Improved Multiple Runway Operations

Charlie - Delta Increments

Portfolio Overview

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

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

Portfolio Content Summary Statistics

		Increment Status				
Segment	Total by Segment	Planned	Concept Exploration & Maturation	Development	Initial Operational Availability	Completed
*Alpha (2010 - 2015)	8	0	0	0	0	8
*Bravo (2016 - 2020)	3	0	0	0	0	3
Charlie (2021 - 2025)	4	0	2	2	0	0
Delta (2026 - 2030)	2	1	1	0	0	0
TOTAL	17	1	3	2	0	11

Segment	% by Segment	% by Segment/Increment Status				
*Alpha (2010 - 2015)	47 %	0 %	0 %	0 %	0 %	100 %
*Bravo (2016 - 2020)	18 %	0 %	0 %	0 %	0 %	100 %
Charlie (2021 - 2025)	24 %	0 %	50 %	50 %	0 %	0 %
Delta (2026 - 2030)	12 %	50 %	50 %	0 %	0 %	0 %
TOTAL	100%	6 %	18 %	12 %	0 %	65 %

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

Improved Multiple Runway Operations

Operational Improvements/Current Operations & Increments

Benefits

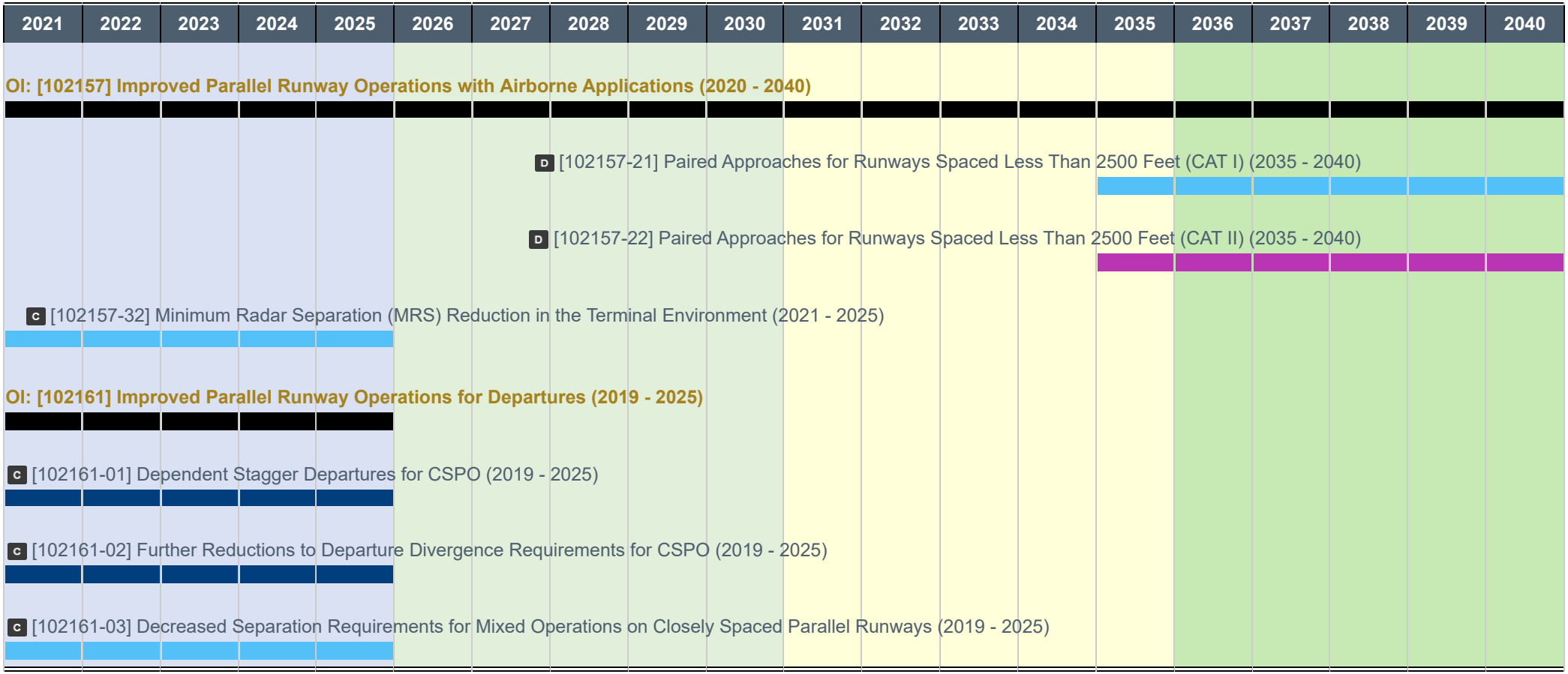
OI: [102157] Improved Parallel Runway Operations with Airborne Applications (2020 - 2040)

- C [102157-32] Minimum Radar Separation (MRS) Reduction in the Terminal Environment **(2021 - 2025)**
- D [102157-21] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT I) **(2035 - 2040)**
- D [102157-22] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT II) **(2035 - 2040)**

OI: [102161] Improved Parallel Runway Operations for Departures (2019 - 2025)

- C [102161-01] Dependent Stagger Departures for CSPO **(2019 - 2025)**
- C [102161-02] Further Reductions to Departure Divergence Requirements for CSPO **(2019 - 2025)**
- C [102161-03] Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways **(2019 - 2025)**

Improved Multiple Runway Operations



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

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

Improved Multiple Runway Operations

OI: [102157] Improved Parallel Runway Operations with Airborne Applications (2020 - 2040)

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.

This OI will take advantage of aircraft capabilities to enable aircraft to fly dependent approaches to parallel runways spaced less than 2500 feet apart with a CAT I and eventually CAT II decision height. It will also expand procedures to conduct Flight Interval Management (FIM) operations to dependent parallel runways spaced greater than 700 ft in less than visual conditions.

These capabilities will be achieved by integrating ground automation that identifies opportunities to the controller who can provide a clearance to the flight crew for specific lateral and longitudinal separation distance from other aircraft and aircraft technologies such as ADS-B In and Out, auto-pilot coupling to approach guidance, cockpit display of traffic information (CDTI), precision navigation, and on board equipment that ensures the required distance from other aircraft is being met.

Aircraft collision avoidance systems will be further enhanced for dependent operations by providing algorithms that calculate the lateral deviation protection area followed by the appropriate procedural maneuver to ensure that the protection area is not compromised.

OI Benefit

Capacity (P): Enabled by improved flight deck capabilities, reduced separation for dependent approaches lead to increased arrival capacity for parallel runway operations in IMC.

Safety (S): Improved lateral deviation protection algorithms increase aircraft safety.

Improved Multiple Runway Operations

Increments

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

C [102157-32] Minimum Radar Separation (MRS) Reduction in the Terminal Environment (2021 - 2025) (Concept Exploration & Maturation)

D [102157-21] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT I) (2035 - 2040) (Concept Exploration & Maturation)

D [102157-22] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT II) (2035 - 2040) (Planned)

Improved Multiple Runway Operations

Increments/Enabling Activities

C [102157-32] Minimum Radar Separation (MRS) Reduction in the Terminal Environment (2021 - 2025)

Increment Overview

Runway capacity in IFR conditions will be increased closer to that achieved in VFR conditions through revised procedures and separation standards for minimum radar separation requirements based on specific airport operational conditions, such as the fleet mix and runway occupancy time. Capacity Improvements may be gained at applicable airports from decreasing the current separation standards and/or extending the distance from the runway threshold where these standards apply.

Increment Status

Concept Exploration & Maturation

Success Criteria

2023 : Document Change Proposal (DCP) Published

2024 : IOC at one site

Implementation Approach

This capability will be implemented through changes to FAA Order 7110.65. The CSPO program will complete a reduced MRS feasibility and safety study in 2022 and develop controller/pilot training materials to support the use of new standards for MRS at applicable airports.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Capacity (P): Terminal airspace capacity is increased by reduced separation requirements when wake turbulence spacing is not required, increasing capacity during Instrument Meteorological Conditions (IMC).

System Interactions

This capability is managed via the implementation of procedures.

STARS (T): MRS separation standards will be updated in ATPA for STARS to maintain applicable separation on approach.

Improved Multiple Runway Operations

Tertiary Systems

- STARS: Standard Terminal Automation Replacement System

Improved Multiple Runway Operations

Increments/Enabling Activities

D [102157-21] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT I) (2035 - 2040)

Increment Overview

The Paired Approach concept will increase runway capacity in IMC by enabling properly equipped aircraft to fly dependent approaches to parallel runways spaced 700 to 2500 feet apart. One aircraft flies a straight in precision approach with a CAT I decision height. The second aircraft flies a 3 degree offset RNP approach to a decision height of approximately 350 feet. The aircraft electronically communicate relative speed and position information. This information will be used in concert with flight deck avionics and automation to fly instrument approaches in a prescribed lateral and longitudinal geometry, relative to each aircraft, in order to avoid the risks of collision and wake vortex encounter. The concept requires ADS-B In for the trail aircraft and ADS-B Out for the lead aircraft, autopilot coupling to approach guidance, cockpit display of traffic information (CDTI), and flight deck capabilities, in concert with pilot and controller procedures, to enable the required interval on approach.

Increment Status

Concept Exploration & Maturation

Success Criteria

To Be Defined

Implementation Approach

FAA has defined an operational concept as part of the avionics development in RTCA. The avionics functionality will be available in earlier Interval Management Phases. Deployment at selected airports in the NAS will require site-specific separation standards analyses, safety analyses, new automation functions in STARS for controller monitoring, and changes to 7110.65. This capability is a candidate for Interval Management Phase 3.

Benefits

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

Capacity (P): Increase runway capacity in IMC by enabling closer spacing of pairs of landing aircraft.

System Interactions

Improved Multiple Runway Operations

STARS (P): STARS provides controller automation and displays. STARS will continue to provide aircraft tracks as it currently does. Future STARS enhancements may need to address operational integration issues that may come about due to implementation of paired approaches to runways closer than 2500 feet.

TBFM (S): TBFM is designed to improve the flow of aircraft within congested airspace. This capability requires TBFM to have the ability to schedule to dependent parallel runways to perform the paired approach operation.

ILS (T): ILS CAT I provides aircraft guidance during approach procedure.

SBAS (WAAS) (T): WAAS provides aircraft guidance during approach procedure.

GPS/GNSS (T): GPS/GNSS provides aircraft guidance during an approach procedure.

ILS CAT I Avionics (A), SBAS (WAAS) Avionics (A), GNSS/GPS Avionics (A)

FMS (A): FMS must meet RNAV or RNP requirements.

ADS-B In Avionics (A): ADS-B In and ADS-B Out provides required capabilities for advanced flight deck interval management. ADS-B In is required for trail aircraft and ADS-B Out is required for lead aircraft in concert with pilot and controller procedures, to enable the required interval on approach. ADS-B In avionics will require at least software modifications to support the IM functionality.

Primary Systems

- STARS: Standard Terminal Automation Replacement System

Secondary Systems

- TBFM: Time Based Flow Management

Tertiary Systems

- GPS: Global Positioning System
- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)
- ILS: Instrument Landing System

Improved Multiple Runway Operations

Avionics Systems

- GNSS/GPS Avionics: Global Navigation Satellite System/Global Positioning System Avionics
- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics
- ADS-B In Avionics: Automatic Dependent Surveillance - Broadcast In Avionics
- ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics
- FMS: Flight Management System

Improved Multiple Runway Operations

Increments/Enabling Activities

D [102157-22] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT II) (2035 - 2040)

Increment Overview

Paired Approaches for Runways Spaced Less Than 2500 Feet Category II (CAT II) is intended to further extend the CAT I capability to weather minima lower than CAT I to increase arrival capacity. It enables dependent parallel approach procedures for runways spaced less than 2500 feet centerline-to-centerline down to at least CAT II minima in Instrument Meteorological Conditions (IMC). Additionally, this application may enable Paired Approach implementations at sites which may not be able to accommodate the 3 degree offset approach required by the CAT I PA procedure. Ground automation with wind forecasting capabilities will identify initiation opportunities to the controller who can then provide a clearance to the flight crew to ensure a minimum safe distance behind an aircraft intending to land on the closely spaced parallel runway. Flight crews will use on-board equipment to ensure the distance is being maintained such that the application can be performed at the target level of safety. In addition to the wind forecasting capability, the CAT II PA procedure will require on-board GNSS-based navigation, lateral deviation detection and resolution algorithms, and may require ADS-B surveillance performance exceeding the current ADS-B rule.

Increment Status

Planned

Success Criteria

To Be Defined

Implementation Approach

This capability is a candidate for Interval Management Phase 3.

Benefits

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

Capacity (P): Increase runway throughput in IMC by enabling closer spacing of pairs of landing aircraft.

System Interactions

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

Improved Multiple Runway Operations

STARS (P): STARS provides controller automation and displays. STARS will continue to provide aircraft tracks as it currently does. Future STARS enhancements may need to address operational integration issues that may come about due to implementation of paired approaches to runways closer to 2500 feet.

TBFM (S): TBFM is designed to improve the flow of aircraft within congested airspace. This capability requires TBFM to have the ability to schedule to dependent parallel runways to perform the paired approach operation.

ILS (T): ILS CAT II provides aircraft guidance during approach procedure.

SBAS (WAAS) (T): WAAS provides aircraft guidance during approach procedure.

GPS/GNSS (T): GPS/GNSS provides aircraft guidance during an approach procedure.

ILS CAT II Avionics (A), SBAS (WAAS) Avionics (A), GNSS/GPS Avionics (A), FMS (A): FMS must meet RNAV or RNP requirements.

ADS-B In Avionics (A): ADS-B In and ADS-B Out provides required capabilities for advanced flight deck interval management. ADS-B In is required for trail aircraft and ADS-B Out is required for lead aircraft in concert with pilot and controller procedures, to enable the required interval on approach. ADS-B In avionics will require at least software modifications to support the IM functionality.

Primary Systems

- STARS: Standard Terminal Automation Replacement System

Secondary Systems

- TBFM: Time Based Flow Management

Tertiary Systems

- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)
- GPS: Global Positioning System
- GBAS: Ground Based Augmentation System
- ILS: Instrument Landing System

Improved Multiple Runway Operations

Avionics Systems

- ADS-B In Avionics: Automatic Dependent Surveillance - Broadcast In Avionics
- FMS: Flight Management System
- GNSS/GPS Avionics: Global Navigation Satellite System/Global Positioning System Avionics
- GBAS CAT II/III Avionics: Ground Based Augmentation System Category II/III Avionics
- ILS CAT II/III Avionics: Instrument Landing System Category II/III Approach Avionics
- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics

Improved Multiple Runway Operations

OI: [102161] Improved Parallel Runway Operations for Departures (2019 - 2025)

The improvement will recover lost capacity through reduced separation standards and increased applications of dependent and independent operations for Closely Spaced Parallel Runway departure operations.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. Improvements will be focused on finding ways to recover lost departure capacity using proven methods that increase CSPO arrival capacity.

This improvement will result in additional reductions in spacing between departures.Additionally, improvements will be focused on finding ways to update standards and terminal instrument procedures in order to recover lost capacity due to IMC events by taking advantage of improved course deviation modeling, systems with advanced navigation accuracy and advanced surveillance capabilities.

OI Benefit

Capacity (P): Increased runway capacity in IMC through reduced separation standards and increased applications of dependent and independent operations for Closely Spaced Parallel Runway departure operations.

Efficiency (S): Decreased operational costs due to improved runway operations.

Environment (S): More efficient operations will reduce fuel burn and engine emissions.

Access and Equity (S): Improving access of available runways.

Increments

Charlie

(2021 - 2025)

3

C **[102161-01] Dependent Stagger Departures for CSPO (2019 - 2025)** (Development)

C **[102161-02] Further Reductions to Departure Divergence Requirements for CSPO (2019 - 2025)** (Development)

C **[102161-03] Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways (2019 - 2025)** (Concept Exploration & Maturation)

Improved Multiple Runway Operations

Increments/Enabling Activities

C [102161-01] Dependent Stagger Departures for CSPO (2019 - 2025)

Increment Overview

This increment will increase departure capacity by reducing the separation stagger between dependent departures from closely spaced parallel runways (less than 2,500 feet). This improvement will develop revised policy, standards, and procedures to allow dependent stagger departures from closely spaced parallel runways. The current standard defines runways spaced closer than 2,500 feet as a single runway, mitigating the benefit that runway layouts could provide in increasing runway capacity. Procedures will define a release distance required to ensure a minimum spacing of 2,500 feet with an immediate or initial parallel divergence course. Operationally this will increase predictability and throughput from closely spaced parallel runways by developing procedures that take into consideration runway layout geometry such as staggered thresholds and runway centerline distance.

Increment Status

Development

Success Criteria

2022 : Document Change Proposal (DCP) Published

2023 : IOC at one site

Implementation Approach

This capability will be implemented through changes to FAA Order 7110.65. The CSPO program completed a feasibility and initial safety analysis in 2019 for departures and will develop controller/pilot training materials to support the use of new standards for CSPO Departures at applicable airports.

Benefits

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

Capacity (P): Reduced separation standards for departures on closely spaced parallel runways increases airport capacity.

Efficiency (S): Increase efficiency of departure queuing.

System Interactions

Improved Multiple Runway Operations

Capability is managed via the implementation of procedures. Aircraft participating in dependent stagger departures would need to be RNAV equipped.

FMS (A): FMS must meet RNAV requirements.

Avionics Systems

- FMS: Flight Management System

Improved Multiple Runway Operations

Increments/Enabling Activities

C [102161-02] Further Reductions to Departure Divergence Requirements for CSPO (2019 - 2025)

Increment Overview

This increment will look for opportunities to further reduce the angle at which departures from closely spaced parallel runways must diverge in order to maintain safe separation, which will increase departure efficiency, increase throughput and reduce departure delays.National standards for reduced divergence for simultaneous CSPO departures will be based on the results of research that assess current improvements and waivers as well as an analysis of course deviations in nominal and non-nominal departure operations.

Increment Status

Development

Success Criteria

2022 : Document Change Proposal (DCP) Published

2023 : IOC at one site

Implementation Approach

This capability will be implemented through changes to FAA Order 7110.65. The CSPO program completed a feasibility and initial safety analysis in 2019 for departures and will develop controller/pilot training materials to support the use of new standards for CSPO Departures at applicable airports.

Benefits

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

Capacity (P): Reduced separation standards for departures on closely spaced parallel runways increases airport capacity.

Efficiency (S): Increase efficiency of departure queuing.

System Interactions

Capability is managed via the implementation of procedures. Aircraft participating would need to be RNAV equipped.

FMS (A): FMS must meet RNAV requirements.

Improved Multiple Runway Operations

Avionics Systems

- FMS: Flight Management System

Improved Multiple Runway Operations

Increments/Enabling Activities

C [102161-03] Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways (2019 - 2025)

Increment Overview

This increment will look for opportunities to reduce the distance between a departing flight at take-off and an arrival headed towards a closely spaced parallel runway, which will increase airport capacity. National standards for reduced initial lateral separation between arrivals and departures using closely spaced parallel runways will be based on the results of research that assess the current rule for parallel runways with centerline spacing < 2500 ft that allows departing aircraft to begin takeoff roll when the arriving aircraft is at least 2 NM out, provided that by 1 minute into the departing aircraft's flight, separation increases to 3 NM. An analysis of lateral and vertical behavior about extended runway centerlines for airport- and runway-specific behavior for aircraft when executing a missed approach or divergent departure next to an active parallel will assist with determining improvements that can be safely implemented.

Increment Status

Concept Exploration & Maturation

Success Criteria

2023 : Document Change Proposal (DCP) Published

2025 : IOC at one site

Implementation Approach

This capability will be implemented through changes to FAA Order 7110.65. The CSPO program will complete a feasibility and safety analysis in 2021 and develop controller/pilot training materials to support the use of new standards for CSPO Integrated Arrivals/Departures at applicable airports.

Benefits

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

Capacity (P): Reduced separation standards for mixed operations on closely spaced parallel runways increases airport capacity

Efficiency (S): Increase efficiency of departure queuing

System Interactions

Improved Multiple Runway Operations

Capability is managed via the implementation of procedures.

FMS (A): FMS must meet RNAV requirements.

Avionics Systems

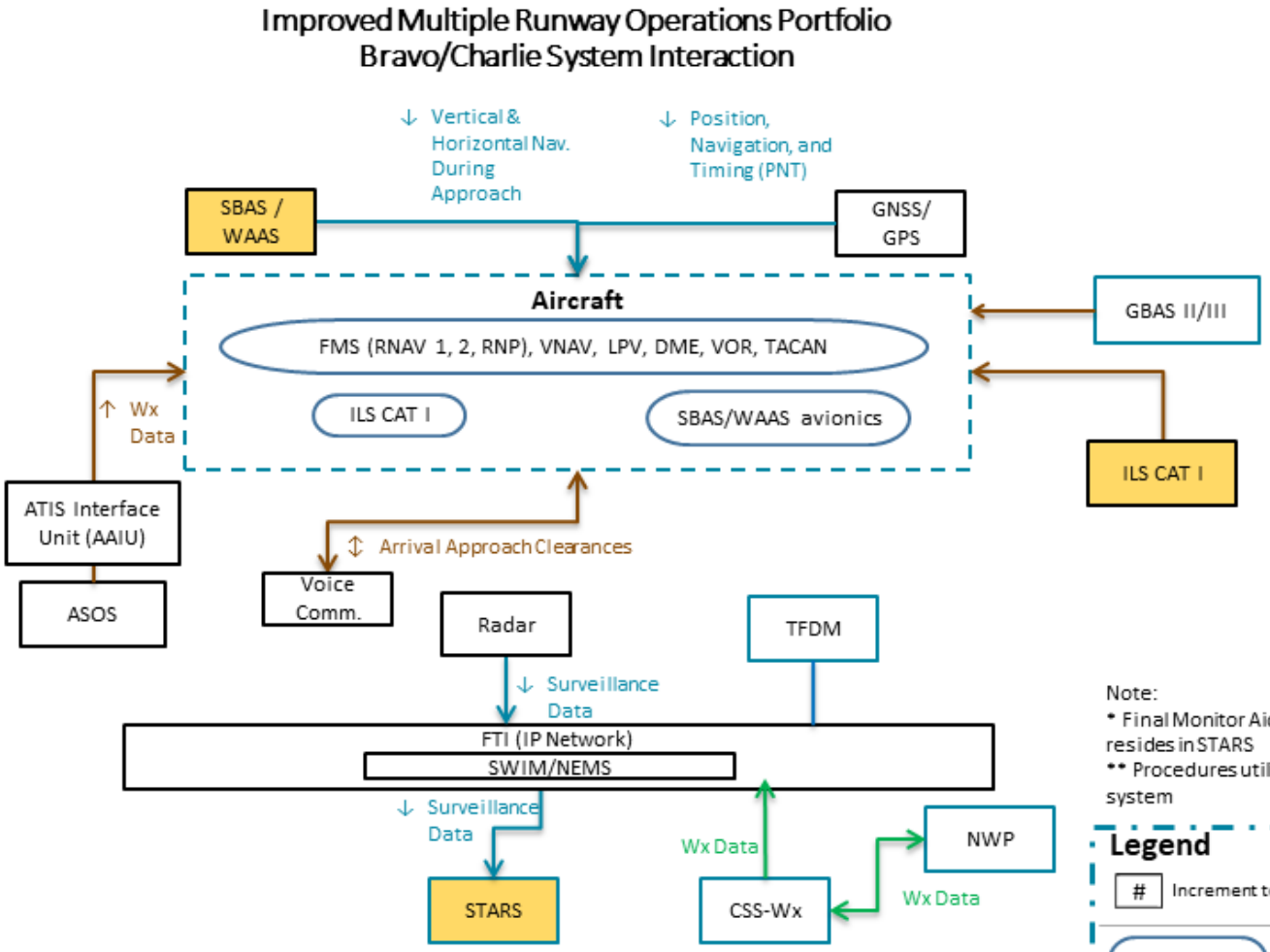
- FMS: Flight Management System

Improved Multiple Runway Operations

Systems Interactions

The improvements in this portfolio, as depicted in this figure, will come about through the application of technology and procedural changes to permit safe operation of new approach and departure procedures on parallel, converging, and intersecting runways in situations and conditions not previously approved.

Improved Multiple Runway Operations



Improved Multiple Runway Operations Portfolio Bravo Increments:

1. 102141-22 Amend Standards for Simultaneous Independent Approaches – Dual with Offset* **
2. 102141-24 Amend Standards for Simultaneous Independent Approaches – Triple**
3. 102141-28 Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 Feet**

Improved Multiple Runway Operations Portfolio Charlie Increments:

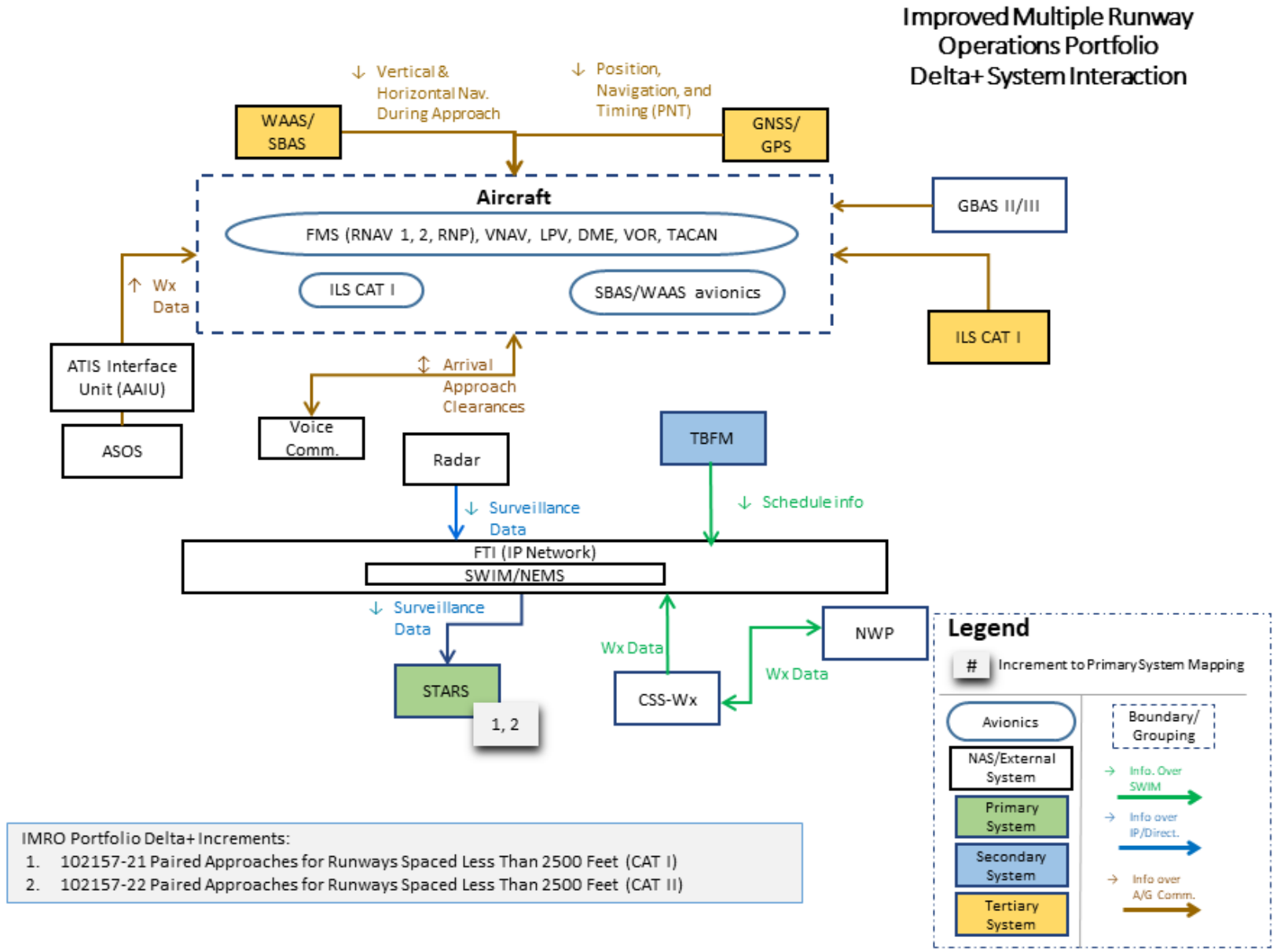
4. 102157-32 Minimum Radar Separation (MRS) Reduction in the Terminal Environment **
5. 102161-01 Dependent Stagger Departures for CSPO **
6. 102161-02 Further Reductions to Departure Divergence Requirements for CSPO **
7. 102161-03 Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways **

Improved Multiple Runway Operations

Systems Interactions

The improvements in this portfolio, as depicted in this figure, will come about through the application of technology and procedural changes to permit safe operation of new approach and departure procedures on parallel, converging, and intersecting runways in situations and conditions not previously approved.

Improved Multiple Runway Operations



IMRO Portfolio Delta+ Increments:

1. 102157-21 Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT I)
2. 102157-22 Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT II)

Improved Multiple Runway Operations

Increment	FMS	STARS
C [102157-32] Minimum Radar Separation (MRS) Reduction in the Terminal Environment		T
C [102161-01] Dependent Stagger Departures for CSPO	A	
C [102161-02] Further Reductions to Departure Divergence Requirements for CSPO	A	
C [102161-03] Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways	A	

Operationally Available | Complete | In Service System | Planned System

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

D Delta

Improved Multiple Runway Operations

Increment	ADS-B In Avionics	FMS	GBAS	GBAS CAT II/III Avionics	GNSS/GPS Avionics	GPS	ILS	ILS CAT I Avionics	ILS CAT II/III Avionics	SBAS (WAAS)	SBAS (WAAS) Avionics	STARS	TBFM
D [102157-21] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT I)	A	A			A	T	T	A		T	A	P	S
D [102157-22] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT II)	A	A	T	A	A	T	T		A	T	A	P	S

Operationally Available Complete In Service System Planned System

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

D Delta

Improved Multiple Runway Operations

Stakeholders

Specific roles and responsibilities for the implementation of all capabilities in this portfolio are outlined in the RASCI (Responsible, Accountable, Supporting, Consulted, Informed) matrix below. All stakeholder organizations involved in the delivery of capabilities are listed across the top. Portfolio capabilities are listed on the left side of the table, organized by OI/OS and increment. For the Additional Order 7110.308 Airports increment, AJT-2 is accountable and ANG-C and AFS-400 are responsible. AJM-1 and AOV provide ongoing support in the areas of requirements, standards, approvals, and safety analysis. For the increment WTMA-P for Heavy/B757 Aircraft, AJT-2 is accountable for implementation and ANG-C is responsible for concept development and approval. AFS-400 also has a responsible role. AJM-1, AOV, and AEE provide support in the areas of standards, procedure design approval, and safety analysis. For the increments Amend Independent Runway Standards and Amend Dependent Runway Standards in Order 7110.65, AJT-2 is accountable and responsible, AFS-400 has a responsible role, and AOV provides support. For the increments Implement SATNAV or ILS for Parallel Runway Operations and Enable Additional Approach Options for New Independent Runway Separation Standards, AJT-2 is accountable and AJM-32, and AFS-400 are responsible. For the increment WTMD, AJT-2C is accountable and responsible, with support from ANG-C, to coordinate installation and data collection for three prototype systems at IAH, SFO, and MEM. After an implementation decision is made, AJM-2 will assume accountability and responsibility, with support from AJT-2, and AJM-1 for implementation of operational systems at selected sites. AOV and AFS-400 provide ongoing support in the areas of requirements, standards, approvals, and safety analysis. For the increment Use CRDA, AJT-28 is both accountable and responsible and AOV is consulted. The appropriate lead offices will coordinate with external stakeholders.

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

Improved Multiple Runway Operations

RASCI Matrix	AJV	AOV	AJT		ANG					AFS		AJI			AJM						AAE	AIR
	0	001	2	0	C5	C7	C	C2	B	400	001	1	2	3	24	32	3	22	25	0	001	001
• C [102157-32] Minimum Radar Separation (MRS) Reduction in the Terminal Environment (2021 - 2025)	R	S	A/R		S	C				R												
• C [102161-01] Dependent Stagger Departures for CSPO (2019 - 2025)	R	S	A/R		S	C				R												
• C [102161-02] Further Reductions to Departure Divergence Requirements for CSPO (2019 - 2025)	R	S	A/R		S	C				R												
• C [102161-03] Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways (2019 - 2025)	R	S	A/R		S	C				R												
• D [102157-21] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT I) (2035 - 2040)	S	S	S	S	S	C					S	S	S	S			S	R	S	A/R		S
• D [102157-22] Paired Approaches for Runways Spaced Less Than 2500 Feet (CAT II) (2035 - 2040)						A			R													

Improved Multiple Runway Operations

Appendix A

Alpha Increments

Portfolio Overview

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

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

Portfolio Content Summary Statistics

		Increment Status				
Segment	**Total by Segment**	**Planned**	**Concept Exploration & Maturation**	**Development**	**Initial Operational Availability**	**Completed**
*Alpha (2010 - 2015)	8	0	0	0	0	8
TOTAL	8	0	0	0	0	8
Segment	**% by Segment**	**% by Segment/Increment Status**				
*Alpha (2010 - 2015)	100%	0 %	0 %	0 %	0 %	100 %
TOTAL	100%	0 %	0 %	0 %	0 %	100 %

Improved Multiple Runway Operations

Operational Improvements/Current Operations & Increments

Benefits

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

- A [102141-11] Additional 7110.308 Airports **(2014 - 2015)**
- A [102141-12] Implement SATNAV or ILS for Parallel Runway Operations **(2011 - 2012)**
- A [102141-13] Amend Independent Runway Separation Standards in Order 7110.65 (including Blunder Model Analysis) **(2013 - 2013)**
- A [102141-14] Amend Dependent Runway Separation Standards in Order 7110.65 **(2015 - 2017)**
- A [102141-15] Enable Additional Approach Options for New Independent Runway Separation Standards **(2014 - 2014)**

CO: [102144] Wake Turbulence Mitigation for Arrivals: CSPRs (2015 - 2017)

- A [102144-11] Wake Turbulence Mitigation for Arrivals - Procedures for Heavy/B757 Aircraft **(2015 - 2015)**

OI: [102140] Wake Turbulence Mitigation for Departures (WTMD) (2013 - 2015)

- A [102140-01] Wake Turbulence Mitigation for Departures **(2013 - 2015)**

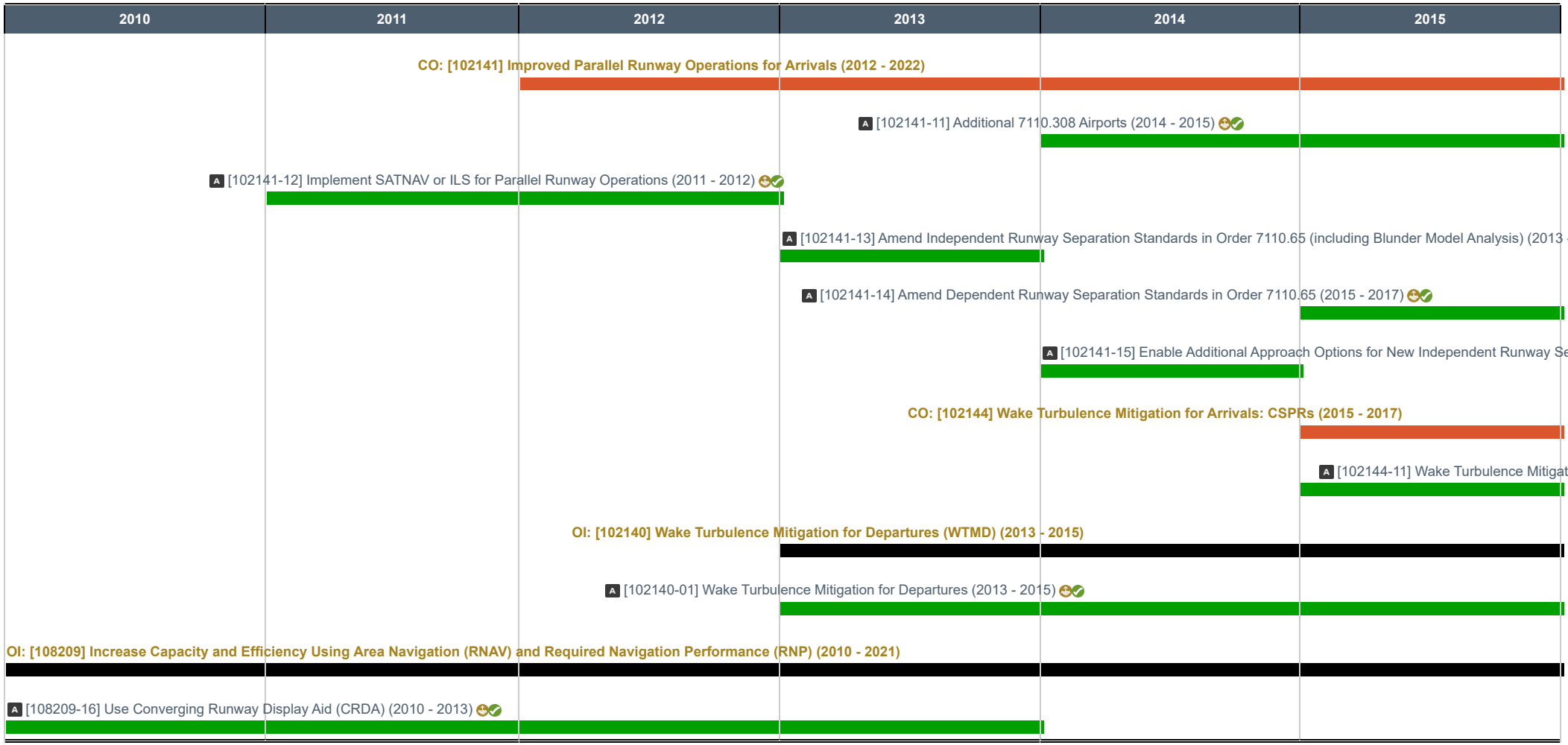
OI: [108209] Increase Capacity and Efficiency Using Area Navigation (RNAV) and Required Navigation Performance (RNP) (2010 - 2021)

- A [108209-16] Use Converging Runway Display Aid (CRDA) **(2010 - 2013)**

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

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

Improved Multiple Runway Operations



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

OI | CO | COE/CBTE | A Alpha | External Commitment

Improved Multiple Runway Operations

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

The improvement will recover lost capacity through reduced separation standards and increased applications of dependent and independent operations.

This improvement will develop improved procedures that enable operations for parallel runways in reduced visibility weather conditions. 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.

Improvements will be focused on finding ways to recover lost capacity due to IMC events by providing a monitoring capability that mimics or replaces visual separation. This improvement allows additional reduction of lateral spacing for arrivals. Additionally, improvements will be focused on finding ways to recover lost capacity due to IMC events by updating standards and terminal instrument procedures by taking advantage of improved course deviation modeling, systems with advanced navigation accuracy and advanced surveillance capabilities such as multilateration Precision Runway Monitor-Alternate (PRM-A) and the future implementation of STARS Fusion with Automatic Dependent Surveillance Broadcast (ADS-B) Out. Aircraft collision avoidance systems will be improved to use the more precise data provided by new surveillance sources using an optimized threat resolution logic leading to a decrease in nuisance alerts for these procedures. Aircraft participating in a closely spaced paired operation will be known to the collision avoidance system and generate a traffic advisory only for the paired aircraft and will generate resolution advisories for all other aircraft in the vicinity.

CO Benefit

Efficiency (S): Decreased operational costs due to improved runway operations.

Capacity (P): Increased runway capacity in IMC by enabling closer spacing of pairs of landing aircraft.

Environment (S): More efficient operations will reduce fuel burn and engine emissions.

Access and Equity (S): Improving access of available runways.

Improved Multiple Runway Operations

Increments

Alpha

(2010 - 2015)

5

A [102141-11] Additional 7110.308 Airports (2014 - 2015) (Complete)

A [102141-12] Implement SATNAV or ILS for Parallel Runway Operations (2011 - 2012) (Complete)

A [102141-13] Amend Independent Runway Separation Standards in Order 7110.65 (including Blunder Model Analysis) (2013 - 2013) (Complete)

A [102141-14] Amend Dependent Runway Separation Standards in Order 7110.65 (2015 - 2017) (Complete)

A [102141-15] Enable Additional Approach Options for New Independent Runway Separation Standards (2014 - 2014) (Complete)

Improved Multiple Runway Operations

Increments/Enabling Activities

A [102141-11] Additional 7110.308 Airports (2014 - 2015)

Increment Overview

This increment provides airports with maximum use of closely spaced parallel runways by authorizing participating aircraft to operate at reduced lateral and longitudinal spacing on dependent, instrument approach procedures to runways with centerline spacing less than 2500 feet. This increment will expand the application of FAA Order 7110.308 beyond the locations and runway ends already approved, and implement this capability using available ground and airborne equipment, existing displaced runway thresholds, historical wind data, and procedural modifications to instrument approach procedures to maximize the reduced separation benefit.

Increment Status

Complete

Success Criteria

✓ 2010 : Approve Order 7110.308 procedures for EWR 4/22, MEM 18C/L and 36C/R. This will satisfy RTCA TF5 12-AP1.

✓ 2015 : 7110.308 procedure developed but not implemented at BOS (RWYs 4R and 4L) due to environmental concerns. This will satisfy a NAC/NIWG Commitment.

✓ 2015 : Approve change to FAA Order 7110.308 to authorize simultaneous dependent parallel approaches at EWR or SFO.This will satisfy RTCA TF5 12-AP2.

Implementation Approach

This increment authorizes procedures that allow reduced dependent stagger distances for aircraft conducting instrument approaches to runways with centerlines spaced less than 2500 feet apart, when the lead aircraft requires wake separation applied to the following aircraft. Research determined the safest minimum stagger distance to avoid wake turbulence between such aircraft pairs, based on factors similar to those affecting the .308 procedures (e.g., runway geometry, historical wind data, instrument approach characteristics, etc.). The minimum distance standard was determined and validated through testing and safety analysis, an implementation decision was made by AJV-8 and a location decision was made by AJT for this procedure with approval through AJI and AOV. A new order, 7110.308A was developed and published to govern this operation. An initial set of approved airports is included in the new order.

Benefits

Access & Equity Capacity Flexibility Efficiency Environment Predictability Safety

Improved Multiple Runway Operations

Access and Equity (P): Access is improved providing airports with maximum use of closely spaced parallel runways by authorizing participating aircraft to operate at reduced lateral and longitudinal spacing on dependent, instrument approach procedures to runways with centerline spacing less than 2500 feet

Capacity (P) : Enables dependent operations to runway <2500 at specific sites.

System Interactions

ILS CAT I (T): ILS provides aircraft guidance during approach procedure

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure

Avionics: ILS CAT I, SBAS/WAAS

Tertiary Systems

- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)
- ILS: Instrument Landing System

Avionics Systems

- ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics
- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics

Improved Multiple Runway Operations

Increments/Enabling Activities

A [102141-12] Implement SATNAV or ILS for Parallel Runway Operations (2011 - 2012)

Increment Overview

This increment will enable policy, standards, and procedures to allow use of Satellite Navigation (SATNAV) or ILS when conducting simultaneous independent and dependent instrument approaches, and implement this new capability at approved locations. The current standard for parallel approaches relies on ILS for simultaneous independent and dependent approaches. This increment expands this capability by implementing both unaugmented GPS-based approaches, such as RNAV (GPS), RNAV (RNP AR), and RNAV (RNP) with, as well as WAAS-augmented GPS-based approaches such as LPV for these parallel approach applications. This provides more options for Air Traffic Control (ATC) and users during IMC. Further research and evaluation of GLS approaches is required, but their inclusion in a future update to Order 7110.65 is expected. These additional options increase the chance of maintaining higher throughput when needed to support the demand.

This improvement will increase access to parallel runways during less than visual conditions. Particularly where various constraints prevent ILS installation, and will allow continued operation using SATNAV as a backup approach option if the ILS is out of service.

This increment has achieved its success criteria.

Increment Status

Complete

Success Criteria

2012 : Make new standards available in Order 7110.65 to set lower (i.e., less than 4300 feet) runway separation standards for LNAV/VNAV, RNP, and RNP AR approaches in SIPIA operations without high-update surveillance.

Implementation Approach

A process has been in place since October 1, 2007, to collect surveillance and communications data from major airports where aircraft conduct simultaneous independent instrument approach procedures to parallel runways. Additional, but more limited, data was collected in 2006. All of this data is being analyzed to better quantify the type, frequency, and severity of aircraft lateral deviations (commonly referred to as blunders) after the pilot receives clearance to intercept and maintain the precision final approach course. Previous blunder assumptions and the collision risk model created more than 20 years ago were based on very limited data on blunders, and conservative estimates were made by the subject matter experts involved in the studies at that time. An improved model of collision risk associated

Improved Multiple Runway Operations

with blunders has been developed and will be updated as additional data on aircraft deviations is collected. This data will be used in Human-in-the-Loop (HITL) and Monte Carlo simulations to help determine if improvements can be made to lateral runway spacing standards for closely spaced runways. This updated blunder/collision risk modeling is just one facet of improving spacing standards. Other key factors that will affect testing results, and must be accounted for, include human reaction time; size of the No-Transgression Zone; operating characteristics of key ground and flight deck equipment and procedures (e.g., ILS, Traffic Alert and Collision Avoidance System (TCAS) Resolution Advisories); surveillance system update rates; controller displays; and voice communications. Additionally, implementation of any changes to standards will require specific safety studies and site-specific evaluations of airspace design, airport operations, costs, and environmental concerns. Other external factors must be identified and addressed.

Benefits

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

Access and Equity (S): Improving access of available runways

Capacity (P): Implementing SATNAV (GPS, WAAS, GBAS) or ILS for parallel runway operations will lead to increased capacity by increasing the number of eligible sites/runways

System Interactions

ILS CAT I (T): ILS provides aircraft guidance during approach procedure

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure

Avionics: ILS CAT I, SBAS/WAAS

Tertiary Systems

- ILS: Instrument Landing System
- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)

Avionics Systems

- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics
- ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics

Improved Multiple Runway Operations

Increments/Enabling Activities

A [102141-13] Amend Independent Runway Separation Standards in Order 7110.65 (including Blunder Model Analysis) (2013 - 2013)

Increment Overview

This increment will result in increased access and capacity by allowing independent approach operations where currently only dependent or single-runway operations are authorized, as well as reducing spacing requirements for new parallel runway construction. This is achieved by performing analysis to amend runway spacing standards to increase access to parallel runways with centerline spacing less than 4300 feet, without high-update surveillance, and implementing this change at approved locations.

Current runway spacing standards for independent closely spaced parallel approaches are based, in part, on outdated assumptions about aircraft blunder rates that include severity and frequency. Due to the fact that the blunder assumptions were based on information available 20 years ago and some subjective views at the time, current spacing standards may be unnecessarily conservative, limiting capacity and airport growth.

Increment Status

Complete

Success Criteria

2013 : Publish new, independent runway separation standards in Order 7110.65. This will satisfy RTCA TF5 13-AP1, AP2, and AP3.

Implementation Approach

Increment completed. This increment has achieved its success criteria. Implementation Approach: A process has been in place since October 1, 2007, to collect surveillance and communications data from major airports where aircraft conduct simultaneous independent instrument approach procedures to parallel runways. Additional, but more limited, data was collected in 2006. All of this data is being analyzed to better quantify the type, frequency, and severity of aircraft lateral deviations (commonly referred to as blunders) after the pilot receives clearance to intercept and maintain the precision final approach course. Previous blunder assumptions and the collision risk model created more than 20 years ago were based on very limited data on blunders, and conservative estimates were made by the subject matter experts involved in the studies at that time. An improved model of collision risk associated with blunders has been developed and will be updated as additional data on aircraft deviations is collected. This data will be used in Human-in-the-Loop (HITL) and Monte Carlo simulations to help determine if improvements can be made to lateral runway spacing standards for closely spaced runways. This updated blunder/collision risk modeling is just one facet of improving spacing standards. Other key factors that will affect

testing results, and must be accounted for, include human reaction time; size of the No-Transgression Zone; operating characteristics of key ground and flight deck equipment and procedures (e.g., ILS, Traffic Alert and Collision Avoidance System (TCAS) Resolution Advisories); surveillance system update rates; controller displays; and voice communications. Additionally, implementation of any changes to standards will require specific safety studies and site-specific evaluations of airspace design, airport operations, costs, and environmental concerns. Other external factors must be identified and addressed.

Benefits

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

Access and Equity (P): Improving access of available runways

Capacity (P): Increase runway capacity in IMC by enabling closer spacing of pairs of landing aircraft

Environment (S): Reduction of separation standards results in decreased time flown in terminal airspace, providing benefit in the form of reduced fuel burn

System Interactions

FMA (T): FMA provides display for controller monitor position. FMA is a requirement for simultaneous independent ILS/MLS approaches. FMA provides a high-resolution color monitor with alert algorithms that must be used to monitor approaches

ILS CAT I (T): ILS provides aircraft guidance during approach procedure

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure

STARS (T): STARS provides controller automation and displays

Avionics: ILS CAT I, SBAS/WAAS

Tertiary Systems

STARS: Standard Terminal Automation Replacement System

FMA: Final Monitor Aid

ILS: Instrument Landing System

SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)

Avionics Systems

SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics

Improved Multiple Runway Operations

ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics

Improved Multiple Runway Operations

Increments/Enabling Activities

A [102141-14] Amend Dependent Runway Separation Standards in Order 7110.65 (2015 - 2017)

Increment Overview

This increment will increase throughput by increasing arrival rates during dependent operations to closely spaced parallel runways. Safety analysis will identify a revised separation standard for simultaneous dependent parallel instrument approaches to runways spaced between 2500 feet and 4299 feet. Work will then be performed to update FAA Order 7110.65 and operational application of the order at selected locations.

Increment Status

Complete

Success Criteria

✓ 2015 : Reduce Diagonal standard separation for dependent parallel operations for MSP, JFK, SEA, PDX, RDU, DAL, MEM. This will satisfy a NAC/NIWG Commitment.

✓ 2015 : Revise standards in Order 7110.65 to set lower (i.e., less than 1.5 nm) diagonal stagger separation for simultaneous dependent parallel instrument approaches.

✓ 2017 : Reduce Diagonal standard separation for dependent parallel operations for SFO. This will satisfy a NAC/NIWG Commitment.

Implementation Approach

This increment will capitalize on data collected and analyzed in the accomplishment of increment 102141-13 (Amend Independent Runway Separation Standards in Order 7110.65). A study was completed in 2013 and 2014 to determine the reduction in diagonal stagger separation that can be safely supported. Work has begun to develop an SRMD which will be approved by the appropriate safety oversight organizations, and a Document Change Proposal for 7110.65.

Benefits

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

Access and Equity (S): Improving access of available runways.

Capacity (P): Enabling a reduced separation standard for diagonal stagger in the operation of simultaneous dependent parallel approaches will provide significant improvements to airport throughput during Marginal VMC and IMC operations.

Improved Multiple Runway Operations

Environment (S): Reduction of separation standards results in decreased time flown in terminal airspace, providing benefit in the form of reduced fuel burn

System Interactions

ILS CAT I (T): ILS provides aircraft guidance during approach procedure

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure

ILS CAT I (A), SBAS/WAAS (A)

Tertiary Systems

- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)
- ILS: Instrument Landing System

Avionics Systems

- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics
- ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics

Improved Multiple Runway Operations

Increments/Enabling Activities

A [102141-15] Enable Additional Approach Options for New Independent Runway Separation Standards (2014 - 2014)

Increment Overview

This increment will allow increased throughput via the use of simultaneous independent parallel instrument approach (SIPIA) procedures for runways at reduced lateral runway separation (i.e., less than 4300 feet) where ILS is unavailable or does not currently exist by extending the analysis of SIPIA runway separation standards performed for increment 102141-13 to include the use of GPS-based approach options with vertical guidance (e.g. LNAV/VNAV, RNP and RNP AR).Analysis will determine the supported lateral runway spacing for these GPS-based procedures.

Increment Status

Complete

Success Criteria

2014 : Revise standards in Order 7110.65 to set lower (i.e., less than 4300 feet) runway separation standards for LNAV/VNAV, RNP, and RNP AR approaches in SIPIA operations without high-update surveillance.

Implementation Approach

Implementation Approach: This increment capitalized on data collected and analyzed in the accomplishment of increment 102141-13 (Amend Independent Runway Separation Standards in Order 7110.65). Additional analysis of GPS approaches was completed to determine target level of safety was achieved.

Benefits

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

Access and Equity (S): Improving access of available runways

Capacity (P): Enabling reduced runway separation standards for SIPIA by amending independent runway separation standards to allow GPS-based procedures

System Interactions

STARS (T): STARS Final Monitor Aid (FMA) provides display for controller monitor position. FMA is a requirement for simultaneous independent ILS/MLS approaches. FMA provides a high-resolution color monitor with alert algorithms that must be used to monitor

Improved Multiple Runway Operations

approaches

ILS CAT I (T): ILS provides aircraft guidance during approach procedure

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure

Avionics: ILS CAT I, SBAS/WAAS

Tertiary Systems

- ILS: Instrument Landing System
- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics
- STARS: Standard Terminal Automation Replacement System

Avionics Systems

- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)
- ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics

Improved Multiple Runway Operations

CO: [102144] Wake Turbulence Mitigation for Arrivals: CSPRs (2015 - 2017)

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. In persistent crosswind conditions, separation at less than today's wake separation minima for dependent approaches will be permitted for certain aircraft pairs, based on systems that sense and predict wind and indicate to controllers when the upwind approach is safe from wakes generated by aircraft on the downwind approach.

Changes to wake separation minima are implemented based on measured and predicted airport area winds. Supporting procedures, developed at applicable locations based on analysis of wake measurements and safety, allow more closely spaced arrival operations increasing airport/runway capacity in IMC. During peak demand periods, these procedures allow airports to increase airport arrival throughput during IMC and favorable wind conditions. Implementation of changes in procedures and standards, as well as the implementation of new technology, will safely reduce the impact of wake vortices on airport IMC arrival operations. The achieved separation reduction will depend on the specific lead/trail aircraft pair when crosswinds are taken into account, and could default to minimum radar separation, based on wind blowing an aircraft's wake away from the parallel runway's operating area.

Crosswind dependent wake-based arrival procedures at specific airports will be deployed with corresponding operating periods. As technology matures and further study provides more detail and accuracy for wake turbulence drift and decay predictions, the amount of time that reduced wake separation procedures will be available will increase.

CO Benefit

Capacity (P): Changes to wake separation minima will allow for more closely spaced arrival operations for closely space parallel runways thereby increasing the number of operations.

Efficiency (S): Increased arrival rate reduces flight time and increases economic and operational efficiency.

Environment (S): Improves predictability of arrival times and provides corresponding environmental benefits due to reduced delay and associated flight time.

Improved Multiple Runway Operations

Increments

Alpha

(2010 - 2015)

1

A [102144-11] Wake Turbulence Mitigation for Arrivals - Procedures for Heavy/B757 Aircraft (2015 - 2015) (Complete)

Improved Multiple Runway Operations

Increments/Enabling Activities

A [102144-11] Wake Turbulence Mitigation for Arrivals - Procedures for Heavy/B757 Aircraft (2015 - 2015)

Increment Overview

This increment will increase runway throughput at approved airports by allowing heavy and Boeing 757 aircraft to lead a dependent, staggered instrument approach procedure to closely spaced parallel runways less than 2500' apart at spacing's less than the single-runway separation used today.

Increment Status

Complete

Success Criteria

- 2014 : Conduct Safety Analysis at PHL DTW. This will satisfy a NAC/NIWG commitment.
- 2015 : Conduct Safety Analysis at ATL. This will satisfy a NAC/NIWG commitment.
- 2015 : Publish new update to FAA order 7110.308 authorizing WTMA-P for heavy/B757 aircraft.

Implementation Approach

This increment authorizes procedures that allow reduced dependent stagger distances for aircraft conducting instrument approaches to runways with centerlines spaced less than 2500 feet apart, when the lead aircraft requires wake separation applied to the following aircraft. Research determined the safest minimum stagger distance to avoid wake turbulence between such aircraft pairs, based on factors similar to those affecting the .308 procedures (e.g., runway geometry, historical wind data, instrument approach characteristics, etc.). The minimum distance standard was determined and validated through testing and safety analysis, an implementation decision was made by AJV-8 and a location decision was made by AJT for this procedure with approval through AJI and AOV. A new order, 7110.308A was developed and published to govern this operation. An initial set of approved airports is included in the new order.

Benefits

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

Capacity (P): Allowing heavy/B757 aircraft to fly in the lead position on dependent instrument approaches to parallel runways that were not previously eligible will increase airport capacity, giving controllers greater flexibility to merge and space arriving aircraft for greater throughput.

Flexibility (S): Allowing heavy/B757 aircraft to fly in the lead position on dependent instrument approaches to parallel runways that

were not previously eligible will give controllers greater flexibility to merge and space arriving aircraft

Efficiency (S): Allowing heavy/B757 aircraft to fly in the lead position on dependent instrument approaches to parallel runways that were not previously eligible will increase airport capacity, giving controllers greater flexibility to merge and space arriving aircraft for greater throughput.

System Interactions

Capability is managed via the implementation of procedures.

To be determined

Improved Multiple Runway Operations

OI: [102140] Wake Turbulence Mitigation for Departures (WTMD) (2013 - 2015)

Changes to wake rules are implemented based on wind measurements. Procedures allow more closely spaced departure operations to maintain airport/runway capacity.

Procedures are developed at applicable locations based on the results of analysis of wake measurements and safety analysis using wake modeling and visualization. During peak demand periods, these procedures allow airports to maintain airport departure throughput during favorable wind conditions.

A staged implementation of changes in procedures and standards, as well as the implementation of new technology will safely reduce the impact of wake vortices on operations. This reduction applies to specific types of aircraft and is based on wind transporting an aircraft's wake away from the parallel runway's operating area.

An operational demonstration of this capability was successfully conducted but did not prove to achieve sufficient operational benefits to warrant full implementation.

OI Benefit

Efficiency (S): Decreased taxi delay times due to increased runway throughput.

Capacity (P): Improved wake turbulence procedures will allow airports to increase capacity during peak demand periods by increasing the number of departures when winds are sufficient to reduce the time required to dissipate the wake turbulence created by the leading aircraft.

Environment (S): More efficient operations will reduce fuel burn and engine emissions.

Increments

Alpha

(2010 - 2015)

1

A [102140-01] Wake Turbulence Mitigation for Departures (2013 - 2015) (Complete)

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

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

Improved Multiple Runway Operations

Increments/Enabling Activities

A [102140-01] Wake Turbulence Mitigation for Departures (2013 - 2015)

Increment Overview

Changes to wake rules are implemented based on wind measurements. Procedures allow more closely spaced departure operations to maintain airport/runway capacity. Procedures are developed at applicable locations based on the results of analysis of wake measurements and safety analysis using wake modeling and visualization. During peak demand periods, these procedures allow airports to maintain airport departure throughput during favorable wind conditions. A staged implementation of changes in procedures and standards, as well as the implementation of new technology, will safely reduce the impact of wake vortices on operations. This reduction applies to specific types of aircraft and is based on wind transporting an aircraft's wake away from the parallel runway's operating area.

Increment Status

Complete

Success Criteria

- 2014 : Operationally Demonstrated at SFO, MEM, and IAH.
- 2015 : Complete benefits decision on WTMD. This will satisfy a NAC/NIWG Commitment.

Implementation Approach

A staged implementation of changes in procedures and standards, as well as the implementation of new technology will safely reduce the impact of wake vortices on operations. This reduction applies to specific types of aircraft and is based on wind transporting an aircraft's wake away from the parallel runway's operating area. Acquisition plan for WTMD is planned for FY15.

Benefits

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

Capacity (P): Increase runway capacity in certain wind conditions for departures

Efficiency (S): Increase efficiency of departure queuing

System Interactions

ASOS (T): ASOS reports all the parameters of the AWOS-III, while also having the additional capabilities of reporting temperature and dew point in degrees Fahrenheit, present weather, icing, lightning, sea level pressure and precipitation accumulation

Improved Multiple Runway Operations

Tertiary Systems

- ASOS: Automated Surface Observing System

Improved Multiple Runway Operations

OI: [108209] Increase Capacity and Efficiency Using Area Navigation (RNAV) and Required Navigation Performance (RNP) (2010 - 2021)

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.

RNAV and RNP will permit the flexibility of point-to-point operations and allow for the development of routes, procedures, and approaches that are more efficient and free from the constraints and inefficiencies of the ground-based NAVAIDS. This capability can also be combined with an Instrument Landing System (ILS), to improve the transition onto an ILS final approach and to provide a guided missed approach. Consequently, RNAV and RNP will enable safe and efficient procedures and airspace that address the complexities of the terminal operation through repeatable and predictable navigation. These will include the ability to implement curved path procedures that can address terrain, and noise-sensitive and/or special-use airspace. Terminal and en route procedures will be designed for more efficient spacing and will address complex operations.

OI Benefit

Efficiency (P): Efficiency is improved through airspace design that allow for route placement in locations where they are needed rather than over ground-based NAVAIDS, allowing for more efficient routings and increased ability to accommodate optimal descent and ascents.

Access and Equity (P): Improved as PBN procedures allow access without the need for additional ground infrastructure.

Capacity (P): Additional routes and fewer conflicts between arrival and departure paths will increase airspace capacity.

Safety (S): Increasing navigation accuracy will result in repeatable and predictable navigation performance which will increase safety.

Increments

Alpha

(2010 - 2015)

1

A **[108209-16] Use Converging Runway Display Aid (CRDA) (2010 - 2013)** (Complete)

Improved Multiple Runway Operations

Increments/Enabling Activities

A [108209-16] Use Converging Runway Display Aid (CRDA) (2010 - 2013)

Increment Overview

CRDA is an automation aid used by air traffic controllers to judge spatial relationships between aircraft that are destined for converging or intersecting runways. CRDA projects position information for an aircraft approaching one runway onto the straight-in final approach course of another aircraft approaching a converging or intersecting runway (known as "ghost" targets), thus allowing a controller to easily visualize and direct a safe and efficient separation distance between the two arriving aircraft. This activity is assessing the current use of CRDA functionality and facilitating the development of procedures to extend its use. This activity supports the implementation of an arrival/departure window tool at selected sites.

Increment Status

Complete

Success Criteria

2010 : Successful completion of RTCA TF5 9-AP1.

2013 : Add 1-2 airport configurations in addition to MSP, PDX, and EWR 22/11; those under consideration are EWR 4R/11, EWR 4/29, BOS, and SEA/BFI.

Implementation Approach

Implemented via Terminal Automation at selected sites.

Benefits

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

Capacity (P): Improving awareness of all relevant airborne traffic approaching runways that converge or intersect, or whose flight paths converge or intersect, will allow spacing actions to be performed more efficiently. This will increase runway throughput and capacity in VMC conditions. Fewer conflicts between arriving streams will result in increased throughput and fewer aborted landings/missed approaches.

Safety (S): Improving awareness of all relevant airborne traffic approaching runways that converge or intersect, or whose flight paths converge or intersect, will allow spacing actions to be performed in a safely manner

Improved Multiple Runway Operations

System Interactions

STARS (P): STARS provides controller automation and displays. CRDA provides information to controllers by displaying spatial relationships for arrivals at airports with converging runways. This information is displayed on STARS/CARTS displays.

Primary Systems

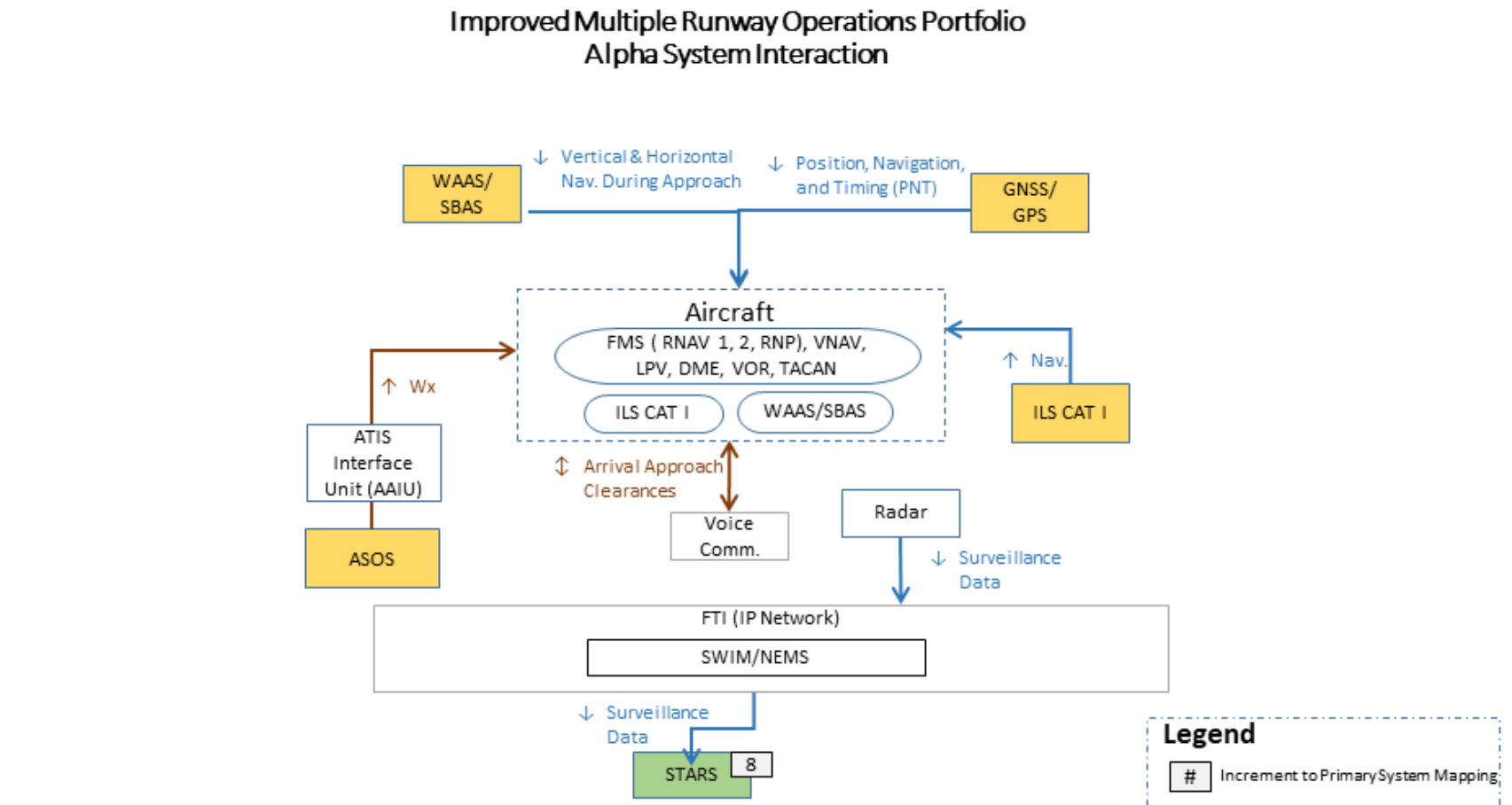
- STARS: Standard Terminal Automation Replacement System

Improved Multiple Runway Operations

Systems Interactions

The improvements in this portfolio, as depicted in this figure, will come about through the application of technology and procedural changes to permit safe operation of new approach and departure procedures on parallel, converging, and intersecting runways in situations and conditions not previously approved.

Improved Multiple Runway Operations



Improved Multiple Runway Operations Portfolio Alpha Increments:

1. 102140-01 Wake Turbulence Mitigation for Departures *
2. 102141-11 Additional 7110.308 Airports *
3. 102141-12 Implement SATNAV or ILS for Parallel Runway Operations *
4. 102141-13 Amend Independent Runway Separation Standards in Order 7110.65 (including Blunder Model Analysis) *
5. 102141-14 Amend Dependent Runway Separation Standards in Order 7110.65 *
6. 102141-15 Enable Additional Approach Options for New Independent Runway Separation Standards *
7. 102144-11Wake Turbulence Mitigation for Arrivals - Procedures for Heavy/B757 Aircraft*
8. 108209-16 Use Converging Runway Display Aid (CRDA)

* No Primary System Dependency identified; procedure based

Improved Multiple Runway Operations

Increment	ASOS	FMA	ILS	ILS CAT I Avionics	SBAS (WAAS)	SBAS (WAAS) Avionics	STARS
A [102140-01] Wake Turbulence Mitigation for Departures ✔	T						
A [102141-11] Additional 7110.308 Airports ✔			T	A	T	A	
A [102141-12] Implement SATNAV or ILS for Parallel Runway Operations ✔			T	A	T	A	
A [102141-13] Amend Independent Runway Separation Standards in Order 7110.65 (including Blunder Model Analysis) ✔			T	A	T	A	T
A [102141-14] Amend Dependent Runway Separation Standards in Order 7110.65 ✔			T	A	T	A	
A [102141-15] Enable Additional Approach Options for New Independent Runway Separation Standards ✔			T	A	A	T	T
A [102144-11] Wake Turbulence Mitigation for Arrivals - Procedures for Heavy/B757 Aircraft ✔							
A [108209-16] Use Converging Runway Display Aid (CRDA) ✔							P

Operationally Available ✔ Complete In Service System Planned System

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

A Alpha

Improved Multiple Runway Operations

Stakeholders

Specific roles and responsibilities for the implementation of all capabilities in this portfolio are outlined in the RASCI (Responsible, Accountable, Supporting, Consulted, Informed) matrix below. All stakeholder organizations involved in the delivery of capabilities are listed across the top. Portfolio capabilities are listed on the left side of the table, organized by OI/OS and increment. For the Additional Order 7110.308 Airports increment, AJT-2 is accountable and ANG-C and AFS-400 are responsible. AJM-1 and AOV provide ongoing support in the areas of requirements, standards, approvals, and safety analysis. For the increment WTMA-P for Heavy/B757 Aircraft, AJT-2 is accountable for implementation and ANG-C is responsible for concept development and approval. AFS-400 also has a responsible role. AJM-1, AOV, and AEE provide support in the areas of standards, procedure design approval, and safety analysis. For the increments Amend Independent Runway Standards and Amend Dependent Runway Standards in Order 7110.65, AJT-2 is accountable and responsible, AFS-400 has a responsible role, and AOV provides support. For the increments Implement SATNAV or ILS for Parallel Runway Operations and Enable Additional Approach Options for New Independent Runway Separation Standards, AJT-2 is accountable and AJM-32, and AFS-400 are responsible. For the increment WTMD, AJT-2C is accountable and responsible, with support from ANG-C, to coordinate installation and data collection for three prototype systems at IAH, SFO, and MEM. After an implementation decision is made, AJM-2 will assume accountability and responsibility, with support from AJT-2, and AJM-1 for implementation of operational systems at selected sites. AOV and AFS-400 provide ongoing support in the areas of requirements, standards, approvals, and safety analysis. For the increment Use CRDA, AJT-28 is both accountable and responsible and AOV is consulted. The appropriate lead offices will coordinate with external stakeholders.

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

Improved Multiple Runway Operations

RASCI Matrix	AJV	AOV	AJT		ANG					AFS		AJI			AJM						AAE	AIR
	0	001	2	0	C5	C7	C	C2	B	400	001	1	2	3	24	32	3	22	25	0	001	001
• A [102140-01] Wake Turbulence Mitigation for Departures (2013 - 2015)		S	A/R			C	S				S	S	S	S	S							
• A [102141-11] Additional 7110.308 Airports (2014 - 2015)		S	A			C	R				R	S	S	S								
• A [102141-12] Implement SATNAV or ILS for Parallel Runway Operations (2011 - 2012)			A			C					R	S	S	S		R						
• A [102141-13] Amend Independent Runway Separation Standards in Order 7110.65 (including Blunder Model Analysis) (2013 - 2013)		S	A/R			C				R												
• A [102141-14] Amend Dependent Runway Separation Standards in Order 7110.65 (2015 - 2017)		S	A/R			C		R		R												
• A [102141-15] Enable Additional Approach Options for New Independent Runway Separation Standards (2014 - 2014)		S	A/R			C				R												
• A [102144-11] Wake Turbulence Mitigation for Arrivals - Procedures for Heavy/B757 Aircraft (2015 - 2015)	R	S	A/R			C				R											S	
• A [108209-16] Use Converging Runway Display Aid (CRDA) (2010 - 2013)		C	A/R			C						S	S	S								

Operationally Available Complete External Commitment A Alpha

Improved Multiple Runway Operations

Appendix B

Bravo Increments

Portfolio Overview

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

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

Portfolio Content Summary Statistics

		Increment Status				
Segment	**Total by Segment**	**Planned**	**Concept Exploration & Maturation**	**Development**	**Initial Operational Availability**	**Completed**
*Bravo (2016 - 2020)	3	0	0	0	0	3
TOTAL	3	0	0	0	0	3
Segment	**% by Segment**	**% by Segment/Increment Status**				
*Bravo (2016 - 2020)	100%	0 %	0 %	0 %	0 %	100 %
TOTAL	100%	0 %	0 %	0 %	0 %	100 %

Improved Multiple Runway Operations

Operational Improvements/Current Operations & Increments

Benefits

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

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

Improved Multiple Runway Operations

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

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

Improved Multiple Runway Operations

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

The improvement will recover lost capacity through reduced separation standards and increased applications of dependent and independent operations.

This improvement will develop improved procedures that enable operations for parallel runways in reduced visibility weather conditions. 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.

Improvements will be focused on finding ways to recover lost capacity due to IMC events by providing a monitoring capability that mimics or replaces visual separation. This improvement allows additional reduction of lateral spacing for arrivals. Additionally, improvements will be focused on finding ways to recover lost capacity due to IMC events by updating standards and terminal instrument procedures by taking advantage of improved course deviation modeling, systems with advanced navigation accuracy and advanced surveillance capabilities such as multilateration Precision Runway Monitor-Alternate (PRM-A) and the future implementation of STARS Fusion with Automatic Dependent Surveillance Broadcast (ADS-B) Out. Aircraft collision avoidance systems will be improved to use the more precise data provided by new surveillance sources using an optimized threat resolution logic leading to a decrease in nuisance alerts for these procedures. Aircraft participating in a closely spaced paired operation will be known to the collision avoidance system and generate a traffic advisory only for the paired aircraft and will generate resolution advisories for all other aircraft in the vicinity.

CO Benefit

Efficiency (S): Decreased operational costs due to improved runway operations.

Capacity (P): Increased runway capacity in IMC by enabling closer spacing of pairs of landing aircraft.

Environment (S): More efficient operations will reduce fuel burn and engine emissions.

Access and Equity (S): Improving access of available runways.

Improved Multiple Runway Operations

Increments

Bravo

(2016 - 2020)

3

B **[102141-22] Amend Standards for Simultaneous Independent Approaches - Dual with Offset (2016 - 2020)** (Complete)

B **[102141-24] Amend Standards for Simultaneous Independent Approaches - Triple (2016 - 2020)** (Complete)

B **[102141-28] Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 Feet (2016 - 2018)** (Complete)

Improved Multiple Runway Operations

Increments/Enabling Activities

B [102141-22] Amend Standards for Simultaneous Independent Approaches - Dual with Offset (2016 - 2020)

Increment Overview

This increment will allow increased throughput via the reduction of the lateral runway separation required to safely support dual simultaneous independent instrument approaches with one approach offset 2.5 degrees to 3.0 degrees away from an approach conducted to a parallel runway. The use of an offset approach to one of the parallel runways will provide additional mitigation of collision risk to allow for a reduction of required lateral separation for dual simultaneous independent instrument approaches below that obtained in Alpha increment 102141-13 through the use revised course deviation assumptions. Safety analysis will fully identify and address operational and technical factors that influence the setting of this new standard.Once the analysis is complete, a Safety Risk Management Document will be developed and approved by the appropriate safety oversight organizations, and a Document Change Proposal for 7110.65 executed.

Increment Status

Complete

Success Criteria

✓ 2015 : Implement reduction of the lateral runway separation required to safely support dual simultaneous independent instrument approaches with one approach offset at sites ORD and DTW. This is will satisfy a NAC/NIWG commitment.

✓ 2015 : Publish new, independent runway separation standards when using offset approaches in FAA Order - 7110.65.

Implementation Approach

A process has been in place since October 1, 2007, to collect surveillance and communications data from major airports where aircraft conduct simultaneous independent instrument approach procedures to parallel runways. Additional, but more limited, data was collected in 2006. All of this data is being analyzed to better quantify the type, frequency, and severity of aircraft lateral deviations (commonly referred to as blunders) after the pilot receives clearance to intercept and maintain the precision final approach course. Previous course deviation assumptions and the collision risk model created more than 20 years ago were based on very limited data on course deviations, and conservative estimates were made by the subject matter experts involved in the studies at that time. An improved model of collision risk associated with course deviations has been developed and will be updated as additional data on aircraft deviations is collected. This data will be used in Human-in-the- Loop (HITL) and Monte Carlo simulations to help determine if improvements can be made to lateral runway spacing standards for closely spaced runways. This updated course deviation/collision risk modeling is just one facet of improving spacing standards. Other key factors that will affect testing results, and must be accounted for, include human reaction

Improved Multiple Runway Operations

time; size of the No -Transgression Zone; operating characteristics of key ground and flight deck equipment and procedures (e.g., ILS, Traffic Alert and Collision Avoidance System (TCAS) Resolution Advisories); surveillance system update rates; controller displays; and voice communications. Additionally, implementation of any changes to standards will require specific safety studies and site-specific evaluations of airspace design, airport operations, costs, and environmental concerns. Other external factors must be identified and addressed.

Benefits

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

Access and Equity (P): Improving access of available runways.

Capacity (P): This increment will allow increased throughput via the reduction of the lateral runway separation required to safely support dual simultaneous independent instrument approaches with one approach offset 2.5 degrees to 3.0 degrees away from an approach conducted to a parallel runway.

Environment (S): Reduction of separation standards results in decreased time flown in terminal airspace, providing benefit in the form of reduced fuel burn.

System Interactions

STARS (T): STARS provides a Final Monitor Aid (FMA) display capability to controllers. FMA is a requirement for simultaneous independent approaches.

ILS CAT I (T): ILS provides aircraft guidance during approach procedure.

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure.

ILS CAT I (A), SBAS/WAAS (A)

Tertiary Systems

- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)
- STARS: Standard Terminal Automation Replacement System

Improved Multiple Runway Operations

- ILS: Instrument Landing System

Avionics Systems

- ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics
- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics

Improved Multiple Runway Operations

Increments/Enabling Activities

B [102141-24] Amend Standards for Simultaneous Independent Approaches - Triple (2016 - 2020)

Increment Overview

This increment will allow increased throughput via the reduction of the lateral runway separation required to safely support triple simultaneous independent parallel instrument approaches (without high update rate surveillance). Revised assumptions for course deviation frequency and angle, along with analysis of evasion procedures in the event of an aircraft course deviation from one of the three approaches will be used to determine the revised standards for triple CSPR approaches. Additional data collection and analysis may need to be performed to fully identify and address other operational and technical factors that may influence the setting of this new standard. Once the safety analysis is complete, a Safety Risk Management Document will be developed and approved by the appropriate safety oversight organizations, and a Document Change Proposal for 7110.65 executed.

Increment Status

Complete

Success Criteria

- 2015 : Implement triple independent parallel operations at ORD. This will satisfy a NAC/NIWG commitment.
- 2015 : Publish, new independent runway separation standards when using triple approaches in FAA Order 7110.65.
- 2017 : Implement triple independent parallel operations at ATL and IAD. This will satisfy a NAC/NIWG commitment.

Implementation Approach

A process has been in place since October 1, 2007, to collect surveillance and communications data from major airports where aircraft conduct simultaneous independent instrument approach procedures to parallel runways. Additional, but more limited, data was collected in 2006. All of this data is being analyzed to better quantify the type, frequency, and severity of aircraft lateral deviations after the pilot receives clearance to intercept and maintain the precision final approach course. Previous course deviation assumptions and the collision risk model created more than 20 years ago were based on very limited data on course deviations, and conservative estimates were made by the subject matter experts involved in the studies at that time. An improved model of collision risk associated with course deviations has been developed and will be updated as additional data on aircraft deviations is collected. This data will be used in Human-in-the- Loop (HITL) and Monte Carlo simulations to help determine if improvements can be made to lateral runway spacing standards for closely spaced runways. This updated course deviation/collision risk modeling is just one facet of improving spacing standards. Other key factors that will affect testing results, and must be accounted for, include human reaction time; size of the No -Transgression Zone; operating characteristics of key ground and flight deck equipment and procedures (e.g., ILS, Traffic Alert and Collision Avoidance System

Improved Multiple Runway Operations

(TCAS) Resolution Advisories); surveillance system update rates; controller displays; and voice communications. Additionally, implementation of any changes to standards will require specific safety studies and site-specific evaluations of airspace design, airport operations, costs, and environmental concerns. Other external factors must be identified and addressed.

Benefits

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

Access and Equity (S): Improving access of available runways.

Capacity (P): Increased throughput via the reduction of the lateral runway separation required to safely support triple simultaneous independent parallel instrument approaches (without high update rate surveillance, e.g. ATL)
Environment (S): Reduction of separation standards results in decreased time flown in terminal airspace, providing benefit in the form of reduced fuel burn.

System Interactions

STARS (T): STARS provides a display for controller monitor position and incorporates Final Monitor Aid (FMA) functions. FMA is a requirement for simultaneous independent ILS/MLS approaches. FMA provides a high-resolution color monitor with alert algorithms that must be used to monitor approaches.

ILS CAT I (T): ILS provides aircraft guidance during approach procedure.

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure.

ILS CAT I (A), SBAS/WAAS (A)

Tertiary Systems

- STARS: Standard Terminal Automation Replacement System
- ILS: Instrument Landing System

Avionics Systems

- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics

Improved Multiple Runway Operations

ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics

Improved Multiple Runway Operations

Increments/Enabling Activities

B [102141-28] Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 Feet (2016 - 2018)

Increment Overview

This increment will increase throughput by increasing arrival rates during dependent operations to parallel runways spaced greater than 4300 feet. In cases where controller staffing or display limitations preclude the use of independent parallel operations for runways spaced greater than 4300', dependent operations are used which require a minimum of 2 miles radar separation diagonally between successive aircraft on adjacent final approach. This increment will reduce the diagonal separation for these operations below 2 miles. Safety analysis will identify a revised separation standard for simultaneous dependent parallel instrument approaches to runways spaced greater than 4300 feet and additional work will then be performed to update FAA Order 7110.65 and permit this operation.

Increment Status

Complete

Success Criteria

- 2017 : Publish runway separation standards for dependent approaches to runways spaced > 4300'
- 2017 : Implement independent runway standards at SDF, PHX, CVG, MEM. This will satisfy a NAC/NIWG commitment.

Implementation Approach

This increment will capitalize on data collected and analyzed in the accomplishment of increment 102141-13 (Amend Independent Runway Separation Standards in Order 7110.65). A study was initiated in 2014 to determine the reduction in diagonal stagger separation that can be safely supported. After completion of the safety study, an SRMD will be approved by the appropriate safety oversight organization, followed by a Document Change Proposal for 7110.65. The site implementation will occur in 2017.

Benefits

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

Capacity (P): Increase runway throughput in IMC by enabling closer spacing of pairs of landing aircraft.

Environment (S): Reduction of separation standards results in decreased time flown in terminal airspace, providing benefit in the form of reduced fuel burn.

Improved Multiple Runway Operations

System Interactions

ILS CAT I (T): ILS provides aircraft guidance during approach procedure

SBAS/WAAS (T): WAAS provides aircraft guidance during approach procedure

ILS CAT I (A), SBAS/WAAS (A)

Tertiary Systems

- SBAS (WAAS): Satellite Based Augmentation System (Wide-Area Augmentation System)
- ILS: Instrument Landing System

Avionics Systems

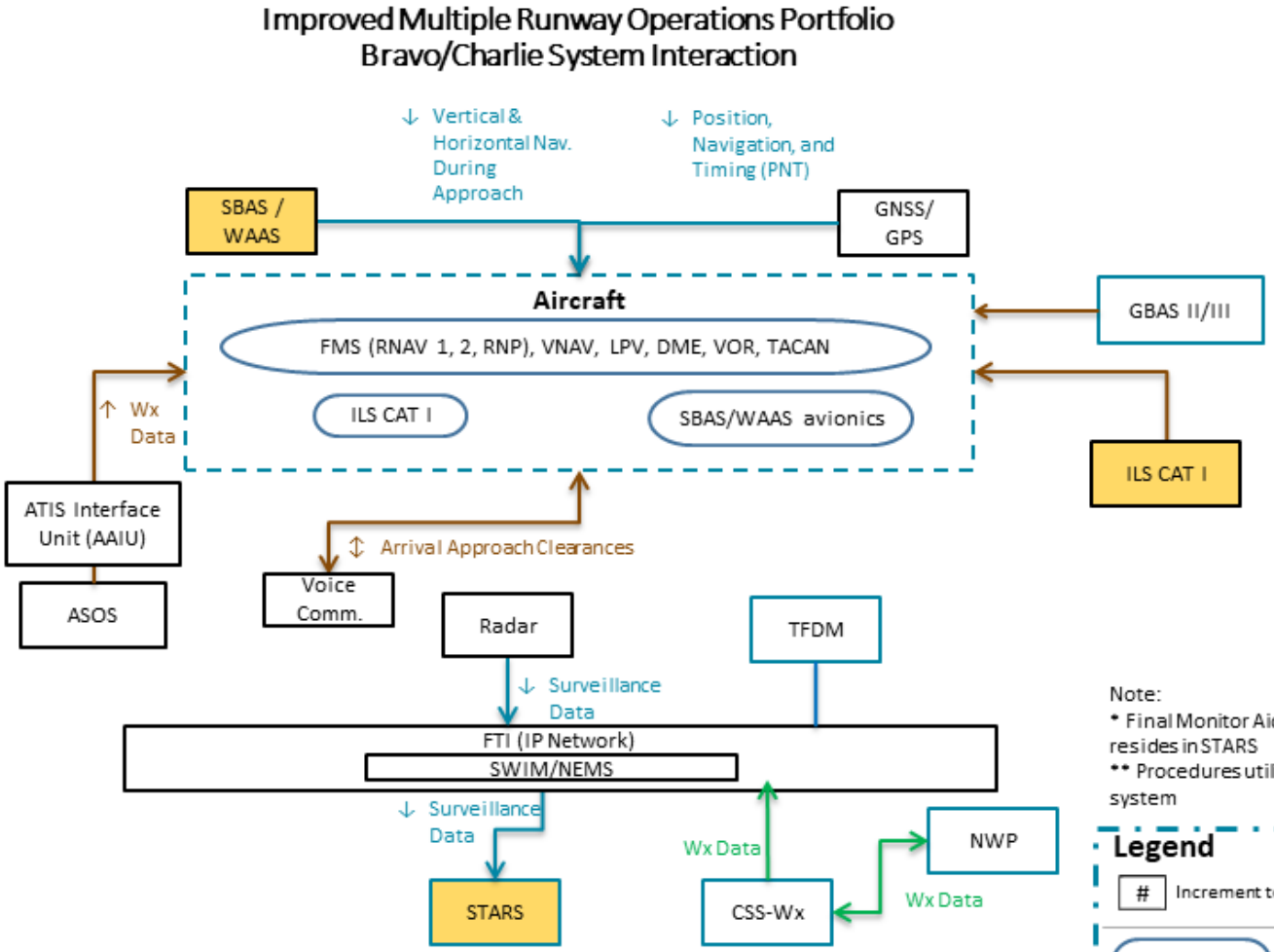
- ILS CAT I Avionics: Instrument Landing System Category I Approach Avionics
- SBAS (WAAS) Avionics: Satellite Based Augmentation System/Wide Area Augmentation System Avionics

Improved Multiple Runway Operations

Systems Interactions

The improvements in this portfolio, as depicted in this figure, will come about through the application of technology and procedural changes to permit safe operation of new approach and departure procedures on parallel, converging, and intersecting runways in situations and conditions not previously approved.

Improved Multiple Runway Operations



Note:
* Final Monitor Aid (FMA) functionality resides in STARS
** Procedures utilized instead of primary system

Legend

Increment to Primary System Mapping

Avionics
NAS/External System
Primary System
Secondary System
Tertiary System
Boundary/ Grouping
Info. Over SWIM
Info over IP/Direct.
Info over A/G Comm.

Improved Multiple Runway Operations Portfolio Bravo Increments:

1. 102141-22 Amend Standards for Simultaneous Independent Approaches – Dual with Offset* **
2. 102141-24 Amend Standards for Simultaneous Independent Approaches – Triple**
3. 102141-28 Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 Feet**

Improved Multiple Runway Operations Portfolio Charlie Increments:

4. 102157-32 Minimum Radar Separation (MRS) Reduction in the Terminal Environment **
5. 102161-01 Dependent Stagger Departures for CSPO **
6. 102161-02 Further Reductions to Departure Divergence Requirements for CSPO **
7. 102161-03 Decreased Separation Requirements for Mixed Operations on Closely Spaced Parallel Runways **

Improved Multiple Runway Operations

Increment	ILS	ILS CAT I Avionics	SBAS (WAAS)	SBAS (WAAS) Avionics	STARS
B [102141-22] Amend Standards for Simultaneous Independent Approaches - Dual with Offset ✓	T	A	T	A	T
B [102141-24] Amend Standards for Simultaneous Independent Approaches - Triple ✓	T	A		A	T
B [102141-28] Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 Feet ✓	T	A	T	A	

Operationally Available ✓ Complete ● In Service System ○ Planned System

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

B Bravo

Improved Multiple Runway Operations

Stakeholders

Specific roles and responsibilities for the implementation of all capabilities in this portfolio are outlined in the RASCI (Responsible, Accountable, Supporting, Consulted, Informed) matrix below. All stakeholder organizations involved in the delivery of capabilities are listed across the top. Portfolio capabilities are listed on the left side of the table, organized by OI/OS and increment. For the Additional Order 7110.308 Airports increment, AJT-2 is accountable and ANG-C and AFS-400 are responsible. AJM-1 and AOV provide ongoing support in the areas of requirements, standards, approvals, and safety analysis. For the increment WTMA-P for Heavy/B757 Aircraft, AJT-2 is accountable for implementation and ANG-C is responsible for concept development and approval. AFS-400 also has a responsible role. AJM-1, AOV, and AEE provide support in the areas of standards, procedure design approval, and safety analysis. For the increments Amend Independent Runway Standards and Amend Dependent Runway Standards in Order 7110.65, AJT-2 is accountable and responsible, AFS-400 has a responsible role, and AOV provides support. For the increments Implement SATNAV or ILS for Parallel Runway Operations and Enable Additional Approach Options for New Independent Runway Separation Standards, AJT-2 is accountable and AJM-32, and AFS-400 are responsible. For the increment WTMD, AJT-2C is accountable and responsible, with support from ANG-C, to coordinate installation and data collection for three prototype systems at IAH, SFO, and MEM. After an implementation decision is made, AJM-2 will assume accountability and responsibility, with support from AJT-2, and AJM-1 for implementation of operational systems at selected sites. AOV and AFS-400 provide ongoing support in the areas of requirements, standards, approvals, and safety analysis. For the increment Use CRDA, AJT-28 is both accountable and responsible and AOV is consulted. The appropriate lead offices will coordinate with external stakeholders.

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

Improved Multiple Runway Operations

RASCI Matrix	AJV	AOV	AJT		ANG					AFS		AJI			AJM						AAE	AIR
	0	001	2	0	C5	C7	C	C2	B	400	001	1	2	3	24	32	3	22	25	0	001	001
• B [102141-22] Amend Standards for Simultaneous Independent Approaches - Dual with Offset (2016 - 2020)	R	S	A/R			C		R		R												
• B [102141-24] Amend Standards for Simultaneous Independent Approaches - Triple (2016 - 2020)	R	S	A/R			C		R		R												
• B [102141-28] Amend Dependent Runway Separation Standards for Runways Spaced Greater Than 4300 Feet (2016 - 2018)	R	S	A/R			C		R		R												

Operationally Available Complete External Commitment B Bravo