



FAA-H-8083-28

Aviation Weather Handbook



U.S. Department of Transportation
Federal Aviation Administration

UA /OV TRI240010/TM
2244/FL080/TP S22T/SK C
UNKN-TOP100/IC NEG/RM
BETWEEN OVC LAYERS =

full-barb
10 knots half-barb
5 knots
From the west
at ~15 knots (~17 mph)

Flag
50 knots
From the south
at ~50 knots (~58 mph)

From the southeast
at ~75 knots (~86 mph)



Aviation Weather Handbook

2022

United States Department of Transportation
FEDERAL AVIATION ADMINISTRATION
Flight Standards Service

Preface

This handbook consolidates the weather information from the following advisory circulars (AC) into one source document. By doing this, the Federal Aviation Administration (FAA) intends to streamline access to the FAA's weather documentation for users of the National Airspace System (NAS). The following ACs will remain in effect, but they will eventually be cancelled at a later date following the publication of this handbook:

- AC 00-6, Aviation Weather.
- AC 00-24, Thunderstorms.
- AC 00-30, Clear Air Turbulence Avoidance.
- AC 00-45, Aviation Weather Services.
- AC 00-54, Pilot Windshear Guide.
- AC 00-57, Hazardous Mountain Winds.

This handbook is designed as a technical reference for all who operate in the NAS. Pilots, dispatchers, and operators will find this handbook a valuable resource for flight planning and decision making.

This handbook conforms to pilot weather training and certification concepts established by the FAA. The discussion and explanations reflect the most commonly used weather products and information.

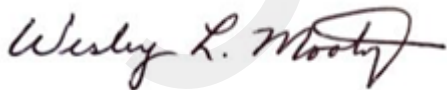
It is essential for persons using this handbook to also become familiar with and apply the pertinent parts of Title 14 of the Code of Federal Regulations (14 CFR) and the Aeronautical Information Manual (AIM). Title 14 CFR, the AIM, this handbook, current ACs, and other FAA technical references are available via the internet at the FAA home page <https://www.faa.gov>.

This handbook is available for download in Portable Document Format (PDF) from the FAA's Regulations and Policies web page at https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/.

This handbook is published by the U.S. Department of Transportation (DOT), FAA Flight Technologies and Procedures Division.

The guidance and recommendations in this handbook are not legally binding in their own right and will not be relied upon by the FAA as a separate basis for affirmative enforcement action or other administrative penalty. Conformity with the guidance and recommendations is voluntary only and nonconformity will not affect rights and obligations under existing statutes and regulations.

Comments regarding this publication should be sent, in email form, to the following address: 9-AWA-AFS400-Coord@faa.gov.



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11/25/2022

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1 Introduction

This handbook describes the United States (U.S.) aviation weather program, products, and services. It also documents weather theory and its application to aviation. The objective of this handbook is to help the pilot and operator understand the basics of weather, aviation weather hazards, and aviation weather products. The information included is not prescriptive. Furthermore, the guidance and recommendations in this handbook are not legally binding in their own right and will not be relied upon by the FAA as a separate basis for affirmative enforcement action or other administrative penalty. Conformity with the guidance and recommendations is voluntary only and nonconformity will not affect rights and obligations under existing statutes and regulations.

The handbook is a consolidated source of weather information and, in some cases, best practices to assist with providing safety for flight.

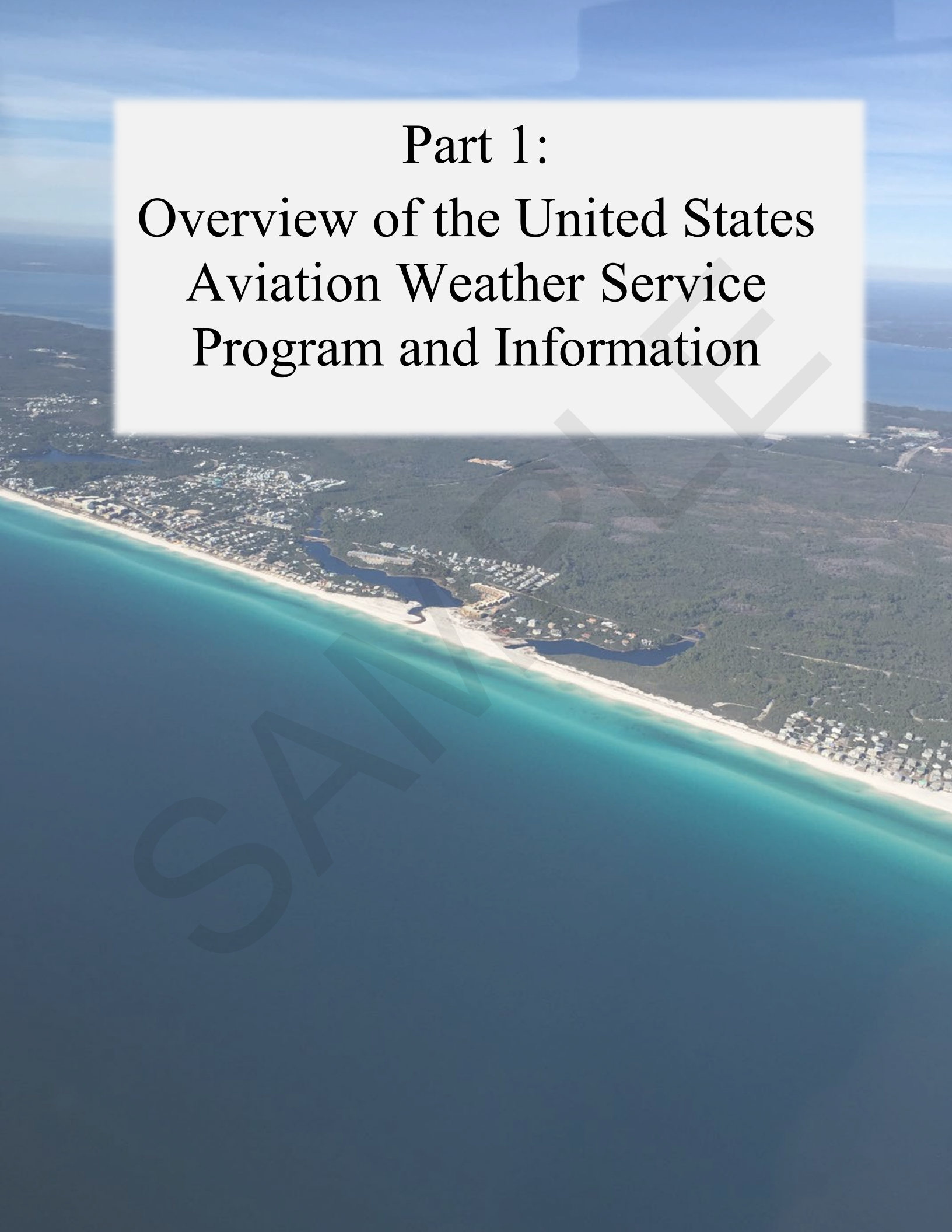
The visualization of the products discussed in this handbook has evolved over the past decade with the use of internet websites. The use of static black and white depictions of aviation forecasts is quickly becoming a thing of the past. Today's websites provide the products in color and offer options to select and overlay multiple pieces of weather information.

Today's aviation weather websites, including those of the National Weather Service (NWS), continue to improve the content and visualization of products. Unfortunately, it is not practical to update this handbook with every change to a weather product.

Examples of weather products in this handbook represent one way of how they can be visualized on a user's viewing device (e.g., computer, tablet, mobile phone, or cockpit display). The examples shown in this handbook are from NWS websites.

This handbook is broken into three parts:

- Part 1: Overview of the United States Aviation Weather Service Program and Information.
- Part 2: Weather Theory and Aviation Hazards.
- Part 3: Technical Details Relating to Weather Products and Aviation Weather Tools.

An aerial photograph of a coastal town and beach. The town is built on a peninsula or near a bay, with a mix of residential buildings and greenery. A sandy beach runs along the coast, and the ocean is visible in the foreground. A large white rectangular box is overlaid on the top half of the image, containing the title text. The text is in a black, serif font. There is a large, faint watermark in the background that reads "SAMPLE".

Part 1:
Overview of the United States
Aviation Weather Service
Program and Information



2 Aviation Weather Service Program

2.1 Introduction

The aviation weather service program is a joint effort of the National Oceanic and Atmospheric Administration (NOAA), the Federal Aviation Administration (FAA), the Department of Defense (DOD), and commercial aviation weather providers.

2.2 National Oceanic and Atmospheric Administration (NOAA)

NOAA is an agency of the Department of Commerce (DOC). NOAA conducts research and gathers data about the global oceans, atmosphere, space, and Sun, and applies this knowledge to science and service, which touches the lives of all Americans. Among its six major divisions are the National Environmental Satellite, Data, and Information Service (NESDIS) and the NWS.

2.2.1 National Environmental Satellite, Data, and Information Service (NESDIS)

NESDIS manages the U.S. civil operational remote-sensing satellite systems, as well as other global information for meteorology, oceanography, solid-earth geophysics, and solar-terrestrial sciences. NESDIS provides this data to NWS meteorologists and a wide range of other users for operational weather forecasting.

2.2.1.1 Satellite Analysis Branch (SAB)

NESDIS' Satellite Analysis Branch (SAB) serves as the operational focal point for real-time imagery products and multidisciplinary environmental analyses. The SAB's primary mission is to support disaster mitigation and warning services for the U.S. Federal agencies and the international community. Routine environmental analyses are provided to forecasters and other environmental users, and are used in the numerical models of the NWS. The SAB schedules and distributes real-time satellite imagery products from global geostationary and polar-orbiting satellites to environmental users.

The SAB coordinates the satellite and other information for the NOAA Volcanic Hazards Alert Program, under an agreement with the FAA, and works with the NWS as part of the Washington, DC, Volcanic Ash Advisory Center (VAAC). The Washington, DC, VAAC area of responsibility stretches from 40° W to 130° E and includes the areas of the contiguous United States (CONUS), New York and Oakland Oceanic Flight Information Regions (FIR), and southward through Central America and the Caribbean to 10° S in South America.

2.2.2 National Weather Service (NWS)

The NWS provides weather data, forecasts, and warnings for the United States, its territories, adjacent waters, and ocean areas for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure that can be used by other government agencies, the private sector, the public, and the global community. The following sections provide a description of NWS offices associated with aviation weather.

2.2.2.1 National Centers for Environmental Prediction (NCEP)

The National Centers for Environmental Prediction (NCEP) is where virtually all global meteorological data is collected and analyzed for the United States. The NCEP then provides a wide variety of national and international weather guidance products to NWS field offices, government agencies, emergency managers, and private sector meteorologists. The NCEP is a critical resource in national and global weather prediction and is the starting point for nearly all weather forecasts in the United States.

The NCEP is comprised of nine distinct centers and the Office of the Director. Each center has its own specific mission. The following NCEP centers provide aviation weather products and services.

2.2.2.1.1 NCEP Central Operations (NCO)

The NCEP Central Operations (NCO) in College Park, MD, sustains and executes the operational suite of the numerical analysis and forecast models and prepares NCEP products for dissemination. It also links all nine of the national centers together via computer and communications-related services.

2.2.2.1.2 Aviation Weather Center (AWC)

The Aviation Weather Center (AWC) in Kansas City, MO, issues a suite of aviation weather forecasts in support of the National Airspace System (NAS) that are described in this handbook, including Airmen's Meteorological Information (AIRMET), Significant Meteorological Information (SIGMET), Convective SIGMETs, and various icing, turbulence, and convective forecast products. The AWC is a Meteorological Watch Office (MWO) for the International Civil Aviation Organization (ICAO). The AWC, in conjunction with the NCO, also serves as one of two ICAO World Area Forecast Centers (WAFc), known as WAFc Washington, issuing flight planning data (winds and temperatures) and Significant Weather (SIGWX) forecasts.

The AWC's website provides the aviation community with textual, digital, and graphical forecasts, analyses, and observations of aviation-related weather variables. Additionally, the website provides information for international flights through the World Area Forecast System (WAFS) Internet File Service (WIFS).

2.2.2.1.3 Weather Prediction Center (WPC)

The Weather Prediction Center (WPC) in College Park, MD, provides analysis and forecast products specializing in multiday, quantitative precipitation forecasts and weather forecast guidance, weather model diagnostics discussions, and surface pressure and frontal analyses.

2.2.2.1.4 Storm Prediction Center (SPC)

The Storm Prediction Center (SPC) in Norman, OK, provides tornado and severe weather watches for the CONUS along with a suite of hazardous weather forecasts.

2.2.2.1.5 National Hurricane Center (NHC)

The National Hurricane Center (NHC) in Miami, FL, provides official NWS forecasts of the movement and strength of tropical weather systems and issues the appropriate watches and warnings for the CONUS and surrounding areas. It also issues a suite of marine products covering the tropical Atlantic, Caribbean, Gulf of Mexico, and tropical eastern Pacific. In support of ICAO, the NHC is also referred to as a Tropical Cyclone Advisory Center (TCAC).

2.2.2.1.6 Space Weather Prediction Center (SWPC)

The Space Weather Prediction Center (SWPC) in Boulder, CO, provides space weather information (e.g., current activity and forecasts) to a wide variety of users. The SWPC is also an ICAO Space Weather Center and is responsible for issuing global advisories for space weather events affecting communication and navigation systems as well as events that pose a potential health hazard to passengers and crew.

2.2.2.1.7 Alaska Aviation Weather Unit (AAWU)

The Alaska Aviation Weather Unit (AAWU), located in Anchorage, AK, is an MWO for ICAO. The AAWU is responsible for the entire Anchorage FIR. They issue a suite of aviation weather products for the airspace over Alaska and adjacent coastal waters, including AIRMETs, SIGMETs, FAs, and SIGWX Prognostic Charts.

The AAWU is also designated as the Anchorage VAAC. The VAAC area of responsibility includes the Anchorage FIR and Far Eastern Russia and is responsible for the issuance of Volcanic Ash Advisories (VAA).

2.2.2.1.8 Center Weather Service Unit (CWSU)

Center Weather Service Units (CWSU) are units of NWS meteorologists under contract with the FAA that are stationed at, and support, the FAA's air route traffic control center (ARTCC).

CWSUs provide timely weather consultation, forecasts, and advice to managers within ARTCCs and to other supported FAA facilities.

Special emphasis is given to those weather conditions that are hazardous to aviation or that could impede the flow of air traffic within the NAS. CWSU meteorologists issue the following products in support of their respective ARTCC: Center Weather Advisories (CWA) and Meteorological Impact Statements (MIS).

2.2.2.1.9 Weather Forecast Office (WFO)

The NWS has 122 Weather Forecast Offices (WFO) across the United States and select territories. An NWS WFO is a multipurpose, local weather forecast center that produces, among its suite of services, aviation-related products. In support of aviation, WFOs issue Terminal Aerodrome Forecasts (TAF) and Aviation Forecast Discussions (AFD), with some offices issuing Airport Weather Warnings (AWW), Soaring Forecasts, and Balloon Forecasts. The WFO also issues weather warnings such as tornado and severe thunderstorm warnings.

The Honolulu WFO is unique among NWS WFOs in that it provides multiple services beyond the typical WFO. WFO Honolulu is also designated as an MWO for ICAO. As a result of this unique designation, WFO Honolulu is the only WFO to issue the following text products: AIRMETs and SIGMETs. WFO Honolulu is co-located with the Central Pacific Hurricane Center (CPHC). The CPHC provides official NWS forecast of the movement and strength of tropical weather systems and issues the appropriate watches and warnings for the central Pacific, including the State of Hawaii. WFO Honolulu also issues a suite of marine products covering a large portion of the Pacific Ocean. In support of ICAO, the CPHC is also referred to as a TCAC.

2.3 Federal Aviation Administration (FAA)

The FAA, a part of the Department of Transportation (DOT), provides a safe, secure, and efficient airspace system for the promotion of U.S. aerospace safety.

Per Title 49 of the United States Code (49 U.S.C.) § 44720, Meteorological Services, the FAA establishes all requirements for aviation weather reports and forecasts.

The FAA provides a wide range of services to the aviation community. The following sections provide a description of those FAA facilities that are involved with aviation weather and pilot services.

2.3.1 Air Traffic Control Systems Command Center (ATCSCC)

The air traffic control systems command center (ATCSCC) has the mission of balancing air traffic demand with system capacity. This ensures maximum safety and efficiency for the NAS, while minimizing delays. The ATCSCC utilizes the Traffic Management System (TMS), aircraft situation display, monitor alert, follow-on functions, and direct contact with ARTCC and Terminal Radar Approach Control (TRACON) facility Traffic Management Units (TMU) to manage flow on a national level.

Because weather is the most common reason for air traffic delays and reroutings, NWS meteorologists support the ATCSCC. These meteorologists, called National Aviation Meteorologists, coordinate NWS operations in support of traffic flow management within the NAS.

2.3.2 Air Route Traffic Control Center (ARTCC)

An ARTCC is a facility established to provide air traffic control (ATC) service to pilots operating on instrument flight rules (IFR) flight plans within controlled airspace, principally during the en route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to pilots operating under visual flight rules (VFR).

En route controllers become familiar with pertinent weather information and stay aware of current weather information needed to perform ATC duties. En route controllers advise pilots of hazardous weather that may impact operations within 150 nautical miles (NM) of the controller's assigned sector or jurisdiction and may solicit Pilot Weather Reports (PIREP) from pilots.

2.3.3 Airport Traffic Control Tower (ATCT) and Terminal Radar Approach Control (TRACON)

An airport traffic control tower (ATCT) is a terminal facility that uses air-to-ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area.

Terminal controllers become familiar with pertinent weather information and stay aware of current weather information needed to perform ATC duties. Terminal controllers advise pilots of hazardous weather that may impact operations within 150 NM of the controller's assigned sector or area of jurisdiction and may solicit PIREPs from pilots. ATCTs and TRACONs may opt to broadcast hazardous weather information alerts only when any part of the area described is within 50 NM of the airspace under the ATCT's jurisdiction.

2.3.4 Flight Service

The FAA delivers flight services to pilots in the CONUS, Alaska, Hawaii, and Puerto Rico. Services are provided by phone at 1-800-WX-BRIEF, on the internet through the Flight Service Pilot Web Portal (which can be found in Appendix G, Websites), and in person (Alaska only) at 17 Flight Service Stations (FSS). Services include, but are not limited to: preflight weather briefings, flight planning, and in-flight advisory services.

2.3.4.1 FAA Weather Camera Program

Flight Service also delivers the FAA's Aviation Weather Camera Network. It features an expanding network of camera sites in Alaska, Hawaii, and the CONUS. Weather cameras provide pilots in certain areas with snapshots of current conditions at a specific location, enabling pilots to have additional information for improved decision making. Services may be obtained by visiting the Aviation Weather Cameras website, which can be found in Appendix A. See Section 3.3.3.2 and Section 24.9 for additional information.

2.4 Department of Defense (DOD)

The DOD is a key partner with the FAA and NWS in the next generation weather radar (NEXRAD) program. Various branches of the DOD provide their own weather support, but this is beyond the scope of this handbook.

2.5 Commercial Weather Information Providers

Commercial weather information providers are a major source of weather products for the aviation community. In general, they produce proprietary weather products based on NWS information with

formatting and layout modifications, but no material changes to the weather information itself. This is also referred to as “repackaging.”

Commercial providers also produce forecasts, analyses, and other proprietary weather products, which may substantially differ from the information contained in NWS-produced products. Operators who desire to use products prepared by a commercial weather provider should consult the Aeronautical Information Manual (AIM), Chapter 7, Section 1, Paragraph 7-1-3, Use of Aviation Weather Products, which provides additional information pertaining to commercial providers, including the Enhanced Weather Information System (EWINS).

SAMPLE

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 proposed 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

Aviation Weather Handbook

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U.S. Department
of Transportation
**Federal Aviation
Administration**

This important Federal Aviation Administration (FAA) Handbook updates and consolidates information previously available in six different Advisory Circulars:

- AC 00-6, *Aviation Weather*
- AC 00-24, *Thunderstorms*
- AC 00-30, *Clear Air Turbulence Avoidance*
- AC 00-45, *Aviation Weather Services*
- AC 00-54, *Pilot Windshear Guide*
- AC 00-57, *Hazardous Mountain Winds*

Pilots and dispatchers must learn to deal with all aspects of weather, including how to appreciate good weather, recognize and respect marginal or hazardous weather, and avoid violent weather. This knowledge and the ability to make sound weather decisions are critical to the successful outcome of all flights. This book discusses each aspect of weather as it relates to aircraft operation and flight safety and provides information on the tools available for flight planning and inflight weather decisions, including observations, analyses, and forecasts.

The information in this handbook applies to students, experienced pilots, and flight instructors alike and is a key reference for meteorology and weather services pertinent to FAA Knowledge Exams and airman certification. It is a comprehensive resource for what you need to know about weather to fly safely in both visual (VMC) and instrument (IMC) meteorological conditions. Subjects covered include the U.S. aviation weather service program; weather briefings; weather theory and aviation hazards; meteorology; mountain, tropical, arctic, and space weather; observations (ASOS, AWOS, METAR, PIREP, radar); weather charts; advisories (including AIRMET, SIGMET, wind shear); forecasts (TAF, FA); online weather resources and flight planning tools; and much more.

The examples and explanations are supported with online references for further weather resources, definitions, and related FAA publications. Illustrated throughout with detailed, full-color drawings and photographs.

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