3 Overview of Aviation Weather Information

3.1 Introduction

Title 14 of the Code of Federal Regulations (14 CFR) part 91, § 91.103 states the requirements for preflight action for part 91 operations. According to § 91.103, each pilot in command (PIC) shall, before beginning a flight, become familiar with all available information concerning the flight, including weather reports and forecasts.

This handbook describes the weather products primarily produced by the NWS. There is an ever-expanding suite of weather products available on the internet, weather applications (apps) for phones and tablets, as well as commercial Electronic Flight Bags (EFB). Pilots and operators should consult with their Principal Operations Inspector (POI) or their service provider when in doubt about the content and use of new weather products. Note that the FAA does not certify internet providers of aviation weather services.

3.2 Use of Aviation Weather Information

3.2.1 Product Latency

With few exceptions, all weather information and products have latency. Latency is the element of data age. The total latency of weather information and products includes the total time between the actual occurrence of the phenomenon, the data collection, processing, transmittal, and the display or application of the information in the cockpit, on the pilot's EFB, or other publication for use. It is important to be aware of the product time or "valid until" time on the particular data link information displayed in the cockpit or EFB. The amount of latency may limit the use or application of the information or product.

An example of weather information without latency is the wind direction when looking at the windsock along the runway. However, the wind reported in the Automated Weather Observing System (AWOS) or Automated Surface Observing System (ASOS) broadcast has a latency of up to 3 minutes. Why? While the AWOS and ASOS wind (direction and speed) is continuously being recorded by the AWOS/ASOS system processor, the reported wind is the most recent average of the direction and speed over the past 2 minutes. That 2-minute average is then updated once a minute for the radio or telephone broadcast.

Onboard aircraft radar has minimal latency, while NEXRAD data has a latency of 5 to 15 minutes or more with weather apps and data uplink services. This is why NEXRAD data is used for broad strategic avoidance of thunderstorms and never used to navigate through thunderstorms.

3.2.2 Additional Use Information

Details on the use of both government and commercial aviation weather information are discussed in the AIM, Chapter 7, Section 1, Paragraph 7-1-3, Use of Aviation Weather Products. Items discussed include:

- Approved sources for aviation weather information,
- The development of new products through the FAA's Next Generation Air Transportation System (NextGen) Aviation Weather Research Program (AWRP),
- The use of new products to meet regulatory requirements, and
- The use of weather services and products provided by entities other than the FAA, the NWS, or their contractors.

3.3 Obtaining Weather Information

3.3.1 Weather Briefings

Prior to every flight, pilots should gather all information vital to the nature of the flight. This includes a weather briefing obtained by the pilot using online weather resources, a dispatcher, or Flight Service.

Historically, Flight Service has been the primary source for obtaining preflight briefings. Today, increasing numbers of pilots are using online weather resources to obtain weather information through government or commercial providers. Pilots can receive a regulatory compliant briefing without contacting Flight Service. Pilots who prefer to contact Flight Service are encouraged to conduct a self-briefing prior to calling. Conducting a self-briefing before contacting Flight Service provides familiarity of weather conditions applicable to the route of flight and promotes a better understanding of weather information.

To obtain an appropriate weather briefing, pilots need to know which of the three types of briefings is needed for the flight—standard, abbreviated, or outlook. Other necessary information includes whether the flight will be conducted under VFR or IFR, aircraft identification and type, departure point, estimated time

of departure, desired flight altitude, route of flight, destination, and estimated time en route. If the briefing updates previously received information, the time of the last briefing is also important.

The information is entered into a flight plan form. When using the route brief feature in the Flight Service Pilot Web Portal (see Appendix G) or speaking to an FSS specialist, the type of weather briefing is recorded. If necessary, the information can be referenced later to file or amend a flight plan. It can also be used when an aircraft is overdue or is reported missing. All briefings provided by Flight Service (online or voice) are time-stamped and archived for 45 days.

Pilots can make a final weather check immediately before departure using online weather apps, when possible.

3.3.1.1 Standard Briefing

A standard briefing provides a complete weather picture and is the most detailed of all briefings. It includes conditions and significant weather information that may influence the pilot in planning, altering, or cancelling a proposed route or flight. A standard briefing provides the following information (if applicable to the route of flight) in sequential order:

- **Adverse Conditions.** This includes significant weather and/or aeronautical information about adverse conditions that may influence a decision to cancel or alter the route of flight (e.g., hazardous weather conditions, airport closures, or air traffic delays). Pilots should also be alert for any reported or forecast icing if the aircraft is not certified for operating in icing conditions. Flying into areas of icing or weather below minimums could have disastrous results.
- **VFR Flight Not Recommended (VNR).** When VFR flight is porposed and sky conditions or visibilities are present or forecast, surface or aloft, that, in the briefer's judgment, would make flight under VFR doubtful, the briefer will describe the conditions, describe the affected locations, and use the phrase "*VFR flight not recommended*." This recommendation is advisory in nature. The final decision as to whether the flight can be conducted safely rests solely with the pilot. Upon receiving a "*VFR flight not recommended*" statement, the non-IFR rated pilot will need to make a "go or no go" decision. This decision should be based on weighing the current and forecast weather conditions against the pilot's experience and ratings. The aircraft's equipment, capabilities, and limitations should also be considered. This advisory is not provided via the internet.
- **Synopsis.** A brief statement describing the type, location, and movement of weather systems and/or air masses that might affect the proposed flight.
- **Current (Latest) Conditions.** This portion of the briefing contains the current (latest reported or received) surface weather summarized from all available resources, including observations, PIREPs, and satellite and radar data along the route of flight. If the departure time is more than 2 hours away, current conditions will not be included in the briefing unless the pilot specifically requests the information.
- **En Route Forecast.** Forecast en route conditions for the proposed route are summarized in logical order (i.e., departure/climbout, en route, and descent). Heights are above mean sea level (MSL), unless the contractions "AGL" or "CIG" are denoted, indicating that heights are above ground.
- **Destination Forecast.** The destination forecast for the planned estimated time of arrival (ETA). Any significant changes within 1 hour before and after the planned arrival are included.

- **Winds and Temperatures Aloft.** Forecast winds aloft will be provided in knots and tens of degrees and referenced to true north. The briefer will interpolate wind directions and speeds between levels and stations as necessary to provide expected conditions at planned altitudes. (Heights are MSL.) Temperature information will be provided on request.
- **Notices to Air Missions (NOTAM), ATC Delays, and Other Information.** Refer to the AIM Chapter 7, Section 1, Paragraph 7-1-5, Preflight Briefing, subparagraphs 8b through 10 for a complete description of this part of the briefing. Also refer to the AIM Chapter 5, Section 1, Paragraph 5-1-3, Notice to Air Missions (NOTAM) System, for a complete description of all NOTAM types.

3.3.1.2 Abbreviated Briefing

An abbreviated briefing is a shortened version of the standard briefing. It can be requested when a departure has been delayed or when specific weather information is needed to update a previous standard briefing. Pilots who prefer to contact Flight Service are encouraged to conduct a self-briefing prior to calling. Conducting a self-briefing before contacting Flight Service provides familiarity of weather conditions applicable to the route of flight and promotes a better understanding of weather information. When contacting Flight Service by phone, the FSS specialist will ask for the time and source of the previous briefing so the specialist does not inadvertently omit the necessary weather information.

3.3.1.3 Outlook Briefing

An outlook briefing can be requested when a planned departure is 6 or more hours away. It provides initial forecast information that is limited in scope due to the timeframe of the planned flight. This type of briefing is a good source of flight planning information that can influence decisions regarding route of flight, altitude, and ultimately the "go, no-go" decision. A followup standard or abbreviated briefing prior to departure is advisable, since an outlook briefing generally only contains information based on weather trends and existing weather in geographical areas at or near the departure airport.

3.3.2 Telephone

3.3.2.1 Flight Service 1-800-WX-BRIEF

For flights within the CONUS, Alaska, Hawaii, and Puerto Rico, call 1-800-WX-BRIEF (1-800-992-7433).

Additionally, for flights within Alaska, individual FSS telephone numbers are listed in the FAA Chart Supplement for Alaska, Section 4, Associated Data.

FSS specialists are qualified and certified as Pilot Weather Briefers by the FAA. They are not authorized to make original forecasts, but are certified to translate and interpret available weather information directly into terms describing the weather conditions that can be expected at the departure, along the route of flight, and at the destination.

The FSS' purpose is to serve the aviation community. Pilots can ask questions and discuss factors they do not fully understand. The briefing is considered complete when the pilot has a clear picture of what weather to expect.

3.3.2.2 Airport Weather

The latest weather reports from airport automated observing systems (e.g., AWOS and ASOS) can be accessed from the phone. Phone numbers can be found in FAA Chart Supplements.

3.3.3 Self-Briefing

Preflight decision making using online weather information continues to offer more options for the pilot. The advent of interactive online aviation weather has allowed pilots to assemble aviation weather information into a better decision making process.

Pilots can receive a regulatory compliant briefing through online weather resources. Pilots that prefer to contact an FSS are encouraged to use the online weather resources prior to calling. Some online weather sources do not provide Flight Information Services (FIS), such as NOTAMs and Temporary Flight Restrictions (TFR). However, this information can also be found online through other websites.

3.3.3.1 Flight Service 1800wxbrief.com

The FAA contract provider for flight services provides a website (https://www.1800wxbrief.com) that allows pilots to review weather information, receive online preflight briefings, file flight plans, and receive automatic notifications and alerts. The website also offers an interactive map to allow pilots to view a variety of weather products and access to a variety of aeronautical information that can be tailored to their planned flight route. See Chapter 28, Aviation Weather Tools, for additional information.

3.3.3.2 Aviation Weather Cameras

The FAA's Aviation Weather Cameras website provides access to current weather camera images from the FAA's Aviation Weather Camera Network. On the website, pilots can compare the images to clear day views or play back a loop of past images to establish weather trends. Weather camera images are a supplementary product and may only be used to improve situational awareness.

The website also delivers a variety of safety of flight information including adverse conditions (e.g., AIRMETs and SIGMETs), current conditions (e.g., Aviation Routine Weather Reports (METAR), radar, satellite imagery, and weather trends), TAFs, PIREPs, and other aeronautical information (e.g., remote communications outlets (RCO), TFRs, and charts).

The FAA's Aviation Weather Cameras website can be found in Appendix G. The website uses a set of progressive web application standards that enables an application-level experience on certain mobile devices. See Section 24.9 for additional information.

3.3.3.3 AviationWeather.gov

The website https://aviationweather.gov is operated by the NWS AWC in Kansas City, MO. It is a major aviation weather website for obtaining text and graphical preflight weather information and products.

3.3.3.3.1 Graphical Forecasts for Aviation (GFA) Tool

The Graphical Forecasts for Aviation (GFA) Tool is a set of web-based displays that provide the necessary aviation weather information to give users a complete picture of the weather that may impact flights in the CONUS, Gulf of Mexico, the Caribbean, portions of the Atlantic Ocean, and portions of the Pacific Ocean, including the Hawaiian Islands and Alaska. See Chapter 28 for additional information.

3.3.3.4 Flight Information Service-Broadcast (FIS-B)

Pilots can receive a regulatory compliant briefing through online weather resources that can be used in conjunction with the Flight Information Service-Broadcast (FIS-B) products. See Section 3.3.4.1 for information on FIS-B.

3.3.3.5 Commercial Services

There are several commercial aviation weather providers that offer aviation weather and flight information suitable for tablets and EFBs. These have a subscription fee for the service.

3.3.3.6 Weather Applications (Apps)

There are an increasing number of weather apps that allow pilots to access a wide range of weather reports and forecasts from their phone, tablet, and computer. Some apps include flight planning services, in-flight updates, NOTAMs, and TFRs. Details on these weather apps and other online weather services can be found in the information from the service provider.

3.3.4 In-Flight Updates

3.3.4.1 Flight Information Service-Broadcast (FIS-B)

FIS-B over Universal Access Transceiver (UAT) datalink service provides aeronautical information and meteorological information to the flight deck for aircraft operating in the NAS. These products are broadcast over the Automatic Dependent Surveillance-Broadcast (ADS-B) UAT link so that pilots have timely information of regional weather and NAS status/changes that might affect flight. FIS-B aeronautical information and meteorological information products provide strategic information to the flight deck that enhances a preflight briefing. FIS-B products do not include all NOTAMs.

Advisory Circular (AC) 00-63, Use of Flight Deck Displays of Digital Weather and Aeronautical Information, contains detailed information concerning FIS-B meteorological products. The AIM Chapter 3, Airspace; Chapter 4, Air Traffic Control; and Chapter 5, Air Traffic Procedures, contain information on Special Use Airspace (SUA), TFR, and NOTAM products.

FIS-B update intervals are defined as the rate at which the product data is available from the source. Transmission intervals are defined as the amount of time within which a new or updated product transmission must be completed and the rate or repetition interval at which the product is rebroadcast. Refer to the AIM, Chapter 7, Section 1, Table 7-1-2, FIS-B Over UAT Product Update and Transmission Intervals, for update and transmission intervals for each FIS-B product.

Where applicable, FIS-B products include a look-ahead range expressed in nautical miles for three service domains: Airport Surface, Terminal Airspace, and En Route/Gulf of Mexico. The AIM, Chapter 7, Section 1, Table 7-1-3, Product Parameters for Low/Medium/High Altitude Tier Radios, provides service domain availability and look-ahead ranging for each FIS-B product.

Details on the content, format, and symbology of individual FIS-B products can be obtained from the manufacturer of the avionics equipment used to receive and display them.

3.3.4.2 Automated Surface Observing System (ASOS) and Automated Weather Observing System (AWOS)

ASOS and AWOS information can be retrieved in flight. Typically, the range of an ASOS/AWOS broadcast is 25 NM. ASOS and AWOS frequencies are printed on Sectional Charts and listed in FAA Chart Supplements. The majority of ASOS and AWOS are on airports, but there are a few located off-airport, such as in a mountain pass. See Section 24.3 for more information on ASOS and AWOS.

3.3.4.3 Automatic Terminal Information Service (ATIS)

The Automatic Terminal Information Service (ATIS) is a continuous broadcast on an assigned frequency of recorded information in selected terminal areas to provide pilots with necessary airport and local area information prior to arrival or departure.

ATIS frequencies can be found on Sectional Charts and Chart Supplements, as well as on instrument approach charts.

The ATIS broadcast is updated upon the receipt of new hourly weather, special weather, or when there is a change in other pertinent data, such as runway change, instrument approach in use, etc.

3.3.4.4 Flight Service

FSS specialists provide in-flight weather updates as well as collect PIREPs. FSS frequencies are listed on Sectional Charts and Chart Supplements.

3.3.4.5 Automatic Flight Information Service (AFIS) – Alaska Only

The Automatic Flight Information Service (AFIS) provides a continuous broadcast of recorded non-control information at airports in Alaska where Flight Service provides local airport advisory (LAA) service. The AFIS broadcast automates the repetitive transmission of essential but routine information, such as weather, wind, altimeter, favored runway, braking action, airport NOTAMs, and other applicable information. The information is continuously broadcast over a discrete very high frequency (VHF) radio frequency (usually the ASOS frequency). When rapidly changing conditions exist, the ceiling, visibility, altimeter, wind, or other conditions may be omitted from the AFIS and will be issued by the FSS specialist on the appropriate radio frequency. AFIS frequencies can be found on Sectional Charts and the Alaska Chart Supplement.

3.4 Overview of Aviation Weather Products

There are many aviation weather products available to the pilot through the internet and mobile phone apps. Each product has a specific purpose that provides the user with reported or forecast weather conditions either at an airport or aloft. Table 3-1 and Table 3-2 are matrices of aviation weather products versus the weather elements and the weather phenomena applicable to aviation. These tables are a high-level overview and do not attempt to capture all products and elements.

A brief summary of the weather products that contain information pertaining to each weather element and weather phenomenon is provided in individual tables in the next section. Technical specifications (e.g., codes and contents) pertaining to the products in Table 3-1 and Table 3-2, as well as others, are provided in Chapters 24, 25, 26, 27, and 28.

3.4.1 Weather Products versus Weather Elements and Phenomena

Table 3-1. High-Level Overview of Select Weather Products and Select Weather Elements and Phenomena that are of Interest to Aviation Users (See Table 3-3 for acronyms and abbreviations.)

An 'X' indicates that the weather product contains information pertaining to the weather element or phenomenon.

Product	T-Storm	Wind	Wind Shear	Visibility	Precip	Fog	In-Flight Icing	Freezing Level	Turb	Ash	TC	SS/DS	Mtn Obsc
Observations													
METAR, SPECI (ASOS, AWOS, ATIS)	X	X	X	X	X	X				X		X	
PIREP/AIREP /VAR	X		X	X	X	X	X	X	X	X		X	X
Radar	X				X				X	X	X	X	
Lightning Data	X												
Satellite	X								X	X	X	X	
Weather Camera	X			X	X	X				X			X

Product	T-Storm	Wind	Wind Shear	Visibility	Precip	Fog	In-Flight Icing	Freezing Level	Turb	Ash	TC	SS/DS	Mtn Obsc
Analysis													
Surface Analysis Charts		X		X	X	X					X		
Upper-Air Analysis													
Freezing Level Analysis								X					
CIP							X						
GTG									X				
Advisories													
Convective-SIGMET	X		X				X		X		X		
SIGMET	X						X		X	X	X	X	
AIRMET		X	X	X	X	X	X	X	X				X
CWA	X	X		X	X		X		X	X		X	
VAA										X			
TCA		X									X		
Space Weather Advisory													
LLWAS			X										
AWW	X	X			X								
Forecasts													
Wind and Temp Aloft		X											
TAF	X	X	X	X	X	X			X	X		X	
Aviation Surface Forecast	X	X		X	X	X						X	
Aviation Clouds Forecast							X						X
AK FA	X	X		X	X	X	X	X	X	X			X
HI FA	X	X		X	X	X				X			
Gulf of Mexico and Caribbean FA	X	X		X	X	X	X	X	X	X			
Low-Level SIGWX								X	X			X	
Med-Level SIGWX	X	X					X		X	X	X		
High-Level SIGWX	X	X							X	X	X		
AK SIGWX	X							X	X				
AK Surface Chart	X				X	X							
AK Convective Outlook	X												
Surface Prog Charts	X				X						X		
WAFS	X	X					X		X				
Upper Air Forecasts		X						X					
FIP							X						
Cloud Top													
Convective Outlook	X												
TCF	X												
ECFP	X												

Product	T-Storm	Wind	Wind Shear	Visibility	Precip	Fog	In-Flight Icing	Freezing Level	Turb	Ash	TC	SS/DS	Mtn Obsc
SAW	X												
AFD	X	X	X	X	X	X				X	X	X	X
MIS	X			X	X	X	X		X	X	X		
Tools													
GFA Tool	X	X	X	X	X	X	X	X	X	X	X	X	X
Flight Service Interactive Map	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 3-2. Continuation of Table 3-1 (See Table 3-3 for acronyms and abbreviations.)

An 'X' indicates that the weather product contains information pertaining to the weather element or phenomenon.

Product	IFR	MVFR	Cloud Cover	Cloud Base	Cloud Tops	Cloud Layers	Pressure	Fronts	Temp Aloft	Space Weather	Density Altitude
Observations											
METAR, SPECI (ASOS, AWOS, ATIS)	X	X	X	X		X	X	X	X		X
PIREP/AIREP			X	X	X	X			X		
Radar											
Lightning Data											
Satellite			X								
Weather Camera			X	X							
Analysis											
Surface Analysis Charts			X	X			X	X	X		
Upper-Air Analysis									X		
Freezing Level Analysis									X		
CIP											
GTG											
RTMA									X		
Advisories											
Convective SIGMET					X						
SIGMET					X						
CWA	X			X							
VAA											
TCA											
Space Weather Advisory										X	
LLWAS										X	
AWW											
Forecasts											
Wind and Temp Aloft									X		
TAF	X	X	X	X		X		X			
Aviation Surface Forecast	X										
Aviation Clouds Forecast			X	X	X	X					
AK FA	X	X	X	X	X	X		X			
HI FA	X	X	X	X	X	X		X			
Gulf of Mexico and Caribbean FA	X	X	X	X	X	X		X			

Product	IFR	MVFR	Cloud Cover	Cloud Base	Cloud Tops	Cloud Layers	Pressure	Fronts	Temp Aloft	Space Weather	Density Altitude
Low-Level SIGWX	X	X	X	X					X		
Med-Level SIGWX											
High-Level SIGWX											
AK SIGWX	X	X	X	X				X			
AK Surface Chart								X			
Surface Prog Charts							X	X			
WAFS									X		
Upper Air Forecasts									X		
FIP											
GTG											
Cloud Top			X		X						
Convective Outlook											
TCF					X						
ECFP											
SAW											
AFD	X	X	X	X				X			
MIS	X			X							
Tools											
GFA Tool	X	X	X	X	X	X					
Flight Service Interactive Map	X	X	X	X		X					

Table 3-3. Acronyms and Abbreviations Used in Product/Element/Phenomenon Tables

Acronym/Abbreviation	Definition
AFD	Aviation Forecast Discussion
AGL	Above Ground Level
AIREP	Aircraft Report
AIRMET	Airmen's Meteorological Information
AK	Alaska
ARTCC	Air Route Traffic Control Center
Ash	Volcanic Ash
ASOS	Automated Surface Observing System
ATIS	Automatic Terminal Information Service
AWOS	Automated Weather Observing System
AWW	Airport Weather Warning
BCFG	Patchy Fog
BKN	Broken
BLDU	Blowing Dust

Acronym/Abbreviation	Definition
BLSA	Blowing Sand
BR	Mist
CB	Cumulonimbus
CIP	Current Icing Product
CONUS	Contiguous United States
CWA	Center Weather Advisory
DRDU	Drifting Dust
DRSA	Drifting Sand
DS	Dust Storm
ECFP	Extended Convective Forecast Product
FA	Area Forecast
FG	Fog
FIP	Forecast Icing Product
FL	Flight Level
FROPA	Frontal Passage
ft	Feet
FZFG	Freezing Fog
GFA	Graphical Forecasts for Aviation
GTG	Graphical Turbulence Guidance
HI	Hawaii
HZ	Haze
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
kt	knot
LIFR	Low Instrument Flight Rules
LLWAS	Low-Level Wind Shear Alert System
LLWS	Low-Level Wind Shear
METAR	Aviation Routine Weather Report
MIFG	Shallow Fog
MIS	Meteorological Impact Statement
MSL	Mean Sea Level
Mtn Obsc	Mountain Obscuration
MVFR	Marginal Visual Flight Rules
NIL SIG	No Significant

Acronym/Abbreviation	Definition
NOAA	National Oceanic and Atmospheric Administration
Obsc	Obscuration
OVC	Overcast
PIREP	Pilot Weather Report
Precip	Precipitation
PRFG	Partial Fog
Prog	Prognostic
RMK	Remarks
RTMA	Real-Time Mesoscale Analysis
SAW	Aviation Watch Notification Message
SIGMET	Significant Meteorological Information
SIGWX	Significant Weather
SLD	Supercooled Large Drop
sm	statute mile
SPECI	Aviation Selected Special Weather Report
SS	Sandstorm
TAF	Terminal Aerodrome Forecast
TC	Tropical Cyclone
TCA	Tropical Cyclone Advisory
TCF	Traffic Flow Management Convective Forecast
Temp	Temperature
TS	Thunderstorm
TSRA	Thunderstorm with Rain
T-Storm	Thunderstorm
Turb	Turbulence
VA	Volcanic Ash
VAA	Volcanic Ash Advisory
VAR	Volcanic Activity Report
VC	Vicinity
VCFG	Fog in the Vicinity
VCTS	Thunderstorm in the Vicinity
VFR	Visual Flight Rules
WAFS	World Area Forecast System
WDSPR DS	Widespread Dust Storms

Acronym/Abbreviation	Definition
WDSPR SS	Widespread Sandstorms
Wx or WX	Weather
Z	Zulu

3.4.2 Summaries of Specific Weather Information Contained in Various Weather Products

The following set of tables identify specific weather elements (e.g., thunderstorms, turbulence) and list the products that contain information relating to those elements. A brief summary description is also provided. These summaries are not intended to provide all of the details. More detailed information can be found in Chapters 24, 25, 26, 27, and 28.

3.4.2.1 Products with Thunderstorm Information

Table 3-4. Weather Element: Thunderstorm

Type: text (T), graphic (G), image (I), voice (V)

Thunderstorm Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	Thunderstorms are reported in the body section of the METAR/SPECI when observed or detected by lightning networks or observers. Lightning information is provided in the RMK section of the METAR/SPECI.
PIREP	T, G, V	Included when reported.
Radar	I	Radar provides intensity levels of precipitation. Thunderstorms can typically be distinguished based on intensity, but not always. Certain radar limitations can be misleading.
Lightning data	G	Used in the METAR, SPECI, ASOS, AWOS, ATIS, as well as incorporated into other product overlays (e.g., satellite pictures, radar display).
Satellite	I	Thunderstorms can be inferred by a meteorologist or trained specialist, unless they are embedded in other cloud layers.
Weather Camera	I	CB clouds may be seen on the camera.
Analysis		
Advisories		
Convective SIGMET	T, G	Active area of thunderstorms. Only issued for the CONUS instead of a SIGMET for thunderstorms.
SIGMET	T, G	Active area of thunderstorms. Issued for areas outside the CONUS.
CWA	T, G	Active area of thunderstorms. Issued as a supplement to a Convective SIGMET or when Convective SIGMET criteria have not been met.
AWW	T	Intended for ground operations at select airports. Criteria may vary depending on user needs. For example, it can be issued for cloud to ground lightning within 5 miles of the airport.

Thunderstorm Information Contained In:	Type	Summary
Forecasts		
TAF	T, G	Thunderstorm included using various descriptors. For example: - TS: thunderstorm without precipitation (means dry thunderstorms). - TSRA: thunderstorm with precipitation (in this case, rain). - VCTS: thunderstorms in the vicinity (i.e., within 5–10 sm of the center of the airport).
Aviation Surface Forecast	G	Derived from the GFA and includes forecasts of areas of thunderstorms at specified valid times.
Alaska Area Forecast	T	A description of significant clouds and weather including thunderstorms and CB clouds.
Hawaii Area Forecast	T	A description of significant clouds and weather including thunderstorms and CB clouds.
Gulf of Mexico and Caribbean Area Forecast	T	A description of significant clouds and weather including thunderstorms and CB clouds.
Med-Level SIGWX	G	Forecast of significant weather including areas of CB clouds at specified valid times for limited geographic areas around the globe.
High-Level SIGWX	G	Global forecast of significant weather including areas of CB clouds at specified valid times.
Alaska SIGWX Chart	G	Forecast of significant weather including areas of thunderstorms at specified valid times.
Alaska Surface Chart	G	Forecast of surface weather features including areas of thunderstorms at specified valid times.
Alaska Convective Outlook	G	Seasonal product that provides forecasts that indicate where conditions are favorable for towering cumulus and thunderstorms at specified valid times.
Surface Prog Charts	G	CONUS forecast that includes areas of thunderstorms at specified valid times.
WAFS	G	Global forecasts that include areas of CB clouds.
TCF	G	The TCF depicts areas of convection meeting select criteria.
ECFP	G	The ECFP is a planning forecast mainly intended for air traffic managers.
Convective Outlook	T, G	Convective Outlooks provide the potential for severe (tornado, wind gusts 50 knots or greater, or hail 1-in diameter or greater) and non-severe (general) convection and specific severe weather threats during the following 8 days.
SAW	T, G	Formerly known as the AWW, the SAW provides an approximation of the area covered by a Severe Thunderstorm Watch or Tornado Watch.
Severe Thunderstorm Watch	T, G	A watch is when conditions are favorable for severe thunderstorms, which is hail 1-in diameter or greater and/or damaging winds of 50 knots or greater. Not to be confused with a Severe Thunderstorm Warning, which is issued when severe thunderstorms are occurring.
Tornado Watch	T, G	A watch is when conditions are favorable for tornadoes. Not to be confused with a Tornado Warning, which is issued when tornadoes are occurring.
AFD	T	Describes the weather conditions as they relate to a specific TAF or group of TAFs, and may provide additional aviation weather-related issues that cannot be encoded into the TAF, such as the reasoning behind the forecast.
MIS	T	A discussion of meteorological events (including significant convection) causing or expecting to impact the flow of air traffic across an ARTCC.

Thunderstorm Information Contained In:	Type	Summary
Tools		
GFA Tool	G	Interactive website that includes forecast thunderstorm areas with different coverage levels. Also overlays radar Convective SIGMETs, CWAs for thunderstorms and Severe Thunderstorm/Tornado Warnings.
Flight Service Interactive Map	G	Interactive website that includes overlays of radar, Convective SIGMETs, CWAs for thunderstorms, and Severe Thunderstorms/Tornado Watches and Warnings. Also includes an overlay for radar echo tops.

3.4.2.2 Products with Wind Information

Table 3-5. Weather Element: Wind

Type: text (T), graphic (G), image (I), voice (V)

Wind Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	Surface wind speed and direction are included. Wind direction is reported relative to magnetic north in ATIS as well as ASOS and AWOS radio (voice) broadcasts. Otherwise reported relative to true north. Wind speed is reported in knots.
PIREP/AIREP	T, G, V	Wind direction is reported in tens of degrees magnetic north and wind speed in knots.
Analysis		
Surface Analysis Chart	G	Surface wind speed and direction (true north) are depicted with standard symbols on station plot models.
Upper Air Analysis	G	At select pressure levels, the wind direction aloft is displayed in tens of degrees true north and wind speed aloft is displayed in knots.
Advisories		
AIRMET	T, G	AIRMET Tango issued when sustained surface winds greater than 30 knots are occurring or expected to occur.
CWA	T, G	May be issued if surface wind gusts are at or above 30 knots.
TCA	T	Includes maximum sustained surface winds.
AWW	T	Intended for ground operations at select airports. Criteria may vary depending on user needs.
Forecasts		
Winds and Temperature Aloft	T, G	Wind direction aloft is indicated in text format as tens of degrees with reference to true north, and wind speed aloft in knots. The graphical forecast uses standard wind barb display for wind speed/direction (true north).
TAF	T, G	Surface wind forecasts of direction rounded to the nearest 10 degrees (true north) and the surface mean wind speed in knots are included in the wind group.
Aviation Surface Forecast	G	Derived from the GFA and includes forecasts of surface winds at specified valid times. Also includes AIRMET for surface winds.
Alaska Area Forecast	T	Surface winds greater than 20 knots are included in the description of significant clouds and weather.

Wind Information Contained In:	Type	Summary
Hawaii Area Forecast	T	Sustained surface winds of 20 knots or greater are included in the description of significant clouds and weather.
Gulf of Mexico and Caribbean Area Forecast	T	Sustained surface winds greater than or equal to 20 knots are included in the description of significant clouds and weather.
Medium-Level SIGWX	G	A jet stream axis with a wind speed aloft of more than 80 knots is depicted with double hatched lines identifying 20-knot speed changes.
High-Level SIGWX	G	Global forecast of a jet stream axis with a wind speed aloft of more than 80 knots is depicted with double hatched lines identifying 20-knot speed changes.
WAFS	G	Winds aloft are issued at select FLs and are provided in chart and grid point formats. Wind speed and direction (true north) are displayed with wind barbs.
Upper Air Forecasts	G	Model outputs for winds aloft are shown at select pressure levels. Wind speed and direction (true north) are displayed with wind barbs.
AFD	T	Describes the weather conditions as they relate to a specific TAF or group of TAFs, including surface winds.
Tools		
GFA Tool	G	Interactive website that includes surface winds (true north) and winds aloft at select altitudes/FLs.
Flight Service Interactive Map	G	Interactive website that includes overlap of AIRMET for surface winds and winds aloft (true north) at select altitudes/FLs.

3.4.2.3 Products with Wind Shear Information

Table 3-6. Weather Element: Wind Shear

Type: text (T), graphic (G), image (I), voice (V)

Wind Shear Information Contained In:	Type	Summary
Observations		
ATIS	V	LLWS and/or microburst is included in ATIS broadcast for 20 minutes following last report.
PIREP/AIREP	T, G, V	Wind shear is included in the RMK section when reported.
Analysis		
Advisories		
Convective SIGMET	T, G	Possible LLWS is implied within the convective SIGMET area.
AIRMET	T, G	AIRMET Tango issued when nonconvective LLWS potential below 2,000 ft AGL is occurring or expected to occur.
LLWAS	T	A wind shear alert occurs when wind shear ±15 kt is detected.
Forecasts		
TAF	T, G	Included in the nonconvective LLWS group.
AFD	T	Describes the weather conditions as they relate to a specific TAF or group of TAFs, including nonconvective LLWS.

Wind Shear Information Contained In:	Type	Summary
Tools		
GFA Tool	G	Interactive website that includes overlay of AIRMET for nonconvective LLWS.
Flight Service Interactive Map	G	Interactive website that includes overlay of AIRMET for nonconvective LLWS.

3.4.2.4 Products with Visibility Information

Table 3-7. Weather Element: Visibility

Type: text (T), graphic (G), image (I), voice (V)

Visibility Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	Visibility is reported in the body section of the METAR/SPECI. The visibility is reported in statute miles.
PIREP/AIREP	T, G, V	Distance for visibility is reported by the pilot in statute miles.
Weather Camera	I	A rough estimate could be inferred when known distance features are seen on the camera.
Analysis		
Surface Analysis Chart	G	Certain surface analysis charts may include the reported visibility in the station plot model.
Advisories		
AIRMET	T, G	AIRMET Sierra depict areas of surface-based IFR (ceilings less than 1,000 ft and/or visibilities less than 3 sm) that is occurring or expected to occur.
CWA	T, G	Issued if conditions are at or approaching low IFR (ceiling less than 500 ft and/or visibilities less than 1 sm).
Forecasts		
TAF	T, G	Included under the visibility group when prevailing visibility is forecast to be less than or equal to 6 sm.
Aviation Surface Forecast	G	Derived from the GFA and includes forecasts of visibility at specified valid times.
Alaska Area Forecast	T	Visibilities of 6 sm or less and obscurations to visibility are included.
Hawaii Area Forecast	T	Visibilities of 6 sm or less and obscurations to visibility are included.
Gulf of Mexico and Caribbean Area Forecast	T	Visibilities of 6 sm and obscurations to visibility are included.
AFD	T	Describes the weather conditions as they relate to a specific TAF or group of TAFs, including visibilities.

Visibility Information Contained In:	Type	Summary
Tools		
GFA Tool	G	Interactive website that includes visibility.
Flight Service Interactive Map	G	Interactive website that includes overlay of AIRMET Sierra and CWAs.

3.4.2.5 Products with Precipitation Information

Table 3-8. Weather Element: Precipitation

Type: text (T), graphic (G), image (I), voice (V)

Precipitation Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	Precipitation is reported in the body section of the METAR/SPECI when observed or detected. Some AWOS systems do *not* report precipitation.
PIREP	T, G, V	Pilot reports may include precipitation, which in places in the "/WX" section of the PIREP.
Radar	I	Radar provides intensity levels of precipitation.
Weather Camera	I	Precipitation may be seen on the camera.
Analysis		
Surface Analysis Chart	G	Precipitation is included within the station plot models or when charts are combined with radar imagery.
Advisories		
AIRMET	G	AIRMETs are issued when weather phenomena such as precipitation restricts visibility (less than 3 sm).
CWA	T, G	May be issued for heavy, extreme, or frozen precipitation.
AWW	T	Intended for ground operations at select airports. Criteria may vary depending on user needs. Examples of criteria that could issue this warning are heavy snow or freezing rain.
Forecasts		
TAF	T, G	Included when conditions are expected and indicated by various descriptors based on the type of precipitation. Intensity is also coded with precipitation types.
Aviation Surface Forecast	G	Derived from the GFA and includes forecasts of precipitation at specified valid times includes weather phenomena.
Alaska Area Forecast	T	A description of significant clouds and weather, including precipitation.
Hawaii Area Forecast	T	A description of significant clouds and weather, including precipitation.
Gulf of Mexico and Caribbean Area Forecast	T	A description of significant clouds and weather, including precipitation.

Precipitation Information Contained In:	Type	Summary
Alaska Surface Chart	G	Includes forecast of precipitation.
Surface Prog Charts	G	Depicts the type of precipitation and the forecast percent probability of measurable precipitation.
AFD	T	Describes the weather conditions as they relate to a specific TAF or group of TAFs, including precipitation.
MIS	T	A nontechnical discussion of meteorological events (including precipitation) causing or expecting to impact the flow of air traffic across an ARTCC.
Tools		
GFA Tool	G	Interactive website that includes precipitation information and overlay of radar.
Flight Service Interactive Map	G	Interactive website that includes overlay of radar.

3.4.2.6 Products with Fog Information

Table 3-9. Weather Element: Fog

Type: text (T), graphic (G), image (I), voice (V)

Fog Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	Fog (including mist and haze) information is reported in METAR/SPECI from manual and ASOS stations, and included in ASOS and ATIS broadcasts. Fog/mist/haze is not included in METARs/SPECIs from most AWOS, nor most AWOS broadcasts, depending on the type of AWOS. FG is reported when visibility is less than 5/8 sm. FZFG is reported when temperature is below 00 ºC. BR or HZ is reported for visibilities from 5/8 sm to less than 7 sm, depending on the difference between the temperature and dewpoint. If the difference is 40 ºF (~20 ºC) or less, then FG is reported. Otherwise HZ is reported.
PIREP	T, G, V	Included if reported.
Weather Camera	I	Fog may be seen on the camera.
Analysis		
Surface Analysis Chart	G	Noted on the chart or in the station plots.
Advisories		
AIRMET	T, G	Issued when weather phenomena such as fog/mist occurs or is expected to occur that could restrict visibility (less than 3 sm).

Fog Information Contained In:	Type	Summary
Forecasts		
TAF	T, G	A visibility threshold must be met for fog to be included in the TAF (visibility of less than 5/8 sm). The fog code is "FG," with the following additional terms: - Freezing fog (FZFG). - Shallow fog (MIFG). - Patchy Fog (BCFG). - Partial Fog (PRFG). - Fog in the vicinity (VCFG). Vicinity (VC) is defined as area 5 to 10 sm from the center of the airport. - BR is included for visibilities from 5/8 to 6 sm.
Aviation Surface Forecast	G	Derived from NOAA's GFA and includes forecasts of areas of thunderstorms at specified valid times includes obscurations such as fog/mist.
Alaska Area Forecast	T	Visibilities of 6 sm or less and obstruction(s) to visibility are included.
Hawaii Area Forecast	T	Visibilities of 6 sm or less with obstruction(s) to visibility are included.
Gulf of Mexico and Caribbean Area Forecast	T	Visibilities of 6 sm or less and obstruction(s) to visibility are included.
Alaska Surface Chart	G	Forecast of surface weather features including areas of fog/mist at specified valid times.
AFD	T	Describes the weather conditions as they relate to a specific TAF or group of TAFs, including fog/mist.
MIS	T	A discussion of meteorological events (including fog/mist) causing or expecting to impact the flow of air traffic across an ARTCC.
Tools		
GFA Tool	G	Interactive website that includes fog/mist. Also includes AIRMET Sierra.
Flight Service Interactive Map	G	Interactive website that includes overlay of AIRMET Sierra.

3.4.2.7 Products with In-Flight Icing Information

Table 3-10. Weather Element: In-Flight Icing

Type: text (T), graphic (G), image (I), voice (V)

In-Flight Icing Information Contained In:	Type	Summary
Observations		
PIREP/AIREP	T, G, V	Icing intensity, type, and altitude reported. Noted as an Urgent PIREP or Special AIREP when severe.
Analysis		
CIP	G	Computer model's 0-hour forecast (referred to on the product as an analysis) depicting five icing analysis products: - Icing Probability. - Icing Severity. - Icing Severity – Probability > 25%. - Icing Severity – Probability > 50%. - Icing Severity plus SLD.
Advisories		
Convective SIGMET	T, G	Possible severe icing is implied within the convective SIGMET area.
SIGMET	T, G	Nonconvective SIGMETs are issued for severe icing.
AIRMET	T, G	AIRMET Zulu depicts areas of active or expected moderate icing.
CWA	T, G	May be issued for moderate or greater icing.
Forecasts		
Aviation Clouds Forecast	G	Includes a depiction of icing AIRMETs.
Alaska Area Forecast	T	May includes a description of icing not meeting AIRMET criteria otherwise "NIL SIG" is noted if no significant icing is forecast.
Gulf of Mexico and Caribbean Area Forecast	T	A description of moderate or severe icing conditions.
Medium-Level SIGWX	G	Areas moderate or severe icing are depicted.
WAFS	G	Global icing forecasts provided in a grid point format.
FIP	G	Five icing forecast graphics derived from computer model data for the following: - Icing Probability. - Icing Severity. - Icing Severity – Probability > 25%. - Icing Severity – Probability > 50%. - Icing Severity plus SLD.
MIS	T	A discussion of meteorological events (including inflight icing information) causing or expecting to impact the flow of air traffic across an ARTCC.

In-Flight Icing Information Contained In:	Type	Summary
Tools		
GFA Tool	G	Interactive website that includes in-flight icing (PIREPs, FIPs, AIRMETs, SIGMETs, and CWAs).
Flight Service Interactive Map	G	Interactive website that includes icing.

3.4.2.8 Products with Freezing Level Information

Table 3-11. Weather Element: Freezing Level

Type: text (T), graphic (G), image (I), voice (V)

Freezing Level Information Contained In:	Type	Summary
Observations		
PIREP/AIREP	T, G, V	Included when reported.
Analysis		
Freezing Level Analysis	G	Depicts the height (MSL) of the lowest freezing level.
Advisories		
AIRMET	T, G	Contains one or more of the following: - Areas of multiple freezing levels. - Range of freezing levels over the area. - Lowest freezing levels at intervals of 4,000 ft MSL.
Forecasts		
Alaska Area Forecast	T	A description of significant clouds and weather that includes freezing levels.
Gulf and Caribbean Area Forecast	T	A description of significant clouds and weather that includes freezing levels.
Low-Level SIGWX	G	Freezing level at the surface are depicted.
Alaska SIGWX	G	Freezing levels are shown for the surface and at 2,000-ft intervals.
Upper Air Forecasts	G	Computer model outputs for freezing levels at select height levels (available levels vary depending on the model).
Tools		
GFA Tool	G	Interactive website that includes freezing levels.
Flight Service Interactive Map	G	Interactive website that includes freezing levels.

3.4.2.9 Products with Turbulence Information

Table 3-12. Weather Element: Turbulence

Type: text (T), graphic (G), image (I), voice (V)

Turbulence Information Contained In:	Type	Summary
Observations		
PIREP/AIREP	T, G, V	Turbulence reports include location, altitude, and aircraft type. The pilot determines the degree of turbulence, intensity, and duration. Severe or extreme turbulence is reported as an Urgent PIREP or Special AIREP. The vast majority of AIREPs are automated and include turbulence reports derived from the aircraft's motion.
Radar	I	Convective weather on radar could indicate potential areas of severe turbulence.
Satellite	I	Potential turbulence areas may be inferred from certain cloud patterns by a meteorologist or trained specialist. CB always implies severe turbulence.
Analysis		
GTG	G	Product provides a computer analysis of turbulence based on multiple computer algorithms. Graphic also depicts any turbulence PIREPs.
Advisories		
Convective SIGMET	T, G	Possible severe turbulence is implied within the convective SIGMET area.
SIGMET	T, G	Issued for severe turbulence not associated with thunderstorms.
AIRMET	T, G	AIRMET Tango depicts areas of active or expected moderate turbulence. The product is divided into high and low altitude at 18,000 ft.
CWA	T, G	May be issued for moderate or greater turbulence not covered by an existing AIRMET or SIGMET.
Forecasts		
TAF	T, G	Low-level mechanical turbulence could be inferred when strong and gusty surface winds are forecast
Alaska Area Forecast	T	Expected turbulence conditions are included along with the following information: - AIRMET information for turbulence or LLWS. - Turbulence not meeting SIGMET/AIRMET criteria during the 6 to 12-hour period. - "NIL SIG" is noted if no significant turbulence in forecast.
Gulf of Mexico and Caribbean Area Forecast	T	Moderate or greater turbulence is noted at the end of forecast bulletin.
Low-Level SIGWX	G	Moderate or greater turbulence is depicted.
Medium-Level SIGWX	G	Areas of nonconvective clouds with moderate or severe turbulence are depicted.
High-Level SIGWX	G	Global forecasts of moderate or severe turbulence associated with wind shear zones and mountain waves are depicted.
Alaska SIGWX	G	Areas of forecast moderate or greater nonconvective low-level turbulence are depicted.
WAFS	G	Global forecasts of turbulence provided in a grid point format primarily intended for use in flight-planning systems.

Turbulence Information Contained In:	Type	Summary
MIS	T	A discussion of meteorological events (including turbulence information) causing or expecting to impact the flow of air traffic across an ARTCC.
Tools		
GFA Tool	G	Interactive website that includes turbulence (PIREP/AIREP, GTG, AIRMET, SIGMET, and CWA).
Flight Service Interactive Map	G	Interactive website that includes turbulence (PIREP/AIREP, GTG, AIRMET, SIGMET, and CWA).

3.4.2.10 Products with Volcanic Ash Information

Table 3-13. Weather Element: Volcanic Ash

Type: text (T), graphic (G), image (I), voice (V)

Volcanic Ash Information Contained In:	Type	Summary
Observations		
METAR, SPECI (ATIS)	T, G, V	Reported in manual and select augmented METAR/SPECIs as "VA." Included in ATIS as appropriate.
PIREP/AIREP/VAR	T, G, V	Reported by pilot and noted as an Urgent PIREP or Special AIREP. First part of VAR reported immediately to ATC, second part of VAR submitted postflight.
Radar	I	Potentially visible on radar.
Satellite	I	May be visible on satellite if not obscured by cloud cover.
Weather Camera	I	Volcanic ash cloud may be seen on the camera.
Analysis		
		See SIGMET and VAA
Advisories		
SIGMET	T, G	One of the conditions that triggers the issuance of a SIGMET. Provides an analysis and 6-hour forecast location of the ash cloud.
VAA	T, G	Provides an analysis, 6-, 12-, 18-, and 24-hour forecast location of the ash cloud. Issued every 6 hours until the volcanic ash is no longer discernible from satellite and no further reports of volcanic ash are received from the area.
CWA	T, G	One of the conditions that triggers the issuance of a CWA.
Forecasts		
TAF	T	Included when conditions are expected and indicated in the forecast as "VA" under the significant weather group.
Alaska Area Forecast	T	Obstructions to visibility such as volcanic ash are noted in the description of significant clouds and weather for the region during the first 12 hours of the forecast period.
Hawaii Area Forecast	T	Obstructions to visibility such as volcanic ash are noted in the description of significant clouds and weather for the region during the first 12 hours of the forecast period.
Gulf of Mexico and Caribbean Area Forecast	T	Obstructions to visibility such as volcanic ash are noted in the description of significant clouds and weather for the region during the first 12 hours of the forecast period.

Volcanic Ash Information Contained In:	Type	Summary
Medium-Level SIGWX	G	Erupting volcano is identified with a trapezoidal symbol along with the name, latitude, and longitude. Location of ash cloud is not depicted.
High-Level SIGWX	G	Erupting volcano is identified with a trapezoidal symbol along with the name, latitude, and longitude. Location of ash cloud is not depicted.
AFD	T	May include a discussion on volcanic ash when applicable.
MIS	T	A discussion of meteorological events (including volcanic ash cloud) causing or expecting to impact the flow of air traffic across an ARTCC.
Tools		
GFA Tool	G	Interactive website that includes SIGMETs and CWAs for volcanic ash cloud when they are in effect.
Flight Service Interactive Map	G	Interactive website that includes SIGMETs and CWAs for volcanic ash cloud when they are in effect.

3.4.2.11 Products with Tropical Cyclone Information

Table 3-14. Weather Element: Tropical Cyclone (e.g., Hurricane)

Type: text (T), graphic (G), image (I), voice (V)

Tropical Cyclone Information Contained In:	Type	Summary
Observations		
Radar	I	Tropical cyclones are visible on radar when in range.
Satellite	I	Tropical cyclones are visible on satellite.
Analysis		
Surface Analysis Chart	G	Tropical cyclones are included using standard symbols.
Advisories		
Convective SIGMET	T, G	Issued for thunderstorms associated with tropical cyclones.
SIGMET	T, G	SIGMETs are issued for tropical cyclones except over the CONUS and associated coastal waters.
TCA	T, G	TCAs are issued four times daily and report the current and forecast tropical cyclone position and intensity.
Forecasts		
Medium-Level SIGWX	G	Tropical cyclones are included using standard symbols.
High-Level SIGWX	G	Global forecasts that include tropical cyclones using standard symbols.
Surface Prog Charts	G	Tropical depressions, tropical storms, and hurricanes are included using symbols.
AFD	T	May include a discussion on tropical cyclones when applicable.
MIS	T	A nontechnical discussion of meteorological events (including tropical cyclones) causing or expecting to impact the flow of air traffic across an ARTCC.

Tropical Cyclone Information Contained In:	Type	Summary
Tools		
GFA Tool	G	Interactive website that includes tropical cyclones, if applicable.
Flight Service Interactive Map	G	Interactive website that includes tropical cyclones, if applicable.

3.4.2.12 Products with Sandstorm/Dust Storm Information

Table 3-15. Weather Element: Sandstorm/Dust Storm

Type: text (T), graphic (G), image (I), voice (V)

Sandstorm/Dust Storm Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	SS, DS, BLDU and BLSA are reported in manual observations, at some augmented observations, but not automated observations. Automated observations may report these as HZ.
PIREP	T, G, V	Included if reported.
Radar	I	Potentially visible on radar.
Satellite	I	Sandstorms/dust storms may be visible on satellite if not obscured by cloud cover.
Advisories		
SIGMET	T, G	Widespread sandstorms/dust storms (WDSPR DS, WDSPR SS) are conditions that trigger the issuance of a SIGMET.
CWA	T, G	One of the conditions that triggers the issuance of a CWA.
Forecasts		
TAF	T, G	Included as BLDU, BLSA, DRDU and DRSA.
Aviation Surface Forecast	G	Derived from the GFA and includes forecasts of obscurations such as sandstorms/dust storms.
Low-Level SIGWX	G	Could be inferred when IFR or MVFR conditions are depicted in desert areas and supported by other products (e.g., METAR, TAF, SIGMET).
AFD	T	May include a discussion on current or forecast sandstorms/dust storms when applicable.
Tools		
Graphical Forecast of Aviation (GFA) Tool	G	Interactive website that includes sandstorms/dust storms, if applicable.
Flight Service Interactive Map	G	Interactive website that includes sandstorms/dust storms, if applicable.

3.4.2.13 Products with Mountain Obscuration Information

Table 3-16. Weather Element: Mountain Obstruction

Type: text (T), graphic (G), image (I), voice (V)

Mountain Obscuration Information Contained In:	Type	Summary
Observations		
METAR, SPECI (ASOS, AWOS, ATIS)	T, V	May be included in RMK section at some mountain airports. At times it may be inferred or implied by the reporting of clouds at ASOS/AWOS located in mountain passes.
PIREP	T, G, V	Included when reported.
Weather Camera	I	Mountain obscuration may be visible on the camera.
Advisories		
AIRMET	T, G	AIRMET Sierra are issued when widespread mountain obstruction is occurring or expected to occur.
Forecasts		
Aviation Clouds Forecast	G	Part of the derived forecasts from the GFA and includes overlays of mountain obscuration when applicable.
Alaska Area Forecast	T	A description of significant clouds and weather including mountain obscuration.
AFD	T	May include a discussion on current or forecast mountain obscuration.
Tools		
GFA Tool	G	Interactive website that includes mountain obscuration, if applicable.
Flight Service Interactive Map	G	Interactive website that includes mountain obscuration, if applicable.

3.4.2.14 Products with Surface-Based IFR Information

For most aviation weather products, IFR refers to ceilings less than 1,000 feet (ft) (i.e., above ground level (AGL)) and/or surface visibilities less than 3 statute miles (sm). But many aviation weather websites provide a graphical depiction of METARs or Aviation Selected Special Weather Reports (SPECI), and sometimes TAFs, using color-coded station plots for various Weather Flight Categories. These Weather Flight Categories and color codes serve as a means to help pilots visually assess ceilings and visibilities on a map of METARs. Most aviation weather websites use the following color codes and definitions for their display of METARs/SPECIs (and sometimes TAFs) on their website:

- Purple: LIFR = Low IFR, ceilings less than 500 ft and/or visibilities less than 1 sm.
- Red: IFR = Ceiling 500 ft to less than 1,000 ft and/or visibility 1 sm to less than 3 sm.
- Blue: MVFR = Ceiling 1,000 to 3,000 ft and/or visibility 3 to 5 sm.
- Green: VFR = Ceiling greater than 3,000 ft and visibility greater than 5 sm.

Note: The VFR Weather Flight Category is not to be confused with the basic VFR weather minimums given in § 91.155. Weather Flight Categories are only intended for situational awareness.

Table 3-17. Weather Element: Surface IFR

Type: text (T), graphic (G), image (I), voice (V)

Surface IFR Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	Ceiling less than 1,000 ft and/or visibility less than 3 sm. ***Note:*** *Websites may graphically depict METAR/SPECI as IFR when ceilings are from 500 ft to less than 1,000 ft and/or visibility 1 sm to less than 3 sm.*
Analysis		
Advisories		
AIRMET	T, G	AIRMET Sierra is issued when surface-based IFR conditions are occurring or expected to occur.
CWA	T, G	May be issued if conditions are at or approaching LIFR conditions (ceilings less than 500 ft and/or visibilities less than 1 sm).
Forecasts		
TAF	T, G	Ceiling less than 1,000 and/or visibility less than 3 sm. ***Note:*** *Websites may graphically depict TAFs as IFR when ceilings are from 500 ft to less than 1,000 ft and/or visibility 1 sm to less than 3 sm.*
Aviation Surface Forecast	G	Derived from NOAA's GFA and includes forecasts of surface IFR at specified valid times.
Alaska Area Forecast	T	A 12 to 18-hour categorical outlook for IFR is included in the description of significant clouds and weather.
Hawaii Area Forecast	T	A 12 to 18-hour categorical outlook for IFR is included in the description of significant clouds and weather.
Gulf of Mexico and Caribbean Area Forecast	T	A 12 to 24-hour categorical outlook for IFR is included in the description of significant clouds and weather.
Low-Level SIGWX	G	Areas of forecast IFR conditions are depicted.
Alaska SIGWX	G	Areas of forecast IFR conditions are depicted.
AFD	T	Describes weather conditions such as surface IFR as they relate to the TAF and provide additional aviation weather-related issues.
MIS	T	A nontechnical discussion of meteorological events (including surface IFR) causing or expecting to impact the flow of air traffic across an ARTCC.
Tools		
GFA Tool	G	Interactive website that includes observed and forecast IFR, including AIRMET for IFR.
Flight Service Interactive Map	G	Interactive website that includes METAR and TAF station plots depicting surface-based IFR conditions. AIRMETs for IFR are also shown.

3.4.2.15 Products with Surface-Based MVFR Information

MVFR is a Weather Flight Category. While the "R" in the acronym means "rules," there are no part 91 MVFR weather minimums. The MVFR weather category is defined as ceilings from 1,000 ft to and including 3,000 ft (AGL), and/or surface visibilities from 3 sm to and including 5 sm.

Table 3-18. Surface MVFR

Type: text (T), graphic (G), image (I), voice (V)

Surface MVFR Information Contained In:	Type	Summary
Observations		
METAR and SPECI (ASOS, AWOS, ATIS)	T, G, V	Ceiling 1,000 to 3,000 ft (inclusive) and/or visibility 3 to 5 sm (inclusive). Graphical depictions may provide color-coded flight categories, including MVFR.
Analysis		
Advisories		
Forecasts		
TAF	T, G	Ceiling 1,000 to 3,000 ft (inclusive) and/or visibility 3 to 5 sm (inclusive). Graphical depictions may provide color-coded MVFR flight categories for the TAF.
Alaska Area Forecast	T	A 12 to 18-hour categorical outlook for MVFR is included in the description of significant clouds and weather.
Hawaii Area Forecast	T	A 12 to 18-hour categorical outlook for MVFR is included in the description of significant clouds and weather.
Gulf of Mexico and Caribbean Area Forecast	T	A 12 to 24-hour categorical outlook for MVFR is included in the description of significant clouds and weather.
Low-Level SIGWX	G	Areas of forecast MVFR conditions are depicted.
Alaska SIGWX	G	Areas of forecast MVFR conditions are depicted.
AFD	T	Describes weather conditions such as surface MVFR as they relate to the TAF and provide additional aviation weather-related issues.
Tools		
GFA Tool	G	Interactive website that includes observed and forecast MVFR.
Flight Service Interactive Map	G	Interactive website that includes METAR and TAF station plots depicting MVFR conditions.

3.4.2.16 Products with Cloud Coverage Information

Table 3-19. Weather Element: Cloud Coverage

Type: text (T), graphic (G), image (I), voice (V)

Cloud Coverage Information Contained In:	Type	Summary
Observations		
METAR, SPECI (ASOS, AWOS, ATIS)	T, G, V	Cloud coverage is included.
PIREP	T, G, V	Includes sky condition such as cloud coverage when reported.

Cloud Coverage Information Contained In:	Type	Summary
Satellite	I	A general cloud coverage can be inferred from satellite.
Weather Camera	I	Clouds over the horizon can be seen if in view of the camera and there is sufficient daylight. Overhead clouds cannot be seen.
Analysis		
Surface Analysis Charts	G	Cloud coverage amounts are included within the station plot models and can be inferred when charts are combined with satellite imagery.
Advisories		
AIRMET	T, G	Issued for areas of IFR ceilings and/or visibilities (i.e., BKN or OVC less than 1,000 ft and/or 3 sm).
Forecasts		
TAF	T, G	Cloud coverage is included.
Aviation Clouds Forecast	G	Part of the derived forecasts from the GFA and includes cloud coverage.
Alaska Area Forecast	T	Cloud coverage is included.
Hawaii Area Forecast	T	Cloud coverage is included.
Gulf of Mexico and Caribbean Area Forecast	T	Cloud coverage is included.
Low-Level SIGWX	G	Depicts forecasts areas of IFR ceilings and/or visibilities (i.e., BKN or OVC less than 1,000 ft and/or less than 3 sm) as well as MVFR (i.e., BKN or OVC from 1,000 ft to 3,000 ft and/or 3 to 5 sm).
Alaska SIGWX	G	Areas of forecast IFR and MVFR conditions are depicted.
Cloud Top Forecast	G	Computer model cloud amount and height of cloud tops.
AFD	T	May include a discussion on current or forecast cloud cover.
Tools		
GFA Tool	G, I	Interactive website that includes cloud coverage overlay, METAR station plots, and satellite imagery.
Flight Service Interactive Map	G, I	Interactive website that includes METAR station plots and satellite imagery.

3.4.2.17 Products with Cloud Base Information

Table 3-20. Weather Element: Cloud Base

Type: text (T), graphic (G), image (I), voice (V)

Cloud Base Information Contained In:	Type	Summary
Observations		
METAR, SPECI (ASOS, AWOS, ATIS)	T, G, V	Cloud bases included when reported.
PIREP	T, G, V	Includes cloud bases when reported.
Weather Camera	I	Cloud bases are difficult to estimate or impossible to determine from a camera.
Analysis		
Surface Analysis Charts	G	Some surface analysis charts may plot the height of a BKN or OVC ceiling.
Advisories		
AIRMET	G	Issued for areas of IFR ceilings and/or visibilities (i.e., BKN or OVC less than 1,000 ft and/or less than 3 sm).
CWA	T, G	May be issued for ceilings less than 500 ft.
Forecasts		
TAF	T, G	Cloud bases included.
Aviation Cloud Forecast	G	Part of the derived forecasts from GFA and includes cloud bases.
Alaska Area Forecast	T	Cloud bases included.
Hawaii Area Forecast	T	Cloud bases included.
Gulf of Mexico and Caribbean Area Forecast	T	Cloud bases included.
Low-Level SIGWX	G	Depicts forecast areas of IFR ceilings and/or visibilities (i.e., BKN or OVC less than 1,000 ft and/or less than 3 sm) as well as MVFR (i.e., BKN or OVC from 1,000 ft to 3,000 ft and/or 3 to 5 sm).
Alaska SIGWX	G	Areas of forecast IFR and MVFR conditions are depicted.
AFD	T	May include a discussion on current or forecast cloud bases and/or IFR, MVFR, etc. conditions.
MIS	T	May include a discussion on current or forecast IFR conditions.
Tools		
GFA Tool	G	Interactive website that includes overlay of forecast cloud bases as well as METAR station plots.
Flight Service Interactive Map	G	Interactive website that includes METAR station plots.

3.4.2.18 Products with Cloud Tops Information

Table 3-21. Weather Element: Cloud Tops

Type: text (T), graphic (G), image (I), voice (V)

Cloud Tops Information Contained In:	Type	Summary
Observations		
PIREP	T, G, V	Cloud tops included when reported.
Analysis		
Advisories		
Convective SIGMET	T, G	CB cloud tops are included in Convective SIGMETs.
SIGMET	T, G	CB cloud tops are included in SIGMETs for thunderstorms (outside the CONUS).
Forecasts		
Aviation Cloud Forecast	G	Part of the derived forecasts from the GFA and includes cloud tops. This product provides a forecast of cloud coverage and height (in hundreds of feet MSL).
Alaska Area Forecast	T	A description of significant clouds and weather for the first 12 hours includes cloud tops.
Hawaii Area Forecast	T	A description of significant clouds and weather for the first 12 hours includes cloud tops.
Gulf of Mexico and Caribbean Area Forecast	T	A description of significant clouds and weather for the first 12 hours includes cloud tops.
Medium-Level SIGWX	G	Forecast height of CB tops included.
High-Level SIGWX	G	Global forecasts that include forecast CB tops.
Cloud Top Forecast	I	Computer model cloud amount and height of cloud tops.
TCF	G	The TCF includes forecast CB tops.
Tools		
GFA Tool	G	Interactive website that includes overlay of forecast cloud tops.

3.4.2.19 Products with Cloud Layers Information

Table 3-22. Weather Element: Cloud Layers

Type: text (T), graphic (G), image (I), voice (V)

Cloud Layers Information Contained In:	Type	Summary
Observations		
METAR, SPECI, (ASOS, AWOS, ATIS)	T, G, V	Reports the sky condition including cloud layers.
PIREP/AIREP	T, G, V	PIREPs may include cloud layers.
Analysis		
Advisories		
Forecasts		
TAF	T, G	Cloud layers are included.
Aviation Cloud Forecast	G	Part of the derived forecasts from GFA and includes cloud layers.
Alaska Area Forecast	T	A description of cloud layers is included.
Hawaii Area Forecast	T	A description of cloud layers is included.
Gulf of Mexico and Caribbean Area Forecast	T	A description of cloud layers is included.
Tools		
GFA Tool	G	Interactive website that includes overlay of forecast cloud layers as well as METAR station plots.
Flight Service Interactive Map	G	Interactive website that includes METAR station plots.

3.4.2.20 Products with Pressure Information

Table 3-23. Weather Element: Pressure

Type: text (T), graphic (G), image (I), voice (V)

Pressure Information Contained In:	Type	Summary
Observations		
METAR, SPECI (ASOS, AWOS, ATIS)	T, G, V	Altimeter setting is included. Sea level pressure included in the RMK section of the METAR.
Analysis		
Surface Analysis Chart	G	Sea level pressure is depicted as isobars and within the station plots. High and low pressure centers are also shown.

Pressure Information Contained In:	Type	Summary
Advisories		
Forecasts		
Surface Prog Charts	G	Sea level pressure is depicted as isobars. High and low pressure centers depicted.
Tools		

3.4.2.21 Products with Fronts Information

Table 3-24. Weather Element: Fronts

Type: text (T), graphic (G), image (I), voice (V)

Fronts Information Contained In:	Type	Summary
Observations		
METAR, SPECI (ASOS, AWOS, ATIS)	T, G, V	Manually produced METARs and SPECIs may report "FROPA" in the RMK portion.
Analysis		
Surface Chart Analysis	G	Depicts the location of fronts as well as the high and low pressure systems.
Advisories		
Forecasts		
TAF	T	Fronts are not explicitly mentioned under weather phenomena, but a significant change in wind direction coupled with changes in other elements can imply a forecast frontal passage.
Alaska Area Forecast	T	There is a brief discussion of the synoptic weather affecting the region during the first 18-hour valid period, which could include frontal boundaries.
Hawaii Area Forecast	T	There is a brief discussion of the synoptic weather affecting the region during the first 18-hour valid period, which could include frontal boundaries.
Gulf of Mexico and Caribbean Area Forecast	T	There is a brief discussion of the synoptic weather affecting the region during the entire 24-hour valid period, which could include frontal boundaries.
Alaska SIGWX	G	Pressure systems and fronts are included using standard symbols.
Alaska Surface Chart	G	Fronts are depicted using standard symbols for this chart. This product is issued every 6 hours with forecasts valid for 00Z, 06Z, 12Z, and 18Z.
Surface Prog Charts	G	Fronts are included using standard symbols.
AFD	T	May include a discussion on fronts when applicable.
Tools		

3.4.2.22 Products with Temperature Information

Table 3-25. Weather Element: Temperature

Type: text (T), graphic (G), image (I), voice (V)

Temperature Aloft Information Contained In:	Type	Summary *Note: Temperatures are in degrees Celsius (°C)*
Observations		
METAR, SPECI (ASOS, AWOS, ATIS)	T, G, V	Surface temperature is included.
PIREP/AIREP	T, G, V	Temperature aloft is included if reported.
Analysis		
Upper-Air Analysis	T, G	At select pressure levels, the wind direction and speed are displayed in tens of degrees and wind speed is in knots.
Freezing Level Analysis	G	Temperatures aloft can be indicated with limitations. Depicts the freezing level at the lowest altitude in the atmosphere over a given location at which the air temperature reaches 0 °C.
RTMA	T	Surface temperature is included.
Advisories		
Forecasts		
Winds and Temperature Aloft	T, G	The text format provides the temperature aloft in a coded format for select height levels and locations. Graphical format provides contours of temperatures aloft.
Low-Level SIGWX	G	Temperatures aloft can be indicated with limitations. Multiple freezing levels can be forecast when temperatures are 0 °C at more than one altitude aloft.
WAFS	G	Global forecasts include temperatures aloft, at selected height levels, from model data in a grid point format.
Upper Air Forecasts	G	Computer model outputs for temperatures aloft at select height levels (available levels vary depending on the model). Depicted using contours (isotherms).
Tools		

3.4.2.23 Products with Space Weather Information

Table 3-26. Weather Element: Space Weather

Type: text (T), graphic (G), image (I), voice (V)

Space Weather Information Contained In:	Type	Summary
Observations		
		(See Space Weather Advisory)
Analysis		

Space Weather Information Contained In:	Type	Summary
Advisories		
Space Weather Advisory	T	Issued whenever space weather conditions exceed predefined ICAO thresholds for both moderate and severe impacts. Provides an observed or expected location for the impact and 6-, 12-, 18-, and 24-hour forecasts.
Forecasts		
		(See Space Weather Advisory)
Tools		

3.4.2.24 Products with Density Altitude Information

Table 3-27. Weather Element: Density Altitude

Type: text (T), graphic (G), image (I), voice (V)

Density Altitude Information Contained In:	Type	Summary
Observations		
ASOS, AWOS and ATIS	V	Included in the ASOS and AWOS broadcasts (phone and radio) when density altitude exceeds the field elevation by more than 1,000 ft. A density altitude advisory (i.e., “check density altitude”) is broadcast on ATIS when appropriate.
Analysis		
Advisories		
Forecasts		
Tools		