Federal Aviation Administration

NextGen Implementation Plan 2018–19

NextGEN

INTRODUCTION

The Federal Aviation Administration (FAA) is modernizing the National Airspace System (NAS), the nation's air traffic infrastructure, transforming the way aircraft fly. The United States calls this modernization the Next Generation Air Transportation System (NextGen).

NextGen is a portfolio of initiatives, including programs delivering new technology, airspace redesign to provide advanced air traffic procedures, and efforts to advance concept development. Modernization depends on the advancement of many initiatives sequenced in priority order to meet both short- and long-term modernization goals.

Through applied research, technology innovation, and aviation community collaboration, the United States' modernization of the air transportation system is making steady progress. NextGen is delivering new capabilities that are improving system efficiency, reducing fuel usage, and creating better predictability in the system. This requires full-cycle development of new operational concepts and technologies, including new tools, performance-based procedures, and the most advanced aircraft capabilities. The NextGen transformation is setting standards around the world and serving as an example of the FAA's global leadership in aviation.

A core element of the transformation included replacing legacy systems with new digital technology. The FAA succeeded in replacing the planned systems without interrupting operations — tens of thousands of flights, millions of passengers, and tons of cargo moving daily — while overcoming challenges. The communications, navigation, and surveillance infrastructure is in place. We have begun the next big leap in aviation history: the transition from distance-based separation of aircraft to time-based separation of aircraft. Adding the element of time to aircraft movement is a move to what is called Trajectory Based Operations (TBO).

What's in the 2018–19 NextGen Implementation Plan (NGIP)

The NGIP provides an overview of the programs and portfolios that make up NextGen and is one of the ways the FAA shares NAS modernization progress and next steps with the American people. The plan delivers the latest information on the programs and the portfolios that are reshaping the NAS.

NAS modernization efforts since 2009 have focused on building a new infrastructure and adding initial operational capability to improve NAS service. Current initiatives build on that momentum by adding advanced capabilities. Examples include improved airport surface operations and tools to improve arrival and departure management at airports, which are critical for delivering TBO.

The NGIP programs section reports on NextGen infrastructure programs that have matured and

met the business case to support investment and are currently in final phases of development or deployment to deliver new operational capabilities. The NGIP portfolios section reports on ongoing efforts to build upon the NextGen infrastructure to deliver air traffic enhancements necessary to complete the operational transformation of the NAS.

Programs

In this document we report on the critical key infrastructure programs. Additional NextGen programs are reported in the portfolios section. Critical infrastructure programs include:

- Surveillance: Automatic Dependent Surveillance–Broadcast (ADS–B)
- Communication: Data Communications (Data Comm)
- Automation: En Route Automation Modernization (ERAM) and Terminal Automation Modernization and Replacement (TAMR)
- Information: System Wide Information Management (SWIM)

For each program, we define the target users, equipage requirements, operational capabilities, service capabilities, implementation status, and benefits. Each program delivers benefits while enabling additional future capabilities. We monitor and refine our programs to ensure they meet our stringent safety standards and deliver their intended benefits. This plan contains the most current information available.

The agency is making modifications to the NAS Voice System (NVS) program, which is designed to replace older, less-flexible analog voice communications systems with secure Voice over Internet Protocol (VoIP) technology. Technical challenges prevented the contractor from developing the system within required costs and schedule. The agency is now pursuing technical and acquisition approaches to achieve the functionality and benefits offered by NVS while continuing to ensure reliability, safety, and security in the NAS.

Portfolios

The FAA uses a portfolio approach to assess, develop, and implement new capabilities and to understand the linkage to overarching supporting activities, including safety, environment and energy, and infrastructure. This document includes an overview of the 11 portfolios in the current framework with a list of target users and NAS components, anticipated benefits, funded operational improvements (OI), and implementation timelines:

- Improved Surface Operations
- Improved Approaches and Low-Visibility Operations
- Improved Multiple Runway Operations
- Performance Based Navigation
- Time Based Flow Management (TBFM)
- Collaborative Air Traffic Management (CATM)
- Separation Management
- On-Demand NAS Information
- Environment and Energy
- System Safety Management
- NAS Infrastructure

The timelines are divided into 5-year segments: Alpha (2010–2015), Bravo (2016–2020), Charlie (2021–2025), and Delta (2026–2030). Each portfolio includes several OIs, strategic operational changes to the NAS, intended to enhance FAA service delivery through delivering benefits (e.g., increased capacity) externally to NAS users. They are advanced technologies that aim to streamline equipment, consolidate common operational tasks, and facilitate human management of air traffic operations.

For example, the capabilities that support the integration of arrival, surface, and departure concepts, which are key components of the path to TBO, are being delivered in three key portfolios supported by three key programs: the TBFM portfolio and the TBFM program; the Improved

Surface Operations portfolio and the Terminal Flight Data Manager (TFDM) program; and the Collaborative Air Traffic Management portfolio and the Traffic Flow Management System (TFMS) program:

TBFM Portfolio and the TBFM Program

- The TBFM portfolio researches, develops, and delivers new decision support systems and air traffic controller tools to enable time-based man agement of flights.
- This portfolio developed and deployed the TBFM system, which is active in the NAS today, providing time based management of en route air traffic.
- Enhancements are under development to bring time based management to the terminal air traffic domain, and provide additional tools for improved use and flexibility of time based management.

Improved Surface Operations Portfolio and the TFDM Program

- The Improved Surface Operations portfolio provides better surface surveillance and develops and deploys enhanced decision-support systems for airport tower management of surface traffic.
- Within this portfolio, the TFDM system is in development. TFDM will replace the paper flight strips used in towers today with an automated electronic flight strip system. It also provides a set of decision-support capabilities to facilitate management of airport surface resources and to improve surface traffic management.
- Additional surface enhancements are in development, which will leverage increased data sharing between the FAA, operators, and airports to improve management of surface movement and departures.

CATM Portfolio and the TFMS program

- The CATM Portfolio focuses on the development and deployment of capabilities to improve traffic flow management, with an emphasis on strategic planning and collaboration to accommodate user preferences.
- The Traffic Flow Management System (TFMS) is active in the NAS today, providing air traffic managers with the tools they need to manage flows of aircraft in the NAS.
- Enhancements are in development, including tools to optimize aircraft re-routes around constraints in the NAS, better inform decision-making on departure routing operations, and improve accommodation of operator preferences related to traffic flow management decisions.

Why It Matters

NextGen's orchestrated rollout of modernized communication, navigation, surveillance, and information-sharing systems are supporting the transition to time-based air traffic management (ATM), which we call TBO.

TBO is an ATM method for strategically planning, managing, and optimizing flights throughout the operation using time-based management, information exchange between air and ground systems, and an aircraft's ability to fly precise paths in space and time. Flights that are more efficient will yield more predictable schedules and more environmentally friendly operations.

In the next several years, the FAA and the aviation community will implement initial TBO (iTBO) in the Northeast Corridor (NEC), the busy airspace between Boston and Washington, D.C., as well as in Atlanta and Denver. In the NEC, iTBO implementation includes arrival and departure metering for aircraft operating in Philadelphia and the greater New York City airports. Our goal is to use iTBO to manage flights serving major airports in the NEC by 2025.

What's Next

Looking ahead, we must deploy additional NextGen infrastructure elements to ensure that modernized systems are used. The NAS will remain current by

adding advanced capabilities as they become available.

The FAA recognizes community involvement as an essential part of our modernization efforts. Community involvement helps us make informed decisions when we initiate changes to airspace to accommodate new technologies and procedures that improve the safe operation of the NAS.

As we adopt advanced operational procedures and integrate new technologies into the NAS, we must also identify, assess, and remedy cybersecurity risks. We accomplish this through specific risk-management programs consisting of security architecture and engineering, research and development, risk modeling, test and assessment, and effective collaboration with interagency, international, and aviation community partners.

The FAA cannot modernize the NAS alone; it depends on partnerships with the aviation community to accelerate modernization by sharing skills and resources, advancing mutual interests, and achieving common purpose.

Airlines and individual operators are equipping their aircraft with the avionics necessary to take advantage of NextGen capabilities and procedures, resulting in continuous growth of NextGen benefits to operators, the NAS, and society. Optimal aircraft equipage levels are essential for successful NAS modernization as we are moving toward TBO. To that end, the government has mandated that operators in most airspace serviced by air traffic control are required to equip their aircraft with ADS-B Out by January 1, 2020 (Federal Regulations 14 CFR 91.225 and 14 CFR 91.227).

The government cannot implement new technology such as Data Comm or procedures such as PBN alone. When operators adopt base levels of NextGen equipage, this accelerates the delivery of NextGen benefits by reducing mixed equipage operations.

The FAA will continue to collaborate with the aviation community through the NextGen Advisory Committee (NAC), which provides independent advice and recommendations to the FAA and responds to specific taskings, received directly from the agency, that affect the future of the air traffic management system and the integration of new technologies. In addition, the NAC recommends consensus-driven standards for FAA consideration relating to ATM system modernization, which the FAA may adopt.

As we continue to reach NextGen milestones, the Joint Analysis Team (JAT), composed of FAA and aviation community experts, will examine performance and benefits attributed to NextGen. The JAT evaluates data, metrics, methods, and tools typically used in benefits analysis, so that the FAA and the aviation community reach a common understanding of the advantages of NextGen operations and the value of its benefits.

NextGen accomplishes its goals by focusing on three key FAA principles:

- Delivering improved services while maintaining the highest levels of safety.
- Ensuring seamless integration.
- Meeting new challenges.

We are firmly on the path to TBO, with advancements in communications, navigation, surveillance, automation, weather, and integrated information sharing in the NAS. The NGIP explains how NextGen has evolved from concept to functioning initiative.

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AUTOMATIC DEPENDENT SURVEILLANCE–BROADCAST

Automatic Dependent Surveillance–Broadcast (ADS-B) is a transformational NextGen technology that tracks aircraft more frequently and consistently than traditional radar. ADS-B Out transmits an aircraft's position, ground speed, and other surveillance data to air traffic controllers and to other aircraft equipped to receive the information. A constellation of GPS satellites and an infrastructure across the United States collect and distribute the data. The FAA requires aircraft operating in most controlled U.S. airspace to be equipped with ADS-B Out by January 1, 2020.

ADS-B In, which is not mandated, provides operators of properly equipped aircraft with Traffic Information Service–Broadcast (TIS-B) delivered directly to the cockpit. Aircraft equipped with a Universal Access Transceiver (UAT) will also receive weather and aeronautical information such as Notices to Airmen (NOTAM) through Flight Information Services–Broadcast (FIS-B).

TARGET USERS

- Aircraft owners and pilots, particularly those who fly 10,000 feet above mean sea level, in Class B or C airspace, the airspace surrounding most major airports or low-altitude airspace along the Gulf of Mexico.
- Air traffic controllers.
- Airport surface vehicle operators.

EQUIPAGE REQUIREMENTS

Avionics equipment requirements for operators and installers are detailed in Technical Standard Order (TSO)-C166b, TSO-C154c, and TSO-C195b, and Advisory Circular (AC) 20-165B, AC 90 114A Change 1, and AC 20-172B. To meet the ADS-B Out mandate, aircraft require a position source such as GPS and a compatible transmitter. For ADS-B In, a receiver and display device are needed.

- Aircraft operating internationally or above 18,000 feet (flight level 180) require an ADS-B Out system with Mode S transponder operating on 1090 megahertz with Extended Squitter (1090ES). A 1090 MHz receiver and display are needed to process TIS-B information. FIS-B is not available with 1090 MHz equipment.
- Aircraft operating within U.S. airspace below FL180 can use a 1090ES or a UAT operating on 978 MHz. A UAT is capable of receiving TIS-B and FIS-B. A receiver and display are needed to receive and view TIS-B and FIS-B information.

OPERATIONAL CAPABILITIES

As stated before, ADS-B Out avionics transmit flight data to nearby aircraft equipped for ADS-B In and to ground receivers. Additional avionics are required for ADS-B In to receive and display ADS-B data from other aircraft and TIS-B/FIS-B data from ADS-B infrastructure.

SERVICE CAPABILITIES

ADS-B In-equipped aircraft can access additional broadcast services:

- FIS-B: On UAT, broadcasts graphical weather to the cockpit, as well as text-based advisories including NOTAMs, significant weather activity and pilot reports. The FAA added more products to FIS-B in 2018, including graphical Airmen's Meteorological Information (AIRMET) reports, lightning strikes, icing, cloud tops, turbulence, and Center Weather Advisories.
- TIS-B: On UAT and 1090ES, provides altitude, position and speed of aircraft equipped with transponders flying in radar coverage and within a 15-nautical-mile (nm) radius — and within 3,500 feet above or below the aircraft equipped with ADS-B Out and In.
- Automatic Dependent Surveillance–Rebroadcast (ADS-R): Information can be broadcast on 1090 MHz and UAT. ADS-R rebroadcasts ground station data from one frequency to the other. It provides pilots equipped with ADS-B Out the ability to see each other's aircraft on their traffic displays when they are within 15 nm and 5,000 feet above or below each other, and within range of ADS-B infrastructure.

IMPLEMENTATION

ADS-B services are operational nationwide. ADS-B is integrated into automation platforms at all 24 en route air traffic control facilities — 20 En Route Automation Modernization (ERAM) systems and four Micro-En Route Automated Radar Tracking Systems (MEARTS) — that control high-altitude traffic.

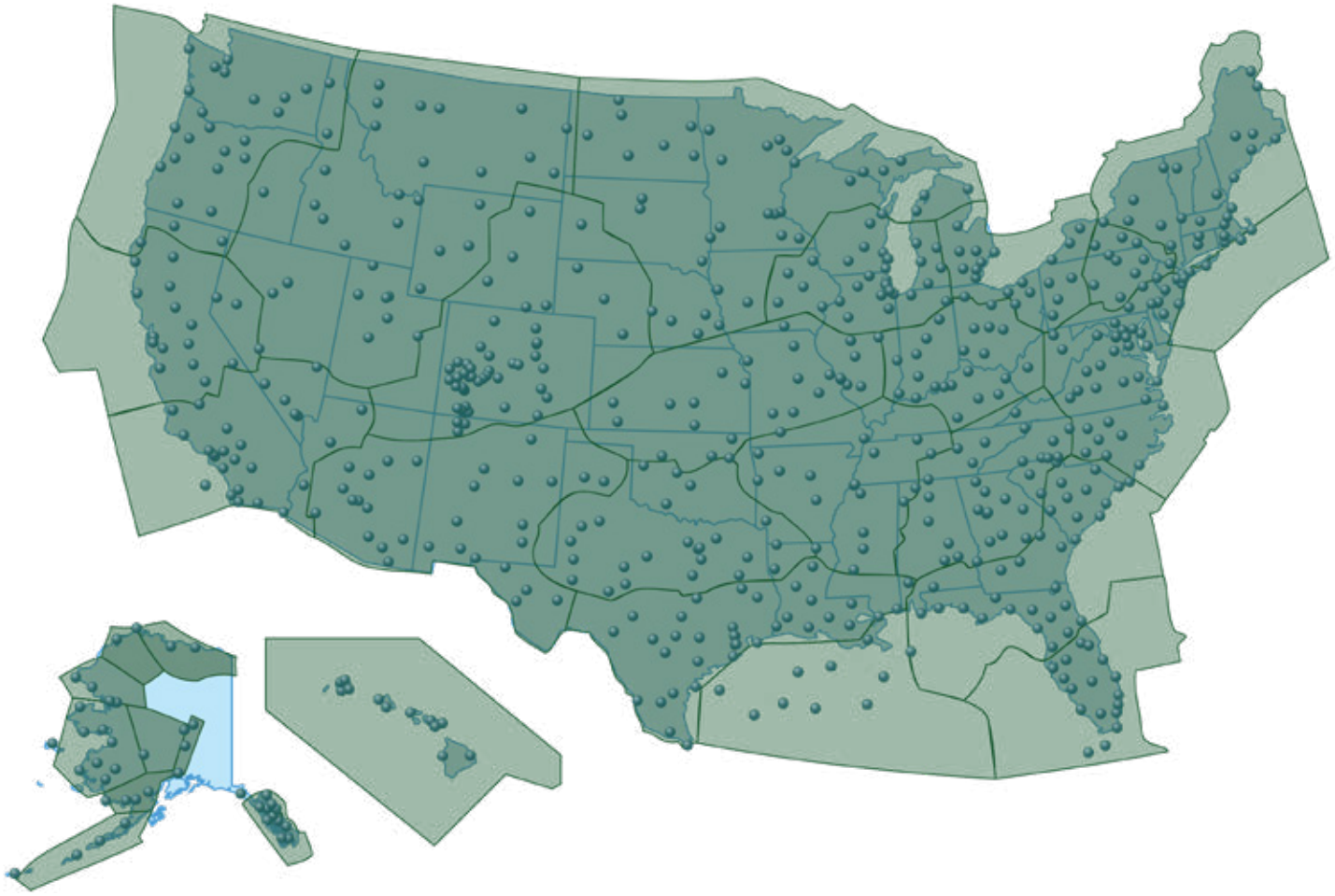
ADS-B is in automation platforms at more than 145 terminal radar approach control (TRACON) facilities, which provide radar and non-radar services at major airports. This includes the nation's 30 busiest terminal areas. ADS-B will be integrated into all other terminal areas as their automation platforms are updated. Prior to January 1, 2020, the FAA plans to operate ADS-B at all TRACON facilities. ADS-B traffic and weather broadcasts are available nationwide.

As of June 30, 2019, more than 83,000 U.S. aircraft were equipped with rule-compliant ADS-B Out avionics.

BENEFITS

- The FAA has successfully tested ADS-B as a sole source of surveillance; controllers can track ADS-B-equipped aircraft during radar outages in controlled airspace.
- ADS-B is used to control traffic in areas where radar surveillance is limited like the Gulf of Mexico. Flights that use a special ADS-B route over the Gulf due to convective weather or adverse headwinds save an average of 7–11 minutes of flight time and burn less fuel. This saves money and cuts aircraft exhaust emissions compared to flights using traditional area navigation routes over land. ADS-B-equipped helicopters servicing oil platforms in the Gulf may fly in visual and instrument meteorological conditions under air traffic control. ADS-B allows direct routing clearances for properly equipped helicopters. This has shortened trips by about 14 nm and saved about 14 gallons of fuel per instrument flight rules (IFR) flight plan. The FAA estimates flight savings of about 750,000 nm occurred from December 2009 to June 2017.
- One of ADS-B In's capabilities, Cockpit Display of Traffic Information–Assisted Visual Separation, enhances pilots' ability to track aircraft flying in front of them during a visual approach. This reduces time and distance flown during arrivals.
- Standards are in place for ADS-B Traffic Awareness System (ATAS), an ADS-B In capability. ATAS provides pilots with audible alerts to warn of other aircraft that might be collision risks.
- General aviation pilots with a UAT receiver get current weather and airspace-status information from the FAA's free FIS-B service.
- Airport Surface Detection Equipment–Model X (ASDE-X), a ground-surveillance system that alerts air traffic controllers to potential runway and taxiway conflicts using ADS-B and other data sources, reduces runway incursions and other ground-operation accidents at 35 U.S. airports. Airport Surface Surveillance Capability (ASSC), which uses ADS-B and has benefits similar to ASDE-X, is working at six airports. By 2020, ASSC will be active at nine airports; shorter average taxi times are expected.

ADS-B COVERAGE AND EN ROUTE INTEGRATION*



* Information is accurate as of June 2019.

PROGRAM MILESTONES*	DATE*
ADS-B Segment 1 and Segment 2 investment decision	August 2007
Segment 1 Surveillance and Broadcast Services Interim Situation Display for ADS-B	September 2010
Initial operating capability (IOC) ADS-B Capability on Common Automated Radar Terminal System IIIE at New York TRACON	July 2011
IOC ADS-B Capability on Standard Terminal Automation Replacement System at Houston TRACON	March 2012
IOC ERAM Release 3 with ADS-B Capability at Houston Center	April 2012
Flight testing	June 2013
Achieve en route separation services IOC at the 12th site	March 2014
Achieve 12 of 16 remote units sending Airport Surface Surveillance Capability data to air traffic control tower equipment at San Francisco	March 2014
Achievement of critical Services Implementation Service Acceptance Test at all 306 service volumes (Services encompass ADS-B Out, ADS-B In, TIS-B and FIS-B.)	March 2014
Complete baseline ADS-B radio station infrastructure deployment	March 2014
Achieve IOC for Terminal Separation Services at the 55th site	June 2014
Complete IOC surface advisory services at all 35 Airport Surface Detection Equipment–Model X sites	September 2014
Investment Analysis Readiness Decision for ADS-B In applications planning milestones	June 2015
MEARTS fusion processing for 5 nm separation services IOC at Anchorage	August 2015
Complete IOC at 24th and final en route site	September 2015
Expansion of Gulf of Mexico ADS-B coverage	September 2016
Oceanic in-trail procedures operational at Oakland, New York and Anchorage	September 2017
Complete all terminal and surface IOCs	2020
ADS-B Out rule compliance (aircraft equipage deadline)	January 1, 2020

*Information is accurate as of June 2019.

DATA COMMUNICATIONS

Data Communications (Data Comm) supplements voice communications with digitally delivered messages for air traffic controllers and pilots. Controllers will electronically send departure clearance (DCL) instructions to cockpits for review and acceptance by flight crews. Messages appear only on the cockpit display of the intended aircraft, reducing the potential for miscommunication from widely broadcast voice exchanges. Airline dispatchers simultaneously receive the same information. This gives all decision makers shared awareness so they react faster to changes. Flight reroutes and other types of messages such as flight crew requests will be possible when Data Comm expands to en route airspace.

TARGET USERS

- Air traffic controllers.
- Airline pilots.
- Airline dispatchers.

EQUIPAGE REQUIREMENTS

Future Air Navigation System 1/A.

Tower service accommodates VHF Digital Link Mode 0 and Mode 2 avionics.

VHF Data Link Mode 2 avionics for en route services. A framework is in place to accommodate alternate media.

OPERATIONAL CAPABILITIES

- Data Comm started with tower service, which enables DCL with route revisions.
- En route airspace services will follow tower service, enabling controllers to provide pilots with flight reroutes as well as other messages, such as handoffs between controllers from one center to the next, and altitude changes. Pilots will be able to send messages to controllers.
- These capabilities increase efficiency and flexibility through better routing around weather and congestion, accommodation of user requests, and reduced potential for miscommunication.

IMPLEMENTATION

DCL tower service is active at 62 U.S. locations. Because the first 55 locations finished more than two years ahead of schedule and significantly under budget, the program received approval in 2017 to deliver service at seven additional sites: Buffalo-Niagara International Airport, Charleston International Airport, John Glenn Columbus International Airport, Joint Base Andrews, Reno-Tahoe International Airport, Southwest Florida International Airport and Van Nuys Airport. The FAA completed the final site in August 2018, more than one year ahead of schedule for the original 55 airports.

The FAA will continue functional verification testing of initial en route services in 2019 at the Indianapolis and Kansas City key sites. The December 22, 2018, to January 25, 2019, lapse in appropriations adversely affected the en route phase of the program causing all site testing

and training activities to stop. Due to the length of the lapse, site training activities had to be re-accomplished, and the entire deployment strategy had to be re-planned and deconflicted with other agency initiatives impacting the en route facilities.

In 2016, the FAA made the Final Investment Decision and baselined full en route services, which will add more capabilities.

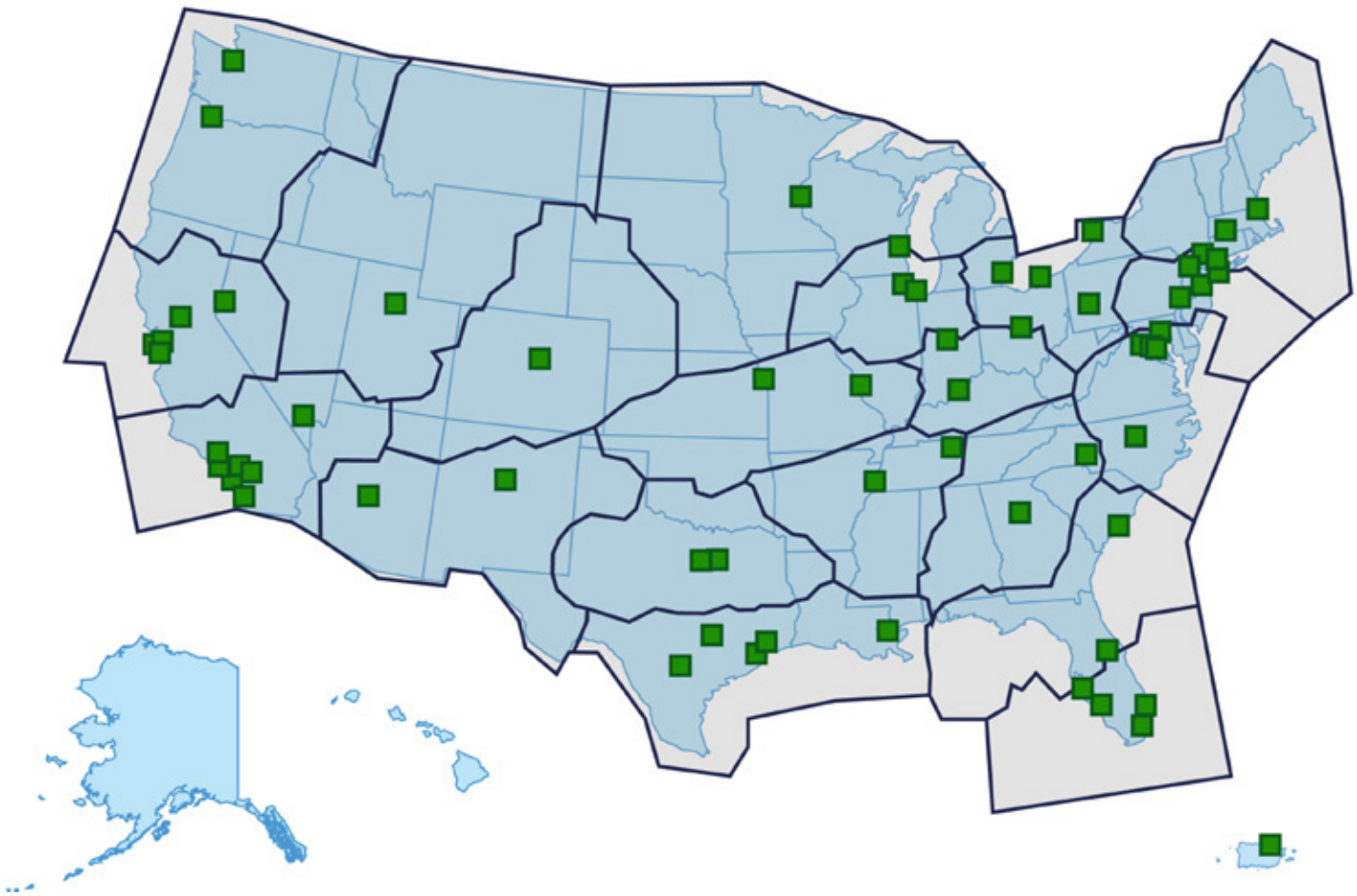
Advanced services such as Dynamic Required Navigation Performance and tailored arrivals are in the concept phase.

To jump-start the equipage installation necessary for the program's success, eight operators agreed to equip their fleets with Data Comm avionics through an FAA incentive. More than 2,465 aircraft have equipped using the incentive. Approximately 6,000 aircraft are equipped overall, exceeding the FAA's goal of 1,900 Data Comm-capable aircraft by 2019.

BENEFITS

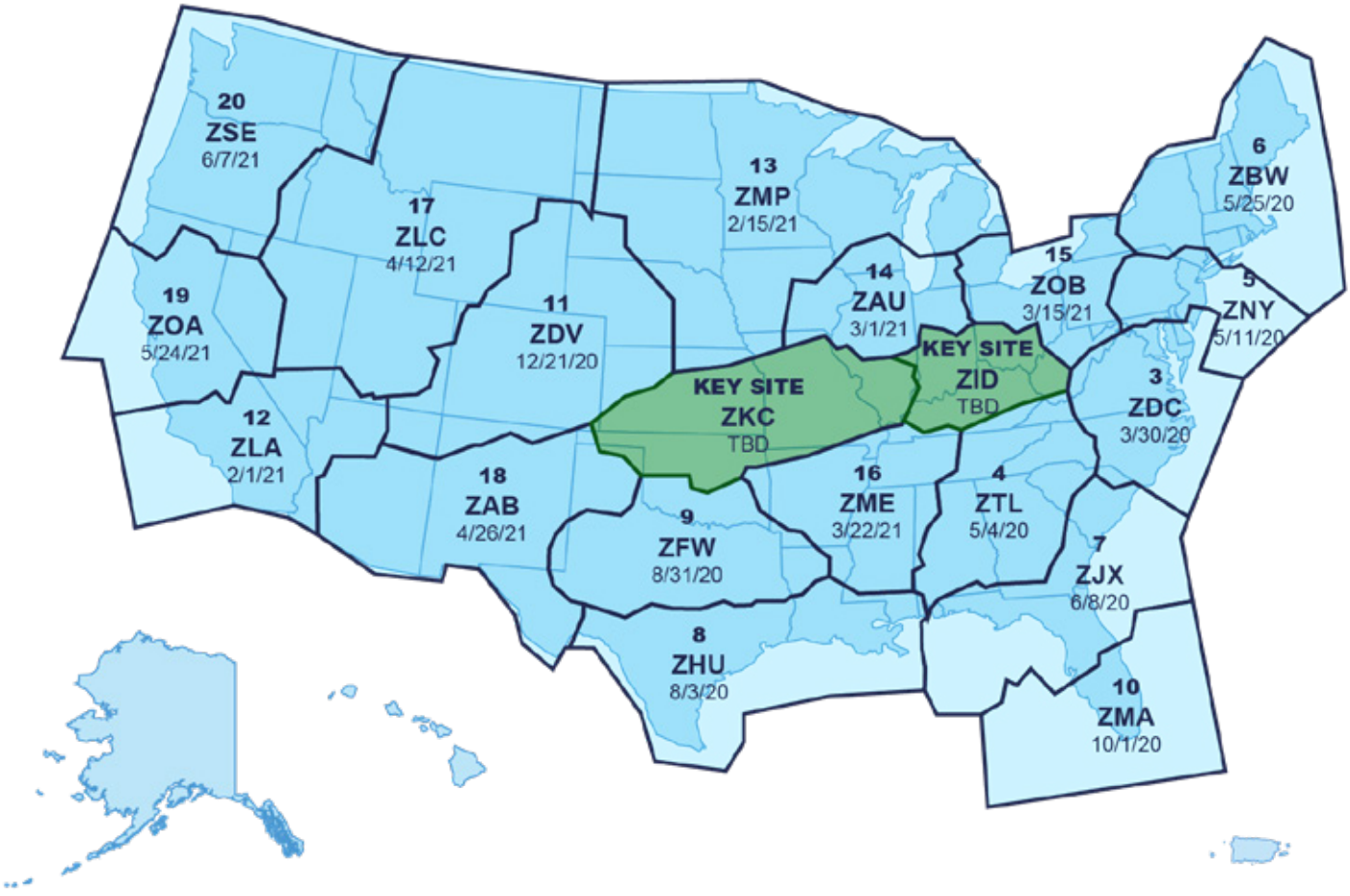
- Data Comm is critical to NextGen success and essential to move toward the goal of Trajectory Based Operations (TBO). Data Comm enhances safety by reducing communication errors; improving controller and pilot efficiency by paring down time spent in voice communication; increasing airspace capacity and efficiency through better routing around weather and congestion; accommodating user requests; and reducing delays, fuel consumption, and aircraft engine exhaust emissions.
- A joint FAA and industry analysis, performed per NAC request at five airports in the NAS, revealed average taxi-out timesaving between 0.2 and 8.5 minutes per rerouted flight during the first two months of the 2017 convective season. Discreet estimates show Data Comm will save operators more than $10 billion over the lifecycle of the program and will save the FAA approximately $1 billion in operating costs.

DATA COMMUNICATIONS DEPARTURE CLEARANCE TOWER SERVICE*



* Information is accurate as of June 2019.

DATA COMMUNICATIONS EN ROUTE INTIAL SERVICE*



* Information is accurate as of June 2019.

PROGRAM MILESTONES*	DATE*
SEGMENT 1 PHASE 1	
Data Comm Segment 1 Phase 1 Final Investment Decision (FID) for En Route Automation Modernization (ERAM) and Tower Data Link System (TDLS)	May 2012
Data Comm Segment 1 Phase 1 Data Comm integrated services contract award	September 2012
Data Comm Segment 1 Phase 1 TDLS preliminary design review complete	October 2012
Data Comm Segment 1 Phase 1 TDLS critical design review complete	July 2013
Complete program level integrated baseline review	February 2014
Deliver Data Comm Network Service Build 1 to FAA William J. Hughes Technical Center	March 2014
Data Comm Segment 1 Phase 1 ERAM initial test release (ITR)	April 2014
TDLS V12 ITR	April 2014
Complete Data Comm informal integration and interface service test	July 2014
Data Comm Segment 1 Phase 1 operational test and evaluation	March 2015
Data Comm Segment 1 Phase 1 departure clearance (DCL) tower services IOC at Salt Lake City key site	August 2015
IOC at Houston Hobby and Houston Bush	September 2015
Data Comm Segment 1 Phase 1 Site Operational Readiness Decision	September 2015
Data Comm Segment 1 Phase 1 In-Service Decision (ISD)	December 2015
Data Comm Segment 1 Phase 1 IOC at last site	December 2016
SEGMENT 1 PHASE 2	
Data Comm Segment 1 Phase 2 initial en route services FID	October 2014
Data Comm Segment 1 Phase 2 full en route services FID	August 2016
Data Comm Segment 1 Phase 2 development test and evaluation complete	September 2017
Data Comm Segment 1 Phase 2 IOC at first site	September 2019
Data Comm Segment 1 Phase 2 ISD	March 2020
Data Comm Segment 1 Phase 2 full En Route services development test and evaluation complete	November 2020
Data Comm Segment 1 Phase 2 initial en route services IOC at last site	September 2021
Data Comm Segment 1 Phase 2 full en route services IOC at first site	March 2022
Data Comm Segment 1 Phase 2 full en route services IOC at last site	December 2023
TOWER TRIALS	
Initiate DCL tower trials at Memphis	January 2013
Initiate DCL tower trials at Newark	April 2013
Complete DCL tower trials	January 2016

*Information is accurate as of June 2019.

AUTOMATION

The FAA is modernizing the NAS with two state-of-the-art automation platforms: the Standard Terminal Automation Replacement System (STARS) and En Route Automation Modernization (ERAM). This foundation for transformational NextGen capabilities will enable controllers to handle growing volumes of air traffic for decades to come. The FAA's Terminal Automation Modernization and Replacement (TAMR) program is overseeing STARS installations.

TARGET USERS

- Air traffic controllers.

EQUIPAGE REQUIREMENTS

Additional equipage is not required for NAS users.

OPERATIONAL CAPABILITIES

STARS enables core NextGen NAS capabilities at terminal sites.

- Provides terminal controllers with aids for separation and sequencing of air traffic, conflict and terrain avoidance alerts and weather advisories, and allows for radar vectoring for departing and arriving traffic.
- Enables new tools that accommodate greater air traffic and new technologies. STARS prepares controllers at air traffic towers and terminal approach facilities to track more aircraft, to see greater nuances in local weather, and to observe a greater radius of airspace on their monitors.
- Processes ADS-B data.
- Has backup capabilities to prevent system failure, and incurs fewer operating and maintenance costs compared to earlier automation systems.

The ERAM automation platform enables core NextGen NAS capabilities at en route sites.

- ERAM provides open software architecture with modular sub-systems that can be enhanced to support evolving NAS operational needs.
- The ERAM architecture provides two highly available, full-function channels.
  - It eliminates system downtime due to scheduled and unscheduled outages.
  - It allows more flexibility for scheduled maintenance.
- ERAM architecture provides separation of mission-critical and non-mission-critical functions.
  - It reduces critical service outages.

IMPLEMENTATION

TAMR

- STARS is deployed at more than 90 percent of all U.S. TRACON facilities. Providence achieved Initial Operating Capability (IOC) on June 26, 2019.
- STARS Sustainment 1 brings hardware and software upgrades to existing sites. In this phase, TAMR is upgrading 48 automation systems to STARS G4.
- STARS Sustainment 2 (SS2) includes development and testing of the transition to a new operating system, qualification of digital video, document modernization, and upgrade of five legacy STARS systems outside the TAMR program to the current STARS baseline.
- SS2 achieved Final Investment Decision (FID) at the Joint Resources Council (JRC) in September 2017 and has achieved one of two FY19 acquisition program baseline (APB) goals on time. The second goal is on track to complete on September 30, 2019.
- Phase 3 replaced Automated Radar Terminal Systems (ARTS) IIIE with STARS at the 11 largest TRACONs: Atlanta, Northern California, Southern California, Chicago, Dallas-Fort Worth, Denver, Louisville, Minneapolis-St. Paul, New York, Potomac (Washington, D.C., area), and St. Louis.
- Phase 4 replaces ARTS IIEs and ARTS IEs with STARS at the remaining sites.
- Prior to the 2018-2019 lapse in appropriations, the TAMR program had completed 24 of 24 APB goals on time.
- TAMR is expected to complete deployment of the SS1 and P4 programs by 2020.
- TAMR will standardize the terminal automation systems at more than 144 TRACONs and 400 air traffic control towers.

ERAM

- ERAM achieved operational readiness at the last of the 20 en route centers in March 2015.
- The ERAM program now focuses on operations and maintenance of deployed systems.
- In September 2017, ERAM completed system enhancements and a technology refresh that included user-driven system upgrades and enhanced security for En Route Information Display equipment.
- Ongoing implementations:
  - ERAM Enhancements 2: incorporates NextGen-driven new capabilities into the system.
  - ERAM Sustainment 2: keeps critical components for which spare parts are no longer available, and transitions operating system to Linux.
  - Sustainment 3: supports the remaining ERAM hardware components not replaced by Sustainment 2.
  - Other: deployment of integrating application software (Data Comm, Airborne Reroutes, Ground Interval Management–Spacing) and planning for other external stakeholder needs.

BENEFITS

TAMR

- Using multiple radars and ADS-B, STARS can track 1,300 aircraft in a 400-square-nautical-mile area. This provides controllers with a clearer picture of overall operations.
- Weather displays show six different levels of radar returns. This gives controllers better bad-weather views as they work with pilots to steer aircraft around storms.
- STARS provides display customization tools that maximize each controller's efficiency.
- STARS has two redundant systems; a backup can be activated with the flip of a switch.
- A single automation system in the NAS significantly reduces costs by eliminating the need to develop, test, and deploy software on multiple platforms and to maintain legacy systems.

ERAM

- Controllers can see which surveillance source is tracking an aircraft and in some cases reduce en route separation from 5 nm to 3 nm in congested areas, like certain sectors of New York Center's airspace.
- Controllers can watch incoming traffic from other en route centers, allowing them to calculate most-efficient trajectories before handoff.
- ERAM accommodates time, speed, and spacing applications used to achieve the NextGen goal of TBO.
- New data — like navigation charts that renew every 56 days — can be loaded for operational use without disrupting air traffic service.
- New software can be tested offline without affecting operations.
- Training scenarios are much more realistic and easily modified to enhance teaching.
- Controllers can customize control settings for maximum efficiency.
- They can save and recall commonly entered commands to minimize typing and maximize traffic monitoring.

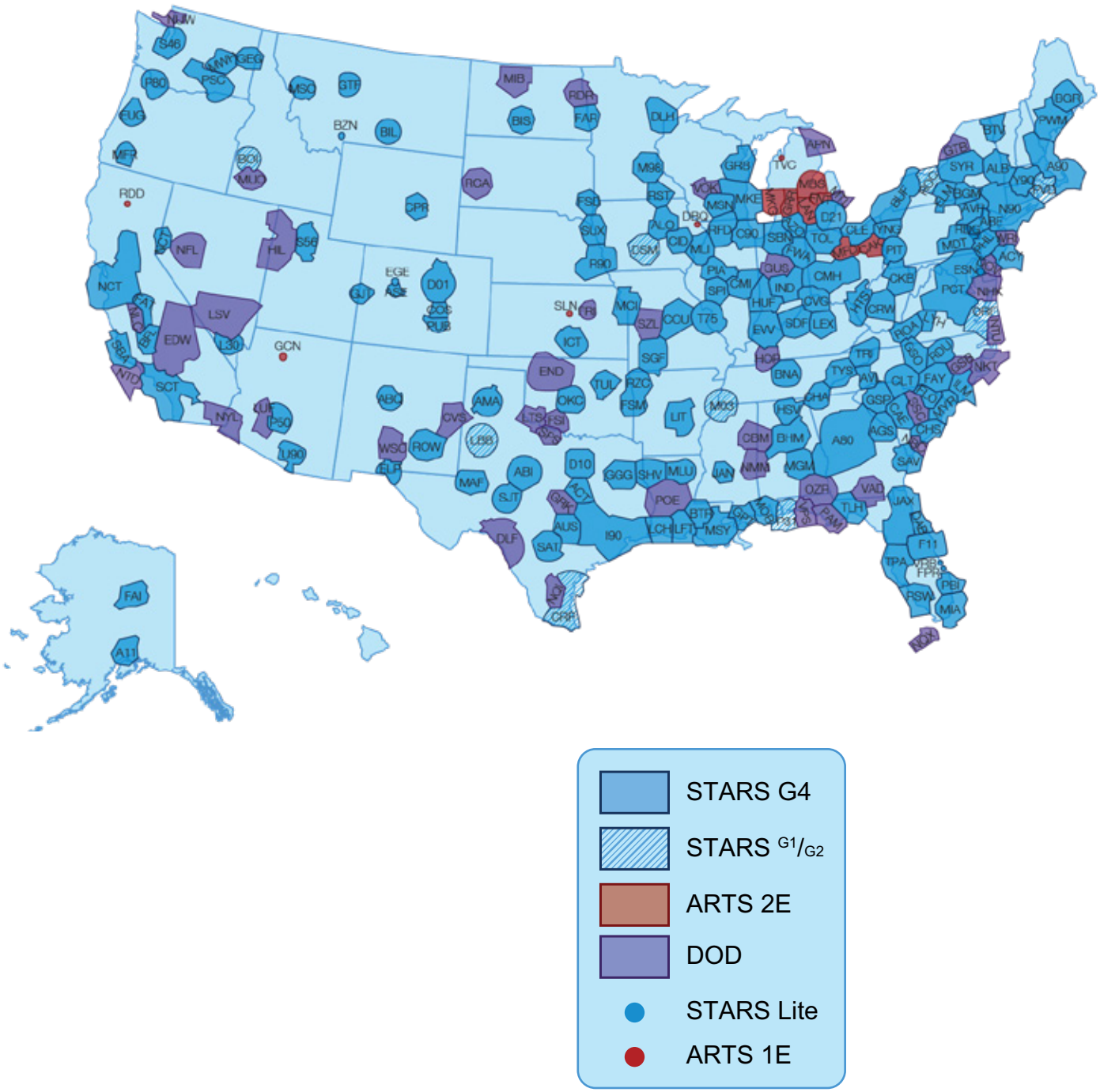
PROGRAM MILESTONES*	DATE*
STARS SUSTAINMENT 1 (SS1)	
STARS Sustainment 1 Final Investment Decision (FID)	September 2012
STARS Sustainment 1 complete initial operating capability (IOC) at key site	December 2012
STARS Sustainment 1 software build R26 Standard Terminal Automation Replacement System (STARS), complete	August 2013
STARS Sustainment 1 National STARS release build R26	August 2013
STARS Sustainment 1 software build 37C, Common Automated Radar Terminal System (CARTS), complete	September 2013
STARS Sustainment 1 national CARTS release 37C	September 2013
STARS Sustainment 1 complete IOC at second site	January 2014
STARS Sustainment 1 complete IOC at 26th site	December 2017
STARS Sustainment 1 complete IOC at 39th site	April 2019
STARS Sustainment 1 complete IOC at 48th and final site	July 2020
TAMR PHASE 3	
TAMR Phase 3 authorization to proceed	December 2010
TAMR Phase 3 contract award of 11 STARS systems	December 2010
TAMR Phase 3 FID	December 2011
TAMR Phase 3 first site hardware delivery	May 2012
TAMR Phase 3 complete installation and checkout of upgraded hardware for CARTS IIIE system at N90 to support ADS-B	May 2012
TAMR Phase 3 contract definitization	May 2012
TAMR Phase 3 complete IOC at key site on R1	May 2013
TAMR Phase 3 complete IOC at key site on R2	September 2014
TAMR Phase 3 complete operational readiness demonstration (ORD) at key site on R2	May 2015
Baseline Change Decision (BCD)	August 2015
TAMR Phase 3 complete IOC at fifth site (M98)	October 2015
TAMR Phase 3 complete IOC at 11th and final site (N90)	October 2016
TAMR Phase 3 complete ORD at 11th and final site (N90)	October 2017
TAMR PHASE 4	
TAMR Phase 4 FID	September 2012
TAMR Phase 4 first site hardware delivery (ARTS IIE)	September 2013
TAMR Phase 4 complete STARS Enhanced Local Integrated Tower (ELITE) operational test and evaluation	May 2014
TAMR Phase 4 complete IOC at first site (ARTS IIE)	August 2014
TAMR Phase 4 complete IOC at 12th site (ARTS IIE)	December 2015

*Information is accurate as of June 2019.

PROGRAM MILESTONES*	DATE*
TAMR Phase 4 complete IOC at 65th site (ARTS IIE)	December 2017
TAMR Phase 4 complete IOC at 91st and final site (ARTS IIE)	May 2019
TAMR Phase 4 complete ORD at last site ARTS IIE site	June 2019
TAMR Phase 4 complete ORD at last site ARTS IE site	March 2020
STARS SUSTAINMENT 2	
STARS Sustainment 2 Contract Award	January 2018
STARS Sustainment 2 OS: Software Build S6.R12 Thin Specs Complete	January 2018
STARS Sustainment 2 Remote Towers: First Site IOC	May 2019
STARS Sustainment 2 OS: Software Build S6.R12 Early User ATCoach Evaluation Event	September 2019
STARS Sustainment 2 software build S6.R11 delivered	December 2019
STARS Sustainment 2 X3000/DRD Replacement ECP	February 2020
STARS Sustainment 2 Digital Video ECP	February 2020
STARS Sustainment 2 Remote Towers: Last (5th) Site IOC	June 2020
STARS Sustainment 2 OS: Software Build S6.R12 Delivered	November 2020
STARS Sustainment 2 S6.R11 Conduct Run-for-Record	February 2021
STARS Sustainment 2 Operational Test (OT) Conduct Run-for-Record	May 2022
EN ROUTE AUTOMATION MODERNIZATION	
Complete installation of En Route Communications Gateway (ECG) router firewall equipment at last site	March 2016
ERAM sector enhancements FID	December 2016
Collaborative Air Traffic Management airborne reroute capability operational	December 2017
Deploy last ERAM release containing system enhancements	September 2017

*Information is accurate as of June 2019.

TERMINAL AUTOMATION*



* Information is accurate as of June 2019.

SYSTEM WIDE INFORMATION MANAGEMENT

System Wide Information Management (SWIM) is NextGen's digital data-sharing backbone. The SWIM infrastructure enables members of the aviation community to access the information they need in a usable message format through a single connection. This contributes to an efficient and innovative NAS. By providing access to relevant information in real time, SWIM improves the FAA's ability to securely deliver the right information to the right people at the right time, increases collaboration among aviation partners, and reduces costs.

TARGET USERS

- FAA programs.
- Air traffic controllers.
- Operators, including passenger. and cargo carriers, business aviation, and airports.
- Research institutions and universities.
- Other government agencies.

EQUIPAGE REQUIREMENTS

NAS users need appropriate software to access data.

OPERATIONAL CAPABILITIES

- NAS Enterprise Messaging Service (NEMS), a SWIM core service, provides standards-based message communication, a suite of system capabilities and services, and a way for consumers to manage their data subscriptions. NEMS uses the FAA Telecommunications Infrastructure for a two-way, service-oriented architecture data exchange. NEMS connection points are deployed at all 20 en route centers for internal messaging. Eight NEMS gateways in Atlanta, Atlantic City, Oklahoma City, and Salt Lake City give external messaging capabilities. Two NEMS nodes in Atlantic City and Oklahoma City provide mission-support capabilities.

- SWIM Terminal Data Distribution System (STDDS) takes raw surface and terminal surveillance data and converts it into Extensible Markup Language (XML) format. It sends surface information from airport towers to the corresponding TRACON facility through NEMS for internal and external NAS consumers.

- SWIM Flight Data Publication Service (SFDPS) receives En Route Automation Modernization flight, airspace, and general message data from the legacy Host Air Traffic Management Data Distribution System in a common message set. SFDPS changes the data into XML and the Flight Information Exchange Model (FIXM), the international XML format for flight data. SFDPS deconflicts and consolidates flight data from the 20 en route centers that multiple systems formerly published. SFDPS temporarily stores data in its repository, which users access on request.

- The SWIM Visualization Tool (SVT) is installed at the Boston, Chicago, Houston, Louisville, Northern California, Philadelphia, Potomac, and Southern California TRACON facilities, as well as the Air Traffic Control System Command, Boston, and Los Angeles centers. In 2018, we deployed SVT at Houston-area facilities including the en route center, and Houston Bush and Houston Hobby airports. Hickam Air Force Base, Hawaii, received SVT at the request of the FAA NAS Defense Program. SVT positioning at these sites supports the Terminal Flight Data Manager early implementation strategy. In December 2017, we enhanced SVT to include traffic flow management data, specifically gate-assignment information that airline partners started publishing in SWIM. SVT is to be installed at Portland and Anchorage once the Airport Surface Surveillance Capability systems for these locations are operational.
- TFMS provides a variety of flight and flow information, including flight-plan data, departure and arrival times, flight cancellations, flow-constraint area or flow-evaluation area, ground stop, reroutes and TFMS status of all data flows received and/or transmitted to SWIM. The latest version of TFMS additionally allows airlines to exchange data with TFMS via SWIM.
- Time Based Flow Management provides a variety of aircraft metering information, times of arrival, and other information, such as airport configuration.
- Notices to Airmen (NOTAM) Distribution Service delivers digital NOTAM data.
- Aeronautical Information Management (AIM) Special Activity Airspace provides airport reference and configuration data, definitions, and schedule for affected areas.
- Aeronautical Information Management Modernization (AIMM) Segment 2 updates the ingestion, integration, management, and distribution of this information by establishing the Aeronautical Common Services (ACS) and a one-stop-shop portal.
- Integrated Terminal Weather System (ITWS) Data Publication provides specialized weather products in the terminal area.
- Enterprise Service Monitoring (ESM) provides enterprise monitoring of SWIM services and SWIM-related systems. The enterprise service desk uses this when assisting consumers and producers.
- Identity and Access Management (IAM) provides security controls for access to SWIM. In alignment with the National Strategy for Trusted Identities in Cyberspace, IAM deploys strong authentication and authorization using public key infrastructure certificates to ensure the right level of access and security in the NAS.
- NAS Common Reference (NCR) will provide a unified, application-level interface to obtain filtered subsets of NAS information through request or subscription. It will integrate NAS status and constraint information from cross-domain sources.

IMPLEMENTATION

The FAA completed Segment 1 in September 2015 on time and within budget. This consisted of a common infrastructure, data from seven NAS programs, a service registry, and governance. SWIM Segment 2 consists of Segment 2A, which was completed in December 2017, and Segment 2B, which is scheduled to be finished in fiscal 2021. Segment 2C is scheduled to start in fiscal 2019.

Segment 2A completed the SWIM infrastructure and:

- Added NEMS nodes to all 20 en route centers.
- Added new system-level capabilities to NEMS, including message-reliability quality of service, dynamic subscriptions, and advanced data transformation and mediation.
- Added new data sets from TFMS Release 13, AIM Federal NOTAM System, and AIM ACS.
- Enriched the set of traffic-flow data for external consumers to maintain common NAS situational awareness.
- Increased security capabilities with the IAM prototype.
- Increased monitoring capabilities with the ESM prototype.

Segment 2B builds upon 2A and will:

- Increase security of NAS data flows by providing digital certificates through IAM. This enables more secure data exchanges between systems by expanding authentication and introducing authorization.
- Enhance ESM, the existing infrastructure's enterprise-monitoring capability, by adding operational and maintenance status of the infrastructure and services.
- Enhance infrastructure and data of existing STDDS Phase 1 services and provide new services to the list of STDDS-published information, including STARS track and flight-plan data, and real-time status or alerts from tower and airport systems.
- Add the ability to request complex aeronautical, flight, and weather data from the NAS with the NCR tool.
- Enable global harmonization of information standards, including the Aeronautical Information Exchange Model (AIXM), Weather Information Exchange Model (WXXM), and FIXM.

Segment 2C will:

- Provide a technical refresh of existing infrastructure and capacity expansion to accommodate new programs such as AIMM Segment 3, Common Support Services-Weather, and NextGen Weather Processor.
- Implement a cloud solution to handle a growing number of users and amount of data flowing through the system.

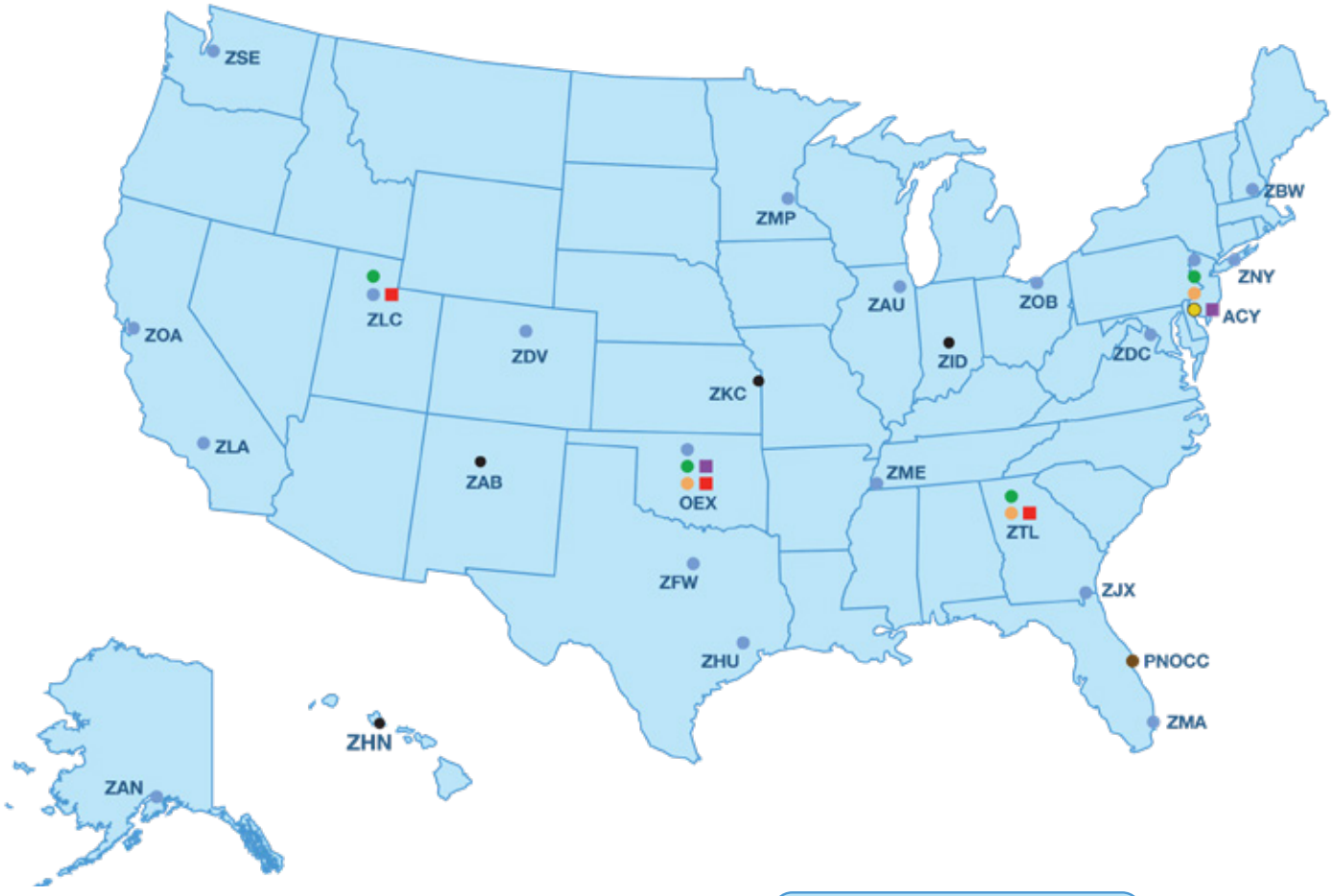
BENEFITS

- SWIM enables access to real-time, relevant, and reliable aeronautical, flight, and weather information so all users can respond to changes faster and more accurately. For instance, airline dispatchers and traffic managers can collaborate on routing and rerouting of traffic based on real-time information, such as current traffic management initiatives, runway configurations, and de-icing status.

- Safety increases through improved common situational awareness.
- Because air traffic managers, air traffic controllers, flight dispatchers, and pilots can manage the airspace more efficiently, passengers gain from SWIM. An improved infrastructure and higher efficiency standards lead to fewer or shorter delays, less time airborne, lower fuel consumption, and reduced aircraft emissions.
- Infrastructure and maintenance costs are lower because of the decreasing number of unique interfaces between systems.
- SWIM's structure stimulates innovation to develop products to satisfy the needs of aviation partners and the public.
- Installed at 38 TRACONs, STDDS provides surface data from the movement area and incidental non-movement areas to TFMS. Air traffic managers use TFMS to balance runway demand with capacity across the NAS and to better calculate gate-to-gate flight trajectories.
- SVT raises surface situational awareness for traffic-management coordinators. TRACON controllers can easily identify departure congestion and anticipate changes, such as switching runway operations in response to a shift in wind direction.
- SWIM is accelerating the transition to global harmonization of information standards. Ongoing implementation of core information models includes AIXM, WXXM, and FIXM.
- SWIM expanded the set of external producers, including airlines that publish TFMS Release 13 data, to better predict demand and to manage surface traffic.

SWIM INFRASTRUCTURE DEPLOYMENT

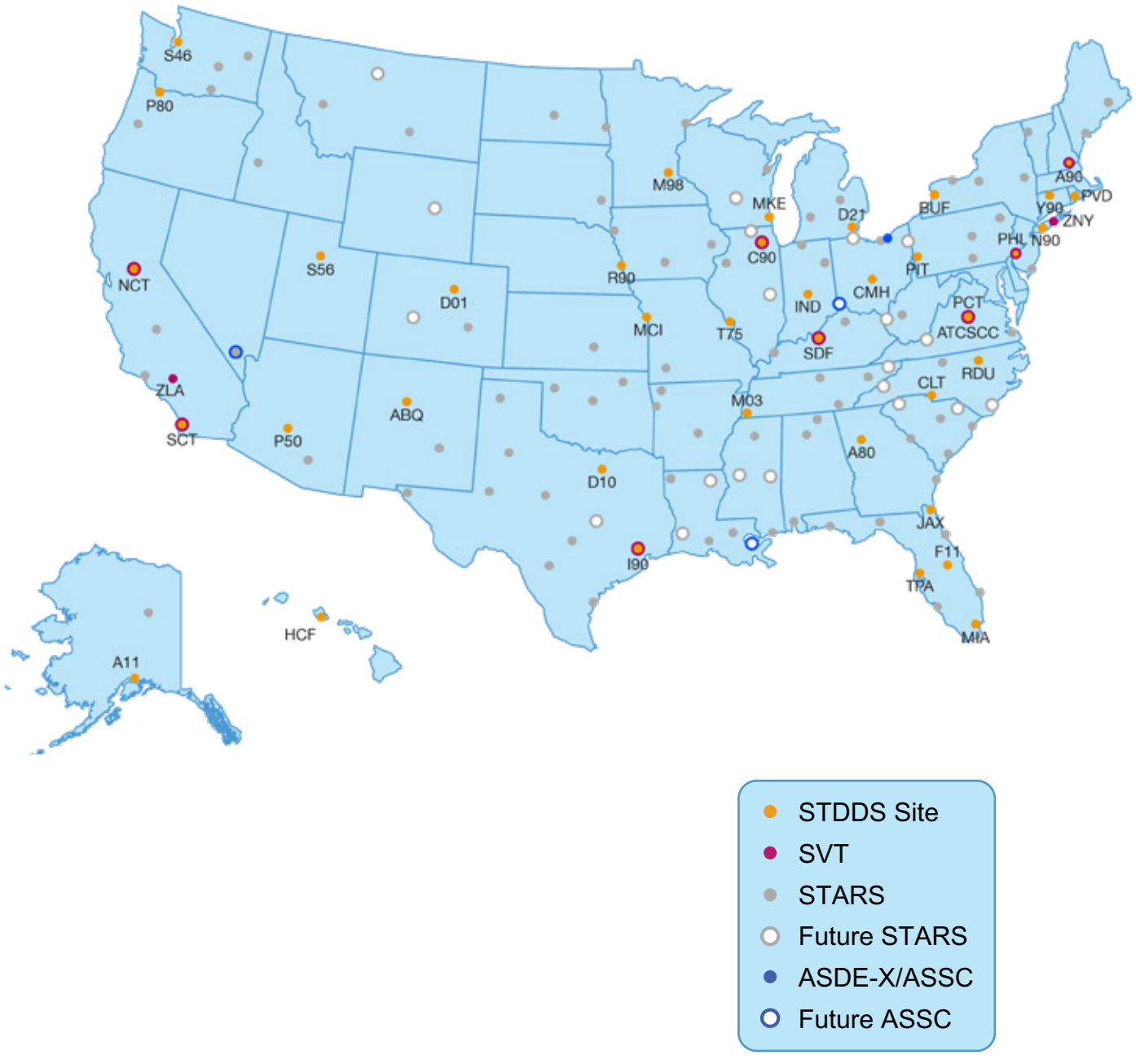
NAS ENTERPRISE MESSAGING SERVICE (NEMS)*



* Information is accurate as of June 2019.

SWIM TERMINAL DATA DISTRIBUTION SYSTEM

(STDDS) BY TRACON*



* Information is accurate as of June 2019.

PROGRAM MILESTONES*	DATE*
SEGMENT 1	
System Wide Information Management (SWIM) Segment 1 Final Investment Decision (FID)	July 2009
SWIM Segment 1 Corridor Integrated Weather System (CIWS) publication operational – SWIM Implementation Programs (SIP) = CIWS	September 2010
SWIM Segment 1 Special Use Airspace Automated Data Exchange operational – SIP = Aeronautical Information Management	December 2010
SWIM Segment 1 Integrated Terminal Weather Service (ITWS) Publication operational – SIP = ITWS	January 2011
SWIM Segment 1 Reroute Data Exchange operational – SIP = Traffic Flow Management (TFM)	June 2011
SWIM Segment 1 Terminal Data Distribution operational – SIP = SWIM Terminal Data Distribution System (STDDS)	March 2012
SWIM Segment 1 Pilot Report Data publication operational - SIP = Weather Switching Center Replacement (WMSCR)	June 2012
SWIM Segment 1 flight data publication – initial flight data services operational – SIP = En Route Automation Modernization	December 2012
Miami Terminal Radar Approach Control distributes data to airline via STDDS	August 2013
Complete NextGen capabilities packages	September 2013
SWIM Segment 1 operational test and evaluation complete – Flight Data Publication Service (FDPS) – SIP = FDPS	March 2014
SWIM Segment 1 Runway Visual Range Publication Service operational – SIP = STDDS	June 2014
SWIM Segment 1 flow information publication operational – SIP = TFM	December 2014
SWIM Segment 1 FDPS operational – SIP = FDPS	July 2015
SWIM Segment 1 SWIM tool kits (core services) – complete implementation	September 2015
SEGMENT 2A	
SWIM Segment 2A authorization to proceed	November 2010
SWIM Segment 2A FID for SWIM Segment 2A planning milestone	July 2012
SWIM Segment 2A complete SWIM NAS Enterprise Messaging Service (NEMS) demand assessment and associated deployment of new NEMS nodes – Phase I	April 2013
SWIM Segment 2A complete NEMS dynamic subscription capability development	June 2013
SWIM Segment 2A complete on-ramping of ITWS using SWIM NEMS	June 2013
SWIM Segment 2A complete NEMS web services capability development	June 2013
SWIM Segment 2A complete on-ramping of CIWS and WMSCR using NEMS	September 2013
SWIM Segment 2A complete Enhanced Weather Information Network Server (EWINS) using SWIM NEMS	November 2013

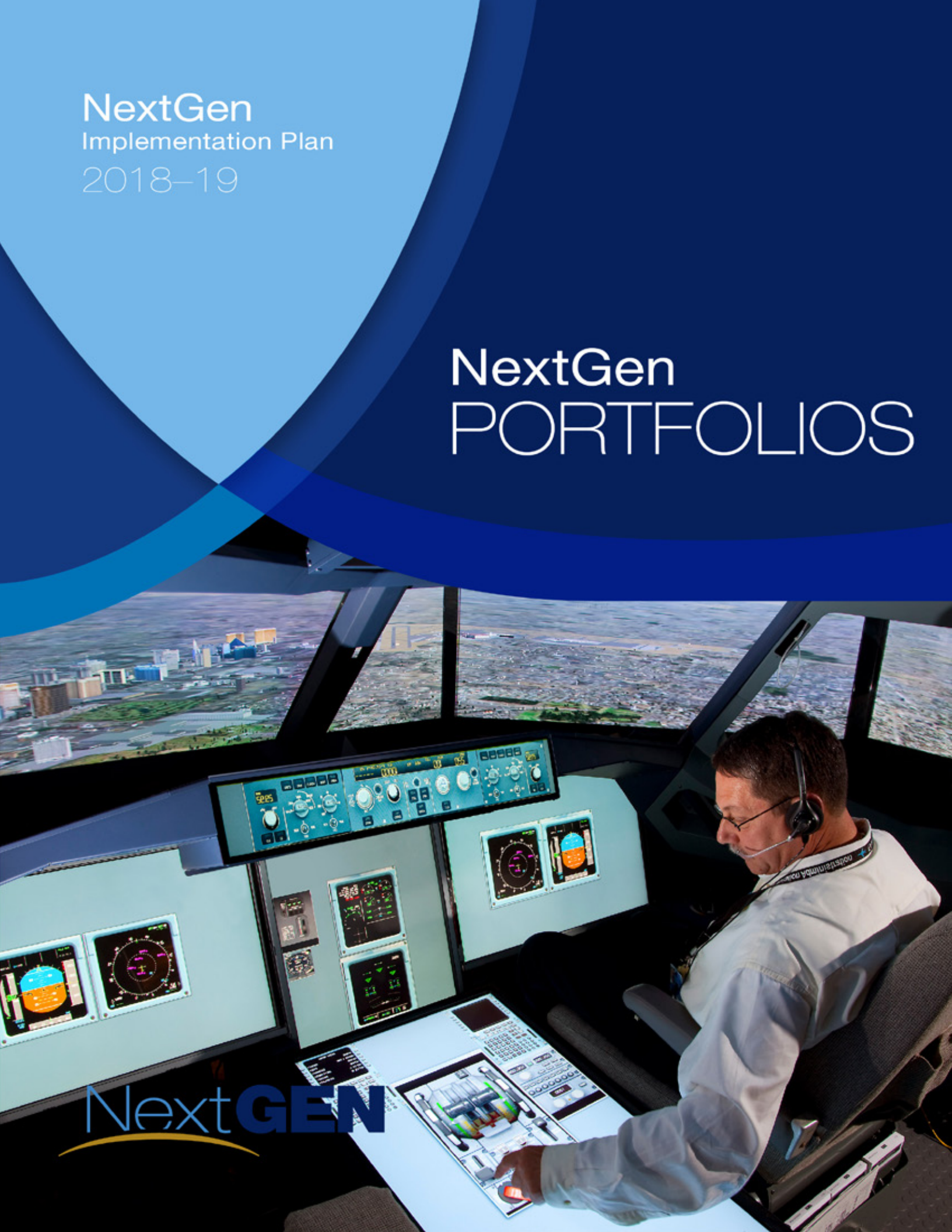
*Information is accurate as of June 2019.

PROGRAM MILESTONES*	DATE*
Complete on-ramping of EWINS using SWIM NEMS	November 2013
SWIM Segment 2A complete NEMS demand assessment and associated deployment of new NEMS nodes – Phase II	April 2014
SWIM Segment 2A complete on-ramping of TBFM using SWIM NEMS	April 2014
Complete on-ramping of AIM Special Use Airspace using SWIM NEMS	September 2014
SWIM Segment 2A complete NEMS security services capability development	February 2015
SWIM Segment 2A complete NEMS demand assessment and associated deployment of new NEMS Nodes – Phase III	April 2015
SWIM Segment 2A complete NEMS demand assessment and associated deployment of new NEMS nodes – Phase IV	April 2016
SWIM Segment 2A completion	December 2017
SEGMENT 2B	
SWIM Segment 2B FID for SWIM Segment 2B planning milestone	September 2015
SWIM Segment 2B complete initial operating capability (IOC) for strong authentication using digital certificates for internal connections between NAS systems (Identity Access Management (IAM) Phase 2)	October 2017
SWIM Segment 2B complete enterprise service monitoring (ESM) Phase 2 IOC	March 2018
SWIM Segment 2B complete NAS common reference IOC	March 2020
SWIM Segment 2B complete ESM Phase 3 IOC	February 2020
SWIM Segment 2B complete IOC for attribute based access control (authorization) capability (IAM Phase 2)	July 2020
SWIM Segment 2B STDDS Phase 2 release 6 IOC	September 2021

*Information is accurate as of June 2019.

NextGen
Implementation Plan
2018–19

NextGen PORTFOLIOS



Bravo - Charlie - Delta

Portfolio Overview

Improved Surface Operations will be implemented through the proliferation of improved airport surveillance information, the use of cockpit displays for increased situational awareness, and the deployment of an enhanced departure management decision-support system. Safety features include surface moving-map displays in the cockpits. Improved data communications for revised departure clearances, surface movement data exchange, and departure routing improvements will also enhance efficiency.

In the Bravo timeframe this portfolio focuses on safely improving surface management by delivering aircraft to the departure runway in a more efficient manner, enhancing data exchange with flight operators, and integrating flight data with surveillance data for improved surface visualization. Further, automating manual flight strip processes will improve intra-facility coordination while enhanced vision system technology will enable aircraft to taxi in poor visibility conditions.

Improved surface operations anticipated benefits are as follows:

Reduced fuel burn and operating costs related to long departure queues (metering)
Reduced taxi delay by optimizing the departure sequence, based on overhead stream operations
Reduced Passenger Value of Time costs from missed connections
Reduced FAA operating costs through the use of automated flight strips
Increased safety through Situational Awareness and Alerting of Ground Vehicles
Increased safety through ASDE-X to Additional Airports
Increased safety through Expansion of Surface Surveillance
Increased safety through Moving Map with Own-Ship Position
Increased safety through CDTI with TIS-B and ADS-B for Surface
Increased capacity, flexibility, and efficiency through External Surface Data Release
Increased capacity, efficiency, environment, and predictability through implementation of Surface Situational Awareness for Traffic Management

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.

* This portfolio contains Alpha increments that have not achieved Initial Operationally Available or Complete Status.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)	Charlie (2021-2025)	Delta (2026-2030)
7	6	1	4

Total Number of Increments in Inital Operationally Available Status

Alpha 1 of 7 (14%) *
Bravo 1 of 6 (17%)
Charlie 0 of 1 (0%)
Delta 0 of 4 (0%)

Total Number of Increments in Complete Status

Alpha 6 of 7 (86%) *
Bravo 1 of 6 (17%)
Charlie 0 of 1 (0%)
Delta 0 of 4 (0%)

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

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

B Bravo | C Charlie | D Delta

Operational Improvements/Current Operations & Increments

Benefits

CO: [102129] Current Terminal Separation

D [102129-02] Augmented Runway Separation **(2026 - 2030)**

OI: [102138] Enhanced Air Traffic Control Tower Services for Airport Operations at Non-Primary Airports (2017 - 2022)

B [102138-01] Establish Air Traffic Control Tower Criteria for Airport Operations at Non-Primary Airports **(2017 - 2022)**

OI: [102408] Improved Pilot Awareness on Surface by Providing Location and Alerting Functions (2026 - 2030)

D [102408-21] Airport Traffic Situation Awareness with Indications and Alerts (SURF-IA) **(2026 - 2030)**

OI: [104206] Full Surface Traffic Management with Conformance Monitoring (2026 - 2029)

D [104206-21] Taxi Conformance Monitoring for Controllers **(2026 - 2029)**

D [104206-22] Electronic Exchange of Taxi Information **(2026 - 2029)**

CO: [104208] Enhanced Departure Flow Operations (2016 - 2019)

B [104208-12] Revised Departure Clearance via Data Comm **(2016 - 2019)**

OI: [104211] Surface Traffic Management (2016 - 2028)

B [104211-21] TFDM Scheduler/Sequencer **(2019 - 2021)**

B [104211-22] Surface Metering Operations **(2019 - 2021)**

B [104211-23] Improved Electronic Flight Data Exchange **(2019 - 2020)**

B [104211-25] Establish Enhanced Data Exchange with Flight Operators (FOC) and Airport Operators **(2016 - 2021)**

C [104211-24] Integrate Surveillance Data with Flight Data (Surface) **(2025 - 2028)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

B Bravo · C Charlie · D Delta

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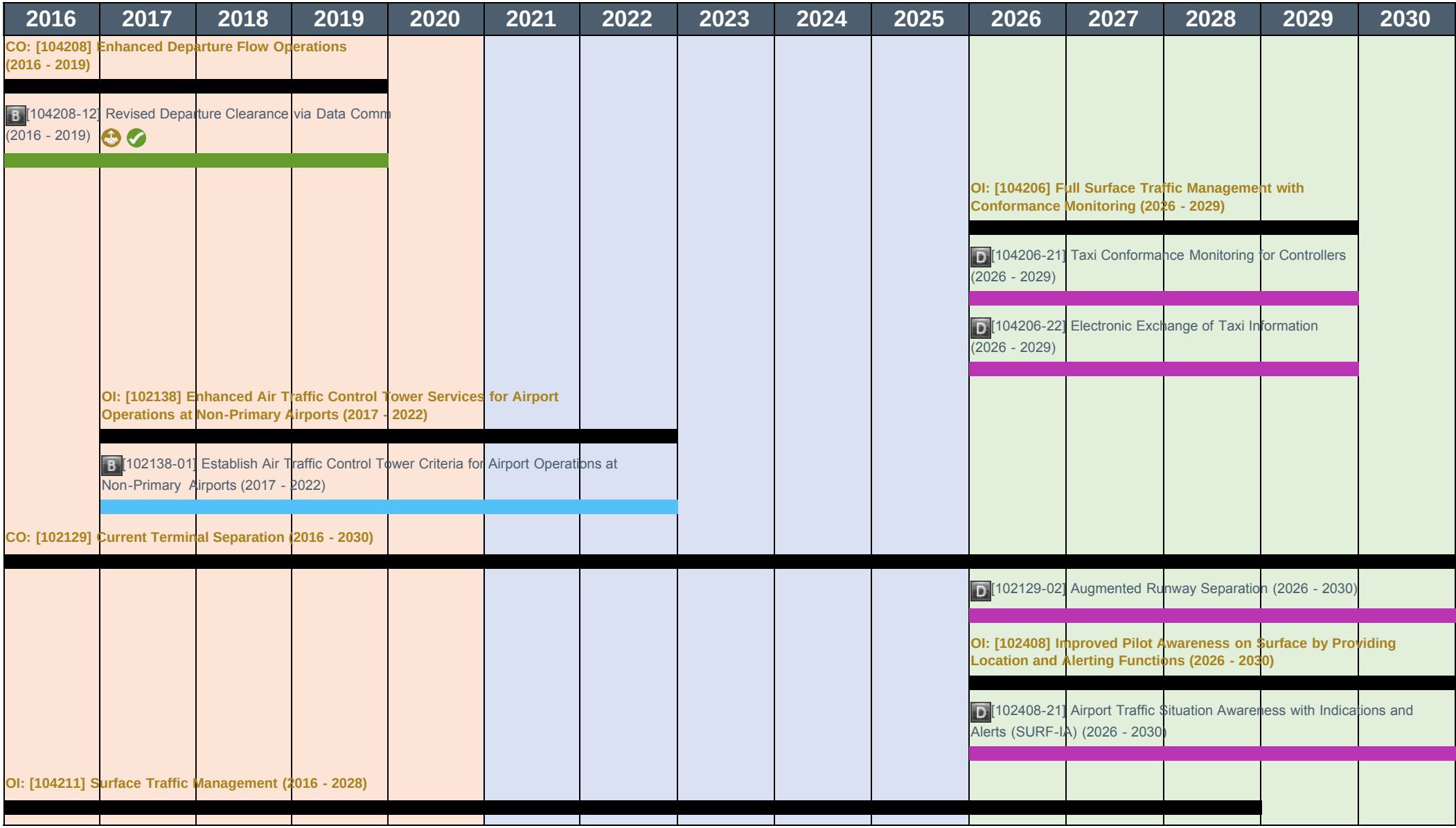
2019 Approved Baseline

NextGEN

Improved Surface Operations Portfolio



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

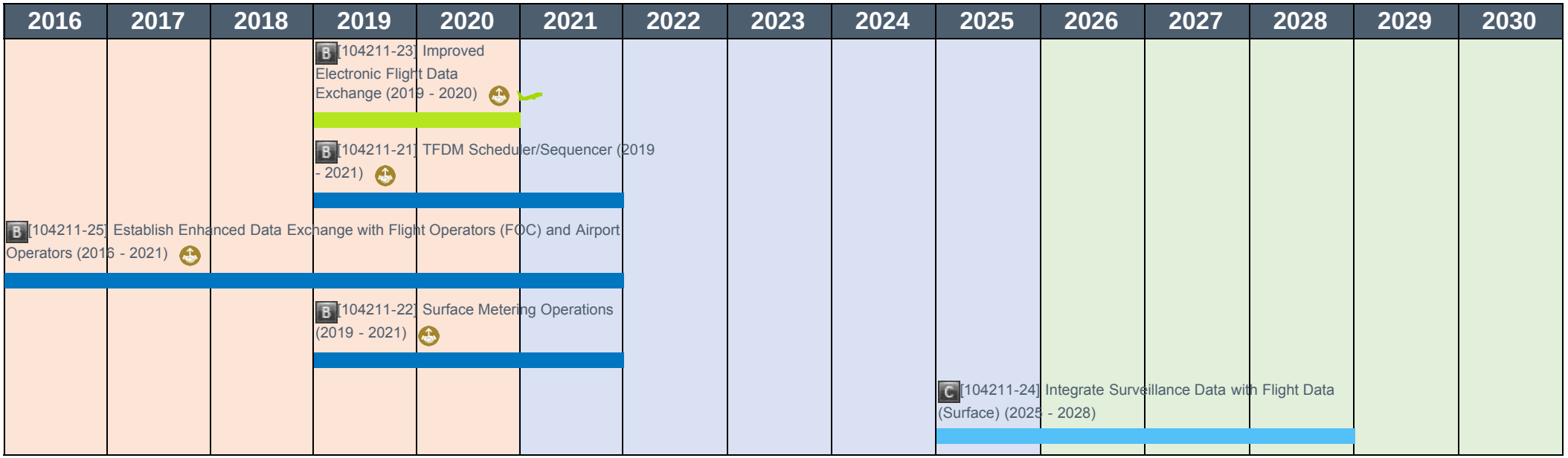
B Bravo | C Charlie | D Delta

Federal Aviation Administration

2019 Approved Baseline

NextGEN

Improved Surface Operations Portfolio



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

B Bravo C Charlie D Delta

Federal Aviation Administration

2019 Approved Baseline

NextGEN

Bravo - Charlie - Delta

Portfolio Overview

The Improved Approaches and Low-Visibility Operations portfolio outlines ways to increase access and flexibility for approach operations. This will be accomplished through a combination of procedural changes, improved aircraft capabilities, and improved precision approach guidance. The procedural changes allow for more efficient profiles. The improved aircraft capabilities include vertical navigation. Ground-Based Augmentation Systems (GBAS) will provide improved approach guidance to flight crews and will enhance satellite navigation capabilities

In the Bravo and Charlie timeframes, this portfolio focuses on safely providing additional low-visibility approaches (i.e., during Category I and lower weather conditions) in NAS operations through the use of advanced navigation, imaging sensors, and computational technologies.

The anticipated benefits of the LowVis portfolio are in the areas of improved access to and capacity at airports during certain weather conditions.

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.

* This portfolio contains Alpha increments that have not achieved Initial Operationally Available or Complete Status.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)
6	5
Charlie (2021-2025)	**Delta (2026-2030)**
2	0

Total Number of Increments in Inital Operationally Available Status

Alpha 1 of 6 (17%) *

Bravo 0 of 5 (0%)

Charlie 0 of 2 (0%)

Delta 0 of 0 (0%)

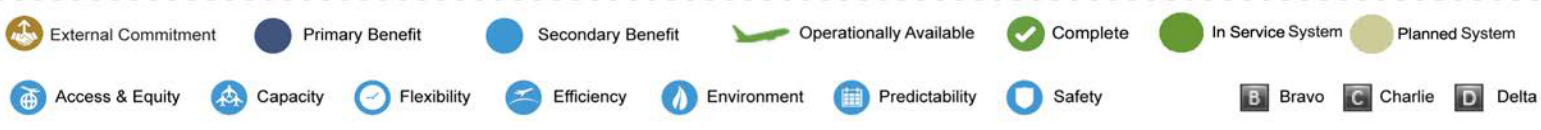
Total Number of Increments in Complete Status

Alpha 5 of 6 (83%) *

Bravo 1 of 5 (20%)

Charlie 0 of 2 (0%)

Delta 0 of 0 (0%)



Operational Improvements/Current Operations & Increments

Benefits

OI: [107107] Ground Based Augmentation System (GBAS) Precision Approaches (2012 - 2024)

C [107107-21] GBAS Category II/III Standards and Non-Federal Approval **(2019 - 2024)**

OI: [107115] Low Visibility/Ceiling Takeoff and Departure Operations (2014 - 2025)

B [107115-11] Enhanced Flight Vision Systems (EFVS) for Takeoff **(2014)**

C [107115-21] Advanced Flight Vision System for Take-Off and Departure **(2020 - 2025)**

OI: [107117] Low Visibility/Ceiling Approach and Landing Operations (2015 - 2021)

B [107117-12] Synthetic Vision Guidance Systems (SVGS) for Approach **(2016 - 2021)**

OI: [107202] Low Visibility Surface Operations (2016 - 2022)

B [107202-21] Low-Visibility Taxi Operations **(2016 - 2020)**

B [107202-22] Enhanced Flight Vision System (EFVS)/Accurate Position Information for Taxi **(2016 - 2020)**

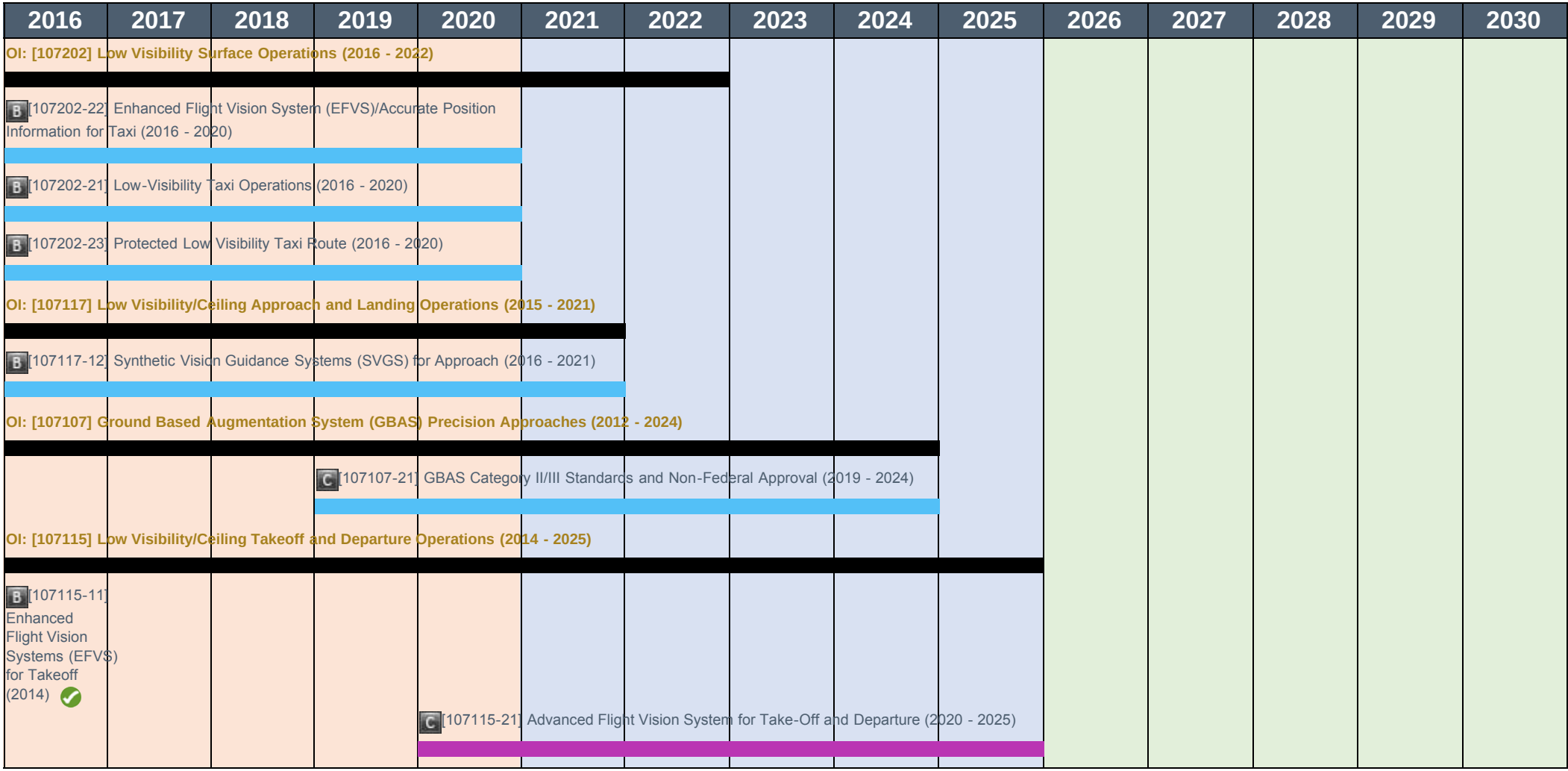
B [107202-23] Protected Low Visibility Taxi Route **(2016 - 2020)**

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

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

B Bravo | C Charlie | D Delta

Improved Approaches and Low-Visibility Operations Portfolio



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

B Bravo | C Charlie | D Delta

Federal Aviation Administration

2019 Approved Baseline

NextGEN

Bravo - Charlie - Delta

Portfolio Overview

The Improved Multiple Runway Operations portfolio improves access to closely spaced parallel runways to enable more arrival and departure operations. Improving runway access will increase efficiency and capacity while reducing delays. These capabilities will enable the use of simultaneous approaches in less than visual conditions, decrease required separations for dependent approaches, and mitigate the effects of wake turbulence that leads to increased separation in terminal airspace. Twenty-six of FAA's Core 30 Airports with runways spaced less than 4300 feet apart could benefit from the increased throughput enabled by IMRO capabilities.

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.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)
8	3
Charlie (2021-2025)	**Delta (2026-2030)**
4	3

Total Number of Increments in Inital Operationally Available Status

Alpha 0 of 8 (0%)

Bravo 0 of 3 (0%)

Charlie 0 of 4 (0%)

Delta 0 of 3 (0%)

Total Number of Increments in Complete Status

Alpha 8 of 8 (100%)

Bravo 3 of 3 (100%)

Charlie 0 of 4 (0%)

Delta 0 of 3 (0%)

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

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

B Bravo | C Charlie | D Delta

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NextGEN

Improved Multiple Runway Operations Portfolio

Operational Improvements/Current Operations & Increments

Benefits

CO: [102141] Improved Parallel Runway Operations for Arrivals (2012 - 2022)

- B [102141-22] Amend Standards for Simultaneous Independent Approaches - Dual with Offset **(2016 - 2020)**
- B [102141-24] Amend Standards for Simultaneous Independent Approaches - Triple **(2016 - 2020)**
- B [102141-28] Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 Feet **(2016 - 2018)**

OI: [102157] Improved Parallel Runway Operations with Airborne Applications (2020 - 2030)

- D [102157-21] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT I) **(2026 - 2030)**
- D [102157-22] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT II) **(2026 - 2030)**
- D [102157-23] Interval Management for Dependent Staggered Approaches **(2026 - 2030)**

OI: [102159] CSPR Paired Departure Wake Mitigation (2021 - 2025)

- C [102159-01] CSPR Paired Departure Wake Mitigation **(2021 - 2025)**

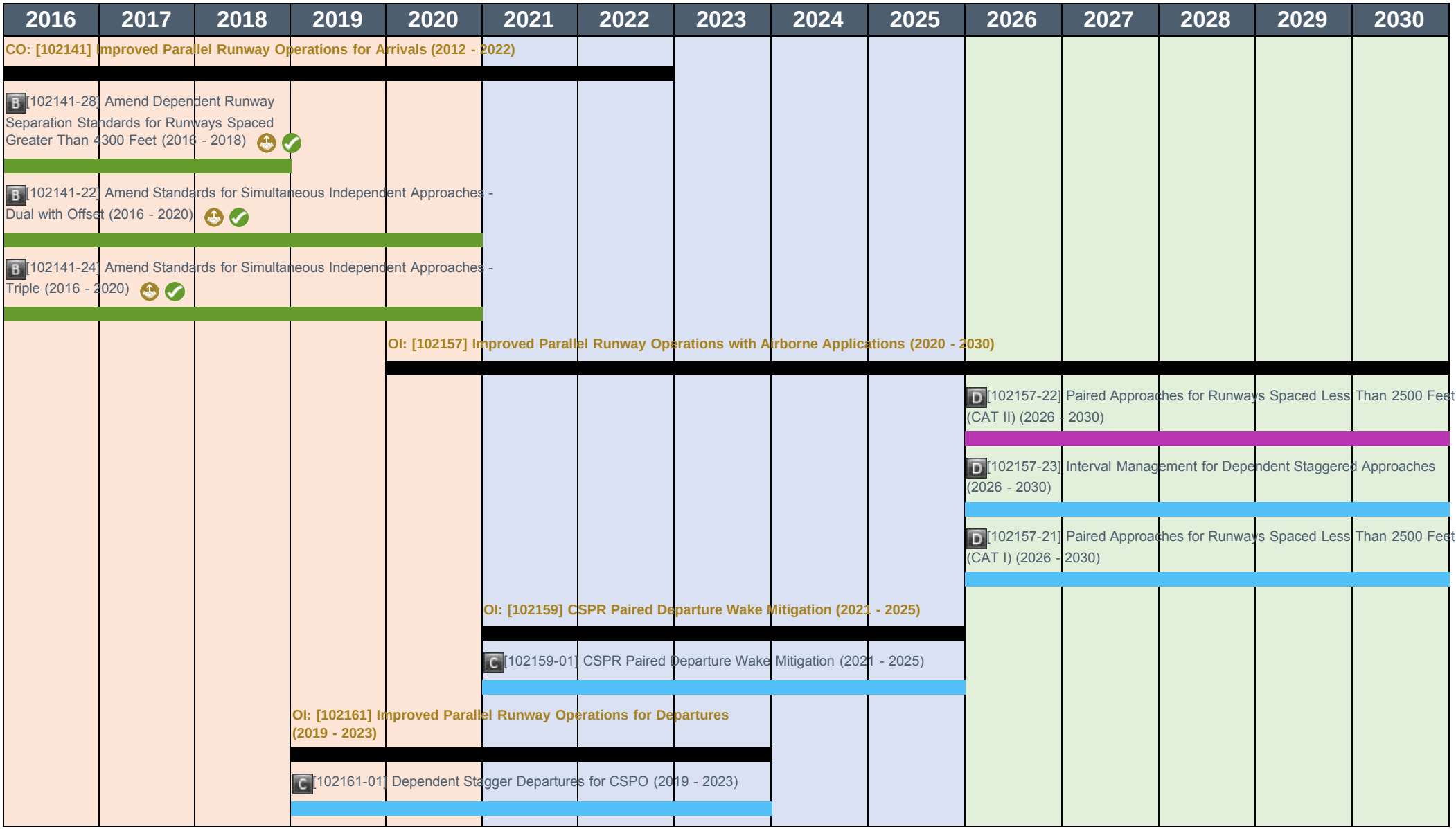
OI: [102161] Improved Parallel Runway Operations for Departures (2019 - 2023)

- C [102161-01] Dependent Stagger Departures for CSPO **(2019 - 2023)**
- C [102161-02] Further Reductions to Departure Divergence Requirements for CSPO **(2019 - 2023)**
- C [102161-03] Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways **(2019 - 2023)**

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety | B Bravo | C Charlie | D Delta

Improved Multiple Runway Operations Portfolio



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

B Bravo C Charlie D Delta

Federal Aviation Administration

2019 Approved Baseline

NextGEN

Improved Multiple Runway Operations Portfolio

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
			C [102161-02] Further Reductions to Departure Divergence Requirements for CSPO (2019 - 2023)											
			C [102161-03] Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways (2019 - 2023)											

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

B Bravo C Charlie D Delta

Federal Aviation Administration

2019 Approved Baseline

NextGEN

Bravo - Charlie - Delta

Portfolio Overview

Improvements in aircraft navigation performance provide an opportunity to increase efficiency and flexibility. The Performance-Based Navigation (PBN) portfolio addresses ways to leverage emerging technologies, such as RNAV and RNP, to improve access and flexibility for point-to-point operations.

The PBN portfolio reflects the intention to safely permit and enhance the flexibility of point-to-point operations, while allowing for the development and use of more efficient routes, procedures, and approaches that are free from the constraints of ground-based navigational aids (NAVAIDS).

Anticipated benefits include efficiency and predictability through the proliferation of PBN operations.

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.

* This portfolio contains Alpha increments that have not achieved Initial Operationally Available or Complete Status.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)
8	3
Charlie (2021-2025)	**Delta (2026-2030)**
5	2

Total Number of Increments in Inital Operationally Available Status

Alpha 1 of 8 (13%) *

Bravo 2 of 3 (67%)

Charlie 0 of 5 (0%)

Delta 0 of 2 (0%)

Total Number of Increments in Complete Status

Alpha 7 of 8 (88%) *

Bravo 1 of 3 (33%)

Charlie 0 of 5 (0%)

Delta 0 of 2 (0%)

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Operational Improvements/Current Operations & Increments

Benefits

OI: [104122] Integrated Arrival and Departure Airspace Management (2027 - 2031)

D [104122-23] Integrated Arrival and Departure Management Services: Airspace Enhancements **(2027 - 2031)**

OI: [107120] Resilient PBN Operations (2021 - 2025)

C [107120-01] Resilient PBN Operations for DME-Equipped Aircraft **(2021 - 2025)**

OI: [108209] Increase Capacity and Efficiency Using Area Navigation (RNAV) and Required Navigation Performance (RNP) (2010 - 2020)

B [108209-20] Advanced and Efficient RNP **(2013 - 2020)**

B [108209-22] Expansion of Metroplex PBN Procedures **(2017 - 2020)**

B [108209-23] Established-on-RNP Independent Duals and Triples with RF Procedures **(2017 - 2020)**

OI: [108215] Increase Capacity and Efficiency Using Streamlined PBN Services (2021 - 2030)

C [108215-01] PBN Airways **(2021 - 2025)**

C [108215-02] Established-on-RNP Independent Duals and Triples with TF Procedures **(2021 - 2025)**

C [108215-03] More Optimal Metroplex PBN Procedures with Time-Based Sequencing and Spacing **(2021 - 2025)**

C [108215-05] Multiple Airport Route Separation **(2023 - 2030)**

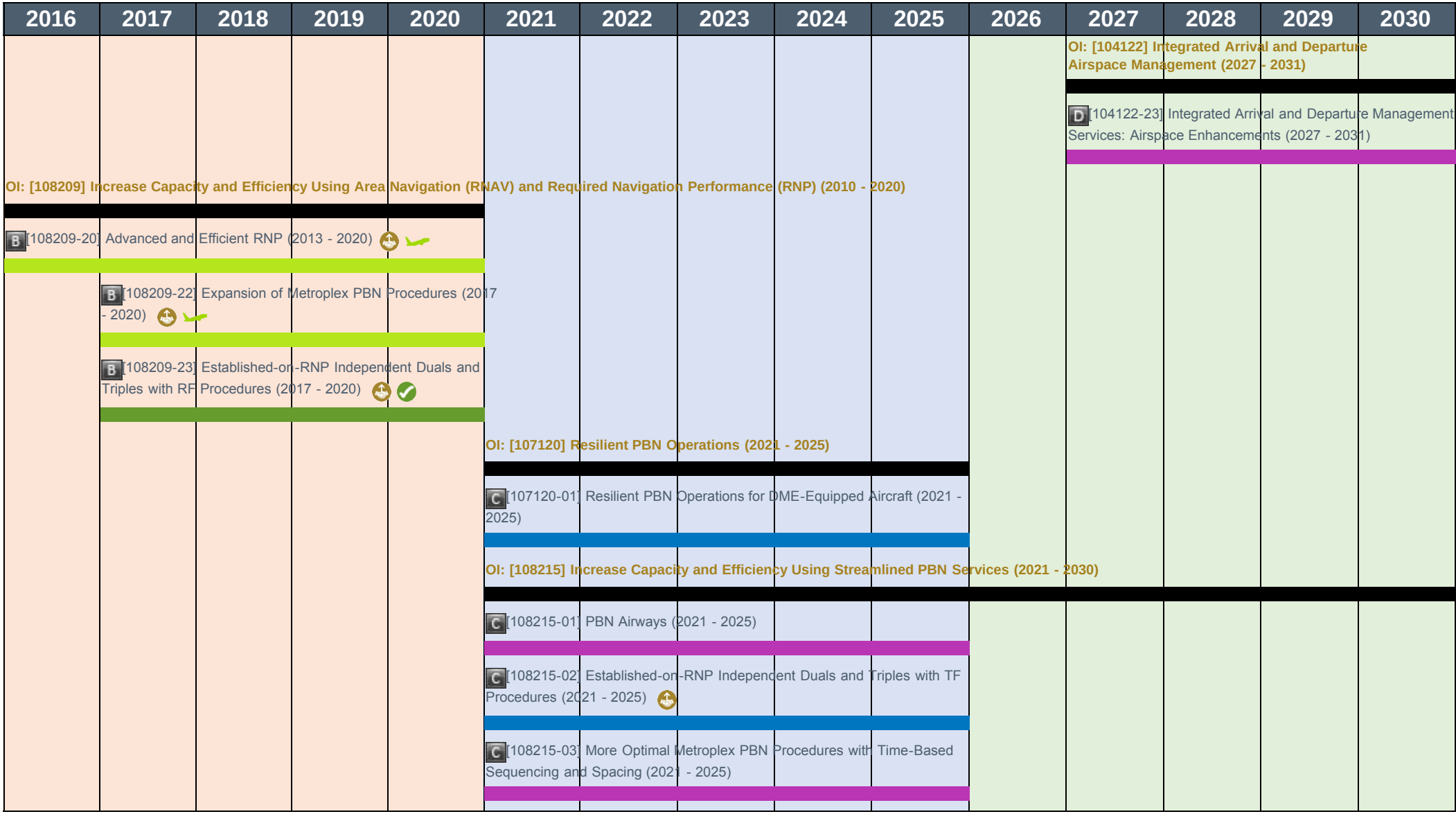
D [108215-04] Dynamic Required Navigation Performance (D-RNP) **(2025 - 2030)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

B Bravo · C Charlie · D Delta

Performance-Based Navigation Portfolio



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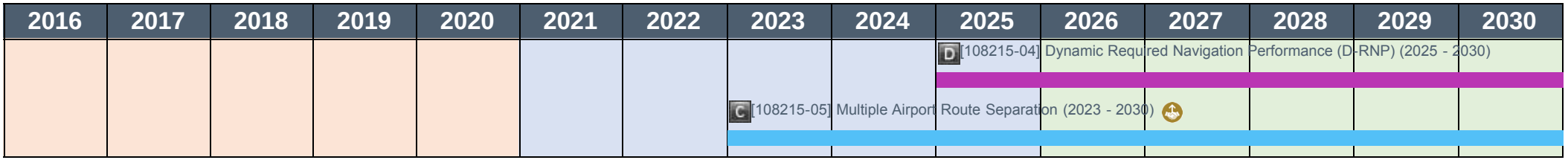
Performance-Based Navigation Portfolio



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

B Bravo | C Charlie | D Delta

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NextGEN

Bravo - Charlie - Delta

Portfolio Overview

The Time-Based Flow Management (TBFM) portfolio enhances system efficiency by leveraging the capabilities of the TBFM decision-support tool, a system that is already deployed to all CONUS ARTCCs. Improvements in TBFM's core Time-Based Metering (TBM) capability, an expansion of TBFM and its departure capabilities to additional locations will enhance efficiency and optimize demand and capacity. Further, improvements will be made to enable controllers to more accurately deliver aircraft to the Terminal Radar Approach Control facility (TRACON) while providing the opportunity for aircraft to fly optimized descents. These changes will be leveraged to enable aircraft to maintain a spacing interval behind preceding aircraft, further improving capability and flight efficiency. These benefits should reduce fuel burn due to more efficient flight paths.

This portfolio focuses on scheduling and interval management tools that further expand TBM benefits to safely assure the smooth flow of traffic and increase the efficient use of airspace. Point-in-Space Metering, Time-Based Metering in the Terminal Environment, and Improved Management of Arrival/Surface/Departure Flow extend, enhance, and proliferate metering operations; improve the accuracy of schedules and demand predictions for more efficient and predictable NAS operations; and continue the path toward trajectory-based operations. This portfolio also begins the use of Interval Management-Spacing (IM-S) operations, using a combination of ground- and flight deck-based capabilities.

Anticipated benefits are in the areas of system efficiency and predictability, as follows:
Improved efficiency through optimized descents and optimized aircraft spacing during metering operations
Increased predictability by expanding the use of TBM from departure through the en route environment and ultimately to the airport.

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.

* This portfolio contains Alpha increments that have not achieved Initial Operationally Available or Complete Status.

Total Number of Increments By Segment

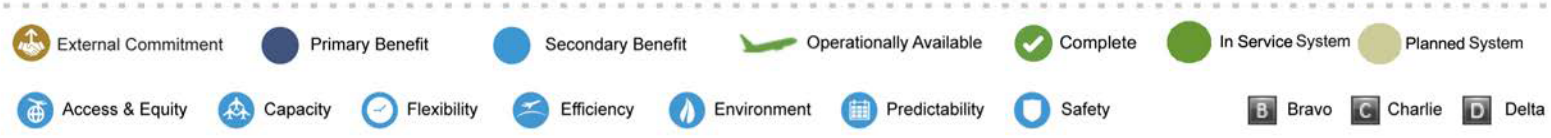
Alpha (2010-2015)	Bravo (2016-2020)
6	1
Charlie (2021-2025)	**Delta (2026-2030)**
8	4

Total Number of Increments in Inital Operationally Available Status

Alpha 1 of 6 (17%) *
Bravo 0 of 1 (0%)
Charlie 0 of 8 (0%)
Delta 0 of 4 (0%)

Total Number of Increments in Complete Status

Alpha 5 of 6 (83%) *
Bravo 0 of 1 (0%)
Charlie 0 of 8 (0%)
Delta 0 of 4 (0%)



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Time-Based Flow Management Portfolio

Operational Improvements/Current Operations & Increments

Benefits

OI: [102118] Relative Spacing Using Interval Management (2028 - 2035)

D [102118-21] Relative Spacing Using Interval Management - Cruise **(2028 - 2035)**

OI: [102149] Pair-wise Trajectory Management (2026 - 2029)

D [102149-01] Pair-wise Trajectory Management (PTM) **(2026 - 2029)**

OI: [102152] Dynamic, Pair-wise Wake Turbulence Separation (2024 - 2030)

D [102152-01] Interval Management with Wake Mitigation **(2024 - 2030)**

OI: [104117] Improved Management of Arrival/Surface/Departure Flow Operations (2015 - 2030)

C [104117-22] Arrival Scheduling with Departure Data **(2024 - 2028)**

C [104117-23] Departure Scheduling with Arrival Data **(2024 - 2028)**

OI: [104120] Enhanced Time Based Metering Operations in All Weather (2014 - 2025)

C [104120-21] Metering During Reroute Operations **(2021 - 2025)**

C [104120-22] Meet TBFM Constraints Using Required Time of Arrival (RTA) Capability **(2021 - 2025)**

C [104120-28] FOC Preferences Incorporated into Metering **(2021 - 2025)**

D [104120-31] Enhanced Time Based Metering Operations **(2025 - 2028)**

OI: [104123] Time-Based Metering Using RNAV and RNP Route Assignments (2014 - 2027)

C [104123-21] Lateral Maneuvering for Delay Absorption (Path Stretch) **(2022 - 2026)**

C [104123-24] Rerouting During Metering Operations **(2023 - 2027)**

C [104123-25] OPDs to the Runway Enabled by Required Time of Arrival (RTA) Capability **(2023 - 2026)**

OI: [104128] Time-Based Metering in the Terminal Environment (2019 - 2028)

B [104128-24] Time-Based Metering in the Terminal Environment **(2019 - 2022)**

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety | B Bravo | C Charlie | D Delta

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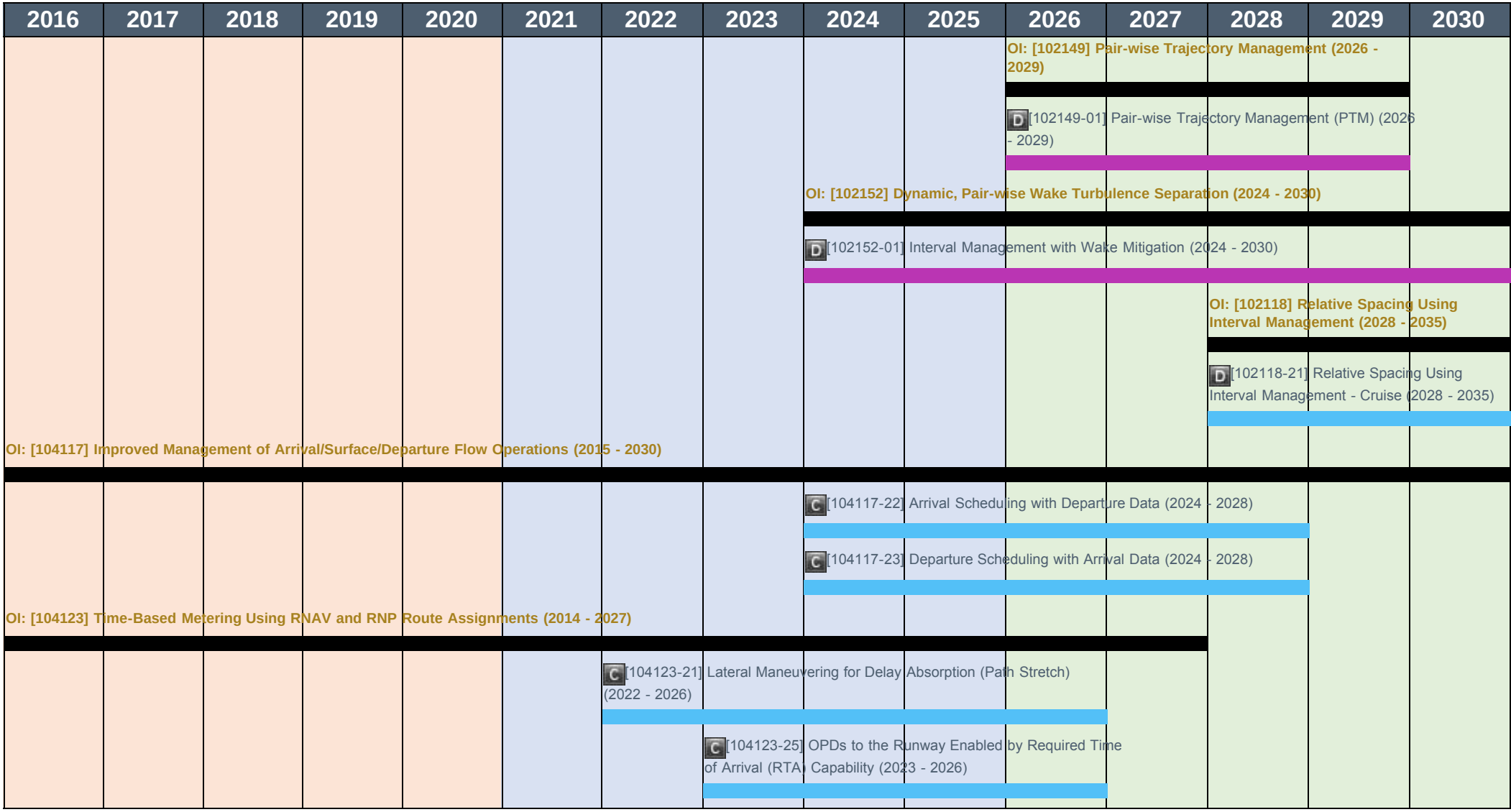
Time-Based Flow Management Portfolio



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

B Bravo | C Charlie | D Delta

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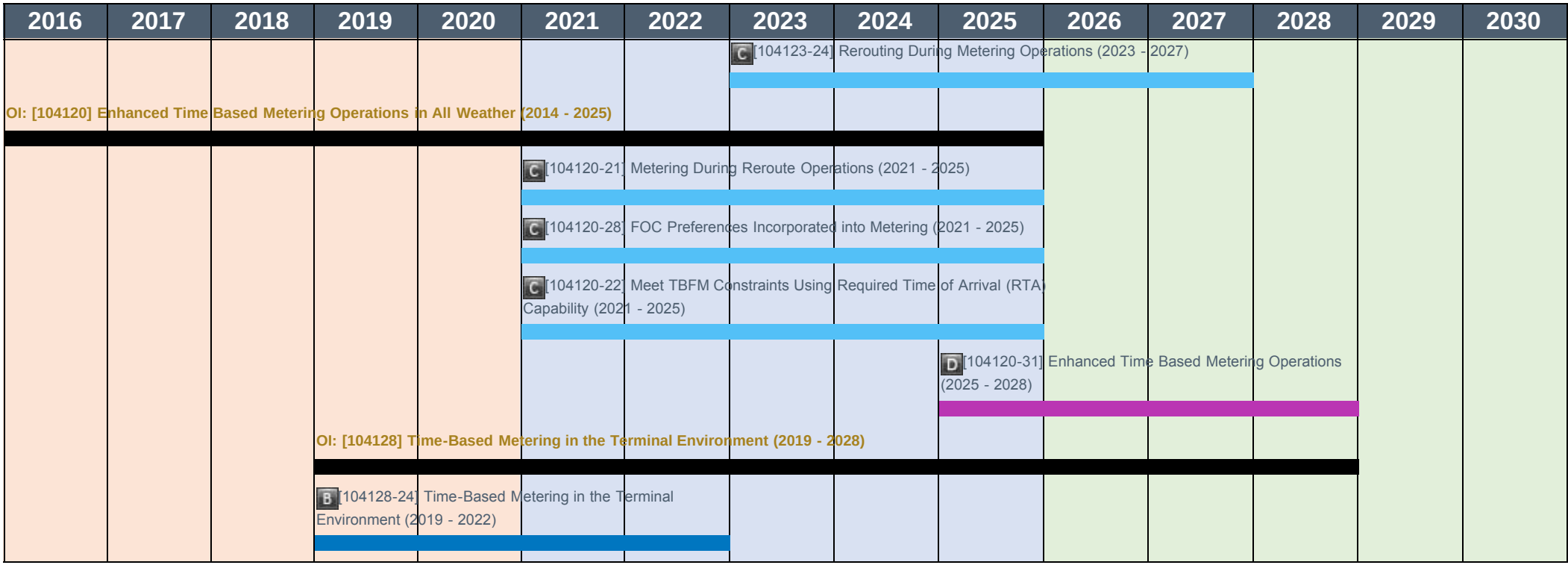
Time-Based Flow Management Portfolio



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

B Bravo C Charlie D Delta

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Bravo - Charlie - Delta

Portfolio Overview

Collaborative Air Traffic Management (CATM) coordinates flight and flow decision-making by flight planners and FAA traffic managers to improve overall efficiency, provide greater flexibility to flight planners, and make the best use of available airspace and airport capacity. The overall philosophy driving the delivery of CATM services is to accommodate user preferences to the maximum extent possible. Traffic managers impose Traffic Management Initiatives (TMIs) to account for congestion, weather, special activity airspace, or other constraints. TMIs are the means by which traffic managers manage constraints. These initiatives can alter users' flight plans. The impact of TMIs can be reduced by tailoring flow management actions to specific flights. This can be done through a combination of increased information on the users' preferred alternative routes; enhanced tools for assessing the impact of rerouting decisions; and improved communications and display of instructions to the controllers who must implement the initiatives. The three Operational Improvements (OIs) in this portfolio contain incremental steps to achieve these goals. In the Bravo timeframe, CATM focuses on providing traffic managers with improved Decision-Support Tools (DSTs) to better predict, identify, and resolve imbalances between traffic demands and NAS capacity. The primary function of Traffic Flow Management (TFM) is to safely manage flows of air traffic to assure efficient throughput in the NAS. This is a collaborative effort between NAS users and TFM service providers to share plans and provide information to enable timely actions to adjust to traffic and environmental dynamics over time. TFM is conducted from a national level to areas as small as a single airport, and from days in advance of a flight to real-time airborne adjustments. The need for strategic and tactical situational awareness, planning, and action requires timely and accurate information as well as timely and efficient collaboration and coordination between decision-makers. Automated tools that enable meeting these demands across all levels of the traffic management team are critical to maintaining both the safety and efficiency of NAS operations. Benefits resulting from the Bravo increments will include increased system efficiency, flexibility, predictability, and capacity.

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.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)
5	5
Charlie (2021-2025)	**Delta (2026-2030)**
17	4

Total Number Initial Operationally Available Increments

Alpha 0 of 5 (0%)

Bravo 2 of 5 (40%)

Charlie 0 of 17 (0%)

Delta 0 of 4 (0%)

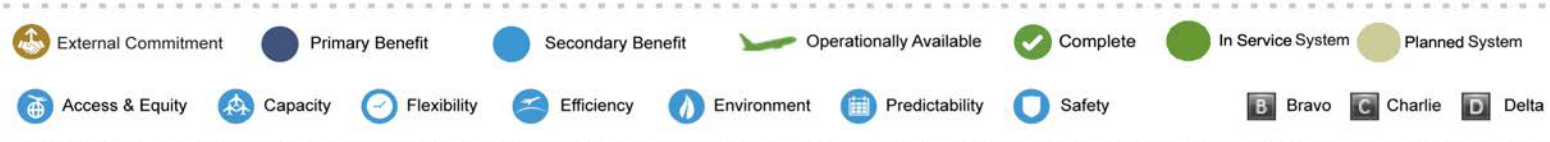
Total Number of Complete Increments

Alpha 5 of 5 (100%)

Bravo 1 of 5 (20%)

Charlie 0 of 17 (0%)

Delta 0 of 4 (0%)



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Operational Improvements/Current Operations & Increments

Benefits

OI: [101102] Provide Automated Flight Plan Constraint Evaluation with Feedback (2012 - 2025)

- C [101102-21] Constraint Evaluation Feedback **(2021 - 2025)**
- C [101102-22] Additional Flight Plan Options and Preferences **(2021 - 2025)**
- C [101102-23] Constraint Feedback for Flight Plan Segments **(2022 - 2025)**

OI: [101103] Provide Flight Plan Evaluation and Feedback in all Phases of Flight (2018 - 2025)

- B [101103-21] Aircraft Access to Flight Planning Information **(2018 - 2020)**
- C [101103-32] Aircraft Access to Advanced Flight Planning Information **(2021 - 2025)**
- C [101103-33] Access to Airborne Reroute Evaluation, Feedback, and Synchronization **(2021 - 2025)**

OI: [104102] Optimized Oceanic Trajectories via Interactive Planning (2020 - 2025)

- C [104102-21] User Tactical Trajectory Feedback **(2022 - 2025)**

CO: [104115] Current Tactical Management of Flow in En Route for Arrivals and Departures

- C [104115-21] Automation Support for Space Vehicle Operations **(2021 - 2025)**

OI: [104117] Improved Management of Arrival/Surface/Departure Flow Operations (2015 - 2030)

- D [104117-31] Collaborative Airport and Airspace Flow Management **(2026 - 2030)**

OI: [104208] Enhanced Departure Flow Operations (2016 - 2019)

- B [104208-11] Delivery of Pre-Departure Reroutes to Controllers **(2016 - 2017)**

OI: [105207] Full Collaborative Decision Making (2020 - 2030)

- B [105207-26] Integrated Departure Route Planning **(2020 - 2022)**
- C [105207-28] Airborne Trajectory Negotiation **(2021 - 2025)**
- D [105207-22] Daily Objectives Exchange **(2026 - 2030)**

OI: [105208] Traffic Management Initiatives with Flight-Specific Trajectories (2012 - 2025)

- B [105208-21] Airborne Rerouting **(2016 - 2017)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

B Bravo · C Charlie · D Delta

Collaborative Air Traffic Management Portfolio

C [105208-23] Arrival Route Availability Planning **(2021 - 2025)**

C [105208-24] Aircraft Equipage Eligibility During TMIs **(2020 - 2024)**

C [105208-25] Advanced Flight-Specific Trajectories **(2021 - 2025)**

CO: [105302] Initial Flight Day Evaluation (2011 - 2018)

B [105302-27] User Input to Improve Departure Predictions **(2016 - 2018)**

OI: [105303] Advanced Flight Day Evaluation (2020 - 2028)

C [105303-21] Improve Demand Predictions **(2020 - 2022)**

C [105303-22] Probabilistic Constraint Prediction **(2022 - 2024)**

C [105303-23] Integrate TMI Modeling **(2021 - 2025)**

C [105303-24] Enhanced Post Operations **(2022 - 2024)**

C [105303-26] Improved Statistical Methods for Departure Predictions **(2023 - 2025)**

C [105303-27] Improve SAA-Based Flow Predictions **(2020 - 2025)**

D [105303-25] Airport Acceptance Rate Decision Support **(2026 - 2028)**

OI: [108206] Flexible Airspace Management (2021 - 2030)

D [108206-33] Flexible Airspace Design and Selection **(2026 - 2030)**

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

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

B Bravo | C Charlie | D Delta

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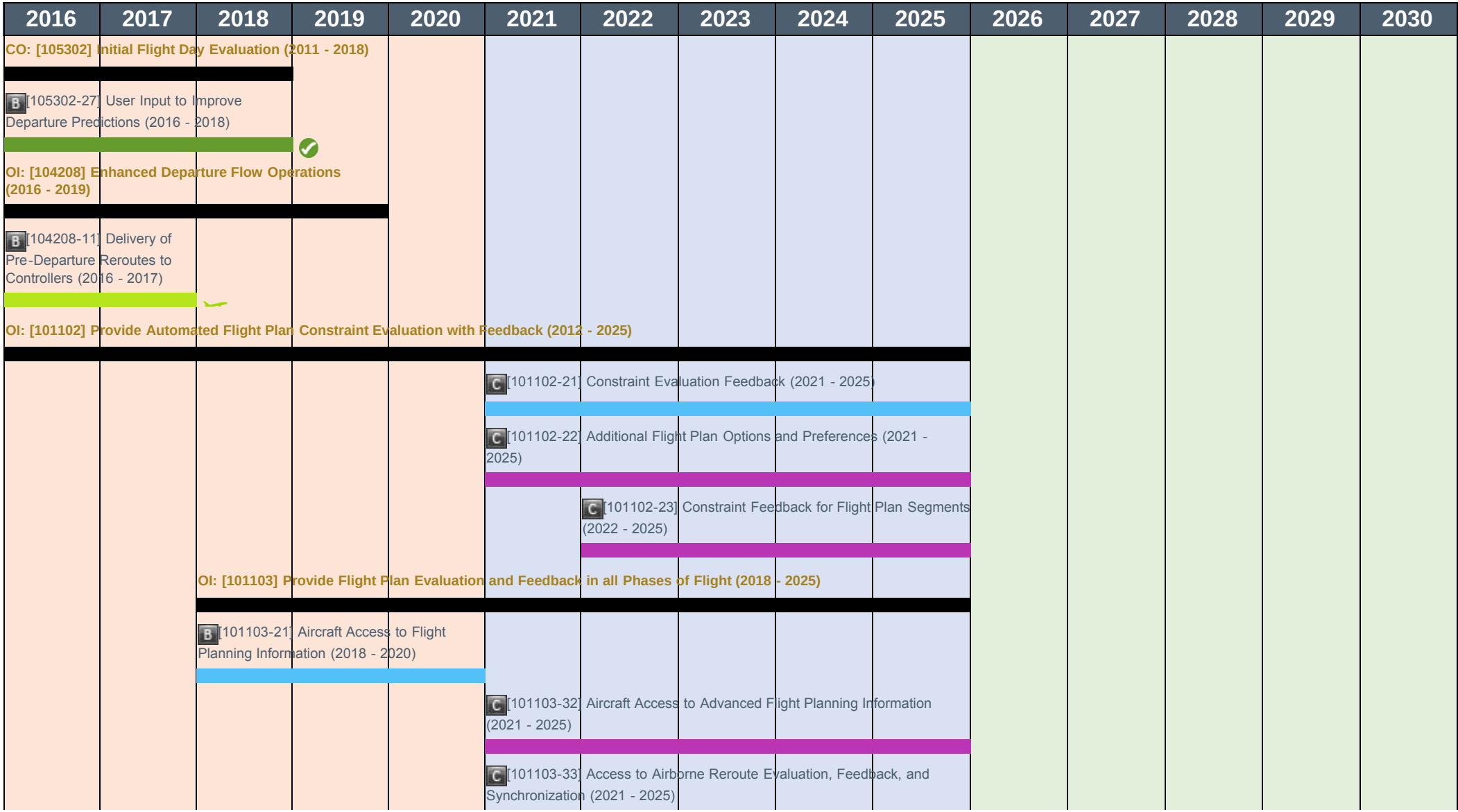
Collaborative Air Traffic Management Portfolio



Planned | Concept Exploration & Maturation | Development | Inital Operation Availability | Complete | Current Operation

B Bravo | C Charlie | D Delta

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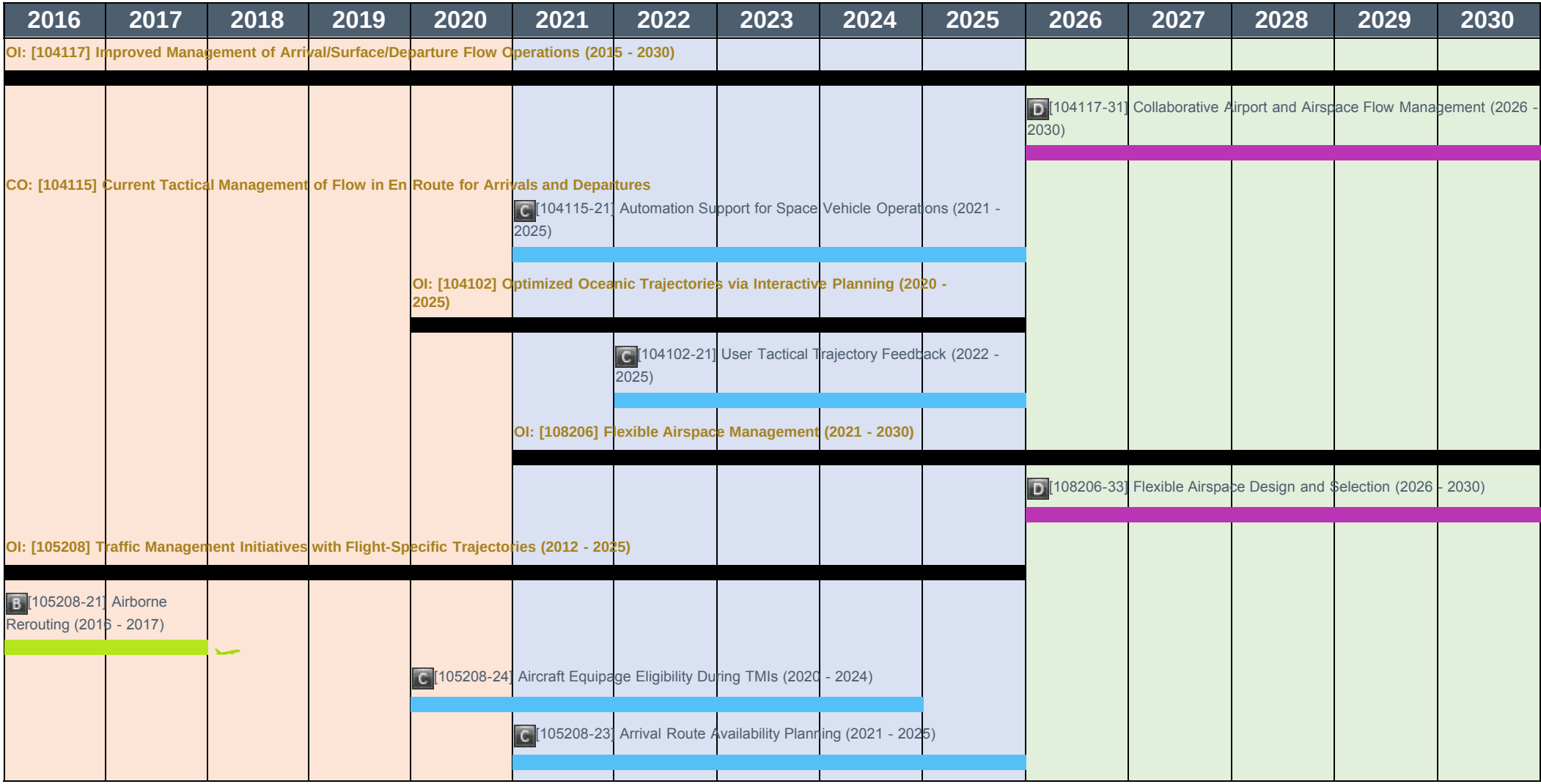
Collaborative Air Traffic Management Portfolio



Planned | Concept Exploration & Maturation | Development | Inital Operation Availability | Complete | Current Operation

B Bravo C Charlie D Delta

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Collaborative Air Traffic Management Portfolio

Planned | Concept Exploration & Maturation | Development | Inital Operation Availability | Complete | Current Operation

B Bravo C Charlie D Delta

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Bravo - Charlie - Delta

Portfolio Overview

Enhancements to Separation Management will provide controllers with tools and procedures to manage aircraft in a mixed environment of varying navigation equipment and wake performance capabilities. Aircraft separation assurance is the cornerstone of Air Traffic Control (ATC) operations. Separation management in the National Airspace System (NAS) can be accomplished procedurally and/or by using automation support. The enhancements to aircraft separation standards based on the revision of wake turbulence categories and enhancements to the terminal and oceanic automation systems are required to support separation management. Separation management is performed in a different way in each of the domains. New wake turbulence categories will provide controllers with new guidance on how to procedurally apply wake turbulence separation criteria in certain situations, primarily for arrivals and departures. The automation changes required will assist controllers in performing separation management for specific conditions and types of operations in their respective domains.

In the Bravo timeframe this portfolio focuses on the following:

- Satisfying user operational needs
- Improving operational efficiency
- Increasing access to the NAS
- Enhancing sector team efficiency
- Geographically expanding current capabilities
- Maintaining and improving the safety of the NAS

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.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)
3	5
Charlie (2021-2025)	**Delta (2026-2030)**
13	14

Total Number of Increments in Inital Operationally Available Status

Alpha 0 of 3 (0%)

Bravo 2 of 5 (40%)

Charlie 0 of 13 (0%)

Delta 0 of 14 (0%)

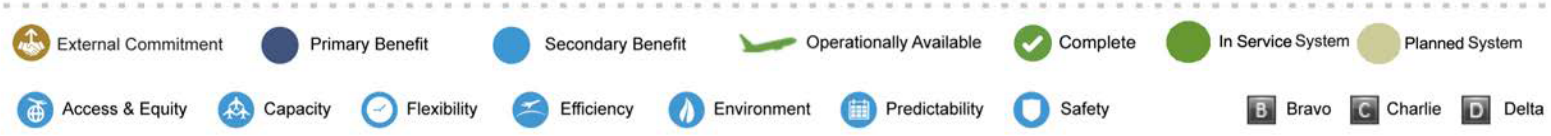
Total Number of Increments in Complete Status

Alpha 3 of 3 (100%)

Bravo 2 of 5 (40%)

Charlie 0 of 13 (0%)

Delta 0 of 14 (0%)



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Operational Improvements/Current Operations & Increments

Benefits

OI: [101202] Flight Management with Trajectory (2017 - 2030)

C [101202-22] Unique Attributes for UAS Flight Planning **(2022 - 2026)**

CO: [102105] Current Oceanic Separation

C [102105-21] Advanced Surveillance Enhanced Procedural Separation (ASEPS) for the Ocean **(2020 - 2023)**

CO: [102108] Oceanic In-Trail Climb and Descent (2010 - 2016)

B [102108-12] Enhanced Oceanic Climb/Descent Procedure via ADS-C Automation **(2016)**

B [102108-13] Automatic Dependent Surveillance-Broadcast (ADS-B) Oceanic In-Trail Procedure and Automation **(2011 - 2016)**

CO: [102112] Current En Route Separation

C [102112-31] UAS Detect and Avoid **(2022 - 2026)**

D [102112-22] UAS ATC Direct Communications **(2026 - 2029)**

OI: [102117] Reduced Horizontal Separation Standards, En Route - 3 Miles (2020 - 2030)

C [102117-22] Active Surveillance Collision Avoidance **(2020 - 2025)**

D [102117-23] Expanded Use of 3 NM Separation Airspace **(2027 - 2030)**

D [102117-24] En Route Wake Turbulence Encounter Mitigation **(2027 - 2030)**

OI: [102118] Relative Spacing Using Interval Management (2028 - 2035)

D [102118-23] Relative Spacing Using Interval Management - Arrivals and Approach **(2028 - 2035)**

OI: [102137] Automation Support for Separation Management (2014 - 2025)

C [102137-28] Vertical Conformance Verification **(2022 - 2025)**

OI: [102146] Improved Aircraft Trajectories (2024 - 2031)

C [102146-23] Initial Air-Ground Synchronization of Aircraft Intent **(2024 - 2027)**

D [102146-21] Increase Capacity and Efficiency Using Flight Management Computer (FMC) Route Offset **(2027 - 2030)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

B Bravo · C Charlie · D Delta

Separation Management Portfolio

D [102146-22] Air-to-Ground Trajectory Synchronization **(2027 - 2031)**

OI: [102148] Time-Based Spacing Using Interval Management (2025 - 2030)

D [102148-01] Initial Time-Based Spacing Using Interval Management **(2025 - 2030)**

D [102148-02] Advanced Time-Based Spacing using Interval Management **(2025 - 2030)**

OI: [102152] Dynamic, Pair-wise Wake Turbulence Separation (2024 - 2030)

D [102152-31] Dynamic, Pair-wise Wake Separation Standards **(2024 - 2027)**

OI: [102154] Wake Re-Categorization (2014 - 2020)

B [102154-21] Wake Re-Categorization Phase II - Static, Pair-wise Wake Separation Standards **(2016 - 2018)**

OI: [102157] Improved Parallel Runway Operations with Airborne Applications (2020 - 2030)

C [102157-31] Operation Specific Collision Avoidance **(2020 - 2026)**

OI: [102158] Automated Support for Initial Trajectory Negotiation (2019 - 2027)

C [102158-03] Enhanced En Route Data Communications Services **(2024 - 2027)**

OI: [102160] Advanced Automation Support for Separation Management (2025 - 2030)

D [102160-01] En Route Conformance Monitor for PBN Routes **(2027 - 2030)**

D [102160-02] Controller Tools for Managing Advanced Wake Separation Standards **(2025 - 2030)**

D [102160-03] Separation Tools to Increase PBN Route Utilization **(2027 - 2030)**

OI: [104102] Optimized Oceanic Trajectories via Interactive Planning (2020 - 2029)

C [104102-22] Approval of User Requests in Oceanic Airspace - Auto Re-Probe **(2020 - 2025)**

C [104102-25] Preferred Oceanic Routes Through Automated Airspace Reservations **(2026 - 2029)**

C [104102-30] Enhanced Conflict Probe for ATOP Surveillance Airspace **(2020 - 2025)**

C [104102-37] Improved Oceanic Weather Routes **(2020 - 2025)**

OI: [104104] Initial Conflict Probe Improvements (2026 - 2030)

D [104104-01] More Efficient Conflict Resolution in En Route Airspace **(2026 - 2030)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

B Bravo · C Charlie · D Delta

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Separation Management Portfolio

OI: [104127] Automated Support for Conflict Resolution (2026 - 2030)

D [104127-22] Approval of User Requests and Resolving Conflicts with Multiple Maneuvers in En Route Airspace Phase 2 **(2026 - 2030)**

OI: [108212] Improved Management of Special Activity Airspace (2015 - 2025)

C [108212-22] Increased Utilization of SAAs in En Route Airspace **(2021 - 2025)**

OI: [108214] UAS Airspace Access (2017 - 2022)

B [108214-01] UAS Airspace Access when Operating within Visual Line of Sight **(2017 - 2018)**

B [108214-02] UAS Airspace Access when Operating Beyond Visual Line of Sight **(2019 - 2022)**

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety | B Bravo | C Charlie | D Delta

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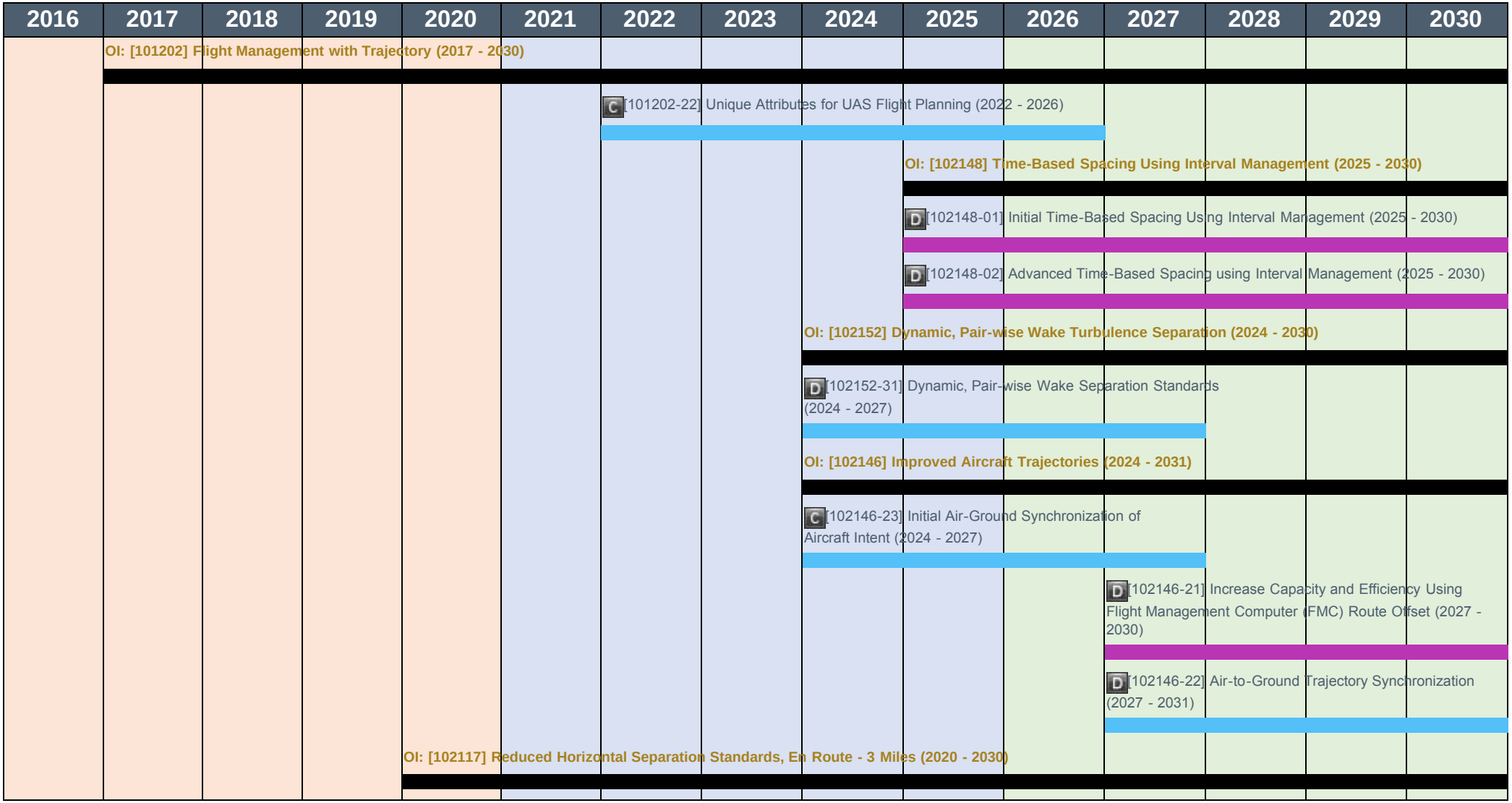
Separation Management Portfolio



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

B Bravo | C Charlie | D Delta

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Separation Management Portfolio

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

B Bravo | C Charlie | D Delta

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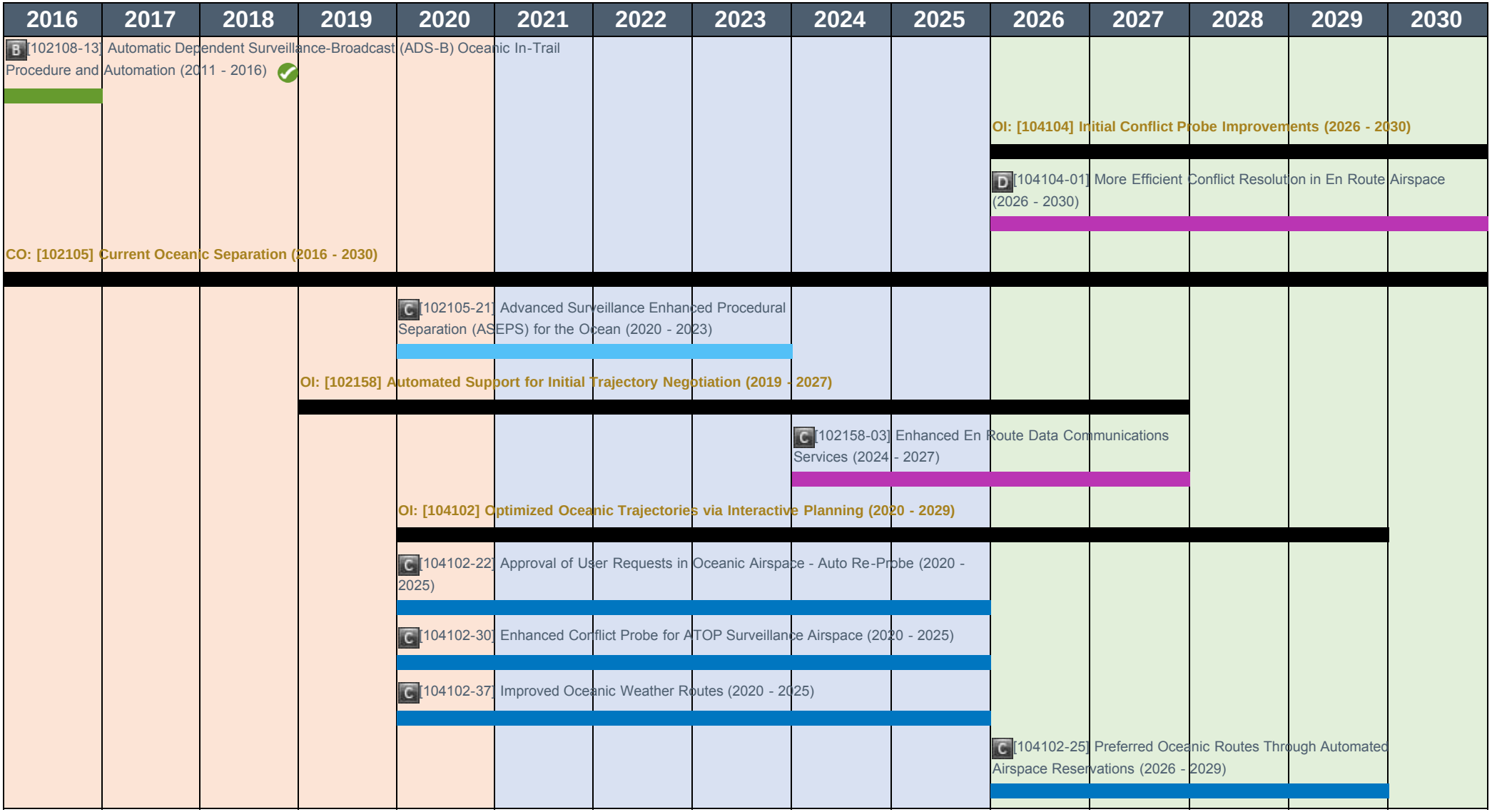
Separation Management Portfolio



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

B Bravo C Charlie D Delta

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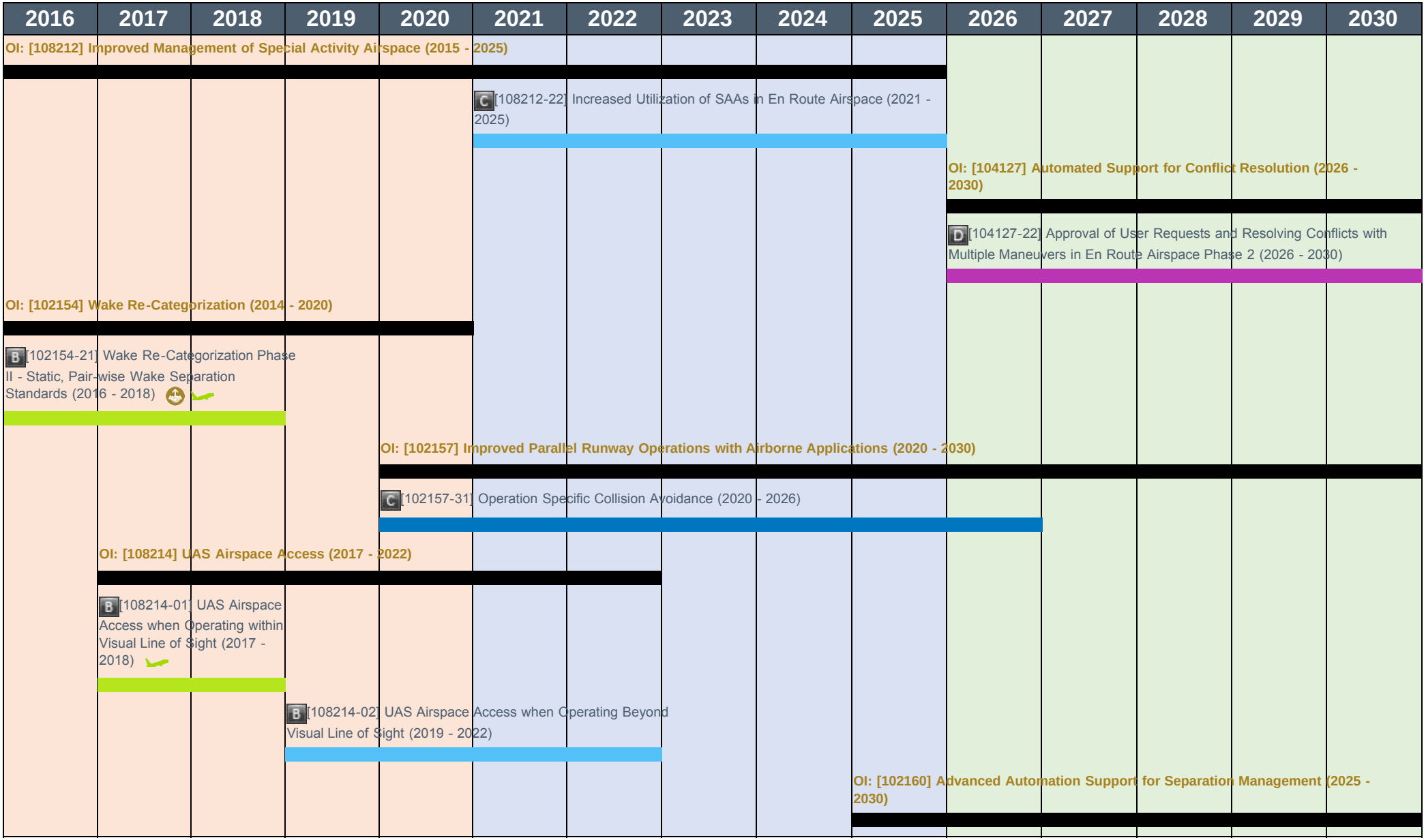
Separation Management Portfolio



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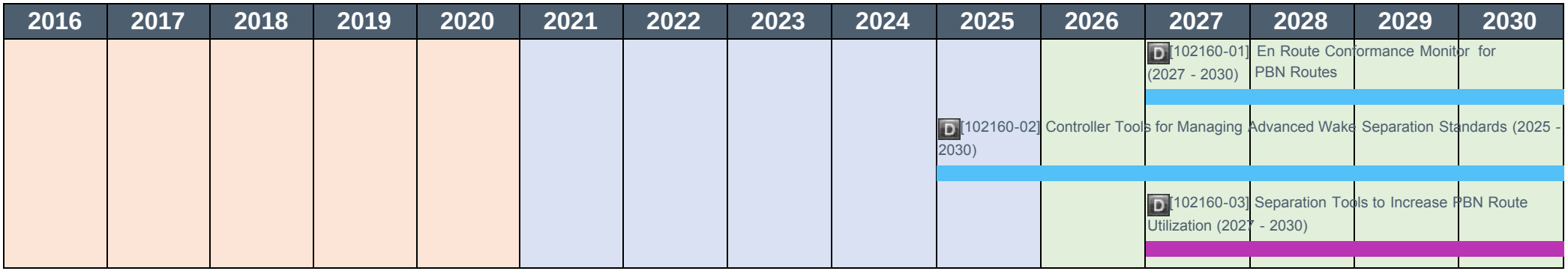
Separation Management Portfolio



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

B Bravo C Charlie D Delta

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Bravo - Charlie - Delta

Portfolio Overview

The On-Demand National Airspace System (NAS) Information portfolio will implement programs and processes to ensure that NAS and aeronautical information are consistent across applications and locations, and are available to authorized subscribers and equipped aircraft. Users will request NAS information when planning flights through services that will allow them to collaborate with Air Navigation Service Providers (ANSPs), resulting in improved flow management and efficient use of resources. In-flight Air Traffic Management (ATM) planning will be improved by making consistent data on constraints available to all NAS users. For example, it will increase the ability to adapt to changing conditions by making better use of flight paths through inactive Special-Use Airspace (SUA) and adjusting routes per event notification information. The initial Segment Alpha capabilities will be delivered primarily as part of capabilities implemented by the Aeronautical Information Management (AIM) program. The capabilities will focus on providing users within (i.e., ANSP) and outside of the NAS with reliable and relevant SUA schedule changes and Notice to Airmen (NOTAM) constraints. This information will be disseminated via a System-Wide Information Management (SWIM)-based approach, Traffic Information Service-Broadcast (TIS-B), and Flight Information Services-Broadcast (FIS-B).

In the Bravo timeframe this portfolio focuses on enhancing advisory services and quality of information shared with flight operators. When airspace users are unable to receive consistent information, status, or conditions affecting flight planning and flight operations, the result is inefficient and inflexible routing options. The manual nature of record-keeping and updating the information, as well as the manual sharing of the information, leads to the user's being presented with inconsistent, incomplete, and in some instances irrelevant information.

Improving the consistency, completeness, and accuracy of the NAS advisory service information has the following anticipated benefits:

- Reduced fuel burn and operating costs related to planning around constraints that are not accurate representations of NAS status and airspace usage
- Increased flexibility of the NAS to enable users to adapt according to their own needs
- Maintenance and improved safety of the NAS.

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.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)	Charlie (2021-2025)	Delta (2026-2030)
5	3	7	1

Total Number of Increments in Inital Operationally Available Status

Alpha 0 of 5 (0%)

Bravo 1 of 3 (33%)

Charlie 0 of 7 (0%)

Delta 0 of 1 (0%)

Total Number of Increments in Complete Status

Alpha 5 of 5 (100%)

Bravo 1 of 3 (33%)

Charlie 0 of 7 (0%)

Delta 0 of 1 (0%)

Operational Improvements/Current Operations & Increments

Benefits

OI: [101202] Flight Management with Trajectory (2017 - 2030)

- C [101202-23] Extended Flight Planning Horizon **(2022 - 2025)**
- D [101202-21] Command and Control Flight Information Service **(2026 - 2030)**

OI: [101203] UAS Flight Information (2017 - 2022)

- B [101203-01] Initial Notification and Authorization Planning for Part 101 and Part 107 Operators **(2017 - 2018)**
- C [101203-02] UAS Flight Information Management System **(2019 - 2022)**

OI: [103305] On-Demand NAS Information (2011 - 2020)

- B [103305-12] Improved Access to NAS Aeronautical, Status, and Constraint Information for Authorized NAS Users and Subscribers **(2018 - 2020)**

OI: [103306] Tailored Delivery of On-Demand NAS Information (2019 - 2025)

- C [103306-01] Static Airspace Constraints **(2022 - 2025)**
- C [103306-05] UAS Advisory Information **(2020 - 2025)**

OI: [108206] Flexible Airspace Management (2021 - 2030)

- C [108206-34] Increased Flexibility in Inter-Facility Sector Transfer **(2021 - 2025)**

OI: [108212] Improved Management of Special Activity Airspace (2015 - 2025)

- B [108212-21] Improved Access to SAA Information **(2018 - 2022)**
- C [108212-11] ANSP Real-Time Status for SAAs **(2020 - 2023)**
- C [108212-24] Planned Airspace Constraints **(2023 - 2025)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

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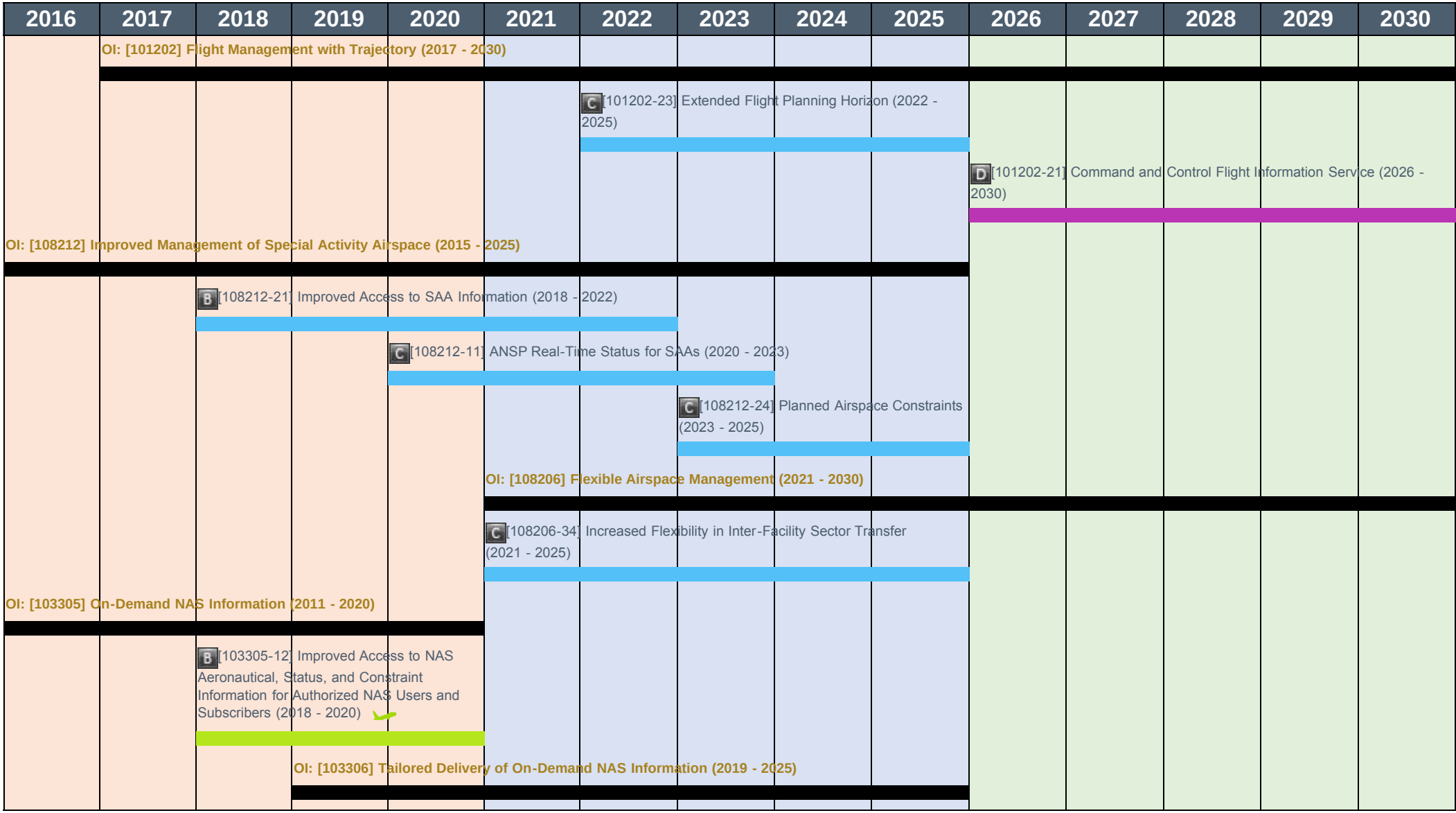
On-Demand NAS Information Portfolio



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

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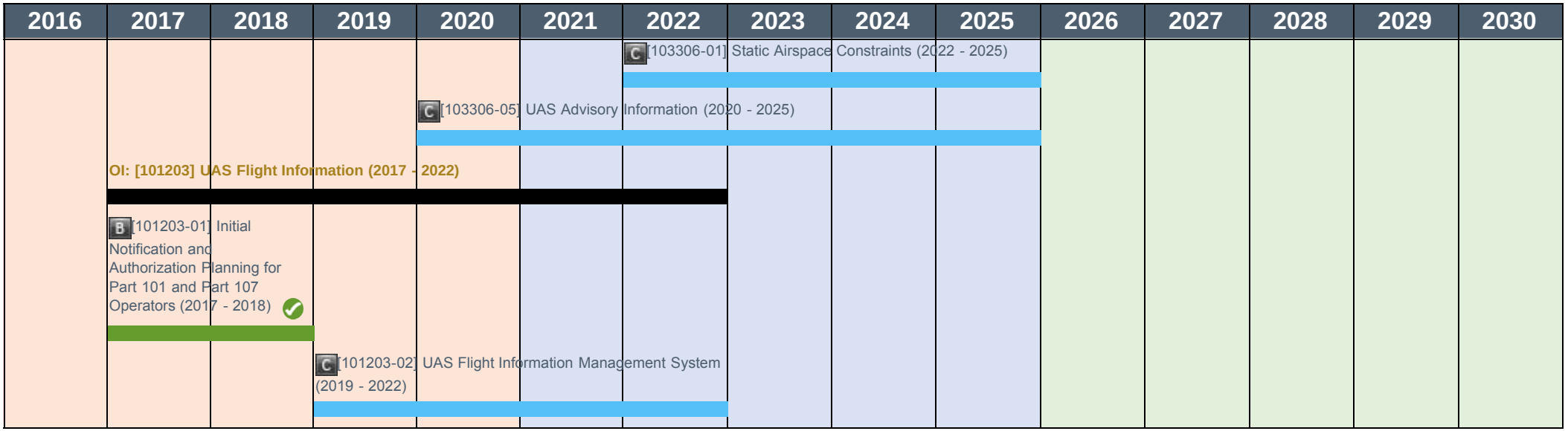
On-Demand NAS Information Portfolio



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

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Portfolio Overview

The environmental vision for the FAA's strategic plan is to develop and operate a system that reduces aviation's environmental and energy impacts to a level that does not constrain growth and is a model of sustainability. Aircraft noise, air quality, climate, and energy are the most are the most significant potential environmental constraints to increasing aviation capacity, efficiency, and flexibility. Limiting and reducing future aviation environmental impacts to levels that protect public health and welfare as well as ensuring energy availability and sustainability are the guiding principles of aviation environmental protection. The FAA is pursuing the following environmental goals:

Noise: Reduce the number of people exposed to significant noise around U.S. airports in absolute terms, notwithstanding aviation growth, and provide additional measures to protect public health and welfare and national resources.

Air Quality: Achieve an absolute reduction of significant air quality health and welfare impacts attributable to aviation.

Climate: Limit the impact of aircraft carbon dioxide (CO2) emissions on the global climate by achieving carbon-neutral growth by 2020 compared to 2005, and net reductions of the climate impact from all aviation emissions over the longer term (by 2050).

Energy: Improve National Airspace System (NAS) energy efficiency and develop and deploy alternative jet fuels for commercial aviation.

To achieve these goals, the FAA's environmental and energy research strategy is based on characterization of the problem and assessment of associated risks; development of technological and policy based solutions; and management of system-wide performance while working closely with stakeholders community. The FAA Office of Environment and Energy is pursuing 5-pillar approach to meet environmental goals (1) Improve scientific knowledge and enhance integrated environmental modeling capability; (2) accelerate maturation of new aircraft technologies; (3) advance alternative jet fuels; (4) explore air traffic management modernization and operational improvements; and (5) develop policies, environmental standards, and market based measures. The Operational Improvements and increments reflect this strategy.

Activities in this portfolio will be conducted in such a way that they do not impact the safety of the NAS. In the Bravo timeframe this portfolio will build on progress from the enabling activities in the Alpha timeframe, which includes Phase 2 maturation of environmentally friendly technologies, fuels, and continued focus on environmental and energy- favorable concepts and operations.

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.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)	Charlie (2021-2025)	Delta (2026-2030)
22	8	5	0

Total Number of Increments in Inital Operationally Available Status

Alpha 0 of 22 (0%)

Bravo 4 of 8 (50%)

Charlie 0 of 5 (0%)

Delta 0 of 0 (0%)

Total Number of Increments in Complete Status

Alpha 22 of 22 (100%)

Bravo 3 of 8 (38%)

Charlie 0 of 5 (0%)

Delta 0 of 0 (0%)

Operational Improvements/Current Operations & Increments

Benefits

OI: [701103] Integrated Environmental Modeling - Phase II (2016 - 2020)

- B [701103-01] Aviation Environmental Tools Suite **(2016 - 2020)**

OI: [701104] Integrated Environmental Modeling - Phase III (2021 - 2025)

- C [701104-01] Aviation Environmental Tools Suite - Phase III **(2021 - 2025)**

CO: [702102] NextGen Environmental Engine and Aircraft Technologies - Phase I (2012 - 2017)

- B [702102-07] Ultra High-Bypass Ratio Geared Turbo Fan **(2015 - 2017)**

OI: [702103] NextGen Environmental Engine and Aircraft Technologies - Phase II (2016 - 2020)

- B [702103-03] Explore and Demonstrate New Technologies Under CLEEN - Phase II **(2016 - 2020)**

OI: [702104] NextGen Environmental Engine and Aircraft Technologies - Phase III (2021 - 2025)

- C [702104-01] Explore and Demonstrate New Technologies Under CLEEN - Phase III **(2021 - 2025)**

OI: [703103] Sustainable Alternative Jet Fuels - Phase II (2016 - 2020)

- B [703103-01] Other Advanced Drop-In Aviation Alternative Jet Fuels - Phase II **(2016 - 2020)**
- B [703103-02] Generic Methodology for Alternative Jet Fuel Approval **(2016 - 2020)**

OI: [703104] Sustainable Alternative Jet Fuels - Phase III (2021 - 2025)

- C [703104-01] Support Qualification and Deployment of Drop-In Alternative Jet Fuels **(2021 - 2025)**

OI: [704103] Environmental Policies, Standards and Measures - Phase II (2016 - 2020)

- B [704103-01] Environmental Performance and Targets - Phase II **(2016 - 2020)**
- B [704103-03] EMS Data Management **(2016 - 2020)**
- B [704103-04] Analysis to Support International Environmental Standard-Setting - Phase II **(2016 - 2020)**

OI: [704104] Environmental Policies, Standards and Measures - Phase III (2021 - 2025)

- C [704104-01] Environmental Performance and Targets - Phase III **(2021 - 2025)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

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C [704104-02] Analysis to Support International Environmental Standard-Setting - Phase III **(2021 - 2025)**

Environment and Energy Portfolio

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Portfolio Overview

The planned growth and complexity in the air transportation system requires a fundamental change in the way the air transportation community manages safety. System safety management research provides a shared, proactive approach to identifying, assessing and mitigating risk, enabling all stakeholders to be more effective in their approach to managing safety.

This portfolio contains activities that will improve safety in the NAS and ensure that changes introduced with NextGen capabilities enhance safety. These activities will support development of safety standards and risk mitigation efforts to be applied systematically to the air transportation system in order to support improved safety practices.

System Safety Management benefits the American Public by reducing aviation accidents and fatalities across a broad range of aviation communities. Aviation Safety Information Analysis and Sharing (ASIAS) discovers and analyzes safety risks in the NAS and supports safety enhancements to mitigate risk, working with the Commercial Aviation Safety Team (CAST), the General Aviation Joint Steering Committee (GAJSC), FAA stakeholders and other government agencies. System Safety Management Transformation (SSMT) discovers safety risks in the NAS through its anomaly detection tools and analyzes those risks through its integrated baseline safety risk models, contributing to overall safety through risk-informed evaluation of proposed changes to operations and proposed safety enhancements.

The SSM portfolio includes the following projects:

- ASIAS: A collaborative government and industry initiative to share and analyze data to proactively discover system safety concerns before accidents or incidents occur, leading to timely mitigation and prevention. Information shared within ASIAS will be used to enable future System Safety Assessment.

- SSMT: A stakeholder-driven, cross-functional effort to incorporate best-available and most timely safety risk data and current and forecasted operations spanning NAS operations. Its anomaly detection and safety risk assessment tools reflect historical fatal accidents and significant incidents, represent potential system failures and barrier interdependencies, and support identification of latent and emergent risk.

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.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)
11	8
Charlie (2021-2025)	**Delta (2026-2030)**
6	0

Total Number of Increments in Inital Operationally Available Status

Alpha 0 of 11 (0%)
Bravo 1 of 8 (13%)
Charlie 0 of 6 (0%)
Delta 0 of 0 (0%)

Total Number of Increments in Complete Status

Alpha 11 of 11 (100%)
Bravo 0 of 8 (0%)
Charlie 0 of 6 (0%)
Delta 0 of 0 (0%)

Operational Improvements/Current Operations & Increments

Benefits

OI: [601103] Safety Information Sharing and Emergent Trend Detection (2016 - 2020)

- B [601103-01] Additional ASIAS Participants **(2016 - 2020)**
- B [601103-02] NextGen Enabled Data **(2016 - 2020)**
- B [601103-03] Architecture Evolution and NextGen Support **(2016 - 2020)**
- B [601103-04] Analytical Capabilities in Support of NextGen **(2016 - 2020)**
- B [601103-05] Automated Vulnerability Discovery **(2016 - 2020)**
- B [601103-06] Continued Studies and Results **(2016 - 2020)**
- B [601103-07] Expanded Collaboration Environments **(2016 - 2020)**

OI: [601104] Automated Safety Information Sharing and Analysis (2021 - 2025)

- C [601104-01] Expanded Participation **(2021 - 2025)**
- C [601104-02] Data Fusion **(2021 - 2025)**
- C [601104-03] Expanded Analytical Capabilities to Include New Entrants **(2021 - 2025)**
- C [601104-04] Vulnerability Discovery through Automated Trend Detection **(2021 - 2025)**

OI: [601202] Integrated Safety Analysis and Modeling (2014 - 2025)

- B [601202-05] Integrated NAS-wide Automation System Modeling and Anomaly Detection **(2016 - 2020)**
- C [601202-06] Integrated Tools for Safety Risk Assessment Modeling **(2021 - 2025)**

OI: [601302] Increase International Cooperation for Aviation Safety (2019 - 2025)

- C [601302-01] EUROCONTROL-FAA Joint Analytical Platform Development and Deployment **(2019 - 2025)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

Access & Equity · Capacity · Flexibility · Efficiency · Environment · Predictability · Safety · B Bravo · C Charlie · D Delta

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System Safety Management Portfolio

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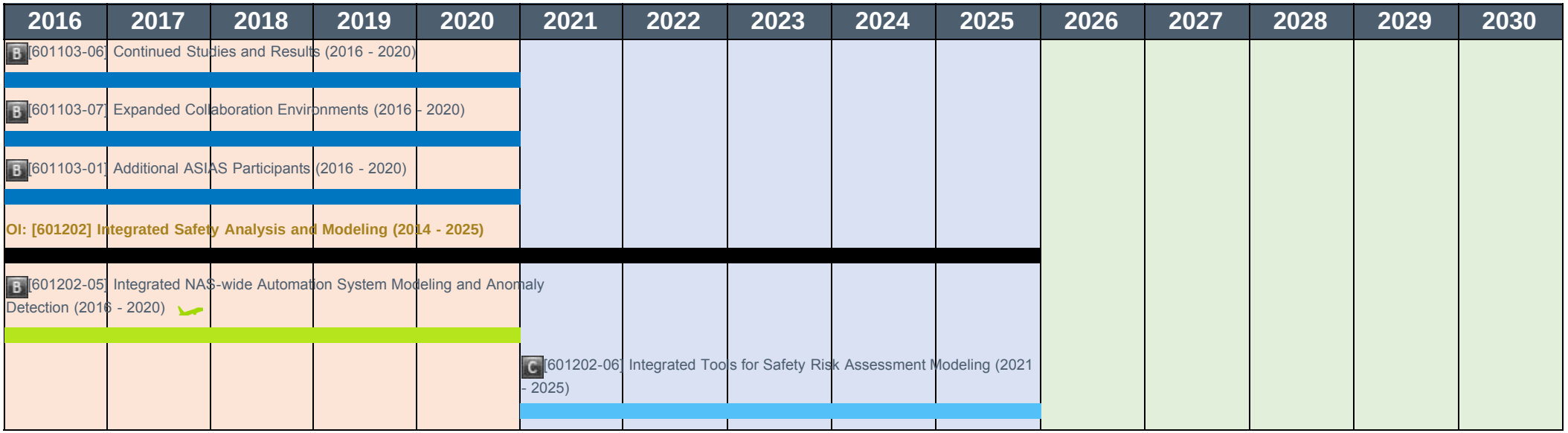
System Safety Management Portfolio



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

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Bravo - Charlie - Delta

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 an Operational Improvements (OIs).

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

- Communications
- Oceanic
- Information Management
- Weather
- Facilities

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

- Capacity
- Flexibility
- Efficiency
- 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 4-D Trajectories and Advanced Flight Interval Management.

The Oceanic capability focuses on the Advanced Technologies and Oceanic Procedures (ATOP) system and oceanic automation. Sustaining oceanic automation and enhancing information exchange between oceanic and other domains is a key goal of these improvements. The Information Management capabilities focus on improvements needed to accomplish the following:

- Enhance flight data exchange between controllers in non-surveillance sectors
- Improve information sharing between en route sector controllers using an integrated display
- Integrate surface surveillance data and flight data
- Enhance data exchange with flight operations centers (FOCs) and airport operators

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 capability seeks 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.

Total Number of Increments By Segment

Alpha (2010-2015)	Bravo (2016-2020)	Charlie (2021-2025)	Delta (2026-2030)
0	11	11	3

Total Number of Increments in Inital Operationally Available Status

Alpha 0 of 0 (0%)

Bravo 1 of 11 (9%)

Charlie 0 of 11 (0%)

Delta 0 of 3 (0%)

Total Number of Increments in Complete Status

Alpha 0 of 0 (0%)

Bravo 0 of 11 (0%)

Charlie 0 of 11 (0%)

Delta 0 of 3 (0%)

Operational Improvements/Current Operations & Increments

Benefits

CO: [102105] Current Oceanic Separation

D [102105-15] ATOP in Transition Sectors **(2025 - 2028)**

OI: [102158] Automated Support for Initial Trajectory Negotiation (2019 - 2027)

B [102158-01] Initial En Route Data Communication Services **(2019 - 2021)**

C [102158-02] Full En Route Data Communication Services **(2022 - 2025)**

OI: [103119] Initial Integration of Weather Information into NAS Automation and Decision Making (2012 - 2022)

B [103119-11] Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making **(2020 - 2022)**

B [103119-13] Enhanced In-Flight Icing Diagnosis and Forecast **(2014 - 2022)**

B [103119-14] Enhanced Weather Radar Information for ATC Decision-Making **(2020 - 2022)**

B [103119-15] Extended Convective Weather on Traffic Forecast for NextGen Decision-Making **(2020 - 2022)**

B [103119-16] Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations **(2018 - 2022)**

B [103119-17] 4-D Tailored Volumetric Retrievals of Aviation Weather Information **(2018 - 2022)**

B [103119-18] Enhanced Turbulence Forecast and Graphical Guidance **(2018 - 2022)**

B [103119-19] Enhanced Ceiling and Visibility Analysis **(2012 - 2022)**

B [103119-21] Enhanced Convective Weather Using Satellite-Based Observation in Offshore Oceanic Airspace **(2017 - 2022)**

OI: [103123] Full Integration of Weather Information Into NAS Automation and Decision Making (2021 - 2027)

C [103123-01] Aircraft-to-Severe Weather Notification **(2021 - 2026)**

C [103123-02] Net-Enabled Access to NextGen Common Weather Information Source - Enhanced **(2021 - 2026)**

C [103123-03] Enhanced Icing Information **(2021 - 2027)**

C [103123-04] Expanded Turbulence Information **(2021 - 2026)**

C [103123-05] Generation of Enhanced NextGen Weather Information - Extended **(2021 - 2026)**

C [103123-06] Expanded Ceiling and Visibility Information **(2021 - 2026)**

External Commitment · Primary Benefit · Secondary Benefit · Operationally Available · Complete · In Service System · Planned System

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

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C [103123-07] Enhanced Weather Products from Improved Satellite Observation Data **(2023 - 2026)**

C [103123-08] Enhanced Automated Winter Weather Information **(2017 - 2026)**

C [103123-09] Space Weather Information **(2023 - 2026)**

OI: [103210] Aircraft Collision Avoidance for New Aircraft Types (2023 - 2030)

C [103210-31] Collision Avoidance for Unmanned Aircraft Systems **(2023 - 2028)**

D [103210-32] Passive Collision Avoidance **(2026 - 2030)**

OI: [103306] Tailored Delivery of On-Demand NAS Information (2019 - 2025)

B [103306-04] Common Support Services - Weather **(2019 - 2022)**

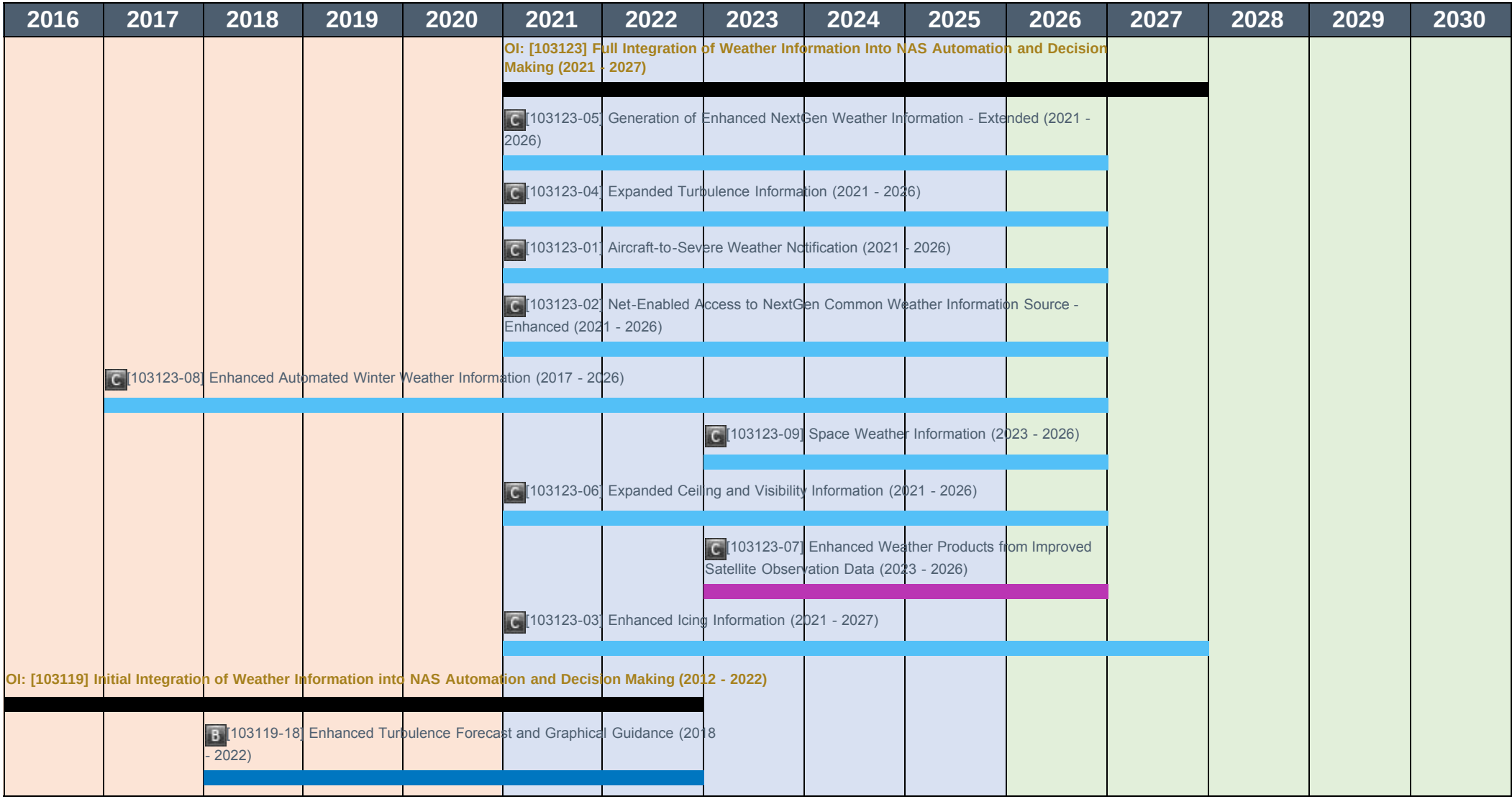
OI: [104122] Integrated Arrival and Departure Airspace Management (2027 - 2031)

D [104122-22] Integrated Arrival and Departure Management Services: Single Facility **(2027 - 2031)**

External Commitment | Primary Benefit | Secondary Benefit | Operationally Available | Complete | In Service System | Planned System

Access & Equity | Capacity | Flexibility | Efficiency | Environment | Predictability | Safety | B Bravo | C Charlie | D Delta

NAS Infrastructure Portfolio



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

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NAS Infrastructure Portfolio

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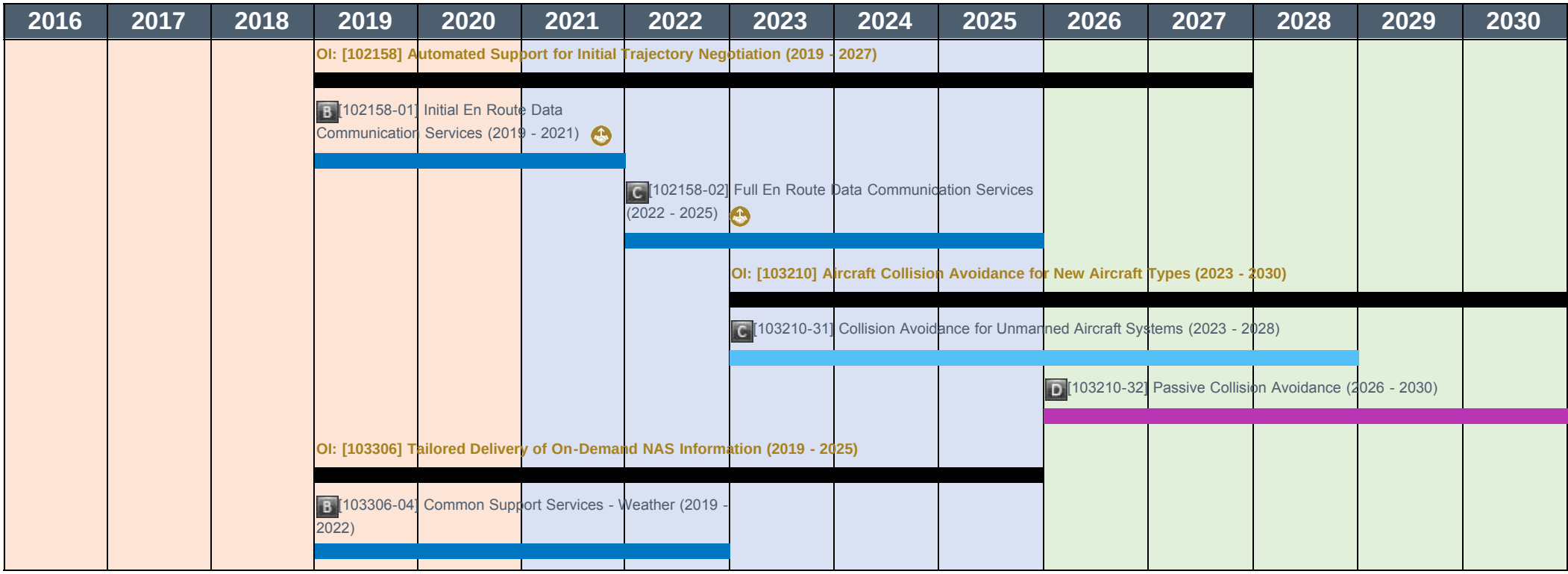
NAS Infrastructure Portfolio



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

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