NextGEN

AVS Work Plan 2015

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From the

Associate Administrator for Aviation Safety

June 2015

Aviation is not a static environment. To keep pace with change we must understand our mission and goals. Our FAA strategic priorities are to make aviation safer and smarter, deliver benefits through technology and infrastructure, enhance global leadership, and empower and innovate with the FAA's people. With this sixth edition of the AVS Work Plan for NextGen, I see AVS supporting each of these priorities and I want to re-emphasize Aviation Safety's commitment to the FAA's overall NextGen implementation. This Work Plan reinforces our safety mission and reviews how AVS organizations contribute to NextGen. From the strategic level to the tactical level, this document shows where you make a difference.

On a monthly basis, we review AVS' progress on these Work Plan initiatives and hold ourselves accountable for the objectives listed.   For example, our standards and guidance documents explain what is expected of the pilot and aircraft as they interact with air traffic control and other aircraft. Our rulemaking accomplishments focus on safety management systems (SMS) and aircraft centric operations. Safety Management Systems and the Aviation Safety Information Analysis and Sharing (ASIAS) help us work smarter by pointing to suspected areas of greater risk, and then working to mitigate this risk.

It is through your efforts we will make aviation safer and smarter. Whether publishing policy, approving operations, or overseeing continued operational safety, your contributions to delivering benefits through technology help us achieve the benefits of NextGen. Through shaping global standards, we better target FAA resources and efforts and enhance global leadership.

I challenge all of us to identify ways to improve our efficiency and continue to perform at the highest standard of safety. Training is an important part of preparing the FAA's workforce of the future, so I am always interested in your ideas and suggestions on ways to increase our effectiveness toward aviation safety. Feedback on this plan can be sent to 9-AVS-AWA-NextGen. Thank you for your continued hard work as we transform our nation's air transportation system.

Margaret Gilligan

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Associate Administrator for Aviation Safety

Document Format

Section 1 focuses on AVS Responsibilities for NextGen Capabilities. It explains how AVS supports PBN, ADS-B, Data Communications, Low-Visibility Operations, Flight Deck Enhancements, Aircraft Engine, Airframe, and Fuel Technologies.

Section 2 describes the accomplishments and plans in each of the enabler categories since publication of the last AVS Work Plan for NextGen. Section 2 also contains the Equipage Level Table summarizing current equipage levels of mature avionics enablers among air transport operators [Title 14 of the Code of Federal Regulations (14 CFR) part 121 operators], air taxis (14 CFR part 91K and 135 operators) and helicopters (14 CFR part 135 operators).

Section 3 lays out the planned schedule for AVS to develop policy documents i.e., Operational Guidance, Equipment Installation Guidance and Equipment Standards in support of NextGen Capabilities that reside onboard the aircraft. It also illustrates AVS policy dependent upon accepted industry standards (e.g., RTCA and PARC).

Photo Courtesy of Joseph Geni, Nationwide IT Services, contractor

Section 1

AVS and NextGEN

This section provides an overview of existing and planned capabilities, the benefits these capabilities enable and which technologies and equipment can take advantage of specific NextGen capabilities.

NEXTGEN CAPABILITIES

NextGen is a collaborative effort between the FAA and the aviation community. Benefits depend on all stakeholders investing in the airspace modernization effort. Improvements in aircraft engines, airframes and fuel technologies, advances in avionics capabilities and changes to airport infrastructure form a vital contribution to NextGen.

The term enabler is used to describe the technologies required for an aircraft, operator or airport to implement a NextGen capability. Each enabler is defined by performance and functional requirements that allow for market flexibility whenever possible. AVS provides guidance for operators in satisfying these requirements and deploying the enablers through advisory circulars (AC) and technical standard orders (TSO). Enablers are linked to operational improvements and capabilities that provide benefits and build on current equipage.

NextGen capabilities are usually grouped by functionality, for example, performance based navigation (PBN). AVS support for NextGen equipage usually takes the form of standards development, ACs, TSOs and or project-specific policy. A snapshot of avionics enablers, schedules, capability overviews and guidance is provided on the following pages with the target users, target areas and maturity icons.

For each enabler, icons provide a quick look at key information.

- **Target Users:** Target users for each enabler can include air carriers, business jets, general aviation fixed-wing aircraft and rotorcraft. These categories represent generalized modes of operation and may not apply to every civil or military operator. The FAA does not limit NextGen capabilities to targeted user groups. In addition to specified user groups, some users may find it worthwhile to invest in a particular enabler to meet their operational objectives.

- **Target Areas for Implementation:** The general strategy for deployment can be nationwide, in oceanic areas or in metroplexes. Metroplexes are areas with large- and medium-hub airports and satellite airports.

- **Maturity:** An enabler may be available for operator investment, in development (including standards development) or in concept exploration.

The icons (see table 1 - Icon Legend) describe the status of technologies from a standards and implementation perspective (see tables 2-7). Target user categories represent generalized modes of operation. Target areas describe the general deployment strategy. Maturity indicates availability for operator investment.

Target Users	Target Areas	Maturity
Air Carrier	Nation Wide	Available
Business Aviation	Oceanic	Development
General Aviation	Metroplex	Concept Exploration
Rotocraft		

Table 1 - Icon Legend

Avionics Enablers	Aircraft and Operator Guidance		Capability Overview	Target Aircraft	Target Area	Maturity
	Guidance	Schedule				
PERFORMANCE-BASED NAVIGATION						
RNP 10[1]	Order 8400.12C	Complete	Reduces oceanic separation			
RNP 4[1]	Order 8400.33	Complete	Further reduces oceanic separation (in conjunction with FANS-1/A)			
RNAV 1, RNAV 2	AC 20-138D AC 90-100A	Complete	Enables more efficient routes and procedures			
RNP 1 with Curved Path	AC 20-138D AC 90-105	Complete	Enables precise departure, arrival and approach procedures, including repeatable curved paths			
Vertical Navigation	AC 20-138D AC 90-105	Complete	Enables defined climb and descent paths			
LPV	AC 20-138D AC 90-107	Complete	Improves access to many airports in reduced visibility, with an approach aligned to the runway			
RNP Approaches (Authorization Required)	AC 20-138D AC 90-101A	Complete	Improves access to airports in reduced visibility, with an approach that can curve to the runway; improves procedures to separate traffic flows			
Advanced RNP, RNP 0.3, RNP 2	AC 90-105A	2015	Enables more accurate and predictable flight paths for enhanced safety and efficiency			
Trajectory Operations Navigation Standard	TSO, AC	2016	Enables RNP system for trajectory operations			
Alternative Position, Navigation, & Timing (APNT)	TSO, AC	TBD	Provides GPS-independent APNT capability			

Table 2 - PBN Enablers

[1] *Order 8400.12C and Order 8400.33 are being consolidated into AC 90-105A.*

Avionics Enablers	Aircraft and Operator Guidance		Capability Overview	Target Aircraft	Target Area	Maturity
	Guidance	Schedule				
ADS-B CAPABILITIES						
ADS-B Out	AC 20-165A AC 90-114A TSO-C166b TSO-C154c	Complete	Enables improved air fraffic surveillance and automation processing			
Airborne/ Ground CDTI	AC 20-172 TSO-C195	Complete	Improves awareness of other traffic			
In-Trail Procedure (ITP)	AC 20-172A AC 90-114A TSO-C195a	Complete	Improves oceanic in-trail climb/descent			
Flight Interval Management	TSO, AC	2016[2]	Displays along-track guidance, control and indications and alerts			
ADS-B Traffic Awareness System (ATAS)	TSO-C195b	Complete	Displays and alerts crew to airborne conflicts independent of TCAS alerting			
	AC 20-172B	Complete				
Closely Spaced Parallel Operations	TSO, AC	2018	Provides guidance information for aircraft participating in paired approaches to closely spaces runways			
Advanced Flight Interval Management	TSO, AC	2018	Provides higher performance along-track guidance, control and indications and alerts for terminal operations. Ground infrastructure is underway.			

Table 3 - ADS-B Enablers

[2]*Forecasted delivery date for FAA FIM policy documents dependent on outcome of NASA's FIM trials..*

Avionics Enablers	Aircraft and Operator Guidance		Capability Overview	Target Aircraft	Target Area	Maturity
	Guidance	Schedule				
DATA COMMUNICATIONS						
FANS 1/A (Sat Com)	AC 20-140A AC 120-70B AC 20-150A TSO-C159a	Complete	Provides oceanic data communications and surveillance, transfer of communications			
FANS 1/A (VHF Digital Link Mode 0, 2)	AC 20-140B AC 120-70B[3] TSO-C160a	Complete	Provides domestic data link clearances			
Baseline 2	AC (Installation guidance; data link recording	2016	Provides clearances, terminal information and Initial Trajectory Operations			
		2016	Provides guidance on aircraft recording systems for Data Comm			

Table 4 - ATS Data Communications Enablers

[3]*The operational guidance for data communications is being updated, and expanded to provide guidance for general aviation in a new 90-series Advisory Circular.*

Avionics Enablers	Aircraft and Operator Guidance		Capability Overview	Target Aircraft	Target Area	Maturity
	Guidance	Schedule				
LOW-VISIBILITY OPERATIONS						
HUD / ILS	Order 8400.13D	Complete	Reduces minima at qualifying runways			
EFVS	AC 20-167 AC 90-106	Complete	Uses enhanced flight visibility to continue approach below minima			
	AC 20-167A AC 90-106A	2015	Expands operational use of EFVS			
	AC 20-EFVS	2016	Expands installation guidance extending use of EFVS for landing			
SVGS	AC	2015	Provides installation guidance for synthetic vision guidance systems			
	AC	2016	Provides operational guidance for use of SVGS for CAT I ILS operations.			
GLS III	Project specific policy	2019	Provides autoland in very low visibility			

Table 5 - Low Visibility Enablers

Avionics Enablers	Aircraft and Operator Guidance		Capability Overview	Target Aircraft	Target Area	Maturity
	Guidance	Schedule				
FLIGHT DECK ENHANCEMENTS						
FIS-B	TSO-C157a TSO-C154c	Complete	Provides weather and aeronautical information in the cockpit			
	TSO-C157b	Complete	Provides UAT link-specific requirements for weather and aeronautical info to the cockpit			
EFB	AC 20-173 AC 120-76C AC 91-78	Complete	Enables electronic access and authorization of EFB applications			
Synthetic Vision Systems	AC 20-167	Complete	Displays a synthetic vision image of the external scene topography to the flight crew			
SVS for Airplane State Awareness	Installation Guidance	2018	SVS to support airplane state awareness safety initiative			
AAtS	AC 20-177	Complete	Provies flight crews with access to SWIM over non-aeronautical frequency bands			
ACAS X	TSO, AC	2020	Improves airborne collision avoidance performance with fewer nuisance alerts			

Table 6 - Flight Deck Enablers

Avionics Enablers	Aircraft and Operator Guidance		Capability Overview	Target Aircraft	Target Area	Maturity
	Guidance	Schedule				
AIRCRAFT (AIRFRAME AND ENGINE) AND FUEL TECHNOLOGIES						
Drop-In Alternative Jet Fuel Blends with Jet A	ASTM standard D7566	Complete	Expands jet fuel specification to allow use of Jet A blended with up to 50% of Synthetic Paraffinic Kerosene from Fischer-Tropsch or Hydroprocessed Esters and Fatty Acids processes			
Additional Drop-In Alternative Jet Fuels	ASTM standards alcohol-to-fuel pathways	2015	Expands jet fuel specification to allow use of Jet A blended with up to 50% of alternative jet fuels from novel processes and feedstocks (e.g., alcohol-to-jet, pyrolysis, biochemical and thermochemical processes)			
	ASTM standards pyrolysis	2015				
New Airframe Technologies	Technology available for product development	2015	Provides demonstrated and certifiable airframe technologies with lower fuel burn, emissions and noise			
More Efficient Engines	Technology available for product development	2015	Provides demonstrated and certifiable turbine engine technologies with lower fuel burn, emissions and noise			
Electric Propulsion	ASTM standards (electric propulsion)	Complete	Enable certifiable electric propulsion technology with zero fuel burn and lower noise for recreational GA Aircraft			

Table 7 - Aircraft Engine, Airframe and Fuel Technologies Enablers

PERFORMANCE BASED NAVIGATION (PBN)

PBN encompasses a set of enablers with a common underlying capability of constructing a flight path not constrained by the location of ground-based navigation aids.

Area Navigation (RNAV) is a navigation method that permits aircraft operation on any desired flight path within the coverage of ground- or space-based navigation aids, within the limits of the capability of self-contained aids or a combination of these capabilities.

PBN defines RNAV system performance requirements in terms of the accuracy, integrity, continuity and functionality needed for operations in a particular airspace environment. FAA advisory material identifies performance requirements through ACs. Equipment performance standards are outlined in TSOs. The International Civil Aviation Organization (ICAO) defines these performance parameters through standards and recommended practices.

Navigation specifications (NavSpecs) identify aircraft and aircrew requirements to support a specific navigation application within a defined airspace concept. Some procedures currently require GPS augmentation in the form of Wide Area Augmentation System (WAAS). WAAS is the FAA's implementation of Satellite Based Augmentation System (SBAS).

The FAA works with other countries through ICAO to define NavSpecs with a sufficient level of detail to facilitate global harmonization with the ICAO PBN Manual, Document 9613. For example, to assist in this harmonization, AC 90-105 incorporates three new PBN expansion NavSpecs; Required Navigation Performance (RNP) 2 (Domestic enroute and Oceanic/Remote continental operations), RNP 0.3 rotorcraft operations enroute and terminal phases; and guidance for advanced RNP (A-RNP) functions.

RNP is an RNAV system that includes onboard performance monitoring and alerting capability, for example Receiver Autonomous Integrity Monitoring (RAIM). RNP Approach and RNP Authorization Required (AR) Approach are two NavSpecs used to design and execute GPS-based instrument approach procedures (IAP).

RNP approach procedures are titled RNAV (GPS) and offer several lines of minima to accommodate varying levels of aircraft equipage:

- Lateral navigation (LNAV);

- LNAV/vertical navigation (LNAV/VNAV).
- Localizer Performance with Vertical Guidance (LPV); and
- Localizer Performance without vertical guidance (LP).

GPS or WAAS provides lateral information supporting LNAV minima. LNAV/VNAV incorporates LNAV lateral with vertical guidance for systems and operators capable of barometric or WAAS vertical guidance. WAAS enables pilots to fly to the LPV or LP minima. Procedures with LPV minima rely on GPS and the WAAS error correction and integrity signal. The refined accuracy of WAAS lateral and vertical guidance provides an approach capability comparable to an instrument landing system (ILS), and allows operations as low as 200 feet above the runway.

The FAA published LPV minima at airports without ILS infrastructure and associated maintenance costs. RNAV (GPS) approaches are not subject to the ILS challenges of siting the localizer and glideslope antennas and do not require ground traffic to hold outside of a critical area. The FAA can often implement procedures with LPV minima where an ILS installation is not feasible.

RNP Authorization Required (RNP AR) approach procedures are titled RNAV (RNP). RNP AR vertical navigation performance is based upon Baro-VNAV or WAAS. RNP AR provides benefits at specific locations and is not intended for every operator or aircraft. RNP AR capability requires specific aircraft performance, design, operational processes, training and specific procedure design criteria to achieve the required level of safety. These are the most demanding PBN operations, using very precise lateral paths (down to 0.1 nautical miles (NM) accuracy) and can include the application of Radius-to-Fix (RF) leg segments in the final approach segment (FAS). With proper aircraft equipment, operators may obtain approval to fly these procedures. This approval includes RNP AR training, database validation and operating procedures. RNP AR instrument approaches enable access at airfields with more demanding obstacles, terrain, or traffic constraints.

The RNAV designation refers to navigation accuracy but includes other performance and functional requirements. The FAA publishes RNAV Q-routes, T-routes, arrival procedures and departure procedures. For example:

- RNAV 2 requires sustaining an accuracy of 2 NM for 95 percent of flight time during the operation. The FAA uses RNAV 2 for en route operations.
- RNAV 1 requires sustaining an accuracy of 1 NM for 95 percent of flight time. The FAA uses RNAV 1 for arrivals and departures.

RNAV 1 is the mainstay in the terminal area, except where a NavSpec includes requirements for onboard performance

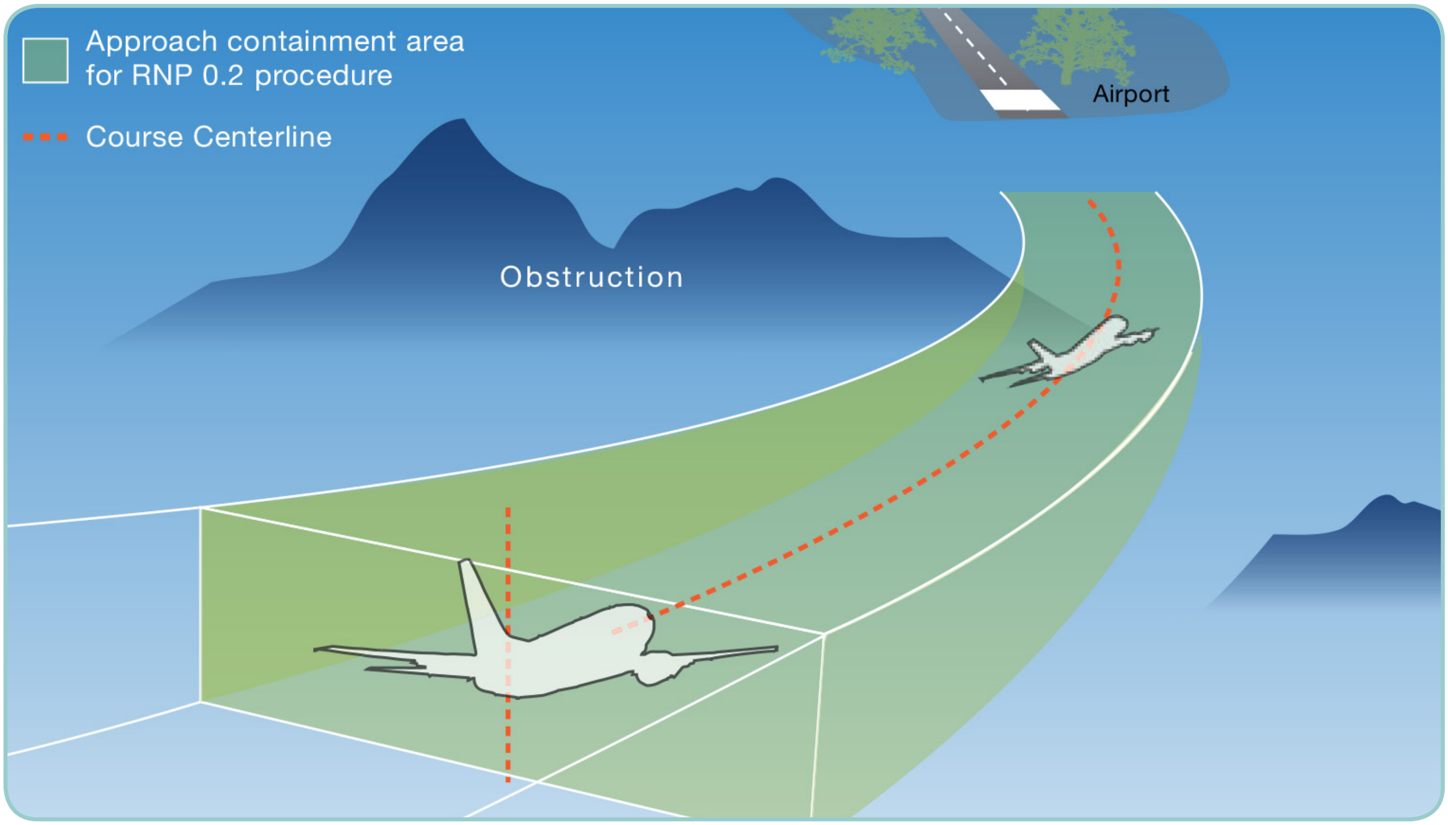


Figure 1 Required Navigation Performance refers to the degree of navigation precision required to fly the course.

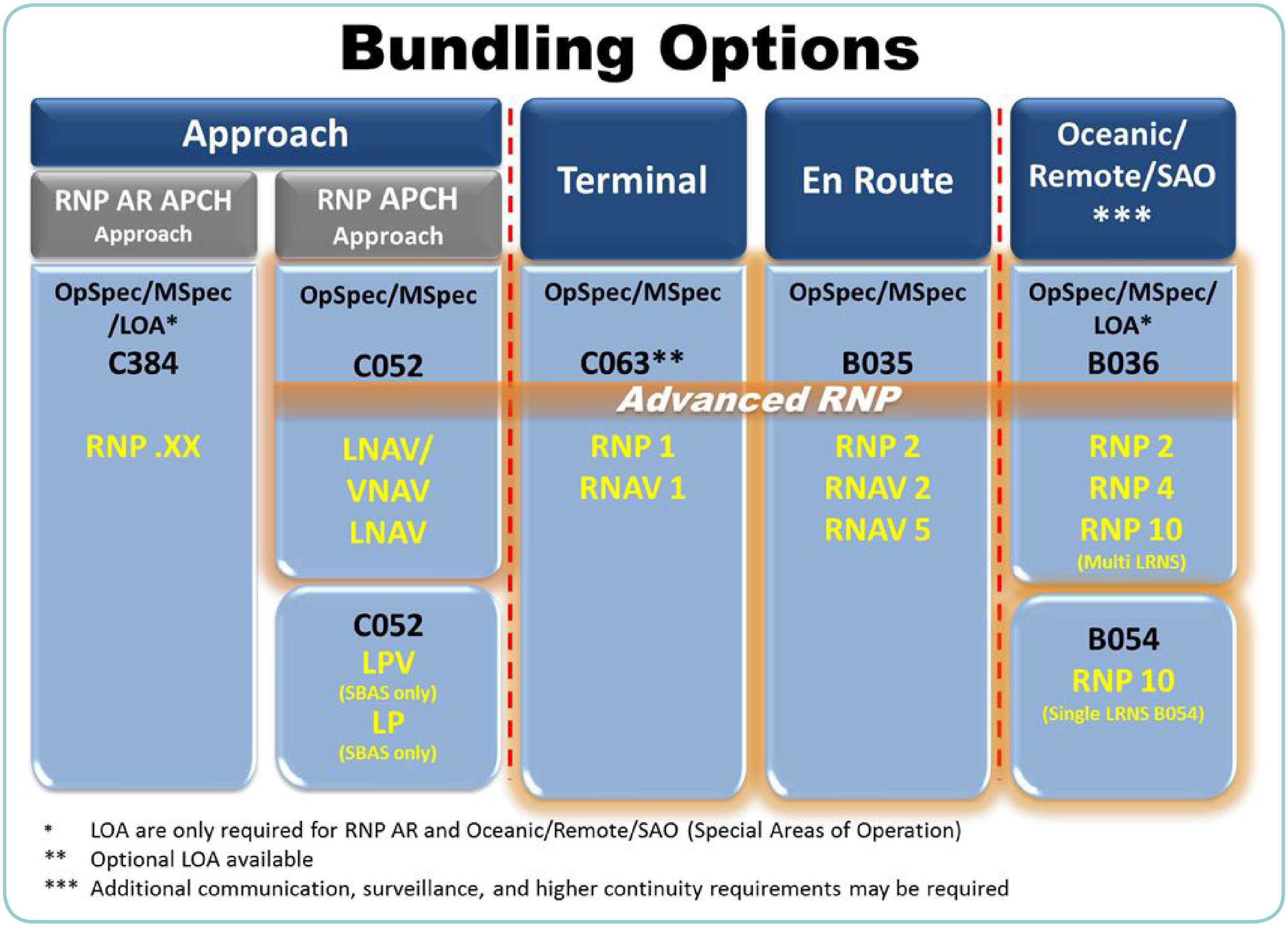


Figure 2 FAA concept of bundling. A method of combining PBN authorizations within an OpSpec/ MSpc/LOA with less restrictive PBN operations.

monitoring and alerting or additional functionality, the FAA designates the application as RNP. Whereas RNAV 1 is a mainstay in the terminal area, RNP 1 provides improved performance for safe flight near obstacles, terrain or airspace conflicts.

The FAA is expanding RNP use where beneficial. One expected benefit is RNP 1 with a defined curved path. Flying precise curved path RF legs increases the consistency of aircraft tracks. RF leg application is an option where beneficial for SIDs, STARs, RNP and RNP AR APCH operations. However, only RNP AR APCH operations can include an RF leg segment in the FAS. Expanded use of the RF legs may help deconflict arrivals and departures in metroplexes and provide more efficient routing in the National Airspace System (NAS).

Many aircraft use approved barometric altitude through the Flight Management System (FMS) to obtain vertical guidance and fly a defined vertical path. This aircraft capability is referred to as Baro-VNAV. Advisory vertical guidance helps the pilot maintain an optimum descent profile while complying with an air traffic control (ATC) clearance. The pilot is still responsible for complying with all procedure-defined altitude restrictions by referencing the primary barometric altitude source. Controllers can plan traffic flows more efficiently by accounting for vertical guidance capabilities in the design of arrival and departure procedures.

The FAA allows distance measuring equipment (DME) facilities for use with inertial input and Global Navigation Satellite System (GNSS) for RNAV 1 and RNAV 2 capabilities. DME-only navigation has limited coverage and infrastructure limitations and will not be supported on every published procedure in the current configuration.

The general aviation community typically implements PBN via a GPS or GPS/SBAS navigator located on an aircraft's instrument panel. These increasingly integrated systems usually include navigation, voice communications and uplinked weather information. These installations can support RNP routes and the LNAV minima on RNP approaches, and those equipped with WAAS can support LPV and LP minima on RNP approaches. Some general aviation aircraft configurations may be upgradeable to RNP with curved path capability.

Operational advantages provide the primary motivation for equipping with PBN enablers. Operators who equip obtain efficiency and access enhancements from beneficial routes, procedures and approaches.

Advanced RNP operations include a set of new capabilities that will enable increased RF leg use without the stringent RNP AR requirements. The FAA also envisions procedures with scalable accuracy values as low as 0.3 NM and criteria for RNP 2 en route operations. For helicopters, the FAA is developing material for RNP 0.3 departure and en route operations in congested environments, taking advantage of the slow speed and high maneuverability of the rotorcraft.

Letter of Authorizations are not required for CFR part 91 operators (other than subpart K) except for oceanic and remote continental operations or if required in foreign airspace. Operators of all other CFR parts, the FAA has worked to simplify the authorization approval process. Figure 2 shows the FAA concept of "bundling." It is a method of combining PBN authorizations within an OpSpec/MSpc/LOA with less restrictive PBN operations.

As the NAS moves towards trajectory operations, new requirements will be allocated to aircraft navigation systems. The widespread use of trajectory operations will require aircraft navigation systems to perform to a new degree of standardization, particularly in flying a predictable vertical path and speed management to arrive at a given fix within a tight time tolerance. The FAA is working with industry stakeholders to determine the new performance standards for trajectory operations.

The FAA is planning to reduce the legacy ground navaid infrastructure and is exploring means to reduce the existing VOR network and a limited number of secondary surveillance radar facilities. The Alternative Positioning, Navigation and Timing (APNT) project team is also investigating alternatives to provide a GPS backup capability.

PBN GLOBAL HARMONIZATION

The primary strategy for harmonizing all of the PBN enablers is through ICAO and the ICAO PBN Study Group. Through the Study Group and related panels, AVS has harmonized the criteria for all the existing PBN enablers. AVS is helping ICAO update the ICAO Manual on PBN, adding NavSpecs for a number of new capabilities for various operations including specifications for RNP AR departure procedures. These new operations should permit more flexible procedure designs, leveraging the same basic set of aircraft capabilities already defined for RNP AR, but without requiring unique authorization.

AVS is also involved in coordinating the implementation of these capabilities, primarily through regional planning groups. In conjunction with ATO and the Oceanic Separation Reduction Working Group, AVS develops and advocates United States (U.S.) operational policy for ICAO North Atlantic, Cross Polar, Pacific, and Caribbean/South American Working Groups. There is also AVS work in coordinating implementation with Europe, working with Single European Sky ATM Research (SESAR) and European Organization for the Safety of Air Navigation EUROCONTROL as the European Union (EV) considers a mandate for RNP capabilities.

Later this decade, AVS involvement will produce a GNSS standard towards global acceptance and interoperability with multiple GNSS constellations under development.
AVS also supports the following groups outside of ICAO:

- Satellite-Based Augmentation System (SBAS) Interoperability Working Group: A forum for providers of SBAS service, to promote harmonization and alignment of programs;
- International GBAS Working Group: A forum of states and other entities interested in GBAS, promoting common resolution of program challenges and resolution of issues for Category III operations; and
- Aviation industry standards committees, RTCA/SC-159 and EUROCAE Working Groups 28 and 62, are developing technical standards for modernized GNSS receivers.

PERFORMANCE BASED OPERATIONS AVIATION RULEMAKING COMMITTEE (PARC)

The PARC provides a forum for the U.S. aviation community to discuss, prioritize, and resolve issues, provide direction for U.S. flight operations criteria and produce U.S. consensus positions for global harmonization. PARC input was invaluable in the drafting of the Roadmap for Performance-Based Navigation, and they have helped update numerous FAA regulatory documents as well. They continue to provide guidance and recommendations to help the FAA transition to a performance-based NAS. AVS enabling policy dependent upon PARC initiatives is located in Part III of this Work Plan.

ADS-B

There are many ADS-B enablers, with different cost and benefit implications. The foundational enabler is ADS-B Out. ADS-B Out uses ground infrastructure and avionics to enable the next generation of ATC and air-to-air surveillance. ADS-B Out avionics broadcast an aircraft's position, velocity and other data. A network of ADS-B ground radio stations collects the broadcast information for integration into the ATC system where air traffic controllers use this precise surveillance information to provide air traffic separation and advisory services.

Beginning in January 2020, aircraft operating in Class A airspace — from 18,000 feet mean sea level (MSL) to and including Flight Level 600 — must broadcast position data with a Mode S, 1090 Extended Squitter (1090 ES). Aircraft operating exclusively below 18,000 feet MSL, in designated

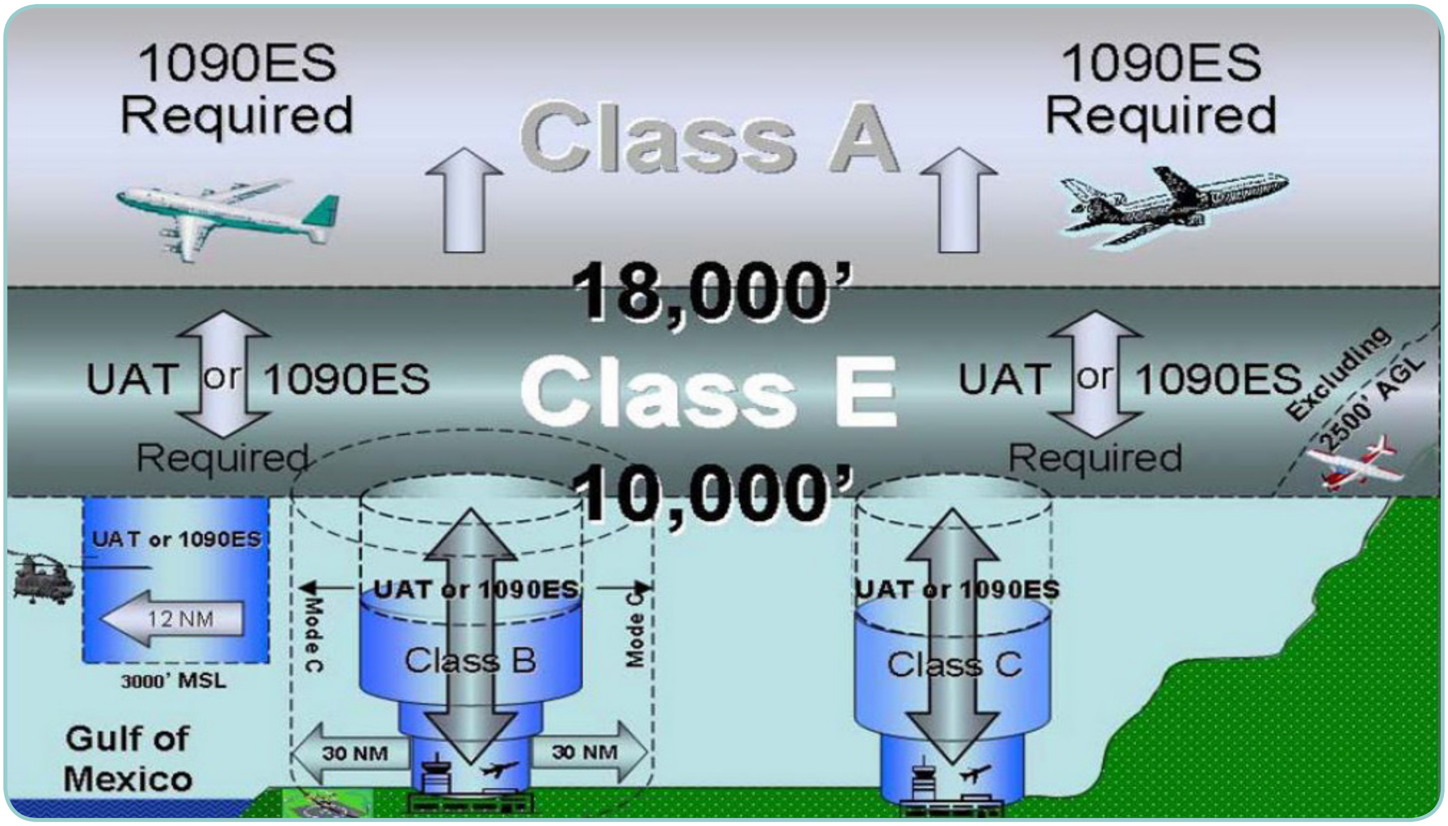


Figure 3 Automatic Dependent Surveillance - Broadcast Airspace Rule

airspace, can broadcast the required information with either 1090 ES or the Universal Access Transceiver (UAT) on 978 MHz.

Because aircraft can broadcast on one of two frequencies, Automatic Dependent Surveillance–Rebroadcast (ADS-R) is part of the ground infrastructure. ADS-R collects position information broadcast on each frequency and rebroadcasts it on the opposite frequency. Traffic Information Services–Broadcast (TIS-B) is another part of the ground infrastructure. Since it will be some time before all aircraft are equipped with ADS-B Out, TIS-B broadcasts the position of non-ADS-B Out aircraft that ground surveillance radar detects. Combined, TIS-B and ADS-R provide ADS-B In–equipped aircraft with a more complete airspace and airport surface traffic picture. ADS-R delivers traffic data within a 15-NM radius and plus or minus 5,000 feet relative to the receiving aircraft's position. TIS-B provides traffic data within a 15-NM radius and plus or minus 3,500 feet.

Operators can take advantage of the increasing prevalence of ADS-B Out broadcasts from nearby traffic and the ground infrastructure with a number of ADS-B In enablers. The most basic enabler provides enhanced situation awareness, improving the flight crew's ability to identify the location and direction of nearby traffic in the air and on the surface. To view traffic, the ADS-B In aircraft must be equipped with a Cockpit Display of Traffic Information (CDTI). The CDTI may be presented on a new display, a multifunction display or it may be integrated with a conventional Traffic Alert and Collision Avoidance System (TCAS) or Airborne Collision Avoidance System X (ACAS X) that is currently under development. CDTI graphically displays the relative position of other aircraft and surface vehicles equipped with ADS-B Out. It also receives and displays TIS-B and ADS-R traffic information. In light general aviation (GA) aircraft, this is typically presented on a portable display.

In-Trail Procedure (ITP) using ADS-B equipment enables increased opportunities to fly at a more desirable altitude in oceanic airspace. The lack of radar in most oceanic airspace requires ATC to maintain large separation distances between transiting aircraft. This separation requirement can prevent an aircraft from changing to a more optimal altitude because of traffic at an intervening altitude. A flight crew can use CDTI and ITP software to verify nearby traffic meets specific distance and relative groundspeed criteria, allowing for reduced separation from the traffic at the intervening altitude while transiting from one altitude to another.

Flight Deck Interval Management (FIM) is the airborne component of the interval management enabler. FIM exploits ADS-B Out information to enable more precise spacing between aircraft. FIM aircraft avionics process ADS-B Out information of nearby traffic. When ATC clears the FIM aircraft to follow an ADS-B Out aircraft, the avionics present the FIM crew with speed guidance. By following speed guidance, the flight crew maintains a more precise spacing from the designated traffic than can be achieved with present-day procedures. This reduces inefficient vectoring and speed instructions. The FAA is working with European counterparts and industry to develop initial avionics standards in 2016 which can be used for prototyping and trial demonstrations. Plans are still in place to develop standards and guidance for demonstration purposes. Lessons learned from trials will be incorporated into an Advanced Flight Interval Management TSO and Advisory Circular.

ATAS (ADS-B Traffic Awareness System) is an ADS-B In application that improves general aviation safety. In 2014 standards were published for this traffic alerting capability designed for aircraft that do not have TCAS. Using ADS-B Out information of nearby aircraft and a robust collision prediction algorithm, ATAS will alert the pilot of fixed wing and rotorcraft aircraft of a potential collision and indicate the position of the target aircraft on an optimal CDTI. The benefit will be an improved alerting system.

More advanced ADS-B In applications will be integrated with other capabilities such as data communications and a new generation of TCAS. These integrated solutions will support access to closely spaced runways in almost all weather conditions; more advanced FIM and is compatible with separation similar to visual operations today.

While current FIM provides spacing on a single arrival stream, Advanced Flight Interval Management will allow more consistent spacing for merging from various directions and flight paths. Research continues on the use of ADS-B for paired approaches to parallel runways, where aircraft stay close enough together to avoid wake turbulence while maintaining safe separation.

In air carrier aircraft, most operators will implement ADS-B as an upgrade to the Mode S transponder and integrate the CDTI with existing or supplemental aircraft displays. The various ADS-B In capabilities will require different levels of integration with the controls and displays in the cockpit. Situational awareness is available using side console-mounted displays that are not integrated. Instrument panel-mounted displays that are not integrated can provide along-track and speed guidance. More advanced capabilities will require integration with other navigation data and eventually be designed into flight displays as benefits are substantiated. By providing early benefits such as ITP and ATAS, the FAA is encouraging operators to equip portions of their fleets with ADS-B before the ADS-B Out equipage mandate goes into effect on January 1, 2020. As operators experience these benefits, they will have an incentive to accelerate and expand ADS-B equipage to the rest of their fleet.

- For air carriers, this strategy uses memorandums of agreement in which each party provides in-kind contributions critical to the success of the project. Each agreement is unique, reflecting the specific operator's business model, route structure and existing avionics infrastructure, among other factors.
- For general aviation operators, deployment of traffic and weather information uplinked over the UAT will enhance benefits and motivation to equip. This information is provided by two no-cost broadcast services, TIS-B and Flight Information Services–Broadcast (FIS-B).

The FAA is also evaluating additional locations where surveillance may be expanded by employing ADS-B.

ADS-B GLOBAL HARMONIZATION

The EU published a European mandate for ADS-B Out equipment in European airspace. The FAA worked with European Aviation Safety Agency (EASA) and EUROCONTROL during the development of this rule to harmonize the European mandate with the U.S. mandate. The FAA resolved the most significant issues; manufacturers can comply with both mandates without any conflicts, but some differences remain since Europe does not plan to use ADS-B to reduce Secondary Surveillance Radar coverage. These differences include:

- U.S. forward-fit and retrofit requirements are effective in 2020. EU has a forward-fit mandate effective in June 2016, and retrofit in June 2020;
- U.S. requirements affects all operators in designated airspace (see 14 CFR 91.225 and 14 CFR 91.227); EU affects aircraft more than 5700 Kg or with maximum speed exceeding 250 knots;
- EU has no explicit performance requirements for the broadcast data;
- EU has expanded data requirements (vertical accuracy, vertical rate, antenna offset, selected altitude and barometric pressure setting); and
- EU requires a continuity of the system of 5,000 hours mean-time between failures.

RTCA/SC-186 and EUROCAE WG-51 continue global harmonization of the ADS-B standards. This joint U.S.-European committee is pursuing an aggressive schedule to develop future ADS-B In operational uses and equipment standards. In 2014, they completed work on Minimum Operational Performance Standards (MOPS) for ATAS. Publication of the MOPS for FIM is expected in 2015.

DATA COMMUNICATIONS

Data communications allows some communications to move off the voice channel and provides a verifiable record, reducing communication errors. It also allows increased air traffic efficiency by reducing the time spent on routine tasks such as communications transfers.

Photo Courtesy of FAA

The FAA deployed data communications as part of the FANS program in oceanic airspace. Boeing and Airbus developed integrated communication and navigation capabilities known as FANS 1 and FANS A, respectively. FANS 1/A provides a controller-to-pilot data link and enables aircraft to send surveillance data to the ATC system through Automatic Dependent Surveillance–Contract. Data communications, along with specific navigation capability, enables controllers to safely reduce oceanic separation between aircraft from 100 NM to 50 NM and later to 30 NM.

The domestic program will support FANS 1/A over VHF Digital Link Mode 2 (VDL-2). VHF Digital Link Mode 0 (VDL-0) will be supported for departure clearances only and the FAA is evaluating how VDL-0 could also be accomplished for airborne use. This enabler builds on pre-existing FANS 1/A capabilities, adapting them for domestic operations. Plans are to update and supersede AC 120-70C with a 90-series AC to address data communications use by 14 CFR part 119 and 14 CFR part 91 operators. This 90-series AC will harmonize with AC 20-140, as appropriate, and will account for legacy domestic data link operations. Part 91 operators (other than subpart K) will not need an operational authorization to use data communications with VDL mode 2 domestically.

Aeronautical Telecommunication Network (ATN) was developed through ICAO to provide a more universally capable and reliable ATC data communication system. Earlier versions of ATN provided interim capabilities. Europe has a mandate for ATN Baseline 1 (Link 2000+), which operators can retrofit into aircraft without modification of the navigation system. The desired capability for full participation in continental U.S. airspace will be Baseline 2. RTCA SC-214 and the European Organization for Civil Aviation Equipment WG-78 are jointly developing standards to define the safety, performance and interoperability requirements for air traffic services supported by data communications. Data communications will also need to accommodate evolving navigation, surveillance and aeronautical information service requirements to support air-ground functional integration. Both Europe and the United States plan to recognize Baseline 2 criteria in 2016. The European Commission (EC) recently decided to delay its mandate for aircraft equipage with Controller Pilot Data Link Communications (CPDLC) until February 2020. Operators of fleets flying internationally have adopted FANS 1/A for oceanic and remote area applications. The FAA is evaluating potential operational incentive scenarios in which aircraft may receive more rapid or efficient departure reroutes during inclement weather.

ATS DATA COMMUNICATIONS GLOBAL HARMONIZATION

The joint SC-214 and EUROCAE WG-78 aviation industry standards committees are addressing the data communication messages, and will reference the resultant standards as acceptable means of compliance to ICAO member state aviation regulations. Appropriate committees are working on data communication services and end-to-end requirements.

Harmonization of ATS data communication is key to avoid regional implementations that may result in increased risk due to dissimilar cockpit procedures and expensive multiple equipage solutions on aircraft. AVS is actively supporting the development of international data communication standards for Baseline 2. Our objective is to be able to make available data communication services supporting operations beginning in the early 2020’s in both EU and the U.S. We are advocating an integrated view of this timeframe and capabilities, considering navigation, ADS-B, and other AIS/MET enhancements under development but considered essential elements for trajectory based operations.

LOW-VISIBILITY OPERATIONS

The FAA is supporting several capabilities for operators who need to access an airport during low visibility, when the cloud ceiling is below 200 feet above the runway or visibility is less than one-half mile. At many airports, the FAA has approved approach procedures which use a head-up display (HUD) on a precision approach to lower minima. A HUD provides critical flight and navigation data on a transparent screen in front of the pilot, allowing simultaneous viewing of primary flight display information, navigation information and the external scene through the HUD.

Use of a qualified HUD when flying special category ILS approach reduces the required runway visual range (RVR) visibility for the approach. Use of a qualified HUD increases airport access compared with non-equipped aircraft. The accuracy of these ILS facilities was verified for this type of operation. In addition, the airport must have the equipment to measure and report the current RVR visibility. The FAA is increasing the number of airports with RVR reporting capability to expand this capability under the Enhanced

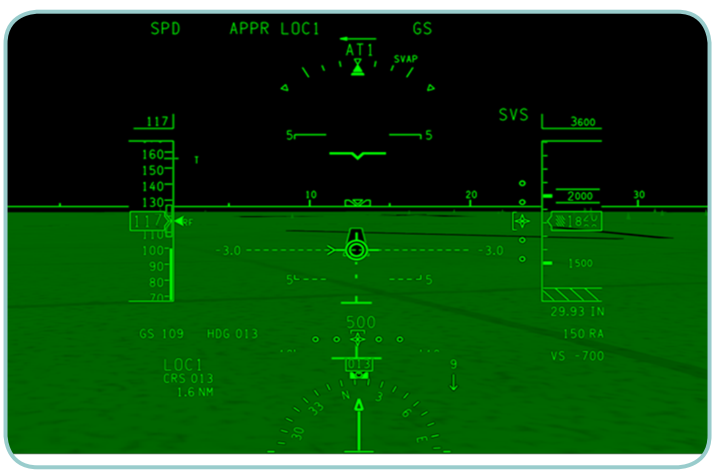
	CAT I		
	Standard	With head up display (HUD) (or Autopilot or Flight Director)	With HUD & Special Authoriza-tion
Runway Visual Range	1800	1800	1400
Decision Height	200	200	150
Reduced Ground Infra-structure	No	Yes	Yes

Table 8 - CAT I Matrix Minima

Low Visibility Operations (ELVO) program. Other ELVO improvements are described in FAA Order 8400.13, *Procedures for the Evaluation and Approval of Facilities for Special Authorization CAT I Operations and All CAT II and III Operations.*

The FAA permits an Enhanced Flight Vision System (EFVS) to be used in lieu of natural vision to descend below decision altitude/decision height (DA/DH) or minimum descent altitude (MDA) on straight-in instrument approaches down to 100 feet above the touchdown zone.

At 100 feet, the flight crew must acquire the required visual references with natural vision. EFVS affords a higher level of access, providing a visual advantage for the flight crew to see required visual references using EFVS technology. With an EFVS, access is allowed that otherwise would be denied because of low natural visibility. The FAA expects to release a final rule in 2015 expanding the initial use of EFVS through landing. The initial guidance will enable operations to 1000 RVR and will be updated for even lower visibility based on the performance demonstrated by EFVS.



HUD Presentation of SVGS
Photo Courtesy of Bombardier, used by permission

Another enabler is the Ground Based Augmentation System (GBAS) landing system (GLS). This system uses differential corrections to GPS to support all precision approach categories. Several airports operate non-federal ground systems approved for CAT I operations to as low as 200 feet above the runway. A single ground station can service multiple runways at an airport and does not require ILS critical area taxi restrictions. Changes to ground equipment and avionics are expected to support CAT III operations. Operational approval for GLS CAT III could begin as early as 2018 based on current manufacturer information.

LOW VISIBILITY OPERATIONS GLOBAL HARMONIZATION

In expanding the operational capability for EFVS, the FAA works closely with the joint committee of RTCA SC-213 and EUROCAE WG-79 to develop common performance standards and implementation strategies for next generation of Enhanced Vision Systems (EVS) and SVS. Additionally, we are actively harmonizing our standards with EASA to ensure the operational benefit realized by this technology is maximized in Europe. It is important that AVS continues to monitor EU regulatory activities and remain engaged with those regulatory authorities as they proceed. This is primarily being accomplished through the All Weather Operations Harmonization ARC (AWOH ARC), which consists of U.S. and EU regulatory authorities as well as industry stakeholders.

FLIGHT DECK ENHANCEMENTS

In addition to new technologies needed for NextGen operations there are other new technologies which will enhance flight deck safety, situational awareness or efficiency independent of any operation being conducted. These flight deck enhancements include Flight Information Service – Broadcast (FIS-B), Airborne Access to Swim (AAtS), Electronic Flight Bag (EFB's) and Airborne Collision Avoidance System -X (ACAS-X), and Synthetic Vision System (SVS).

FIS-B provides terrestrial-based weather data and real-time NAS status information to aircraft equipped with ADS-B In using the UAT and an appropriate display. The FAA intends for these data to improve the safety of general aviation operations. FIS-B products include graphical and textual weather and other aeronautical information such as Notices to Airmen and Special Use Airspace information.

We also envision AAtS functionality. AAtS enables aircraft systems to access data to support collaborative decision making and ensures a common understanding of airspace status, systems and weather. Information may be displayed by an installed system or as an EFB application (on portable or installed equipment) depending on the application. AAtS must be used to support collaborative decision making to qualify as NextGen avionics for certification priority. For more information on installation of non-required telecommunication equipment, see AC 20-177, Design and Installation Guidance for an Airborne System for Non-Required Telecommunication Service in Non-Aeronautical Frequency Bands.

EFB applications can display a host of aviation data including navigational products, weather, aeronautical information, performance data, and fuel calculations. EFB applications have the ability to send and receive graphical and textual information for use on the flight deck. When authorized, EFB applications have the capability of being hosted on both certified displays and portable electronic devices.

ACAS X is a family of collision avoidance systems. ACAS Xa (active mode) is intended to fill the role of current TCAS, serving as a collision avoidance system for large transport and cargo aircraft. ACAS XO (operational mode) is intended for specific flight operations of those same users when normal separation may result in excessive nuisance alerts, such as closely spaced parallel operations (CSPO). ACAS Xu (unmanned aircraft mode) is intended to provide both vertical and horizontal advisories for unmanned intruder traffic. ACAS Xp (passive mode) is intended to provide reduced advisory capability for general aviation applications.

Synthetic Vision Systems, which electronically show external topography, are certified for situational awareness. Synthetic Vision Guidance Systems (SVGS) is a complete system which integrates the SV scene with additional elements. The additional elements may include a guidance system displays, trajectory monitoring elements, and integrity alerts. The FAA is exploring the operational credit this technology can provide for lower decision altitudes.

FLIGHT DECK ENHANCEMENT GLOBAL HARMONIZATION

Portable devices hosting EFB applications are being utilized by both domestic and international certificate holders. In an effort to standardize the various applications and interoperability of EFBs with aircraft systems, AFS and AIR continue to work with EASA and ICAO to develop EFB policy. This international harmonization is critical since these devices replace both required paper products and display an array of applications utilized on the flight deck. An EFB definition and Standards and Recommended Practices is now included in the ICAO Annex 6, to the Convention on International Civil Aviation, Part I, International Commercial Air Transport – Aeroplanes. In addition, a draft EFB Manual is available to provide ICAO member states guidance on how to evaluate both EFB hardware solutions and EFB software applications. In addition, EASA requested the FAA's participation in support of EASA's EFB Rulemaking effort. This work is commencing in FY 2015.

Photo Courtesy of International Civil Aviation Organization

AIRCRAFT ENGINE, AIRFRAME AND FUEL TECHNOLOGIES

The Aircraft Certification Service is partnering with the Office of Environment and Energy in research and development programs such as the Continuous Lower Energy, Emissions and Noise (CLEEN) program and the Aviation Sustainability Center of Excellence (ASCENT) to accelerate the development of new certifiable aircraft technologies and alternative jet fuels. Drop-in alternative jet fuels research continues with the intent of developing a range of ASTM International-approved fuels that provide improved environmental performance without compromising safety or requiring changes in aircraft, engines or fuel-supply infrastructure. The term "drop-in" means the fuel meets the fuel specification and requires no additional approvals at the aircraft level[3].

ASTM International has approved alternative jet fuels for commercial use consisting of Jet A blended with up to 50 percent synthesized paraffinic kerosene from the Fischer-Tropsch process (approved in 2009) or Hydroprocessed Esters and Fatty Acids process (approved in 2011). Most recently, ASTM International approved Jet A fuel blended with up to 10% Synthesized Iso-paraffins (SIP) fuel produced from the direct sugar to hydrocarbons process in June 2014. Developers are testing additional advanced alternative jet fuels in support of eventual ASTM International approval. Other pathways such as alcohol-to-jet fuel, pyrolysis (thermochemical decomposition of organic material at elevated temperatures in the absence of oxygen), and catalytic conversion of sugars are under evaluation for future approval by ASTM International. The Aircraft Certification Service has also established the Alternative Fuels Program Staff to manage the FAA's participation in the General Aviation industry's initiative to develop, approve and deploy a high-octane unleaded aviation gasoline for the piston engine powered aircraft fleet. In collaboration with industry, the FAA helped establish the Piston Aviation Fuel Initiative (PAFI) and is working closely with the FAA's William J.

Hughes Technical Center to evaluate the candidate unleaded aviation gasolines.

AIRCRAFT ENGINE, AIRFRAME AND FUEL TECHNOLOGIES GLOBAL HARMONIZATION

Open Rotor Engine Harmonization

The Open Rotor engine offers significant improvements in fuel burned and carbon emissions. The technological advances in noise reduction since this type of engine was first introduced in the 1980's now permit these designs to be introduced into service. However, new requirements are needed to address consequences of Uncontained Engine Rotor Failure. To accommodate an engine development program and product launch, EASA established an industry/authority stakeholder working group with the objective of recommending EASA/FAA harmonized draft requirements and advisory material for engines (14 CFR part 33/CS-E) and aircraft (14 CFR part 25/CS-25), respectively, and/or Special Conditions to address the novel features inherent in Open Rotor engine designs and their integration with the aircraft. These new provisions and associated means of compliance should ensure the safety levels of Open Rotor engine installations are consistent with those of the existing turbofan fleet. AIR is actively participating in this effort with the purpose of ensuring results can be implemented within the harmonized transport aircraft and engine regulations.

Drop-In Renewable Jet Fuel:

Under the United States-Brazil Memorandum of Understanding, the FAA is supporting Brazil's efforts to develop alternative jet fuel qualification/certification procedures and conduct a fast-track approval of a narrowly focused drop-in renewable jet fuel produced from sugar. The project will require close coordination with both Brazilian and United States aerospace manufacturers. Through its sponsorship of the CAAFI, the FAA engages international stakeholders to identify collaboration opportunities. As a result, the FAA established cooperative agreements to facilitate and promote the approval of drop-in renewable jet fuels with Australia and Germany and is preparing an agreement with Spain.

The FAA actively participates in the standards-setting organization ASTM International and was instrumental in leading industry and government stakeholders to develop the first alternative jet fuel specification D7566, Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons. The FAA continues to lead stakeholders to test, certify, and qualify additional sustainable alternative jets fuels and pathways, such as alcohol-to-jet fuels.

The FAA supports the ICAO Global Framework for Aviation

[3] By comparison, unleaded avgas will not be a "drop-in" and will require FAA action to authorize its use.

Photo Courtesy of Luis Viegas © 2012, used under license from ShutterStock, Inc.

Alternative Fuels to facilitate global development and deployment of sustainable alternative jet fuels.

CAAFI and the FAA are coordinating with the United Kingdom's Ministry of Defense Aviation Fuel Committee (AFC) to develop specification requirements for alternative aviation fuels. The AFC publishes the DEF STAN 91-91 specification for jet fuel that is used by many countries in Europe and other areas of the world. The FAA is also engaging the People's Republic of China to coordinate development of specifications for renewable jet fuels and aviation gasoline. In addition, the FAA is coordinating with Brazil to evaluate and approve the use of biodiesel fuel blends in agricultural aircraft.

The FAA is working closely with the international community and industry to coordinate avgas approval methods to facilitate the introduction of an unleaded alternative avgas. The FAA works closely with environmental groups and industry stakeholders including aviation associations, aircraft and engine manufacturers and fuel suppliers to facilitate the development of unleaded fuel for piston powered general aviation aircraft. The goal of the effort is to make available an unleaded alternative to 100 octane low-lead (100 LL) fuel by 2018. In addition to the obvious environmental concern of operating with fuel that contains lead, the use of lead-containing fuel also creates significant long-term challenges to the continued viability of the piston engine powered U.S. general aviation fleet. The FAA is communicating as closely as possible with the Environmental Protection Agency (EPA) to discuss PAFI's plan for environmental and toxicological evaluation of candidate unleaded fuels and to obtain EPA comments and feedback.

The FAA established the Unleaded Avgas Transition Aviation Rulemaking Committee (UAT ARC) in 2010, a government–industry group, to provide recommendations on how the agency might address the challenges of transitioning piston engine powered aircraft to unleaded avgas. The ARC issued their report in 2012, identifying the issues associated with the transition, and recommending a detailed plan for transitioning the current fleet of general aviation aircraft to operate on unleaded avgas.

In response to the recommendations of the UAT ARC, the FAA established the Alternative Fuels Program Staff Office in 2012 to oversee the transition to unleaded fuel. This office enables the FAA to centralize aviation fuel expertise in one office that can more effectively support industry initiatives and the associated fuels certification projects relating to unleaded aviation gasolines. In addition, the collaborative industry-government Piston Alternative Fuels Initiative (PAFI) was kicked off with the signing of the PAFI Steering Group (PSG) charter in February 2013. The PSG will ensure coordination between the industry and government stakeholders in the process of implementing a replacement unleaded aviation gasoline.

In June 2013, the FAA released a research and development report in response to the FAA Modernization and Reform Act of 2012 that included a requirement to develop a research program to help transition the general aviation fleet to an unleaded avgas. The report was based largely on the recommendations in the UAT ARC final report. The research and development program is funded by NextGen.

The FAA subsequently issued a request in 2013 for fuel developers to submit fuel formulations for testing at the William J. Hughes Technical Center in New Jersey. Candidate fuels selected to progress through the two-phase testing program are being evaluated for chemical properties and suitability for use as an aviation gasoline in Phase 1 testing, to be conducted in 2015. Test reports will be generated on the fuels that can be used to obtain ASTM Production Specifications, and to obtain fleetwide authorization to operate the general aviation piston powered fleet on these fuels. This solicitation for proposed fuel formulations closed July 2014. Four fuel formulations from three offerors have been selected to participate in the program.

Based on Phase 1 results the best fuels will be selected for participation in Phase 2, which will start in 2016 and conclude by the end of 2018.

Usually, an applicant would request approval for use of alternate fuels, and provide substantiating data. For example, unless using an Approved Model List Supplemental Type Certificate, this is usually accomplished one product at a time. Obtaining approval for the current fleet of GA aircraft to operate on these new fuels will be a significant challenge and workload for AVS, and will require a new and innovative approach. The authority does not currently exist for the FAA to authorize large populations of aircraft and engines for unleaded avgas. We are seeking new language in the next Reauthorization to expand the Administrator's authority to allow aircraft and engines which the FAA determines to be eligible to operate on the PAFI replacement unleaded fuels. The R&D program is being designed to allow the broadest determination of eligibility from an evaluation of a reasonable number of engines and aircraft. The PAFI program is pursuing new and innovative methodologies to allow as much of the existing general aviation fleet as possible to operate on the new unleaded replacement avgas formulations.

RTCA DEPENDENCIES

RTCA Special Committees (SCs) leverage the expertise of the aviation community to generate recommendations in response to requests from the FAA to address technical topics. Special Committees develop Operational and Safety Performance Requirements, Interoperability Requirements, Minimum Aviation System Performance Standards (MASPS), Minimum Operational Performance Standards (MOPS), reports and guidelines. These documents shape the certification of the safety and efficiency of new equipment and provide a competitive market for the implementation of these technologies. MASPS and MOPS are frequently referred to by the FAA in Advisory Circulars and Technical

Standard Orders and, thereby, provide a partial basis for the airworthiness equipment standards. RTCA documents are also used by the private sector for development, investment and other business decisions. AVS enabling policy dependent upon publication of RTCA documents is located in Part 3 of this Work Plan.

FOUNDATIONAL AVIONICS ENABLERS

The FAA has evaluated available enablers and identified those that provide the most NAS benefits when a high participation level is achieved in the near term.

The metroplex foundational enablers were selected for providing the greatest impact on metroplex operations and presume high levels of equipage. General foundational enablers target the minimum NextGen capabilities outside metroplex areas. Both capability levels are displayed below. We will update the recommended avionics list when additional enablers become available. Operators may elect to use other enablers that provide benefits but do not require high participation levels.

The FAA and industry are working together on a second bundle of capabilities for the far term. This future bundle integrates communication, navigation and surveillance avionics (the ATNB2, TOPs navigation, and Advanced FIM enablers). These standards are all planned to be completed by 2018. As FAA and industry plans mature, it is recognized that these schedules may need to be revised.

AVS RESPONSIBILITIES FOR NEXTGEN

This section provides an overview of AVS responsibilities in support of NextGen, highlights our safety oversight mission, and discusses our three core business areas:

1. Developing standards;
2. Managing approval processes and procedures; and,
3. Overseeing continuous operational safety (COS).

It also reiterates the roles and responsibilities of the services and offices within AVS, as they relate to NextGen.

AVS plays an important role both in developing and implementing NextGen technologies and operations. Figure 4 portrays the life cycle of technologies and operations, highlighting the role of the AVS Services. Generally, initiatives mature from an initial concept, through experimental prototyping, operational prototyping and then deployment. However, not all projects go through these stages; a concept may go directly to implementation without an experimental or operational prototype if the technology and concepts involved are mature.

Figure 4 shows the primary responsibilities of AVS: collaboratively developing standards and overseeing

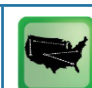
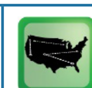
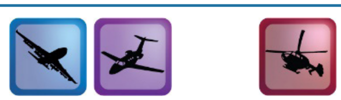
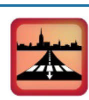
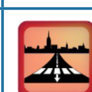
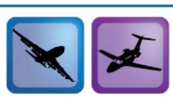
Foundational Avionics Enablers					
Metroplex			General		
Enablers	Target Users	Target Area	Enablers	Target Users	Target Area
REQUIRED ADS-B CAPABILITIES					
ADS-B Out			ADS-B Out		
RECOMMENDED PBN					
RNAV 1, RNAV 2			RNAV 1, RNAV 2		
RNP 1 with Curved Path			LPV		
VNAV					
RNP AR Approach					

Table 9 - Foundational Avionics Enabler

safety assessment. This figure shows an ideal alignment of the development of standards with the technology itself. The standard should be initiated early in the concept development, with a baseline standard available for use by the operational prototype. In addition to prototypes, the applicant may develop a proof of concept using new technology or technology in a new way. AVS will work with the applicant to prove and refine these new prototypes and/or concepts of operation. If an industry standard is not available in time for an operational prototype, the applicant and the FAA must determine the appropriate requirements to apply to the system to ensure safety and achieve the desired operation. This can be resource intensive, as the level of safety as achieving is the same for an operational prototype as it is for full deployment.

Figure 4 also illustrates the importance of safety assessments throughout the development life cycle. Safety must be included in the initial concept development. Otherwise, whole aspects of the technology or operational concept may need revision. The safety assessment must mature as the standards are developed, with a sufficient safety assessment available to enter the operational prototype into service. Typically, AVS approves the operational prototype with some unique operational limitations to address potential deficiencies in the requirements until the requirements can be validated. Mature standards are aligned with a mature safety assessment, after which AVS monitors the initiative in service to ensure that any assumptions or analyses are valid and to identify any unanticipated risks.

The demand for AVS resources, on a per-application basis for each operational prototype, peaks during the standards development stage. This stage is where AVS accepts the initial standards and corresponding safety assessments must be accepted, and where it is crucial to mature the standards and concepts leading to a final standard.

The demand for AVS resources, as applied to an entire initiative, peaks in the approval and oversight phase as many applicants seek approvals and the scope of monitoring for safety continues to expand. Ensuring that standards are robust and simple can reduce the required resources for the implementation phase. In general, we develop NextGen standards as performance-based standards when possible, due to the flexibility in implementation that they accommodate. However, this flexibility increases the workload for implementation, as the AVS workforce must prepare to provide oversight of the technological and operational variations engendered by that flexibility. This is an important consideration when developing standards.

While figure 4 describes generalized phases for the life cycle of a NextGen initiative, it does not describe all of the necessary tasks. For example, aircraft requirements may begin with a special condition or rule, and standards development involve the equipment standard and installation guidance. Engineers may also need technical training on a specific technology. After standards are developed, flight operational requirements must be addressed and maintenance requirements considered, ensuring COS.

Flight operational requirements involve several factors, depending on the complexity and maturity of the technology and the operating environment. The following factors apply to operational prototypes (including demonstrations or trials)

Figure 4 Policy Development Life-Cycle

and to NAS-wide implementations:

- Operating rule, e.g., 14 CFR part 91, 121, or 135;
- Simulation, modeling, and analysis;
- User information, e.g., Aeronautical Information Manual/ Pilot Controller Glossary;
- Operational approval guidance, e.g., AC;
- Operational authorization method;
- Inspector guidance;
- Inspector training;
- Aeronautical information and charting;
- Procedure/Route design criteria; and
- Safety risk management/Operational Safety Assessment Panel participation.

Photo Courtesy of FAA

STREAMLINING STRATEGIES

Prior versions of this Work Plan have explained a number of streamlining initiatives that were based in the RTCA Task Force 5 recommendations. These initiatives recognized the importance of clear requirements and guidance, timely approvals, and effective oversight. The list below describes the initiatives which have been completed, and Section 3 of this Work Plan has the remaining NextGen-specific streamlining initiatives.

In addition, efficient safety oversight is a responsibility that transcends NextGen and we have started a number of broader initiatives with industry. We convened an Aircraft Certification Process Review and Reform Aviation Rulemaking Committee (ARC), an ARC dedicated to updating part 23 airworthiness standards, and an ARC on the consistency of regulatory implementation. In addition, the FAA is working with the aviation industry to implement safety management systems in ways that can recognize a manufacturer or operator's competence to handle certain types of changes without FAA approvals. All of these initiatives benefit NextGen implementation, but as they are not unique to NextGen they are not addressed in this Work Plan.

- **Plan for NextGen standards:** The FAA agrees that timely and cost-effective standards for new capabilities are essential. As part of the NextGen Implementation Plan, the FAA will maintain a plan for all of the standards for aircraft systems and operational approval. This plan is coordinated as a part of NextGen in an effort to provide the standards at the right time, when sufficiently mature to achieve safe and cost-effective solutions. Standards for NextGen are incorporated into Appendix A of the FAA NextGen Implementation Plan, and updated annually.

- **Coordination: Operational Approvals** – AFS implemented NextGen branches in each Regional Office. These branches concentrate experts in new technologies and procedures to support the operational review and approval of NextGen throughout the region. They also work with other NextGen branches, and their activities will be coordinated through a National NextGen focal point in the office of Flight Technologies and Procedures.

- **Coordination: Aircraft Certification** – AIR implemented a NextGen Policy Team to coordinate across the Directorates (responsible for different types of aircraft), and identified NextGen Specialists in aircraft certification offices with significant NextGen activity. The NextGen Policy Team reports to the Standards Management Team and assists in the coordination of new technologies.

- **Coordination: System Safety Assessments** – FAA created a cross-agency team responsible for coordinating across all lines of business and performing organizations. This team facilitates timely integration and execution of safety assessments. The cost and schedule risks associated with ensuring a safe system can best be mitigated by addressing safety from the onset of the program. This ensures the requisite performance, robustness, human factors and mitigations are built into the system and the operation.

- **Procedures for Coordination of New Technology Certification Projects:** FAA published new procedures for coordinating aircraft certification projects which introduce new NextGen technologies, to ensure coordination between the field office conducting the project and the offices responsible for NextGen standards (through issue papers). Through early coordination, AVS provided more effective feedback on innovative projects early in their application process, as well as utilizing the experience from these projects in developing national policy. (See

FAA Order on Standardized Usage of Issue Papers.)

- **Tracking Operational Applications:** FAA provided status reports at certain milestones to applicants for operational approvals that require Flight Standards Service Regional Office (RO) and/or Headquarters (HQ) level concurrence. At a minimum, these updates may be provided within 3 days of a request for status; upon receipt of an application package at the Regional Office and Headquarters levels; and once final concurrence is provided.

- **Coordination of Policy:** FAA coordinated draft policy and guidance material with industry forums during development of policy. For example, the FAA continues to coordinate PBN documents with the Performance-Based Operations Aviation Rulemaking Committee (PARC). Recognizing that no single forum represents all industry stakeholders, the FAA provided for public comment on all draft policy and incorporated that step into QMS procedures.

- **Aviation Safety Communication:** AVS developed a website to promote communication and coordination of NextGen-related projects and policy.

- **Aviation Safety Training Plan:** AVS developed a training plan to identify NextGen training requirements for the AVS workforce.

- **Consolidated, Electronic Application Process:** A review of the capabilities of Web-based automated Operations Safety System (WebOPSS) was conducted to determine the feasibility of multiple, electronic applications for various NextGen operations. Actions included in NavLean recommendations.

- **Process Review:** Lean Process review for Instrument Flight Procedures – the FAA will conduct a review of processes, tools, and procedures related to standards, policies, development, approval, publication, and utilization of instrument flight procedures such as RNAV and RNP. A cross-agency team with representation from all affected offices reviewed the end-to-end process with the objective of establishing a Lean process providing efficiency and consistency for development and implementation of all instrument flight procedures. This review also addressed the operational approval process for procedures. Additional information can be found in the NavLean Report.

- **Early-Adopter Procedure for Coordination:** The FAA developed coordination procedures for projects to ensure early involvement of aviation safety representatives when the FAA is funding development or implementation of technology or procedure being incorporated into FAA Acquisition Management System.

- **Expansion of Consultants for RNP AR Approvals:** The FAA had previously allowed companies to apply as RNP AR approval consultants. When approved by the FAA, these companies are recognized as having the skills and experience to assist operators in developing applications for RNP AR operations. The FAA re-opened this program to allow additional companies to obtain this accreditation.

- **Update Guidance for RNP (Authorization Required) Approaches:** Working with the Performance-based Aviation Rulemaking Committee (PARC), AVS developed an update to AC 90-101A, Approval Guidance for RNP Procedures with AR. This revision clarifies training requirements, reduces the requirements for operator flyability checks, and harmonizes with ICAO Doc 9613 PBN manual (including name change to RNP AR). Additional guidance with respect to database validation was developed. Concurrent with this revision, a change to the relevant procedure design criteria, FAA Order 8260.52 was cancelled and replaced with FAA Order 8260.58 , United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design. Equivalent changes were made to FAA inspector guidance in Order 8900.1 Flight Standards Information Management System (FSIMS) and relevant operations specifications (OpsSpecs).

- **Coordination of PBN implementation:** AVS tasked the PARC to coordinate implementation of PBN from a national perspective. The PARC shared domestic developments, certification and operational approval issues, procedure design challenges, and tracked international development. The FAA reviewed the membership of the PARC to ensure there were appropriate representatives for all stakeholder groups.

- **Update operational specifications for international RNP approaches:** OpsSpecs paragraph C384 Required Navigation Performance (RNP) with Authorization Required (AR) was revised. This update provides for operations on RNP AR procedures designed in accordance with U.S. or international RNP AR procedure design standards.

- **Establish international procedures coordination procedure:** AVS refined processes for the recently developed International Review Board conducted by the Flight Technologies and Procedures Division, AFS-400. In addition, in late 2012 AFS-400 published FAA Order 8260.31C Foreign Terminal Instrument Procedures. Prioritization and Sequencing: AVS updated the criteria used for sequencing projects for aircraft certification to recognize NextGen projects. Safety initiatives will continue to receive the highest priority.

- **Use of Manufacturer-Data for Installation:** NextGen avionics are typically approved under a TSO. The FAA published guidance material on the use of TSO data when an article is installed in aircraft. This guidance acknowledges that the manufacturer of the article has typically accomplished many demonstrations and tests that may be needed for installation approval, including verification that the software has been developed in accordance with industry standards. Unique installation issues will still have to be addressed under the installation approval. (AC for Engineering Data Approvals and TSO Installations).

- **Manufacturer approval of TSO articles:** AVS updated policy on the issuance of TSO authorizations, and provided guidance to industry in an Advisory Circular. The AC addresses the TSO submittal and approval process, as well as addresses how applicants may obtain FAA acceptance of additional functions included in the article but not covered under the TSO.

- **Expansion of Approved Model Lists:** AVS views the expansion of the Approved Model List, STC process as a key enabler for streamlining the installation approval of several NextGen technologies. The process leverages the appropriate re-use of compliance data across multiple type data approvals whereby an applicant can obtain one approval that encompasses multiple aircraft. The FAA created a team to evaluate the harmonization of this policy across aircraft types, which will propose recommendations for new policy.

- **Field Approvals of Avionics Installations:** AVS updated guidance to aviation safety inspectors on the approval of avionics installations under field approvals. This includes the use of approved data, and addresses integration with other avionics. This update also addresses the approval authority of changes to the aircraft flight manual.

- **Guidance Material on Major and Minor Changes in Type Design:** AVS published guidance material on the determination of changes in an aircraft type design as being major or minor. Major changes must be approved by amended type certificate or supplemental type certificate, while minor changes can be approved through several different methods, thereby enabling more flexible and potentially expedient approvals.

SERVICE AND OFFICE ROLES AND RESPONSIBILITIES

NextGen involves implementing new, complex systems and flight crew procedures. Our safety mission dictates we ensure those systems are reliable and safe, and we address the operational aspects of these systems. Our certification and operational approval processes provide the tools to address flight crew procedures, maintenance procedures, training development, and continuous safety monitoring.

Title 14 CFR part 21 defines the approval of modification to aircraft, including installations or upgrades to aircraft through the certification process. The use of specific navigation, surveillance, and communication equipment for a particular operation typically requires operational approval for air carriers and air taxi operators. General aviation may also require operational approval if there are unique training or qualification requirements warranting additional FAA oversight. Following is an overview of service and office responsibilities as they apply to NextGen.

FLIGHT STANDARDS SERVICE (AFS) ROLES AND RESPONSIBILITIES

AFS supports NextGen implementation through aviation safety standards and oversight of the aircraft operators. AFS promotes the safety of flight of civil aircraft by establishing regulations and standards for operators and airmen. AFS accomplishes certification, inspection, surveillance, investigation, and enforcement activities related to operators and airmen.

Operational approval for a commercial operator includes approving:

- Flight crew procedures;

- Maintenance procedures; and

- Training programs.

For general aviation operations, AFS provides standards, guidance, and recommended practices and procedures for installing equipment and conducting flight operations. Operations, which require unique operational approval, are where 1) the complexity of the operation, or 2) the level of risk associated with conducting the operation warrants unique FAA oversight.

With respect to NextGen, operational approval focuses on all of the above areas and considers the ability of the aircraft to support the operation (aircraft qualification). Due to both the unique technologies and the new operations, flight crew and maintenance training and procedures require particular emphasis.

Operation Specifications (OpsSpecs), Management Specifications (Mspecs for part 91 subpart K), and Letters of Authorization (LOAs for part 91) reflect the requirement of a specific approval. The approval identifies the operation, the aircraft, and any unique requirements or limitations.

AIRCRAFT CERTIFICATION SERVICE (AIR) ROLES AND RESPONSIBILITIES

AIR supports NextGen through administering safety standards governing the design, production, and airworthiness of civil aeronautical products. AIR promotes the safety of flight of civil aircraft by establishing regulations and standards for aircraft, engines, and enabling avionics..

Aircraft certification includes:

- Developing avionics equipment performance standards and installation guidance;

- Overseeing design, production, and airworthiness certification programs to foster compliance with the prescribed safety standards; and

- Working with aviation authorities, manufacturers, and other stakeholders to help them successfully improve the safety of the international air transportation system.

With respect to NextGen, the aircraft certification evaluation process considers the design of the system, potential failure conditions, and crew interface issues to ensure the equipment can support its intended function. The type certificate or supplemental type certificate (STC) reflects approval of installed equipment. A TSOA reflects approval of avionics (prior to installation). Both processes are in accordance with procedures defined in 14 CFR part 21.

AIR TRAFFIC SAFETY OVERSIGHT SERVICE (AOV) ROLES AND RESPONSIBILITIES

AOV supports NextGen implementation by providing oversight of ATO NAS changes (new equipment, modifications to existing equipment, or procedural). NextGen's complexity demands safety risk management oversight and involvement early in the development process to promote seamless integration into the existing NAS. AOV accomplishes this task through certification, inspection, surveillance, and compliance actions related to ATO operations, procedures and personnel.

Most new NextGen initiative will require certification of new equipment and requisite standards development. After certification of new equipment and development of new standards, the NextGen initiative must integrate safely into air traffic control. AOV seeks early, proactive engagement with ATO to mitigate potential safety concerns. AOV minimizes potential operational disruptions by coordinating safety requirements for NextGen initiatives with the ATO, AIR, and AFS.

ACCIDENT INVESTIGATION AND PREVENTION (AVP) ROLES AND RESPONSIBILITIES

AVP coordinates the implementation and utilization of the FAA Safety Management System, the backbone of proactive risk management and safe transition to NextGen. AVP takes an integrated approach to system safety management, providing a comprehensive strategy for building increased safety into the air transportation system. During NextGen implementation, AVP will evolve and define its emerging analytical requirements through a series of activities that include research, analysis, demonstrations, and acquisition. AVP will define the evolving role of system safety management for improving safety in the current and future NAS.

AVS develops and maintains an integrated view of the current operational safety in the NAS and provides a forecast of the potential impacts of the system changes, including those associated with NextGen.

AVP develops safety data resources and analytical capabilities to support design and implementation of NextGen operational improvements. Capabilities such as data mining, operator benchmarks, metrics and systems modeling tools are available to all NextGen designers and implementers in ATO, AVS, and Office of Airports (ARP) to enhance their ability to meet NextGen goals in a timely and

safe manner.

AVP conducts FAA major accident and incident investigations both as the FAA representative to the National Transportation Safety Board investigations and as the Investigator-in-Charge for the FAA investigation. These investigations identify opportunities for safety improvement and are the foundation for recommendations for agency actions to avoid future events of the same nature. AVP is also responsible for managing safety recommendations brought forward by other sources, parties, or data analysis.

AVP will develop metrics and measures that verify certain changes introduced with NextGen will maintain or enhance safety benefits to the FAA and stakeholders.

- Lead in the policy and guidance development for the Agency's SMS and manage implementation of the AVS SMS.

- Define and coordinate the implementation of integrated system safety risk management capabilities, including system safety, information sharing, and risk modeling.

- Provide safety data, modeling tools, and analytical capabilities verifying system safety performance improves as NextGen increases capacity and efficiency.

- Manage the AVS research requirements and budget process to support safety and other NextGen priorities. Coordinate NextGen-specific research requirements with the NextGen office for inclusion in the overall NextGen budget.

- Develop and manage Integrated Safety Assessment Model and simulation capabilities using historical event attributes, hazard data and subject matter experts to identify and assess potential future exposures related to NexGen operational improvements (OIs). For example, ISAM capabilities are now being used to assess how historical causes of accidents will be affected by changes in the NextGen portfolio through historical data analysis and subject matter expert analysis.

- Continue development of ASIAS data collection, analytical tools and capabilities that support safety analysts responsible for the design and implementation of NextGen operational improvements. Currently ASIAS collects and houses safety data from most major domestic air carriers and other aviation sector stakeholders (NTSB, NASA, FAA, etc.). Safety metric and benchmark data related to commercial operations is also currently maintained by ASIAS. Upcoming development work is focused on expanded data collection, analysis and dissemination capabilities for General Aviation, Rotorcraft and other emerging operations in the NAS.

OFFICE OF RULEMAKING (ARM) ROLES AND RESPONSIBILITIES

ARM manages the Agency's rulemaking process. The Rulemaking Management Council determines priorities and allocates resources to individual rulemaking projects. ARM works with all FAA LOBs to facilitate drafting, reviewing, and expeditious processing of rulemaking documents. ARM provides these rulemaking services to NextGen initiatives.

OFFICE OF QUALITY, INTEGRATION AND EXECUTIVE SERVICES (AQS) ROLES AND RESPONSIBILITIES

AQS supports NextGen by managing and overseeing all phases of AVS planning, financial management, human resources management, training, and quality management of mission critical technical and business process. AQS provides oversight of budget requirements, and serves as the Information Technology liaison to the FAA Office of Information Technology.

OFFICE OF AEROSPACE MEDICINE (AAM) ROLES AND RESPONSIBILITIES

AAM may involve the Civil Aerospace Medical Institute (CAMI) in future human factors studies. With the automation and integration of NextGen technologies, AAM will need to monitor the role of human-in-the-loop interaction. Incorporating new technologies into the cockpit will require a better understanding of how pilots actually use these devices.

COMMUNICATIONS AND TRAINING

COMMUNICATIONS

AVS must ensure the safety of the new systems and operations as NextGen deploys. Our workforce must be aware of the changes taking place and be prepared to enhance safety standards and oversight. To assist in preparing the workforce to identify, mitigate, and manage risk, we will provide information about NextGen throughout AVS and train the workforce to reach and sustain NextGen levels of safety and efficiency.

This section identifies the key messages of NextGen for AVS, as well as the communication strategies to ensure we are all informed of the latest NextGen developments, and describes the plan for training staff to keep them up to date on NextGen developments.

KEY MESSAGES

Integrated collection of initiatives, not a single program.

Individual initiatives comprise NextGen to improve safety, efficiency, and the environment. It consists of different acquisition programs, operational changes, research projects, and prototypes. Some of the programs and initiatives are mature; other initiatives are still in research. These initiatives will take advantage of existing aircraft

capabilities, empower the flightcrew by providing applicable information to the flight deck, and implement performance-based operations where practical. Many of the cockpit initiatives relate to the transformational programs of PBN, ADS-B, and ATC data communications. The NAS transformation will occur over time, not all in one year.

Help improve safety.

As the FAA implements NextGen, we will ensure the maintenance and improvement of system safety as we deploy NextGen capabilities. Safety improvements must accompany both the expected increase in traffic as well as new operations in increasingly demanding conditions. The application of SMS principles at earlier stages in a system's development will support a comprehensive, proactive approach for managing and evaluating all aspects of system safety, even before a new system is introduced into the operational environment. This approach will help as we monitor the level of safety achieved in the air transportation system and evaluate changes to the system. ASIAS is a tool that will play a significant role in supporting data driven risk based decision making tenants of SMS, including Safety Risk Management and Safety Assurance requirements.

Efficient safety oversight is vital.

Implementing NextGen requires a significant investment from industry and government. For those investments to continue, work must demonstrate a return on investment within a few years. We must use our resources effectively to identify and mitigate risks, while promptly introducing new systems and operations, we tested and proved safe. In addition, we must ensure that industry understands the safety requirements and expectations through early involvement of AVS in developmental activities.

Integration of AVS NextGen activities.

We developed an AVS Work Plan for NextGen to capture the impact of NextGen on AVS Services and Offices. The field is the first to see the applications for approval of new technologies and operations. Increased communication through such groups as the NextGen Policy Team and the AFS NextGen Branches helps coordinate the integration of NextGen technologies and procedures. We have aligned resources to meet the challenges of NextGen, through the NextGen branches in AFS, NextGen focal points in AIR, and the NextGen Safety Management Review construct in airline operations.

Promote synergy between FAA offices.

In the last several years, we have worked more closely with other LOBs to plan for NextGen. The aircraft applicant cannot achieve benefit for equipage if air traffic automation and the ATC workforce cannot implement the change. Many core NextGen changes for air traffic and airspace redesign rely on improved aircraft capability.

Coordinate with Stakeholders.

The FAA alone cannot implement NextGen initiatives. Manufacturers will need to develop new aircraft systems, and operators will need to install those systems and train for their use. We must coordinate the planned capabilities to ensure that the other members of the aviation community can align their plans and focus their resources to achieve our common goals. We must also coordinate with other agencies and entities as appropriate (for example, the Department of Defense).

Communication Strategies

We must all have an opportunity to review NextGen objectives and contribute to their refinement and overall program success. AVS has unique insights into the opportunities and challenges we face in implementing NextGen. AVS uses the following tools to inform and engage the workforce.

AVS TOWN HALL MEETINGS

AVS Town Hall meetings are held quarterly, and provide the AVSMT an opportunity to keep the workforce up to date on NextGen progress and issues. The Town Halls also provide a forum for staff to ask specific questions about NextGen since questions are solicited in advance of each Town Hall. Town hall meetings, conducted for the benefit of the entire AVS workforce, provide a forum for the AVSMT to discuss pertinent NextGen issues and to address questions.

AVS INTRANET SITE FOR NEXTGEN COMMUNICATION

The AVS intranet site contains AVS-specific documents, such as this plan: https://employees.faa.gov/org/linebusiness/avs/nextgen/. The AVS Web site includes enabler tutorials and an email box for feedback, which is checked regularly to answer AVS employee questions about NextGen. The address is: 9-AVS-AWA-NextGen. The FAA NextGen Web site at http://www.faa.gov/nextgen, has NextGen videos, a calendar of events, and more information.

IDENTIFY APPROPRIATE TARGET AUDIENCES FOR MESSAGING

AIR: NGPT and Aircraft Certification Office (ACO) focal points

The NextGen Policy Team is a cross-organization team that coordinates policy and initial issue papers relating to NextGen technologies and complex avionics issues. The primary focus is on developing consistent and coordinated approaches to the airworthiness approval of these systems. Initial issue papers include first installations of NextGen and related technologies. Some of these projects will require coordination with other organizations, such as AFS and ATO. Additionally, ACO focal points will work with AIR-130 and directorate standards staff in the development of policy for new and novel applications.

AFS NextGen Field Offices

AFS has established NextGen branches in the AFS regional offices. These NextGen liaisons will facilitate understanding of the big picture and ensure the FAA's safety workforce sees, knows, and understands where the agency is headed with NextGen.

AOV

The Safety Management Future Systems Branch is the NextGen focal point for AOV. The branch ensures systematic management of safety risks and serves as an information exchange for emerging systems. The Future Systems Branch employs a matrix architecture of safety system experts to collaborate and ultimately provide consultation and feedback to the ATO as they work NextGen systems through the AMS. The supporting AOV Safety Management Review (SMR) construct focuses on ensuring early and regular safety system collaboration with emphasis on risk mitigation, solution development, and control validation and verification. The SMR construct collects information and provides actionable systems awareness to the management team with updates on the progress of particular NextGen or future systems in the AMS life cycle as well as the associated emerging risks considered by System Safety Working Group and the Safety Risk Management Panel (SRMP). The goal of the SMR is coherent, accurate, and comprehensive situational awareness, to provide timely processing of Safety Risk Management Documents (SRMD) and High-Risk Hazard mitigation control strategies through AOV.

INTERNAL AWARENESS CAMPAIGN

In an announcement from the AVS Associate Administrator to the workforce, we rolled out messaging about the launch of the AVS NextGen Work Plan linking to the Plan and encouraging the workforce to become familiar with it. Concurrently, articles were posted on Focus FAA, the FAA NextGen Website, and in the AVS Flyer. Since the launch, Town Hall meetings hosted by the Associate Administrator and Deputy Associate Administrator for AVS as well as articles in the AVS Flyer and on NextGen news help promote understanding of what NextGen is, how it will improve aviation and what the AVS role is in it. For the latest information available on NextGen, go to www.faa.gov/NextGen.

AVS NEXTGEN TRAINING PLAN

Implementing interdependent systems in various stages of development and maturity occurs over a variety of timeframes. There is continuous need for updated information. Training and communicating where to find current information are essential for successful NextGen implementation. The AVS NextGen Training Plan is evolving over time and must continue to be flexible to serve a varied workforce.

Through training, AVS will ensure that everyone involved in and impacted by NextGen has a common understanding of what NextGen is and how to work in accordance with it. Additionally, training will provide both AVS employees and their managers the tools and skills necessary to meet

NextGen requirements in their service or office.

The AVS training strategy for NextGen consists of:

- Providing an overview of NextGen as it relates to AVS responsibilities;

- Conducting training needs analysis as it relates to the AVS NextGen business plan, and develop curriculum map(s) for AIR, AFS, and AOV, respectively.

- Developing new courses and training interventions.

- Revising current courses to incorporate NextGen concepts;

- Identifying and documenting the appropriate training for our technical specialties through training profiles; and

- Providing employees with resources on the latest NextGen technologies.

Each Service and Office is responsible for identifying a specific NextGen training strategy for its workforce. To avoid duplication of effort and ensure a consistent message, new training development should be undertaken in collaboration with the AVS NextGen Coordination Group and the AVS Training Council. When necessary, a training team can be established to develop cross-Service/Office training. AFS and AIR will manage the process for uploading these courses into the FAA's e-Learning Management System (eLMS) and assist in assigning the courses to the appropriate employees.

RESEARCH AND DEVELOPMENT

This AVS NextGen Work Plan focuses primarily on accomplishing NSIP: Segment Alpha and Bravo, which we will implement between today and 2022. AVS and NextGen research supports a number of these activities.

AVS R&D integrates the research requirements of the other FAA LOBs within the structure of the R&D Executive Board (REB) process, managed by FAA Office of NextGen and Operations Planning (ANG). The output of the R&D REB is an annual FAA R&D portfolio and budget request, ultimately submitted to Congress with the President's Budget Request.

The FAA assigned the NextGen budget responsibility to ANG, including funding for NextGen-related R&D needs. Facilities and Equipment monies fund some NextGen development and applied research through a separate budget development process from R&D.

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AVS R&D REQUIREMENTS PROCESS

The aviation safety research community identifies, conducts, and delivers credible safety research products that respond to the regulatory and oversight needs of the FAA. The FAA's research program ensures that there is a clearly defined and understood R&D process to:

- Collect and evaluate research requirements;

- Identify and prioritize research requirements;

- Present prioritized research requirements;

Photo Courtesy of FAA

Figure 5 Boeing Simulator
Photo Courtesy of FAA

- Evaluate the priority of pop-up requirements;
- Recommend redirection of research activities;
- Maintain current knowledge; and
- Communicate research results to the AVS organizations.

The AVS R&D Requirements Process defines the steps to develop the annual AVS R&D portfolio. The AVS R&D Requirements Process is both a top-down and bottom-up process. It starts with the release of strategic guidance from upper management early in the planning cycle. In the April-May period, the AVSMT will specify particular areas of research that are strategic to the LOB. Likewise, the S/O level and the Division/Directorate level may also indicate areas that may be strategic from the Service, Office, Division, and Directorate level(s). This guidance is provided to the AVS R&D Technical Community Representative Groups (TCRG). The TCRGs are the initial point of origin (bottom-up) in AVS for identifying research requirements. TCRGs have a particular area of technical responsibility and are responsible for identifying the technical knowledge needed to support the subsequent delivery of AVS products within their area of expertise. Suggestions for new technical requirements, approaches, and technical solutions to meet those research requirements can come from almost any source within the various technical communities. On behalf of their respective AVS organization, TCRG representatives should develop NextGen research requirements needed to fulfill AVS NextGen responsibilities.

We define and recommend research requirements at the lowest levels of the organization, based on the strategic guidance and overall mission. The requirements are then reviewed and prioritized by the AVS R&D Group. This is followed by subsequent reviews and approvals by each S/O, the AVSMT, and final approval by AVS-1.

The AVS R&D Requirements Process identifies a clear line of sight between each issue or need, the R&D need to resolve it, and implementation of the research to achieve the intended sponsor outcome. The process also supports a framework for sponsor management of each project throughout the life cycle.

For a complete description of the FAA R&D Program, see the National Aviation Research Plan (NARP). The National Aviation Research Plan (NARP) is an integrated, performance-based plan for the FAA R&D Program supporting both the day-to-day operation of the NAS, including the vision and implementation of NextGen. For a complete description of the overall FAA R&D Program, see the NARP Web site at: http://www.faa.gov/about/office_org/headquarters_offices/ang/offices/ac_td/research_planning/narp/

NEXTGEN PORTFOLIO MANAGEMENT PROCESS

FAA NextGen R&D programs are subsets of the FAA R&D portfolio. ANG manages NextGen research investment. ANG ensures effective and efficient application, planning, programming, budgeting, and execution of the FAA

NextGen portfolio, including the NextGen R&D Programs. ANG NextGen solution set coordinators meet regularly to review NextGen R&D, allocate resources, and manage the NextGen R&D.

FAA NextGen R&D submits requirements to ANG for consideration, which then prioritizes and programs funds. The AVS R&D Requirements Process provides the NextGen Lifecycle Integration Office our NextGen requirements.

NEXTGEN RESEARCH ASSETS

AFS Flight Operations Simulation Laboratory

The Flight Operations Simulations Branch (AFS-440) provides operational simulations of new, emerging, or modified communications, navigation, and surveillance technologies and procedures that support aviation safety. AFS-440 manages Boeing 737-800 and Airbus 330 (convertible to Airbus 340) flight simulators along with air traffic controller radar monitors linked to provide real-time, realistic, dynamic virtual terminal operations, pilot/controller interface, and pilot/controller/aircraft data collection. These assets are complemented with a High Level Architecture (HLA) communications infrastructure providing the ability to conduct robust Human-In-The-Loop (HITL) tests and evaluations. By the end of 2015 an A320 capability within the Airbus simulator will be available for research purposes only, as well as the capability to connect both simulators with geographically displaced research facilities for HITLs and other test efforts using the NextGen Prototyping Network (NPN).

The Flight Systems Laboratory Branch (AFS-450) gathers data from real world aeronautical activities to create simulation models. High-speed computers use these models to generate millions of simulated flight operations and produce data representing years of actual flight operations. For example, Airspace Simulation and Analysis Tool (ASAT) is a software tool that simulates operational scenarios in realistic environments. RNAV-Pro is a screening tool to support the development of RNP/RNAV routes and procedures. AFS-450 analyzes and translates the data collected from these modeling tools, as well as from flight tests and flight simulator, into performance and safety parameters used to establish NextGen operational standards.

Civil Aerospace Medical Institute (CAMI)

CAMI's principal concern is the human element in flight – pilots, flight attendants, passengers, air traffic controllers – and the entire human support system that embraces civil aviation. Under the guidance of the Federal Air Surgeon, the Aerospace Human Factors Research Division at CAMI conducts research that focuses on improving individual system effectiveness, efficiency, and safety. General Aviation and ATC are two of the broad interest areas of the researchers in the division.

NextGen Integration and Evaluation Capability

The NextGen Integration and Evaluation Capability (NIEC) is located at the FAA William J. Hughes Technical Center, Atlantic City International Airport, New Jersey. The NIEC is the FAA's research platform to explore, integrate, and evaluate NextGen concepts through simulation activities resulting in concept maturation and requirements definition. For example, the research cockpit simulator is shown in 3.

AVS NEXTGEN RESEARCH NEEDS

Looking forward to the more advanced technologies and operations of NextGen, AVS will participate in defining, prioritizing, and conducting research to address core issues relating to future system safety. We must address these issues through collaboration with industry or by refining internal processes and procedures. AVS plans to advocate for the following research requirements:

End-to-end safety analysis and performance allocation.
Historically, allocating responsibility and requirements among the aircraft, the aircraft operator, and the Air Navigation Service Provider (ANSP) has been a pacing item in deploying new technologies and applications. It is critical to establish a process to accomplish this allocation with quantitative instead of qualitative criteria. The FAA is working with U.S. industry, European Aviation Safety Agency (EASA), and ICAO to address the challenge.

Identifying safety opportunities.
Every NextGen OI has potential safety implications.

Collection and analysis of quality data from across the FAA enterprise is critical to understanding system effects and interactions during and after NextGen implementation.

We need research to ensure optimized data collection, storage, modeling, and analysis systems and to meet the needs of safety initiatives and priorities of each FAA LOB.

Regulatory framework.
AVS should evaluate the airworthiness and operational regulations within its purview and identify any appropriate changes to implement NextGen. For example, some rules may need to transition from system specific to performance based. Another example is the increased role of avionics in future operations may require changing the TSO program or developing new regulations to ensure appropriate avionics performance.

Improving flightcrew awareness.
With the increased role of automation, maintaining flightcrew awareness and effective intervention during failure and abnormal conditions is critical. Research has suggested mode awareness is already a challenge, a trend we must address as we introduce new technologies. We need to develop new displays and alerting, as appropriate, to

Figure 6 Unmanned Aircraft System (UAS)
Photo Courtesy of FAA

improve awareness and retain the ability for the flightcrew to manage the operation.

Trajectory Operations (TOps).

These functions integrate the traditional functions of navigation (defining a path and creating path guidance) and flight control (steering the aircraft to that path). It adds additional capabilities for NextGen, including conformance monitoring, trajectory negotiation (a traditional "communication" function), and some functions to support trajectory planning (weather data, traffic data, fuel optimization, etc.). Strategic trajectory planning, or trajectory optimization (to optimize time or fuel within a given set of constraints such as aircraft performance and weather), may take place within the aircraft trajectory management function. We may also accomplish trajectory optimization in a ground system and the result communicated to the aircraft. A common operational concept of use for midterm Tops is in development through ANG, and a parallel activity in JPDO defined the long-term Trajectory-Based Operations concept.

Unmanned Aircraft System (UAS).

UAS access to the NAS remains limited. The FAA allows UAS-NAS operations on a case-by-case basis through the issuance of a Certificate of Waiver or Authorization for public aircraft, or a Special Airworthiness Certificate – Experimental Category for civil users. In 2015 the FAA began issuing exemptions to allow commercial operators using UAS. Due to the diverse utility UASs offer, we expect their use to increase exponentially in a variety of key public and civil areas. Industry projections for 2018 forecast more than 15,000 UASs in service in the United States, with almost 30,000 deployed worldwide [World Unmanned Aerial Vehicle Systems, Market Profile and Forecast 2009-2010, The Teal Group]. From operational, infrastructure and safety perspectives, the increasing number of UASs presents a number of challenges, the solutions to which will involve and impact all NAS constituencies, but ultimately require a seamless integration of UASs into the NAS. The FAA also continues to work with government, industry, and academic organizations on UAS R&D challenges to support the development of policy, standards, regulations, and procedures needed for safe integration of UASs in the NAS.

ACRONYMS

14 CFR	Title 14 of the Code of Federal Regulations
AAM	Office of Aerospace Medicine
AAtS	Aircraft Access to System Wide Information Management (SWIM)
AC	Advisory Circular
ACAS	Airborne Collision Avoidance System
ACO	Aircraft Certification Office
ADS-B	Automatic Dependent Surveillance-Broadcast
AFS	Flight Standards Service
AIR	Aircraft Certification Service
AIS	Aviation Information System
ANG	FAA Office of NextGen and Operations Planning
ANG-1	Assistant Administrator for NextGen and Operations Planning
ANSP	Air Navigation Service Provider
AOV	Air Traffic Safety Oversight Service
APNT	Alternative Position, Navigation, and Timing
AQS	Office of Quality, Integration, and Executive Services
AR	Authorization Required
ARC	Aviation Rulemaking Committee
ARM	Office of Rulemaking
ARP	Office of Airports
ASDE-X	Airport Surface Detection Equipment Model X
ASIAS	Aviation Safety Information Analysis and Sharing
ATAS	ADS-B Traffic Awareness System
ATC	Air Traffic Control
ATJ	Alcohol to Jet
ATO	Air Traffic Organization
ATS	Air Traffic Service
Avgas	Aviation Gasoline
AVP	Office of Accident Investigation and Prevention
AVS	Aviation Safety
AVSMT	AVS Management Team
CAMI	Civil Aerospace Medical Institute
CAVS	CDTI-Assisted Visual Separation
CDTI	Cockpit Display of Traffic Information
CEDS	CDTI-Enhanced Delegated Separation
CFR	Code of Federal Regulations
COS	Continuous Operational Safety
CSPO	Closely Spaced Parallel Operations
DCL	Departure Clearance
EA	Enterprise Architecture
EASA	European Aviation Safety Agency
EFB	Electronic Flight Bag
EFVS	Enhanced Flight Vision System
EUROCAE	European Organisation for Civil Aviation Equipment
EVS	Enhanced Vision System
EWR	Newark Liberty International Airport
FANS	Future Air Navigation System
FAS	Final Approach Segment
FIM-DI	Flight deck-based Interval Management-Defined Interval
FIM-S	Flight deck-based Interval Management-Spacing
FIR	Flight Information Region
FIS	Flight Information Services
FIS-B	Flight Information Services - Broadcast
FMS	Flight Management System
GBAS	Ground-Based Augmentation System
GIM-S	Ground-based Interval Management-Spacing
GLS	(Ground-Based Augmentation System) Landing System

ACRONYMS

GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HEFA	Hydroprocessed Fatty Acid Esters and Fatty Acids
HUD	Head-Up Display
I2I	Idea to In-Service
IAH	George Bush Intercontinental Airport
ICAO	International Civil Aviation Organization
IFP	Instrument Flight Procedure
IFPP	Instrument Flight Procedure Panel
ILS	Instrument Landing System
IM	Interval Management (ADS-B)
IMS	Integrated Master Schedule
ITP	In-Trail Procedures
LOB	Line of Business (AVS, for example)
LPV	Localizer Performance with Vertical Guidance
MOPS	Minimum Operational Performance Standards
MSpec	Management Specification
NAC	NextGen Advisory Committee
NAS	National Airspace System
NAV Lean	Navigation Procedures Project
NextGen	Next Generation Air Transportation System
NGIP	NextGen Implementation Plan
NMB	NextGen Management Board
NOTAM	Notices to Airmen
NSIP	NextGen Segment Implementation Plan
OI	Operational Improvement
OPSP	ICAO Operations Panel
PBN	Performance Based Navigation
R&D	Research and Development
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radius-to-Fix
REB	R&D Executive Board
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP AR	RNP Authorization Required
SA	Situation(al) Awareness
SBAS	Satellite-Based Augmentation System
SC	Special Committee
SESAR	Single European Sky ATM Research
SID	Standard Instrument Departure
SMR	Safety Management Review
SMS	Safety Management System
Spec	Specification
SSA	System Safety Assessment
STAR	Standard Terminal Arrival
STC	Supplemental Type Certificate
SVS	Synthetic Vision Systems
SWIM	System Wide Information Management
TBO	Trajectory-Based Operation
TCAS	Traffic Alert and Collision Avoidance System
TCRG	Technical Community Representative Groups
TOps	Trajectory Operations
TSAA	Traffic Situation Awareness with Alerts
TSO	Technical Standard Order
TSOA	Technical Standard Order Authorization
UAS	Unmanned Aircraft System

ACRONYMS

UAT	Universal Access Transceiver
VDL	VHF Digital Link
VHF	Very High Frequency
VFR	Visual Flight Rules
VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
WAAS	Wide Area Augmentation System

Photo Courtesy of Joseph Geni,
Nationwide IT Services, contractor

Section 2

2014 Report Card

The following section describes the accomplishments and plans in each enabler category. For tracking from the previous year's Work Plan, table 10 summarizes the status of the enabling policies that were scheduled for completion within the last year.

Initiative	Specific Action (Activity Target)	OPR	2014 Work Plan Schedule	Status
PERFORMANCE-BASED NAVIGATION				
Advanced RNP, RNP 0.3, RNP 2	Update AC 90-105, *Approval Guidance for RNP Operations and Barometric Vertical Navigation in the U.S. National Airspace System*, to include new, internationally harmonized navigation specifications of Advanced RNP, RNP 0.3, and RNP 2	AFS-470	December 2014	AC 90-105 Update June 2015
Trajectory Operations	MASPS RTCA DO 236C Change 1 RNP for Area Navigation	RTCA 227	March 2015	DO 236C Change 1 September 2014
ADS-B				
ADS-B In Traffic Advisory System	MOPS: DO 317B Automatic Dependent Surveillance – Broadcast	SC-186	June 2014	DO 317B June 2014
ADS-B In Traffic Advisory System	TSO-C195b Equipment Standard for non-TCAS equipped aircraft to obtain conflict detection capability that is compatible with typical VFR operations	AIR-132	September 2014	TSO-C195b September 2014
ADS-B In Traffic Advisory System	AC 20-172B, Airworthiness Approval for ADS-B In Systems and Applications: Update installation guidance for ADSS-B In Traffic Awareness System	AIR-132	January 2015	AC 20-172B May 2015
Closely Spaced Parallel Operations (ADS-B In)	Feasibility Study on Paired Approach Operations (Simulator Evaluation)	AFS-450	December 2014	June 2014

Table 10 - 2014 Policy

2014 REPORT CARD (CONT.)

Initiative	Specific Action (Activity Target)	OPR	2014 Work Plan Schedule	Status
FANS-1/A (Over Satcom)	MOPS: RTCA DO-262B, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)	RTCA SC-222	June 2014	RTCA DO-262B June 2014
FANS-1/A (Over Satcom)	TSO-C159b Avionics Supporting Next Generation Satellite Systems: Update TSO to invoke standards for new Inmarsat service SatCom (International Mobile Satellite Organization (Inmarat) Swift Broadmand)	AIR-132	September 2014	TSO-C159b September 2014
FANS-1/A (Over SatCom)	AC 20-150B, Airworthiness Approval of Satellite Voice Equipment Supporting Air Traffic Service (ATS) Communication	AIR-132	December 2014	AC 20-150B Completed December 2014
EFVS	Publish final rule expanding operational use of EFVS Systems	AFS-410	March 2015	August 2015
EFVS	AC 90-106A Enhanced Flight Vision Systems: Update AC to address use of EFVS for touchdown	AFS-410	March 2015	AC 90-106A August 2015
EFVS	AC 20-167A Airworthiness Approval of EVS, SVS, CVS and EFVS: Update AC to address use of EFVS for touchdown	AIR 131	March 2015	AC 20-167A August 2015
SVGS	MASPS: RTCA DO-359 Synthetic Vision Guidance Systems	RTCA SC-213	December 2014	May 2015
FIS-B	MOPS: RTCA DO-358 Minimum Operational Performance Standards (MOPS) for Flight Information Services Broadcast (FIS-B) with Universal Access Transceiver (UAT)	RTCA SC-206	March 2015	March 2015
FIS-B	TSO - C157b, Aircraft Flight Information Services Broadcast (FIS-B) Data Link Systems and Equipment	AIR-132	May 2015	May 2015

Table 10 - 2014 Policy

2014 REPORT CARD (CONT.)

Initiative	Specific Action (Activity Target)	OPR	2014 Work Plan Schedule	Status
Drop-In Renewable Jet Fuel Pathways)	Expanded jet fuel specification to allow production via alternative process and feedstocks	AIR-20	December 2014	SIP Fuel Approved June 2014
Electric Propulsion	Enables certifiable electric propulsion technology with zero fuel burn and lower noise for light sport aircraft.	ACE-100	December 2014	ASTM F2840 August 2014
Training Courses	NextGen Avionics Familiarization Course	AIR-130	July 2014	Completed Course #27200093
Training Courses	Auxiliary Displays and Applications (EFB) Course	AIR-130	October 2014	Completed Course #27200101
Training Courses	NextGen Surveillance Course	AIR-130	November 2014	Completed Course #27200099
Training Courses	HUD/EVS/SVS Course	AIR-130	December 2014	Completed Course #27200100

Table 10 - 2014 Policy

2014 EQUIPAGE LEVELS

The Equipage Level table summarizes current equipage levels of mature avionics enablers among air transport operators [Title 14 CFR part 121 operators], air taxis [Title 14 CFR part 91K and 135 operators] and helicopters [Title 14 CFR part 135 operators]. The high penetration of PBN enablers reflects the maturity of these capabilities, some which have been available for more than 10 years. While the general aviation fleet continues to experience significant adoption of advanced technologies, especially with WAAS avionics, precise equipage numbers are difficult to obtain and are not included. The equipage numbers are based on documented operational approvals for air carriers, air taxi and helicopters, and are normalized to the subset of the fleet applicable to the operation.

Enabler	Air Transport	Fixed Wing Air Taxi	Helicopter Air Taxi
RNP 10 (Oceanic)**	99%	99%	AAR
RNP 10 (GOMEX)**	98%	88%	29%
RNP 4	95%	96%	AAR
RNAV 1	97%	92%	30%
RNAV 2	98%	92%	30%
RNP 1 with Curved Path	56%	1%	0%
VNAV	86%	19%	<1%
LPV (Approach)	<1%	17%	<1%
RNP AR	59%	2%	<1%
ADS-B Out (DO-260B)	3%	3%	2%
ADS-B In (CAVS, SURF, AIRB)	1%	<1%	<1%
ADS-B In In-Trail Procedures**	<1%	<1%	AAR
FANS 1/A over SATCOM**	42%	9%	AAR
FANS 1/A+ over VDL Mode 2	4%	1%	<1%
HUD/ILS	22%	N/A	N/A
EFVS	1%	N/A	N/A
Electronic Flight Bag	87%	N/A	N/A

Note: N/A means flight plan data for specific capability not available; AAR indicates additional analysis required
The reported numbers are derived from multiple sources and are sensitive to fleet composition changes.
** Oceanic enablers numbers reported are based on the subset of aircraft that operate in oceanic airspace.
Data updated as of 4/20/15

Table - 11 Equipage Levels

2014 U.S.-EU HARMONIZATION

The different compliance criteria and dates are a function of the individual nation's needs. The FAA works very hard to harmonize the equipment requirements (regardless of the technology) so a single solution is viable internationally. Below is a table providing results of the Avionics Roadmap harmonization activity supported jointly between SESAR and NEXTGEN as part of a Memorandum of Cooperation at the EU-U.S. level.

Sesar & NextGen	Aircraft Capability	Status: Sesar & NextGen
Navigation	RNP 10	Harmonized
	RNP 4	Harmonized
	RNP 2	Ongoing
	RNAV 5 (BRNAV)	Europe Only
	RNAV 1, RNAV 2	Harmonized
	RNP with curved path	Harmonized
	Vertical Navigation	Harmonized
	LPV	Harmonized
	RNP AR	Harmonized
	Advanced-RNP	Ongoing
	RNP 0.3	Ongoing
	TBO with EU I-4D and U.S. Tops	Ongoing
	Automatic Optimized Braking	Europe Only
	Initial GBAS CAT II/III Using GPS L1 and U.S. GLS III	Harmonized
Surveillance	ADS-B Out	Compatible
	ADS-B IN - CDTI	Harmonized
	Traffic SA on Surface	Harmonized
	ADS-B In Airport Traffic Situation Awareness (SURF) Alert	Harmonized
	ADS-B In Interval Management	Ongoing
	Closely Spaced Parallel Operations	U.S. only
	ACAS-X	Ongoing

Table -12 U.S.-EU Harmonization

2014 U.S.-EU HARMONIZATION (CONT.)

Sesar & NextGen	Aircraft Capability	Status: Sesar & NextGen
Communication	FANS 1/A Satellite Communication	Harmonized
	FANS 1/A (VDL m2)	U.S. Continental Only
	ATNB1 (VDL m2)	Europe Continental Only
	Baseline 2 (Initial)	Europe Only
	Baseline 2 (Final)	Ongoing
On-Board Information and System Display	AAtS	Ongoing
	HUD/ILS	Ongoing
	EFVS	Ongoing
	EFB	Harmonized
	FIS-B	U.S. Only

Table 12 - U.S.-EU Harmonization (Continued)

Photo Courtesy of Joseph Geni, Nationwide IT Services, contractor

Section 3

Future Commitments

This section lays out the planned schedule for AVS to develop policy documents (i.e., Operational Guidance, Equipment Installation Guidance and Equipment Standards) in support of NextGen Capabilities that reside onboard the aircraft. It also relates AVS policy which may be dependent upon accepted industry standards. Many of the FAA Policy documents that enable NextGen capabilities are dependent on the development of consensus based industry standards, such as the industrial standards documents that are produced by RTCA Inc. Where relevant these industry standards are listed with their estimated date that they will reach final approval of their standards body. The dates listed below are the best estimates as to the completion dates for both the industrial standards bodies and the FAA. Furthermore, activities listed below that were listed in the previous year's plan will be footnoted if their scheduled completion date has been modified.

FUTURE COMMITMENTS

Enabler	Initiative	Specific Action (Activity Target)	OPR	Schedule
PERFORMANCE-BASED NAVIGATION				
RNAV	Procedure Criteria	Update Order 8260.58 (PBN) - OPD Guidance (STAR Criteria)	AFS-420	December 2015
	Procedure Criteria	Update Order 8260.3 – to incorporate STAR guidance and vertical guided approaches	AFS-420	August 2015
	Procedure Criteria	Update Order 8260.19 – to support implementation of Orders 8260.58 and 8260.3	AFS-420	August 2015
Advanced RNP, RNP 0.3, RNP 2	Operational Guidance	AC 90-105A update to support RNP 2 operations, RNP 0.3 rotorcraft operations and Advanced RNP (A-RNP) capabilities	AFS-470	July 2015
	Industry Standard	MOPS: RTCA DO-283B RNP for Area Navigation	RTCA SC-227	December 2015
Trajectory Operations Navigation*	Equipment Standard	TSO-115d: Equipment standard for RNP system suited for advanced RNP operations	AIR-131	February 2016
	Installation Guidance	AC revision (AC 20-138D, Chg 2): RNP system installation guidance supporting advanced RNP operations	AIR-131	August 2016
Alternative Position, Navigation, & Timing (APNT)	Research	Support research for GPS independent APNT capability	AIR-131/ AFS-470	September 2015
**See discussion in Foundational Avionics Enablers. (page 24)*				

Table 13 - Future Commitments

FUTURE COMMITMENTS (CONT.)

Enabler	Initiative	Specific Action (Activity Target)	OPR	Schedule
ADS-B				
Flight Interval Management (FIM) (ADS-B In)	Industry Standard	MOPS: DO 317C Automatic Dependent Surveillance - Broadcast	RTCA SC-186	December 2015
	Equipment Standard	TSO-C195c, revised equipment standard for interval management	AIR-132	February 2016[2]
	Installation Guidance	AC 20-172C, revised AC on interval management installation	AIR-132	May 2016[2]
	Operational Guidance	AC 90-114, Automatic Surveillance Broadcast (ADS-B) Operations, Appendix for Flight Interval Management (FIM)[6]	AFS-430	June 2016[3]
	Implementation Guidance	Revise Order 8900.1, Standard Operations Specifications	AFS-430	June 2016[3]
Closely Spaced Parallel Operations (ADS-B In)	Industry Standard	Technical Report on Paired Approach Analysis Data Collection	AFS-450	August 2015
		RTCA: Standard for CSPO/Advanced FIM	RTCA SC-186	2018[4]
Advanced Flight Interval Management (ADS-B In)*	Industry Standard	RTCA: Standard for CSPO/Advanced FIM	RTCA SC-186	2018[5]
	Equipment Standard	TSO: Provides higher performance along-track guidance , control and indications, and alerts for terminal operations	AIR-132	2018
	Installation Guidance	AC: Provides higher performance along-track guidance control and indications, and alerts for terminal operations	AIR-132	2018
	Operational Guidance	AC 90-114, Automatic Surveillance Broadcase (ADS-B) Operations, Appendix for Advanced Flight Interval Management (FIM)[6]	AFS-430	2018[7]
	Implementation Guidance	Revise Order 8900.1 Standard Operations Specifications	AFS-430	2018[7]

**See discussion in Foundational Avionics Enablers. (page 24)*

[1]Schedule revised to accommodate July 2016 completion of Advanced Technologies & Oceanic Procedures (ATOP) system operational modifications.

[2]Forecasted delivery date for FAA FIM policy documents is dependent on the outcome of NASA's FIM trials.

[3]Publication predicated on development and publication of the required industry standards (MOPS).

[4]Forecasted schedule pending successful research.

[5]Schedule revised to accommodate publication of material after industry standards are developed.

[6]Appendix will be added to the current revision of AC 90-114.

[7]Publication date dependent on the completion of industry standards for Baseline 2 (Final)

Table 13 - Future Commitments (Continued)

FUTURE COMMITMENTS (CONT.)

Enabler	Initiative	Specific Action (Activity Target)	OPR	Schedule
DATA COMMUNICATIONS				
FANS 1/A	Operational Guidance	Supersede guidance in AC 120-70B with AC 120-70C	AFS-470	July 2015
	Operational Guidance	AC 90 – Data Comm, update operational use of data communications	AFS-470	March 2016
Baseline 2 (Final)*	Industry Standard	RTCA: Safety and Performance Standard for Baseline 2 ATS Data Communications (Final)	RTCA SC-214	July 2016
	Installation Guidance	AC 20-140C *Guidelines for Design Approval of Aircraft Data Link Communications Systems Supporting Air Traffic Services (ATS)*	AIR-132	July 2016[7]
	Operational Guidance	AC 90 - Data Comm	AFS-470	2018
Data Link Recording	Installation Guidance	AC 20-160A, *Onboard Recording of Controller Pilot Data Link Communication in Crash Survivable Memory. (Add Baseline 2 approved message set)*	AIR-132	July 2016[7]
LOW VISIBILITY OPERATIONS				
Enhanced Flight Vision System (EFVS)	Installation Guidance	AC 20-167A *Airworthiness Approval of EVS, SVS, CVS and EFVS*: Update AC to address use of EFVS for touchdown	AIR-131	September 2015
	Installation Guidance	AC 20-167B *Airworthiness Approval of EVS, SVS, CVS and EFVS*: Update AC to address use of EFVS for touchdown with visibilities down to 300 RVR	AIR-131	2017[8]
	Operational Guidance	AC 90-106A Enhanced Vision Systems: Update AC to address use of EFVS for touchdown	AFS-410	September 2015
	Operational Guidance	Publish final rule expanding operational use of EFVS systems	AFS-410	September 2015
Synthetic Vision Guidance System (SVGS)	Installation Guidance	AC 20-SVGS	AIR-131	September 2015
	Operational Guidance	Operational guidance on use of SVGS for reduced visibility ILS approach operations.	AFS-410	September 2016
GLS Category III	Installation Guidance	Interim criteria (project specific policy)	AIR-131	2019[9]
	Operational Guidance	AC 120-XLS Criteria for Approval of Category I, II and III Weather Minima for Takeoff, Approach and Landing updated to include CAT III GLS	AFS-410	October 2016

**See discussion in Foundational Avionics Enablers. (page 24)*

[7] Publication date dependent on the completion of industry standards for Baseline 2 (Final)

[8] Schedule depends on operational acceptance of RTCA/DO-341, concepts. FAA and industry are evaluating the use of a fail operational architecture as envisioned by RTCA, which may drive a revision to DO-341.

[9] New projected date moved to 2019 in order to synch up with development of GLS III ground sites.

Table 13 - Future Commitments (Continued)

FUTURE COMMITMENTS (CONT.)

Enabler	Initiative	Specific Action (Activity Target)	OPR	Schedule
FLIGHT DECK ENHANCEMENTS				
Flight Information System – Broadcast (FIS-B)	Operational Guidance	AC 00-63B: Updated language to support exclusive use (Category 1) information.	AFS-430	September 2015[10]
Airborne Collision Avoidance System (ACAS-X)	Equipment Standard	MOPS: RTCA DO-ACAS-X	RTCA SC-147	2018
		TSO: Improves airborne collision avoidance performance with fewer nuisance alerts	AIR-132	2020
	Installation Guidance	AC: Improves airborne collision avoidance performance with fewer nuisance alerts	AIR-132	2020
SVS for Airplane State Awareness	Standard	RTCA MASPS for SVS to support airplane state awareness safety initiative.	RTCA SC-213	December 2016
	Installation Guidance	AC/Installation Guidance for SVS to support airplane state awareness safety initiative.	AIR-130	2018
ENGINES AND FUEL				
Drop-In Renewable Jet Fuel	ASTM standards (Pyrolysis)	Expand jet fuel specification to allow production via alternative processes and feedstocks	AIR-20	December 2016
More Efficient Engines (Open Rotor)	Enabling policy through a Special Condition template and initiating action for new 14 CFR part 33 regulations	Address novel features in Open Rotor engine designs and their integration with the aircraft	ANE-110	December 2015
Unleaded Avgas Fuel Replacement	Phase 1: Chemical properties evaluation and suitability	Phase 1 test data to be supplied to offerors and used to select fuels for Phase 2	AIR-20	December 2015
	Phase 2: Engine and aircraft testing	Phase 2 test report to support ASTM production specification and fleetwide authorization	AIR-20	December 2018
NAVLEAN				
NAVLEAN	(Rec.21)	Establish a Web-based Operations Approval entry portal and a Web-based work package to accommodate the needs of other LOBs and external stakeholders	AFS-200	September 2015

[10] Publication predicated on development and publication of the required industry standards (MOPS)

Table 13 - Future Commitments (Continued)

NAS SEGMENT IMPLEMENTATION PLAN

This appendix will lay out the enablers that support each increment in Segment A, Segment B and Segment C of the NAS Segment Implementation Plan. Specific details of what guidance material supports a given enabler can be found on tables 1-4 of the main document. Other activities, beyond the policies for particular enablers, may be required to achieve full implementation of NextGen capabilities. Those activities are specified in the AIR, AFS, AOV and AVP Activity columns. Increments identified [A], [B], [C] are designated by the NSIP to be in segments A, B, and C respectively.

COLLABORATIVE AIR TRAFFIC MANAGEMENT			
OI 105208 Traffic Management Initiatives with Flight Specific Trajectories	IIndividual flight-specific trajectory changes resulting from Traffic Management Initiatives (TMIs) will be disseminated to the appropriate Air Navigation Service Provider (ANSP) automation for tactical approval and execution. This capability will increase the agility of the NAS to adjust and respond to dynamically changing conditions such as bad weather, congestion, and system outages.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 105208-21 Airborne Rerouting	2016	None	AOV: AOV SMART teams monitoring activity
[B] 105208-23 Arrival Route Availability Planning	2020	None	
[C] 105208-24 Aircraft Equipage Eligibility During TMI's	2016-2021	None	No Additional Support Activity Planned
OI 105302 Continuous Flight Day Evaluation	Performance analysis, where throughput is constrained, is the basis for strategic operations planning. Continuous (real-time) constraints are provided to ANSP traffic management decision-support tools and NAS users. Evaluation of NAS performance is both a real-time activity feedback tool and a post-event analysis process. Flight day evaluation metrics are complementary and consistent with collateral sets of metrics for airspace, airport, and flight operations.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 105302-21 Improve Demand Predictions	2019	None	No Additional Support Activity Planned
[B] 105302-23 Integrate TMI Modeling	2020	None	No Additional Support Activity Planned
[B] 105302-25 Airport Acceptance Rate Decision Support	2020	None	No Additional Support Activity Planned
[B] 105302-27 User Input to Improve Departure Predictions	2016	None	No Additional Support Activity Planned
[C] 105302-26 Improved Statistical Methods for Departure Prediction	2023	None	No Additional Support Activity Planned
[C] 105302-22 Probabilistic Constraint Prediction	2024	None	No Additional Support Activity Planned
[C] 105302-24 Enhanced Post Operations	2024	None	No Additional Support Activity Planned

Table 14 - NAS Segment Implementation Plan

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

COLLABORATIVE AIR TRAFFIC MANAGEMENT			
OI 101102 Provide Air Full Flight Plan Constraint Evaluation with Feedback	Timely and accurate NAS information enables users to plan and fly routings that meet their objectives. Constraint information that impacts the proposed route of flight is incorporated into Air Navigation Service Provider (ANSP) automation and is available to users. Examples of constraint information include Special Use Airspace (SUA) status, Significant Meteorological Information (SIGMETS), infrastructure outages, and significant congestion events.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 101102-22 Negotiate Mitigation	2021	Data Comm	No Additional Support Activity Planned
OI 101103 Provide Interactive Flight Planning from Anywhere	Flight planning activities are accomplished from the flight deck as readily as any location. Airborne and ground automation provide the capability to exchange flight planning information and negotiate flight trajectory agreement amendments in near real-time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 101103-21 Flight Plan Filing From Anywhere	2020	AAtS	
[C] 101103-25 Constraint Evaluation Feedback	2021	None	
[C} 101103-31 Constraint Feedback for Flight Plan Segments	2025	AAtS	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

COLLABORATIVE AIR TRAFFIC MANAGEMENT			
OI 104117 Improved Management of Arrival/Surface/Departure Flow Operations	This Operational Improvement (OI) integrates advanced Arrival/Departure flow management with advanced Surface operation functions to improve overall airport capacity and efficiency. Air Navigation Service Provider (ANSP) automation uses arrival and departure-scheduling tools and four dimensional trajectories (4DT) to flow traffic at high-density airports. This includes the integration of departure scheduling from multiple airports into the overhead stream, the assignment of arrival and departure runways to maximize the use of available runways at an airport, and runway configuration management with airspace configuration management to optimize the use of surface and airspace capacity when changing a runway configuration. Automation incorporates Traffic Management Initiatives (TMIs), current and forecasted conditions (e.g., weather), airport configuration, user provided gate assignments, requested runway, aircraft wake characteristics, and flight performance profiles.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104117-31 Collaborative Airport and Airspace Configuration Management	2023	None	AOV: AOV SMART teams monitoring activity
OI 104102 Interactive Planning Using 4D Trajectory Information in the Oceanic Environment	Interactive planning between the airspace user and FAA automation both before and after departure enhances the ability of the flight to fly closer to the user's preferred 4D trajectory. FAA automation supports coordination and feedback on contention as well as planning and management for congested oceanic airspace. By incorporating entry optimization algorithms within the request review process prior to departure, flights trade-off some near-term suboptimal profiles to achieve more overall optimal oceanic profiles. After departure, enhanced, up-to-date communication of intent information from the user allows oceanic controllers to adjust to expected 4D trajectories and, in conjunction with the use of new decision support capabilities, to grant clearances that more closely match the user's preferred trajectory. Meanwhile, the user will continue to receive feedback on the likelihood of obtaining the preferred oceanic clearance, including oceanic constraints.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104102-21 User Tactical Trajectory Feedback	2022	AAtS	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

COLLABORATIVE AIR TRAFFIC MANAGEMENT			
OI 108206 Flexible Airspace Management	ANSP automation supports reallocation of trajectory information, surveillance, communications, and display information to different positions or different facilities.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 108206-33 Flexible Airspace Design and Selection	2025	None	AOV: AOV SMART teams monitoring activity
OI 105207 Full Collaborative Decision Making	Timely, effective, and informed decision-making based on shared situational awareness is achieved through advanced communication and information sharing systems.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 105207-26 Integrated Departure route Planning	2020	None	AOV: AOV SMART teams monitoring activity
[C] 105207-22 Daily Objectives Exchange	2021	None	No Additional Support Activity Planned
[C] 105207-25 Airborne Trajectory Option Negotiation	2021	FANS 1/A	No Additional Support Activity Planned
[C] 105207-28 Airborne Trajectory Negotiation with FOC	2025	None	AOV: AOV SMART teams monitoring activity
OI 104209 Initial Surface Traffic Management	Departures are sequenced and staged to maintain throughput. ANSP uses automation to integrate surface movement operations with departure sequencing to ensure departing aircraft meet departure schedule times while optimizing the physical queue in the movement area. ANSP automation also provides surface sequencing and staging lists for departures and average departure delay (current and predicted). These functions will incorporate Traffic Management Initiatives (TMIs), separation requirements, weather data, and user preferences, as appropriate.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B]104209-33 Establish Enhanced Data Exchange with Flight Operators (FOC) and Airport Operators	2016-2021	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

IMPROVED SURFACE OPERATIONS			
OI 103306 - Tailored Delivery of On-Demand NAS Information	The delivery of selected National Airspace System (NAS) and aeronautical information data elements will be available to users and tailored based on their flight trajectory. Airport status information will be sent over data communications based on the aircraft's location. Selected NAS and aeronautical information, such as information pertaining to airspace constraints that are contained in digital NOTAMs, Letters of Agreement, and Standard Operating procedures, can be tailored based on the flight's trajectory. Users will be able to subscribe to information updates based on the aircraft's trajectory and will receive the information in an Aeronautical Information Exchange Model (AIXM)-compliant format.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 103306-03 Automatic Terminal Information Service via Data Communications (D-ATIS)	2025	Baseline 2	AOV: AOV SMART teams monitoring activity
OI 102129 Current Terminal Separation	Terminal air traffic separation consists of rules and techniques to separate aircraft on and around airports. Terminal separation rules apply to the separation of aircraft from aircraft, aircraft from terrain and obstructions, and aircraft from adjacent protected airspace. Controllers in Air Traffic Control Towers and Terminal Radar Approach Control facilities apply standard separation, which includes radar, non-radar and visual separation. At certain locations, in-flight specialists at Flight Service Stations (FSS) relay clearances to pilots as provided by air traffic controllers. The airspace around an airport with an operating control tower is controlled airspace and is designated one of several classes, based on its complexity and volume of traffic. The areas are Class B, Class C, or Class D. Each airspace class has different air traffic separation standards, aircraft equipment requirements, and pilot responsibilities		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] Augmented Tower Operations	2025	None	
OI 102138 Enhanced Separation Services to Small Community Airports	Improved surveillance and communication capabilities at or near smaller community airports allow for increased capacity in previous non-radar environments. Automatic Dependent Surveillance-Broadcast (ADS-B), expanded coverage of ground based surveillance, data communications, and surface surveillance information at uncontrolled airports provides ANSP with enough data to reduce typical non-radar separation guidelines. This information provides a smooth transition from en-route airspace to the airport by providing radar-like service from a controlling radar facility. This capability also enhances alerting and emergency services beyond normal radar coverage areas.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 102138-01 Remote Operations at Non-Towered Airports	2020	None	

Table 14 - NAS Segment Implementation Plan (Continued)

IMPROVED SURFACE OPERATIONS			
OI 104208 Enhanced Departure Flow Operations	This operational improvement increases efficiencies of operations through the increased use of data communications, decision support tools and information sharing. Flight plan clearances, amendments, runway assignments, and TMI messages and restrictions are transmitted to equipped aircraft. Enhanced flight data management scheduling and sequencing systems support delay reduction by maintaining up to date status of schedules of departing aircraft within a defined time horizon. Collaborative information sharing from users regarding push-back estimates improves efficiencies in surface movement and airport throughput.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 104208-12 Revised Departure Clearance via Data Comm	2015-2020	FANS-1/A	
OI 104209 Initial Surface Traffic Management	Departures are sequenced and staged to maintain throughput. ANSP uses automation to integrate surface movement operations with departure sequencing to ensure departing aircraft meet departure schedule times while optimizing the physical queue in the movement area. ANSP automation also provides surface sequencing and staging lists for departures and average departure delay (current and predicted). These functions will incorporate Traffic Management Initiatives (TMIs), separation requirements, weather data, and user preferences, as appropriate.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 104209-17 Surface Situational Awareness for Traffic Management	2015-2016	None	AOV: Approve controls that are defined to mitigate or eliminate initial high-risk hazards
[B] 104209-13 TFDM Scheduler/ Sequencer	2019	None	AOV: AOV SMART teams monitoring activity
[B] 104209-31 Electronic Flight Data Exchange	2020	None	AOV: AOV SMART teams monitoring activity
[B] 104209-27 Departure Reservoir Management (DRM)	2020	None	AOV: AOV SMART teams monitoring activity
OI 104206 Full Surface Traffic Management with Conformance Monitoring	Efficiency and safety of surface traffic management is increased, with corresponding reduction in environmental impacts, through the use of improved surveillance, automation, on-board displays, and data link of taxi instructions.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104206-21 Taxi Conformance Monitoring for Controllers	2027	None	AOV: AOV SMART teams monitoring activity
[C] 10206-22 Taxi Clearances via Data Communications (D-TAXI)	2027	Baseline 2	No Additional Support Activity Planned

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

IMPROVED SURFACE OPERATIONS			
OI 102406 Provide Full Surface Situation Information	Automated broadcast of aircraft and vehicle position to ground and aircraft sensors/receivers provides a digital display of the airport environment. Aircraft and vehicles are identified and tracked to provide a full comprehensive picture of the surface environment to ANSP, equipped aircraft, and flight operations centers (FOCs).		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 102406-12 Expansion of Surface Surveillance	2015-2017	ADS-B TIS-B	
OI 102408 Improved Pilot Awareness on Surface by Providing Location and Alerting Functions	Arrival and departure runway and taxi operations are improved by providing pilots with an enhanced awareness of own ship and other vehicle location on the airport surface. Cockpit traffic displays may incorporate airport moving maps that provide constantly changing views of an airport's runways, taxiways and other obstacles to help pilots identify the aircraft's location on the airport surface. The incorporation of runway status indications and alerting capabilities into the cockpit displays are designed to decrease the likelihood and severity of runway incursions by providing timely runway status indications and alerting. Status indications and alerting also extends to traffic on approach to improve the flight crew's situational awareness of aircraft and vehicle traffic on and in the vicinity of active runways.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102408-21 Airport Traffic Situation Awareness with Indications and Alerts (SURF-IA)	2030	ADS-B In (SURF- IA)	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

TIME-BASED FLOW MANAGEMENT			
OI 104120 Point In Space Metering	ANSP uses scheduling tools and trajectory-based operations to assure smooth flow of traffic and increase the efficient use of airspace.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104120-21 Metering During Reroute Operations	2022	None	AOV: AOV SMART teams monitoring activity
[C] 104120-28 FOC Preferences Incorporated into Metering	2020	None	AOV: AOV SMART teams monitoring activity
[C] 104120-22 Meet TBFM Constraints Using Required Time of Arrival (RTA) Capability	2020	RTA	No Additional Support Activity Planned
[C]Aircraft-to-Flow Management Time Resolution	2025	None	
OI 104123 Time-Based Metering Using Area Navigation (RNAV) and Required Navigation Performance (RNP) Route Assignment	RNAV, RNP, and time-based metering provide efficient use of runways and airspace in high-density airport environments. RNAV and RNP provide users with more efficient and consistent arrival and departure routings and fuel-efficient operations. Metering automation will manage the flow of aircraft to meter fixes, thus permitting efficient use of runways and airspace.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104123-21 Lateral Maneuvering for Delay Absorption (Path Stretch)	2022	RNAV	AOV: AOV SMART teams monitoring activity
[C] 104123-23 Complex Clearances	2025	Baseline 2 TOps FMS	AOV: AOV SMART teams monitoring activity
[C] 104123-25 OPDs to the Runway Enabled by Required Time of Arrival (RTA) Capability	2021	RTA TOps FMS	No Additional Support Activity Planned

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

TIME-BASED FLOW MANAGEMENT			
OI 104208 Enhanced Departure Flow Operations	This operational improvement increases efficiencies of departure operations through the improved ability to quickly revise departure clearances in the event that changing weather, winds or system constraints requires amendments to the cleared route pre-departure. This ability will also reduce the risk of airport gridlock that can occur when arrivals continue to land while departures are delayed waiting for revised departure clearances.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 104208-12 Revised Departure Clearance via Data Comm	2016		
OI 102149 Pair-wise Trajectory Management (PTM)	Pair-wise Trajectory Management (PTM) is intended to increase efficiency during separation-related maneuvers in the cruise phase of flight through the use of ground and airborne pair-wise distance assurance capabilities to save fuel and reduce delays. PTM will address limited-geometry crossing scenarios between the PTM aircraft and a limited number of other aircraft.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102149-01 Pair-wise trajectory Management	2023	ADS-B CDTI FIM	AOV: AOV SMART teams monitoring activity
OI 102152 Dynamic, Pairwise Wake Turbulence Separation	Wake turbulence separation applications for departure and arrival operations are integrated into air traffic automation to provide dynamic, pair-wise, lateral, longitudinal, and vertical wake separation requirements for trajectory management based on aircraft and weather conditions, in real time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102152-31 Wake Re-Categorization Phase 3 - Dynamic, Pair-wise Wake Separation Standards	2027	FIM/Advanced FIM	
OI 102118 Interval Management - Spacing	Enhanced surveillance and new procedures enable the ANSP to initiate Interval Management, in which the position of an aircraft in a traffic flow is managed in relation to the position of one or more other aircraft in the same or another traffic flow converging to a common point. Interval Management is different from absolute spacing, where spacing goals are achieved by independently controlling aircraft to a specified point-in-space at a desired time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 102118-23 Interval Management – Spacing Arrivals and Approach	2020	ADS-B CDTI CSPO	AOV: AOV SMART teams monitoring activity
[C] 102118-21 Interval Management – Spacing (IM-S) Cruise	2022	FIM	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

TIME-BASED FLOW MANAGEMENT			
OI 104117 Improved Management of Arrival/Surface/Departure Flow Operations	This Operational Improvement (OI) integrates advanced Arrival/Departure flow management with advanced Surface operation functions to improve overall airport capacity and efficiency. Air Navigation Service Provider (ANSP) automation uses arrival and departure-scheduling tools and four dimensional trajectory (4DT) agreements to flow traffic at high-density airports. This includes the integration of departure scheduling from multiple airports into the overhead stream, the assignment of arrival and departure runways to maximize the use of available runways at an airport, and runway configuration management with airspace configuration management to optimize the use of surface and airspace capacity when changing a runway configuration. Automation incorporates Traffic Management Initiatives (TMIs), current and forecasted conditions (e.g., weather), airport configuration, user provided gate assignments, requested runway, aircraft wake characteristics, and flight performance profiles. ANSP, flight planners, and airport operators monitor airport operational efficiency and make collaborative real-time adjustments to schedules and sequencing of aircraft to optimize throughput.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 104117-11 Integrated Departure/ Arrival Capability	2014-2017	None	AOV: AOV SMART teams monitoring activity
[C] 104117-22 Arrival Scheduling with Departure Data	2025	None	No Additional Support Activity Planned
[C] 104117-23 Departure Scheduling with Arrival Data	2021	None	
OI 104128 Time-Based Metering in the Terminal Environment	Aircraft are time-based metered inside the terminal environment, enhancing efficiency through the optimal use of terminal airspace and surface capacity. ANSP automation develops trajectories and allocates time-based slots for various points (as needed) within the terminal environment, applying RNAV route data and leveraging enhanced surveillance, and closely spaced parallel, converging, and intersecting runway capabilities (where applicable).		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 104128-24 Time Based Metering in the Terminal Environment	2018	None	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

IMPROVED MULTIPLE RUNWAY OPERATIONS			
OI 102140 Wake Turbulence Mitigation for Departures (WTMD)	Changes to wake rules are implemented based on wind measurements. Procedures allow more closely spaced departure operations to maintain airport/runway capacity.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 102140-01 Wake Turbulence Mitigation for Departures	2014-2015	None	
OI 102141 Improve Parallel Runway Operations	This improvement will explore concepts to recover lost capacity through reduced separation standards, increased applications of dependent and independent operations, enabled operations in lower visibility conditions, and changes in separation responsibility between Air Traffic Control (ATC) and the flight deck.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 102141-11 Additional 7110.308 Airports	2015	ILS Cat I WAAS	
[A] 102141-14 Amend Dependent runway Separation Standards in Order 7110.65	2015-2017	ILS Cat I WAAS	AFS: Complete safety study and support SMS activity to draft document change proposals AOV: Approve changes or waivers to provisions of handbooks, orders, and documents, including FAA Order 7110.65, Air Traffic Control, current edition, that pertain to separation minima
[B] 102141-22 Amend Standards for Simultaneous independent Approaches – Dual with Offset	2016-2017	ILS Cat I WAAS	AOV: AOV SMART teams monitoring activity
[B] 102131-23 Simultaneous Independent Closely Spaced Approaches – High Update rate Surveillance Required	2018	ILS Cat I WAAS	AOV: AOV SMART teams monitoring activity
[B] 102141-24 Amend Standards for Simultaneous Independent Approaches –Triple	2016-2017	ILS Cat I WAAS	AOV: AOV SMART teams monitoring activity
[B] 101141-28 Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 feet	2016-2017	ILS Cat I WAAS	

Table 14 - NAS Segment Implementation Plan (Continued)

IMPROVED MULTIPLE RUNWAY OPERATIONS			
OI 102144 Wake Turbulence Mitigation for Arrivals: CSPRs	Initially, dependent separation between aircraft on parallel approach courses to Closely Spaced Parallel Runways (CSPRs) will be procedurally reduced in IMC in all crosswind conditions to something less than today's wake separation behind Heavy or B757 aircraft based on a safety analysis of the airport geometry, local meteorology and other factors at each airport. Further separation reduction will be permitted down to radar minima for dependent approaches (1.5 nm stagger) using wind sensing and prediction systems to determine when crosswinds are sufficiently stable and strong enough that wake turbulence drift and decay will ensure safe separation reduction. A decision support aid will indicate to the controller when stable crosswinds (both measured and predicted) will ensure that the upwind approach is safe from wakes generated from Heavy or B757 aircraft on the downwind approach.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 102144-11 Wake Turbulence Mitigation for Arrivals – Procedures for Heavy/B757 Aircraft	2015	None	AOV: AOV SMART teams monitoring activity
[B] 102141-23 Automated Terminal Proximity Alert (ATAPA) for Closely Spaced Parallel runway (CSPR)	2016	None	
[C] 102144-21 Wake Turbulence Mitigation for Arrivals: System for CSPRs Spaced Less Than 2500 feet.	2022	None	AOV: AOV SMART teams monitoring activity
[C] 102144-28 ATPA for Complex Dependent Approach Operations	2022	None	No Additional Support Activity Planned
OI 102157 Improved Parallel Runway Operations with Airborne Applications	Improved flight deck capabilities allow for increased arrival capacity for parallel runway operations in Instrument Meteorological Conditions. Capacity of closely spaced parallel runways will be enhanced through reduced separation for dependent approaches through the use of aircraft avionics that assist pilots in maintaining the required interval from other aircraft. This operational improvement promotes a coordinated implementation of policies, technologies, standards and procedures to meet the requirement for increased capacity while meeting safety, security, and environmental goals.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102157-21 Paired Approaches for Runways Spaced Less Than 2500 Feet (Cat I)	2018-2020	ILS Cat I WAAS ADS-B CSPO	
[C] 102157-23 Paired Approaches for Runways Spaced Less Than 2500 Feet (Cat II)	2028	ILS Cat I WAAS ADS-B CSPO	
[C] 102157-23 Interval Management – Defined Interval for Closely Spaced Parallel Operations (IM-DI CSPO)	2028	ILS Cat I WAAS ADS-B CSPO	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

IMPROVED APPROACHES AND LOW-VISIBILITY OPERATIONS			
OI 107202 Low Visibility Surface Operations	Aircraft and ground vehicle movement on airports in low visibility conditions is guided by accurate location information and moving map displays.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 107202 -21 Low Visibility Taxi Operations	2018	EFVS	No Additional Support Activity Planned
[B] 107202-22 Enhanced Flight Vision System (EFVS)/ Accurate Position Information for Taxi	2016	EFVS (Airport Moving Map)	
[B] 107202-23 Protected Low Visibility Taxi Route	2018	EFVS	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

IMPROVED APPROACHES AND LOW-VISIBILITY OPERATIONS			
OI 107117 Low Visibility/Ceiling Approach and Landing Operations	The ability to complete approaches in low visibility/ceiling conditions is improved for aircraft equipped with some combination of navigation derived from augmented GNSS or ILS and other cockpit-based technologies or combinations of cockpit-based technologies and ground infrastructure.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 107117-11 Enhanced Flight Vision Systems (EFVS) for Approach	2015	EFVS	AFS: Complete rulemaking project to expand operational use
[A] 107117-13 Enhanced Flight Vision Systems (EFVS) for Landing	2015	EFVS	AFS AIR
[B] 107117-12 Synthetic Vision Guidance System for Approach	2017	SVGS	
OI 107107 Ground-Based Augmentation System Precision Approaches	GPS/GBAS support precision approaches to Category (CAT) I and eventually CAT II/III minimums, for properly equipped runways and aircraft. GBAS can support approach minimums at airports with fewer restrictions to surface movement, and offers the potential for curved precision approaches. GBAS may also support high-integrity surface movement requirements.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 107107-21 GBAS Category II/III Standards	2017	GBAS	AOV: AOV SMART teams monitoring activity
OI 107115 Low Visibility/Ceiling Take Off Operations	This improvement leverages some combination of Heads-Up Display (HUD), and aircraft vision system capabilities to allow appropriately equipped aircraft to depart, including takeoff, in low visibility conditions. Due to onboard avionics the aircraft will be less dependent on ground based infrastructure at the airport while conducting take-off operations.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 107115-21 Advanced Flight Vision System for Take-Off and Departure	2025	EFVS SVS CVS	No Additional Support Activity Planned

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

PERFORMANCE BASED NAVIGATION			
OI 108209 Increase Capacity and Efficiency Using Area Navigation (RNAV) and Required Navigation Performance (RNP)	Both RNAV and RNP will enable more efficient aircraft trajectories. RNAV and RNP, combined with airspace changes, increase airspace efficiency and capacity. Further efficiencies will be gained through the development and implementation of advanced criteria.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 108209-12 Metroplex PBN Procedures	2015-2017	None	AFS: NextGen branch participation on teams
[A] 108209-19 RNAV (GPS) Approaches	2010-2016	DME GNSS WAAS	
[A] 108209-20 Advanced and Efficient RNP	2013-2017	DME GNSS WAAS	AOV: AOV SMART teams monitoring activity
[A] 108209-21 Equivalent Lateral Spacing Operations Standard (ELSO)	2014-2018	DME GNSS WAAS RNAV 1	AOV: AOV SMART teams monitoring activity
[A] 108209-14 Transition to PBN Routing for Cruise Operations	2015	GNSS WAAS RNAV 2/ RNP 2	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

PERFORMANCE BASED NAVIGATION			
OI 107103 RNAV Standard Instrument Departures (SIDs), Standard Terminal Arrivals (STARs), and Approaches	PBN is the framework for defining navigation performance along a route, during a procedure, or in an airspace. Progressive stages of PBN capabilities include the safe implementation of more closely spaced paths for departure, arrival, and approach that allow for improved operations and efficiency. Complementary efforts to new capabilities include NAS right-sizing activities that allow for the removal of non-beneficial procedures and infrastructure currently in place.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 107103-12 RNAV (RNP) Authorization Required (AR) Approaches	2010-2016	WAAS RNP AR Advanced RNP	AFS AIR also listed as “Responsible” org in NSIP
[A] 107103-13 RNAV SIDs and STARs at Single Sites	2014-2016	DME WAAS GNSS RNAV 1	AFS AIR also listed as “Responsible” org in NSIP
OI 104122 Integrated Arrival and Departure Airspace Management	New airspace design takes advantage of expanded use of terminal procedures and separation standards. This is particularly applicable in major metropolitan areas supporting multiple high-volume airports. This increases aircraft flow and introduces additional routes and flexibility to reduce delays. ANSP decision support tools are instrumental in scheduling and staging arrivals and departures based on airport demand, aircraft capabilities, gate assignments and improved weather data products.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104122-23 Integrated Arrival and Departure Management Services: Airspace Enhancements	2025	None	AOV: AOV SMART teams monitoring activity
OI 104123 Time Based Metering Using RNAV and RNP Route Assignments	RNAV, RNP, and time-based metering provide efficient use of runways and airspace in high-density airport environments. RNAV and RNP provide users with more efficient and consistent arrival and departure routings and fuel-efficient operations. Metering automation will manage the flow of aircraft to meter fixes, thus permitting efficient use of runways and airspace.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104123-24 Optimized Route Capability	2025	None	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

ON DEMAND NAS			
OI 103305 On Demand NAS Information	National Airspace System (NAS) and aeronautical information will be available to users on demand. NAS and aeronautical information is consistent across applications and locations, and available to authorized subscribers and equipped aircraft. Proprietary and security sensitive information is not shared with unauthorized agencies/individuals.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 103305-13 Provide NAS Status via Digital Notices to Airmen (NOTAMs) for FOCs/AOCs	2015	FIS-B D-NOTAMs SWIM	AFS: AC 00-63, which addresses FIS-B and digital NOTAMS AOV: AOV SMART teams monitoring activity
[B] 103305-12 Improved Access to NAS Aeronautical, Status, and Constraint Information for Authorized NAS Users and Subscribers	2020	FIS-B AAtS	No Additional Support Activity Planned
[A] 103305-23 Airborne Access to Information Portal	2015	AAtS	AOV: AOV SMART teams monitoring activity
OI 101202 Flight Management with Trajectory	Flight Management with Trajectory will develop and maintain all information about a flight and make that information available to all decision support tools which will improve both strategic flight planning and tactical flight management. All information about a flight will be presented as a 4D trajectory, either provided by the user or developed by the ground automation. Users may also supply trajectory option sets that represent their route preferences in the event of a capacity constraint, such as weather. These can be used to ensure that when weather or capacity constraints necessitate a reroute, that each user can request the reroute that best meets their business objectives. As reroutes are selected, user preferences assessed, and approved, the trajectory flight data will continue to be updated and made available to subscribers so that both tactical and strategic plans can be developed with the most up to date 4D trajectory of the flight. Based on these capabilities, Flight Management with Trajectory will also provide continuous monitoring of the status of all flights - quickly alerting the system to unexpected termination of a flight and rapid identification of last known position.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 101202-21 Flight Information Service	2022	None	
[C] 101202-23 Extended Flight Planning Horizon	2022	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

ON DEMAND NAS			
OI 108212 Improved Management of Special Activity Airspace	Special Activity Airspace (SAA) assignments, schedules, coordination, and status changes are conducted automation-to-automation. Changes to status of SAA are readily available for operators and Air Navigation Service Providers (ANSP). Status changes are transmitted to the flight deck via voice or data communications. Flight trajectory planning is managed dynamically based on real-time use of airspace.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 108212-12 Improve SUA-Based Flow Predictions	2015	None	AOV: Approve changes or waivers to provisions of handbooks, orders, and documents, including FAA Order 7110.65, Air Traffic Control, current edition, that pertain to separation minima
[B] 108212-11 ANSP Real-Time Status for SAAs	2020	None	AOV: AOV SMART teams monitoring activity
[B] 108212-23 Automation Support for Space Vehicle for Space Vehicle Operations	2020	None	No Additional Support Activity Planned
OI 103209 Enhanced Traffic Advisory Services	Traffic information is available to the flight deck and the UAS's control station. This includes automatic dependent surveillance (ADS) information and the rebroadcast of aircraft on secondary networks, e.g., UAT, to UAS operators.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 103209-01 Traffic Situation Awareness with Alerts (TSAA)	2015	ADS-B ADS-R ADS-B Traffic Situation Awareness with Alerts (ADS-B In)	AOV: AOV SMART teams monitoring activity
OI 103306 Tailored Delivery of On-Demand NAS Information	The delivery of selected National Airspace System (NAS) and aeronautical information data elements will be available to users and tailored based on their flight trajectory. Airport status information will be sent over data communications based on the aircraft's location. Selected NAS and aeronautical information, such as information pertaining to airspace constraints that are contained in digital NOTAMs, Letters of Agreement, and Standard Operating procedures, can be tailored based on the flight's trajectory. Users will be able to subscribe to information updates based on the aircraft's trajectory and will receive the information in an Aeronautical Information Exchange Model (AIXM)-compliant format.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] tailored NAS Status via Digital NOTAM for ANSP	2017	None	
[C] Static Airspace Constraints	2022	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

ON DEMAND NAS			
OI 105104 NAS Wide Sector Demand Prediction and Resource Planning	An integrated model of NAS wide capacity resource drivers and demand information from collaborative decision making (CDM) are combined in one integrated decision support tool.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 105104-21 Improve SAA-Based Flow Predictions	**2020**	None	
OI 108207 Manage Airspace Flow	This capability provides resources that allow the ANSP or Front Line Supervisor to dynamically reconfigure airspace boundaries and/or altitude stratums to accommodate changes in demand, flow, weather constraints and staffing. Lateral airspace changes may be inter and/or intra facility. Associated dedicated frequencies as well as frequency system mapping are adjusted as well as Air Navigation Service Provider (ANSP) radar display mapping. All flight posting, coordination and other airspace logic such as Special Activity/Use (SAA/SUA) penetration is adjusted to support the changes. The new airspace configuration is displayed to the controller and provided to NAS users who use it to improve their trajectory planning.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] Planned Airspace Constraints	**2023**	None	
OI 102158 Automated Support for Initial Trajectory Negotiation	En Route sector capacity and throughput are increased through the ability to send route changes and instructions to the cockpit over data communications. Trajectory management is enhanced by automated assistance to negotiate pilot trajectory change requests with properly equipped aircraft operators. The trajectory change would then be relayed to the pilot/aircraft operator over a safety critical link. The aircraft operator must acknowledge receipt and acceptance of the negotiated trajectory change.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 102158-01 Initial En Route Data Communication Services	2019	Data Comm	
[C] 102158-02 Full En Route Data Communication Services	2022	Data Comm	

Table 14 - NAS Segment Implementation Plan (Continued)

SEPARATION MANAGEMENT			
OI 102137 Automation Support for Separation Management	The ANSP automation provides the controller with tools to manage aircraft separation in a mixed navigation and wake performance environment.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102137-28 Vertical Conformance Verification	2022	None	No Additional Support Activity Planned
[C] 102137-34 En Route Conformance Monitor for PBN Routes	2022	None	
OI 101202 Flight Management with Trajectory	Flight Management with Trajectory will develop and maintain all information about a flight and make that information available to all decision support tools which will improve both strategic flight planning and tactical flight management. All information about a flight will be presented as a 4D trajectory, either provided by the user or developed by the ground automation. Users may also supply trajectory option sets that represent their route preferences in the event of a capacity constraint, such as weather. These can be used to ensure that when weather or capacity constraints necessitate a reroute, that each user can request the reroute that best meets their business objectives. As reroutes are selected, user preferences assessed, and approved, the trajectory flight data will continue to be updated and made available to subscribers so that both tactical and strategic plans can be developed with the most up to date 4D trajectory of the flight. Based on these capabilities, Flight Management with Trajectory will also provide continuous monitoring of the status of all flights - quickly alerting the system to unexpected termination of a flight and rapid identification of last known position.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 101202-22 Unique Attributes for UAS Flight Planning	2020-2022	None	
OI 102112 Current En Route Separation	Separation standards applied in en route airspace consist of rules and procedures for separating aircraft operating under Instrument Flight Rules (IFR) from each other, from protected airspace, and from terrain. En route airspace is classified as Class A, Class E, or Class G airspace. The en route controller workstation presents a radar display, weather display, airway maps, sector boundaries, adjacent facility boundaries, special activity airspace, prohibited areas, or sector-specific information for the controller to provide air traffic services in that sector. Controllers obtain the flight data and radar data used to provide separation services between aircraft from various FAA automated systems.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 102112-22 UAS ATC Direct Communications	2022	None	
[C] 102112-31 UAS Sense and Avoid (Detect and Avoid)	2025	ACAS-Xu Self-Separation Avionics	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SEPARATION MANAGEMENT			
OI 102148 Interval Management – Defined Interval	Interval Management-Defined Interval (IM-DI) builds on IM-S and is intended to further increase capacity by taking advantage of improved surveillance (i.e., ADS-B), additional automation and procedures, and precise inter-aircraft spacing enabled by FIM equipment to allow IM-DI equipped aircraft to space more closely than current separation standards while meeting the target level of safety.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102148-01 Interval Management – Defined Interval (IM-DI)	2023	Advanced FIM	AOV: AOV SMART teams monitoring activity
OI 102144 Wake Turbulence Mitigation for Arrivals: CSPRs	Initially, dependent separation between aircraft on parallel approach courses to Closely Spaced Parallel Runways (CSPRs) will be procedurally reduced in IMC in all crosswind conditions to something less than today's wake separation behind Heavy or B757 aircraft based on a safety analysis of the airport geometry, local meteorology and other factors at each airport. Further separation reduction will be permitted down to radar minima for dependent approaches (1.5 NM stagger) using wind sensing and prediction systems to determine when crosswinds are sufficiently stable and strong enough that wake turbulence drift and decay will ensure safe separation reduction. A decision support aid will indicate to the controller when stable crosswinds (both measured and predicted) will ensure that the upwind approach is safe from wakes generated from Heavy or B757 aircraft on the downwind approach.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 102144-23 Automated Terminal Proximity Alert (ATPA) for Closely Spaced Parallel Runway (CSPR)	2016	None	No Additional Support Activity Planned
[C] 102144-28 Automated Terminal Proximity Alert (ATPA) for Complex Dependent Approach Operations	2022	None	No Additional Support Activity Planned
[A] 102144-11 Wake Turbulence Mitigation for Arrivals - Procedures for Heavy/B757 Aircraft	2015		

Table 14 - NAS Segment Implementation Plan (Continued)

SEPARATION MANAGEMENT			
OI 102143 Relative Spacing Using Traffic Display	Enhanced surveillance and new procedures enable the ANSP to initiate relative spacing operations, in which the position of an aircraft in a stream is managed in relation to the position of one or more other aircraft. Relative spacing is different from absolute spacing, in which spacing goals are achieved by independently controlling aircraft to a specified point-in-space at a desired time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102143-21 Relative Spacing "No Closer Than"	2025	None	No Additional Support Activity Planned
OI 102146 Flexible Routing	Leveraging enhanced flight capabilities based on Required Navigation Performance, flight operators can operate along preferred and dynamic flight trajectories based on an optimized and economical route for a specific flight, accommodating user preferred flight trajectories. Four-Dimensional Trajectories (4DTs) are negotiated between the pilot/aircraft operator and the air navigation service provider (ANSP), using ground-based automation to provide trial planning using intent data in en route trajectory-based operations.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102146-21 Increase Capacity and Efficiency Using Flight Management Computer (FMC) Route Offset	2022	None	AOV: AOV SMART teams monitoring activity
[C] 102146-22 4D Trajectories	2025	4D/Top FMS	
OI 102117 Reduced Horizontal Separation Standards, En Route – 3 Miles	The Air Navigation Service Provider (ANSP) provides reduced and more efficient separation between aircraft where the required performance criteria are met, regardless of location other than operations in oceanic airspace.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 102117-21 Wake Turbulence Mitigations for En Route Controllers	2020-2022	None	No Additional Support Activity Planned
[C] 102117-22 Active Surveillance Collision Avoidance	2025	ACAS-X	
[C] 102117-23 Expanded Use of 3 NM Separation Airspace	2025	None	
OI 102118 Interval Management - Spacing	Enhanced surveillance and new procedures enable the ANSP to initiate Interval Management, in which the position of an aircraft in a traffic flow is managed in relation to the position of one or more other aircraft in the same or another traffic flow converging to a common point. Interval Management is different from absolute spacing, where spacing goals are achieved by independently controlling aircraft to a specified point-in-space at a desired time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102118-22 Interval Management – Spacing During Departure Operations (IM-S DO)	2030	FIM	No Additional Support Activity Planned

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SEPARATION MANAGEMENT			
OI 102108 Oceanic In-Trail Climb and Descent	Improved ANSP automation provides the opportunity to use new procedures and reduce longitudinal spacing for the duration of the procedure. Aircraft are able to fly the most advantageous trajectories with climb and descent maneuvers.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 102108-12 Enhanced Oceanic CDP via ADS-C Automation	2016-2017	ADS-C FANS-1/A (SatCom) RNP 4 (A056)	AFS: Under Review AOV: Approve controls that are defined to mitigate or eliminate initial high-risk hazards. AIR listed in current NSIP
[B] 102108-13 Automatic Dependent Surveillance-Broadcast (ADS-B) Oceanic In-Trail Procedure and Automation	2016-2017	ADS-B Out ADS-B In FANS- 1/A ADS-B IN (ITP) (A354)	AOV: Monitoring Trial. Approve changes or waivers to provisions of handbooks, orders, and documents, including FAA Order 7110.65 Air Traffic Control, current edition, that pertain to separation minima
OI 104104 Initial Conflict Resolution Advisories	The ANSP predicts and resolves conflicts using en route automation. Automation is enhanced not only to recognize conflicts but also to provide rank-ordered resolution advisories to the ANSP. The ANSP may select one of the resolutions to issue to the aircraft.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104104-01 Approval of User Requests and Resolving Conflicts with Efficient Maneuvers in En Route Airspace	2022	None	AOV: AOV SMART teams monitoring activity
[C] 104104-02 Efficient Maneuvers to Assist Aircraft in Avoiding Severe Weather	2025	None	No Additional Support Activity Planned
[C] 104104-03 Rank Ordered Conflict Resolution	2025	Data Comm	
[C] 104104-04 Reduced Controller Coordination for Strategic Resolution Maneuver Implementation	2023	None	
OI 104122 Integrated Arrival Management	New airspace design takes advantage of expanded use of terminal procedures and separation standards. This is particularly applicable in major metropolitan areas supporting multiple high-volume airports. This increases aircraft flow and introduces additional routes and flexibility to reduce delays. ANSP decision support tools are instrumental in scheduling and staging arrivals and departures based on airport demand, aircraft capabilities, gate assignments and improved weather data products.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104122-23 Integrated Arrival and Departure Management Services: Airspace Enhancements	2021		

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SEPARATION MANAGEMENT			
OI 104102 Interactive Planning Using 4D Trajectory Information in the Oceanic Environment	Interactive planning between the airspace user and FAA automation both before and after departure enhances the ability of the flight to fly closer to the user's preferred 4D trajectory. FAA automation supports coordination and feedback on contention as well as planning and management for congested oceanic airspace. By incorporating entry optimization algorithms within the request review process prior to departure, flights trade-off some near-term suboptimal profiles to achieve more overall optimal oceanic profiles. After departure, enhanced, up-to-date communication of intent information from the user allows oceanic controllers to adjust to expected 4D trajectories and, in conjunction with the use of new decision support capabilities, to grant clearances that more closely match the user's preferred trajectory. Meanwhile, the user will continue to receive feedback on the likelihood of obtaining the preferred oceanic clearance, including oceanic constraints.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104102-22 Approval of User Requests in Oceanic Airspace – Auto Re-Probe	2022-2023	None	AOV: AOV SMART teams monitoring activity
[C] 104102-25 Preferred Routing in Constrained Oceanic Airspace	2022-2023	None	AOV: AOV SMART teams monitoring activity
[C] 104102-26 Approval of User Requests In Oceanic Airspace – Conflict Resolution Advisory	2022-2023	None	AOV: AOV SMART teams monitoring activity
[C] 104102-30 Enhanced Conflict Probe for ATOP Surveillance Airspace	2022-2023	None	AOV: AOV SMART teams monitoring activity
OI 108212 Improved Management of Special Activity Airspace	Special Activity Airspace (SAA) assignments, schedules, coordination, and status changes are conducted automation-to-automation. Changes to status of SAA are readily available for operators and Air Navigation Service Providers (ANSP). Status changes are transmitted to the flight deck via voice or data communications. Flight trajectory planning is managed dynamically based on real-time use of airspace.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 108212-22 Increased Utilization of SAAs in En Route Airspace	2021	None	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SEPARATION MANAGEMENT			
OI 108206 Flexible Airspace Management	ANSP automation supports reallocation of trajectory information, surveillance, communications, and display information to different positions or different facilities. The ANSP moves controller capacity to meet demand. Automation enhancements enable increased flexibility to change sector boundaries and airspace volume definitions in accordance with pre-defined configurations. The extent of flexibility has been limited due to limitations of automation, surveillance, and communication capabilities, such as primary and secondary radar coverage, availability of radio frequencies, and ground-communication lines. New automated tools will define and support the assessment of alternate configurations as well as re-mapping of information (e.g., flight and radar) to the appropriate positions.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 108206-32 Generic Airspace	2023	None	AOV: AOV SMART teams monitoring activity
OI 104127 Automated Support for Conflict Resolution	ANSPs, supported by automation, remain responsible for separation management. Conflict resolution is enhanced by automated assistance to probe pilot trajectory change requests with properly equipped aircraft operators to resolve conflicts.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104127-22 Approval of User Requests and Resolving Conflicts with Multiple Maneuvers in En Route Airspace Phase 2	2023	None	No Additional Support Activity Planned
[C] 104127-24 Reduced Controller Coordination for Ranked 4DT options and Complex Clearance Maneuvers in En Route Airspace	2025	Datacomm Advanced FIM 4DT Navigation	
OI 108206 Flexible Airspace Management			
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 108206-32 Generic Airspace	2023	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SEPARATION MANAGEMENT			
OI 102154 Wake Re-Categorization	Legacy wake separation categories are updated based on analysis of wake generation, wake decay, and encounter effects for representative aircraft. Eventually, static wake separation standards are established that consider model specific leader-follower aircraft pairings, replacing categorical standards and increasing capacity. ANSP automation supports application of standards as needed.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 102154-11 Wake Re-Categorization Phase 1 - Aircraft Re-Categorization	2013-2017	None	AOV: Approve changes or waivers to provisions of handbooks, orders, and documents, including FAA Order 7110.65, Air Traffic Control, current edition, that pertain to separation minima
[B] 102154-21 Wake Re-categorization Phase 2 - Static, Pair-wise Wake Separation Standards	2015-2016	None	AOV: AOV SMART teams monitoring activity
OI 102157 Improved Parallel Runway Operations with Airborne Applications	Improved flight deck capabilities allow for increased arrival capacity for parallel runway operations in Instrument Meteorological Conditions. Capacity of closely spaced parallel runways will be enhanced through reduced separation for dependent approaches through the use of aircraft avionics that assist pilots in maintaining the required interval from other aircraft. This operational improvement promotes a coordinated implementation of policies, technologies, standards and procedures to meet the requirement for increased capacity while meeting safety, security, and environmental goals.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102157-31 Operation Specific Collision Avoidance	2025	CSPO ACAS-X	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SEPARATION MANAGEMENT			
OI 104102 Interactive Planning Using 4D Trajectory Information in the Oceanic Environment	Interactive planning between the airspace user and FAA automation both before and after departure enhances the ability of the flight to fly closer to the user's preferred 4D trajectory. FAA automation supports coordination and feedback on contention as well as planning and management for congested oceanic airspace. By incorporating entry optimization algorithms within the request review process prior to departure, flights trade-off some near-term suboptimal profiles to achieve more overall optimal oceanic profiles. After departure, enhanced, up-to-date communication of intent information from the user allows oceanic controllers to adjust to expected 4D trajectories and, in conjunction with the use of new decision support capabilities, to grant clearances that more closely match the user's preferred trajectory. Meanwhile, the user will continue to receive feedback on the likelihood of obtaining the preferred oceanic clearance, including oceanic constraints.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 104102-22 Approval of User Requests in Oceanic Airspace – Auto Re-Probe	2022	FANS-1/A	
[C] 104102-25 Preferred Routing in Constrained Oceanic Airspace	2022	FANS-1/A	
[C] 104102-26 Approval of User Requests in Oceanic Airspace – Conflict Resolution Advisory	2022	None	
[C] 104202-30 Enhanced Conflict Probe for ATOP Surveillance Airspace	2022	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

NAS INFRASTRUCTURE			
OI 103119 Initial Integration of Weather Information into NAS Automation and Decision Making	Advances in aviation weather information content and dissemination enhances cross-domain ATM decision-making and synchronizes weather situational awareness for all users. They will be able to request and receive aviation weather information tailored to their specific volumetric areas (e.g., terminal, ARTCC or flight trajectory) and timeframes of interest to support assessment of flight-specific thresholds that indicate re-planning actions are needed and streamline the process by which the user - with or without decision support ATM tools - conducts system-wide risk management in planning for both individual flight trajectories and flows.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 103119-18 Enhanced Turbulence Forecast and Graphical Guidance	2015-2018	None	AOV: AOV SMART teams monitoring activity
[B] 103119-19 enhanced Ceiling and Visibility Analysis	2017-2018	None	AOV: AOV SMART teams monitoring activity
[B] 103119-11 Enhanced NAS-Wide Access of 0-2 Hour Convective Weather on Traffic Forecast for NextGen Decision-Making	2019	None	AOV: AOV SMART teams monitoring activity
[B] 103119-13 Enhanced In-Flight Icing Diagnosis and Forecast	2017-2018	None	No Additional Support Activity Planned
[B] 109113-14 Enhanced Weather Radar Information for ATC Decision-Making	2019	None	No Additional Support Activity Planned
[B] 103119-15 Extended Convective Weather on Traffic Forecast for NextGen Decision-Making	2019	None	No Additional Support Activity Planned
[B] 103119-16 Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations	2019	None	No Additional Support Activity Planned
[B] 103119-17 4-D Tailored Volumetric Retrievals of Aviation Weather Information	2018	None	No Additional Support Activity Planned
[B] 103119-21 Enhanced Satellite-Based Observation	2016-2018	None	
[B] 103119-22 Enhanced Automated Winter Weather Information	2017	None	
[B] 103119-23 Space Weather Information	2019	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

NAS INFRASTRUCTURE			
OI 102105 Current Oceanic Separation			
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 102105-15 ATOP in Transition Sectors	2015	None	
[C] 102105-21 Spaced Based ADS-B	2023	**ADS-B Out**	
OI 103123 Full Integration of Weather Information Into NAS Automation and Decision Making	Consistent and improved weather data integrated into decision support tools will enable more effective and timely decision making by both ANSPs and flight operators for meeting capacity, efficiency, and safety objectives. Integration of weather information into Air Traffic Management (ATM) automation and decision support tools will span all operational services including Traffic Management Strategic Planning, Flight Planning, Arrival and Departure, Cruise, Ocean, and Airport Services. The integration of weather into ATM platforms will foster improved performance of decision support and metering and sequencing tools which will contribute to the increased system efficiency that these other NextGen improvements provide.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 103123-01 Aircraft-to-Severe Weather Notification	2021	None	AOV: AOV SMART teams monitoring activity
[C] 103123-03 Enhanced Airborne Icing Information	2021	None	No Additional Support Activity Planned
[C] 103123-02 Net-Enabled Access to NextGen Common Weather Information Source - Enhanced	2021	None	No Additional Support Activity Planned
[C] 103123-04 Enhanced Turbulence Information	2025	None	
OI 103121 Full Improved Weather Information and Dissemination	This improvement provides a capability that supports the NextGen concept of operations to assimilate weather information into operational decision-making for ATC services. Given the ability to form a common weather picture, operational decision-makers can collaboratively perceive weather constraints and determine impacts in their respective temporal and spatial areas of interest.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 103121-01 Generation of Enhanced NextGen Weather Information – Extended	2025	None	AOV: AOV SMART teams monitoring activity

Table 14 - NAS Segment Implementation Plan (Continued)

NAS INFRASTRUCTURE			
OI 103210 Aircraft Collision Avoidance for New Aircraft Types	New technologies will benefit aircraft-based Collision Avoidance (CA) capabilities avionics as they are extended to accommodate new/additional aircraft types (e.g. Unmanned Aircraft Systems (UAS) and General Aviation (GA)). The new CA capabilities will provide more cost effective technology solutions for GA aircraft by improving the situational awareness of GA pilots and by reducing the risk of a mid-air collision. These benefits will directly lead to increased safety of encounters between GA aircraft. CA techniques will become more adaptable and flexible through the use of optimized threat resolution logic that will be tuned to accommodate the airspace and the specific types of encounters which would be typical for the aircraft involved in a potential encounter. For UAS aircraft, the CA technologies will also process non-cooperative surveillance targets in order to sense/detect and avoid other aircraft. In addition, the logic will also account for the variety of aircraft sizes and dynamic capabilities of the aircraft. For GA aircraft, the logic will account for a passive surveillance only variant (e.g., ADS-B) that will provide traffic displays, traffic advisories, and resolution advisories.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 103210-31 Collision Avoidance for Unmanned Aircraft Systems	2025	UAS Sense and Detect/ Avoid	
[C] 103210-32 Passive Collision Avoidance	2025	ACAS-X	
OI 103305 On-Demand NAS	National Airspace System (NAS) and aeronautical information will be available to users on demand. NAS and aeronautical information is consistent across applications and locations, and available to authorized subscribers and equipped aircraft. Proprietary and security sensitive information is not shared with unauthorized agencies/individuals.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 103305-25 Common Support Services-Weather	2018	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

NAS INFRASTRUCTURE			
OI 104209 Initial Surface Traffic Management	Departures are sequenced and staged to maintain throughput. Automation generates predicted airport and runway schedules for arrivals and departures providing better demand/capacity balancing. ANSP uses automation to integrate surface movement operations with departure sequencing to ensure departing aircraft meet departure schedule times while optimizing the physical queue in the movement area as well as the ability to save fuel and emissions through the use of virtual departure queues into the movement area. ANSP automation also provides surface sequencing and staging lists for departures and average departure delay (current and predicted). These functions will incorporate traffic management initiatives, separation requirements, weather data, and user preferences, as appropriate.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 104209-32 Integrate Surveillance Data with Flight Data (Surface)	2019	None	AOV: AOV SMART teams monitoring activity
OI 104122 Integrated Arrival Airspace Management	New airspace design takes advantage of expanded use of terminal procedures and separation standards. This is particularly applicable in major metropolitan areas supporting multiple high-volume airports. This increases aircraft flow and introduces additional routes and flexibility to reduce delays. ANSP decision support tools are instrumental in scheduling and staging arrivals and departures based on airport demand, aircraft capabilities, gate assignments and improved weather data products.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 104122-22 Integrated Arrival and Departure Management Services: Single Facility	2021-2024	None	AOV: AOV SMART teams monitoring activity
OI 109405 Business Continuity Services	The NextGen net-centric and geo-independent system architecture will allow improved ATM business continuity services throughout the NAS in the event of a facility shutdown or incapacity. Implementing NextGen business continuity will improve service by reducing the number of aircraft delays in the event of a long-term facility outage.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[C] 109405-31 Initial Business Continuity Service Implementation Planning	2021	None	No Additional Support Activity Planned

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

ENVIRONMENT AND ENERGY			
OI 703102 Sustainable Alternative Jet Fuels - Phase I	Determine the feasibility and market viability of alternative aviation fuels for commercial aviation use. Obtain ASTM International approval of Hydrotreated Renewable Jet (HRJ) blends and other advanced sustainable fuel blends from renewable resources that are compatible with existing infrastructure and fleet thus meeting requirement to be a "drop in" fuel. It will include multiple increments delivered over time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 703102-02 Drop In >50% HRJ/ HEFA Fuels (Greater than 50% Blend)	2015	None	No Additional Support Activity Planned
[A] 703-102-03 Other Advanced Aviation Alternative Fuels – Phase 1	2015	Alcohol to Fuel Pyrolysis	No Additional Support Activity Planned
OI 704102 - Environmental Policies, Standards and Measures - Phase I	Develop and implement appropriate policies, programs, and mechanisms to mitigate the environmental impacts of aviation. Enable the use of the NextGen Environmental Management System (EMS) framework to address, plan and mitigate environmental issues, through development of an initial EMS framework, pilot analysis, and outreach programs.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 704102-07 NextGen EMS Frameworks and Stakeholder Collaboration	2015	None	AFS
OI 701102 Integrated Environmental Modeling-Phase I	Develop an integrated aviation environmental analysis tool suite that is based on the best available scientific knowledge and use this capability to evaluate both the environmental impacts of aviation as well as the performance of potential mitigation.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 701102-02 AEDT Version 2B	2015	None	
[A] 701102-03 Improved Scientific Knowledge	2015	None	
[A] Aviation Environmental Portfolio Management Tool	2015	None	
OI 701103 Integrated Environmental Modeling-Phase II	Enhance the integrated aviation environmental analysis tool suite to reflect new scientific information and use this capability to evaluate both the environmental impacts of aviation as well as the performance of potential mitigation options.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 701103-01 Aviation Environmental Tools Suite	2020	None	

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

ENVIRONMENT AND ENERGY			
OI 702102 NextGen Environmental Engine and Aircraft Technologies-Phase I	Develop and mature aircraft and engine technologies to reduce noise, emissions, and fuel burn from commercial subsonic jet aircraft. Demonstrate these technologies at sufficient readiness levels to achieve goals of the FAA's Continuous Lower Energy, Emissions, and Noise (CLEEN) program. It will include multiple time sequenced deliverables.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 702102-05 Engine Weight Reduction and High-Temperature Impeller	2015	None	
[A] 702102-06 Flight Management System-Air Traffic Management (FMS-ATM) Integration	2015	None	
[A] 702102-07 Ultra High-Bypass Ratio Geared Turbo Fan	2015	None	
[A] 702102-08 Ceramic Matrix Composite Turbine Blade Tracks	2016	None	
[A] 702102-09 Dual-Wall Turbine Blade	2016	None	
OI 704102 Environmental Policies, Standards and Measures - Phase I	Develop and implement appropriate policies, programs, and mechanisms to mitigate the environmental impacts of aviation. Enable the use of the NextGen Environmental Management System (EMS) framework to address, plan and mitigate environmental issues, through development of an initial EMS framework, pilot analysis, and outreach programs.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 704102-03 Environmental Targets	2015	None	
[A] 704102-04 Environmental Assessment of NextGen Capabilities	2014	None	
[A] 704102-05 Analysis to Support International Environmental Standard-Setting-Phase I	2015	None	
[A] 704102-06 Environmental Goals and Targets Performance Tracking System	2015	None	
[A] 704102-07 NextGen EMS Frameworks and Stakeholder Collaboration	2015	None	AFS

Table 14 - NAS Segment Implementation Plan (Continued)

ENVIRONMENT AND ENERGY			
OI 704103 – Environmental Policies, Standards and Measures – Phase II	Continue to develop and implement appropriate policies, programs, and mechanisms to mitigate the environmental impacts of aviation. The NextGen Environmental Management System (EMS) framework will be used to address, plan and mitigate environmental issues.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 704103-01 Environmental Performance and Targets	2020	None	
[B] 704103-02 NEPA Strategy and Process-Phase II	2020	None	
[B] 704103-03 EMS Data Management and Stakeholder Collaboration	2020	None	
[B] 704103-04 Analysis to Support International Environmental Standard-Setting - Phase II	2020	None	
OI 702103 - NextGen Environmental Engine and Aircraft Technologies - Phase II	Support certification and commercialization of aircraft technologies for enhanced environmental and energy efficiency improvements demonstrated during Phase I. Demonstrate additional technologies meeting CLEEN goals, including wing laminar flow, advanced aircraft noise reduction, and a lower drag vertical tail. It will include multiple increments delivered over time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 702103-01 Flight-Management System-Air Traffic Management (FMS-ATM) Integration - Phase II	2016	None	No Additional Support Activity Planned
[B] 702103-03 Explore and Demonstrate New Technologies Under CLEEN-Phase II	2020	None	
OI 703103 - Sustainable Alternative Jet Fuels - Phase II	Obtain ASTM International approval of "drop-in" (>50%) HRJ blends as well as other advanced sustainable alternative fuels. These advanced "drop-in" fuels may dramatically reduce fuel production time and cost and will reduce environmental impacts, improve energy security, and enable carbon neutral growth by 2020. It will include multiple increments delivered over time.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 703103-01 Other Advanced Drop-In Aviation Alternative Fuels - Phase II	2020	None	No Additional Support Activity Planned
[B] 703103-02 Generic Methodology for Alternative Fuels Approval	2020	None	No Additional Support Activity Planned

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SYSTEM SAFETY MANAGEMENT			
OI 601102 - Enhanced Safety Information Analysis and Sharing	Aviation Safety Information Analysis and Sharing (ASIAS) will improve system-wide risk identification, integrated risk analysis and modeling, and implementation of emergent risk management. Source software, meta-ware and analytical processes will be developed to link together existing databases, expert knowledge, the results of experimentation and modeling capability to continually assess the performance of the Air Transportation System (ATS) for safety risk management. All participants in ASIAS, including FAA (such as AVS and ATO), industry, and other government agencies, will collaborate to study and evaluate aggregate level system issues within the ATS at the organization level. Participants will be able to access ASIAS information and analysis tools to support the safety management of their own operations or those they regulate. Collaborative ASIAS activities allow stakeholders to draw on more information as context, to raise issues to be worked by the larger community, and to share their assessments with others. The aggregation of information and the sharing of benchmarks, analysis tools, and issues create a context and framework for individual stakeholders' SMS activities. The modeling and analysis conducted under the AVS System Safety Management Transformation (SSMT) extend the capability of the ASIAS data and stakeholder community to identify and manage systemic risks, as preparation to implementation of NextGen systems, and to monitor the impact of system deployments (including but not exclusively NextGen).		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 601102-01 Expanded ASIAS Participation	2015		Continue to strengthen data sharing participation by commercial carriers, initiate outreach with GA, Rotorcraft and other sectors to expand acquisition of data from NAS operations.
[A] 601102-02 ASIAS Data and Data Standards	2015	None	Continue work with the ASIAS community to enhance data standards for available data.
[A] 601102-03 Enhanced ASIAS Architecture	2015	None	Continue to evolve the ASIAS architecture toward a centralized model to achieve operational cost efficiencies and data fusion capabilities when data is stored in a central archive.
[A] 601102-04 Upgraded and Expanded ASIAS Analytical Capabilities	2015	None	Expand ASIAS capabilities such as dashboards, metrics and monitoring tools, text/digital data fusion, voice recorder to data linkage, data mining techniques and enhanced query tools
[A] 601102-05 Vulnerability Discovery	2015	None	Continue development activities to enhance risk assessments and timeliness of NextGen safety analysis results through improved data access, analysis and management techniques.
[A] 601102-06 ASIAS Studies and Results	2015	None	Continued management of ASIAS directed studies, safety enhancement assessments, known-risk monitoring and benchmarking.
[A] 601102-07 ASIAS Collaboration Capabilities	2015	None	Continue outreach efforts with the NextGen design and implementation community. ASIAS stakeholders, the FAA, and the global aviation safety community.

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SYSTEM SAFETY MANAGEMENT			
OI 601103 - Safety Information Sharing and Emergent Trend Detection	ASIAS will improve system-wide risk identification, integrated risk analysis and modeling, and implementation of emergent risk management. Source software, meta-ware and analytical processes will be developed to link together existing databases, expert knowledge, the results of experimentation and modeling capability to continually assess the performance of the NAS for safety risk management. For all participants in ASIAS including FAA organizations such as AVS and ATO, industry and other government agencies, ASIAS participants will collaborate to study and evaluate aggregate level system issues within the NAS (2) at the organization level, participants will be able to access ASIAS information and analysis tools to support the safety management of their own operations or those they regulate.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 601103-01 Additional ASIAS Participants	2020	None	Integrate General Aviation into the ASIAS program and specialized safety studies, metrics, and event monitoring to increase the breadth and depth of safety analyses. Establish standards and enable data-sharing relationships and/or capability with rotocraft, NAS-UAS, and international carrier operations to achieve comprehensive safety analysis coverage of U.S. aviation stakeholders.
[B] 601103-02 NextGen Enabled Data	2020	None	Incorporate new data sources (e.g., SBS, Flight Object) into ASIAS determined by risk-based benefits assessments, fusing to current data where possible, and developing data mining capabilities which leverage the new information in NextGen and ASIAS safety analyses.
[B] 601103-03 Architecture Evolution and NextGen Support	2020	None	Deploy architecture to support GA and rotocraft safety analyses. Develop collaboration enclaves within the Aviation Collaborative Research Environment (ACRE) for FAA, airlines, research institutions and government agencies which enable cross-institutional collaboration and sharing of safety information.
[B] 601103-04 Analytical Capabilities in Support of NextGen	2020	None	Deploy capabilities for trend/anomaly detection of high risk or otherwise anomalous flight states. Deploy voice data query and analysis to leverage collected voice data. Deploy ASIAS analytic capabilities to the cloud for greater community availability. Make available to FAA and ASIAS participants text mining capabilities, trend tracking, and anomaly detection technology for use on their own data.

Table 14 - NAS Segment Implementation Plan (Continued)

NAS SEGMENT IMPLEMENTATION PLAN (CONT.)

SYSTEM SAFETY MANAGEMENT			
OI 601103 - Safety Information Sharing and Emergent Trend Detection (Continued)	ASIAS will improve system-wide risk identification, integrated risk analysis and modeling, and implementation of emergent risk management. Source software, meta-ware and analytical processes will be developed to link together existing databases, expert knowledge, the results of experimentation and modeling capability to continually assess the performance of the NAS for safety risk management. For all participants in ASIAS including FAA organizations such as AVS and ATO, industry and other government agencies, ASIAS participants will collaborate to study and evaluate aggregate level system issues within the NAS (2) at the organization level, participants will be able to access ASIAS information and analysis tools to support the safety management of their own operations or those they regulate.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[B] 601103-05 Automated Vulnerability Discovery	2020	None	Deploy capability for explanatory analysis on text incident report data and for vulnerability assessment on fused text and digital data where governance permits. Deploy vulnerability discovery capability to assess safety impacts of implemented NAS changes based on data analyses. Implement ability to monitor safety metrics for a wide spectrum of aviation risks.
[B] 601103-06 Continued Studies and Results	2020	None	Align ASIAS studies and reporting with NextGen and operator procedural or system changes to support and demonstrate the use of ASIAS monitoring and analysis capabilities to track safety impacts that arise during NextGen capability implementation.
[B]601103-07 Expanded Collaboration Environments	2020	None	Provide collaboration capabilities via emerging technologies (e.g., smartphones) to the FAA and ASIAS participants, via community-targeted virtual InfoShare, through cross-Agency support of FAA safety initiatives and Risk-Based Decision Making and through improved information sharing across FAA and industry stakeholders.

Table 14 - NAS Segment Implementation Plan (Continued)

SYSTEM SAFETY MANAGEMENT PORTFOLIO			
OI 601202 Integrated Safety Analysis and Modeling	This OI mitigates safety risk associated with the design, evolution and implementation of NextGen by providing enhanced integrated safety methods that support making changes to the air transportation system, including: advanced capabilities for integrated, predictive safety baseline risk assessment; advanced capabilities for integrated risk analysis processes (involving data acquisition and modeling as well as SME inputs); improved validation and verification (V&V) processes supporting certification; simulation (fast-time and HITL) protocols that provide enhanced evaluation frameworks for safe operational procedures; and enhanced training requirements analysis for safe system operation.		
Increment	**IOC**	**Enabler**	**Additional AVS Support Activity**
[A] 601202-02 System-Wide Integrated Risk Baseline Annual Reports	2014-2017	None	An updated annual report describing the baseline rish probability for accident scenarios leading to fatalities and incidents and accidents that may be impacted by the NextGen portfolio will be delivered in 2015 to support integrated safety analysis. This report will be a direct input into the Risk-Based Decision Making Framework for the FAA.
[A] 601202-03 Tailored, Domain-Specific Baseline and Predictive Risk Models (NextGen Portfolio Support)	2015-2018	None	Updated simulation models that provide a prediction of the likely causes and consequences of future accidents are now linked to primary source data, making the models capable of providing a more accurate forecast. These simulation models are in the baseline risk analysis process, and are in use by other LOBs (ARP, AJI, etc) in support of ongoing safety analysis of NextGen implementation.
[A] 601202-04 Integrated NAS-wide Hazard Identification, Evaluation and Forecasting	2014-2018	None	An integrated hazard database of over 500 hazards was accumulated through research with all LOBs in the NAS; this hazard database was integrated with the ISAM accident / incident models and is now used in the development of future risk forecasts.
[B] 601202-05 Integrated NAS-wide Automation System Modeling and Anomaly Detection	2012-2020	None	Automation systems risk analysis concept assessments for two domains will be conducted by examining the potential contribution of automation failure in flight deck scenarios, and PBN (RNAV and RNP routing).
[C] 601202-06 Near Real Time Integrated Safety Prediction Models	2021-2023		

Table 14 - NAS Segment Implementation Plan (Continued)