NAS Infrastructure

Charlie - Delta Increments

Portfolio Overview

The NAS Infrastructure (NI) Portfolio contains key transformational and infrastructure sustainment capabilities that are critical to the success of NextGen. They involve the transformation or improvement of infrastructure that supports multiple portfolios. This portfolio also includes technical refresh of infrastructure that is not directly rooted in Operational Improvements (OIs).

The NI portfolio contains capabilities that fall into the following infrastructure categories:

- Communications
- Information Management
- Weather
- Facilities

The NI portfolio also contains transormational capabilities in the following area:
- Aircraft Collision Avoidance

The NI portfolio capabilities in these areas benefit the following KPAs:

- Capacity
- Flexibility
- Efficiency
- Environment
- Predictability
- Safety

The Communications capability is focused on the implementation of a Data Communications (Data Comm) capability for the National Airspace System (NAS). Data Comm enables the exchange of information between controllers and pilots via a digital data link, providing the infrastructure required for NextGen services. Data Comm will initially focus on the delivery of a controller-pilot data link communications (CPDLC) departure clearances (DCL) to equipped aircraft on the surface and then will expand to deliver CPDLC messages to equipped aircraft in en route airspace. Data Comm will provide the required communication infrastructure enhancements to support the more advanced NextGen services not possible using voice communications, such as 4D Trajectories and Advanced Flight Interval Management.

Aircraft collision avoidance capabilities help to support NextGen goals for new entrants. Facilities infrastructure provides integrated arrival and departure airspace management transformational capabilities. These capabilities will serve to sustain and improve key automation infrastructure as well as enhance information exchange between decision support tools and external stakeholders.

The Weather capabilities seek to improve decision-making among controllers and users through better sharing of weather information. They also will reduce the impact of weather on NAS operations through translation of meteorology into immediately usable constraints to the movement of aircraft. These capabilities will serve to deliver a common weather information base or picture among Air Navigation Service Providers (ANSPs) and NAS users.

Note: The dates and timelines included in the NAS Segment Implementation Plan (NSIP) are for planning purposes only. All capability schedules are tentative until their supporting programs are officially baselined.

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Portfolio Content Summary Statistics

		Increment Status				
Segment	Total by Segment	Planned	Concept Exploration & Maturation	Development	Initial Operational Availability	Completed
*Alpha (2010 - 2015)	0	0	0	0	0	0
*Bravo (2016 - 2020)	9	0	0	6	1	2
Charlie (2021 - 2025)	5	0	3	2	0	0
Delta (2026 - 2030)	11	1	9	0	1	0
TOTAL	25	1	12	8	2	2
Segment	**% by Segment**	**% by Segment/Increment Status**				
*Alpha (2010 - 2015)	0 %	0 %	0 %	0 %	0 %	0 %
*Bravo (2016 - 2020)	36 %	0 %	0 %	67 %	11 %	22 %
Charlie (2021 - 2025)	20 %	0 %	60 %	40 %	0 %	0 %
Delta (2026 - 2030)	44 %	9 %	82 %	0 %	9 %	0 %
TOTAL	100%	4 %	48 %	32 %	8 %	8 %

* Please see Appendix A and B for information about Alpha and Bravo Increments, respectively.

NAS Infrastructure

Operational Improvements/Current Operations & Increments

Benefits

OI: [103123] Integration of Weather Information into NAS Automation and Decision Making (2031 - 2035)

- D [103123-01] Severe Weather Notification to Aircraft **(2031 - 2035)**
- D [103123-02] Tailored Access to NextGen Common Weather Information - Enhanced **(2031 - 2035)**
- D [103123-03] Enhanced Icing Information **(2031 - 2035)**
- D [103123-04] Expanded Turbulence Information **(2031 - 2035)**
- D [103123-05] Generation of Enhanced NextGen Weather Information - Extended **(2031 - 2035)**
- D [103123-06] Expanded Ceiling and Visibility Information **(2031 - 2035)**
- D [103123-07] Enhanced Weather Products from Improved Satellite Observation Data **(2031 - 2035)**
- D [103123-09] Space Weather Information **(2031 - 2035)**
- D [103123-21] Enhanced Convective Weather Using Satellite-Based Observation in Offshore Oceanic Airspace **(2031 - 2035)**

OI: [103119] Initial Integration of Weather Information into the NAS (2014 - 2026)

- C [103119-09] Initial Space Weather Information **(2023 - 2026)**
- C [103119-10] Improved Terminal Precipitation on the Glass **(2021 - 2026)**

OI: [102158] Automated Support for Initial Trajectory Negotiation (2019 - 2026)

- C [102158-02] Full En Route Data Communication Services **(2022 - 2026)**

OI: [102163] Aircraft Collision Avoidance for Additional Aircraft Types (2023 - 2030)

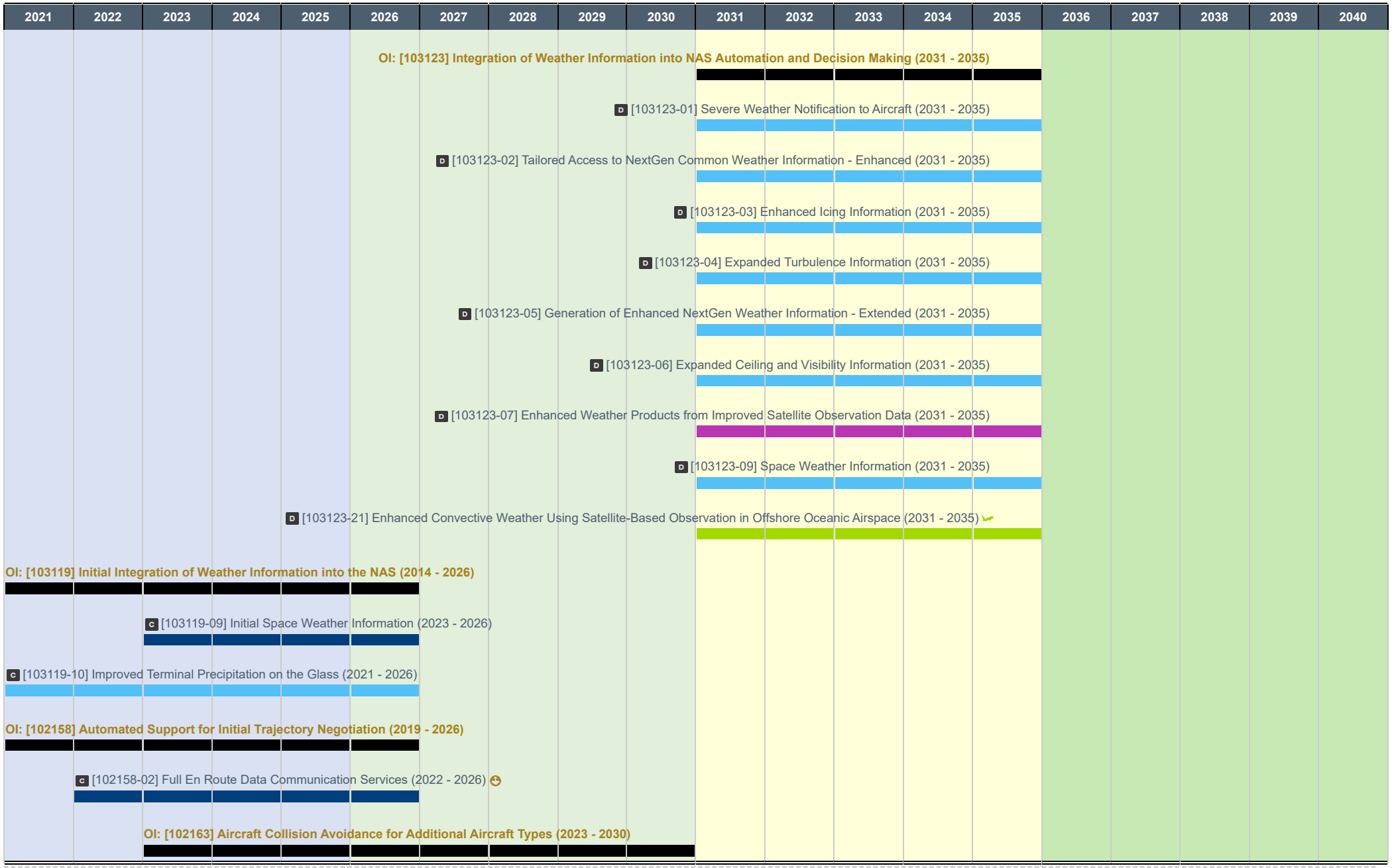
- C [102163-31] Collision Avoidance for Unmanned Aircraft Systems **(2023 - 2028)**
- C [102163-34] Collision Avoidance for Small Unmanned Aircraft Systems **(2023 - 2028)**
- D [102163-33] Collision Avoidance for Rotorcraft **(2026 - 2030)**

OI: [103120] Improved Aviation Weather Information (2017 - 2030)

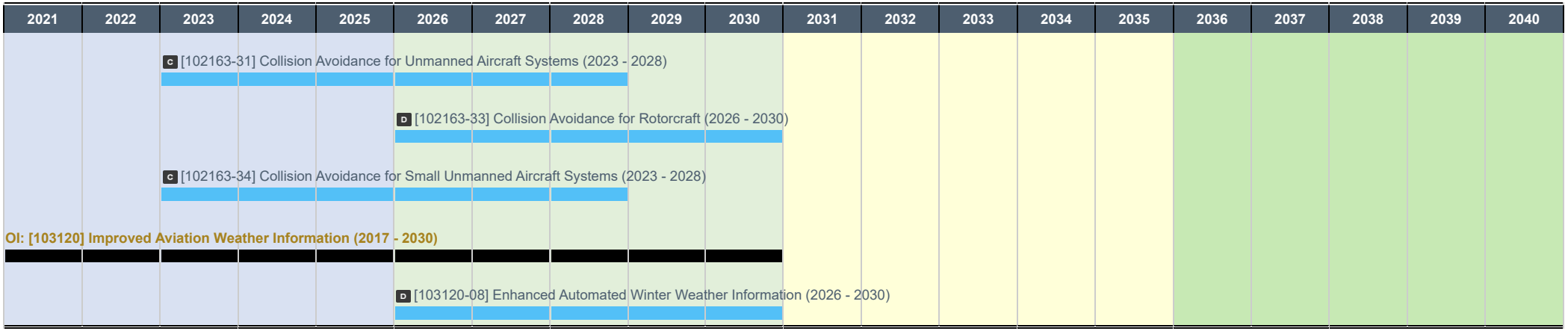
- D [103120-08] Enhanced Automated Winter Weather Information **(2026 - 2030)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete
Access & Equity · Capacity · Flexibility · Efficiency · Environment · Predictability · Safety · C Charlie · D Delta

NAS Infrastructure



NAS Infrastructure



Planned | Concept Exploration & Maturation | Development | Inital Operation Available | Complete

OI | CO | COE/CBTE | C Charlie | D Delta | External Commitment

NAS Infrastructure

OI: [103123] Integration of Weather Information into NAS Automation and Decision Making (2031 - 2035)

Aviation weather information continues to be expanded and improved. Further improvements in weather data and forecasts provide opportunities to automate the translation of weather data into aviation constraints and NAS impact assessments and to assimilate this data into air traffic management decision making. Weather translation into constraint information will aid the human operator in determining impact conditions and mitigation options, especially in areas where increasing complexities make human decision-making more difficult to perform in a timely or efficient manner. Consistent and improved weather data integrated into decision support tools will enable more effective and timely decision making by both ANSPs and flight operators for meeting capacity, efficiency, and safety objectives. The integration of weather into ATM platforms will support all NAS services including Traffic Management Strategic Planning, Flight Planning, Arrival and Departure, Cruise, Oceanic, and Airport operations, and improve the performance and associated benefits of these tools during weather events.

When operational decision makers use weather information that is inconsistent or contradictory, their ability to form collaborative mitigation strategies becomes difficult and inefficient. Improvements in the collection and access of net-centric weather observations, model analyses, and forecasts, fosters an ability to form a common weather picture where operational decision-makers can collaboratively perceive weather constraints and determine impacts in their respective temporal and spatial areas of interest. Based on user-defined weather thresholds, necessary weather information will be sent to ANSPs, flight operations, and aircrews if a change in weather may potentially impact operations. This provides aviation decision-makers with automated forecast updates as weather conditions change.

Each ATM service determines the "level of integration" of weather information needed to meet operational needs. The level of integration will range from weather information and air traffic information contained in separate, stand-alone systems to weather fully integrated in ATM automation systems. Higher levels of integration will combine weather and NAS constraint information to help predict a demand/capacity imbalance and will provide impact mitigation options. Lower levels of integration will require end users to manually translate weather into potential NAS constraints and will not provide any mitigation options. In its simplest case, weather information may be completely separate from an air traffic management system. The full integration of weather information is achieved by meeting the specified "level of integration" for each ATM service.

OI Benefit

Efficiency (P): Consistent and improved weather data integrated into DSTs will enable better weather avoidance plans and faster resumption of more optimal trajectories should weather conditions change.

Capacity (S): Improved weather forecasts and more automated assessment of trajectory and route changes needed as a result of

revised forecasts will decrease workload and enable less restrictive traffic management initiatives in response to hazardous weather forecasts.

Safety (S): Better forecasts of hazardous weather phenomena (e.g., convection, turbulence, and icing) and translation of that information into flight constraints integrated into DSTs will increase flight safety.

Increments

Delta

(2026 - 2030)

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D **[103123-01] Severe Weather Notification to Aircraft (2031 - 2035)** (Concept Exploration & Maturation)

D **[103123-02] Tailored Access to NextGen Common Weather Information - Enhanced (2031 - 2035)** (Concept Exploration & Maturation)

D **[103123-03] Enhanced Icing Information (2031 - 2035)** (Concept Exploration & Maturation)

D **[103123-04] Expanded Turbulence Information (2031 - 2035)** (Concept Exploration & Maturation)

D **[103123-05] Generation of Enhanced NextGen Weather Information - Extended (2031 - 2035)** (Concept Exploration & Maturation)

D **[103123-06] Expanded Ceiling and Visibility Information (2031 - 2035)** (Concept Exploration & Maturation)

D **[103123-07] Enhanced Weather Products from Improved Satellite Observation Data (2031 - 2035)** (Planned)

D **[103123-09] Space Weather Information (2031 - 2035)** (Concept Exploration & Maturation)

D **[103123-21] Enhanced Convective Weather Using Satellite-Based Observation in Offshore Oceanic Airspace (2031 - 2035)** (Initial Operational Availability)

NAS Infrastructure

Increments/Enabling Activities

D [103123-01] Severe Weather Notification to Aircraft (2031 - 2035)

Increment Overview

Enhanced safety and improved efficiency are the benefits of single source gridded weather forecasts that provide filtered weather information along an intended trajectory allowing ANSPs to identify probabilistic weather avoidance fields that may result in trajectory deviations. Additional predictors utilize information about storm growth, decay, vertical structure and weather type (convective or non-convective). This improvement will enable ANSPs and their decision-support systems to request and receive weather observation and forecast information tailored to their specific areas of interest (e.g., en route or terminal domain) and timeframes of interest. The objective, consistent information provided by this increment can be integrated into multiple decision support capabilities for route constraint forecast in combination with ATM demand. ANSPs and flight operators can utilize this information in both their individual planning, and as part of their collaborative mitigation strategy planning. The use of this information will minimize the subjectivity and inconsistencies associated with current human cognitive weather mitigation activities, reducing unplanned delays and unused capacity.

Increment Status

Concept Exploration & Maturation

Success Criteria

2024 : Replace current Convective Weather Avoidance Model (CWAM) with enhanced CWAM that uses machine learning

2026 : Turbulence avoidance Model (TAM) capability made available to CSS-WX/NWP

2030 : Severe weather notification to aircraft capability is available to all FAA users and systems via the CSS-Wx and NWP.

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced weather information products. This information will be available to NAS users and their systems via CSS-Wx and NWP and is a candidate for the NWP/CSS-Wx Enhancement Program.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (P): More efficient weather mitigation strategies for impacted traffic flows are enabled by the availability of more precise tailored forecasts, translated weather information and direct integration into ATM automation.

Safety (S): Single source gridded weather forecasts that provide filtered weather information along an intended trajectory allowing ANSPs to identify probabilistic weather avoidance fields that may result in trajectory deviations.

System Interactions

Initial system dependencies have been identified for this capability. As this capability is further defined, future updates will include revisions to the associated system interaction text.

ERAM (S): ERAM provides flexible routing around weather using information from CSS-Wx and NWP.

NWP (P): NWP will provide a common processing platform for generating NextGen Weather products, and they will be distributed through CSS-Wx.

TFMS (S): TFMS helps traffic managers and stakeholders determine the best solution for weather constraints.

CSS-Wx (S): CSS-Wx will enable net-centric dissemination of the NextGen weather information.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to provide weather forecasts as a single source to ANSPs.

Primary Systems

- NWP: NextGen Weather Processor

Secondary Systems

- CSS-Wx: Common Support Services - Weather
- ERAM: En Route Automation Modernization
- TFMS: Traffic Flow Management System

Tertiary Systems

- SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-02] Tailored Access to NextGen Common Weather Information - Enhanced (2031 - 2035)

Increment Overview

Air traffic managers are able to improve strategic and tactical planning through the ability to receive filtered weather information tailored to a specific area of interest and alerts based on user-defined parameter thresholds. Weather translations are developed for direct customized retrievals by traffic managers to facilitate data driven decision making regarding operations and the need for traffic management initiatives. The operational use of these capabilities will help to inform future requirements for the eventual integration of weather into automated analysis capabilities to meet NextGen operational needs.

Increment Status

Concept Exploration & Maturation

Success Criteria

To Be Defined

Implementation Approach

Implementation of NexGen weather capabilities will focus on research and development of enhanced product retrieval and filtering capabilities; part of NWP/CSS-Wx Enhancements Programs.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (P): Cost-avoidance through replacement of legacy weather distribution and dedicated point to point connections. Enables the incorporation of common weather services, and the addition of new weather information across all users, resulting in enhanced coordination and decision making.

System Interactions

CSS-Wx (P): CSS-Wx will enable net-centric dissemination and direct customized retrieval of NextGen weather information.

NWP (S): NWP will provide for a common processing platform for generating NextGen Weather products and translations, and they will be distributed through CSS-Wx.

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TBFM (S): TBFM is a potential consumer of improved weather products.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to provide weather translations to individual DSTs.

FMDS (S): FMDS will ingest tailored weather information for TMs to use in development of reroutes around weather or for wider-ranging TMIs.

Primary Systems

- CSS-Wx: Common Support Services - Weather

Secondary Systems

- TBFM: Time Based Flow Management
- FMDS: Flow Management Data & Services
- NWP: NextGen Weather Processor

Tertiary Systems

- SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-03] Enhanced Icing Information (2031 - 2035)

Increment Overview

Situational awareness of icing conditions by NAS users is further enhanced through the use of improved and emerging technology inputs to icing forecasts and diagnoses including higher resolution weather modeling capabilities and enhanced surface, radar, airborne, and satellite observational technologies. These enhancements will result in improvements to safety and efficiency. Enhanced CONUS In-flight icing diagnoses and forecasts will provide higher resolution and more rapidly updated data that will allow aviation user development of aircraft/airframe specific icing accretion products to better assess icing impacts based on their planned aircraft type. In addition, terminal area icing weather diagnoses and forecasts will also be improved through the inclusion of high resolution weather observational data from surface stations, radar, satellites as well as airborne aircraft data.

Increment Status

Concept Exploration & Maturation

Success Criteria

2024 : Enhanced resolution Future Icing Product (FIP) transitioned to NWS

2025 : Enhanced resolution Current Icing Product (CIP) transitioned to NWS

2025 : CIP/FIP transitioned to CSS-Wx/NWP and made available to FAA users via the AWD.

2026 : Integrate CIP/FIP into NWP icing processing

2026 : CIP/FIP with drop size information transitioned to NWS

2030 : CIP/FIP with drop size information transitioned to CSS-Wx/NWP and made available to FAA users via the AWD

Implementation Approach

NWP will incorporate weather information into existing icing capabilities. Implementation of NextGen weather capabilities will focus on research and development of enhanced weather information products. This information will be available to NAS users and their systems via CSS-Wx.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Capacity (S): Improved weather forecasts and more automated assessment of trajectory and route changes needed as a result of revised forecasts will decrease workload and enable less restrictive traffic management initiatives in response to hazardous weather forecasts.

Efficiency (P): Consistent and improved weather data integrated into DSTs will enable better weather avoidance plans and faster resumption of more optimal trajectories should weather conditions change.

Safety (S): Situational awareness of icing conditions by NAS users is further enhanced through the use of improved and emerging technology inputs to icing forecasts and diagnoses including higher resolution weather modeling capabilities and enhanced surface, radar, airborne, and satellite observational technologies.

System Interactions

NWP (P): NWP will provide the Aviation Weather Display (AWD) for displaying the enhanced icing information.

CSS-Wx (S): CSS-Wx will receive weather data and products from NWS systems, enable net-centric dissemination of the NextGen weather information, and distribute the enhanced icing information.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to provide enhanced icing forecasts and diagnosis.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

CSS-Wx: Common Support Services - Weather

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-04] Expanded Turbulence Information (2031 - 2035)

Increment Overview

This capability will provide enhanced situational awareness to pilots and ANSPs with respect to turbulence currently impacting a given volume of airspace or forecast to impact operations. Improvements already made to enhance turbulence information will support research leading to turbulence forecasts by type of aircraft and operation. In addition, convectively-induced (outside thunderstorm) turbulence forecast capabilities will be added and coverage of the existing forecast products will be expanded globally to harmonize with international ICAO requirements and capabilities. Turbulence data derived from ADS-B data already being transmitted from equipped aircraft may result in magnitudes of additional real-time information for use by pilots and turbulence forecast capabilities. Adding probabilistic and/or uncertainty attributes to turbulence forecasts are also expected in this timeframe. Turbulence products will generally be provided to users as gridded data.

Increment Status

Concept Exploration & Maturation

Success Criteria

2025 : GTG-N upgrades made available to CSS-Wx.

2025 : GTG-N upgrades transitioned to CSS-Wx/NWP and made available to FAA users via the AWD

2027 : ADS-B derived turbulence data capability implemented (system TBD)

2030 : Turbulence Avoidance Model (TAM) capability made available to CSS-Wx and NWP (not available base program) and made available to FAA users via the AWD

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced raw (i.e., produced by NOAA NWS) and translated (i.e., produced by NWP) turbulence observation and forecast products. This information will be available to NAS users and their systems via NWP/CSS-Wx Enhancements.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (P): Improved turbulent forecasts allow for better strategic planning of flights and flows around turbulence and better tactical en route flight decisions, enabling flight crews to avoid unnecessary route and altitude deviations, thus increasing efficiency.

Capacity (S): Turbulence is associated with significant airspace sterilization, which negatively affects capacity.

Safety (S): This capability will provide enhanced situational awareness to pilots and ANSPs with respect to turbulence currently impacting a given volume of airspace or forecast to impact operations. Turbulence is the leading cause of commercial aircraft accidents (as defined by NTSB).

System Interactions

NWP (P): NWP will host the Turbulence Avoidance Model product capability providing expanded turbulence information to NAS systems. NWP will provide the Aviation Weather Display (AWD) for displaying the expanded turbulence information.

CSS-Wx (S): CSS-Wx will receive weather data and products from NWS systems, enable net-centric dissemination of the NextGen weather information, and distribute the expanded turbulence forecast and graphical guidance information.

TFMS (S): TFMS is a potential consumer for turbulence information.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to provide improved turbulence information to users.

Primary Systems

- NWP: NextGen Weather Processor

Secondary Systems

- TFMS: Traffic Flow Management System
- CSS-Wx: Common Support Services - Weather

Tertiary Systems

- SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-05] Generation of Enhanced NextGen Weather Information - Extended (2031 - 2035)

Increment Overview

Advanced impact assessment tools improve ANSP and user tactical and strategic planning by providing enhanced consolidated weather processing of advanced observational and forecast capabilities (e.g., convective weather products, turbulence, icing) to realize a consistent weather information to be utilized for ATM decision-making. This increment will ensure that these various sources of more advanced weather information (e.g., forecasts, probabilities) are consolidated to produce a consistent information base, alleviating the need for decision makers to arbitrate among those weather sources. The information will be directly accessed by ANSP and users at resolutions and forecast horizons consistent with the operational need, from lower-resolution global forecasts to high-resolution terminal information suitable for arrival/departure and airport operations planning. This improvement will enable ANSPs and their decision-support systems to request and receive weather observation and forecast information tailored to their specific volumetric areas (e.g., en route or terminal domain), intended flight path, and timeframes of interest. For example, automation systems that require winds and temperatures aloft information will be able to receive 4-D weather data customized to their areas of interest and scope (e.g., terminal airspace descent profile winds for the Traffic Management Advisor).

Increment Status

Concept Exploration & Maturation

Success Criteria

To Be Defined

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced weather information products. This information will be available to NAS users and their systems via NWP/CSS-Wx Enhancements.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (P): Development of more effective weather mitigation strategies helps to minimize disruptions to planned flights and flows. Enables streamlined and standardized dissemination of common weather services, and facilitates the efficient addition of new weather services, products, and users.

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System Interactions

NWP (P): NWP will provide for a common processing platform for generating NextGen Weather products, including this enhanced information.

CSS-Wx (S): CSS-Wx will distribute the enhanced weather information provided by NWP.

TFMS (S): TFMS is a potential consumer of improved weather products.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to provide weather information to users.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

CSS-Wx: Common Support Services - Weather

TFMS: Traffic Flow Management System

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-06] Expanded Ceiling and Visibility Information (2031 - 2035)

Increment Overview

This increment provides improved access to enhanced ceiling and visibility (C&V) forecast information which will enable better flight planning, thereby improving safety of flight, especially for GA operations. Visibility estimates will also be enhanced through processing of images from weather cameras. The integration of this enhanced C&V information into emerging NextGen decision support tools will also increase system efficiency by providing traffic managers with more accurate information to use in estimating airport capacity. Improved availability, coverage and quality of the C&V forecast information will be provided through high resolution, rapidly updating grids and station-based data for integration into decision support tools and processes. This information will be available to pilots and FOCs for flight planning purposes to improve safety and efficiency.

Increment Status

Concept Exploration & Maturation

Success Criteria

2020 : C&V forecast grids containing uncertainty attributes transition to NWS operations

2021 : Demonstrate and evaluate visibility estimates from weather cameras using image processing

2023 : Prototype onset and cessation products for high impact Ceiling and Visibility (C&V) events for core 30 airports.

2024 : Increase the temporal resolution of C&V forecast grids to 15-minute valid time windows and transition to NWS operations

2024 : Implement capability to estimate visibility from camera images on FAA Weather Camera system

2030 : C&V grids with uncertainty attributes transitioned to CSS-Wx/NWP and made available to FAA users via the AWD

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced weather information products. This information will be available to NAS users and their systems via NWP/CSS-Wx Enhancements.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (P): Improved C&V forecasts allow for better planning of flights.

Safety (P): This increment provides improved access to enhanced ceiling and visibility (C&V) forecast information which will enable better flight planning, thereby improving safety of flight, especially for GA operations.

System Interactions

CSS-Wx (P): CSS-Wx will receive weather data and products from NWS systems, enable net-centric dissemination of the NextGen weather information, and distribute the expanded C&V information.

NWP (S): NWP will provide the Aviation Weather Display (AWD) for displaying the expanded C&V information.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to provide improved access to enhanced ceiling and visibility (C&V) forecast information.

Primary Systems

CSS-Wx: Common Support Services - Weather

Secondary Systems

NWP: NextGen Weather Processor

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-07] Enhanced Weather Products from Improved Satellite Observation Data (2031 - 2035)

Increment Overview

This capability will leverage improved satellite-based weather observations to provide enhanced weather products for a range of weather phenomena for terminal and en route operations. This will improve situational awareness, flight planning, efficiency, and safety. The improved satellite observation data will enhance convection, turbulence and icing detection, as well as aid in the prediction of fog and cloud ceilings that impact airport departures and arrivals. The improved weather satellite sensors provide higher resolution and higher refresh rate data over larger regions of geographical coverage, providing improved inputs to aviation-specific weather products used for operational decision making. Data may be from new weather satellite imagery channels, lightning detection sensors, or sounders and profilers. Data could also be received from satellites in polar orbiting, geostationary, or other non-traditional orbits. Additionally, data may potentially come from weather satellites operated by the US and international actors, including commercial vendors.

Increment Status

Planned

Success Criteria

2030 : All GOES satellite imagery band data received, ingested and processed by CSS-Wx/NWP, and made available to FAA users via the AWD and operators via CSS-Wx.

Implementation Approach

Raw satellite-based observation data and derived convection, turbulence, icing and cloud products developed from this data from the National Weather Service will be disseminated via CSS-Wx to the FAA for use by decision makers. Enhanced Weather Products would be produced by the National Weather Service and NextGen Weather Processor. This capability is a candidate for NWP/CSS-Wx Enhancements.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (P): Reduces inefficient maneuvers and diversions.

System Interactions

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NWP (P): NWP will generate some of the enhanced weather products made possible by the improved satellite information, and will make the satellite based products available via its Aviation Weather Display (AWD).

CSS-Wx (S): CSS-Wx will receive the improved satellite observation data, and enable net-centric dissemination and distribute the enhanced weather products.

SWIM (T): SWIM provides messaging infrastructure that enables CSS-Wx to distribute the satellite based weather observations.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

CSS-Wx: Common Support Services - Weather

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-09] Space Weather Information (2031 - 2035)

Increment Overview

Flight operations centers (FOCs) and flight crews will use improved Global Space Weather information to make pre-flight planning decisions regarding route selection and fuel loading. ANSPs will use the information for traffic flow management decisions and will disseminate information to FOCs and flight crews, as necessary.

Space Weather services will provide information for space weather events that may adversely affect the performance of aircraft communications, navigation, and surveillance systems. In addition, information pertaining to radiation effective dose at flight altitudes and latitudes will be provided. Improved Space Weather information for aviation will be provided by global and regional advisory centers, as designated by the International Civil Aviation Organization (ICAO). Improved Space Weather information for aviation will consist of more accurate depictions and forecasts of the areas and altitudes affected by the space weather event. Improvements will continue based on the experience gained during active solar periods as well as during more passive cosmic radiation periods. The Space Weather information will be available from CSS-Weather to the Air Traffic Control System Command Center (ATCSCC), Air Route Traffic Control Centers (ARTCCs), FOCs, and pilots.

The information will provide observations, forecasts, and/or climatology for space weather in both text and graphical formats based on standardized formats and global standards for space weather. The severity of the impact will also be presented in text and graphical formats. In addition, information will include observations and/or forecasts for disruptions to Global Navigation Satellite System (GNSS), High Frequency (HF), and Satellite communications which could impact NAS operations.

Increment Status

Concept Exploration & Maturation

Success Criteria

2027 : Improved space weather information made available to CSS-Wx and NWP.

2030 : Improved space weather information made available to FAA users via the AWD and operators via CSS-Wx.

Implementation Approach

Improved Space Weather information for aviation will be provided by global and regional advisory centers, in accordance with the SARPs in ICAO Annex 3. The Space Weather information will be transitioned to CSS-Wx/NWP and made available to users in the ATCSCC and

NAS Infrastructure

ARTCCs via the AWD, and to FOCs and flight crews via CSS-Wx.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (P): Reduces reroutes and diversions by improved route planning and fuel loading when space weather events may impact operations, particularly on high-latitude routes.

Safety (S): Reduces likelihood of exposure to space weather events that can degrade aircraft avionics systems performance.

System Interactions

NWP (P): NWP will provide the Aviation Weather Display (AWD) for displaying the Space Weather information.

CSS-Wx (S): CSS-Wx will receive the space weather data and products from global and regional advisory centers, and enable net-centric dissemination and distribute the space weather information.

SWIM (T): SWIM will provide messaging infrastructure to enable CSS-Wx to distribute the space weather information products.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

CSS-Wx: Common Support Services - Weather

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

D [103123-21] Enhanced Convective Weather Using Satellite-Based Observation in Offshore Oceanic Airspace (2031 - 2035)

Increment Overview

This capability will deliver improved satellite-based weather observations to provide enhanced situational awareness of precipitation and convective weather activity for en route operations in off-shore oceanic airspace. The availability of this capability will improve flight planning, safety, and efficiency for these operations. The capability will use enhanced satellite-based observations as input to generation of radar-like mosaics to provide visibility to storm activity in regions not covered by radar. Improved weather satellite sensors already on orbit provide higher resolution, higher refresh rate data to improve inputs to and fidelity of offshore storm weather products.

Increment Status

Initial Operational Availability

Success Criteria

2017 : Raw GOES-16 satellite-based observation data and products are available from NWS.

2019 : Raw GOES-17 satellite-based observation data and products are available from NWS.

2025 : Enhanced convective weather products using satellite-based observation data transitioned to NWP.

2030 : Enhanced convective weather products using satellite-based observation data available to FAA users via the AWD.

Implementation Approach

Raw satellite-based observation data, imagery, derived convection, precipitation and cloud top height products for off-shore oceanic airspace developed from this data by NWP will be disseminated within the FAA for use by decision makers. This is a candidate capability for NWP/CSS-Wx Enhancement Program.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (P): Reduces incidents of inefficient maneuvers and diversions on long-haul flights (resulting from large avoidance maneuvers).

Predictability (S): Enhanced observations will improve convection and precipitation products to aid in the prediction of thunderstorms, cloud ceilings and areas of possible High Ice Water Content, allowing greater predictability in arrivals and departures of trans-oceanic

flights.

Safety (S): Reduces likelihood of flight through adverse weather via improved planning around it, particularly in oceanic regions.

System Interactions

The prototype Offshore Precipitation Capability (OPC) output can be accessed via a restricted website. Users at the ARTCCs in Miami, Houston, NY, Puerto Rico and the Command Center have dedicated laptops connected to large monitors to view the output.

NWP (P): NWP will produce a satellite mosaic product which combines GOES-16 (GOES-East) and GOES-17/18 (GOES-West) inputs as well as radar mosaics that include satellite-based offshore contributions (OPC).

CSS-Wx (S): CSS-Wx will distribute the satellite mosaic and radar mosaics provided by NWP.

SWIM (T): SWIM provides messaging infrastructure that enables the products that are derived from satellite-based observations to be available.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

CSS-Wx: Common Support Services - Weather

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

OI: [103119] Initial Integration of Weather Information into the NAS (2014 - 2026)

Advances in aviation weather information content and dissemination enhance cross-domain ATM decision-making and synchronize weather situational awareness for all users. They will be able to request and receive aviation weather information tailored to their specific volumetric areas (e.g., terminal, ARTCC or flight trajectory) and timeframes of interest to support assessment of flight-specific thresholds that indicate re-planning actions are needed and streamline the process by which the user - with or without decision support ATM tools - conducts system-wide risk management in planning for both individual flight trajectories and flows.

The enhanced aviation weather information enables the opportunity to initiate mitigations that require more lead time. These include flexible sectorization, tactical staffing adjustments, development of Traffic Management Initiatives (TMI), dynamic fleet reallocations by users and collaborative airspace constraint resolution by both ANSP and users.

The translation of the aviation convective weather information into objective and consistent constraint information enables standardized decision processes/outcomes, allowing full and continuous use of automated tools, and facilitating a more proactive approach during weather events. This supports the ability of ANSPs and users to make informed, collaborative ATM decisions earlier in the planning process, thus minimizing disruptions to daily fleet plans and to individual flights.

As the new information is incorporated into both flight and flow planning activities, improved availability, coverage and quality of the enhanced aviation weather information, along with objective and consistent constraint information, will allow for better flight planning and improved safety of flight, and enhanced efficiency.

OI Benefit

Efficiency (P): Incorporating improved weather information into flight planning allows more efficient routing around weather.

Safety (P): Improved availability, coverage and quality of the enhanced aviation weather information and improved constraints increase safety.

Predictability (S): Enhanced aviation weather information improves flow planning and provides users with increased schedule predictability when weather impacts operations.

NAS Infrastructure

Increments

Charlie

(2021 - 2025)

2

C **[103119-09] Initial Space Weather Information (2023 - 2026)** (Development)

C **[103119-10] Improved Terminal Precipitation on the Glass (2021 - 2026)** (Concept Exploration & Maturation)

NAS Infrastructure

Increments/Enabling Activities

C [103119-09] Initial Space Weather Information (2023 - 2026)

Increment Overview

Flight operations centers (FOCs) and flight crews will use Global Space Weather information to make pre-flight planning decisions regarding route selection and fuel loading. Space Weather services provide warning and advisory information for space weather events that may adversely affect the performance of aircraft communications, navigation, and surveillance systems. This information will be provided by global and regional advisory centers, as designated by the International Civil Aviation Organization (ICAO). The Space Weather information will be available from CSS-Weather to the Air Traffic Control System Command Center (ATCSCC), Air Route Traffic Control Centers (ARTCCs), FOCs, and pilots.

Increment Status

Development

Success Criteria

2025 : Initial TBD space weather information from global and regional advisory centers made available to all users via TBD website.

Implementation Approach

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

System Interactions

To be determined

NAS Infrastructure

Increments/Enabling Activities

C [103119-10] Improved Terminal Precipitation on the Glass (2021 - 2026)

Increment Overview

This increment will enable terminal controllers to better anticipate and prepare for pilot requests for deviation around convective activity through the presentation of precipitation intensity on the display. In addition, it will enable terminal controllers to provide better information to pilots flying toward extreme precipitation in aircraft not equipped with working airborne weather radar. Enhanced weather radar information will be integrated onto terminal controller displays to support situational planning for separation management and other control functions. It will ensure terminal controllers have consistent access to accurate, reliable, and timely depictions of precipitation in relation to their areas of control responsibility. It will alleviate poor precipitation depiction that hinders the ability of the terminal controller to issue accurate precipitation advisories in the terminal environment, to effectively maneuver traffic around weather, and to effectively anticipate changes to traffic patterns and separation strategies.

Increment Status

Concept Exploration & Maturation

Success Criteria

To Be Defined

Implementation Approach

This capability will be achieved by the provision of NWP/CSS-Wx output data to a virtual radar generation processor in a cloud computing environment to the terminal STARs automation system over FTI.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

System Interactions

NWP (P): NWP will generate radar mosaics based on NEXRAD, Canadian Radar, and TDWR inputs.
TPoG (S): Terminal Precipitation on the Glass
CSS-Wx (S): CSS-Wx will disseminate radar mosaic products generated by NWP.
STARS (S):

NAS Infrastructure

Primary Systems

- NWP: NextGen Weather Processor

Secondary Systems

- CSS-Wx: Common Support Services - Weather
- STARS: Standard Terminal Automation Replacement System

NAS Infrastructure

OI: [102158] Automated Support for Initial Trajectory Negotiation (2019 - 2026)

En Route sector capacity and throughput are increased through the ability to send route changes and instructions to the cockpit over data communications. Trajectory management is enhanced by automated assistance to negotiate conflict-free pilot trajectory change requests with properly equipped aircraft operators. The trajectory change would then be relayed to the pilot/aircraft operator over data link. The aircraft operator must acknowledge receipt and acceptance of the negotiated trajectory change. In addition, pilots will be able to downlink more complex route clearance requests that express aircraft operator intent and aircraft-specific constraints.

These improvements will also increase controller productivity through the ability to send precise control instructions and advisory messages to the cockpit. This will enable higher density of operations, which will increase capacity as well as decrease human errors in trajectory negotiation and data entry.

OI Benefit

Capacity (P):The ability to create dynamic and more complex reroute clearances over data comm reduces controller workload and leads to increased airspace capacity, especially when there are airspace constraints.

Efficiency (S): The ability to send revised clearances to the cockpit that do not have to be read over voice comm increases the ability to better accommodate user preferences.

Safety (S):Automated route changes sent via data comm reduces hear-back read-back errors and reduces controller workload associated with routine tasks.

Flexibility (S): The decrease in controller workload associated with a revised route clearance will increase the ability to accommodate user preferences.

Environment (S): Reduced taxi delays and more efficient reroutes will reduce fuel burn and emissions.

Increments

Charlie

(2021 - 2025)

1

C **[102158-02] Full En Route Data Communication Services (2022 - 2026)** (Development)

NAS Infrastructure

Increments/Enabling Activities

C [102158-02] Full En Route Data Communication Services (2022 - 2026)

Increment Overview

Data Communication services will be provided to deliver additional clearances for increasingly complex controller initiated routes, more complex crossing restrictions, advisory messages, and holding instructions. These services will assist controllers in managing aircraft more efficiently, leading to increased productivity of controllers with the beneficial effects of increasing sector capacity and throughput. This capability will reduce system errors and pilot deviations due to missed or misunderstood communications via voice, thereby enhancing system safety. Automation tools will assist controllers with the generation of more complex clearance and other Data Comm messages.

Increment Status

Development

Success Criteria

2024 : Operationally available at selected airspace and key site locations Initial Operational Capability (IOC).

2026 : Deployment and operational availability at all ARTCCs.

Implementation Approach

The strategy is to deploy services incrementally with implementation of basic services at airport towers initially, leveraging existing equipage, and delivering ground system infrastructure for future services (i.e., en route) with initial deployment. Segment 1 Phase 2 includes enhancements to en route services, and will be implemented beginning in FY 2019. The en route services will be delivered in two stages: Initial En Route Services and Full En Route Services.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Capacity (S): Improve recovery from service disruptions, mitigate propagated delay, and improve schedule reliability; improved controller efficiency leads to increased sector capacity.

Flexibility (S): Improve flexibility by enabling NextGen capabilities such as the delivery of airborne reroute clearances to aircraft via digital data communications.

Efficiency (P): Increase throughput/efficiency and reduce delays by reducing communication time for delivery of altitude clearances with altimeter setting information and airborne reroutes; it also improves controller and flight crew efficiency.

Environment (S): Reduced taxi delays and more efficient reroutes will reduce fuel burn and emissions.

Safety (S): Improve communication accuracy and safety with digital communication (i.e., reduced read/hear back errors, reduced loss of communications events).

System Interactions

ERAM (P): ERAM will require functional and interface modifications to support the initial set of En Route Data Communications services. ERAM will interface with the Data Comm Network Service (DCNS) via the NAS Enterprise Security Gateway (NESG) for the exchange of En Route Data Comm messages with participating aircraft.

FTI (S): FTI provides network transport and NESG services for ground communication between ERAM and DCNS. Additional services are provisions to support the Data Comm services.

DCNS (S): Provisioning for air to ground services through DCNS to allow Data Comm delivery to and from aircraft avionics.

Data Comm Avionics (A): Use a subset of FANS 1/A messages to provide ATC services to qualified flights

Primary Systems

- ERAM: En Route Automation Modernization

Secondary Systems

- FTI: FAA Telecommunications Infrastructure
- DCNS: Data Communications Network Service

Avionics Systems

- Data Com Avionics: Data Communication Avionics

NAS Infrastructure

OI: [102163] Aircraft Collision Avoidance for Additional Aircraft Types (2023 - 2030)

New technologies will benefit aircraft-based Collision Avoidance (CA) capabilities avionics as they are extended to accommodate new/additional aircraft types (e.g. Unmanned Aircraft Systems (UAS) and Rotorcraft). The new CA capabilities will provide effective technology solutions for rotorcraft by addressing their unique flight characteristics to hover and to fly near other aircraft at lower altitudes, slower airspeeds, and different attitudes than fixed-wing airplanes. These benefits will directly lead to increased safety of encounters between rotorcraft and other cooperative airspace users. CA techniques will become more adaptable and flexible through the use of optimized threat resolution logic that will be tuned to accommodate the airspace and the specific types of encounters which would be typical for the aircraft involved in a potential encounter. For UAS aircraft, the CA technologies will also process non-cooperative surveillance targets in order to sense/detect and avoid other aircraft. In addition, the logic will also account for the variety of aircraft sizes and dynamic capabilities of the aircraft.

OI Benefit

Safety (P): Improvements in collision avoidance technology for new aircraft types will increase the percentage of the fleet that can benefit from this safety assurance capability.

Increments

Charlie (2021 - 2025)	Delta (2026 - 2030)
2	1

C **[102163-31] Collision Avoidance for Unmanned Aircraft Systems (2023 - 2028)** (Concept Exploration & Maturation)

C **[102163-34] Collision Avoidance for Small Unmanned Aircraft Systems (2023 - 2028)** (Concept Exploration & Maturation)

D **[102163-33] Collision Avoidance for Rotorcraft (2026 - 2030)** (Concept Exploration & Maturation)

NAS Infrastructure

Increments/Enabling Activities

C [102163-31] Collision Avoidance for Unmanned Aircraft Systems (2023 - 2028)

Increment Overview

The integration of Unmanned Aircraft Systems (UAS) into the NAS will be supported through new collision avoidance technologies in the form of Airborne Collision Avoidance System (ACAS) Xu, an unmanned variant of ACAS. The technology will be interoperable with existing and future airborne collision avoidance systems. Existing active and passive forms of cooperative surveillance will be used to track traffic, while allowing additional surveillance methods to track non-cooperative targets in order to sense/detect and avoid other aircraft. In addition, the logic will also account for the variety of aircraft sizes and dynamic capabilities of the aircraft.

Increment Status

Concept Exploration & Maturation

Success Criteria

2020 : Completion of ACAS Xu Minimum Operational Standards (MOPS) at RTCA

2023 : Completion of FAA Technical Standard Order and Advisory Circular for ACAS Xu

Implementation Approach

The ACAS Xu and sXu RTCA MOPS are being developed to define a "detect and avoid" solution that seamlessly integrates remain-well-clear guidance with collision avoidance guidance in an internationally harmonized and interoperable fashion. Upon completion of the RTCA MOPS, corresponding FAA guidance materials will be developed and released for U.S. use of ACAS Xu and sXu. The ACAS Xu RTCA Standard was developed jointly with EUROCAE, and the FAA is collaborating with EASA to seek harmonization among their respective guidance documentation.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Safety (P): Improved collision avoidance for UAS operations.

System Interactions

ACAS-X (A): Operational Type - Xu (UAS) and sXu (small UAS).

NAS Infrastructure

Avionics Systems

- ACAS-X: Airborne Collision Avoidance System X

NAS Infrastructure

Increments/Enabling Activities

C [102163-34] Collision Avoidance for Small Unmanned Aircraft Systems (2023 - 2028)

Increment Overview

The safe separation of small Unmanned Aircraft Systems (sUAS) beyond visual line of sight against manned aircraft, UAS and other sUAS will be enabled through new collision avoidance technologies in the form of Airborne Collision Avoidance System (ACAS) sXu, an unmanned variant of ACAS. The technology will enable autonomous and decentralized sUAS collision avoidance designed for smaller UAS that are less equipped to surveil and coordinate with other aircraft.

Increment Status

Concept Exploration & Maturation

Success Criteria

2022 : Completion of ACAS sXu Minimum Operational Standards (MOPS) at RTCA

2023 : Completion of FAA Technical Standard Order and Advisory Circular for ACAS sXu

Implementation Approach

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

System Interactions

To be determined

NAS Infrastructure

Increments/Enabling Activities

D [102163-33] Collision Avoidance for Rotorcraft (2026 - 2030)

Increment Overview

Safety will be enhanced for rotorcraft operations with the addition of new collision avoidance alerting technologies that consider the different types of operations conducted by helicopters and address their unique flight characteristics to hover and to fly near other aircraft at lower altitudes, slower airspeeds, and different attitudes than fixed-wing airplanes.The technology will be interoperable with existing and future airborne collision avoidance systems.Lower size, weight, and power forms of surveillance will be used to track traffic and generate resolution advisories for other cooperative aircraft in the vicinity.

Increment Status

Concept Exploration & Maturation

Success Criteria

2025 : Completion of ACAS Xr Minimum Operational Standards (MOPS) at RTCA

2027 : Completion of FAA Technical Standard Order for ACAS Xr

Implementation Approach

This increment will be implemented through optimized CAS algorithms on various rotorcraft platforms.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Safety (P): Improvements in collision avoidance technology for new aircraft types will increase the percentage of the fleet that can benefit from this safety assurance capability.

System Interactions

Initial system dependencies have been identified for this capability. As this capability is further defined, future updates will include the associated system interaction text.

ACAS-X (A): Operational Type - Xr (Rotorcraft Surveillance).

NAS Infrastructure

Avionics Systems

- ACAS-X: Airborne Collision Avoidance System X

NAS Infrastructure

OI: [103120] Improved Aviation Weather Information (2017 - 2030)

Improved availability, coverage, quality, and types of aviation weather information will allow for better flight planning and improved flight safety. Improved weather observations and forecasts are generated using inputs from current and additional sensors and extending product coverage to additional areas and altitudes. Weather data may be obtained or derived from non-traditional sensors and means. This information will be available to aviation users to increase situational awareness and provide for improved observation and forecast information to use for planning flights around hazardous weather or to take advantage of favorable weather conditions, which will improve flight efficiency and safety as well as reduce emissions.

OI Benefit

Safety (P): Enable flight planners and pilots to better avoid hazardous weather through improved observation and forecast information.

Efficiency (P): Enable flight planners and pilots to prepare flight plans with improved availability, coverage, quality and types of aviation weather information and forecasts so that more efficient and reliable routes around weather hazards can be planned and executed.

Increments

Delta

(2026 - 2030)

1

D **[103120-08] Enhanced Automated Winter Weather Information (2026 - 2030)** (Concept Exploration & Maturation)

NAS Infrastructure

Increments/Enabling Activities

D [103120-08] Enhanced Automated Winter Weather Information (2026 - 2030)

Increment Overview

Enhanced surface winter weather sensors provide improved detection capability and facilitate improved weather forecasts for all operational decision makers in the NAS. Pilots, ATC personnel, dispatchers, airport managers and associated automation systems receive reliable, timely weather information enabling them to mitigate the impacts of winter weather on operations through improved situational awareness. This enhanced information will include Liquid Water Equivalent Rates or other intensity techniques for all frozen precipitation types, enabling improved calculations of de-icing holdover times and more environmentally efficient use of deicing fluid during all winter weather conditions. This automated winter weather information will provide detection of additional precipitation types at all tiers of Air Traffic Control towers. The expansion of winter precipitation sensor data into meteorological assimilation tools will improve atmospheric characterization used to determine conditions aloft in the terminal area and improves the initiation of forecast models so they better depict the onset and cessation of winter weather events.

Increment Status

Concept Exploration & Maturation

Success Criteria

2022 : Technical transfer of performance requirements for the detection of multiple simultaneous precipitation types (up to three).

2025 : METAR reports are operationally available NAS-wide via CSS-Wx and NWP, including its AWD viewer.

2027 : Enhanced automated winter weather detection available from the sensor system

2028 : Enhanced multiple precipitation type and intensity reporting incorporated into METAR reports.

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced winter weather precipitation phase observation products generated by ASOS.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (P): The expansion of winter precipitation sensor data will result in more precise hold over time calculations; allowing improved winter surface operations.

Safety (S): Improved availability, coverage and quality of the enhanced aviation weather information and improved constraints increase safety.

System Interactions

NWP (P): NWP provide weather products for distribution via CSS-Wx to ATM decision-makers and Aviation Weather Display (AWD).

ASOS (S): Enhanced automated winter weather information will be provided by improvements to surface-based sensor systems.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

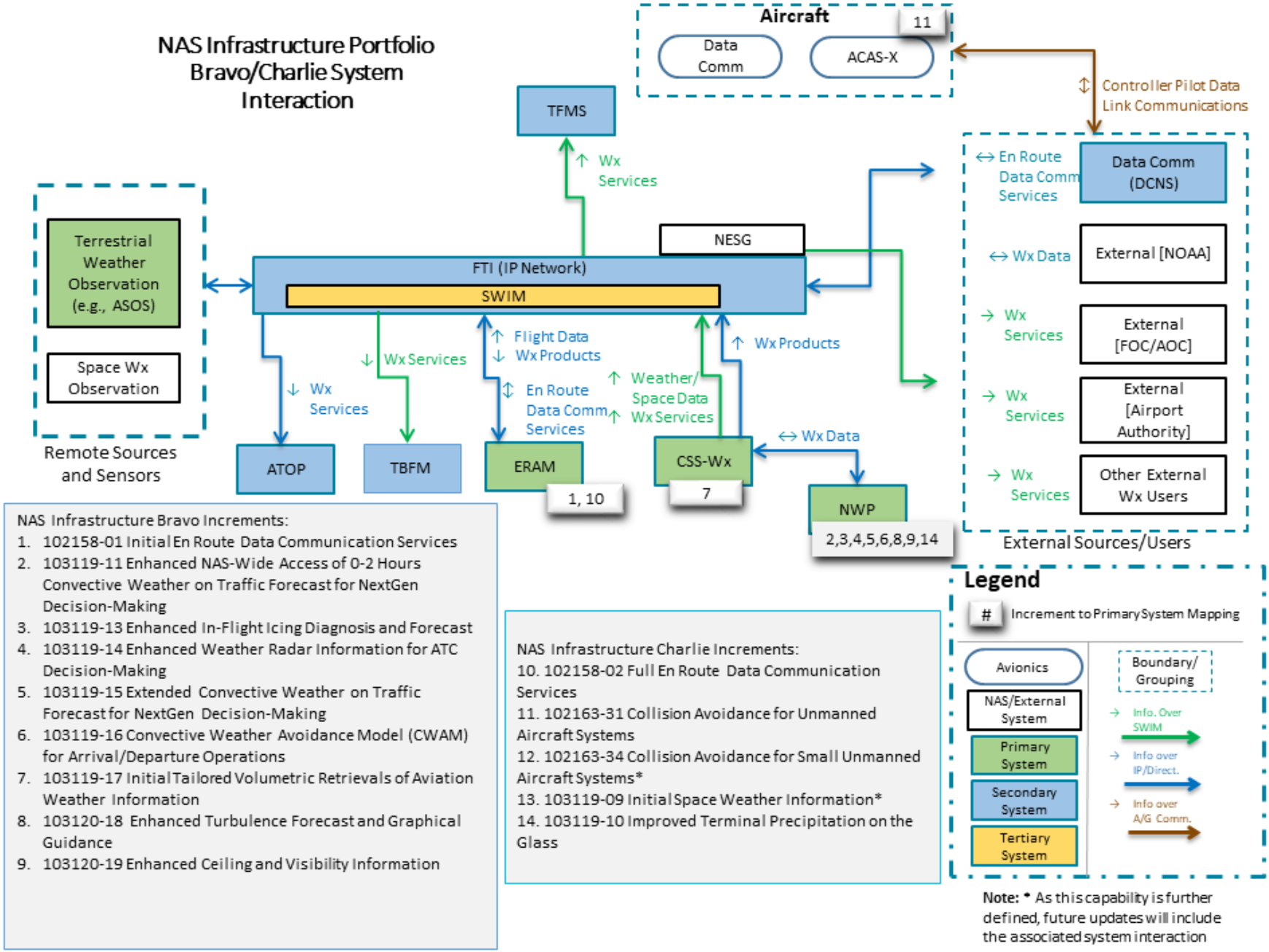
ASOS: Automated Surface Observing System

NAS Infrastructure

Systems Interactions

The NI Portfolio System Interaction (SI) diagram depicts the overall goal of the portfolio to provide transformational and sustainment capabilities critical to the success of NextGen, including technical refresh of infrastructure not directly rooted in Operational Improvements (OIs). The primary information generation and exchange capabilities shown in the SI diagram are Data Communications, Common Support Services Weather (CSS-Wx), and the NextGen Weather Processor (NWP). Data Comm enables the exchange of information between controllers and pilots via externally provisioned Digital Communications Network Services (DCNS), providing the required communication infrastructure enhancements to support the more advanced NextGen services not possible using En Route voice communications. CSS-Wx plays the key role in the ingestion, archiving and smart dissemination of weather information both within and outside of the FAA; as such, it relies on the numerous internal and external system interactions shown in the diagram. NWP generates aviation weather products that are customized for operations in the National Airspace System (NAS); its primary system interaction is with CSS-Wx, which it relies on for the delivery of raw weather information and distribution of its weather products. Data Comm and Weather Wide Area Network (WAN) services will be provisioned by the FAA Enterprise Network Services (FENS) program in the Segment Delta timeframe and beyond; prior to that timeframe, WAN Services will be provided by the FAA Telecommunications Infrastructure (FTI) program. Information management services will be provisioned by the System Wide Information Management (SWIM) program.

NAS Infrastructure



NAS Infrastructure Bravo Increments:

1. 102158-01 Initial En Route Data Communication Services
2. 103119-11 Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making
3. 103119-13 Enhanced In-Flight Icing Diagnosis and Forecast
4. 103119-14 Enhanced Weather Radar Information for ATC Decision-Making
5. 103119-15 Extended Convective Weather on Traffic Forecast for NextGen Decision-Making
6. 103119-16 Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations
7. 103119-17 Initial Tailored Volumetric Retrievals of Aviation Weather Information
8. 103120-18 Enhanced Turbulence Forecast and Graphical Guidance
9. 103120-19 Enhanced Ceiling and Visibility Information

NAS Infrastructure Charlie Increments:

10. 102158-02 Full En Route Data Communication Services
11. 102163-31 Collision Avoidance for Unmanned Aircraft Systems
12. 102163-34 Collision Avoidance for Small Unmanned Aircraft Systems*
13. 103119-09 Initial Space Weather Information*
14. 103119-10 Improved Terminal Precipitation on the Glass

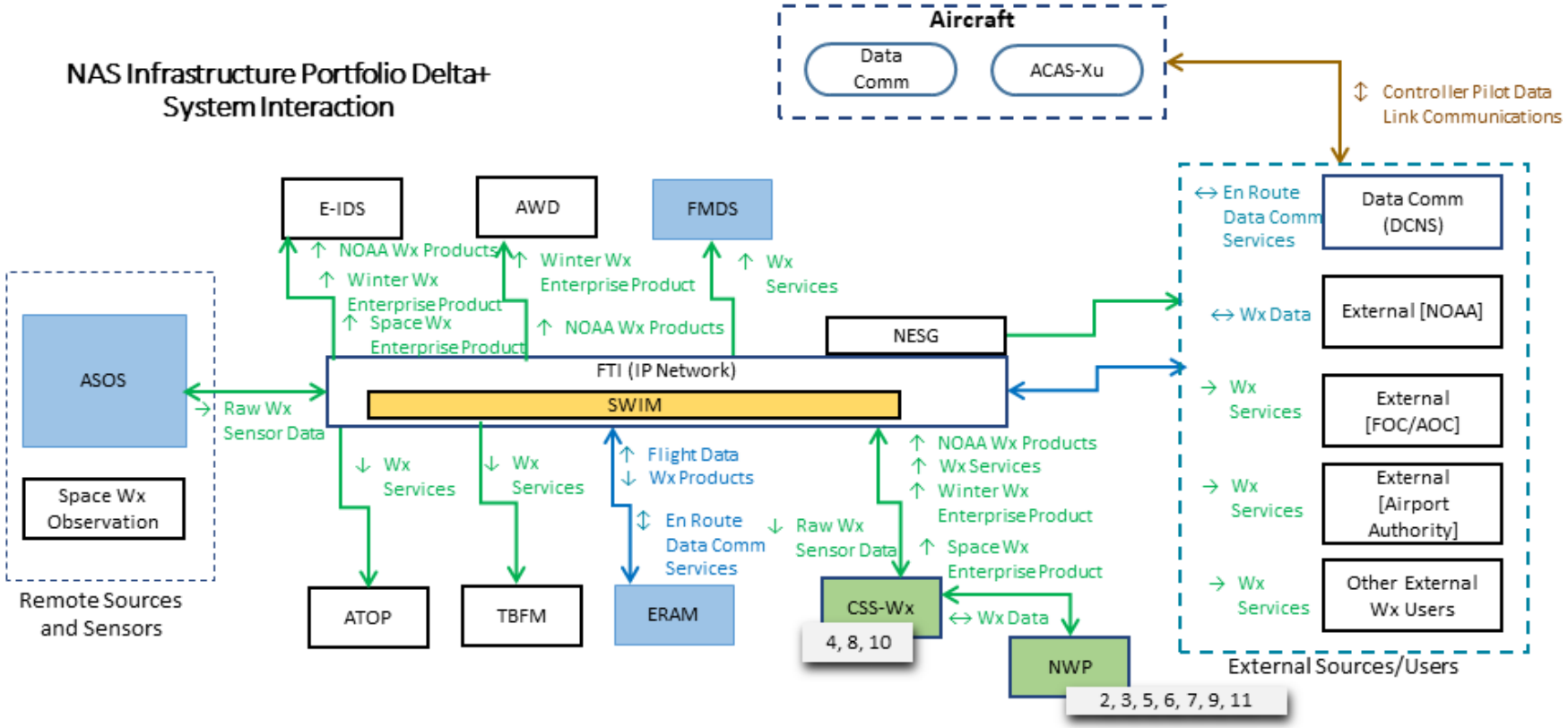
Note: * As this capability is further defined, future updates will include the associated system interaction

NAS Infrastructure

Systems Interactions

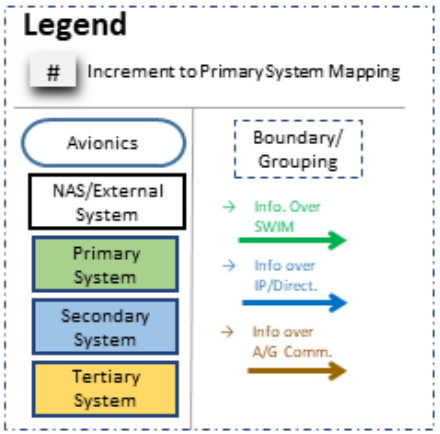
The NI Portfolio System Interaction (SI) diagram depicts the overall goal of the portfolio to provide transformational and sustainment capabilities critical to the success of NextGen, including technical refresh of infrastructure not directly rooted in Operational Improvements (OIs). The primary information generation and exchange capabilities shown in the SI diagram are Data Communications, Common Support Services Weather (CSS-Wx), and the NextGen Weather Processor (NWP). Data Comm enables the exchange of information between controllers and pilots via externally provisioned Digital Communications Network Services (DCNS), providing the required communication infrastructure enhancements to support the more advanced NextGen services not possible using En Route voice communications. CSS-Wx plays the key role in the ingestion, archiving and smart dissemination of weather information both within and outside of the FAA; as such, it relies on the numerous internal and external system interactions shown in the diagram. NWP generates aviation weather products that are customized for operations in the National Airspace System (NAS); its primary system interaction is with CSS-Wx, which it relies on for the delivery of raw weather information and distribution of its weather products. Data Comm and Weather Wide Area Network (WAN) services will be provisioned by the FAA Enterprise Network Services (FENS) program in the Segment Delta timeframe and beyond; prior to that timeframe, WAN Services will be provided by the FAA Telecommunications Infrastructure (FTI) program. Information management services will be provisioned by the System Wide Information Management (SWIM) program.

NAS Infrastructure



NAS Infrastructure Portfolio Delta+ Increments:
1. 102163-33 Collision Avoidance for Rotorcraft**
2. 103120-08 Enhanced Automated Winter Weather Information
3. 103123-01 Severe Weather Notification to Aircraft
4. 103123-02 Tailored Access to NextGen Common Weather Information Source – Enhanced
5. 103123-03: Enhanced Icing Information
6. 103123-04 Expanded Turbulence Information
7. 103123-05 Generation of Enhanced NextGen Weather Information – Extended
8. 103123-06 Expanded Ceiling and Visibility Information
9. 103123-07 Enhanced Weather Products from Improved Satellite Observation Data
10. 103123-09 Space Weather Information
11. 103123-21 Enhanced Convective Weather Using Satellite-Based Observation in Offshore Oceanic Airspace

** System Dependencies are TBD



NAS Infrastructure

Increment	ACAS-X	CSS-Wx	DCNS	Data Com Avionics	ERAM	FTI	NWP	STARS
C [102158-02] Full En Route Data Communication Services			S	A	P	S		
C [102163-31] Collision Avoidance for Unmanned Aircraft Systems	A							
C [102163-34] Collision Avoidance for Small Unmanned Aircraft Systems								
C [103119-09] Initial Space Weather Information								
C [103119-10] Improved Terminal Precipitation on the Glass		S					P	S

Operationally Available | Complete | In Service System | Planned System

P Primary Systems | **S** Secondary Systems | **T** Tertiary Systems | **A** Avionics Systems

D Delta

NAS Infrastructure

Increment	ACAS-X	ASOS	CSS-Wx	ERAM	FMDS	NWP	SWIM	TBFM	TFMS
D [102163-33] Collision Avoidance for Rotorcraft	A								
D [103120-08] Enhanced Automated Winter Weather Information		S				P			
D [103123-01] Severe Weather Notification to Aircraft			S	S		P	T		S
D [103123-02] Tailored Access to NextGen Common Weather Information - Enhanced			P		S	S	T	S	
D [103123-03] Enhanced Icing Information			S			P	T		
D [103123-04] Expanded Turbulence Information			S			P	T		S
D [103123-05] Generation of Enhanced NextGen Weather Information - Extended			S			P	T		S
D [103123-06] Expanded Ceiling and Visibility Information			P			S	T		
D [103123-07] Enhanced Weather Products from Improved Satellite Observation Data			S			P	T		
D [103123-09] Space Weather Information			S			P	T		

Operationally Available Complete In Service System Planned System

P Primary Systems **S** Secondary Systems **T** Tertiary Systems **A** Avionics Systems

D Delta

NAS Infrastructure

Increment	ACAS-X	ASOS	CSS-Wx	ERAM	FMDS	NWP	SWIM	TBFM	TFMS
D [103123-21] Enhanced Convective Weather Using Satellite-Based Observation in Offshore Oceanic Airspace			S			P	T		

Operationally Available | Complete | In Service System | Planned System

P Primary Systems | S Secondary Systems | T Tertiary Systems | A Avionics Systems

D Delta

NAS Infrastructure

Stakeholders

Specific roles and responsibilities for the implementation of all capabilities in this portfolio are outlined in the RASCI (Responsible, Accountable, Supporting, Consulted, Informed) matrix. Portfolio capabilities are listed on the left side of the table, organized by OI and increment. ANG-C6, AJM-33, and ANG-C7 are coordinating the development of detailed plans for transitioning the FAA's current weather infrastructure to new or modernized infrastructure that will enable initial integration of weather information into NAS automation for decision-making. ANG will lead cross-domain coordination with AJM and AJT to plan for the transition to and integration of the new weather capabilities into automation systems (e.g., TFMS, ATOP, and TFDM) baselines in the early Segment Charlie timeframe or sooner. AFS has a supporting role.

A	Accountable for the completion of NextGen capability. The highest level within the RASCI matrix, this office is charged by the FAA to deliver a particular capability. Typically, this designation is provided via an AcquisitionProgram Baseline. To foster a clear line of accountability, two different offices can never be Accountable for the same increment, andAccountability can never be delegated to another office.
R	Responsible for the successful completion of NextGen capability or a critical component of the capability. This office is responsible to theAccountable office. The Responsible office is responsible for initiating an actual change to the NAS such as automation changes, and is often also designated as the Accountable office for that increment. However, there are examples in the NSIP where one office is Accountable for an increment while another office (or offices) is actually making a change in the NAS on behalf of the Accountable office.
A/R	Accountable for the completion of NextGen capability as well as Responsible for its implementation.
S	Supports the Responsible office in the implementation of NextGen capability.Typically, this support is in the form of subject matter expertise, procedural guidance, or training activities.
C	Consulted for input during the implementation of NextGen capability. Provides input on a specific aspect in the development and implementation of a capability, such as safety analysis or approval. Input may or may not be used as determined by the Responsible and Accountable offices.
I	Informed about the progress of implementation.

NAS Infrastructure

RASCI Matrix	AJM						ANG			AJI			AJT	AOV	AFS	AJV	AIR
	3	333	331	23	25	34	C6	C7	B	1	2	3	2	001	001	0	001
• C [102158-02] Full En Route Data Communication Services (2022 - 2026)					S	A/R		C			S						S
• C [102163-31] Collision Avoidance for Unmanned Aircraft Systems (2023 - 2028)				A/R				C									
• C [102163-34] Collision Avoidance for Small Unmanned Aircraft Systems (2023 - 2028)																	
• C [103119-09] Initial Space Weather Information (2023 - 2026)																	
• C [103119-10] Improved Terminal Precipitation on the Glass (2021 - 2026)																	
• D [102163-33] Collision Avoidance for Rotorcraft (2026 - 2030)								A	R								
• D [103120-08] Enhanced Automated Winter Weather Information (2026 - 2030)		S	R				A/R	C									
• D [103123-01] Severe Weather Notification to Aircraft (2031 - 2035)		S					A/R	C									
• D [103123-02] Tailored Access to NextGen Common Weather Information - Enhanced (2031 - 2035)		S					A/R	C									
• D [103123-03] Enhanced Icing Information (2031 - 2035)		S					A/R	C									
• D [103123-04] Expanded Turbulence Information (2031 - 2035)		S					A/R	C									
• D [103123-05] Generation of Enhanced NextGen Weather Information - Extended (2031 - 2035)		S					A/R	C									

Operationally Available Complete External Commitment C Charlie D Delta

NAS Infrastructure

RASCI Matrix	AJM						ANG			AJI			AJT	AOV	AFS	AJV	AIR
	3	333	331	23	25	34	C6	C7	B	1	2	3	2	001	001	0	001
• D [103123-06] Expanded Ceiling and Visibility Information (2031 - 2035)		S					A/R	C									
• D [103123-07] Enhanced Weather Products from Improved Satellite Observation Data (2031 - 2035)								A	R								
• D [103123-09] Space Weather Information (2031 - 2035)		S					A/R	C									
• D [103123-21] Enhanced Convective Weather Using Satellite-Based Observation in Offshore Oceanic Airspace (2031 - 2035)	S						A/R	C									

Appendix B

Bravo Increments

Portfolio Overview

The NAS Infrastructure (NI) Portfolio contains key transformational and infrastructure sustainment capabilities that are critical to the success of NextGen. They involve the transformation or improvement of infrastructure that supports multiple portfolios. This portfolio also includes technical refresh of infrastructure that is not directly rooted in Operational Improvements (OIs).

The NI portfolio contains capabilities that fall into the following infrastructure categories:

- Communications
- Information Management
- Weather
- Facilities

The NI portfolio also contains transormational capabilities in the following area:
- Aircraft Collision Avoidance

The NI portfolio capabilities in these areas benefit the following KPAs:

- Capacity
- Flexibility
- Efficiency
- Environment
- Predictability
- Safety

The Communications capability is focused on the implementation of a Data Communications (Data Comm) capability for the National Airspace System (NAS). Data Comm enables the exchange of information between controllers and pilots via a digital data link, providing the infrastructure required for NextGen services. Data Comm will initially focus on the delivery of a controller-pilot data link communications (CPDLC) departure clearances (DCL) to equipped aircraft on the surface and then will expand to deliver CPDLC messages to equipped aircraft in en route airspace. Data Comm will provide the required communication infrastructure enhancements to support the more advanced NextGen services not possible using voice communications, such as 4D Trajectories and Advanced Flight Interval Management.

Aircraft collision avoidance capabilities help to support NextGen goals for new entrants. Facilities infrastructure provides integrated arrival and departure airspace management transformational capabilities. These capabilities will serve to sustain and improve key automation infrastructure as well as enhance information exchange between decision support tools and external stakeholders.

The Weather capabilities seek to improve decision-making among controllers and users through better sharing of weather information. They also will reduce the impact of weather on NAS operations through translation of meteorology into immediately usable constraints to the movement of aircraft. These capabilities will serve to deliver a common weather information base or picture among Air Navigation Service Providers (ANSPs) and NAS users.

Note: The dates and timelines included in the NAS Segment Implementation Plan (NSIP) are for planning purposes only. All capability schedules are tentative until their supporting programs are officially baselined.

NAS Infrastructure

Portfolio Content Summary Statistics

		Increment Status				
Segment	Total by Segment	Planned	Concept Exploration & Maturation	Development	Initial Operational Availability	Completed
*Bravo (2016 - 2020)	9	0	0	6	1	2
TOTAL	9	0	0	6	1	2
Segment	**% by Segment**	**% by Segment/Increment Status**				
*Bravo (2016 - 2020)	100%	0 %	0 %	67 %	11 %	22 %
TOTAL	100%	0 %	0 %	67 %	11 %	22 %

NAS Infrastructure

Operational Improvements/Current Operations & Increments

Benefits

OI: [103119] Initial Integration of Weather Information into the NAS (2014 - 2026)

- B [103119-11] Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making **(2020 - 2025)**
- B [103119-13] Enhanced In-Flight Icing Diagnosis and Forecast **(2014 - 2025)**
- B [103119-14] Enhanced Weather Radar Information for ATC Decision-Making **(2020 - 2025)**
- B [103119-15] Extended Convective Weather on Traffic Forecast for NextGen Decision-Making **(2020 - 2025)**
- B [103119-16] Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations **(2018 - 2025)**
- B [103119-17] Initial Tailored Volumetric Retrievals of Aviation Weather Information **(2018 - 2025)**

OI: [102158] Automated Support for Initial Trajectory Negotiation (2019 - 2026)

- B [102158-01] Initial En Route Data Communication Services **(2019 - 2025)**

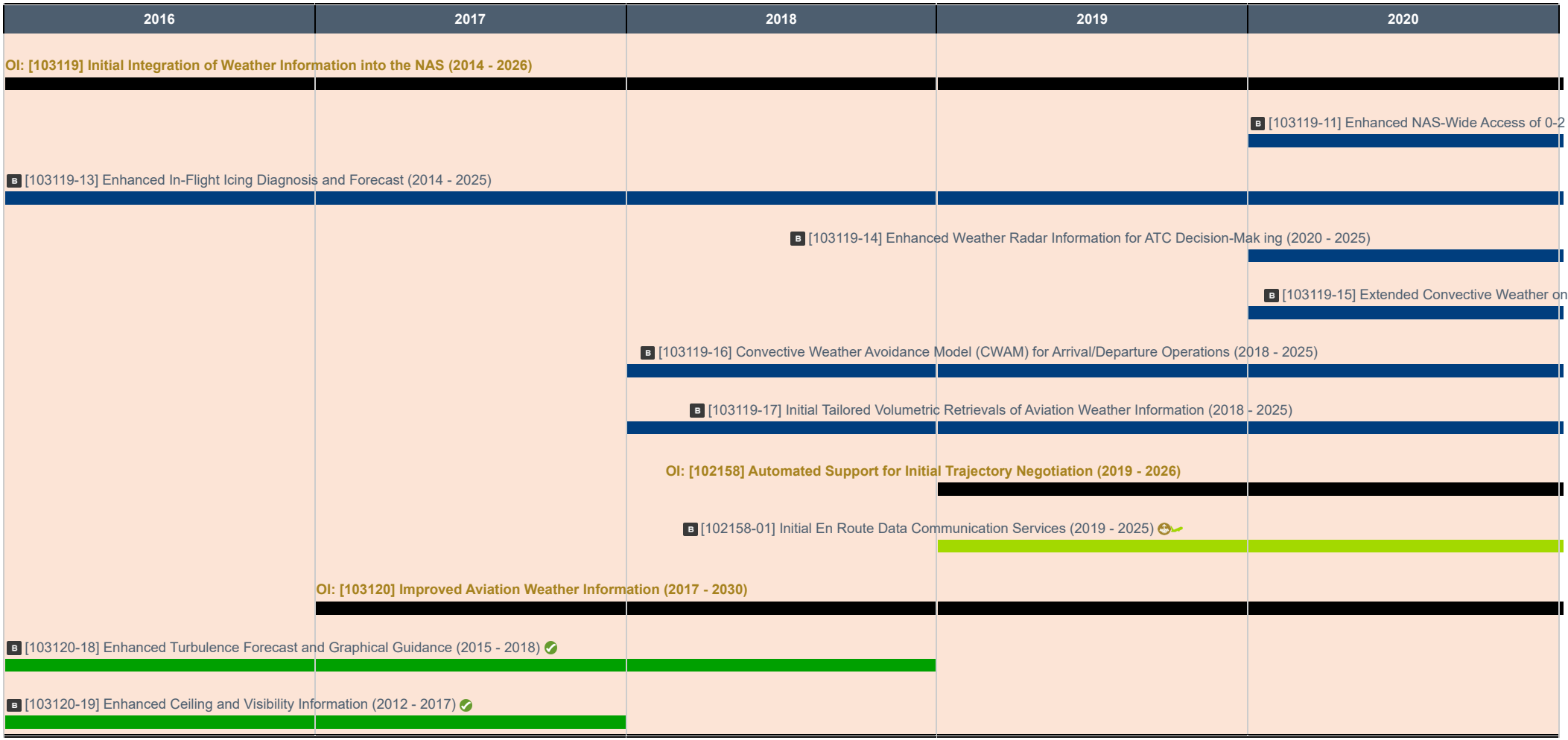
OI: [103120] Improved Aviation Weather Information (2017 - 2030)

- B [103120-18] Enhanced Turbulence Forecast and Graphical Guidance **(2015 - 2018)**
- B [103120-19] Enhanced Ceiling and Visibility Information **(2012 - 2017)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete

Access & Equity · Capacity · Flexibility · Efficiency · Environment · Predictability · Safety · B Bravo

NAS Infrastructure



Planned | Concept Exploration & Maturation | Development | Inital Operation Available | Complete

OI | CO | COE/CBTE | B Bravo | External Commitment

NAS Infrastructure

OI: [103119] Initial Integration of Weather Information into the NAS (2014 - 2026)

Advances in aviation weather information content and dissemination enhance cross-domain ATM decision-making and synchronize weather situational awareness for all users. They will be able to request and receive aviation weather information tailored to their specific volumetric areas (e.g., terminal, ARTCC or flight trajectory) and timeframes of interest to support assessment of flight-specific thresholds that indicate re-planning actions are needed and streamline the process by which the user - with or without decision support ATM tools - conducts system-wide risk management in planning for both individual flight trajectories and flows.

The enhanced aviation weather information enables the opportunity to initiate mitigations that require more lead time. These include flexible sectorization, tactical staffing adjustments, development of Traffic Management Initiatives (TMI), dynamic fleet reallocations by users and collaborative airspace constraint resolution by both ANSP and users.

The translation of the aviation convective weather information into objective and consistent constraint information enables standardized decision processes/outcomes, allowing full and continuous use of automated tools, and facilitating a more proactive approach during weather events. This supports the ability of ANSPs and users to make informed, collaborative ATM decisions earlier in the planning process, thus minimizing disruptions to daily fleet plans and to individual flights.

As the new information is incorporated into both flight and flow planning activities, improved availability, coverage and quality of the enhanced aviation weather information, along with objective and consistent constraint information, will allow for better flight planning and improved safety of flight, and enhanced efficiency.

OI Benefit

Efficiency (P): Incorporating improved weather information into flight planning allows more efficient routing around weather.

Safety (P): Improved availability, coverage and quality of the enhanced aviation weather information and improved constraints increase safety.

Predictability (S): Enhanced aviation weather information improves flow planning and provides users with increased schedule predictability when weather impacts operations.

NAS Infrastructure

Increments

Bravo

(2016 - 2020)

6

- B [103119-11] Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making (2020 - 2025) (Development)
- B [103119-13] Enhanced In-Flight Icing Diagnosis and Forecast (2014 - 2025) (Development)
- B [103119-14] Enhanced Weather Radar Information for ATC Decision-Making (2020 - 2025) (Development)
- B [103119-15] Extended Convective Weather on Traffic Forecast for NextGen Decision-Making (2020 - 2025) (Development)
- B [103119-16] Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations (2018 - 2025) (Development)
- B [103119-17] Initial Tailored Volumetric Retrievals of Aviation Weather Information (2018 - 2025) (Development)

NAS Infrastructure

Increments/Enabling Activities

B [103119-11] Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making (2020 - 2025)

Increment Overview

This improvement provides for NAS-wide access to the 0-2 hour predicted convective product for aviation to enhance cross-domain ATM decision-making and synchronize weather situational awareness for all users. This information augments the current Traffic Flow Management Convective Forecast (TCF) and can be integrated into systems used to monitor air traffic and viewed as an overlay. This implementation subsumes the current prototype Corridor Integrated Weather System (CIWS), which provides convective information that will be available through Common Support Services-Weather (CSS-Wx) and distributed via SWIM. The current system accessing CIWS information includes TFMS. This enables better decision-making capabilities for controllers, traffic managers and users of NAS airports and airspace being impacted by convective weather, through the integration of aviation weather information into ATM systems used to monitor flows of traffic (e.g., TFMS, TBFM). It also makes this information universally accessible to all subscribing ANSP and user systems, and does so via a single, common source of convective information.

Increment Status

Development

Success Criteria

2024 : Digital data operationally available at NWP key sites

2025 : Graphical display operationally available NAS-Wide on NWP AWD

Implementation Approach

The 0-2 Hour Convective Weather information will be created by the NextGen Weather Processor (NWP). CSS-Wx will be used to make raw radar data available to the NWP, and to disseminate the finished convective weather forecast to users. These NWP products will be generated and displayed at two centrally located facilities at Atlanta and Salt Lake City. In addition, the products will be displayed on the NWP Aviation Weather Displays (AWD) at 720 designated facilities and via a website. This capability will be deployed as part of NWP and CSS-Wx.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (P): Improved NAS-wide routing/resource convective weather impact management, Improved Airspace Flow Program Execution/Management, Enhanced Playbook Reroute Planning/Execution.

Safety (S): Reduced incidence of flight through safety-related (e. g., convection) weather phenomena via improved forecasts.

Predictabiliy (S): More accurate convective weather information improves flow planning and provides users with increased schedule predictability when weather impacts operations.

System Interactions

NWP (P): NWP will provide for a common processing platform for generating NextGen weather products that support the 0-2 hours convective weather traffic forecast. NWP also provides NWP Aviation Weather Display (AWD) to display the convective weather information.

CSS-Wx (S): CSS-Wx will distribute the enhanced weather radar information product for ATC decision-makers provided by NWP.

TFMS (S): TFMS will implement modifications to consume the 0-2 hours predicted convective weather product.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to distribute the 0-2 hours information product.

Primary Systems

- NWP: NextGen Weather Processor

Secondary Systems

- TFMS: Traffic Flow Management System
- CSS-Wx: Common Support Services - Weather

Tertiary Systems

- SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

B [103119-13] Enhanced In-Flight Icing Diagnosis and Forecast (2014 - 2025)

Increment Overview

This increment will improve efficiency through better flight and flow planning and improve flight safety, especially for general aviation (GA) operations, as improved availability, coverage and quality of icing diagnostics and forecast information is made available to users. Current in-flight icing information will be improved through the development of an in-flight Icing diagnosis and forecast product for Alaska and an initial ground and in flight Terminal Area Icing Weather diagnosis and forecast capability. In addition, improvements will be made in high altitude icing forecasts to decrease high altitude turbine engine ice crystal icing encounters which currently cause in-flight turbine engine surges, restarts, and damage. CONUS In-flight icing diagnosis and forecasts will be improved through additional input parameters such as liquid water content, drop size distribution, and temperature. In-flight icing information for the CONUS is currently available via the NWS Aviation Weather Center webpage. This increment will improve these products and make the information available to pilots and Flight Operations Centers (FOCs) as advisories to better plan safe and efficient flights.

Increment Status

Development

Success Criteria

2014 : Current Icing Product and Forecast Icing Product Hi-Resolution available on ADDS.

2019 : Icing Product Alaska transition to NWS.

2024 : Current Icing Product (CIP) and Forecast Icing Product (FIP) made available at CSS-Wx key sites (Atlanta and Salt Lake City).

2025 : Graphical display operationally available NAS-Wide on NWP AWD.

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced weather information products, which can be transitioned to operations via the NWS. The FAA will mature research and transition to NWS for implementation. This information will be available to NAS users and their systems via CSS-Wx. CSS-Wx will be deployed at two centrally located facilities at Atlanta and Salt Lake City. The NWP products will be generated at the two centrally located facilities and provided to CSS-Wx for the purposes of making available to AWDs NAS Wide. This capability will be deployed as part of NWP and CSS-Wx.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (S): Users can better plan routes that are both efficient and safe.

Safety (P): Avoidance of airspace with icing potential by aircraft susceptible to degraded safety performance due to icing.

System Interactions

NWP (P): NWP will provide the Aviation Weather Display (AWD) for displaying the icing information.

CSS-Wx (S): CSS-Wx will receive the icing data and products from NWS systems, and enable net-centric dissemination and distribute the icing information.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to distribute the enhanced in-flight icing diagnosis and forecast.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

CSS-Wx: Common Support Services - Weather

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

B [103119-14] Enhanced Weather Radar Information for ATC Decision-Making (2020 - 2025)

Increment Overview

This increment will enable controllers to better anticipate and prepare for pilot requests for deviation around convective activity.In addition, it will enable controllers to provide better information to pilots flying toward convective constraints in aircraft not equipped with working airborne weather radar.Enhanced weather radar information will be integrated onto controller displays to support separation management and other control functions.Enhancements include improved refresh time to make the observation/information more actionable.In addition the implementation of this increment incorporates information from a wider range of sensors (e.g., Canadian radars, TDWR) to improve weather radar information. This implementation subsumes the current Weather and Radar Processor (WARP) NEXRAD radar mosaics to the en route automation and display system.The enhanced product will be broadly available to other NAS ANSPs and users, via the FAA's net-enabled NextGen information dissemination capability.This makes improved weather radar information available to controllers and other NAS ANSPs and systems.The improved product depicts storm location more accurately and allows additional sources of radar imagery to be included in the presented radar mosaics.

Increment Status

Development

Success Criteria

2024 : Digital data operationally available at NWP key sites

2025 : Graphical display operationally available NAS-Wide on NWP AWD

Implementation Approach

The Enhanced Weather Radar Information for ATC Decision-Making capability will be created by the NextGen Weather Processor (NWP). CSS-Wx will be used to make raw radar data available to the NWP, and to disseminate the enhanced weather radar information to users. This NWP product will be generated at two centrally located facilities at Atlanta and Salt Lake City.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (S): Improved weather radar information provides controllers with higher quality data to drive decision-making around weather constraints.

Safety (P): Controllers can better respond to pilot requests for dealing with hazardous weather.

System Interactions

NWP (P): NWP will provide the enhanced weather radar information product for ATC decision-makers.

CSS-Wx (S): CSS-Wx will distribute the enhanced weather radar information product for ATC decision-makers provided by NWP.

ERAM (S): ERAM will be the end system used to display the enhanced weather radar information product to ATC decision-makers in the en route domain.

MEARTS (S): MEARTS will be the end system used to display the enhanced weather radar information product to ATC decision-makers in the en route/terminal domains.

ATOP (S): ATOP will be the end system used to display the enhanced weather radar information product to ATC decision-makers in the oceanic domain.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to distribute the enhanced weather radar information product.

Primary Systems

- NWP: NextGen Weather Processor

Secondary Systems

- CSS-Wx: Common Support Services - Weather
- MEARTS: Microprocessor-En Route Automated Radar Tracking System
- ERAM: En Route Automation Modernization
- ATOP: Advanced Technologies and Oceanic Procedures

Tertiary Systems

- SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

B [103119-15] Extended Convective Weather on Traffic Forecast for NextGen Decision-Making (2020 - 2025)

Increment Overview

The ANSP and the airspace users can plan more effective mitigation of impact of convective weather through the delivery of an 8-hour forecast on traffic of convective weather. The ability to identify with higher accuracy the severity and actual coverage area of the convective weather provides the opportunity to initiate mitigations that require more lead time. These include flexible sectorization, tactical staffing adjustments, development and efficient ending of Traffic Management Initiates (TMI), dynamic fleet reallocations by users and collaborative airspace constraint resolution by both ANSP and users. This supports the ability of ANSPs and users to make informed, collaborative ATM decisions related to mitigating the expected impact of convective weather. These decisions will be made earlier in the planning process, thus minimizing disruptions to daily fleet plans, and to individual flights. These operational benefits are enabled through the universal availability of the aviation-based convective weather predictive products up to eight hours before the event. In addition, these long range products are foundational elements needed in the calculation of convective constraint information, which can then be integrated with ATM demand information, and used by weather-integrated decision support processes to arrive at effective solutions to convective weather interruptions.

In addition to enhancing decision-making capabilities of controllers, traffic managers and users of NAS airports and airspace being impacted by convective weather, the implementation of this increment also makes the associated 0-8 hour thunderstorm predictive products universally accessible to all subscribing ANSP and user systems, and does so via a single, common source.

Increment Status

Development

Success Criteria

2024 : Digital data operationally available at NWP key sites

2025 : Graphical display operationally available NAS-Wide on NWP AWD

Implementation Approach

The Extended Convective Weather on Traffic Forecast for NextGen Decision-Making capability will be created by the NextGen Weather Processor (NWP). CSS-Wx will be used to make raw radar data available to the NWP, and to disseminate the extended convective weather to users. The NWP products will be generated and displayed at two centrally located facilities at Atlanta and Salt Lake City. In

addition, the products will be displayed on the NWP Aviation Weather Displays (AWD) at 72 designated facilities and via a website. This capability will be deployed as part of NWP and CSS-Wx.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (P): Improved NAS-wide routing/resource convective weather impact management, Improved Airspace Flow Program Execution/Management, Enhanced Playbook Reroute Planning/Execution, Improved utilization of available airport capacity through better anticipation of terminal area convective weather impacts.

Safety (S): Reduced incidence of flight through safety-related (e.g., convection) weather phenomena via improved forecasts.

Predictability (S): More accurate convective weather information improves flow planning and provides users with increased schedule predictability when weather impacts operations.

System Interactions

NWP (P): NWP implements long-range convective weather on traffic forecast and distributes product via CSS-Wx for ATM decision-makers. NWP also provides NWP Aviation Weather Display (AWD) to display the extended convective weather information.

CSS-Wx (S): CSS-Wx will distribute the enhanced weather radar information product for ATC decision-makers provided by NWP.

TFMS (S): TFMS will implement modifications to consume the predicted convective weather product.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to distribute the enhanced weather radar information product.

Primary Systems

NWP: NextGen Weather Processor

Secondary Systems

CSS-Wx: Common Support Services - Weather

TFMS: Traffic Flow Management System

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

B [103119-16] Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations (2018 - 2025)

Increment Overview

This increment provides objective and consistent convective weather constraint information for arrival/departure operations, enabling standardized decision processes/outcomes, allowing full and continuous use of automated tools, and facilitating a more proactive approach during convective weather events.This information will describe the airspace around key airports that potentially will be impacted by convective weather and will be used by ANSPs and their decision support systems, to assess the actual impact on airport operations, flights, and flows.The objective, consistent information provided by this increment can be integrated into multiple decision support capabilities for route constraint forecast in combination with ATM demand.ANSPs and flight operators can utilize this information in both their individual planning, and as part of their collaborative mitigation strategy planning.The use of this information will minimize the subjectivity and inconsistencies associated with current human cognitive weather mitigation activities, reducing unplanned delays and unused capacity.

Increment Status

Development

Success Criteria

2024 : Digital data operationally available at NWP key sites

2025 : Operationally available NAS-wide via CSS-Wx and NWP, including its AWD viewer

Implementation Approach

The Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations will be created by the NextGen Weather Processor (NWP). CSS-Wx will be used to make raw data available to the NWP and to disseminate the finished weather products to users. The NWP products will be generated at two centrally located facilities at Atlanta and Salt Lake City.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (P): More consistent and precise interpretation of weather constraints allows users to more strategically plan for weather.

Predictability (S): Convective weather constraint information improves flow planning and provides users with increased schedule predictability when weather impacts operations.

System Interactions

NWP (P): NWP will generate weather avoidance fields (WAFs) and polygons (WAPs), as an initial translation product, to be distributed by CSS-Wx for ATM decision-makers.

CSS-Wx (S): CSS-Wx will distribute the aviation weather constraint information for arrival/departure operations provided by NWP. CSS-Wx will distribute this information for planned integration into TFMS. CSS-Wx will also provide this information to other ANSPs and users.

TFMS (S): TFMS will implement modifications to consume the aviation weather constraint information for arrival/departure operations.

SWIM (T): SWIM will provide the infrastructure that will enable CSS-Wx to distribute the aviation weather constraint information for arrival/departure operations.

Primary Systems

- NWP: NextGen Weather Processor

Secondary Systems

- CSS-Wx: Common Support Services - Weather
- TFMS: Traffic Flow Management System

Tertiary Systems

- SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

B [103119-17] Initial Tailored Volumetric Retrievals of Aviation Weather Information (2018 - 2025)

Increment Overview

This improvement will enable ANSPs and their decision-support systems to request and receive weather observation and forecast information tailored to their specific volumetric areas (e.g., en route or terminal domain) and timeframes of interest. For example, automation systems that require winds and temperatures aloft information will be able to receive weather data customized to their areas of interest and scope (e.g., terminal airspace descent profile winds for TMA).

By tailoring the weather information by specific weather phenomena, temporal bundles and, in some cases, specific geographical areas, the size of data elements delivered and ingested by both decision support systems and humans will be greatly reduced. The integration of weather information into automation is used to automate flow and clearance advisories to controllers. These improvements will enable human decision makers to arrive at a conclusion more quickly and facilitate the timely transmittal of weather advisories from controllers to pilots. In addition, the use of a tailored subscription-type system means that critical alerts will always be automatically delivered, and the decision maker will not miss important changes and updates.

Increment Status

Development

Success Criteria

2024 : Operationally available at CSS-Wx key sites (Atlanta and Salt Lake City)

2025 : Operationally available NAS-Wide via CSS-Wx

Implementation Approach

This capability will be implemented as part of CSS-Wx. CSS-Wx makes data available to the NWP, and disseminates NWP-generated products. This capability will allow the ability for user systems (e.g., ERAM via consumer service adaptor) to retrieve weather data in a volumetrically tailored manner. In addition, CSS-Wx provides NOAA weather information to ATM systems. CSS-Wx will be deployed at two centralized facilities at Atlanta and Salt Lake City.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (P): Enables more effective, targeted decisions related to weather mitigation, e.g., planning for weather adversely impacting a particular airport, performed by ANSP and other ATM decision makers. The ability to provide weather data in a 4-D gridded format ingestible for integration and display by DST systems (e.g., TBFM, TFMS) supports targeted extraction of operations-relevant aviation weather guidance (e.g., along 4-D flight plan paths, at key airport arrival / departure flows and waypoints) for more efficient and proactive assessment of worsening / improving conditions. Enables a significant reduction in the required telecommunications bandwidth and associated costs by tailoring weather information down to limited, pertinent geographic subsets, tightly bound temporal bundles, and specific weather events.

Safety (S): Enables weather to be conveyed to pilots that is targeted to their location and flight path.

System Interactions

CSS-Wx (P): CSS-Wx will implement the capability to enable consumers and their decision-support systems to request and receive weather observation and forecast information tailored to their specific volumetric areas (e.g., en route or terminal domain) and timeframes of interest.

ERAM (S): ERAM will retrieve weather data in a volumetrically tailored manner.

NWP (S): NWP provides weather products for distribution via CSS-Wx to ATM decision-makers.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to distribute weather observation and forecast information tailored to specific volumetric areas operations.

Primary Systems

- CSS-Wx: Common Support Services - Weather

Secondary Systems

- NWP: NextGen Weather Processor
- ERAM: En Route Automation Modernization

Tertiary Systems

- SWIM: System Wide Information Management

NAS Infrastructure

OI: [102158] Automated Support for Initial Trajectory Negotiation (2019 - 2026)

En Route sector capacity and throughput are increased through the ability to send route changes and instructions to the cockpit over data communications. Trajectory management is enhanced by automated assistance to negotiate conflict-free pilot trajectory change requests with properly equipped aircraft operators. The trajectory change would then be relayed to the pilot/aircraft operator over data link. The aircraft operator must acknowledge receipt and acceptance of the negotiated trajectory change. In addition, pilots will be able to downlink more complex route clearance requests that express aircraft operator intent and aircraft-specific constraints.

These improvements will also increase controller productivity through the ability to send precise control instructions and advisory messages to the cockpit. This will enable higher density of operations, which will increase capacity as well as decrease human errors in trajectory negotiation and data entry.

OI Benefit

Capacity (P):The ability to create dynamic and more complex reroute clearances over data comm reduces controller workload and leads to increased airspace capacity, especially when there are airspace constraints.

Efficiency (S): The ability to send revised clearances to the cockpit that do not have to be read over voice comm increases the ability to better accommodate user preferences.

Safety (S):Automated route changes sent via data comm reduces hear-back read-back errors and reduces controller workload associated with routine tasks.

Flexibility (S): The decrease in controller workload associated with a revised route clearance will increase the ability to accommodate user preferences.

Environment (S): Reduced taxi delays and more efficient reroutes will reduce fuel burn and emissions.

Increments

Bravo

(2016 - 2020)

1

B **[102158-01] Initial En Route Data Communication Services (2019 - 2025)** (Initial Operational Availability)

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety | B Bravo

NAS Infrastructure

Increments/Enabling Activities

B [102158-01] Initial En Route Data Communication Services (2019 - 2025)

Increment Overview

Altitude clearances with altimeter setting information and airborne reroute clearances via Data Comm will allow flight clearances to be delivered to aircraft. The use of Data Comm increases the productivity of controllers with the beneficial effects of increasing sector capacity and throughput. Transfer of communications and initial contact via Data Comm will allow the FAA to more efficiently manage aircraft entry into and exit from en route sectors. This capability will reduce system errors and pilot deviations due to missed or misunderstood communications via voice, thereby enhancing system safety. Automation tools will assist controllers with the generation of revised clearances and route messages.

This Increment allows for the usage of Data Comm for transfer of communications between ATC sectors, change of altitude clearances, reroutes and altimeter settings and limited functions for controller initiated routes including Direct-to-Fix and Crossing Restrictions.

Increment Status

Initial Operational Availability

Success Criteria

2020 : Operationally available at selected airspace and key sites (Indianapolis (ZID) and Kansas City (ZKC)) InitialOperational Capability (IOC)

2024 : Deployment and operational availability at all ARTCCs. This is a NAC/NIWG Commitment.

Implementation Approach

The strategy is to deploy services incrementally with implementation of basic services at airport towers initially, leveraging existing equipage, and delivering ground system infrastructure for future services (i.e., en route) with initial deployment. Segment 1 Phase 2 includes enhancements to en route services, and will be implemented beginning in FY 2019. The en route services will be delivered in two stages: Initial En Route Services and Full En Route Services.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Capacity (P): Improve recovery from service disruptions, mitigate propagated delay, and improve schedule reliability; improved controller efficiency leads to increased sector capacity.

Flexibility (S): Improve flexibility by enabling NextGen capabilities such as the delivery of airborne reroute clearances to aircraft via digital data communications.

Efficiency (S): Increase throughput/efficiency and reduce delays by reducing communication time for delivery of altitude clearances with altimeter setting information and airborne reroutes; it also improves controller and flight crew efficiency.

Environment (S):Reduced taxi delays and more efficient reroutes will reduce fuel burn and emissions.

Safety (S): Improve communication accuracy and safety with digital communication (i.e., reduced read/hear back errors, reduced loss of communications events).

System Interactions

ERAM (P): ERAM will require functional and interface modifications to support the initial set of En Route Data Communications services. ERAM will interface with the Data Comm Network Service (DCNS) via the NAS Enterprise Security Gateway (NESG) for the exchange of En Route Data Comm messages with participating aircraft.

FTI (S): FTI provides network transport and NESG services for ground communication between ERAM and DCNS. Additional services are provisions to support the Data Comm services.

DCNS (S): Provisioning for air to ground services through DCNS to allow Data Comm delivery to and from aircraft avionics.

Data Communications Avionics (A): Use a subset of FANS 1/A messages to provide ATC services to qualified flights

Primary Systems

- ERAM: En Route Automation Modernization

Secondary Systems

- FTI: FAA Telecommunications Infrastructure

DCNS: Data Communications Network Service

Avionics Systems

Data Com Avionics: Data Communication Avionics

NAS Infrastructure

OI: [103120] Improved Aviation Weather Information (2017 - 2030)

Improved availability, coverage, quality, and types of aviation weather information will allow for better flight planning and improved flight safety. Improved weather observations and forecasts are generated using inputs from current and additional sensors and extending product coverage to additional areas and altitudes. Weather data may be obtained or derived from non-traditional sensors and means. This information will be available to aviation users to increase situational awareness and provide for improved observation and forecast information to use for planning flights around hazardous weather or to take advantage of favorable weather conditions, which will improve flight efficiency and safety as well as reduce emissions.

OI Benefit

Safety (P): Enable flight planners and pilots to better avoid hazardous weather through improved observation and forecast information.

Efficiency (P): Enable flight planners and pilots to prepare flight plans with improved availability, coverage, quality and types of aviation weather information and forecasts so that more efficient and reliable routes around weather hazards can be planned and executed.

Increments

Bravo

(2016 - 2020)

2

B **[103120-18] Enhanced Turbulence Forecast and Graphical Guidance (2015 - 2018)** (Complete)

B **[103120-19] Enhanced Ceiling and Visibility Information (2012 - 2017)** (Complete)

NAS Infrastructure

Increments/Enabling Activities

B [103120-18] Enhanced Turbulence Forecast and Graphical Guidance (2015 - 2018)

Increment Overview

This increment provides enhanced turbulence information that will improve flight planning, thereby improving safety of flight.Efficiency will also increase as the new information is incorporated into both flight and flow planning activities.Turbulence information is enhanced by adding mountain-wave information, extending the scope of the product to the surface, and adding objective turbulence observation data (Eddy Dissipation Rate (EDR) data).Current turbulence information for the CONUS is available from 100 to FL450 via the NWS Internet-based Aviation Digital Data Service (ADDS).This increment will result in improvements to current turbulence forecasts products used by FOCs, pilots, and air traffic management.

Increment Status

Complete

Success Criteria

2015 : Graphic Turbulence Guidance Version 3.0 (GTG3) transition to NWS.

2018 : Updates of GTG transition to NWS

2019 : NWS makes GTG3 updates available to CSS-Wx

2024 : Operationally available at CSS-Wx key sites (Atlanta and Salt Lake City)

2025 : Graphical display operationally available NAS-Wide on NWP AWD

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced weather information products, which can be transitioned to operations via the NWS. The FAA will mature research and transition to NWS for implementation. This information will be available to NAS users and their systems via CSS-Wx and NWP AWD. CSS-Wx will be deployed at ARTCCs. This NWP product will be generated and displayed at two centrally located facilities at Atlanta and Salt Lake City. In addition, the product will be displayed on the NWP Aviation Weather Displays (AWD) at 70 designated facilities and via a website. This capability will be deployed as part of NWP and CSS-Wx.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Efficiency (S): Enable flight planners and pilots to prepare flight plans, in advance, that avoid airspace with expected turbulence.

Safety (P): Enable flight planners and pilots to better avoid airspace where turbulence is anticipated.

System Interactions

NWP (S): NWP Aviation Weather Display (AWD) will display Graphical Turbulence Guidance Version 3.0 (GTG3).

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to distribute the enhanced turbulence forecast and graphical guidance information.
NWS Aviation Weather Center

Supporting Organizations: NWS Aviation Weather Center and NOAA National Center for Environmental Prediction

Secondary Systems

NWP: NextGen Weather Processor

Tertiary Systems

SWIM: System Wide Information Management

NAS Infrastructure

Increments/Enabling Activities

B [103120-19] Enhanced Ceiling and Visibility Information (2012 - 2017)

Increment Overview

This increment enhances ceiling and visibility (C&V) information by extending the coverage to Alaska. Operational benefits are expected to result from improved availability, coverage and quality of the C&V analysis information. Better access to the superior information will allow for better flight planning and decision making, thereby improving safety of flight, especially for GA operations. This information will be available to pilots and FOCs for flight planning purposes to improve safety and efficiency. This product will be broadly available to NAS users via the National Weather Service (NWS) Aviation Weather Center webpage as well as the Alaska Aviation Weather Unit webpage.

Increment Status

Complete

Success Criteria

2012 : Ceiling and Visibility Analysis (CVA) CONUS available via aviationweather.gov.

2017 : Provide Alaska CVA capability to NWS for operational evaluation

2024 : Operationally available at CSS-Wx key sites (Atlanta and Salt Lake City)

2025 : Graphical display operationally available NAS-Wide on NWP AWD

2025 : Initial TBD space weather information from global and regional advisory centers made available to all users via TBD website

Implementation Approach

Implementation of NextGen weather capabilities will focus on research and development of enhanced weather information products, which can be transitioned to operations via the NWS. The FAA will mature research and transition to NWS for implementation. This information will be available to NAS users, via the NWS internet-based Aviation Weather Center and Alaska Aviation Weather Unit webpage. CSS-Wx will be deployed at ARTCCs. This NWP product will be generated and displayed at two centrally located facilities at Atlanta and Salt Lake City. In addition, the product will be displayed on the NWP Aviation Weather Displays (AWD) at 70 designated facilities and via a website.

Benefits

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety

Efficiency (P): Allows for more efficient use of low altitude en route airspace resources.

Safety (S): Better access to the superior information will allow for better flight planning, thereby improving safety of flight, especially for GA operations.

System Interactions

NWP (S): NWP provides NWP Aviation Weather Display (AWD) displaying ceiling and visibility.

SWIM (T): SWIM will provide messaging infrastructure that will enable CSS-Wx to distribute the enhanced ceiling and visibility analysis information.

Supporting Organizations: NWS Aviation Weather Center and NWS Alaska Aviation Weather Unit

Secondary Systems

NWP: NextGen Weather Processor

Tertiary Systems

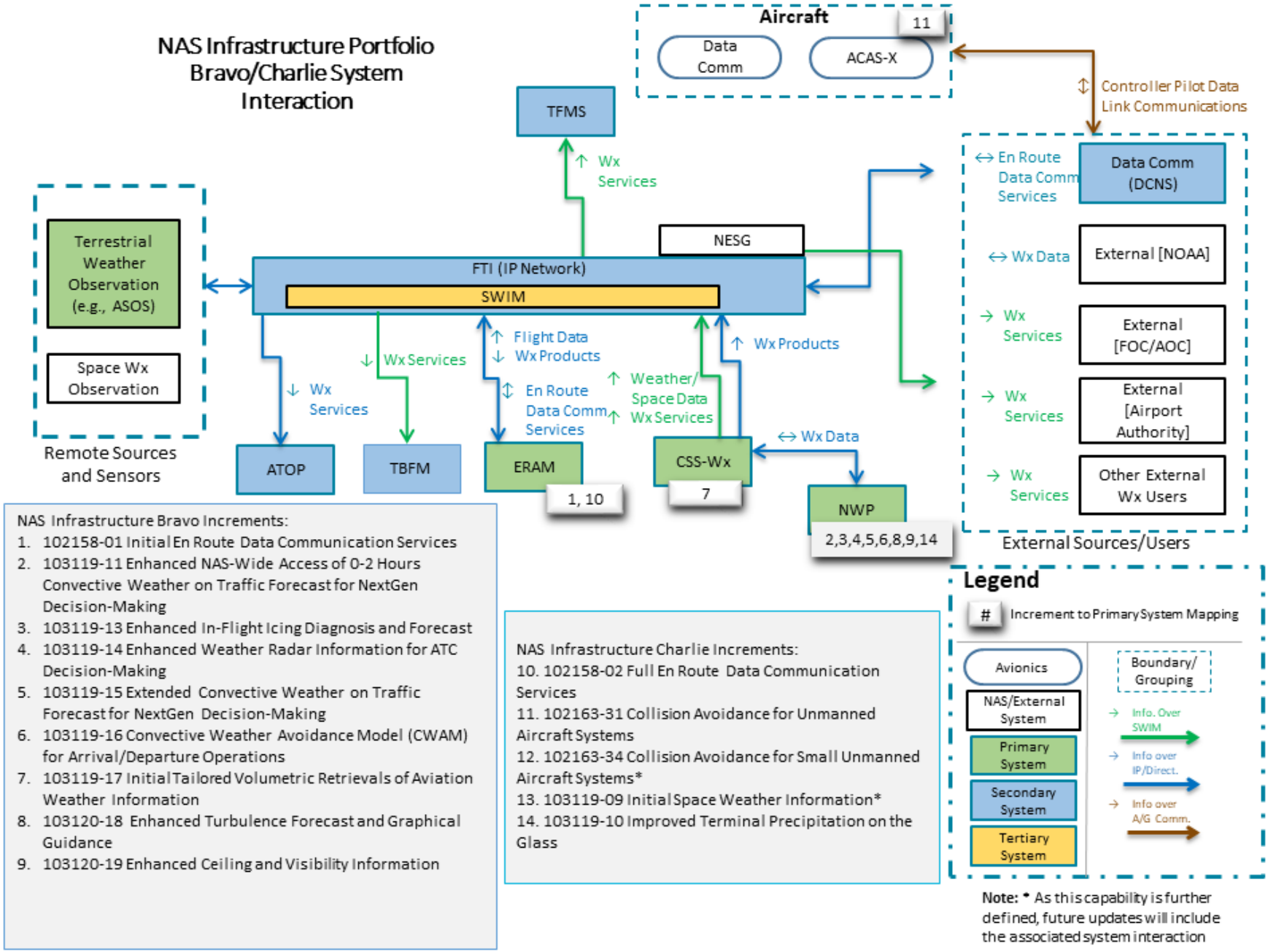
SWIM: System Wide Information Management

NAS Infrastructure

Systems Interactions

The NI Portfolio System Interaction (SI) diagram depicts the overall goal of the portfolio to provide transformational and sustainment capabilities critical to the success of NextGen, including technical refresh of infrastructure not directly rooted in Operational Improvements (OIs). The primary information generation and exchange capabilities shown in the SI diagram are Data Communications, Common Support Services Weather (CSS-Wx), and the NextGen Weather Processor (NWP). Data Comm enables the exchange of information between controllers and pilots via externally provisioned Digital Communications Network Services (DCNS), providing the required communication infrastructure enhancements to support the more advanced NextGen services not possible using En Route voice communications. CSS-Wx plays the key role in the ingestion, archiving and smart dissemination of weather information both within and outside of the FAA; as such, it relies on the numerous internal and external system interactions shown in the diagram. NWP generates aviation weather products that are customized for operations in the National Airspace System (NAS); its primary system interaction is with CSS-Wx, which it relies on for the delivery of raw weather information and distribution of its weather products. Data Comm and Weather Wide Area Network (WAN) services will be provisioned by the FAA Enterprise Network Services (FENS) program in the Segment Delta timeframe and beyond; prior to that timeframe, WAN Services will be provided by the FAA Telecommunications Infrastructure (FTI) program. Information management services will be provisioned by the System Wide Information Management (SWIM) program.

NAS Infrastructure



NAS Infrastructure Bravo Increments:

1. 102158-01 Initial En Route Data Communication Services
2. 103119-11 Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making
3. 103119-13 Enhanced In-Flight Icing Diagnosis and Forecast
4. 103119-14 Enhanced Weather Radar Information for ATC Decision-Making
5. 103119-15 Extended Convective Weather on Traffic Forecast for NextGen Decision-Making
6. 103119-16 Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations
7. 103119-17 Initial Tailored Volumetric Retrievals of Aviation Weather Information
8. 103120-18 Enhanced Turbulence Forecast and Graphical Guidance
9. 103120-19 Enhanced Ceiling and Visibility Information

NAS Infrastructure Charlie Increments:

10. 102158-02 Full En Route Data Communication Services
11. 102163-31 Collision Avoidance for Unmanned Aircraft Systems
12. 102163-34 Collision Avoidance for Small Unmanned Aircraft Systems*
13. 103119-09 Initial Space Weather Information*
14. 103119-10 Improved Terminal Precipitation on the Glass

Note: * As this capability is further defined, future updates will include the associated system interaction

NAS Infrastructure

Increment	ATOP	CSS-Wx	DCNS	Data Com Avionics	ERAM	FTI	MEARTS	NWP	SWIM	TFMS
B [102158-01] Initial En Route Data Communication Services			S	A	P	S				
B [103119-11] Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making		S						P	T	S
B [103119-13] Enhanced In-Flight Icing Diagnosis and Forecast		S						P	T	
B [103119-14] Enhanced Weather Radar Information for ATC Decision-Making	S	S			S		S	P	T	
B [103119-15] Extended Convective Weather on Traffic Forecast for NextGen Decision-Making		S						P	T	S
B [103119-16] Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations		S						P	T	S
B [103119-17] Initial Tailored Volumetric Retrievals of Aviation Weather Information		P			S			S	T	
B [103120-18] Enhanced Turbulence Forecast and Graphical Guidance								S	T	

Operationally Available Complete In Service System Planned System

P Primary Systems S Secondary Systems T Tertiary Systems A Avionics Systems

B Bravo

NAS Infrastructure

Increment	ATOP	CSS-Wx	DCNS	Data Com Avionics	ERAM	FTI	MEARTS	NWP	SWIM	TFMS
B [103120-19] Enhanced Ceiling and Visibility Information ✔								S	T	

✔ Operationally Available ✔ Complete In Service System Planned System

P Primary Systems **S** Secondary Systems **T** Tertiary Systems **A** Avionics Systems

B Bravo

NAS Infrastructure

Stakeholders

Specific roles and responsibilities for the implementation of all capabilities in this portfolio are outlined in the RASCI (Responsible, Accountable, Supporting, Consulted, Informed) matrix. Portfolio capabilities are listed on the left side of the table, organized by OI and increment. ANG-C6, AJM-33, and ANG-C7 are coordinating the development of detailed plans for transitioning the FAA's current weather infrastructure to new or modernized infrastructure that will enable initial integration of weather information into NAS automation for decision-making. ANG will lead cross-domain coordination with AJM and AJT to plan for the transition to and integration of the new weather capabilities into automation systems (e.g., TFMS, ATOP, and TFDM) baselines in the early Segment Charlie timeframe or sooner. AFS has a supporting role.

A	Accountable for the completion of NextGen capability. The highest level within the RASCI matrix, this office is charged by the FAA to deliver a particular capability. Typically, this designation is provided via an AcquisitionProgram Baseline. To foster a clear line of accountability, two different offices can never be Accountable for the same increment, andAccountability can never be delegated to another office.
R	Responsible for the successful completion of NextGen capability or a critical component of the capability. This office is responsible to theAccountable office. The Responsible office is responsible for initiating an actual change to the NAS such as automation changes, and is often also designated as the Accountable office for that increment. However, there are examples in the NSIP where one office is Accountable for an increment while another office (or offices) is actually making a change in the NAS on behalf of the Accountable office.
A/R	Accountable for the completion of NextGen capability as well as Responsible for its implementation.
S	Supports the Responsible office in the implementation of NextGen capability.Typically, this support is in the form of subject matter expertise, procedural guidance, or training activities.
C	Consulted for input during the implementation of NextGen capability. Provides input on a specific aspect in the development and implementation of a capability, such as safety analysis or approval. Input may or may not be used as determined by the Responsible and Accountable offices.
I	Informed about the progress of implementation.

NAS Infrastructure

RASCI Matrix	AJM						ANG			AJI			AJT	AOV	AFS	AJV	AIR
	3	333	331	23	25	34	C6	C7	B	1	2	3	2	001	001	0	001
B [102158-01] Initial En Route Data Communication Services (2019 - 2025)					S	A/R		C			S				S		S
B [103119-11] Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making (2020 - 2025)		A/R						C		S	S	S	S	C			
B [103119-13] Enhanced In-Flight Icing Diagnosis and Forecast (2014 - 2025)		A/R						C									
B [103119-14] Enhanced Weather Radar Information for ATC Decision-Making (2020 - 2025)		A/R						C		S	S	S					
B [103119-15] Extended Convective Weather on Traffic Forecast for NextGen Decision-Making (2020 - 2025)		A/R						C		S	S	S					
B [103119-16] Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations (2018 - 2025)		A/R						C							S	R	
B [103119-17] Initial Tailored Volumetric Retrievals of Aviation Weather Information (2018 - 2025)		A/R						C		S	S	S					
B [103120-18] Enhanced Turbulence Forecast and Graphical Guidance (2015 - 2018)		A/R						C									
B [103120-19] Enhanced Ceiling and Visibility Information (2012 - 2017)		A/R						C									

Operationally Available Complete External Commitment B Bravo