Aviation Weather Reporting in Alaska Update

December 2024

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Abbreviations

AACA	Alaska Air Carriers Association
AASP	Alaska Aviation System Plan
ADS-B	Automatic Dependent Surveillance–Broadcast
AI	Artificial Intelligence
AIP	Airport Improvement Program
ALP	Airport Layout Plan
AOPA	Aircraft Owners and Pilots Association
APAID	Aviation Paid Weather Observer
ASOS	Automated Surface Observing System
AWOS	Automated Weather Observing System
CODEL	Congressional Delegation
CSS-Wx	Common Support Services – Weather
CWO	Contract Weather Observer
DOT&PF	Alaska Department of Transportation and Public Facilities
DYAASI	Don Young Alaska Aviation Safety Initiative (formerly FAASI)
FAA	Federal Aviation Administration
FAASI	FAA Alaska Aviation Safety Initiative
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rule
LAWRS	Limited Aviation Weather Reporting Stations
METAR	Meteorological Aerodrome Report
NADIN	National Airspace Data Interchange Network
NAS	National Airspace System
NF-OBS	Non-Federal Observer
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Air Mission
NWP	NextGen Weather Processor
NWS	National Weather Service
SAWRS	Supplementary Aviation Weather Reporting Stations

SPECI	Aviation Selected Special Weather Report
Tech-Ops	Air Traffic Organization Technical Operations
VEIA	Visibility Estimation through Image Analytics
VWOS	Visual Weather Observation System

Introduction

The Alaska Department of Transportation and Public Facilities (DOT&PF) oversees 237 airports, covering an expansive 2 million square miles of airspace. Maintaining an effective and safe aviation system poses significant challenges, and improving safety is an ongoing focus of the Federal Aviation Administration (FAA), the DOT&PF, and air carriers. One challenge Alaska aviators face is the lack of sufficient weather observation data. The more critical challenge is certified weather, which is required for flight planning. This white paper covers both challenges.

Weather observations relevant to aviation include temperature, cloud height, ceiling, visibility, wind speed and direction, atmospheric pressure, and the type and amount of precipitation. Pilots rely on weather observations for flight planning, route selection, and takeoff and landing decisions. In Alaska, the high latitude climate and challenging mountainous terrain accentuate the need for a more dense network of weather observations; however, the vast size and remoteness of the Alaskan aviation system make collecting such data a complex undertaking.

Recent efforts have brought the FAA, pilots, air carriers, and government agencies together to define concerns and recommend solutions.

Quote From Alaska Air Carriers Association (AACA)

Alaska's air carriers rely on reliable, approved weather reporting to safely transport freight, mail, and people across the state's abundant roadless expanses. For many rural communities, aviation is the sole conduit to emergency healthcare, critical medications, and supplies required to meet citizens' basic needs.

Executive Director, Alaska Air Carriers Association

- **Alaska Aviation System Plan (AASP) Reporting (2017).** The AASP is an ongoing planning process, used to address Alaska's aviation infrastructure and policy needs. Weather reporting was addressed in a prior phase of the AASP (Phase II: 2012-2017). This effort resulted in the Alaska Weather Equipment Needs Summary, which included an inventory of existing weather reporting infrastructure, identified gaps, and presented recommendations for improving weather reporting. Additionally, a white paper describing weather reporting in Alaska was produced. These documents can be found on the AASP website.
- **FAA Alaska Aviation Safety Initiative (FAASI) (2021). Don Young Alaska Aviation Safety Initiative (DYAASI) (2024)**. This initiative was built on research and stakeholder information gathered in the AASP study, documenting planning and safety priorities and providing recommendations. It was renamed in the 2024 reauthorization to honor longtime aviation safety advocate Congressman Don Young.

  Overall, sparse weather reporting stations mean that a lack of data exists to make go/no go decisions; the lack of data also limits airports where Instrument Flight Rule (IFR) approaches are allowed and weather forecasting models. Since the initial report in 2021, roadmaps were subsequently produced in 2022, 2023, and 2024 to detail steps such as installing weather observing systems at multiple airports, testing innovative new systems, developing lower

altitude routes, and continuing to work with stakeholders to develop new goals and strategies to improve aviation safety in Alaska.

This white paper is an update to previous AASP weather research and reports. The paper focuses on recent weather observation and reporting initiatives, progress in addressing needs that were identified in the FAASI process, and remaining weather reporting gaps.

Types of Weather Observation Data

Weather observations are taken at several different types of stations, and data can be collected through a variety of sources, including automated sensors, human observations, and cameras.

Certified Weather Observations

The FAA certifies weather observation equipment to maintain consistency and reliability of the weather information provided to pilots. Certified weather data are distributed through FAA-specific communication channels. The National Airspace Data Interchange Network (NADIN) is a self-contained government data network (used to collect and disseminate weather information), which is integrated into the National Airspace System (NAS) communication framework.

Automated Sensors

Automated sensor systems are the primary method that the FAA uses to collect and distribute weather observations. Data are transmitted in real-time and can be accessed via a variety of methods, including radio broadcasts, telephone, data link services, and online platforms. Most FAA-certified automated sensors are owned and operated by the FAA or the National Weather Service (NWS); however, the FAA can certify automated systems that are owned by other public or private entities. These systems must meet the requirements outlined in Advisory Circular 150/5220-16E: Automated Weather Observing Systems (AWOS) for Non-Federal Applications.

Automated Weather Observing System (AWOS). Most AWOS stations in Alaska are owned by the FAA, with a few exceptions, such as the Akutan Airport AWOS. The DOT&PF contracted with a private company to install this critical AWOS when the Akutan Airport was constructed and continues to operate it today. Pilots must access this AWOS by telephone to obtain current weather for flight planning. More recently, changes in the FAA Airport Improvement Program (AIP) funding guidelines have allowed the DOT&PF to partner with the FAA to install AWOS stations that are then certified and maintained by the FAA.

Various AWOS stations are available and are equipped with different types of sensors. Two types of AWOS stations are the most commonly used in Alaska:

- AWOS III: Measures barometric pressure, density altitude, wind and gust speed and direction, temperature, dew point, visibility, precipitation, and cloud height, density, and sky condition
- AWOS III P: Includes all AWOS III parameters, plus a sensor that describes type of precipitation

Automated Surface Observing System (ASOS). ASOS is another type of automated sensor maintained by the NWS under contract with the FAA. It contains all the sensors of the AWOS III, plus additional sensors designed to meet specific standards set by the NWS. A complete listing of Alaska weather stations is

available on the NWS website. The FAA maintains a detailed Surface Weather Observation Stations website with a searchable map that directly links to the current Meteorological Aerodrome Report (METARs) by location.

Non-Federal Equipment. In addition to the Akutan AWOS, several versions of automated weather reporting equipment are acceptable for aviation use. In some cases, a weather station is funded by a local community or an air carrier, and typically, those systems are still one of the versions of weather reporting equipment acceptable for aviation use. The FAA Reauthorization Act of 2024 encourages the development of other versions of equally accurate weather reporting and a few are being used in Alaska as early adapters. The aviation industry and the State of Alaska are actively working with the FAA to advance new, cost-effective equipment and funding mechanisms that can be deployed across Alaska.

Human Weather Observations

A certified weather observer can manually collect and distribute weather observations. Manual observations can supplement an AWOS or ASOS or be collected in areas that do not have an AWOS or ASOS.

The following mechanisms are in place to provide certified human weather observations:

- Aviation Paid Weather Observer (APAID): APAID observers are certified by the NWS to take surface observations using equipment provided by the NWS. These observers are compensated for their work on a per-observation basis, usually by the NWS or airline operators. This program has been reduced in recent years, and currently only three APAID stations exist in Alaska.
- FAA Contract Weather Observer (CWO): The FAA's Contract Weather Observer Program provides human augmentation to automated weather observations. The FAA pays for these CWOs.
- Limited Aviation Weather Reporting Stations (LAWRS): The LAWRS Program uses air traffic controllers who are trained by the NWS to take weather observations in addition to their duties as tower controllers.
- FAA Non-Federal Observer (NF-OBS): The NF-OBS Program replaced the former Supplementary Aviation Weather Reporting Stations (SAWRS) Program previously managed by the NWS. FAA-certified NF-OBS enter into an agreement with the appropriate FAA office to provide backup and augmentation of automated systems or provide manual weather observations.

NF-OBS Program Requirements

FAA Order 7210.77 outlines procedures specific to the implementation of an NF-OBS Program. Additionally, the NF-OBS Program must comply with the more general weather collection and dissemination requirements described in FAA Order 7900.5E Change 1. To initiate the NF-OBS Program, the sponsor and FAA sign a Memorandum of Agreement. Weather observers must be certified by the FAA, and equipment must receive FAA approval. The FAA provides oversight to ensure compliance with operational and certification requirements; however, the sponsor is responsible for all associated costs and staffing requirements.

An NS-OBS Program can provide three possible levels of service:

1. NF-OBS(F) – Non-Federal Weather Observation station that provides augmentation and backup to an automated weather system with Aviation Selected Special Weather Report (SPECI) capability.
2. NF-OBS(B) – Non-Federal Weather Observation station that provides backup-only service during automated weather system/communications or sensor outages, and manual weather observation service in the event of a total system failure. At sites with automated systems without SPECI capability, the observer may augment the present weather in the Remarks field. The observer may not otherwise edit weather observations generated by an automated system.
3. NF-OBS(M) – Non-Federal Weather Observation station with no automated weather system that provides manual observations.

Pilot Weather Reports

Pilot Weather Reports (PIREPs) are reports submitted by pilots that describe observed in-flight weather conditions. These reports are disseminated through FAA communication channels and provide additional information to inform pre-flight and in-air decision making.

Supplementary Weather Observations

Additional sources of weather observations are still valuable, even though they are not certified and, therefore, not distributed via FAA communication channels. Noncertified weather observations include different types of automated weather systems similar to AWOS and ASOS but not FAA approved. In Alaska, weather cameras are also widely used. An industry letter to the FAA in 2017 outlined the need for distributing additional weather observations and called for a new weather standard to make additional existing weather observations available to pilots. The industry and the FAA continue their discussions to establish weather reporting performance criteria instead of certified equipment packages or brands. Supplemental weather sources are increasingly being used to fill in gaps.

FAA Weather Camera Program

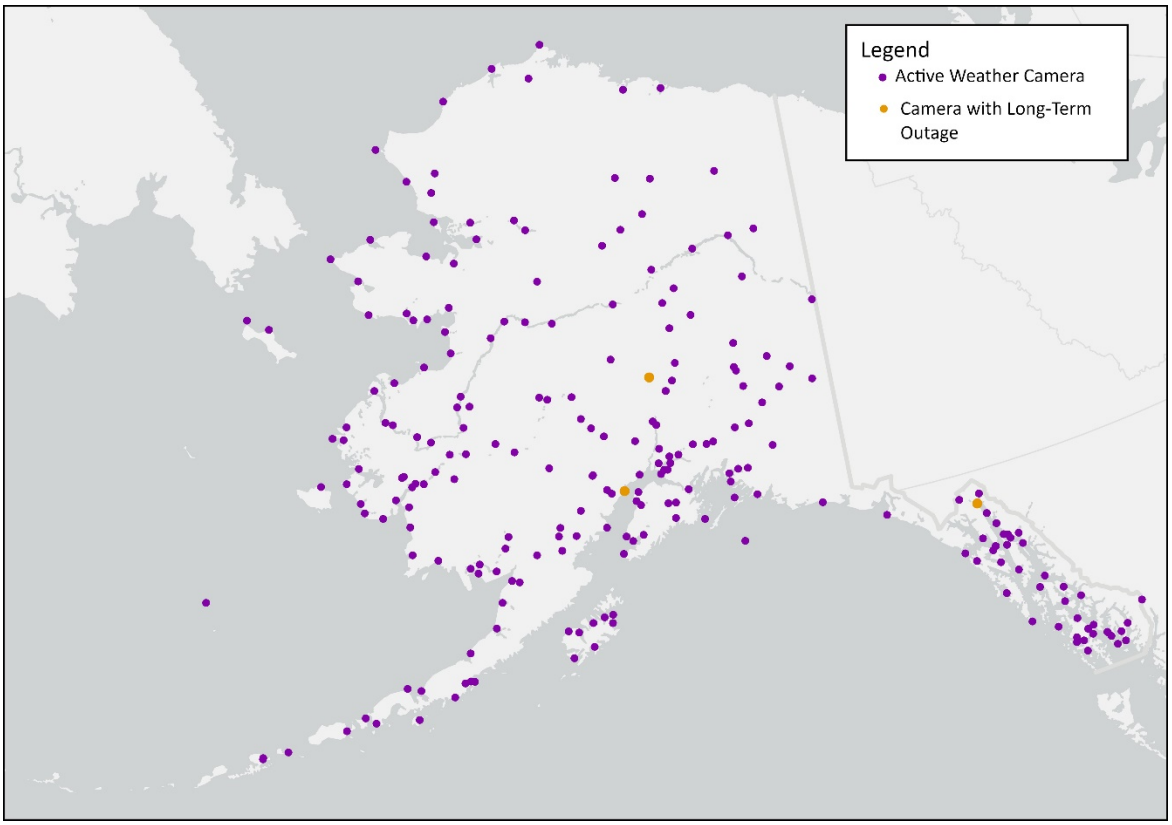
The FAA weather camera program was pioneered in Alaska and has expanded nationwide because of its demonstrated success in improving safety. Camera images, generally taken every 10 minutes, are displayed alongside a reference image of clear-day conditions, providing pilots with a visual of conditions at airports and select enroute critical areas such as mountain passes. Weather cameras are vital at airports that lack other weather observation data. A network of 238 cameras currently exists in Alaska, although three of these cameras are experiencing long-term outages and are not currently active. Information about temporary camera outages and weather camera images is accessible via the FAA weather camera website.

QUOTE FROM AOPA

For pilots who have cameras available where they fly, the [FAA] weather camera program is a great addition to their toolkit.

Tom George, Aircraft Owners and Pilots Association

The FAA supports the addition of more weather cameras. As key locations are identified, the DOT&PF will play a key role in determining priorities for new camera locations.



Instrument Flight Procedures

When visibility is poor, pilots can land IFR, if a published approach exists. Part 135 of Title 14, Code of Federal Regulations mandates that pilots cannot begin an instrument approach unless the latest weather report indicates that weather conditions are at or above the authorized Instrument Flight Procedure (IFPs) landing minimums.

FAA Order 8260.43C describes the process for establishing an IFP. In addition to weather reporting, other data used to determine the feasibility or establish an IFP include the Airport Layout Plan (ALP), lighting, communication facilities, topographic survey, navigational aid availability, air traffic control, airspace analysis, and environmental considerations.

Before 2018, FAA-certified weather observations were required to use an IFP. In Alaska, numerous airports have a published IFP that cannot be used because of a lack of adequate weather reporting. The FAA Reauthorization Act of 2018 attempted to address this issue, changing the rules to make weather reporting requirements for IFR procedures more flexible. “Air carriers are allowed to operate to a destination with a published approach, in a noncontiguous State under instrument flight rules and conduct an instrument approach without a destination Meteorological Aerodrome Report (METAR) if current Area Forecast, supplemented by noncertified local weather observations, such as weather cameras and human observations, is available.” The FAA Reauthorization Act of 2024 included similar language (Sec. 339); however, the FAA has approved very few of these “allowed” procedures. The reality

is that reliable weather observations are still needed, and limitations in weather reporting across Alaska have made this legislation challenging to implement.

The FAA is exploring Artificial Intelligence (AI) options using four weather cameras pointed in four directions from the airport to provide visibility information for flight planning. This new technology is not considered certified weather; however, it provides additional information in areas where it is urgently needed. For the most part, the constraints of using IFR approaches because of inadequate weather reporting have not yet been alleviated.

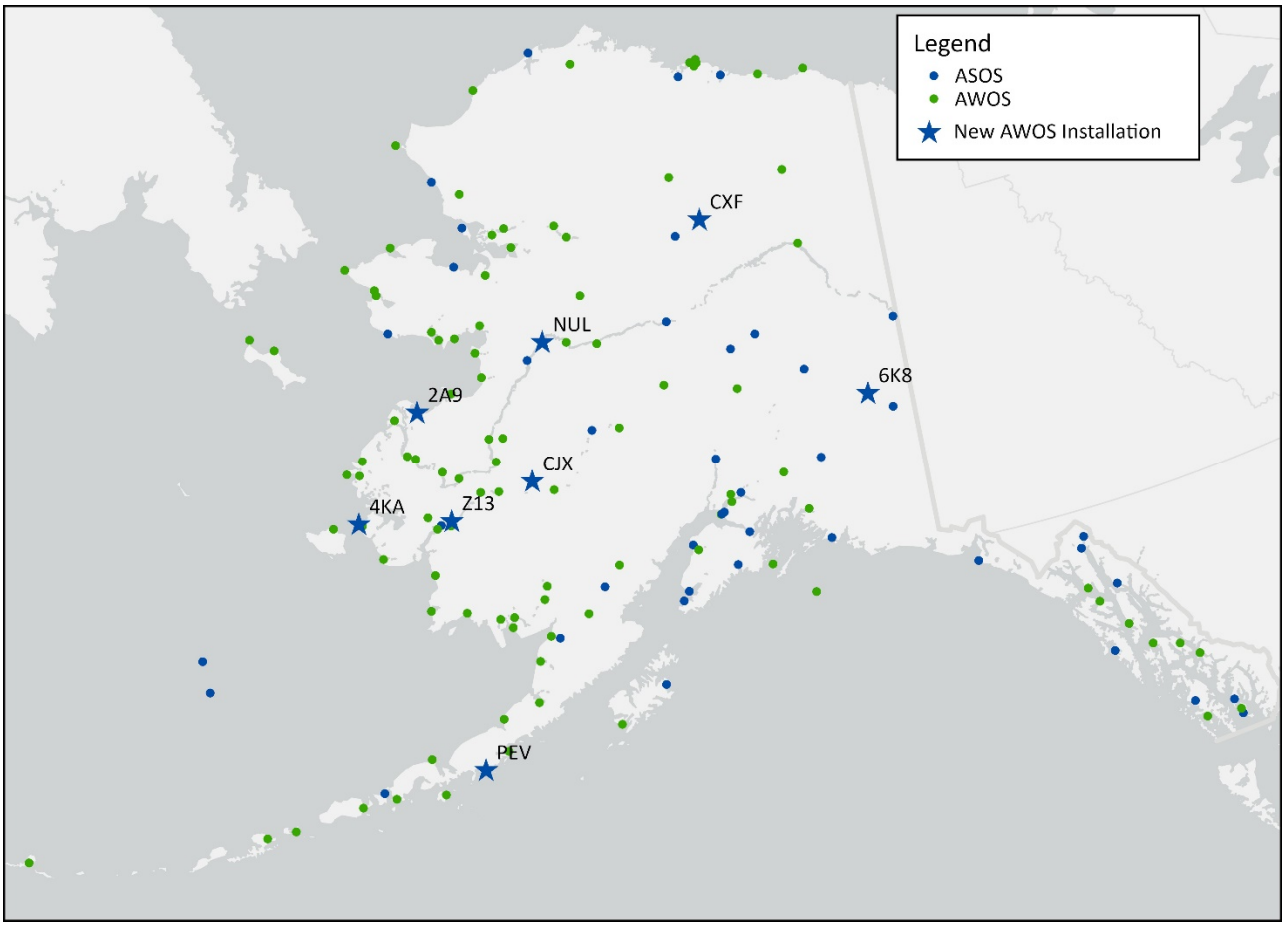
The FAA Reauthorization Act of 2024 requires a study examining ways to improve weather reporting systems' procurement, functionality, and sustainability, including non-Federal weather reporting systems. (Sec. 316) The 'Act' also requires, among other Alaska-specific safety measures, that automated weather systems be installed and operated at each covered airport by December 31, 2030. (Sec. 342).

Addressing Gaps in AWOS Coverage

Both the Phase II AASP weather reporting research and the FAASI emphasized the need for more AWOS stations in Alaska.

Historically, airport sponsors have hesitated to purchase new AWOS stations using AIP funding. This was partly because of the cost/benefit analysis requirement and the high maintenance costs the airport operator sponsor would incur. These concerns were eliminated by the FAA Reauthorization Act of 2018, which removed the requirement for a cost/benefit analysis in low population density states, including Alaska, and mandated the FAA to assume operation and ownership of AWOS stations that meet FAA specifications.

Eight new AWOS stations have been installed through a coordinated effort with the DOT&PF and FAA. In this pilot project, stations were funded by the FAA through AIP Supplemental Discretionary funds. The DOT&PF was responsible for managing the design and construction, while ensuring that FAA design requirements were met. The remoteness of the AWOS stations, along with the time-consuming coordination process between the DOT&PF and FAA, made the installations very expensive, averaging nearly $2 million per unit. Construction was completed between 2021 and 2023, and the transfer of the units to the FAA is expected to be completed in 2024. These new AWOS have brought significant safety benefits to communities and have allowed for the use of IFPs when landing at these airports.



AWOS Connectivity

The reliability of Service-A, encompassing the system of Notices to Air Mission (NOTAMs) and telecommunication lines linking AWOS to the FAA weather database, was also emphasized in the DYAASI. The FAA has identified the need to prioritize the quick deployment of crews to remote weather stations and build up an inventory of spare parts, which will become especially important as systems age; however, Air Traffic Organization Technical Operations (Tech-Ops) have not received increased funding or staff. AWOS connectivity outages have remained a significant concern in Alaska.

Another issue that arises from AWOS connectivity outages is that no notification is issued when a system is down. Outages can be inferred only by a lack of available data. The FAA is currently in the early stages of assessing how to implement the requirement that a NOTAM be issued when an AWOS is down.

Quote From AACA

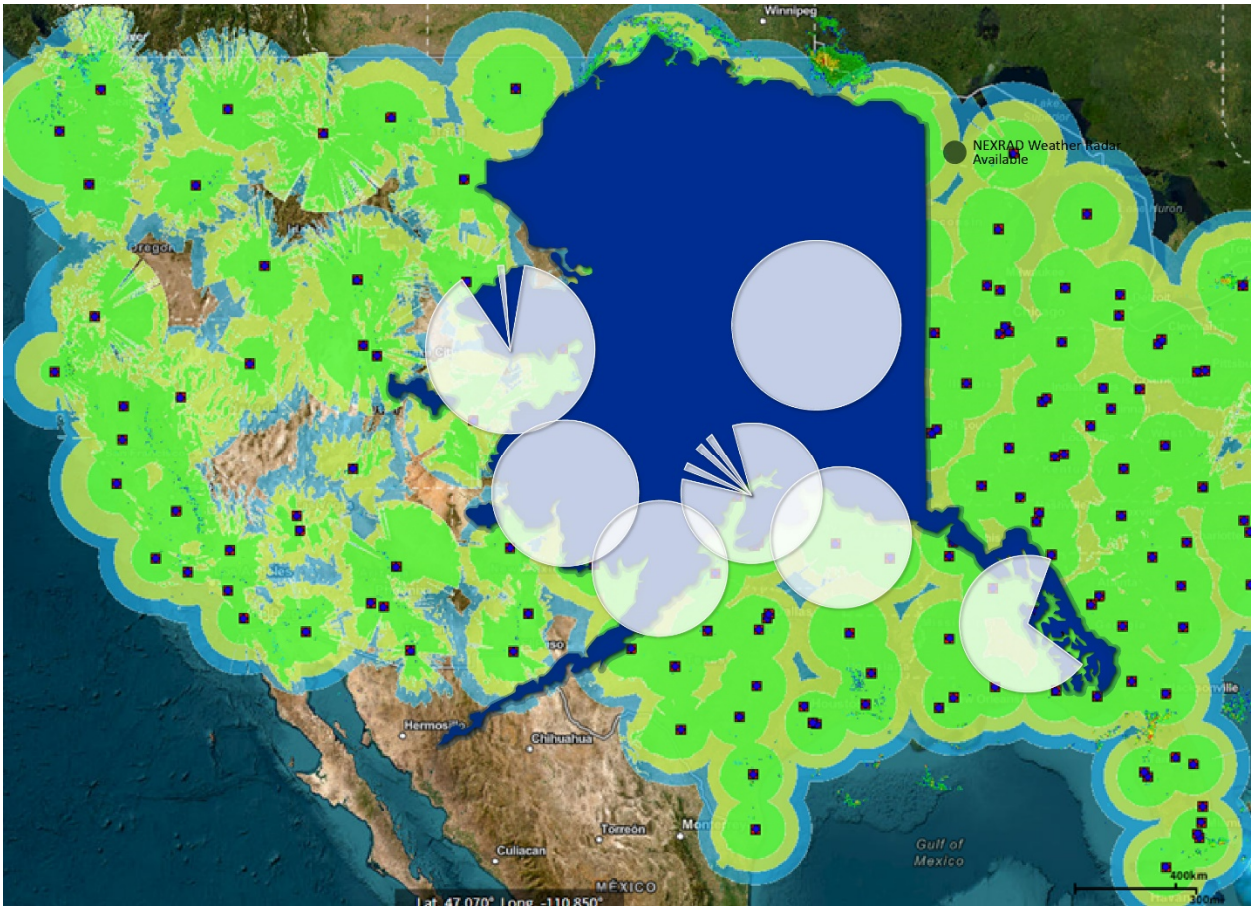
If we could change one thing about Alaska's weather infrastructure, it would be to focus on the reliability of the currently installed AWOS/ASOS station. We are thrilled that new stations have been developed and implemented, but we believe that the focus needs to be on dramatically improving the reliability of pre-existing stations.

Executive Director, Alaska Air Carriers Association

The State continues to work closely with the Alaskan Congressional Delegation (CODEL) and the FAA to identify new ways to track and address weather reporting outages.

En Route Weather Radar Gaps

Next-Generation Radar (NEXRAD) is a system of weather radars, jointly operated by the NWS, FAA, and U.S. Air Force, that processes weather information such as precipitation and wind. Compared to the Lower 48, Alaska has significant en route weather radar gaps, which means some online weather sources and Automatic Dependent Surveillance–Broadcast (ADS-B) may show gaps in coverage. The following graphic shows the areas covered by NEXRAD in Alaska, with the underlying coverage in the Lower 48 as a comparison.



Graphic courtesy of Woolpert, developed as part of the Advanced Air Mobility (AAM) project.

These gaps show that NEXRAD coverage is focused on south coastal areas but lacks the visibility to see the progression of frontal movement or developing weather as it moves across the state. Additionally, long flights across interior areas will not have ADS-B in-weather radar details. The State of Alaska has explored the idea of adding NEXRAD weather radar; however, this remains a challenge because such systems are no longer produced and were built under a one-time national procurement in the late 1980s and early 1990s. The next version of a NEXRAD system is expected to be procured in the mid-2030s.

In the meantime, several vendors are taking advantage of newer technology and building NEXRAD-like capabilities, which may provide opportunities to strengthen Alaska's system in the near future.

New Technologies

VWOS

The Visual Weather Observation System (VWOS) is a new technology that uses sensors attached to existing weather cameras to gather data, including visibility, wind speed and direction, temperature, dew point, and air pressure, along with images from the camera system. These low-cost, advanced, non-FAA-certified weather systems have been identified as a potential solution to collect weather observation data needed for IFR landings.

Testing has occurred at four airports—Palmer, Eek, Healy River, and Tatitlek—with positive results. Currently, additional research about the system is being collected, which will be used to develop standards for operator use. Additionally, the FAA is following a systematic approach to evaluate the feasibility and benefits of funding VWOS across Alaska. VWOS is currently not eligible for AIP funding.

VEIA

Visibility Estimation through Image Analytics (VEIA), a new technology under development, uses existing FAA weather camera infrastructure to provide visibility estimates based on an automated comparison of current conditions to clear-day images. VEIA provides pilots with an easy-to-use online planning tool incorporating real-time visual information. Automating the quantification of visibility will make weather cameras more efficient.

NextGen Weather

As available technologies advance, the FAA NextGen Weather Program works to improve weather forecasting and information management systems to help reduce the impact of weather on aviation. Two significant new technologies include:

- NextGen Weather Processor (NWP): Combines information from weather radars, environmental satellites, lightning, meteorological observations from surface stations and aircraft, and National Oceanic and Atmospheric Administration (NOAA) numerical forecast model output to generate improved weather forecast products
- Common Support Services – Weather (CSS-Wx): Offers a single provider of weather data, products, and imagery within the NAS

FAA Policy Updates

The President signed H.R. 3935 – FAA Reauthorization Act of 2024 into law on May 16, 2024. The new reauthorization has many Alaska-specific clauses, including the DYAASI that aims to reduce the rate of fatal aircraft accidents by 90 percent by 2033 through Alaska-specific solutions for weather reporting and airspace monitoring. The bill includes other Alaska-specific provisions, including the designation of

the FAA Alaska Regional Administrator as the leader of the initiative, providing the state with the authority to address its own needs. The state and FAA are currently collaborating to define more specific plans to accomplish the goals set forth in the legislation.

The legislation does the following:

- Authorizes $25 million annually for the duration of the bill to ensure the DYAASI has the resources to achieve its mandate
- Creates a required process for consulting with the government and airspace users on camera placement and the deployment of new weather cameras
- Sets 2030 deadlines for the installation of certified weather technologies (AWOS/VWOS) and requires the development of a weather system reliability and restoration plan for Alaska within 2 years
- Requires that the FAA ensure ADS-B aircraft tracking technology is available across the state above 5,000 feet by 2030

Conclusion

Weather reporting is vital to aviation safety and reliability in Alaska, and gaps in the reporting are hindrances to an air carrier's ability to provide critical transportation services to Alaskan communities. Understanding the importance of weather reporting, navigational aids, and communications equipment allows planners and engineers to make informed decisions for future development. The DYAASI program continues to post new roadmaps and document progress on weather reporting and other safety initiatives. With the passage of H.R. 3935—FAA Reauthorization Act of 2024, which includes the DYAASI and specific funding to continue advancing the goal of weather system reliability—the FAA, air carriers, and private pilots continue to work collaboratively to address the gaps in weather reporting capabilities in the Alaska system. The DYAASI website is updated annually with the latest roadmap, updates, and information.