EXECUTIVE SUMMARY

Integrated Work Plan

for the Next Generation Air Transportation System

Joint Planning and Development Office | Version FY13

Next Generation Air Transportation System
Joint Planning and Development Office

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Executive Summary

The Next Generation Air Transportation System (NextGen) is a collaborative initiative to transform the National Airspace System (NAS), including our national system of airports, using 21st century technologies. The realization of NextGen will be made through investments in research and development, multiple technologies, operational changes, and the coordinated efforts of the Federal Aviation Administration (FAA) and the Departments of Transportation (DOT), Defense (DOD), Homeland Security (DHS), and Commerce (DOC), as well as the National Aeronautics & Space Administration (NASA), the White House Office of Science and Technology Policy (OSTP), and the Office of the Director of National Intelligence (ODNI).

In 2003, Congress enacted NextGen under VISION 100 – Century of Aviation Reauthorization Act (P.L. 108-176) and established the Joint Planning and Development Office (JPDO). Among the JPDO's responsibilities include maintaining the NextGen vision and facilitating a public/private partnership to manage critical collaborations needed to make NextGen a reality. The JPDO is responsible for developing a framework for NextGen planning and development, identifying and prioritizing key multi-agency concerns, and driving consensus in the development of investment choices and decisions.

The primary planning documents driving the transformation are the NextGen Concept of Operations (ConOps), Enterprise Architecture (EA), and the Integrated Work Plan (IWP). These enterprise-level planning documents, accessible via the JPDO's Joint Planning Environment[1] (JPE), are used to define, depict, and guide the transformation to NextGen. While the NextGen enterprise-level documentation accounts for the full range of capabilities and improvements needed to achieve the overarching NextGen vision, it only represents the top-level of the NextGen concept and is not intended to provide the detail that reflects individual partner agency architectures, programs, or investments. Updates to the foundational documentation will be made as needed to reflect input and feedback from the aviation community, including hundreds of aviation professionals, engineers, subject matter experts, analysts, and planners across the Federal government, industry, and the public. The annual update of the IWP is a critical component of the JPDO's mission to support the collaborative planning and deliberation needed to prioritize needs, establish commitments, coordinate efforts, and focus resources on the work needed to achieve NextGen.

PURPOSE

This document highlights the fundamental changes incorporated into the Fiscal Year 2013 version of the NextGen IWP. Equally important, this Executive Summary summarizes the IWP structure and provides additional clarity for key planning element and attribute definitions. Lastly, this document summarizes the JPDO's efforts to align the IWP with international planning documents and provides a preview of next year's JPDO objectives, which have an inherent focus on enhancing the information needed to drive the portfolio analysis and enable decision making across the NextGen stakeholder community.

[1] http://jpe.jpdo.gov

BACKGROUND

The JPDO first published the NextGen IWP, version 1.0 on September 30, 2008. As part of the annual update and data validation process (discussed later in this Executive Summary), the JPDO publishes a new version of the IWP to coincide with the beginning of each Federal Fiscal Year (FY). A new version naming convention was adopted last year. The IWP version is now titled with the FY for the upcoming President's budget submission to Congress. Therefore, on September 30, 2009, the JPDO published the IWP version FY12. This IWP version FY13 constitutes the third version of the IWP.

OVERVIEW OF THE IWP STRUCTURE

The IWP planning elements are organized under nine NextGen capabilities, which represent transformational improvements to the current NAS. Each capability is expressed in operational terms and can be implemented through various combinations of enabling solutions, such as policies, programs, and systems. The capabilities have been adopted to provide consistency and more specific language around the expected outcomes of NextGen. Descriptions of each capability's transformational summary and supporting operational improvements are provided in Appendix II as a reference. The nine NextGen capabilities provide:

- Collaborative Capacity Management
- Collaborative Flow Contingency Management
- Efficient Trajectory Management
- Flexible Separation Management
- Integrated NextGen Information
- Air Transportation Security
- Improved Environmental Performance
- Improved Safety Operations
- Flexible Airport Facility and Ramp Operations

The IWP depicts the evolution to the NextGen concepts and capabilities using a set of sequenced planning elements that describe operational changes, functional components, research, development, and policy activities. The planning elements include descriptive attributes such as title, description, target initial operational capability or availability date, suggested stakeholder's role assignments for primary and/or collateral responsibility, and dependencies to other planning elements in the IWP. The five basic planning element types within the IWP are listed below.

- **Operational Improvement (OI):** An OI describes the operational changes needed to achieve the concepts and capabilities identified in the ConOps and EA. It describes a specific stage in the transformation and the performance improvements expected at that point in time. Each OI is assigned an initial operational capability (IOC) date, which indicates limited and/or focused realization of the improvement in the NAS. The IWP does not provide a full operating capability date.
- **Enabler:** An Enabler describes a specific functional component needed to support one or more OIs or other Enablers. Enablers describe both materiel components such as communication, navigation, and surveillance systems; and non-materiel components such as procedures, algorithms, and standards. Enablers are assigned an initial availability (IA) date, which is when the functional component is first available to successor IWP planning elements. The date does not describe when the Enabler will be fully deployed throughout the NAS.
- **Development Activity:** Development Activities describe development initiatives or demonstrations and the results and/or outputs needed to support other NextGen planning

elements. Development Activities are assigned an IA date two years prior to the earliest target date of each supported planning element.

- **Research Activity:** Research Activities describe basic or applied research initiatives and the results and/or outputs needed to support other NextGen planning elements. Research activities are assigned an IA date two years prior to the earliest target date of each supported planning element.
- **Policy Issue:** Many of the OIs and Enablers require policy changes to support their realization, particularly related to interoperability, standardization, and governance. It is intended that Policy Issues encourage decision-maker consideration of viable options that range from focused studies and further analysis of topics that are currently not well defined or understood, to specific policy recommendations for more mature issues. Policy Issues are assigned a policy completion date, which identifies when the policy issue needs to be resolved to support successor IWP planning elements.

Target Date Attribute

The planning elements within the IWP are assigned a single target date appropriate to the planning element, which represent the calendar year for which the initial instantiation of the element is planned to be achieved in the NAS. The element may have more than one instantiation or may be used throughout the NAS, but it does not imply that it will be available everywhere in the NAS by that date.

Stakeholder Responsibility Designation

As previously noted, planning elements have stakeholder roles defined within the IWP. The role assignment attribute indicates the primary or collateral responsibility of the organization associated with the particular planning element. The following describes the two roles in more detail:

- **Office of Primary Responsibility (OPR):** The OPR is expected to provide the overall ownership and leadership necessary to achieve the planning element. For OIs, this may involve providing internal resources, as well as coordinating external resources. For Enablers, Research, or Development Activities, the OPR may have more direct control of the work, but may also coordinate with or use external resources, as needed. Each IWP element is initially assigned a Suggested OPR (SOPR) by the JPDO. As commitments are received and planning element content is accepted, the SOPR designation will change to an OPR designation. Until that time, the JPDO will remain as the advocate of the planning element.
- **Office of Collateral Responsibility (OCR):** Many of the NextGen IWP planning elements will be achieved through the support, cooperation, and coordination of multiple organizations. The OCR designation is assigned to organizations that are expected to support the OPR in realizing the NextGen planning element. This support can be provided through the provision of funds, staffing, facilities, intellectual capital, or other resources, as needed. One, or multiple, Suggested Office of Collateral Responsibility (SOCR) is assigned by the JPDO to IWP elements as necessary. As commitments are received and planning element content is accepted, the SOCR designation will change to an OCR designation.

The term OPR has a different meaning for non-Federal Partners such as Industry and Airport Operators as it is difficult to identify a single organization to assume the same level of ownership responsibility for implementing an element throughout the NAS as a Federal Partner. Therefore, the term ‘ownership’ simply implies that the element will eventually be performed by a group. The JPDO will attempt to

validate these elements by coordinating with the appropriate representatives within the JPDO Working Groups[2] to get the most accurate description and date for the planning element.

Planning Element Relationships

The sequencing of IWP planning elements creates a highly interdependent environment of predecessor and successor relationships. A summary of the potential supporting relationships between IWP planning elements is provided in Table 1:

Table 1: Supporting Relationship between IWP Planning Elements

	Supporting Relationship				
IWP Element Type	**OI**	**EN**	**DA**	**RA**	**PI**
Operational Improvement (OI)	●				
Enablers (EN)	●	●			
Development Activities (DA)		●	●		●
Research Activities (RA)		●	●	●	●
Policy Issue (PI)	●	●	●	●	●

Due to challenges associated with presenting the interdependence and relationship complexities of the IWP, the JPDO uses the JPE to capture the full set of relationships and interdependencies among the IWP planning elements.

Table 2 provides a summary of the total number of IWP planning elements and the assignments of these elements to each NextGen stakeholder.

Table 2: Number of IWP Planning Elements by NextGen Stakeholder

NextGen Stakeholder	OI	EN	DA	RA	PI	Total
DOC	4	39	7	1	1	52
DOD	-	10	2	4	2	18
DHS	22	41	11	8	14	96
FAA	94	240	52	58	49	493
NASA	-	4	14	41	-	59
Industry	3	89	14	6	-	112
Airport Operator	11	2	-	-	-	13
Other	-	7	2	2	3	14
Totals	**134**	**432**	**102**	**120**	**69**	**857**

[2] http://www.jpdo.gov/whoswho.asp

SUMMARY OF CHANGES

Over 500 comments have been adjudicated following the JPDO's Change Management process and are included in the IWP version FY13. The major sources for updates to the IWP are briefly discussed in the following paragraphs. A more detailed summary of the IWP changes can be found in Appendix I.

IWP Data Validation

The JPDO engaged the NextGen Federal Partner Agencies (i.e., DOC, DOD, DHS, FAA, and NASA) in a collaborative review and validation process to further develop and improve the IWP planning element content and achieve endorsement, tighter alignment, and better integration. Agency feedback was used to derive proposed changes to element attributes such as title, description, and date. Additionally, the validation process resulted in agency acceptance of elements as OPR.

Research Study Teams

One study, sponsored by the JPDO NextGen Institute, was focused on Integrated Communications, Navigation, and Surveillance (ICNS) and evaluated planned communication, navigation, and surveillance requirements for 2025. A second study, sponsored by NASA, was focused on NASA Advanced Concepts and Vehicles (NACV). The NACV study evaluated advanced vehicle concepts, such as unmanned aircraft systems or supersonic aircraft and the operational implications to NextGen. Both of these studies resulted in changes to several IWP planning elements.

JPDO Working Group and Subject Matter Expert Review

Another source of change to the IWP planning elements was JPDO Working Group (WG) and Subject Mater Expert (SME) reviews as part of the comment adjudication process. Many of the elements assigned to Industry and Airport Operators were also reviewed in collaboration with several of the JPDO Working Groups. Additionally, an internal review of IWP Policy Issues led to numerous updates, with a focus on capturing associations between Policy Issues and Research Actions.

IWP DATA VALIDATION AND MATURITY

The continuing drive towards explicit Federal Partner Agency endorsement is the basis for the JPDO's annual data validation and maturity activities. The JPDO engaged the Federal Partner Agencies in a collaborative review and validation process to further develop, mature, and improve the IWP planning elements and to achieve endorsement, tighter alignment, and better integration. The process included a review of IWP planning elements where suggested primary responsibility was indicated and collaborative workshops focused on enhancing element descriptions to reflect current agency plans and/or roadmaps. The following paragraphs summarize the status of this year's annual validation process and the maturity of each Federal Partner Agency's IWP planning elements:

Department of Commerce (DOC)

Collaborative efforts between the JPDO and DOC to enhance the integrity of the IWP data resulted in revisions to titles, descriptions, and/or availability dates related to 38 of DOC's Enablers. The JPDO also began coordinating with DOC to identify and align the applicable DOC programs associated with near-term Enablers.

Department of Defense (DOD)

The JPDO facilitated meetings between the DOD and FAA to discuss three GPS-related Enablers, resulting in minor updates and DOD acceptance of the OPR designation. Additionally, the DOD NextGen Lead Service Office (LSO) identified the office of the Secretary of the Air Force, Warfighting Integration & Chief Information Officer (SAF/XC) as the performing organization for the 10 net-centric related elements assigned to DOD. The

LSO also authorized the JPDO to coordinate directly with SAF/XC to validate the element content. This effort is currently in progress. The DOD LSO further agreed to change the OPR for 11 integrated surveillance elements to "unassigned" until an Integrated Surveillance Governance Entity is formed and determines which Partner Agency shall have the lead role. Finally, as a result of joint coordination between DOD and FAA, the two Special Use Airspace (SUA) OIs were modified to reflect a broader focus on Special Activity Airspace (SAA) and assignment to the FAA as SOPR and to the DOD as SOCR.

Department of Homeland Security (DHS)

As a result of discussions between JPDO and DHS representatives, DHS began identifying the performing organization that would have responsibility for validating and implementing the elements currently assigned to DHS as SOPR. DHS provided their initial assessment and mapping of internal organizations to each of the DHS elements. DHS is currently contacting the organizations to confirm their plans coincide with the IWP element descriptions. Additionally, DHS accepted the OPR designation for 14 Policy Issues.

Federal Aviation Administration (FAA)

The FAA reviewed OIs within the FAA NAS EA to determine possible alignment and changes made by the FAA to already aligned elements. This effort resulted in the alignment of one orphan OI from FY12 validation efforts, the deletion of seven OIs and the addition of 12 new OIs to the IWP; however, seven orphans still remain. In addition, the FAA began reviewing the IWP Enablers assigned to them as SOPR and provided recommended revisions to Weather, Surveillance, Automation, Avionics, Safety, Security, and Navigation elements. These proposals are being evaluated as part of the JPDO Change Management process.

National Aeronautics and Space Administration (NASA)

As a result of continued efforts between the JPDO and NASA to review and validate the NASA R&D elements, NASA accepted the role of OPR for 15 Research Activities.

Non-Federal NextGen Stakeholders

The JPDO initiated collaborative efforts with the WGs to review the identified elements and validate the non-Federal SOPR assignments and the status of near-term elements. Approximately 115 IWP elements were reviewed, and of those, the content of the elements with IOC dates of 2008, 2009, and 2010 were validated, as well as the status of all elements with 2008 and 2009 IOC dates.

Element Maturity Model

The JPDO uses the following five-level maturity model internally to track the progress of the validation effort and the maturity of the IWP planning elements' content and also the status of its progression to IOC or availability. The model helps focus the JPDO's future validation efforts on the least mature elements of the IWP. The five maturity levels are:

- **Maturity Level 1 –** The planning element is sufficiently described, including all required element attributes, and accepted for inclusion into the IWP.
- **Maturity Level 2** – The SOPR has formally acknowledged that the planning element is within its mission area.
- **Maturity Level 3** – The SOPR has formally accepted the role of OPR and fully concurs with the planning element's title, description, and date.
- **Maturity Level 4** – The OPR concurs with the planning element's prerequisites.
- **Maturity Level 5** – The planning element is aligned to programs/investments within the OPR.

Table 3 displays a summary count of the NextGen stakeholder planning elements and their current maturity level. These numbers reflect the results of this year's data validation efforts. Policy Issue planning elements are not included in the table because they are assessed against a different maturity model and tracked internally – they require continuous agency interaction and significant qualitative analysis beyond data validation.

Table 3: IWP FY13 Planning Element Maturity

Number of IWP Planning Elements at each Maturity Level					
NextGen Stakeholder	Maturity Level				
	1	2	3	4	5
DOC	3	-	-	48	-
DOD	12	-	-	2	2
DHS	78	-	-	4	-
FAA	289	9	105	1	41
NASA	26	6	-	24	3
Industry	100	-	-	-	11
Airport Operator	13	-	-	-	-
Other	10	-	-	-	1
Totals	**531**	**15**	**105**	**79**	**58**

OPR Acceptance Rates

This year's annual data validation coordination efforts resulted in additional levels of OPR acceptance by the Federal Partner Agencies. The information in Table 4 displays the OPR acceptance by element type for each partner agency. For the IWP as a whole, 35% of the elements have received OPR acceptance. This year's data validation effort resulted in OPR acceptance of an additional 121 elements, resulting in a total of 250 elements with OPR acceptance.

Table 4: IWP FY13 OPR Acceptance

NextGen Partner Agency	OI	EN	DA	RA	PI	%OPR
DOC	100%	92%	100%	100%	100%	94%
DOD	-	30%	0%	0%	100%	28%
DHS	5%	5%	9%	0%	100%	18%
FAA	82%	13%	0%	0%	86%	30%
NASA	-	0%	14%	61%	-	46%
% OPR by Element	**68%**	**22%**	**12%**	**22%**	**91%**	**35%**

INTERNATIONAL ALIGNMENT

The JPDO recognizes the need to develop an interoperable system with the international community because the effects of implementing NextGen technologies and procedures throughout the NAS will extend far beyond the borders of the United States. Coordination and collaboration on policy, system standards, operational procedures, avionics capabilities, and equipage milestones across international borders will promote global harmonization. To this end, the JPDO began identifying and relating international activities described in the European ATM Master Plan (replaced the Single European Sky ATM Research (SESAR) Master Plan and the International Civil Aviation Organization (ICAO) Global Air Navigation Plan) to the NextGen IWP, in order to ensure seamless global operations and to align timelines for NextGen OIs with the implementation of future systems around the world.

The alignment activity used existing analysis of FAA and EUROCONTROL high-level planning elements and ICAO Global Plan Initiatives combined with existing IWP OI to NAS OI alignments to

align individual IWP OIs to European Master Plan OI Steps. The results included 32 NextGen IWP OIs aligned to 39 European Master Plan OI Steps. These alignments can be viewed in the JPE under the 'Relationships' area of the Operational Improvements.

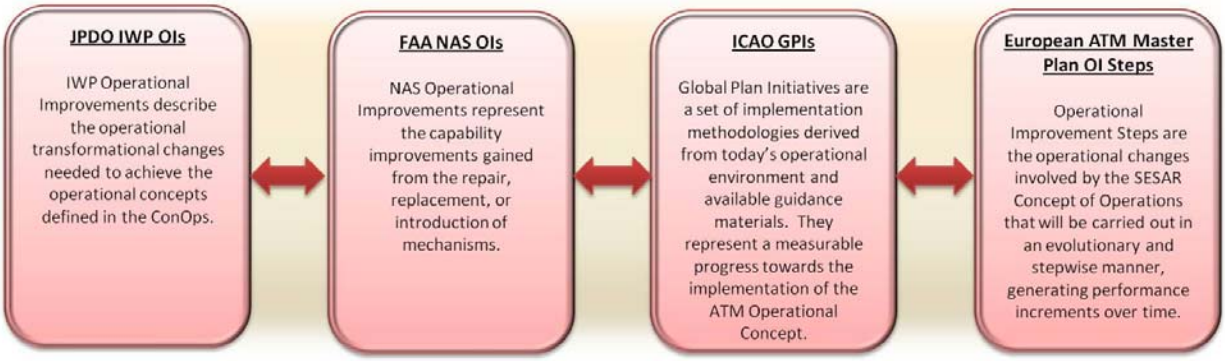


Figure 1: Element Mapping Relationships

NEXT YEAR'S OBJECTIVES

Through the annual validation process the JPDO will continue to collaborate with the stakeholder community to further mature and validate the NextGen planning information, specifically the precision of the elements within the IWP and EA. The JPDO will continue to identify, facilitate, and integrate the activities, commitments, and contributions of Federal Partner Agencies, industry, and other key stakeholders to ensure the NextGen transformation is realized.

This effort will help the JPDO describe NextGen from multiple perspectives and provide a "big picture" of the future air transportation system, as well as consistent interpretations and definitions of NextGen concepts and capabilities. Additionally, it will allow the JPDO to perform analysis to identify and communicate programmatic dependencies and constraints, interagency requirements and priorities, opportunities for interagency collaboration, and/or improvements or adjustments to implementing Partner Agency priorities and resources

The alignment of the high level planning elements to international plans provided a crucial first step in the global harmonization effort. Employing this work will allow for the detailed review and alignment of the enabling technologies that are key to the FAA and EUROCONTROL in their efforts to modernize their respective air transportation systems. The next level of analysis will provide greater fidelity to identify and align international activities between the two systems, as well as bring to light any possible risks in global operations.

New information, as it becomes available, will provide the additional depth needed for detailed analysis of priorities, performance, benefits, risk, cost, and research and technology maturity. The JPDO recognizes this level of fidelity is necessary to perform an objective alternative analysis, derive the case for NextGen, and inform stakeholder decision making.

APPENDIX I

Detailed Summary of Changes

The IWP and many of the planning elements have matured since the last release of the IWP (Version FY12). Over 500 comments entered the JPDO's Change Management process and are now incorporated, as adjudicated, into Version FY13 of the IWP. The major catalysts of change include:

I. IWP Data Validation
II. Research Study Teams
III. JPDO Review & Update

The following sections provide a quick summary and highlight many of the changes incorporated into Version FY13 of the IWP. This overview is intended to accompany the IWP FY13 Executive Summary and the IWP FY13 Adjudicated Comment spreadsheet. This summary does not necessarily represent all changes made to the IWP. For a complete list of comments and for more information on any of the comments summarized in this document, reference the adjudicated comments listing within the reports area of the JPDO's JPE.

I. IWP DATA VALIDATION

The JPDO engaged the NextGen Federal Partner Agencies (i.e., DOC, DOD, DHS, FAA, and NASA) in a collaborative review and validation process to further develop and improve the IWP planning element content and achieve endorsement, tighter alignment, and better integration. Agency feedback was used to derive proposed changes to element attributes such as title, description, and date. Additionally, the validation process resulted in agency acceptance of elements as OPR.

Federal Aviation Administration (FAA)

Table I-1: Summary of FAA Comments/Changes

Summary of Change	Applicable Comment(s)
FAA accepts role as office of primary responsibility for 42 Policy Issues. As part of this acceptance descriptions for PI-0006, PI-0073, and PI-0089 were modified.	846-847, 850-858, 862-869, 871, 873-874, 878-879, 882-883, 890-896, 898-899, 901-906
FAA accepts role as office of primary responsibility for 31 Enablers. As part of this acceptance titles to ENs-0206/0207/1002/1750/4510/4511/4512 were modified.	1779-1781, 1785-1786, 1792-1817
Deleted PI-0005 (combined content with PI-0006)	845
FAA proposed minor modifications to the titles, descriptions, and/or dates of 58 FAA OPR accepted operational improvements.	1027-1028, 1138, 1152, 1206-1214, 1220-1227, 1230-1233, 1235-1236, 1238-1246, 1248-1264, 1266, 1284, 1378, 1379, 1528

Summary of Change	Applicable Comment(s)
FAA accepts role as office of collateral responsibility for 1 operational improvement	1229
Deleted 7 operational improvements (OI-0319, 0329, 0330, 0335, 0352, 0361, 0382)	1031, 1371-1376
Removed FAA OI NAS Alignment to IWP OI-0334	1154
12 New FAA operational improvements added to the IWP (OI-7001-7005 and OI-7007-7013)	1140-1144, 1275-1280, 1285
Minor modifications to the titles and/or descriptions of 14 FAA SOPR weather enablers	797-799, 1415, 1425, 1428, 1432-1435, 1437, 1443-1445
Deleted 3 FAA SOPR weather enablers (EN-2470, 2471, 2472)	1406, 1412, 1422
Added 4 new FAA SOPR weather-related enablers	1454-1457
Date change to 1 policy issue (PI-0104) and modifications to title, description and date of 1 policy issue (PI-0014)	1535, 1536

Department of Commerce (DOC)

Table I-2: Summary of DOC Comments/Changes

Summary of Change	Applicable Comment(s)
DOC accepts role as office of primary responsibility for 1 IWP policy issue	880
DOC was added as a suggested office of collateral responsibility for 1 operational improvement	768
Minor modifications to the titles, descriptions, and/or dates of 37 DOC OPR accepted enablers.	1401-1405, 1407-1411, 1413, 1414, 1416-1421, 1423, 1424, 1426, 1427, 1429-1431, 1436, 1438-1441, 1446-1452
Deleted 2 enablers (EN-2210, 2270)	1442, 1453
IWP Glossary was updated to appropriately reflect DOC weather terminology	793

Department of Defense (DOD)

Table I-3: Summary of DOD Comments/Changes

Summary of Change	Applicable Comment(s)
DOD accepts role as office of primary responsibility for 2 IWP policy issues	861, 897
DOD proposed minor content updates and accepted role as office of primary responsible for 3 enablers	813-815
DOD accepted role as office of collateral responsibility for 1 enabler	816
The date for 1 DOD research action changed	1199
DOD was removed as the suggested office of primary responsibility for 5 enablers, 1 development action, and 1 research action. These elements are now labeled as Unassigned	1192-1198

Department of Transportation (DOT)

Table I-4: Summary of DOT Comments/Changes

Summary of Change	Applicable Comment(s)
DOT accepts role as office of primary responsibility for 1 policy issue	860

National Aeronautics and Space Administration (NASA)

Table I-5: Summary of NASA Comments/Changes

Summary of Change	Applicable Comment(s)
NASA accepts role as office of primary responsibility for 15 research activities	912, 914, 916, 918, 920-924, 927-932
NASA moved from the role of suggested office of primary responsibility to suggested office of collateral responsibility for 2 research activities	909-910

Department of Homeland Security (DHS)

Table I-6: Summary of DHS Comments/Changes

Summary of Change	Applicable Comment(s)
DHS accepts role as office of primary responsibility for 14 policy issues	870, 872, 875-877, 881, 884-890, 907
The date for 2 DHS enablers changed	1288, 1554
The date for 1 DHS development activity changed	1400

II. CHANGES FROM RESEARCH STUDY TEAMS

One study, sponsored by the JPDO NextGen Institute, was focused on Integrated Communications, Navigation, and Surveillance (ICNS) and evaluated planned communication, navigation, and surveillance requirements for 2025. A second study, sponsored by NASA, was focused on NASA Advanced Concepts and Vehicles (NACV). The NACV study evaluated advanced vehicle concepts, such as unmanned aircraft systems or supersonic aircraft and the operational implications to NextGen. Both of these studies resulted in changes to several IWP planning elements.

Table I-7: Summary of ICNS Study Comments/Changes

Summary of Change	Applicable Comment(s)
1 new research action has been added to the IWP	1149
Description for 1 research action (R-1580), 1 development action (D-0830), and 1 enabler (EN-0180) has been updated	1493, 1514, 1518
Prerequisites to OI-0362, OI-0369, OI-0370, OI-3104, and EN-0017 were updated	1337, 1351, 1637, 1639, 1652, 1653

Table I-8: Summary of NACV Study Comments/Changes

Summary of Change	Applicable Comment(s)
Prerequisites for EN-0032 were updated	1492
Minor description update to 2 research actions (R-0140, R-0307)	1503, 1509

III. JPDO REVIEW & UPDATE

Another source of change to the IWP planning elements was JPDO Working Group (WG) and Subject Matter Expert (SME) reviews as part of the comment adjudication process. Many of the elements assigned to Industry and Airport Operators were also reviewed in collaboration with several of the JPDO WGs. Additionally, an internal review of IWP Policy Issues led to numerous updates, with a focus on capturing associations between Policy Issues and Research Actions.

Table I-9: Summary of Working Group Review Comments/Changes

Summary of Change	Applicable Comment(s)
Aircraft WG Review initiated 3 minor changes to IWP avionics enablers (2 modifications to EN description and 1 modification to SOPR/SOCR role assignments)	1202-1204
Airport WG review initiated 8 minor changes to IWP airports elements (modified SOPR/SOCR role assignments for 6 enablers and 1 development action; and minor update to description for 1 research action)	1030, 1265-1270, 1272, 1289, 1689
Alignment with ConOps – Description change to 2 OIs (OI-5014, OI-5010), Deleted 1 OI (OI-5011), Date changes to 2 OIs (OI-5008, OI-5010)	1685-1689
Air Navigation Services (ANS) WG provided minor modifications to the description, date, and/or element relationships for 6 ANS-related operational improvements	484-485, 1368-1370, 1377

Table I-10: Summary of JPDO SME Review Comments/Changes

Summary of Change	Applicable Comment(s)
SOPR/SOCR role assignments have been changed for 1 operational improvement, 2 enablers, and 1 research action.	1150-1151, 1287, 1714
The capability alignment for 2 operational improvements and the functional area grouping for 3 enablers have been updated.	1032-1033, 1290-1292
The term Special Use Airspace (SUA) has been updated to Special Activity Airspace (SAA) in 14 instances	1167, 1172-1184
Minor description modification were made to 3 enablers and one operational improvement	1153, 1155, 1281, 1283
Updated successor element relationships for 1 enabler	934

Summary of Change	Applicable Comment(s)
Deleted 2 enablers (EN-0168, 1040)	933, 1282
Deleted Intermodal elements from the IWP (R-0009, D-2119, EN-5029, EN-5053, OI-5012)	1215-1219
Added 2 new Integrated Surveillance-related enablers (EN-7014, EN-7015)	1539, 1540
To better align with Research and Development identified by the NASA/FAA Research Transition Teams (RTTs) 11 research actions, 7 development actions, and 1 enabler have been added. Additionally, 3 existing IWP research actions and 2 existing development actions have been enhanced.	1690-1713

Table I-11: Summary of Policy Issue Review Comments/Changes

Summary of Change	Applicable Comment(s)
Added policy issue to research action relationships for 80 policy issues	1034-1070, 1072-1106, 1108-1110, 1112-1116
Deleted 2 policy issues (PI-0005, 0082)	843-844
Labeled 2 policy issues as Unassigned (PI-0009, PI-0010) and modified the dates	848-849, 1537-1538

APPENDIX II

NextGen Capabilities Overview

This section further describes the NextGen capabilities and summarizes their expected near- (2009–2012), mid- (2012–2018), and far-term (2018 and beyond) transformational objectives. Each capability's transformational summary is derived from the supporting operational improvement and materiel and non-materiel solution descriptions found in the IWP. The Capability Evolution Roadmaps found within this section graphically summarize the specific operational improvements that support the evolution of each NextGen capability.

Provide Collaborative Capacity Management

Collaborative capacity management provides the ability to dynamically balance anticipated/forecasted demand and utilization, and allocate NAS resources through proactive and collaborative strategic planning with enterprise stakeholders and automation (e.g., decision support systems), using airspace and airport design requirements, standards, and configuration conditions with the consideration of other air transportation system resources.

Transformation Objective

The transformational objective of this NextGen capability is to meet overall system goals, based on user plans, through the allocation of existing NAS assets, including personnel, airspace, services, and facilities. Future airspace needs to be flexible, dynamic, and adaptable based on traffic demand, equipage, user priorities, and weather conditions. Operational improvements are necessary to evolve from today's operational model, where capacity is often managed using a limited set of inflexible rules and static directives, to a future state where capacity is dynamically adjusted based on a wide range of rules. These rules leverage advanced automation technologies designed to safely accommodate demand and constraints while allowing full situational awareness and decision making.

In the mid-term, operational improvements are intended to integrate new airspace designs with terminal procedures and separation standards, particularly important in major metropolitan areas with multiple airports, as well as manage airspace flexibly by extending surveillance, communications, and automation capabilities. Other improvements support flying more efficient flight paths; for instance, using Automatic Dependent Surveillance-Broadcast (ADS-B) to provide general aviation (GA) operators improved access to busy terminal airspace, facilitating more direct routing. ADS-B equipped aircraft may benefit by having traffic situational awareness and filing routes more acceptable by the Air Navigation Service Provider (ANSP). Enhancements to flexible airspace management provide automation that supports reallocation of trajectory information, surveillance, communications, and display information to different positions or different facilities, enabling increased flexibility to modify or change sector boundaries and airspace volume definitions in accordance with pre-defined configurations. The ANSP's ability to reconfigure airspace and services in response to changing demand will improve NAS efficiency and reduce congestion and delay. Integrated arrival and departure airspace management will allow terminal transition areas to extend into current en route airspace, allowing reduced separation standards. Reduced separation standards will permit a greater number of Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures to be flown within the transition airspace, increasing throughput. These improvements allow greater flexibility for aircraft reroutes around severe weather or other disruptions. In addition, capacity and runway throughput are increased through the reduction of lateral separation

requirements. With the use of precision navigation, on-board displays and alerting technology, independent converging approaches are conducted while maintaining Visual Meteorological Condition (VMC) arrival rates in Instrument Meteorological Conditions (IMC).

A significant improvement identified focuses on optimizing and managing airspace in near real time, based on actual flight profiles, leveraging advanced technology and situational information. This can be achieved in part by improving utilization of Special Activity Airspace (SAA) when not in use by military or other scheduled users. Through the use of real-time management and scheduling decision support tools, as well as enhanced automation-to-automation communications and collaboration, decision makers are able to dynamically manage SAA, thus increasing real-time access to and use of unused airspace.

In the far-term, improvements integrate demand and resource information from collaborative decision making into a single decision support tool, allowing strategic resources (e.g., airspace, sectors, personnel, facilities, and NAS systems) to be modeled in parallel with systemic changes in demand. Future traffic loads are modeled against various solutions to mitigate adverse impacts to users. Once NAS-wide modeling efforts are accomplished and analyzed, the ANSP and stakeholders use decision management systems to achieve consensus, increasing capacity while minimizing adverse impacts to users. Full collaborative decision making is achieved through advanced communication and information sharing systems, enabling timely, effective, and informed decision making based on shared situational awareness. Decision makers request information when needed, publish information as appropriate, and use subscription services to automatically receive desired information through the net-centric infrastructure service. Access to airspace is further enhanced through more advanced, automated real-time scheduling and dynamic status updates of SAA. Airspace is negotiated daily between ANSP and military operators to determine effective flow and airspace strategies that meet the needs of all airspace users. This type of operational improvement will allow more timely and increased access to the NAS information and increased situational awareness, providing the maximum flexibility to all users and minimizing the impact on traffic flows. Finally, capacity is increased through the flexible and dynamic allocation and designation of airspace, based on the type of operations to be flown within that airspace. Airspace designation will determine the level of aircraft performance requirements for flying within a particular airspace.

Provide Collaborative Flow Contingency Management

Flow contingency management provides optimal, synchronized, and safe strategic flow initiatives and ensures the efficient management of major flows of traffic while minimizing the impact on other operations in collaboration with enterprise stakeholders, through real- or near-real-time resolutions informed by probabilistic decision making within established capacity management plans.

Transformation Objective

The transformational objective of this NextGen capability is to alleviate the demand capacity imbalance that could originate as a result of excessive demand for a particular airspace, or reduced capacity because of operational constraints, in a manner that is equitable across stakeholders. All operational improvements for this capability are targeted for the mid-term time frame.

In the mid-term, using increasing levels of collaboration and integration among ANSP, aircraft operators, and aircraft, proposed flight plans are evaluated against constraint volumes and adjusted by the filer, using feedback provided, to accommodate changing conditions or imbalances. Flight plans and trajectories are adjusted during flight, using integrated processes and digital communication between the flight deck and ANSP automation. Individual flight-specific changes, resulting from Traffic Management Initiatives (TMI), will be disseminated and uniquely tailored to accommodate and balance the needs of each user with NAS demands, capacities, and constraints, rather than broadly apply global TMIs to multiple flights. To mitigate the risk of chronic sector-level demand and capacity imbalances, the ANSP adjusts sectors and resources to meet anticipated demand, promoting efficiency and ensuring safety.

In the far term, high density En Route static flow corridors efficiently handle high traffic densities, increasing throughput and the airspace available to other traffic. Aircraft, capable of self-separation, traveling in the same direction on similar routes, use onboard separation capabilities, Automatic Dependent Surveillance-Broadcast (ADS- B) and onboard conflict detection and alerting, to maintain separation from other aircraft flying within the corridor. Further capabilities are later provided through the implementation of dynamic high density flow corridors, which are defined daily and shifted throughout the flight day to avoid severe weather regions and airspace restrictions (e.g., SUA) or take advantage of favorable winds. This extends static flow corridor technology via dynamic airspace design capabilities to provide more En Route capacity to trajectory-based aircraft when the available airspace is restricted.

Provide Efficient Trajectory Management

Efficient trajectory management provides the ability to assign trajectories that minimize the frequency and complexity of aircraft conflicts within the flow through the negotiation and adjustment of individual aircraft trajectories and/or sequences when required by resource constraints.

Transformation Objective

The transformational objective of this NextGen capability is to evaluate and adjust individual trajectories to provide appropriate access to airspace system assets (dependent upon aircraft capabilities) and separation assurance to all aircraft, ultimately providing the most efficient trajectory while also saving users' time and fuel.

In the near-term, operational improvements will focus on providing flight trajectories using time-based metering improvements that create greater efficiency. Time-based management is used for sequencing multiple arrival and departure streams over separate assigned fixes, resulting in both a reduction of "lost landing" opportunities at the runway threshold and improved routing upon departure, as well as sequencing any other point-in-space to mitigate the impact of potential delay situations. The use of the most economical power setting from cruise to approach and the accompanying reductions in environmental impact are achieved by Optimized Profile Descent (OPD) improvements. Additionally, the use of Required RNP and RNAV technologies will improve arrival/departure operations, resulting in increased access, capacity, and efficiency when implemented with the separation management capability.

In the mid-term, interactive flight planning from any location will be enabled as flight planning activities are accomplished from the flight deck as readily as any location. ANSP automation will allow the user to enter the flight plan incrementally, with feedback on conditions for each flight segment, enabling users to quickly reach a flight plan agreement, optimizing their business objectives. Airborne and ground automation will provide the capability to exchange flight planning information and the negotiation of flight trajectory contract amendments in near real time, while automated clearance delivery and frequency changes will help streamline departure activities and minimize miscommunications. Precision aircraft approaches, using technology such as the ground-based augmentation system (GBAS), will allow broader access at more airports and increased access to currently under-utilized regional airports. Subsequently, surface safety will increase through the implementation of tools that provide greater situational awareness for controllers and pilots in the prevention of runway incursions. Surface automation will be greatly enhanced with improved low-visibility surface operations that allow ANSP and airport operators to use integrated surveillance data to efficiently coordinate and prioritize surface movement of aircraft and vehicles. Surface decisions support and management of aircraft and ground vehicle movements are supported by improvements in surface traffic management through a combination of advanced displays, alert mechanisms, and other ground and aircraft-based monitoring and automation systems. This will increase efficiency and safety of surface traffic while facilitating a reduced environmental impact.

In the far-term, access to airports with near-zero ceiling and/or visibility is available where needed through a combination of complementary airborne and ground functionality to aid the pilot in approach

guidance and acquisition of the runway environment for safe operations. In addition, with the introduction of a Net-Centric Virtual Facility (Remotely Staffed Towers) and Automated Virtual Towers, a broad range of ANSP services are provided without the need of full tower infrastructure and local staff. ANSPs will have improved conflict alert aids available for use. Some separation responsibility is delegated to aircraft equipped with "sense and avoid" or synthetic aperture-type capabilities. Traffic management initiatives and flight plan data will be available to flight operators and ANSPs via net-centric/shared information capabilities that improve common situational awareness. Decision support tools will also assist ANSPs with planning taxi routes and arrival/departure sequencing. Specifically, metroplex operations will be enhanced by the full integration of trajectory, separation, and capacity management functions, including surface and terminal airspace operations. By scheduling and managing all operations with full situational awareness, the ANSP and flight operators can efficiently collaborate to balance the demands of all users and maximize the utilization of the runway and airspace capacity. Surface movement efficiency and safety are further increased, especially in low-visibility conditions, with tagging and tracking of surface vehicle positions and then sharing or displaying this information to operators and the ANSP. Enabling efficient trajectory management and procedures with the intent of optimizing aircraft arrivals, departures, and surface operations will also inherently reduce aircraft fuel burn, emissions, and noise - thereby having a diminished impact on the environment.

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). Conflict resolution is enhanced by automated assistance to probe pilot trajectory change requests with properly equipped aircraft operators to resolve conflicts.

Provide Flexible Separation Management

Flexible separation management establishes and maintains safe separation minimums from other aircraft, vehicles, protected airspace, terrain, weather, etc., by predicting conflicts and identifying resolutions (e.g., course, speed, altitude, etc.) in real time, and accommodates increasing capacity demands and traffic levels by using automation (e.g., decision support systems) while also introducing reduced separation standards.

Transformation Objective

The transformational objective of this NextGen capability is to increase system capacity and improve efficiency and predictability of the NAS, while maximizing airport operating capacity by implementing safe aircraft separation standards. The operational improvements will focus on the reduction of oceanic profiles, airborne merging and spacing, more closely spaced arrival operations, and delegated self-separation procedures.

In the near-term, ADS-B provides reduced separation minimums and flight following services. Improved surveillance also enables the ANSPs to use radar-like separation standards and services. The ADS-B positional reports are incorporated into the surveillance data processing systems and displayed to controllers. Surveillance and traffic broadcast services improve situational awareness in the cockpit with more accurate and timely digital traffic data provided directly to aircraft avionics for display to the pilot.

In the mid-term, enhancements for reduced oceanic separation further introduce the availability of user-preferred oceanic profiles for capable aircraft, which is increased through pair-wise altitude change maneuvers with ground-based separation responsibility. Aircraft-to-aircraft oceanic longitudinal and lateral spacing is reduced to 10 miles during altitude change maneuvers. Pair-wise maneuvers (in-trail climbs and descents) are enabled through the use of improved oceanic cooperative surveillance information. Data communications between aircraft, and between the aircraft and the ANSP, enable real-time control instructions by the ANSP and aircraft-to-aircraft delegation of separation authority. Aircraft-

to-aircraft separation through enhanced surveillance is delegated by the ANSP and enabled by new procedures and data received from on-board displays. Digital communication is used to reduce controller and aircraft crew workload. Maneuvers, such as airborne merging and spacing, are increasingly delegated to the aircraft, and trajectories are constantly modified to meet projected capacity demand. ANSP automation is enhanced to predict and resolve conflicts, providing rank-ordered resolution advisories. As aircraft separation capabilities increase, separation responsibility is also increasingly delegated from ANSP control to capable aircraft, allowing for more closely spaced arrivals, thus improving airport and runway efficiency and flexibility. 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.

In the far-term, delegated separation improvements are also achieved in other ANSP-managed airspace. Reduced and more efficient separation procedures are applied in new high-density en route airspace, based on required performance criteria as well as the reduced separation and enhanced procedures in oceanic airspace. Additionally, departure capacity will increase for single runways due to the reduction in the longitudinal wake separation standards. Runway capacity is increased with the allowance of more than one aircraft on the runway at a given time for specific situations. Arrival capacity is also increased for single runways due to the reduction in the longitudinal wake separation standards in IMC. These enhancements improve operator routing and operational efficiency, and increase ANSP productivity. The ANSP delegates separation responsibility to capable aircraft with on-board displays to perform specific separation operations, including passing, crossing, turn-behind, and other simple maneuvers. This does not include separation for complex situations that would require on-board conflict alerting.

In self-separation airspace, capable aircraft are responsible for separating themselves from one another, and the ANSP provides no separation services, enabling preferred operator routing with increased ANSP productivity. During self-separation operations in designated areas, aircraft-to-aircraft separation is delegated to the flight deck for aircraft equipped with ADS-B and on-board conflict detection and alerting. Finally, based upon concept exploration and a feasibility analysis, NextGen is envisioned to support delegated separation involving the more complex procedures, including the possibility of maintaining separation from more than one aircraft at a time during crossing, merging, or passing procedures.

Provide Integrated NextGen Information

Integrated NextGen information provides authorized aviation stakeholders timely, accurate, and actionable information (e.g., weather, surveillance, aeronautical information, operational and planning information, and position, navigation and timing information) to shorten decision cycles and improve situational awareness using a net-centric environment managed through enterprise services that meets the information exchange requirements of the NextGen stakeholder.

Transformation Objective

The transformational objective of this NextGen capability is to create an environment that gets the right information, at the right time, in the right format, and under the right protection, to authorized decision makers and their decision support tools. Integrated NextGen Information is an emergent and enabling enterprise capability that depends on and results from the implementation of operational improvements that provide core NextGen capabilities (e.g., capacity, trajectory, flow contingency, and separation management, air transportation security). The Integrated NextGen Information capability will be provided to aviation stakeholders through enterprise management services of the net-centric environment and physical infrastructure, assuring its availability and security, and through content management services that provide discovery, storage, and delivery of information from producers to consumers. Key to the

success of these enablers is the ability to monitor and maintain situational awareness of the health, security, and mission readiness of the net-centric information enterprise.

In the near-term, improvements build a foundational net-centric environment by implementing and upgrading physical infrastructure; integrating existing interagency enterprise networks into an interoperable information sharing environment that meets minimum NextGen requirements for safety, security, and network management; incorporating information from modular legacy sources and new decision support tools; and developing and implementing the security policies (i.e., physical and cyber), information sharing standards and protocols, enterprise governance mechanisms, and standards for the content management framework. Content management services will enable authorized stakeholders to provide, discover, and consume timely and accurate NextGen-relevant information through available enterprise-wide services (e.g., discovery, display, cataloging, compiling, distributing, storing, retrieving, caching, sharing, and mediating), trusted aviation stakeholder partnerships, and aligned data policies, regulations, and standards (including data conflict resolution).

Benefits from these improvements are realized immediately as they begin to enable advancements in NAS operations such as improved air domain awareness, weather information assimilated into decision making, and integration of regulatory and operational risk information. Improvements to air domain awareness are realized as cooperative, non-cooperative, and ground surveillance information from legacy systems are integrated with information from initial ADS-B and Automatic Dependant Surveillance-Contract (ADS-C) solutions and used in decision support tools and display systems. Risk management improvements implement information management and decision support tools. Near-term NextGen weather improvements integrate weather observations systems with decision support tools and develop policies and governance for the 4-D Weather Cube.

In the mid-term, improvements incorporate additional data types, such as aeronautical information, and information sources into the content management framework and improve integration and interoperability of systems across the net-centric enterprise. Air domain awareness is further enhanced as flight risk management systems are integrated with more dynamic risk assessment and decision support capabilities to provide increased response coordination. In the weather domain, user-defined operational capabilities are improved, and advancements in decision support tools begin to leverage new sources and types of weather observation data, which enable the 4-D Weather Cube capability that provides adaptive sensor control, enhanced forecast products, and a common weather picture. Improvements to risk management enable further integration and expansion of risk factors into decision-making criteria.

In the far-term, improvements provide the full Integrated NextGen Information capability. Enterprise and content management improvements link producers and consumers of information in a robust, scalable, resilient, secure, and globally interconnected net-enabled environment in which information is timely and shared consistently among authorized aviation users, systems, and platforms. Information structures and management frameworks are in place and operational to support full consideration of risk information during decision cycles across the enterprise. Completing the integration of weather observation sources and decision tools enables full 4-D Weather Cube capability to improve forecasts and minimize weather impact to NAS operations. Air Domain Awareness coupled with a risk management system incorporates integrated surveillance information and risk profiles to provide situational awareness across the NAS and enable a unified, national command, control, and communications architecture to respond to threats and incidents in the NAS.

Provide Air Transportation Security

The capability to provide Air Transportation Security relies on the concept of layered, adaptive security based on risk assessment and risk management thus yielding the ability to identify, prioritize, and assess national defense and homeland security situations and appropriately adjust resources to facilitate the

defeat of an evolving threat to critical NAS infrastructure and key resources using a collaborative approach (e.g., appropriate tactics, techniques, and procedures) without unduly limiting mobility, making unwarranted intrusions on civil liberties, and minimizing impacts to airline operations or aviation economics.

Transformation Objective

The transformational objective of this NextGen capability is to improve the operational efficiency and effectiveness of air transportation security from reservation to destination with adaptive security technologies, policies, and procedures that are scaled and layered to address potential threats across multiple domains, including people, baggage, cargo, airspace, airports, and aircraft, while meeting the traffic and passenger flow demands posed by the NextGen system.

In the near-term, key operational improvements are expected to reduce the potential of high-risk passengers and personnel becoming security threats to aviation. To achieve this objective, the plan is for gradual improvements in passenger screening, credentialing, and identification, including enhanced biometric technologies and vetting capabilities that are integrated with modernized watch list systems. Beyond passenger screening, there will be improvements in aviation worker screening and credentialing, from initial employment to termination, using random checks and biometric technologies. Also expected in the near term are integrated risk-based planning and security resource management practices based on new policies and procedures that require the timely sharing of operational risk data.

In the mid-term, aviation security improvements include enhancements to aircraft, airports, and airspace. Aircraft and Unmanned Aircraft System (UAS) security is established through a variety of technological, personnel, and procedural improvements that help mitigate potential threats related to unauthorized aircraft diversions, hijacking, and disruption. The threat of aircraft and UAS destruction or use as a weapon is reduced through improvements to aircraft threat containment and redundant flight control capabilities. Threats of unauthorized people and vehicles entering airport airside, landside, and vendor supply areas are reduced by employing integrated access control systems and facility surveillance networks that help proactively identify potential risks. Airspace surveillance and security are improved through the realization of ADS-B, as well as improvements to the management of Security Restricted Airspace (SRA) and increased sharing of flight risk and flight object behavior assessment data. Enhanced automation will enable sharing and tracking SRA waivers across all security stakeholders and integrate the data with flight risk management systems to enhance overall Shared Situational Awareness (SSA).

Additional mid-term aviation security efficiencies are obtained from new policies, procedures, and standards that certify elements of the air transportation supply chain. This is achieved by the introduction of improvements to cargo and mail processing and transportation through the use of Secured and Certified Supply Chain Entities (SSCE and CSCE) that pre-screen cargo/mail for chemical, biological, radiological, nuclear, and high-yield explosives (CBRNE) prior to entering the air transportation system. In addition, existing screening equipment will be enhanced to achieve higher accuracy, greater throughput, and a reduction in overall footprint. This is expected to enhance passenger screening for CBRNE and weapons by integrating and digitally linking embedded sensors and other technologies located throughout the terminal buildings, departure curbs, and approach roadways to airport security command centers. This improvement establishes a foundation for providing instantaneous alert and threat recognition functionality across the network of local and national security operation centers. Screening operations are further improved, which increases levels of threat detection, lowers false alarm rates, and increases passenger and cargo throughput. New policies and bilateral agreements also will introduce international passenger and cargo processing efficiencies as international manifests are shared between aircraft operators and security service providers across a net-centric environment.

In the far-term, enhancements begin to fully integrate CBRNE detection systems, baggage identification and tracking systems, and multi-sensor fusion capabilities using net-centric technologies. Policies will drive aircraft and UAS technology enhancements that include on-board systems that protect against external threats such as light amplification by stimulated emission of radiation (LASERS), man-portable air defense systems (MANPADS), and electromagnetic pulse (EMP). Additional policies will be necessary to establish an integrated operational picture with national command and control, resulting in a network of airport security operation centers connected to a national transportation security operation center. To achieve this, implemented improvements will identify and establish national-to-local integration of command and control capabilities that unify security operations protocols, communications, procedures, and tactics related to security incident response and recovery. Additional improvements will further exploit net-centric capabilities to integrate and share airport access control system and surveillance network data with law enforcement organizations at multiple levels. Operational security capability improvements will provide enhanced accessibility and coordination of real-time SRA information, such as flight object data, to improve airspace planning, configuration, and distribution capabilities that make SRA more adaptive to flight risk determination and more flexible for use.

Provide Improved Environmental Performance

Improved Environmental Performance ensures environmental management considerations, including flexibility in identifying, preventing, and proactively addressing environmental impacts, are fully integrated throughout the air transportation system decision-making process, through increased collaboration and improved tools, technologies, operational policies, procedures, and practices that are consistent and compatible with national and international regulations.

Transformation Objective

The transformational objective of this NextGen capability is to balance sustained aviation growth with environmental goals by facilitating and promoting an effective and common Environmental Management System (EMS) that is adopted by all applicable aviation organizations. The intent of the EMS is to fully integrate environmental protection goals and objectives into the core business and operational decision making process throughout the air transportation system.

In the near-term, operational improvements initiate the implementation of an EMS Framework, which provides the construct for describing the environmental policies, procedures, regulations, goals and metrics, and tools and technologies. The framework establishes the foundation for efforts that develop environmental metrics needed to improve the understanding of aviation impacts on noise, air and water quality, fuel burn, and global climate; improvements to impact modeling and assessments used to monitor and predict environmental performance; the initiation of long-term outreach programs to encourage the adoption and implementation of the EMS; and initial piloting of the environmental goals and decision support tools that help address, plan, and mitigate environmental issues within a subset of U.S. aviation organizations.

In the mid-term, initial improvements to aircraft engines, airframe technologies, and new developments in alternative fuels are introduced. These improvements provide reductions in aircraft noise, emissions, and fuel burn and are sufficient to achieve FAA's continuous low emissions, energy, and noise (CLEEN) program goals and NASA's N+2 future aircraft design concepts. Additional improvements introduce the increased use of "drop-in" alternative aviation fuels that are compatible with existing infrastructure and aircraft fleet in an effort to obtain Hydrotreated Renewable Jet (HRJ) certification. Environmental improvements supporting a wide range of aircraft operations are also introduced in this time frame. Such improvements include solutions that provide environmentally friendly air traffic procedures (e.g., optimized profile descents) and surface operations, as well as avionics (e.g., flight management systems) capable of supporting environmental performance metrics. The EMS framework is further expanded to

refine the goals and decision support tools and increases access to environmental information for planning and mitigation purposes.

In the far-term, further reductions in aircraft noise, emissions, and fuel consumption will be realized from enhancements to aircraft engines and airframe technologies. These results are further enhanced through advancements in environmental management system tool suites, such as impact modeling and assessment capabilities that provide higher-fidelity data to drive decision making and optimization of NAS infrastructure resources.

Provide Improved Safety Operations

Improved safety operations ensure safety considerations are fully integrated throughout the air transportation system through increased collaboration and information sharing, improved automation (e.g. decision support systems), prognostic safety risk analysis, and enhanced safety promotion and assurance techniques that are consistent and compatible with national and international regulations, standards, and procedures.

Transformation Objective

The transformational objective of this NextGen capability is to facilitate and promote a common vision and culture of safety that allows for sustained aviation growth throughout the global air transportation system. This vision and culture includes a combination of safety goals and metrics that drive aviation system improvement activities and investments; fully integrated safety policies, procedures, and operational practices; and automated systems and technologies that are consistently designed and implemented for enhanced safety.

In the mid-term, a safer NAS requires the implementation of operational improvements that proactively address all aspects of safety from design to implementation. The development and systematic application of standardized safety management practices throughout government and industry are expected to reduce the risk of incidents and accidents throughout the system. This improvement is intended to provide a consistent approach for achieving acceptable levels of safety risk in processes such as the operation of aircraft, certification of procedures and equipment, and the conduct of maintenance, and establishes the mechanisms necessary to deliver and monitor safety performance. In addition to safety policies and standards, new developments and enhancements to safety data sharing and information analysis capabilities are introduced and are expected to improve system-wide risk identification, integrated risk analysis and modeling, and risk management. During this time frame, improvements are introduced to the reliability and airworthiness of aircraft, the accuracy of aircraft operational information and system health management, and the enhanced aircraft systems supporting crash survivability. As safety risk management practices are institutionalized and feedback is incorporated, improvements are implemented that increase the effectiveness and efficiency of system safety assessments, design certainty, safety assurance of operational procedures, and advanced training for off-nominal situations.

In the far-term, established safety practices (e.g., safety policy, safety risk management, safety assurance, and safety promotion) are complemented with advancements in technologies that identify contributing factors and causes of incidents and accidents, tools that automate vulnerability detection, and improvements in fault management. Improvements to information sharing build on established processes and analysis capabilities by expanding their coverage and increasing data accessibility. This enables the automation of safety risk identification and notification processes, enhances safety mitigation evaluations, and increases the confidence of analytical results. The consistency and compatibility of safety practices and systems across the global aviation community will be achieved through increased partnership and participation in international aviation safety standards development. Furthermore, harmonized regulations, standards, and procedures—especially for the transport of dangerous goods across multiple

transportation modes—are introduced and are expected to establish equivalent levels of safety across air transportation system boundaries. Lastly, safety enhancements to ground-based systems that improve system health management and crash survivability are introduced, and pilot, controller, and aviation operations personnel situational awareness is improved as a result of risk-reducing system interfaces and supported by technological advancements in safety risk identification and mitigation.

Provide Flexible Airport Facility and Ramp Operations

Flexible airport facility and ramp operations provides the ability to reallocate or reconfigure the airport facility and ramp assets to maintain acceptable levels of service that will accommodate increasing passenger and cargo demand levels, or changes in operational requirements, through infrastructure development, predictive analyses, and improvements to technology (e.g., automation and decision support systems) and procedures.

Transformation Objective

The transformational objective of this NextGen capability is to accommodate the increases in demand enabled by Air Traffic Management (ATM) improvements with commensurate improvements to airside and terminal/landside operations as well as development of new airport infrastructure. Near-term improvements to the airport facility and ramp operations, such as increases to operational capacity of existing runways and the efficiency of surface operations, are achieved through advancements in ATM-related procedures and technologies described in the Efficient Trajectory Management capability. Airside and landside improvements are expected to begin in the midterm and extend to the far-term, with advances in net-centric-enabled information sharing that fosters improved situational awareness and responsive decision making.

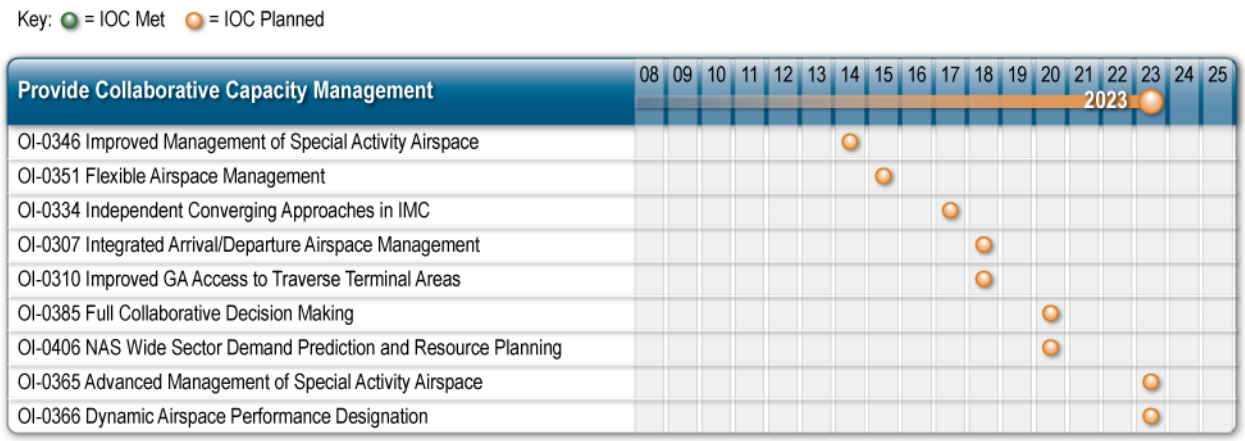
In the mid-term, advances in information sharing allow airport and aircraft operators to synthesize real-time data and proactively manage resources to improve efficiency, safety, and security in airside operations. Movement of ground support equipment (GSE) on the airport surface is monitored and proactively managed as part of a net-centric-enabled surface management system. This ensures GSE clearance from active runways and taxiways and safe separation from aircraft. GSE is also able to efficiently and safely navigate during low-visibility conditions. The tactical management of routine and emergency airport operations is improved by data sharing and resource management capabilities, including the sharing of real-time airport condition information with regional and national emergency response resources, users, ANSP, and security providers. Improvements to terminal/landside operations seek to reduce the time needed to get from the curb to the gate. Passenger flows inside terminal buildings are more efficient and predictable during peak periods with improvements to terminal layouts, signage, and security and baggage processing. At airports with limited room to expand their terminal facilities, off-airport passenger and baggage processing and security screening are done at remote facilities to mitigate crowding and delays in legacy, congested terminal buildings. In addition to improving the operational efficiency of airside and landside functions at airports, preservation will be advanced in the mid-term through coordinated efforts for sustainability, advocacy, and regional planning in order to maintain a robust network of regional airports and promote community access to the NAS.

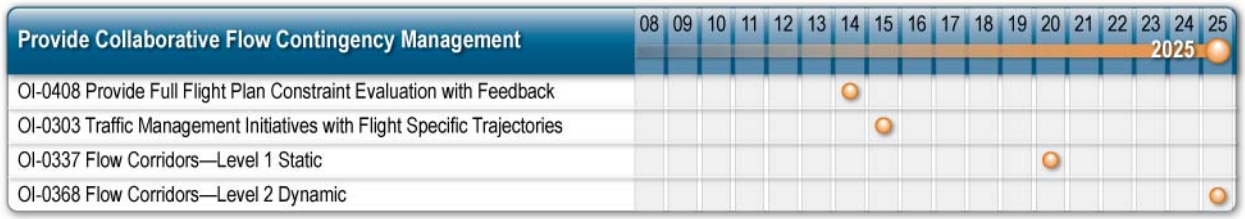
In the far-term, airside facilities are able to remain open and fully functional during most severe weather conditions with advancements in technology, systems, and procedures that help airport operators mitigate weather impacts and proactively schedule inspections, maintenance, and weather-response activities. Aircraft deicing/anti-icing and treatment of airport surfaces during winter weather events are also improved with use of decision support tools to align resources with demand and integrate predictive weather capabilities into decision making. In addition, icing holdover times are incorporated into aircraft Four Dimensional Trajectories (4DT) in order to facilitate departure queuing and to enhance safety. While NextGen ATM capabilities will improve existing runway capacity, new runways are still required at some

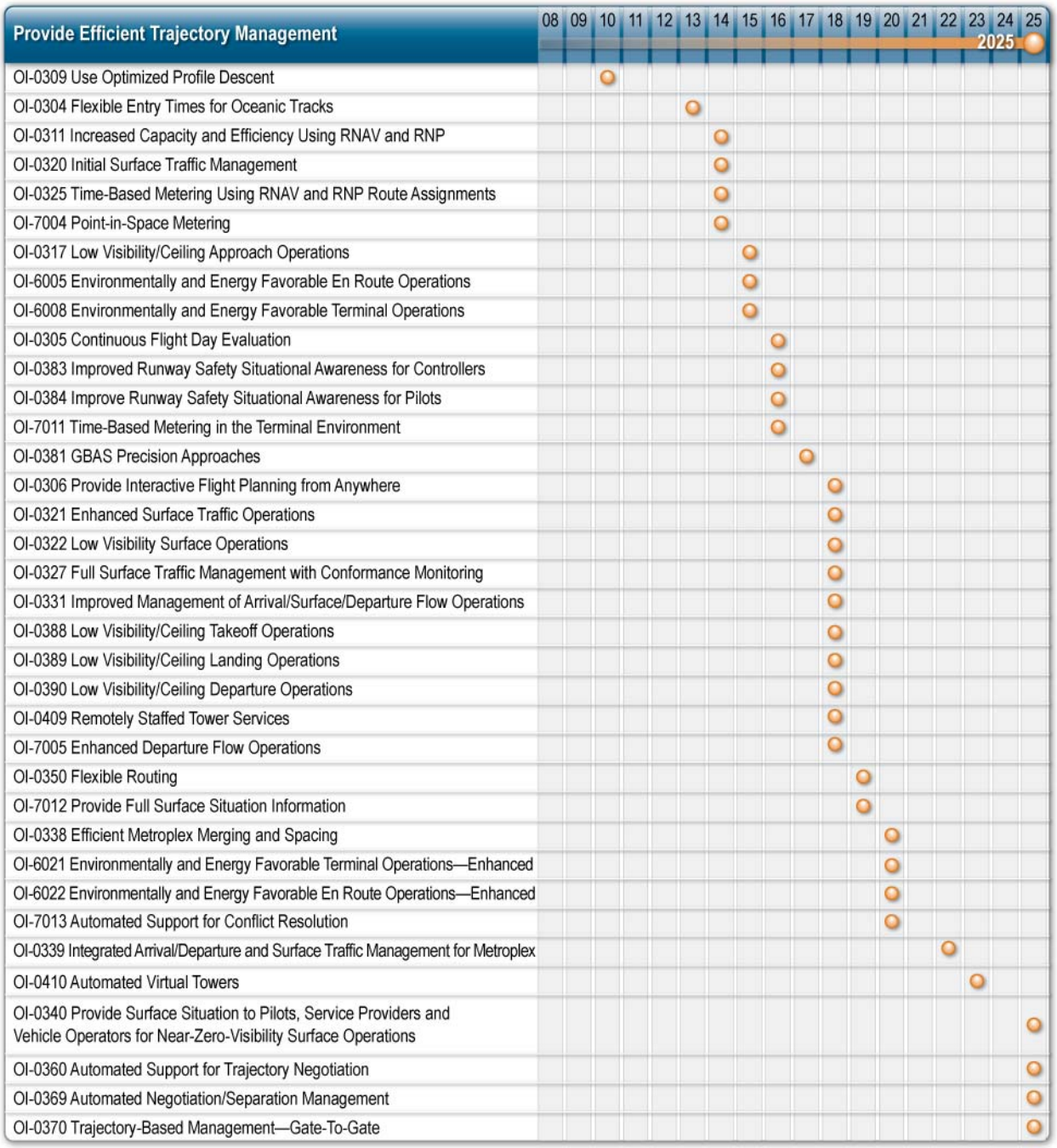
congested airports. As a result, comprehensive, regional planning efforts use NextGen-enabled design standards to guide the development of new closely spaced parallel runways as well as expanded taxiway and ramp areas. Because airport development efforts are long term, ongoing endeavors that will occur throughout the near-, mid-, and far-term time frames, the IWP seeks to assess the cumulative benefit of airport improvements at the NextGen end-state in 2025 rather than track improvements at specific airports.

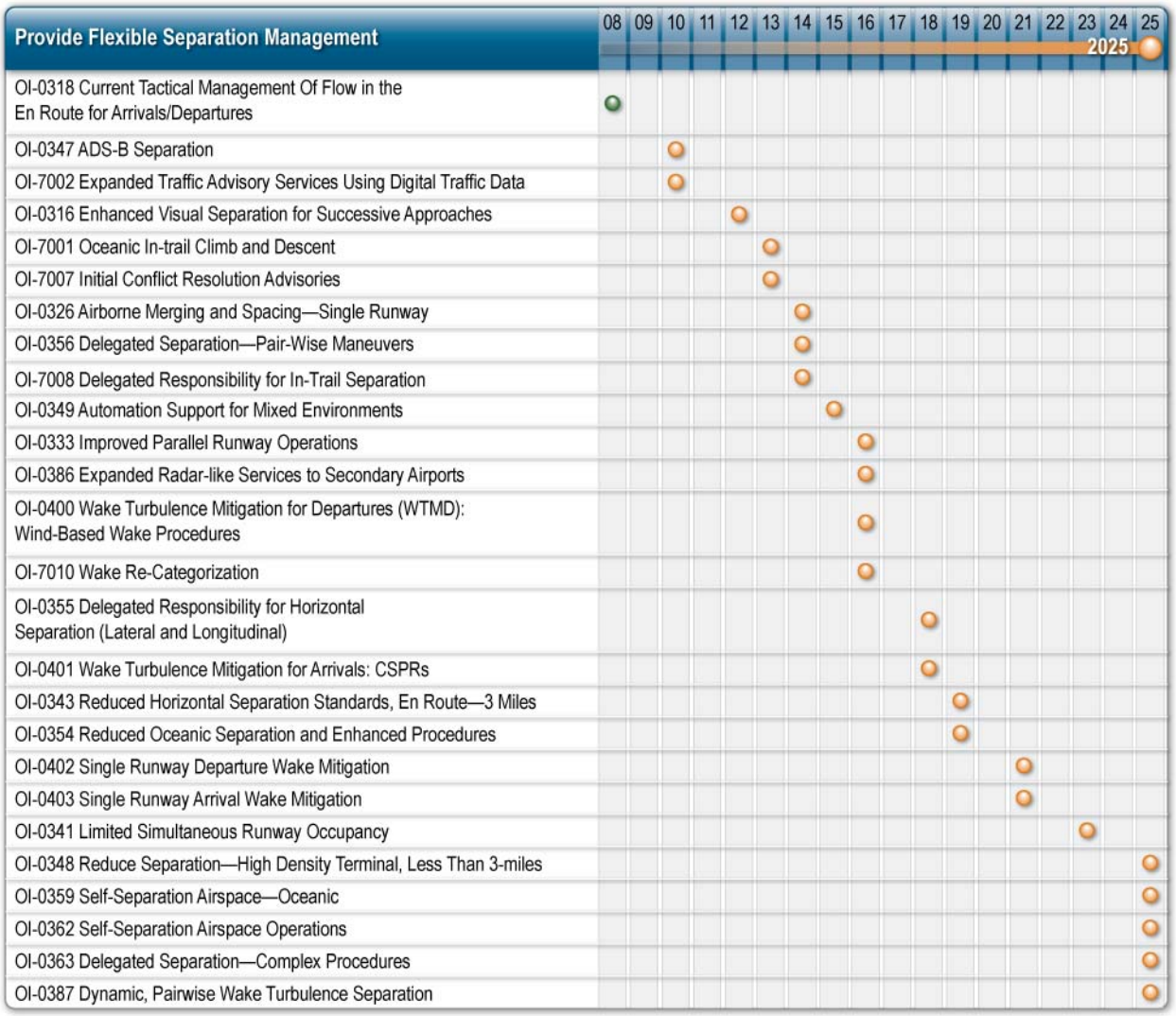
NEXTGEN CAPABILITY EVOLUTION ROADMAPS

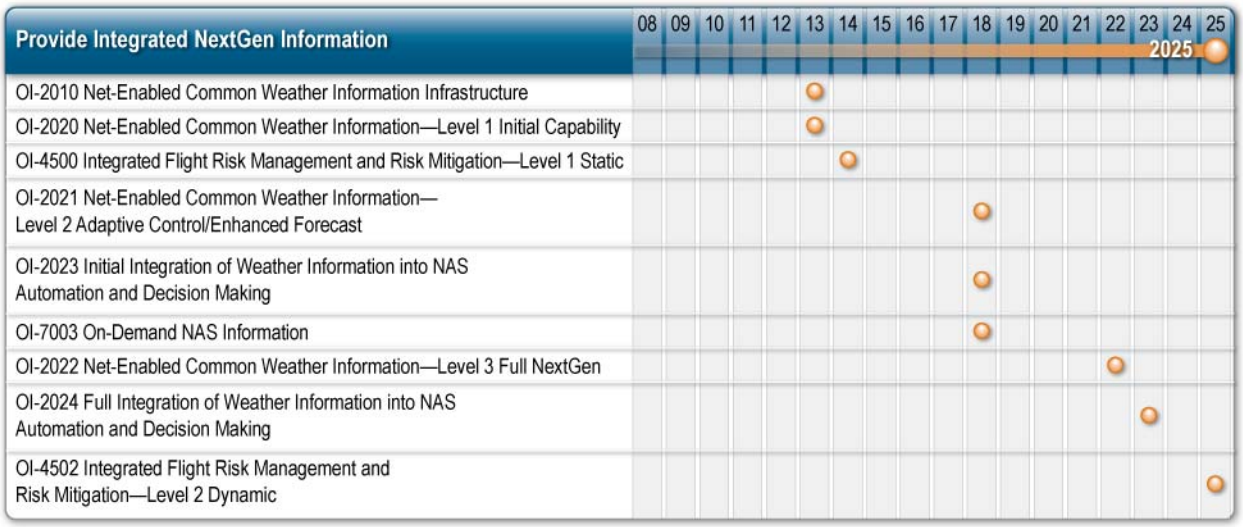
As previously stated, each of the NextGen capability's transformational summaries are derived from the supporting operational improvement and materiel and non-materiel solution descriptions found in the IWP version FY13. The following roadmaps complement the transformational summaries and highlight the specific operational improvements that support the evolution of each NextGen capability.

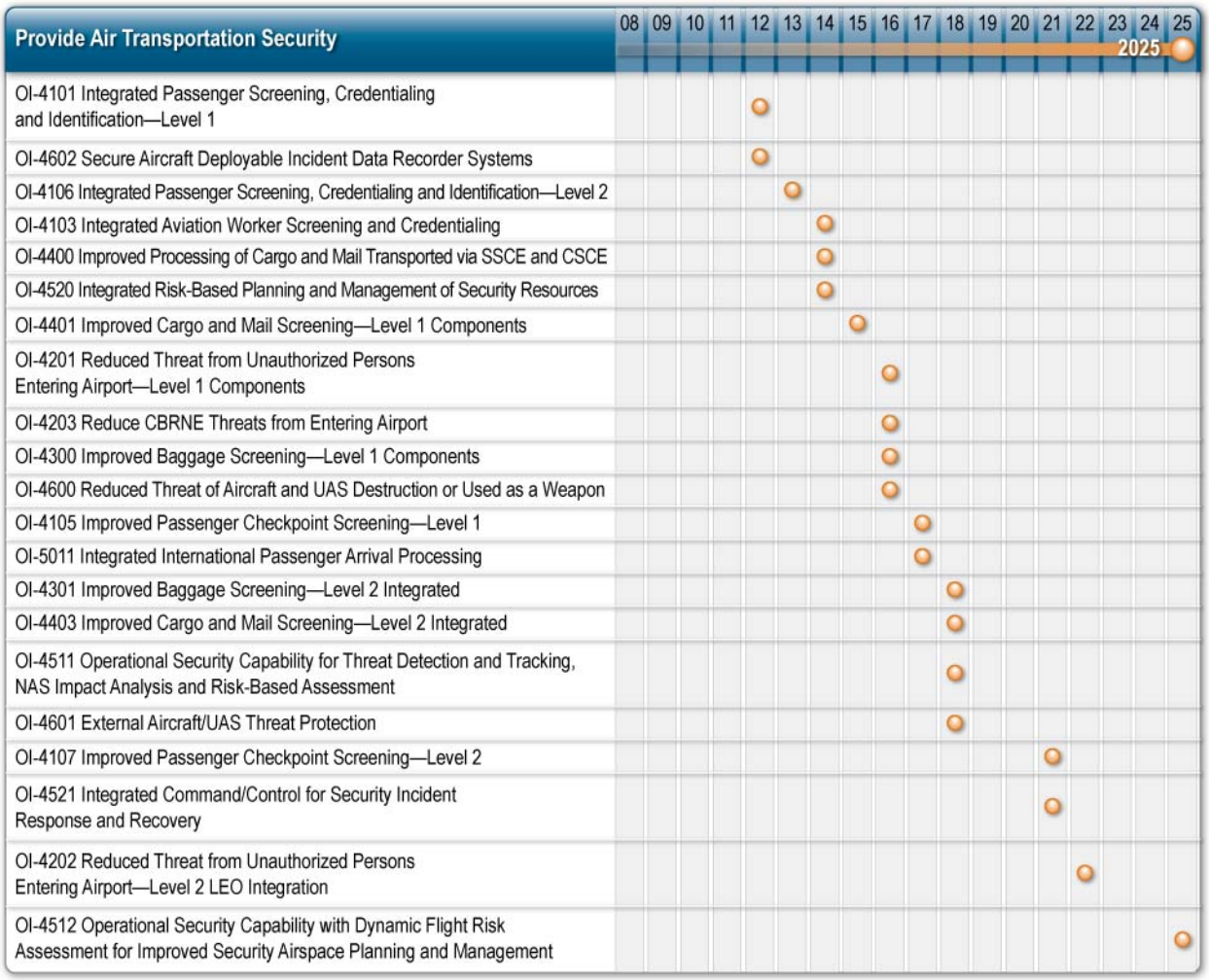




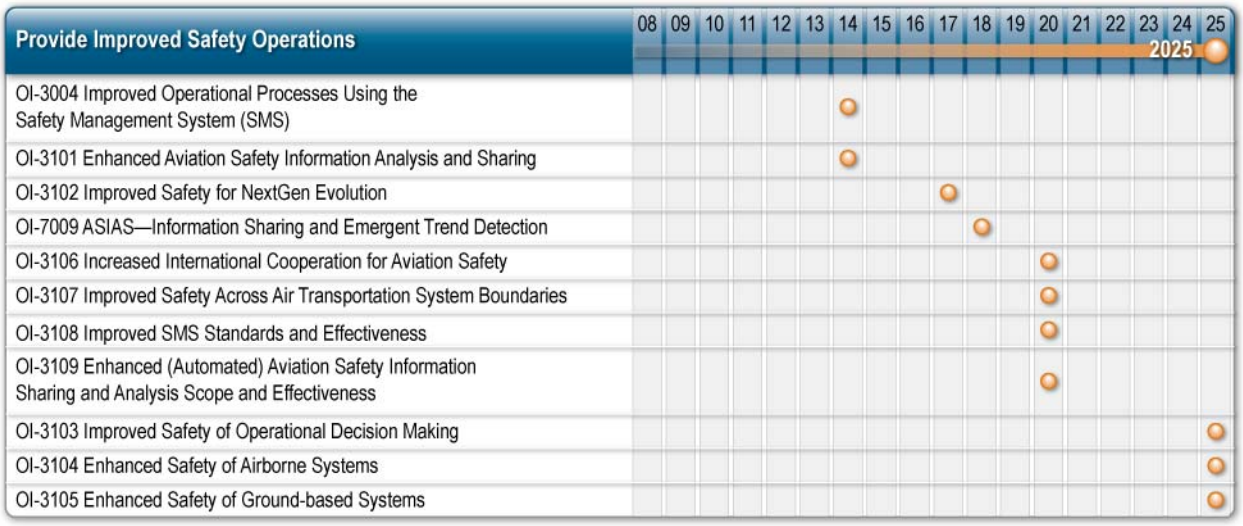

Provide Efficient Trajectory Management
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2025
OI-0309 Use Optimized Profile Descent
OI-0304 Flexible Entry Times for Oceanic Tracks
OI-0311 Increased Capacity and Efficiency Using RNAV and RNP
OI-0320 Initial Surface Traffic Management
OI-0325 Time-Based Metering Using RNAV and RNP Route Assignments
OI-7004 Point-in-Space Metering
OI-0317 Low Visibility/Ceiling Approach Operations
OI-6005 Environmentally and Energy Favorable En Route Operations
OI-6008 Environmentally and Energy Favorable Terminal Operations
OI-0305 Continuous Flight Day Evaluation
OI-0383 Improved Runway Safety Situational Awareness for Controllers
OI-0384 Improve Runway Safety Situational Awareness for Pilots
OI-7011 Time-Based Metering in the Terminal Environment
OI-0381 GBAS Precision Approaches
OI-0306 Provide Interactive Flight Planning from Anywhere
OI-0321 Enhanced Surface Traffic Operations
OI-0322 Low Visibility Surface Operations
OI-0327 Full Surface Traffic Management with Conformance Monitoring
OI-0331 Improved Management of Arrival/Surface/Departure Flow Operations
OI-0388 Low Visibility/Ceiling Takeoff Operations
OI-0389 Low Visibility/Ceiling Landing Operations
OI-0390 Low Visibility/Ceiling Departure Operations
OI-0409 Remotely Staffed Tower Services
OI-7005 Enhanced Departure Flow Operations
OI-0350 Flexible Routing
OI-7012 Provide Full Surface Situation Information
OI-0338 Efficient Metroplex Merging and Spacing
OI-6021 Environmentally and Energy Favorable Terminal Operations—Enhanced
OI-6022 Environmentally and Energy Favorable En Route Operations—Enhanced
OI-7013 Automated Support for Conflict Resolution
OI-0339 Integrated Arrival/Departure and Surface Traffic Management for Metroplex
OI-0410 Automated Virtual Towers
OI-0340 Provide Surface Situation to Pilots, Service Providers and Vehicle Operators for Near-Zero-Visibility Surface Operations
OI-0360 Automated Support for Trajectory Negotiation
OI-0369 Automated Negotiation/Separation Management
OI-0370 Trajectory-Based Management—Gate-To-Gate

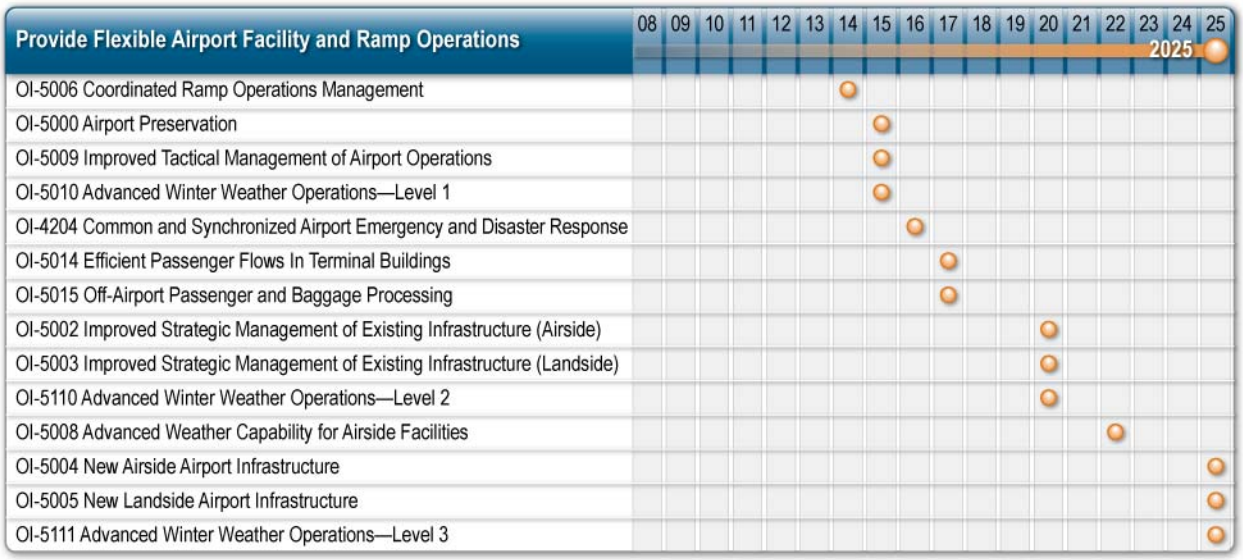

Provide Flexible Separation Management
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2025
OI-0318 Current Tactical Management Of Flow in the En Route for Arrivals/Departures
OI-0347 ADS-B Separation
OI-7002 Expanded Traffic Advisory Services Using Digital Traffic Data
OI-0316 Enhanced Visual Separation for Successive Approaches
OI-7001 Oceanic In-trail Climb and Descent
OI-7007 Initial Conflict Resolution Advisories
OI-0326 Airborne Merging and Spacing—Single Runway
OI-0356 Delegated Separation—Pair-Wise Maneuvers
OI-7008 Delegated Responsibility for In-Trail Separation
OI-0349 Automation Support for Mixed Environments
OI-0333 Improved Parallel Runway Operations
OI-0386 Expanded Radar-like Services to Secondary Airports
OI-0400 Wake Turbulence Mitigation for Departures (WTMD): Wind-Based Wake Procedures
OI-7010 Wake Re-Categorization
OI-0355 Delegated Responsibility for Horizontal Separation (Lateral and Longitudinal)
OI-0401 Wake Turbulence Mitigation for Arrivals: CSPRs
OI-0343 Reduced Horizontal Separation Standards, En Route—3 Miles
OI-0354 Reduced Oceanic Separation and Enhanced Procedures
OI-0402 Single Runway Departure Wake Mitigation
OI-0403 Single Runway Arrival Wake Mitigation
OI-0341 Limited Simultaneous Runway Occupancy
OI-0348 Reduce Separation—High Density Terminal, Less Than 3-miles
OI-0359 Self-Separation Airspace—Oceanic
OI-0362 Self-Separation Airspace Operations
OI-0363 Delegated Separation—Complex Procedures
OI-0387 Dynamic, Pairwise Wake Turbulence Separation


Provide Integrated NextGen Information
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2025
OI-2010 Net-Enabled Common Weather Information Infrastructure
OI-2020 Net-Enabled Common Weather Information—Level 1 Initial Capability
OI-4500 Integrated Flight Risk Management and Risk Mitigation—Level 1 Static
OI-2021 Net-Enabled Common Weather Information—Level 2 Adaptive Control/Enhanced Forecast
OI-2023 Initial Integration of Weather Information into NAS Automation and Decision Making
OI-7003 On-Demand NAS Information
OI-2022 Net-Enabled Common Weather Information—Level 3 Full NextGen
OI-2024 Full Integration of Weather Information into NAS Automation and Decision Making
OI-4502 Integrated Flight Risk Management and Risk Mitigation—Level 2 Dynamic


Provide Air Transportation Security
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2025
OI-4101 Integrated Passenger Screening, Credentialing and Identification—Level 1
OI-4602 Secure Aircraft Deployable Incident Data Recorder Systems
OI-4106 Integrated Passenger Screening, Credentialing and Identification—Level 2
OI-4103 Integrated Aviation Worker Screening and Credentialing
OI-4400 Improved Processing of Cargo and Mail Transported via SSCE and CSCE
OI-4520 Integrated Risk-Based Planning and Management of Security Resources
OI-4401 Improved Cargo and Mail Screening—Level 1 Components
OI-4201 Reduced Threat from Unauthorized Persons Entering Airport—Level 1 Components
OI-4203 Reduce CBRNE Threats from Entering Airport
OI-4300 Improved Baggage Screening—Level 1 Components
OI-4600 Reduced Threat of Aircraft and UAS Destruction or Used as a Weapon
OI-4105 Improved Passenger Checkpoint Screening—Level 1
OI-5011 Integrated International Passenger Arrival Processing
OI-4301 Improved Baggage Screening—Level 2 Integrated
OI-4403 Improved Cargo and Mail Screening—Level 2 Integrated
OI-4511 Operational Security Capability for Threat Detection and Tracking, NAS Impact Analysis and Risk-Based Assessment
OI-4601 External Aircraft/UAS Threat Protection
OI-4107 Improved Passenger Checkpoint Screening—Level 2
OI-4521 Integrated Command/Control for Security Incident Response and Recovery
OI-4202 Reduced Threat from Unauthorized Persons Entering Airport—Level 2 LEO Integration
OI-4512 Operational Security Capability with Dynamic Flight Risk Assessment for Improved Security Airspace Planning and Management

Provide Improved Environmental Performance
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2021
OI-6014 Implement EMS Framework
OI-6012 Implement NextGen Environmental Engine and Aircraft Technologies
OI-6017 Increased Use of Alternative Aviation Fuels
OI-6020 Implement EMS Framework—Enhanced
OI-6023 Implement NextGen Environmental Engine and Aircraft Technologies—Enhanced


Provide Improved Safety Operations
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2025
OI-3004 Improved Operational Processes Using the Safety Management System (SMS)
OI-3101 Enhanced Aviation Safety Information Analysis and Sharing
OI-3102 Improved Safety for NextGen Evolution
OI-7009 ASIAS—Information Sharing and Emergent Trend Detection
OI-3106 Increased International Cooperation for Aviation Safety
OI-3107 Improved Safety Across Air Transportation System Boundaries
OI-3108 Improved SMS Standards and Effectiveness
OI-3109 Enhanced (Automated) Aviation Safety Information Sharing and Analysis Scope and Effectiveness
OI-3103 Improved Safety of Operational Decision Making
OI-3104 Enhanced Safety of Airborne Systems
OI-3105 Enhanced Safety of Ground-based Systems


Provide Flexible Airport Facility and Ramp Operations
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2025
OI-5006 Coordinated Ramp Operations Management
OI-5000 Airport Preservation
OI-5009 Improved Tactical Management of Airport Operations
OI-5010 Advanced Winter Weather Operations—Level 1
OI-4204 Common and Synchronized Airport Emergency and Disaster Response
OI-5014 Efficient Passenger Flows In Terminal Buildings
OI-5015 Off-Airport Passenger and Baggage Processing
OI-5002 Improved Strategic Management of Existing Infrastructure (Airside)
OI-5003 Improved Strategic Management of Existing Infrastructure (Landside)
OI-5110 Advanced Winter Weather Operations—Level 2
OI-5008 Advanced Weather Capability for Airside Facilities
OI-5004 New Airside Airport Infrastructure
OI-5005 New Landside Airport Infrastructure
OI-5111 Advanced Winter Weather Operations—Level 3