3. If a preliminary event-level burst is transmitted in error (e.g., caused by RFI, not occurring, or not event-level), immediately transmit a deletion using the event header (SXXX_ _, where _ _ is the specific numeric designator for each site) and the deletion code "4", and attach a short PLAIN message stating the event was transmitted in error.

4. This only applies to uncertainty in hours and full minutes. It does not apply to uncertainty in tenth of minutes.

5. JJ is the same number for each frequency reported that, in the analyst's judgment, gives burst information associated with the same event. Noise storms on different frequencies will have separate serial numbers assigned, to facilitate ending the noise storms independently.

6. If a distinctly separate burst is superimposed on a non-impulsive burst, a noise storm, or on the decaying stage of a large burst, treat it as a separate burst and assign a different burst serial number.

7. If, for example, the first two significant figures of a flux reading are 52, then a = 5 and b = 2. If the actual reading is 52 solar flux units (sfu) (1 sfu = 10^{-22} watt/m^2/Hz), then p = 1 and abp = 521 (for 5.2×10^1). Similarly, if the actual reading is 5200 sfu, then p = 3, and abp = 523 (for 5.2×10^3). Do not report mean flux for noise storms or fluctuations, instead encode "000". Mean flux estimates for other types of bursts are required, even during manual operations.

8. When a Castelli-U event occurs, continue to report the maximum peaks for each frequency, rather than the peaks used in defining the Castelli-U.

9. Bursts of less than 50 sfu will not normally be reported unless they are significant and/or contribute to the understanding of what is occurring. Examples: Gradual Rise and Fall bursts, or

bursts that are part of a spectral group, should be reported even when their peaks are less than 50 sfu.

10. The standard unit of integrated flux is the solar flux unit-second, where 1 sfu-sec equals 10^{-22} watt-sec/m^2/Hz or 10^{-22} joule/m^2/Hz. Encode an integrated flux of 564,000 sfu-sec as 75605 (or 95605), which equals 5.6 x 10^{-17} watt-sec/m^2/Hz. Do not report integrated fluxes for noise storms or fluctuations; reporting these fluxes are optional for other types of bursts during manual operations, since they can be computed later from the time and mean flux data in the message. If an integrated flux value is not reported, replace the abpp with ////.

5.2. Spectral Solar Radio Burst Code (SWEEP). Use this code to make event-level or routine reports of the solar radio spectrum, as measured on a Solar Radio Spectrograph (SRS) or Sweep Frequency Interferometric Radiometer (SFIR).

Line 1	MANOP heading
Line 2	SWEEP
Line 3	IIiii YMMDD 3//nn
Line 4	11111 cqSJJ GGggt TIfff FFFF/ GGggt 7vvvv PPPRR 99999

Line 1	MANOP heading		
Line 2	SWEEP	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of the year
		MM	-Number of the month
		DD	-Day of the month (corresponding to burst start time**; See Note 1**)
	3//nn	3	-Numerical filler (3rd group)
		//	-Fillers
		nn	-Number of data lines in this message
Line 4	11111	Data line indicator **(See Note 1)**	
	cqSJJ	c	-Certainty of sweep type identification according to: 1 -Certain 2 -Uncertain
		q	-Quality of sweep frequency data coded according to: 1 -Certain frequency range 2 -Uncertain frequency range
		S	-Status of the report coded according to: 1 -Preliminary estimate 2 -Final report 3 -Correction 4 -Deletion
		JJ	-Local sweep serial number assigned independently by each observatory (normally assigned sequentially by GMT day). **(See Note 2)**

GGggt		-Start time (or time sweep was initially observed). Record hour, minute, and tenth of minute, GMT; if start time is unknown or uncertain, use "/" for tenth of minute.
TIfff	T	-Type of the sweep coded according to: 1 -Not Used 2 -Type II (slow drift) burst 3 -Type III (fast drift) burst; one or more bursts over a period of less than 10 minutes 4 -Type IV (smooth broadband continuum) burst 5 -Type V (continuum tail on a Type III) burst; one or more bursts over a period of less than 10 minutes (may include some pure Type III bursts) 6 -Series of Type III bursts over a period of 10 minutes or more, with no period longer than 30 minutes without activity 7 -Series of Type III and Type V bursts over a period of 10 minutes or more, with no period longer than 30 minutes without activity 8 -Continuum (broadband continuum, possibly with Type III and/or Type V bursts superimposed) 9 -Unclassified activity
	I	-Importance of the sweep coded according to: 1 -Minor 2 -Significant 3 -Major / -Data not available
	fff	-Low frequency end of sweep (MHz). Use zero(s) as fill.
FFFF/	FFFF	-High frequency end of sweep (MHz). Use zero(s) as fill.
	/	-Filler
GGggt		-End time (or time sweep was last observed). Record hour, minute, and tenth of minute, GMT; if the end time is unknown or uncertain, use "/" for tenth of minute. Note: If coded message is transmitted before the sweep has ended (preliminary report), encode ///// for GGggt.
7vvvv	7	-Numerical filler (7th group)
	vvvv	-Estimated shock velocity for Type II bursts (km/sec). Encode //// if data are not available. Use zero(s) as fill.
PPPRR	PPP	-Position angle of source of activity measured eastward from apparent heliographic north. Encode /// if data are not available.
	RR	-Radial distance from the center of the sun to the source of activity in units of tenths of the apparent solar optical radius. Encode "//" if data are not available.
99999	End of data indicator (include at end of last data line)	

Notes:

1. Do not include data for more than one GMT day in a single message. Repeat line 4 as often as necessary. Include data for only one spectral burst (sweep) on a single data line.

2. JJ will be a unique identification number for each spectral burst reported, even if two or more sweep types are superimposed in time. Report a superimposed sweep separately from other sweep types when it is one or two importance categories higher, or is associated with a discrete frequency burst. Assign the sweep serial numbers separately from the discrete frequency burst serial numbers.

5.3. Integrated Solar Radio Flux Code (IFLUX). Use this code to report the background component of the solar radio flux as measured on discrete (fixed) frequency radiometers at local noon daily.

Line 1	MANOP heading
Line 2	IFLUX
Line 3	IIiii YMMDD 3GGgg 4S/nn
Line 4	11111 FFFFF qffff FFFFF qffff FFFFF qffff FFFFF qffff
Line 4a	11111 99999

Line 1	MANOP heading		
Line 2	IFLUX	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of year
		MM	-Number of the month
		DD	-Day of the month (corresponding to the GGgg time group)
	3GGgg	3	-Numerical filler (3rd group)
		GGgg	-Begin time of the flux measurements (hours and minutes, GMT)
	4S/nn	4	-Numerical filler (4th group)
		S	-Status of the report coded according to: 1 -Preliminary estimate 2 -Final report 3 -Correction 4 -Deletion
		/	-Filler
		nn	-Number of frequencies (i.e., data pairs "FFFFF qffff") reported in this message
Line 4	11111	Data line indicator **(See Note 1)**	
	FFFFF		-Frequency (MHz) at which the following flux measurement was made. Use zero(s) as fill. **(See Note 2)**
	qffff	q	-Quality of observation coded according to: 1 -Good quality 2 -Uncertain quality due to weather 3 -Uncertain quality due to interference

4 -Uncertain quality due to unknown causes
5 -Uncertain quality due to burst in progress

ffff -Flux (1 solar flux unit (sfu) = $10^{-22}W/m^2/Hz$). Use zero(s) as fill.

99999 End of data indicator (include at end of last data line)

Notes:

1. A full data line 4 includes 11111 followed by data for four frequencies. The final data line 4a of the message will include 11111 and data for one to four frequencies followed by 99999. Include data for only one "GGgg" time on a single data line 4 or 4a.

2. Transmit a "FFFFF qffff" data group for each operational fixed frequency. If no data are available for a particular frequency, omit the corresponding "FFFFF qffff" data group. If flux values are acquired from each antenna sequentially, vice simultaneously, send separate messages using the applicable "GGgg" times.

Chapter 6

IONOSPHERIC CODES

6.1. Automated Ionospheric Data Code (IONOS). This code is used to make routine reports of standard parameter data observed by an automated vertical incidence ionosonde.

Line 1	MANOP heading
Line 2	IONOS
Line 3	IIiii YMMDD 3//nn
Line 4	GGgg0 F2F2F2H2H2 F1F1F1H1H1 EEEHEHE EsEsEsMM FmFmYeYeQ
Line 5	ZELpN SELpN AELpN BELpN CELpN DELpN EELpN FELpN GELpN HELpN
Line 6	ZF1pN SF1pN AF1pN BF1pN CF1pN DF1pN EF1pN FF1pN GF1pN HF1pN
Line 7	ZF2pN SF2pN AF2pN BF2pN CF2pN DF2pN EF2pN FF2pN GF2pN HF2pN
Line 8	99999

Line 1	MANOP heading		
Line 2	IONOS	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of year
		MM	-Number of month
		DD	-Day of month (corresponding to the GGgg time group)
	3//nn	3	-Numerical filler (3rd group)
		//	-Fillers
		nn	-Number of observations **(See Note 1)**
Line 4	GGgg0	GGgg	-Time of observation to nearest minute (GMT)
		0	-Filler
	F2F2F2H2H2	F2F2F2	-Value of foF2 to nearest tenth MHz
		H2H2	-True height of F2 layer maximum in tens of kilometers
	F1F1F1H1H1	F1F1F1	-Value of foF1 to nearest tenth MHz
		H1H1	-True Height of F1 layer maximum in tens of kilometers
	EEEHEHE	EEE	-Value of foEs to nearest tenth MHz
		HEHE	-True Height of E layer maximum in tens of kilometers
	EsEsEsMM	EsEsEs	-Value of foEs to nearest tenth MHz
		MM	-M(3000) factor to nearest tenth
	FmFmYeYeQ	FmFm	-Minimum detected frequency to nearest tenth MHz. A minimum observed frequency (fmin) value greater than 9.9 MHz will be replaced by 9.9 MHz.
		YeYe	-Half thickness of E-layer (parabolic fit) in kilometers
		Q	-Qualifier: If any of the above data are missing, the reason is indicated according to the following table. Only a reason for the first missing element will be coded. 1 -Blanketing Sporadic E 2 -Non-Deviative Absorption (fmin elevated) 3 -Equipment outage

			4 -foF2 greater than equipment upper limit
			5 -foF2 less than equipment lower limit
			6 -Spread F
			7 -foF2 less than foF1
			8 -Interference
			9 -Deviative Absorption in vicinity of foF2
			0 -No qualifier applies
Line 5			-Up to 10 five-character groups, which define the E region electron density profile as determined by the ionosonde's automated data reduction routine **(See Notes 2 and 3)**.
	XXXpN		-Each five-character group (XXXpN) provides a quantity required to calculate the electron density profile, using a representation by Chebychev polynomials. All five-character groups have the same structure:
		XXX	-Three most significant digits of the respective quantity expressed in scientific notation. Those three digits are represented as "X.XX".
		p	-Sign indicator of XXX and N according to:
			7 -XXX and N negative
			8 -XXX negative, N positive
			9 -XXX positive, N negative
			0 -XXX and N positive
		N	-Power of 10 to which XXX is raised
	ZELpN		-Height of E-layer maximum (A_0 in Chebychev polynomials for E-layer); in kilometers, after conversion using above rules
	SELpN		-Start frequency of E-layer; in MHz, after conversion using above rules
	AELpN		-A_1, first of up to eight coefficients which define the E-layer segment of the true height profile; in kilometers, after conversion using above rules
	BELpN ...		-Are the same format as AELpN; they are the coefficients A_2, A_3, ..., A_8 in Chebychev polynomials, for E-layer
Line 6			-Same as Line 5, but for F1 layer
Line 7			-Same as Line 5, but for F2 layer
Line 8	99999	End of data indicator (include at end of last data line).	

Notes:

1. Under current polling procedures and software design, there will be data for only one ionogram per message (the last hourly or half-hourly ionogram run prior to polling). Therefore, 3//nn will always be coded as 3//01.

2. The number of coefficients is variable, depending on the complexity of the true height profile. If less than eight coefficients are used for a given layer, the remaining five-character positions are filled with solidi (/).

3. If E, F1, or F2-layer electron density profile data are absent, the whole corresponding line (all ten five-character groups) will be filled with solidi (/). In the case where data for all three layers are absent, Lines 5, 6, and 7 will all be filled with solidi.

6.2. Ionospheric Height Code (IONHT). This code is used to make routine reports of the virtual height (**See Note 1**) of the main ionospheric echo (the ordinary, or "O", trace) as a function of frequency, as observed by an automated vertical incidence ionosondes.

Line 1	MANOP heading
Line 2	IONHT
Line 3	IIiii YMMDD 3/nnn
Line 4	GGgg0 FFFHH FFFHH FFFHH .... FFFHH
Line 4a	FFFHH FFFHH 99999

Line 1	MANOP heading		
Line 2	IONHT	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of year
		MM	-Number of month
		DD	-Day of month (corresponding to the GGgg time group)
	3/nnn	3	-Numerical filler (3rd group)
		/	-Filler
		nnn	-Number of FFFHH data groups in this report
Line 4	GGgg0	GGgg	-Time of observation to nearest minute (GMT) **(See Note 2)**
		0	-Filler
	FFFHH	FFF	-Frequency of observed O-trace reflection to nearest tenth MHz
		HH	-Virtual height of O-trace reflection in tens of kilometers
Line 4a	FFFHH		-Repeat FFFHH until all groups are sent. Use ten groups per line. Never exceed 66 characters and spaces per line. (Line 4, due to the GGgg0 group, has a maximum of nine FFFHH groups.) **(See Note 3)**
	99999	End of data indicator (include at end of last data line)	

Notes:

1. Virtual height is the apparent height of a reflecting layer. It is determined by multiplying the round trip travel time of the sounder pulse by one-half the speed of light in a vacuum.

2. Under current polling procedures and software design, there will be data for only one ionogram per message (the last hourly or half-hourly ionogram run prior to polling).

3. Repeat line 4a as often as is necessary. Send as many frequency-height groups as necessary to define the virtual height profile (normally less than 300). The total number of groups sent must match the number in line 3.

6.3. Total Electron Content and Scintillation Code (TELSI). This code is used to make routine or special reports of the equivalent total electron content (TEC) and ionospheric scintillation (variability) along paths between GPS/NAVSTAR satellites and an automated Ionospheric Measuring System (IMS) instrument.

Line 1 MANOP heading
Line 2 TELSI
Line 3 IIiii YMMDD 3GGgg 4SRnn 5S1S2S3S4 6nN//
Line 4 Nnnggddq tttdddeq LLLLLoLoLoLo txtxtxtytytyeq1q2 lllllolololo
Line 4a 1sssvvv 2sssvvv 3S1S1S1S2S2S2 lllllolololo tststststs
Line 4b JJJJTTTS JxJxJxJxTxTxTxS lllllolololo JnJnJnJnTnTnTnS lllllolololo 8PPPPPxPxPxPnPnPn
Line 5 (Same as Line 4, but used for second satellite in field of view of ground station)
Line 5a (Same as Line 4a, but used for second satellite in field of view of ground station)
Line 5b (Same as Line 4b, but used for second satellite in field of view of ground station)
Line 6, 6a, 6b (Used for a third satellite in view of ground station)
Line 7, 7a, 7b (Used for a fourth satellite in view of ground station) 99999

Line 1	MANOP heading		
Line 2	TELSI	Data identifier, alphabetic character	
Line 3	IIiii	II	-World Meteorological Organization block number
		iii	-World Meteorological Organization station number
	YMMDD	Y	-Last digit of the year
		MM	-Number of the month
		DD	-Day of the month (corresponding to the GGgg time group)
	3GGgg	3	-Numerical filler (3rd Group)
		GGgg	-Ending time of observation period, in hours and minutes, GMT
	4SRnn	4	-Numerical filler (4th group)
		S	-Data quality indicator coded according to: 0 to 9 (TBD when critical system components are identified.)
		R	-Period of transmission of message coded according to: **(See Note 1)** 1 -Message transmitted every 15 minutes 2 -Message transmitted every 30 minutes 3 -Message transmitted every 45 minutes 4 -Message transmitted every 60 minutes
		nn	-Number of coded lines in message to follow
	5S1S2S3S4	5	-Numerical filler (5th group)
		S1	-Number of satellites reported during first 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)
		S2	-Number of satellites reported during second 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)
		S3	-Number of satellites reported during third 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)

	S4	-Number of satellites reported during fourth 15-minute interval (coded as "0" if no satellites are present, or as "/" if the interval is not reported)
6nN//	6	-Numerical filler (6th group)
	n	-Message number in this sequence of messages
	N	-Number of messages in this sequence of messages
	//	-Filler

Lines 4,5,6,7

Nnnggddq	N	-Line number, coded as 4 corresponding to data set for first satellite, 5 for second satellite, 6 for third satellite, and 7 for fourth satellite **(See Note 2)**
	nn	-Identification number assigned to each GPS/NAVSTAR satellite
	gg	-Ending time of the observation interval in minutes for the data set corresponding to this line. For example, if three 15-minute intervals were reported in a message with an end time of observation equal to 1700, gg would be 30 for the first line (corresponding to 1630), 45 for the second line (1645), and 60 for the third line (1700). **(See Note 3)**
	dd	-Interval period of the data set in minutes
	q	-Data quality indicator (0 to 9). TBD.
tttdddeq	ttt	-Mean equivalent vertical TEC for the interval period at the centroid Ionospheric Penetration Point (IPP) of the ray path between the satellite and the receiver measured in three significant digits to the nearest tenth **(See Note 4)**
	ddd	-Standard deviation from the mean equivalent vertical TEC measured in three significant digits to the nearest tenth
	e	-Power of ten (exponent) of the mean equivalent vertical TEC and standard deviation coded according to: **(See Note 6)** 5 = x 10^{15} electrons 6 = x 10^{16} electrons 7 = x 10^{17} electrons 8 = x 10^{18} electrons 9 = x 10^{19} electrons
	q	-Accuracy indicator (0 to 9). TBD for mean TEC over interval.
LLLLLoLoLoLo		
	LLLL	-Latitude of the satellite subtrack at the midpoint of the observation period (interval) measured in degrees to the nearest tenth **(See Note 5)**
	LoLoLoLo	-Longitude of the satellite subtrack at the midpoint of the observation period (interval) measured in degrees to the nearest tenth **(See Note 5)**
txtxtxtytytyeq1q2		

		txtxtx	-Maximum equivalent vertical TEC within the interval period measured at the IPP between the satellite and receiver in three significant digits to the nearest tenth **(See Note 4)**
		tytyty	-Minimum equivalent vertical TEC within the interval period measured at the IPP between the satellite and receiver in three significant digits to the nearest tenth **(See Note 4)**
		e	-Power of then (exponent) of the maximum and minimum equivalent vertical TEC code according to: **(See Note 7)** 5 = x 10^{15} electrons 6 = x 10^{16} electrons 7 = x 10^{17} electrons 8 = x 10^{18} electrons 9 = x 10^{19} electrons
		q1q2	-Accuracy indicators (0 to 9). TBD for max and min TEC during observation interval.
	lllllolololo	llll	-Latitude of IPP location coincident with TEC maximum measured in degrees to the nearest tenth **(See Note 5)**
		lolololo	-Longitude of IPP location coincident with TEC maximum measured in degrees to the nearest tenth **(See Note 5)**
Lines 4a,5a,6a,7a			
	1sssvvv	1	-Numerical filler (1st group) which identifies data associated with 1.2 GHz satellite signals
		sss	-Mean Amplitude Scintillation Index (S4) at 1.2 GHz averaged over the observation interval measured as a ratio of the standard deviation of received signal power to the mean received power measured to nearest hundredth of a unit (s.ss) **(See Note 8)**
		vvv	-Standard deviation of the mean Amplitude Scintillation Index (S4) at 1.2 GHz, measured to the nearest hundredth of a unit (v.vv)
	2sssvvv	2	-Numerical filler (2nd group) which identifies data associated with 1.6 GHz satellite signals
		sss	-Mean Amplitude Scintillation Index (S4) at 1.6 GHz averaged over the observation interval measured as a ratio of the standard deviation of received signal power to the mean received power measured to the nearest hundredth of a unit (s.ss) **(See Note 8)**
		vvv	-Standard deviation of the mean Amplitude Scintillation Index (S4) at 1.6 GHz, measured to the nearest hundredth of a unit (v.vv)
	3S1S1S1S2S2S2		
		3	-Numerical filler (3rd group)
		S1S1S1	-Maximum Amplitude Scintillation Index (S4) at 1.2 GHz measured to nearest hundredth of a unit (S1.S1S1)
		S2S2S2	-Maximum Amplitude Scintillation Index (S4) at 1.6 GHz measured to nearest hundredth of a unit (S2.S2S2)

lllllolololo	llll	-Latitude of IPP location coincident with S4 maximum measured at 1.2 GHz in degrees to nearest tenth **(See Notes 5 and 9)**
	lolololo	-Longitude of IPP location coincident with S4 maximum measured at 1.2 GHz in degrees to nearest tenth **(See Notes 5 and 9)**
tstststststs		-Time at which maximum S4 was observed during the observation period (HHMMSS, GMT)

Lines 4b,5b,6b,7b

JJJJTTTS	JJJJ	-Mean Phase Scintillation Index (sigma-sub-delta-phi) defined as the standard deviation of the measured differential phase in hundredth of radians (JJ.JJ) over the observation interval **(See Note 8)**
	TTT	-Mean spectral strength obtained from measuring differential carrier phase advances between 1.6 GHz and 1.2 GHz frequencies in tenths of decibels (dB) (TT.T)
	S	-Sign of spectral strength (0=positive, 1=negative)
JxJxJxJxTxTxTxS		
	JxJxJxJx	-Phase Scintillation Index measured in hundredths of radians (JxJx.JxJx) at the maximum spectral strength (TxTxTx) **(See Note 10)**
	TxTxTx	-Maximum spectral strength in tenths of decibels (dB) (TxTx.Tx) **(See Note 10)**
	S	-Sign of spectral strength (0=positive, 1=negative)
lllllolololo	llll	-Latitude of IPP location coincident with the worst case identified by maximum spectral strength parameter (TxTxTx) measured in degrees to nearest tenth **(See Note 5)**
	lolololo	-Longitude of IPP location coincident with the worst case identified by maximum spectral strength parameter (TxTxTx) measured in degrees to nearest tenth **(See Note 5)**
JnJnJnJnTnTnTnS		
	JnJnJnJn	-Phase Scintillation Index measured in hundredths of radians (JnJn.JnJn) at the minimum slope parameter (PnPnPn)
	TnTnTn	-Spectral strength in tenths of dBs (TnTn.Tn) for minimum slope parameter (PnPnPn)
	S	-Sign of spectral strength (0=positive, 1=negative)
lllllolololo	llll	-Latitude of IPP coincident with the worst case identified by minimum slope parameter (PnPnPn) measured in degrees to the nearest tenth **(See Note 5)**
	lolololo	-Longitude of IPP coincident with the worst case identified by minimum slope parameter (PnPnPn) measured in degrees to the nearest tenth **(See Note 5)**
8PPPPxPxPxPnPnPn		
	8	-Numerical filler
	PPP	-Slope parameter associated with the mean Phase Scintillation Index measured in units to nearest hundredth (P.PP)

PxPxPx -Slope parameter associated with the worst case due to maximum spectral strength (TxTxTx) measured in units to nearest hundredth (Px.PxPx)

PnPnPn -Minimum slope parameter associated with the worst measured in units to nearest hundredth **(See Note 10)**

99999 End of data indicator (include at end of last data line)

Notes:

1. For messages sent at 15-minute periods of transmission, only one 15-minute data set would be reported. For messages transmitted every 30 minutes, only two 15-minute data sets (observation intervals) would be reported. Messages transmitted once per hour would contain four 15-minute data sets.

2. Lines 5 through 7 are only used when needed to report data from a constellation of 2, 3, or 4 satellites within the field of view of the IMS during the reporting period of the messages.

3. Lines 4 through 7 are repeated for each data set corresponding to a time interval within the message. For example, a message transmitted once per hour containing four 15-minute data sets and 4 satellites within the field of view for the entire period would have 3 lines for each 15-minute period for satellite 1 (Lines 4, 4a, 4b), 3 lines for each 15-minute period for satellite 2 (Lines 5, 5a, 5b), etc. Thus, 3 lines per satellite per period, for 4 satellites, for 4 periods, would equate to 48 lines.

4. The Ionospheric Penetration Point (IPP) is defined to be where the ray path between the GPS/NAVSTAR satellite and the IMS intersects 350 km altitude (typically in the F-region).

5. Latitudes and longitudes are expressed to the nearest tenth of a degree. Longitudes run from 0 to 359.9 degrees west of Greenwich. Latitudes run from -90.0 to +90.0, the sign being distinguished by the first coded character (0=positive, 1=negative). Examples: 0675 is 67.5N; while 1675 is 67.5S.

6. If the standard deviation (ddd) is lower by a factor of 10 from the TEC, encode ddd as 0dd (which is two significant digits to nearest tenth) in order to raise the exponent by one. For example, if TEC equals 25.2 x 10^{16} and the standard deviation is 31.1 x 10^{15}, then tttddde is 2520316. If ddd is out of range (too low or high), encode as //9 or //0 respectively.

7. If the minimum (tytyty) TEC is lower by a factor of 10 from the maximum TEC, encode tytyty as 0tyty (which is two significant digits to nearest tenth) in order to raise the exponent by one. For example, if TEC (maximum) equals 35.2 x 10^{16} and TEC (minimum) is 98.1 x 10^{15}, encode txtxtxtytytye as 3520986. If TEC (minimum) is two orders of magnitude lower, encode as 00ty to raise exponent by two; i.e., 98.1 x 10^{14} is reported as 009. If TEC minimum is out of range, encode as //9.

8. Locations of the mean Amplitude Scintillation Index (S4) and mean Phase Scintillation Index (sigma-sub-delta-phi) are assumed to be at the same location (IPP) as the mean TEC (tttddde) group in Line 4.

9. The maximum S4 measured at 1.6 GHz should be in approximately the same location as the maximum S4 at 1.2 GHz.

10. The maximum spectral strength (TxTxTx) and the minimum slope parameter (PnPnPn) derived from the differential carrier phase advances between the two satellite frequencies (1.6 GHz and 1.2 GHz) are considered the worst cases for the occurrence of phase scintillation.

Chapter 7

SPECIAL CODES

7.1. Event Code (EVENT). Use this code for rapid reporting of real-time solar and geophysical events. The activity being reported has a unique identifier depending on the type of data. **Note:** the EVENT code (not to be confused with an encoded message such as BURST that is event-level) is transmitted when responding to a REQST from the SPACEWOC/forecast center. An event code (EVENT) response should also be sent by a similar instrument observatory (e.g., radio or optical), when your observations do not meet event criteria that is reported by another site. For example, if Sagamore Hill transmits an event-level burst of 4000sfus on 245 MHz, and your 245 MHz burst at Palehua has reached a maximum of only 120sfus, then you would transmit a RADNS. If you have already sent an event-level burst message, do not respond with an IP (in progress). If you are not on the sun, respond with a RADNO. These same guidelines apply to optical (SOON) responses. RSTN and SOON sites on the sun should respond only once with the appropriate activity condition. The purpose of the EVENT Code is the rapid exchange of brief event information (or lack of it). The valuable information needed at the forecast centers is the coded preliminary burst, sweep, flare or DALAS messages. EVENT coded data should not be sent when the actual messages are available, and repeated EVENT Code transmissions should be minimized.

Line 1	MANOP heading 555555
Line 2	EVENT
Line 3	IIiii 21/01
Line 4	11111 EEEEE 99999

Line 1	MANOP heading			
	555555	Dummy date/time group (GMT)		
Line 2	EVENT	Data identifier, alphabetic character		
Line 3	IIiii	II	-World Meteorological Organization block number	
		iii	-World Meteorological Organization station number	
	21/01	2	-Numerical filler (2nd group)	
		1	-Status of report (1=preliminary estimate)	
		/	-Filler	
		01	-Number of data lines that follow (always one)	
Line 4	11111	Data line indicator		
	EEEEE	Event type indicator coded according to RAD(II), SWP(II), FLA(II), LOOP(I), and LIMB(I) **(See Note 1)**		
	RAD(II)	RAD	-Radio burst information at any fixed frequency **(See Note 2)**	
		(II)	-Status of burst as follows:	
			NO	-No observation possible
			NE	-No radio burst activity occurring
			NS	-Burst occurring, but does not meet event criteria
			//	-Burst equal to or greater than 1,500 solar flux units (sfu), but less than 5,000 sfu

		05	-Burst equal to or greater than 5,000 sfu, but less than 10,000 sfu reported regardless of whether RAD// has already been reported)
		11	-Burst equal to or greater than 10,000 sfu (reported regardless of whether RAD// or RAD05 has already been reported)
		00	-Burst equals or exceeds 100 percent above background on 2695 MHz (tenflare)
		CU	-Castelli "U" shaped burst spectral characteristics
		IF	-Radio burst with integrated flux of 100,000 sfu-seconds or more (reported only in automated mode)
SWP(II)	SWP	-Radio burst information at sweep frequencies	
	(II)	-Status of burst as follows:	
		NO	-No observation possible
		NA	-Data not yet observable **(See Note 3)**
		NS	-No activity, or activity does not meet event criteria
		22	-Type II burst observed
		44	-Type IV burst observed
FLA(II)	FLA	-Solar flare indicator **(See Note 4)**	
	(II)	-Status of flare as follows:	
		NO	-No observation possible
		NE	-No flare occurring
		NS	-Flare activity does not meet event criteria
		//	-Zero brilliance (0B) flare or greater observed
LOOP(I)	LOOP	-Solar loop prominence event observed **(See Note 5)**	
	(I)	-Status of event as follows:	
		D	-Loops seen primarily against solar disk
		E	-Loops seen primarily against east solar limb
		W	-Loops seen primarily against west solar limb
LIMB(I)	LIMB	-Solar energetic limb event (0.15 solar radius or greater from point of origin) observed **(See Note 5)**	
	(I)	-Status of event as follows:	
		E	-Located on east solar limb
		W	-Located on west solar limb
XR(FFI)	XR	-Solar X-ray event indicator **(See Note 6)**	
		-Status of event as follows:	
		NO/	-No observation in real-time
		NS/	-No event criteria enhancement
	(FFI)	-If an event was detected, then: FF = Lower and upper limit of X-ray channel to the nearest Angstrom. (Example: FF = 8 refers to the GOES 1 to 8 Angstrom channel.)	
		I = X-ray flux trend according to:	
		I	-Flux increasing and above event threshold
		S	-Flux steady at or near maximum
		E	-Flux ended, values below event threshold

FALSE	False Alarm. Used only by the forecast center to indicate that an XR (FFI) event is a false alarm.
REQST	Request. Used only by the forecast center if indications of a possible event in progress are received from outside sources, or to exercise the rapid response capability of the observatory network. Observing sites will respond with appropriate messages.
99999	End of data indicator (include at end of last data line)

Notes:

1. RAD(II), SWP(II), FLA(II), LOOP(I), and LIMB(I) may be encoded in any order within a single EVENT code message. These event type indicator groups may be repeated in a message to report multiple phenomena (e.g., RAD05 RADCU RADIF). No more than eight groups may be included in a single message.

2. Do not report a combination of RAD//, RAD05, or RAD11 in the same message. Report RAD00, RADCU, and RADIF regardless of whether RAD//, RAD05, or RAD11 have already been reported. Report RAD00, RADCU, and RADIF only once per burst.

3. SWP(II) data are not immediately available. Transmit reports as soon as an accurate determination of sweep type is made.

4. To initially report a flare event, an optical-only observatory in automatic mode (computer is able to analyze data and generate messages) will transmit a preliminary FLARE code message in place of the EVENT code "FLA//" message. Combined optical-radio observatories are not required to (but may) include a "FLA//" in an all-sensor EVENT code message under these circumstances. Since there is only one flare event threshold (i.e., exceeding 0N), do not transmit another "FLA//" message when a flare increases classification (for example, when it goes from a 1N to a 1B or a 2B). However, an extra FLARE code preliminary message, before the mandatory post maximum preliminary, would be appropriate.

5. Omit the LOOP(I) and/or LIMB(I) group(s) if they do not apply. Report LOOP(I) and LIMB(I) only once per event. There is no "in progress (IP)" option for these groups. So, if a loop prominence event or an energetic limb event is still in progress when a new all-sensor EVENT code message must be transmitted for any reason, the solar analyst may (depending on the exact circumstances) find it appropriate to append a PLAIN stating that loops or limb event activity is still in progress.

6. X-ray event messages do not require a response from the observatories.

7.2. Event Acknowledgment Code (AKNOW). This message is generated by the forecast center to acknowledge receipt of event, SXXX_ _ MANOP, messages and to provide a quality and system acceptance assessment of the messages.

Line 1 MANOP heading 555555
Line 2 TTTTT

Line 3 11111 AKNOW XXXXX 99999

Line 1	MANOP heading	-SXXX7(_) KSFC, where (_) corresponds to the origin of the acknowledged message: 0 -San Vito Solar Observatory 1 -Sagamore Hill Solar Observatory 2 -Ramey Solar Observatory 3 -Holloman Solar Observatory 4 -Palehua Solar Observatory 5 -Learmonth Solar Observatory
	555555	-Dummy date/time group (GMT)
Line 2	TTTTT	-Message type being acknowledged: "FLARE", "DALAS", "BURST", "SWEEP" or "EVENT".
Line 3	11111	-Data line indicator
	AKNOW XXXXX	-Acknowledgment remark. If the message was received error-free and accepted by the forecast center computer system, the remark will read AKNOW GOOD. If the message was received, but rejected due to a data error and/or other cause, the remark will read AKNOW BAD LINE (YY) where (YY) is coded as: 00-Message appears good, but system problems at the forecast center prevented acceptance; retransmit message. 03 to 99-Approximate line number on which an error was detected; check message, correct, and retransmit.
	99999	End of data indicator (include at end of last data line)

7.3. Plain Language Code (PLAIN). Use this code to report astrogeophysical data and/or operational information not reportable by another code, or to expand or explain data reported in another code. PLAIN messages may be transmitted separately or appended to other coded messages.

Line 1 MANOP heading
Line 2 PLAIN
Line 3 (Plain language text)
Line 3a (Plain language text)
Line 4 99999

Line 1	MANOP heading	
Line 2	PLAIN	Data identifier, alphabetic character
Line 3	(text)	Non-decoded alphabetic character word descriptions; not more than 69 characters per line
Line 3a	(text)	Continuation of line 3, repeat as often as necessary
Line 4	99999	End of data indicator (must be on a separate line)

7.4. Patrol Status Code (STATS). Use this code to report patrol start or stop times for an observatory's optical, radio, and/or geophysical observing equipment. Transmit messages as soon as feasible after both opening and closing the observatory, and as needed to report changing operating conditions throughout the day.

Line 1 MANOP heading
Line 2 STATS
Line 3 IIiii YMMDD STTnn
Line 4 11111 GGggM jEEOI jEEOI jEEOI jEEOI ....
Line 4a 22222 jEEOI jEEOI 99999
Line 5 33333 GGggM jFFOI jFFOI jFFOI jFFOI ....
Line 5a 44444 jFFOI jFFOI 99999
Line 6 55555 GGggM jHHOI jHHOI jHHOI jHHOI ....
Line 6a 66666 jHHOI jHHOI 99999

Line 1 MANOP heading **(See Note 1)**
Line 2 STATS Data identifier, alphabetic character
Line 3 IIiii II -World Meteorological Organization block number
iii -World Meteorological Organization station number
YMMDD Y -Last digit of year
MM -Number of the month
DD -Day of the month (corresponding to the GGgg time group)
STTnn S -Status of the report coded according to:
1 -Not Used
2 -Final report
3 -Correction
4 -Not Used
TT -Type of sensor system coded according to: **(See Note 1)**
01 -Optical (SOON-Solar Observing Optical Network)
02 -Radio (RSTN-Radio Solar Telescope Network)
03 -Geophysical (or other non-SOON or RSTN) instrument
nn -Number of data lines in this message
Line 4 11111 Optical (SOON) data line indicator **(See Note 2)**
GGggM GG -Hour of valid time (GMT)
gg -Minutes of valid time (GMT)
M -Method of observation coded according to: **(See Note 3)**
1 -Automatic
2 -Semiautomatic
jEEOI j -Status of equipment coded according to:
0 -On at sunrise
1 -Inoperative at sunrise
2 -On at interim time between sunrise and sunset
3 -Off at interim time between sunrise and sunset
4 -Off at sunset
EE -System/equipment indicator coded according to: **(See Notes 4 and 5)**
01 -Computer
02 -Automated Weather Network (AWN)

- 03 -Defense Switching Network (DSN)
- 04 -Commercial phones
- 05 -FMQ-7 (all SOON subsystems)
- 06 -Hydrogen-alpha system
- 07 -Spectrograph system
- 08 -Digital Image Processing System (DIPS)
- 09 -White light system
- // -All systems/equipment

O -Expected outage time coded according to:

- 1 -Less than 30 minutes
- 2 -30 minutes to less than 60 minutes
- 3 -One hour to less than 4 hours
- 4 -Four hours to less than 8 hours
- 5 -Eight hours or more
- 9 -Unknown
- / -Not applicable

I -Reason the system/equipment is inoperative coded according to:

- 1 -Weather
- 2 -Equipment problems
- 3 -Routine maintenance
- 4 -Power failure
- 5 -Calibrations
- 6 -Local obstructions
- 9 -Unknown
- / -Not applicable

99999 End of data indicator (put only at end of last data line)

Line 4a 22222 Continuation line indicator for optical (SOON) data; the jEEOI groups in line 4a must pertain to the same GGggM given in line 4

99999 End of data indicator (include at end of last data line).

Line 5 33333 Radio (RSTN) data line indicator **(See Note 6)**

GGggM GG -Hour of valid time (GMT)

gg -Minutes of valid time (GMT)

M -Method of observation coded according to:

- 1 -Automatic
- 3 -Manual

jFFOI j -status of equipment coded according to:

- 0 -On at sunrise
- 1 -Inoperative at sunrise
- 2 -On at interim time between sunrise and sunset
- 3 -Off at interim time between sunrise and sunset
- 4 -Off at sunset

FF -Frequency/equipment indicator coded according to: **(See Notes 4 and 5)**

- 01 -Computer
- 02 -Automated Weather Network (AWN)
- 03 -Defense Switching Network (DSN)

04 -Commercial phones
10 -FRR-95 (all discrete frequency radiometers and SRS)

11	-Radiometer at	150	to	299	MHz
22	-Radiometer at	300	to	499	MHz
33	-Radiometer at	500	to	999	MHz
44	-Radiometer at	1,000	to	1,999	MHz
55	-Radiometer at	2,000	to	3,999	MHz
66	-Radiometer at	4,000	to	7,999	MHz
77	-Radiometer at	8,000	to	11,999	MHz
88	-Radiometer at	12,000	to	19,999	MHz

19 -Solar Radio Spectrograph (SRS) or Sweep Frequency Interferometer Radiometer (SFIR)
// -All systems/equipment

O -Expected outage time coded according to:
1 -Less than 30 minutes
2 -30 minutes to less than 60 minutes
3 -One hour to less than 4 hours
4 -Four hours to less than 8 hours
5 -Eight hours or more
9 -Unknown
/ -Not applicable

I -Reason the system/equipment is inoperative coded according to:
1 -Weather
2 -Equipment problems
3 -Routine maintenance
4 -Power failure
5 -Calibrations
6 -Local obstructions
7 -Radio Frequency Interference (RFI)
9 -Unknown
/ -Not applicable

99999 End of data indicator (put only at end of last data line)

Line 5a 44444 Continuation line indicator for radio (RSTN) data; the jFFOI groups in line 5a must pertain to the same GGggM given in line 5

99999 End of data indicator (include at end of last data line)

Line 6 55555 Geophysical (or other non-SOON or RSTN) instrument data line indicator **(See Note 7)**

GGggM
GG -Hour of valid time (GMT)
gg -Minutes of valid time (GMT)
M -Method of observation coded according to:
1 -Automatic
3 -Manual

jHHOI
j -Status of equipment coded according to:
5 -On at time of GGggM group
6 -Off at time of GGggM group
HH -System/equipment indicator coded according to:

			91	-Ionosonde (DISS or manual ionosonde)
			92	-Magnetometer
			93	-Neutron Monitor
			94	-Riometer
			95	-IMS
		O	-Expected outage time coded according to:	
			1	-Less than 30 minutes
			2	-30 minutes to less than 60 minutes
			3	-One hour to less than 4 hours
			4	-Four hours to less than 8 hours
			5	-Eight hours or more
			9	-Unknown
			/	-Not applicable
		I	-Reason the system/equipment is inoperative coded according to:	
			1	-Weather
			2	-Equipment problems
			3	-Routine maintenance
			4	-Power failure
			5	-Calibrations
			6	-Local obstructions
			7	-Radio Frequency Interference (RFI)
			9	-Unknown
			/	-Not applicable
	99999	End of data indicator (put only at end of last data line)		
Line 6a	66666	Continuation line indicator for geophysical (or other non-SOON or RSTN) instruments; the jHHOI groups in line 6a must pertain to the same GGggM given in line 6		
	99999	End of data indicator (include at end of last data line)		

Notes:

1. Do not combine optical, radio, and geophysical instruments in a single STATS message. Send each system status in separate messages, using the MANOP headers appropriate to the data type: AXXX61 for optical, AXXX71 for radio, and SXXX6_ for ionospheric. If old STATS messages are transmitted (e.g., to update the 55th Space Weather Squadron, the current status must be retransmitted after sending the old messages is completed, since it is the last received message that updates the forecast center status displays.

2. Repeat lines 4 and 4a as often as necessary, but do not include data for more than one GMT day in a single message. Data line 4 contains the 11111 and GGggM groups, and a maximum of seven jEEOI groups. Data line 4a contains the 22222 group and a maximum of eight jEEOI groups.

3. At a SOON site the method of observation ("M") may change (from semiautomatic to automatic, or vice versa) without any system/equipment item changing status. This may occur when light levels improve in the morning, making automatic operations possible, and again later in the

evening when declining light levels may make automatic operations impossible. In such situations, the analyst must send a STATS message with a single jEEOI group of 206//. (The 206// group is required for decode purposes at the forecast center, not because the status of the Hydrogen-alpha system (EE = 06) has changed.) For example, a SOON site opened in semiautomatic mode; when light levels improve sufficiently to support automatic operations, the analyst would transmit the following message, even though no systems/equipment changed status:

STATS
IIiii 20226 20101
11111 17401 206// 99999

4. Report the status of all installed systems/equipment, in numerical order (i.e., // or 01, 02, 03, ...), in the first STATS message of the observing day. For SOON, analysts may report 05 (FMQ-7, all SOON subsystems) in place of 06 to 09 if these items have the same status, expected outage time, and reason for outage. For RSTN, analysts may report 10 (FRR-95, all discrete frequency radiometers and SRS) in place of 11 to 88 and 19 if these items have the same status, expected outage time, and reason for outage. For example, a SOON site opens with the computer, commercial phones, and spectrograph inoperative; site has no Defense Switching Network (DSN) capability installed:

STATS
IIiii 20226 20102
11111 17252 10192 002// 10442
22222 006// 10752 008// 009// 99999

Outages can be reported "by exception"; to do so, first indicate all items are operational, then (in the same message) indicate the non-operational item(s) using the same time. The above example could be coded:

STATS
IIiii 20226 20101
11111 17252 0//// 10192 10442 10752 99999

5. After the first STATS message of the observing day, it is only necessary to report the systems/equipment which change status during the day. For example, continuing from the example above, computer repaired, but no other changes:

STATS
IIiii 20226 20101
11111 18301 201// 99999

A STATS reportable AWN, DSN, or commercial phone outage is intended to reflect a site-wide outage in send, receive, or both. The fact that a single phone instrument/line or teletype printer is out of service is not reportable by STATS. For example, at a dual SOON/RSTN site, if SOON has no AWN capability, but RSTN does, the outage is not reportable by STATS. At a dual site, the SOON and RSTN analysts should not both report a site-wide AWN, DSN, or com mercial phone outage. In fact, for a dual site, only a SOON STATS message (i.e., 11111 or 22222 line entry) can be used to update these three items. The same isn't true for computers. It's possible for one side to have a computer outage and the other side to be in automatic mode, so the SOON and RSTN computers are treated separately. For this reason, a computer outage that affects both SOON and RSTN must be reported in both a SOON and a RSTN STATS message.

6. Repeat lines 5 and 5a as often as necessary, but do not include data for more than one GMT day in a single message. Data line 5 contains the 33333 and GGggM groups, and a maximum of seven jFFOI groups. Data line 5a contains the 44444 group and a maximum of eight jFFOI groups.

7. Repeat lines 6 and 6a as often as necessary, but do not include data for more than one GMT day in a single message. For example, status of an ionosonde and an IMS can be reported in the same STATS message using two lines 6. Data line 6 contains the 55555 and GGggM groups, and a maximum of seven jHHOI groups. Data line 6a contains the 66666 group and a maximum of eight jHHOI groups.

Chapter 8

FORWARD AREA LIMITED OBSERVING PROGRAM (FALOP)

8.1. General. The wide dispersion of units on the modern battlefield and the complexity of current and projected weapon systems have increased the requirements for weather information. Weather varies with both time and location; one valley is fogged in while an adjacent one is completely clear; 6 hours later, the situation can be reversed. Weather data must be constantly reappraised and updated to retain its usefulness. The FALOP is designed to obtain timely weather observations from the forward areas of the battlefield.

8.1.1. The FALOP is an Army G2-directed (Deputy, Chief of Staff, Intelligence) program under which maneuver brigade and armored cavalry regiment (ACR) and battalion and squadron S2 (Intelligence officer) personnel collect forward area weather information and transmit this data to the supporting USAF Combat Weather Team (CWT). Also, Air Force Combat Control Teams (CCT), Tactical Air Control Party (TACP), and Special Tactic Teams (STT) are frequently trained in providing FALOP observations to their supporting CWT.

8.1.2. The Army uses these observations to support Army weapon systems; Nuclear, Biological, and Chemical (NBC) planning and operations; terrain analysis; and Intelligence Preparation of the Battlefield (IPB).

8.1.3. The CWT uses this information in preparing tailored tactical weather support products. Collected data include:

8.1.3.1. Measurements of temperature.

8.1.3.2. Wind direction and speed.

8.1.3.3. Cloud information.

8.1.3.4. Visibility estimate.

8.1.3.5. Type of precipitation and intensity.

8.1.3.6. Road, ground, and water conditions.

8.2. FALOP Observation. A FALOP observation is taken using Army-procured mobile observing equipment (i.e., belt weather kit or like equipment, etc.). It is then encoded into a 13-digit message. Each digit is represented in the final message by a letter or number representing the observed weather element. The FALOP voice message template is transmitted as a series of numbers and letters to higher echelons. The Corp G2 or its equivalent specifies the frequency that FALOP observations must be taken based on the mission, enemy, terrain, troops, and time available (METT-T). Normally, the G2 requires observations three times per day at sunrise, noon, and sunset. Additional observations may be required, based on mission needs or a fast-changing weather situation.

8.2.1. The FALOP voice message template consists of three parts:

8.2.1.1. Universal Transverse Mercator (UTM) grid location represented by 8 digits, 2 letters, and 6 numbers.

8.2.1.2. A date-time group (DTG) including day of the month and time of observation in Coordinated Universal Time (UTC) (Zulu). This is represented by 6 numbers.

8.2.1.3. An encoded weather observation consists of 13 encoded weather elements represented by numbers and letters.

8.2.2. The following tables and figures are used to prepare a FALOP report.

8.2.2.1. Example of a FALOP report:

FALOP NB 131825 051200 83455105012212////CEN (Figure 8.1).

8.2.2.2. FALOP codes (Table 8.1 through Table 8.10).

8.2.2.3. Voice message template (Figure 8.2).

8.2.2.4. Example of a completed voice message template (Figure 8.3).

8.2.2.5. Example of a voice message transmission (Figure 8.4).

8.2.2.6. Observing kit description and component parts list (Figure 8.5).

8.2.3. Table 8.1 through Table 8.10 describes the FALOP codes and the 13 weather elements in the report. The highlighted and boldface code digits and explanations correspond to the example in Figure 8.1. The free text to support the FALOP report in Figure 8.1 would read:

8.2.3.1. FALOP weather observation at grid location NB131825, taken at time 051200. It is overcast with hills seen in the clouds. The wind is from the southeast at 10 to 19 miles per hour (mph). Visibility is 2 to 4 km. Currently there is light drizzle. The height of the observation is 500 m. The roads are wet with the ground having pools of water on the surface. Current water level is high, but not overflowing. The temperature is 12° C. No surface pressure was taken. Visibility is lowest in the SW. Higher terrain is obscured. Thunderstorms moving toward NE quadrant.

Figure 8.1. Example of a FALOP Report.

UTM LOCATION									DTG							FALOP WEATHER OBSERVATION																		
1	2	3	4	5	6	7	8		1	2	3	4	5	6		1	2	3	4	5	6	7			8	9	10	11		12	13			
N	B	1	3	1	8	2	5		0	5	1	2	0	0		8	3	4	5	5	1	0	5	0	1	2	2	1	2	////	C	E	N	
UTM grid coordinates								Space	Day of Month		Time in GMT (Zulu)				Space	Cloud Cover	Wind direction	Wind speed	Visibility	Current weather	Amplification to current weather	Height of observation			State of the road	State of the terrain	State of the water	Temperature		Barometric Pressure	Remarks			
N	B	1	3	1	8	2	5		0	5	1	2	0	0		8	3	4	5	5	1	0	5	0	1	2	2	1	2	////	C	E	N	

Table 8.1. Total Amount of Cloud Cover.

CODE DIGIT	EXPLANATION
0	Clear
1	None
2	Scattered
3	Scattered (hills in clouds)
4	None
5	Broken
6	Broken (hills in clouds)
7	Overcast
8	**Overcast (hills in clouds)**
9	None

Table 8.2. Direction of Surface Winds.

CODE DIGIT	EXPLANATION	DEGREES
0	Calm	None
1	Northeast (NE)	023 to 067
2	East (E)	068 to 112
3	**Southeast (SE)**	**113 to 157**
4	South (S)	158 to 202
5	Southwest (SW))	203 to 247
6	West (W)	248 to 292
7	Northwest (NW)	293 to 337

CODE DIGIT	EXPLANATION	DEGREES
8	North (N)	338 to 022
9	Variable	None

Table 8.3. Force of Surface Winds.

CODE DIGIT	EXPLANATION	MILES PER HOUR
0	Calm	Less than 3
1	-----	-----
2	Light Breeze	4 to 9
3	-----	-----
4	**Moderate Breeze**	**10 to 19**
5	-----	-----
6	Strong Breeze	20 to 29
7	-----	-----
8	Gale	30

Table 8.4. Visibility at the Surface.

CODE DIGIT	EXPLANATION
0	< 164 ft (50 m)
1	164 to < 656 ft (50 to < 200 m)
2	656 to < 1,640 ft (200 to <500 m)
3	1,640 to < 3,280 ft (500 to < 1,000 m)
4	3,280 ft to < 1.2 miles (1 to < 2 km)
5	**1.2 to < 2.48 miles (2 to < 4 km)**
6	2.48 to < 6.21 miles (4 to < 10 km)
7	6.21 to < 12.42 miles (10 to < 20 km)
8	12.42 to < 31.06 miles (20 to < 50 km)
9	> 31.06 miles (> 50 km or more)

Table 8.5. Present Weather and Obstruction to Vision.

CODE DIGIT	EXPLANATION
0	No Significant Weather
1	Smoke or Haze
2	Fog in Valley
3	Sandstorm, Duststorm, or Blowing Snow
4	Fog
5	**Drizzle**
6	Rain
7	Snow or Rain and Snow Mixed
8	Showers
9	Thunderstorms with or without Precipitation

Table 8.6. Amplification of Phenomenon in Table 8.5.

CODE DIGIT	EXPLANATION
0	No Specification
1	**Light**
2	Heavy
3	In the past hour, but not at the time of observation
4	Within sight
5	Freezing precipitation
6	None
7	None
8	None
9	Hail or Ice Pellets

8.3. Height of Observation. The height of the observation is stated in decameters above mean sea level (500 m would be encode as 050).

Table 8.7. State of the Road in the Vicinity of Observation Point or Station.

CODE DIGIT	EXPLANATION
0	Dry
1	**Wet**
2	Flooded
3	Slush
4	Ice Patches
5	Glazed Ice
6	Snow Depth 0 to 7.48 inches (0 to 19 cm)
7	Snow Depth 7.87 inches or more (20 cm or more)
8	Snow Drift
9	-----

Table 8.8. State of the Terrain in the Vicinity of Observation Point or Station.

CODE DIGIT	EXPLANATION
0	Dry
1	Wet
2	**Pools of water on surface**
3	Flooded
4	Ground frozen 0 to 1.5 inches (0 to 4 cm) Use of spade possible.
5	Ground frozen 1.97 inches (5 cm or more)
6	Snow depth 0 to 1.5 inches (0 to 4 cm)
7	Snow depth 1.97 to 9.45 inches (5 to 24 cm)
8	Snow depth 9.45 to 17.32 inches (25 to 44 cm)
9	Snow depth >17.32 inches (45 cm or more)

Table 8.9. State of the Water Surface in the Vicinity of Observation Point or Station.

CODE DIGIT	EXPLANATION
0	Water level normal
1	Water level much below normal
2	**Water level high, but not overflowing**
3	Banks overflowing
4	Floating ice (more than half)
5	Thin ice 0 to 1.5 inches (0 to 4 cm) thick, complete cover, impassible for persons
6	Ice depth unknown, complete cover, passable for persons
7	Ice depth 1.97 to 3.54 inches (5 to 9 cm) complete cover
8	Ice depth 3.93 to 9.44 inches (10 to 24 cm) complete cover
9	Ice depth > 9.84 inches (25 cm or more) complete cover

8.4. Temperature. Temperature at observation point or station in whole degrees Celsius. Negative temperatures are encoded by adding 50 to the absolute value of the temperature (i.e., -20°C would be encoded as 70).

8.5. Barometric Pressure (Station Pressure). Surface pressure at observation point or station. This group is used only if a barometer is available to measure pressure. Observers without a barometer will use four slashes (////) to encode the pressure is missing (See Figure 8.1.).

Table 8.10. Remarks.

CODE	EXPLANATION
A	Visibility lowest in the NE quadrant.
B	Visibility lowest in the SE quadrant.
C	**Visibility lowest in the SW quadrant.**
D	Visibility lowest in the NW quadrant.
E	**Higher terrain obscured.**
F	Sky totally obscured, sun or moon not visible.
G	Sky obscured, sun or moon dimly visible.
H	Rainfall 0.2 inches (5 mm) or less since last observation.
I	Rainfall between 0.2 inches (5 mm) and 1 inch (25 cm) since last observation.
J	Rainfall 1 inch (25 mm) or greater since last observation.
K	Ground thawing.
L	Ice forming on vehicles, trees, and exposed surfaces.
M	Thunderstorms over mountains.
N	**Thunderstorms moving toward NE quadrant.**
O	Thunderstorms moving toward SE quadrant.

CODE	EXPLANATION
P	Thunderstorms moving toward SW quadrant.
Q	Thunderstorms moving toward NW quadrant.
R	Rainfall (in hundredths of inches) since last observations.
S	Snowfall (in inches) since last observation.
T	Precipitation not occurring at time of the observation but has occurred in the last 2 hours.
U	Gusty surface winds.
V	Weather conditions fluctuating in the vicinity of observation point during past 2 hours.
W	WBGT in degrees Celsius. Encoded as WXX where XX is the WBGT. If the WBGT is negative, no remark is necessary.
X	PIREP follows in plain language.
Z	Free text narrative.

Figure 8.2. Voice Message Template.

VOICE MESSAGE TEMPLATE

Forward Area Limited Observing Program (FALOP) Weather Observation

	THIS IS		FALOP OVER
Addressee	**originator**		**weather observation**
	THIS IS	SEND	FALOP OVER
Originator	**addressee**		**weather observation**
	THIS IS		
Addressee	**originator**		

FLASH IMMEDIATE PRIORITY ROUTINE

TOP SECRET SECRET CONFIDENTIAL UNCLASSIFIED

Underline and transmit the precedence of this message. Underline and transmit the security classification of this message.

FALOP WEATHER OBSERVATION

Item	Entry	Description
LOCATION	______________________	The center of observed weather expressed in UTM coordinates, accurate to within 100 meters.
TIME	______________________	Day-Time Zulu observation is taken
1	______________________	Cloud cover (See Table 8.1)
2	______________________	Direction of surface winds (See Table 8.2)
3	______________________	Force of surface winds (See Table 8.3)

Figure 8.2. Voice Message Template (Continued).

Page 1 of 2

VOICE MESSAGE TEMPLATE (Continued)
Forward Area Limited Observing Program (FALOP) Weather Observation

4	________________	Visibility at the surface (See Table 8.4)
5	________________	Present weather (See Table 8.5)
6	________________	Amplification of present weather (See Table 8.6)
7	________________	Height of observation (See Para. 8.3)
8	________________	State of the road (See Table 8.7)
9	________________	State of the terrain (See Table 8.8)
10	________________	State of the water surface (See Table 8.9)
11	________________	Temperature (See Para. 8.4)
12	________________	Barometric pressure (See Para. 8.5)
13	REMARKS/NARRATIVE	(See Table 8.10)
	________________	
	________________	
	________________	
14	TIME ________________	Hour-Minute-Zone (See NOTE)
15	AUTHENTICATION IS ________________	Message Authentication (See NOTE)
	OVER	

NOTE: The message time group is used when required to identify message time of origin. Authentication will be in accordance with current CEOI or JTF procedures.

Figure 8.3. Example of a Completed Voice Message Template.

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VOICE MESSAGE TEMPLATE

Forward Area Limited Observing Program (FALOP) Weather Observation

HORNET	THIS IS	RADAR		FALOP OVER
Addressee		originator		weather observation
RADAR	THIS IS	HORNET	SEND	FALOP OVER
Originator		addressee		weather observation
HORNET	THIS IS	RADAR		
Addressee		originator		

FLASH IMMEDIATE PRIORITY <u>ROUTINE</u>

TOP SECRET SECRET CONFIDENTIAL <u>UNCLASSIFIED</u>

Underline and transmit the precedence of this message. Underline and transmit the security classification of this message.

FALOP WEATHER OBSERVATION

Item	Entry	Explanation
	<u>LOCATION NB 131825</u>	The center of observed weather expressed in UTM coordinates, accurate to within 100 meters.
	<u>TIME 051200Z</u>	Day-Time Zulu observation is taken.
1	<u>8</u>	Cloud cover (See Table 8.1)
2	<u>3</u>	Direction of surface winds (See Table 8.2)
3	<u>4</u>	Force of surface winds (See Table 8.3)

Figure 8.3. Example of a Completed Voice Message Template (Continued).

VOICE MESSAGE TEMPLATE
Forward Area Limited Observing Program (FALOP) Weather Observation

4	5	Visibility at the surface (See Table 8.4)
5	5	Present weather (See Table 8.5)
6	1	Amplification of present weather (See Table 8.6)
7	050	Height of observation (See Para. 8.3)
8	1	State of the road (See Table 8.7)
9	2	State of the terrain (See Table 8.8)
10	2	State of the water surface (See Table 8.9)
11	12	Temperature (See Para. 8.4)
12	MISSING	Barometric pressure (See Para. 8.5)
13	REMARKS/NARRATIVE	(See Table 8.10)
14	TIME	Hour-Minute-Zone (See NOTE)
15	AUTHENTICATION IS	Message Authentication (See NOTE)
	OVER	

NOTE: The message time group is used when required to identify message time of origin. Authentication will be in accordance with current CEOI or JTF procedures.

Figure 8.4. Example of a Voice Message Transmission.

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VOICE MESSAGE TRANSMISSION

Forward Area Limited Observing Program (FALOP) Weather Observation

HORNET THIS IS RADAR FALOP WEATHER OBSERVATION OVER

RADAR THIS IS HORNET SEND FALOP WEATHER OBSERVATION OVER

HORNET THIS IS RADAR

PRIORITY

UNCLASSIFIED

FALOP WEATHER OBSERVATION

LOCATION NOVEMBER BRAVO ONE THREE ONE EIGHT TWO FIVE

TIME ZERO FIVE ONE TWO HUNDRED ZULU

LINE ONE EIGHT

LINE TWO THREE

LINE THREE FOUR

LINE FOUR FIVE

LINE FIVE FIVE

LINE SIX ONE

LINE SEVEN ZERO FIVE ZERO

LINE EIGHT ONE

LINE NINER TWO

LINE TEN TWO

LINE ELEVEN ONE TWO

LINE TWELVE MISSING

LINE THIRTEEN CHARLIE ECHO NEVEMBER

OVER

Figure 8.5. Observing Kit Description and Component Parts List.

Observing Kit Description and Component Parts List

A. Bag, Belt weather kit, PN 92402. Heavy olive drab case with fitted pockets for wind meter, compass, psychrometer, water bottle, psychrometric computer, pressure reduction computer, rain gauge, weather forms, pencil, and map. Dimensions: 8-1/2 by 11-1/2 by 2 inches. Weight: 2 pounds. Contents identified above will be marked on the inside case. The outside flap will be marked: "BELT WEATHER KIT."
B. Psychrometer, Sling Type, PN 92021, with reinforced leather case and instructions for use. Measurement ranges and accuracy's: Wet and Dry Bulb –40°C to +66°C ± 25°C.
C. Wind Meter, PN 92175, with cleaners, case, and instructions for use. Measurement ranges and accuracy's: Low Scale: 2 – 8.5 knots ± 10%; High Scale: 6 knots – 56 knots ± 10%.
D. Compass, PN 11012. Liquid filled, fast needle, oscillation stops in 4 seconds, and instructions for use.
E. Psychrometric Computer, Miniature, CO-164/UM-Small, PN 92405. Measurement ranges and accuracies: Dewpoint: -50°C to +29.4°C; Relative Humidity: 1% to 100%: Wet-Bulb Thermometer: -50°C to +29.4°C: Barometric Pressure: 23 to 30 inches: Size: 5-3/4 inches in diameter. Instructions for uses are printed on the computer.
F. Pressure Reduction Computer, Miniature, CO-875/UM-Small, PN 92406. Measurement ranges and accuracy's: Pressure Reduced to Sea Level: 875 to 1,075 millibars (Mb) with 0.5 Mb graduation; 25.80 to 31.75 inches with 0.01 inch graduation. Station Pressure: 711 to 1,075 Mb with 0.5 Mb graduation: 21.00 to 31.75 inches with 0.01 inch graduation. Altimeter: -1,400 to +9,500 feet with 10 feet graduations. Size: 5 inches in diameter. Instructions for use are printed on the computer.
G. Gauge, Precipitation (Rain) with 5-inch Rod, PN 92201. Measurement ranges and accuracy's: Capacity: 2 inches or 50 millimeters: Graduations: 0.02 or 1.0 mm: Scale: Millimeters and Inches.
H. Water Bottle, Psychrometer, with Cap, PN 92026. Plastic – nonbreakable.
I. Pencil No. 2 lead, mechanical, with refill capability.

NOTE: An altimeter barometer has a NSN and has to be ordered separately: NSN 6660-00-551-3998. Order through normal supply channels. The Sims anemometer is a substitute item for the Dwyer wind meter found in the belt weather kit. The anemometer part number is Model BTC Anemometer.

ROBERT H. FOGLESONG, Lt General, USAF
DCS/Air & Space Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

DoD Flight Information Publications (FLIPS)
AFDD 1, *Air Force Basic Doctrine*
AFPD 15-1, *Atmospheric and Space Environmental Support*
AFMAN 15-111, *Surface Weather Observations*
AFMAN 15-129*, Aerospace Weather Operations – Processes and Procedures*
AFMAN 33-322, Vol. 4, *Records Disposition Schedule*
Federal Meteorological Handbook No. 1 (FMH-1), *Surface Weather Observations and Reports*
Federal Meteorological Handbook No. 2 (FMH-2), *Surface Synoptic Codes*
FAAO 7340.1, *Federal Aviation Administration Order, Contractions*
FAAO 7350.7, *Federal Aviation Administration Order, Location Identifiers*
National Weather Service (NWS), *Operations Manual, Chapter 31*
National Weather Service Training Center Home Page
NAVMETOCCOMINST 3143.1F, *Terminal Aerodrome Forecast (TAF) Code*
World Meteorological Organization (WMO) Manual on Codes 306, Part A, Alphanumeric Codes

Abbreviations and Acronyms

- Light Intensity
+—Heavy Intensity
/—Virgule. Separator between PIREP cloud layers, layers of turbulence, or layers of icing.
ABV—Above
AC—Altocumulus
ACC—Altocumulus Castellanus
ACFT MSHP—Aircraft Mishap
ACSL— Altocumulus Standing Lenticular
ADF—Active Dark Filament
ADWS—Automatic Digital Weather Switch
AFS—Arch Filament System
AFWA—Air Force Weather Agency
AFW—Air Force Weather
AKNOW—Event Acknowledgement Code
AIREP—Air Report

ALP—Airport Location Point

ALSTG—Altimeter Setting

APR—Active Prominence Region

APRNT—Apparent

APRX—Approximate, Approximately

ACR—Armored Cavalry Regiment

ASOS—Automated Surface Observing System

ASR—Active Surge Region

ATC—Air Traffic Control

AUTO—Automated Report

AWDS—Automated Weather Distribution System

AWN—Automated Weather Network

BC—Patches (Descriptor used with FG)

BKN—Broken (used to describe cloud cover or weather phenomena)

BL—Blowing (descriptor used with DU, SA or SN)

BLO—Below

BR—Mist

BSD—Bright Surge on Disk

BURST—Discrete Solar Radio Burst

BWS—Base Weather Station

BXOUT—Videometer Box Dimension Outline

CA—Cloud to air (lightning)

CB—Cumulonimbus

CBMAM—Cumulonimbus Mammatus

CC—Cirrocumulus, or Cloud to cloud lightning

CCSL— Cirrocumulus Standing Lenticular

CG—Cloud to ground (lightning)

CHOP—Turbulence type characterized by rapid, rhythmic jolts

CIG—Ceiling

CLR—Clear (icing)

CONS—Continuous

CONTRAILS—Condensation trails

CONUS—Continental United States

COR—Correction To A Previously Disseminated Report

CS—Cirrostratus

CWT—Combat Weather Team

DALAS—Solar Disk and Limb Activity Summary Code

dB—Decibel

DET—Detachment

DIPS—Digital Image Processing System

DoD—Department Of Defense

DR—Low Drifting (descriptor used with DU, SA, or SN)

DS—Dust-storm

DSD—Dark Surge on Disk

DSF—Disappearance of a Solar Filament

DSN—Defense Switching Network

DTG—Date-Time Group

DU—Widespread Dust

DZ—Drizzle

E—East

EMBD—Embedded (used to describe thunderstorms)

ENE—East Northeast

ENRT—Enroute

EPL—Eruptive Prominence on Limb

ESE—East Southeast

EST—Estimate, Estimated

ETS1—Environmental Technical Satellite 1

EVENT—Event Code

EXTRM—Extreme (used to modify turbulence

FAA—Federal Aviation Administration

FAAH—Federal Aviation Administration Handbook

FALOP—Forward Area Limited Observing Program

FALSE—False Alarm

FC—Funnel Cloud

+FC—Tornado or Waterspout

FEW—Few (used to describe cloud cover or weather phenomena)

FG—Fog

FLARE—Solar Flare Code

fmin—Minimum Observed Frequency

foEs—Sporadic E Critical Frequency

foF1—F1 Region Critical Frequency

foF2—F2 Region Critical Frequency

FRQ—Frequent

FIBI—Filed But Impracticable To Transmit

FIRST—First TAF observation After A Break In Coverage At Manual Station

FLIP—Flight Information Publication

FMH-1—Federal Meteorological Handbook No.1, *Surface Weather Observations & Reports*

FT—Feet

FU—Smoke

FZ—Freezing (descriptor used with precipitation or fog)

G—Gust

G2—Assistant Chief of Staff (Intelligence)

GEN—General Type Contraction

GHz—Giga Hertz (10^9 Hz)

GMT—Greenwich Mean Time

GOS3—Geosynchronous Operational Environment Satellite 3

GPS/NAVSTAR—Global Positioning System/Navigation, Surveillance, Tracking, and Reporting

GR—Hail of 1/4 inch or more

GS—Small Hail and/or Snow Pellets (less than 1/4 inch)

HLSTO—Hailstone(s)

hPa—Hectopascals (millibars)

HSTRY—Histogram History Code

HVY—Heavy (used in PIREP remarks to modify precipitation)

Hz—Hertz

HZ—Haze

IC—Ice Crystals, In-Cloud Lightning

ICAO—International Civil Aviation Organization

IFLUX—Integrated Solar Radio Flux Code

IMC—Instrument Meteorological Conditions

IMS—Ionospheric Measuring System

INCRG—Increasing

IPB—Intelligence Preparation of the Battlefield

INTER—Intermittent

IONHT—Ionospheric Height Code

IONOS—Automated Ionospheric Data Code

IPP—Ionospheric Penetration Point

ISOL—Isolated (used to describe weather phenomenon remarks of PIREP)

KT—Knots

L—Left (With Reference To Runway Designation)

LAST—Last Forecast Before A Break In Coverage At A Manual Station

LGT—Light(used to modify turbulence or icing)

LLWS—Low level wind shear

LN—Line (used to describe thunderstorm formations in remarks of a PIREP)

LPS—Loop Prominence

LST—Local Standard Time

LTG—Lightning

LTGCA—Lightning Cloud to Air

LTGCC—Lightning Cloud to Cloud

LTGCG—Lightning Cloud to Ground

LTGIC—Lightning in Cloud

LWDS—Local Weather Dissemination System

LWR—Lower

LYR—Layer (of clouds)

m—Meters

M—Sub-zero temperature

MACOM—Major Army Command

MAJCOM—Major Command

MANOP—Manual Operations

METAR—Aviation Routine Weather Report

METT-T—Mission, Enemy, Terrain, Troops, and Time Available

MHz—Mega Hertz (10^6 Hz)

MI—Shallow

MOD—Moderate

MOV—Moved/Moving/Movement

MSL—Mean Sea Level

MT—Mountains

MXD—Mixed - A type of icing characterized as a combination of clear and rime ice

N—North

N/A—Not Applicable

NAVAID—Navigational aids (JPI-02)

NBC—Nuclear, Biological, and Chemical

NE—Northeast

NIL—Transmitted When Report Not Ready On Time

NMRS—Numerous (used to describe weather phenomena in remarks of a PIREP)

NTFS—New Tactical Forecast System

NW—Northwest

NWS—National Weather Service

OCNL—Occasional

OVC—Overcast

OHD—Overhead

OWS—Operational Weather Squadron

P—Greater Than

PCPN—Precipitation (used in PIREPs)

PIREP—Pilot Weather Report.

PL—Ice Pellets

PLAIN—Plain Language Code

PO—Dust/Sand Whirls (Dust Devils)

PR—Partial (descriptor used with FG)

PV—Prevailing Visibility

PY—Spray

R—Right (With Reference To Runway Designation)

RA—Rain

REQST—Request from the SEOC/Forecast Center

RFI—Radio Frequency Interference

RMK—Remark

RSTN—Radio Solar Telescope Network

RVR—Runway Visual Range

RVRNO—RVR System Not Available

RWY—Runway

S—South

S2—Intelligence Officer

S4—Mean Amplitude Scintillation Index

SA—Sand

SCSL— Stratocumulus Standing Lenticular

SCT—Scattered

SE—Southeast

sec—Second

SEC—Space Environment Center

SEV—Severe (intensity modifier used with turbulence and icing in PIREPs)

SFC—Surface

sfu—Solar Flux Units

SG—Snow Grains

SH—Shower(s) (descriptor used with RA, SN, PE, GS, or GR)

Sigma-sub-delta-phi—Mean Phase Scintillation Index

SKC—Sky Clear

SLD—Solid (used to describe weather phenomena in remarks of PIREPs)

SM—Statute Miles

SN—Snow

SOON—Solar Observing Optical Network

SP—Snow Pellets

SPOTS—Sunspot Code

SPY—Spray

SQ—Squall

SRBL—Solar Radio Burst Locator

SRS— Solar Radio Spectograph

SS—Sandstorm

STATS—Patrol Status Code

STN—Station

SW—Southwest

SWEEP—Spectral Solar Radio Burst Code

SWO—Space Weather Operations

TACAN—UHF (Ultra High Frequency - 300 to 3000 MHz) Tactical Air Navigation Aid

TBD—To Be Determined

TCU—Towering Cumulus

TEC—Total Electron Current

TEI—Text Element Indicator

TELSI—Total Electron Content and Scintillation Code

TOC—Top of Climb (used in PIREPs)

TOP—Top of Clouds (used in PIREPs)

TS—Thunderstorm

TWR—Tower

UA—TEI used in routine PIREP

UNKN—Unknown PIREP TEI

UP—Unknown Precipitation

US—United States

UTC—Coordinated Universal Time

UTM—Universal Transverse Mercator

UTO—Universal Time Observed

UUA—TEI used in urgent PIREP

V—Variable

VA—Volcanic Ash

VC—Vicinity (proximity qualifier)

VHF—Very High Frequency

VIS—Visibility

VISNO—Visibility At Secondary Location Not Available

VOR—Very high frequency omnidirectional range station (JPI-02)

VORTAC—Very high frequency omnidirectional range station/tactical air navigation (JPI-02)

VRB—Variable

VV—Vertical Visibility

W—West

WMO—World Meteorological Organization

WND—Wind

WF—Weather Flight

WSHFT—Wind Shift

XR—Solar X-ray Event Indicator

Z—Zulu (JPI-02)

Terms

Automated Weather Network—A global communications network used for collecting and distributing alphanumeric environmental/weather data and Notices to Airmen (NOTAMs). It consists of two overseas Automatic Digital Weather Switches (ADWSs). They are linked to AFWA via high-speed communications circuits through a hub ADWS at Tinker AFB OK and the CFEP at Offutt AFB NE; three overseas Weather Intercept Concentrator Units, and their supporting circuits; and the circuitry and interfaces interconnecting the ADWSs with other Department of Defense (DoD), federal, and foreign meteorological and aviation facilities.

Aviation Routine Weather Report—The WMO code format used worldwide to code weather observations.

Bulletin Heading—A combination of letters and numbers that describe the contents of a bulletin, including the data type, geographical location, ICAO identifier of the originator and a date-time group.

Contrails (Condensation trails)—A visible cloud streak, usually brilliant white in color, which trails behind a missile or other vehicle in flight under certain conditions.

Distant from the station—Used to forecast weather phenomena expected beyond 10 statute miles (>16 kilometers.).

File Time—The time a weather message or bulletin is scheduled to be transmitted. Expressed either as a specific time or a specific time block during which the message will be transmitted.

ICAO Identifier—A specifically authorized four-letter identifier assigned to a location and documented in ICAO Document 7910.ICAO (used by NTFS): An ICAO identifier with a fifth character appended which designates a specific NTFS username.

International Civil Aviation Organization—A United Nations organization specializing in matters dealing with international aviation and navigation.

Issue Time—Time the last agency was notified. Exclude follow-up notifications when determining issue time.

Limited Duty Station—A weather station that provides less than 24-hour a day forecast service.

NAVAID—An electronic navigation aid facility, specifically limited to VHF Omni-Directional Radio Range (VOR), or combined VHF Omni-Directional Radio Range/Tactical Air Navigation (VORTAC) facilities.

New Tactical Forecast System—An integrated automated system designed to provide weather and air traffic control products to support the missions of base weather stations, weather support units, air traffic control agencies, and command posts of the DoD.

Pilot Report—A report of in-flight weather provided by an aircraft crewmember.

Scheduled—The time a weather report or bulletin is due to be transmitted. The scheduled transmission time may be expressed as a specific time or a specific block of time during which the data must be transmitted.

Severe Thunderstorm—The simultaneous occurrence of a thunderstorm (descriptor TS), in conjunction with hail (GR) greater than or equal to 3/4” diameter and/or surface wind greater than or equal to 50 knots.

Squall—A strong wind characterized by a sudden onset in which the wind speed increases at least 16 knots and is sustained at 22 knots or more for at least one minute.

Text Element Indicator (TEI)—A two-letter contraction with solidus used in the standard PIREP message to identify the elements being reported.

Vicinity—Used to report present weather phenomena when between five (8000 meters) and 10 statute miles (16 kilometers) of the station.

Attachment 2

WMO CODE FORMS - Reference List

FM 12-XI	SYNOP	Report of synoptic surface observation from a land station.
FM 13-XI	SHIP	Report of synoptic surface observation from a sea station.
FM 14-XI	SYNOP MOBIL	Report of surface observation from a mobile land station.
FM 15-X Ext.	METAR	Aviation routine weather report (with or without trend forecast).
FM 16-X Ext.	SPECI	Aviation selected special weather report (with or without trend forecast.
FM 18-XI	BUOY	Report of a buoy observation.
FM 20-VIII	RADOB	Report of ground radar weather observation.
FM 22-IX Ext.	RADREP	Radiological data report (monitored on a routine basis and/or in case of accident)
FM 32-IX	PILOT	Upper wind report from a fixed land station.
FM 33-IX	PILOT SHIP	Upper wind report from a sea station.
FM 34-IX	PILOT MOBIL	Upper wind report from a mobile land station.
FM 35-X Ext.	TEMP	Upper level pressure, temperature, humidity, and wind report from a fixed land station.
FM 36-X Ext.	TEMP SHIP	Upper level pressure, temperature, humidity, and wind report from a sea station.
FM 37-X Ext.	TEMP DROP	Upper level pressure, temperature, humidity, and wind report from a sonde released by carrier balloons or aircraft.
FM 38-X Ext.	TEMP MOBIL	Upper level pressure, temperature, humidity, and wind report from a mobile land station.
FM 39-VI	ROCOB	Upper level temperature, wind, and air density report from a land rocketsonde station.
FM 40-VI	ROCOB SHIP	Upper level temperature, wind, and air density report from a rocketsonde station on a ship.
FM 41-IV	CODAR	Upper air report from an aircraft (other than weather reconnaissance aircraft).
FM 42-XI	AMDAR	Aircraft report (aircraft meteorological data relay)
FM 44-V	ICEAN	Ice analysis
FM 45-IV	IAC	Analysis in full form
FM 46-IV	IAC FLEET	Analysis in abbreviated form.
FM 47-IX Ext.	GRID	Processed data in the form of grid point values.
FM 49-IX Ext.	GRAF	Processed data in the form of grid point values. (abbreviated code form)
FM 50-VIII Ext.	WINTEM	Forecast upper wind and temperature for aviation.
FM 51-X Ext.	TAF	Aerodrome Forecast

FM 53-X Ext.	ARFOR	Area forecast for aviation.
FM 54-X Ext.	ROFOR	Route forecast for aviation.
FM 57-IX Ext.	RADOF	Radiological trajectory dose forecast (defined time of arrival and location).
FM 61-IV	MAFOR	Forecast for shipping
FM 62-VIII Ext.	TRACKOB	Report of marine surface observation along a ship's track..
FM 63-X	BATHY	Report of bathythermal observation.
FM 64-IX	TESAC	Temperature, salinity and current report from a sea station.
FM 65-XI	WAVEOB	Report of spectral wave information from a sea station or from a remote platform (aircraft or satellite).
FM 67-VI	HYDRA	Report of hydrological observation from a hydrological station.
FM 68-VI	HYFOR	Hydrological forecast
FM 71-XI	CLIMAT	Report of monthly values from a land station.
FM 72-VI	CLIMAT SHIP	Report of monthly means and totals from a ocean weather station.
FM 73-VI	NACLI CLINP SPCLI CLISA INCLI	Report of monthly means for an oceanic area.
FM 75-X	CLIMAT TEMP	Report of monthly aerological means from a land station.
FM 76-X	CLIMAT TEMP SHIP	Report of monthly aerological means from an ocean weather station.
FM 81-I	SFAZI	Synoptic report of bearings of sources of atmosphere.
FM 82-I	SFLOC	Synoptic report of the geographical location of sources of atmosphere.
FM 83-I	SFAZU	Detailed report of the distribution of sources of atmosphere by bearings for any period up to and including 24 hours.
FM 85-IX	SAREP	Report of synoptic interpretation of cloud data obtained by a meteorological satellite.
FM 86-XI	SATEM	Report of satellite remote upper air soundings of pressure, temperature, and humidity.
FM 87-XI	SARAD	Report of satellite clear radiance observations.
FM 88-XI	SATOB	Report of satellite observations of wind, surface temperature, cloud, humidity, and radiation.