

Improved Surface Operations

Active Increments

Portfolio Overview

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

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

Improved surface operations anticipated benefits are as follows:

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

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

























































































Improved Surface Operations

Portfolio Content Summary Statistics

		Increment Status				
Segment	Total by Segment	Planned	Concept Exploration & Maturation	Development	Initial Operational Availability	Completed
*Alpha (2010 - 2015)	7	0	0	0	0	7
*Bravo (2016 - 2020)	2	0	0	0	1	1
Charlie (2021 - 2025)	4	0	1	2	1	0
Delta (2026 - 2030)	1	1	0	0	0	0
Echo (2031 - 2035)	5	1	4	0	0	0
Foxtrot (2036 - 2040)	2	1	1	0	0	0
TOTAL	21	3	6	2	2	8
Segment	% by Segment	% by Segment/Increment Status				
*Alpha (2010 - 2015)	33 %	0 %	0 %	0 %	0 %	100 %
*Bravo (2016 - 2020)	10 %	0 %	0 %	0 %	50 %	50 %
Charlie (2021 - 2025)	19 %	0 %	25 %	50 %	25 %	0 %
Delta (2026 - 2030)	5 %	100 %	0 %	0 %	0 %	0 %
Echo (2031 - 2035)	24 %	20 %	80 %	0 %	0 %	0 %
Foxtrot (2036 - 2040)	10 %	50 %	50 %	0 %	0 %	0 %
TOTAL	100%	14 %	29 %	10 %	10 %	38 %

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

Improved Surface Operations

Operational Improvements/Current Operations & Increments	Benefits
OI: [104206] Surface Taxi Information Management with Conformance Monitoring (2034 - 2040)	
E [104206-22] Electronic Exchange of Taxi Information (2034 - 2038)	      
F [104206-21] Taxi Conformance Monitoring for Controllers (2036 - 2040)	      
OI: [102138] Enhanced Air Traffic Control Tower Services for Airport Operations at Non-Primary Airports (2020 - 2026)	
C [102138-01] Establish Air Traffic Control Tower Criteria for Airport Operations at Non-Primary Airports (2020 - 2026)	      
OI: [104117] Improved Departure Scheduling into Overhead Streams (2015 - 2035)	
E [104117-32] Improved Departure Operations using Mobile Applications (2031 - 2035)	      
OI: [102408] Improved Pilot Awareness on Surface by Providing Location and Alerting Functions (2035 - 2040)	
E [102408-21] Airport Traffic Situation Awareness with Indications and Alerts (SURF-IA) (2035 - 2040)	      
OI: [104211] Surface Traffic Management (2016 - 2029)	
C [104211-21] TFDM Scheduler/Sequencer (2024 - 2029) 	      
C [104211-22] Surface Metering Operations (2024 - 2029) 	      
C [104211-25] Establish Enhanced Data Exchange with Flight Operators and Airport Operators (2016 - 2023)  	      
OI: [104212] Expansion of Surface Traffic Management (2030 - 2040)	
D [104212-28] Expanded Integration of Surface Data (2030 - 2035)	      
E [104212-26] Departure Clearances using Mobile Applications (2033 - 2038)	      
E [104212-27] Establish Enhanced Data Exchange through Mobile Applications (2033 - 2038)	      
F [104212-29] Full Integration of Surface Data (2036 - 2040)	      

Improved Surface Operations

[illegible]

2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040		
								E [104212-27]	Establish Enhanced Data Exchange through Mobile Applications (2033 - 2038)												
								D [104212-28]	Expanded Integration of Surface Data (2030 - 2035)												
								F [104212-29]	Full Integration of Surface Data (2036 - 2040)												



Improved Surface Operations

OI: [104206] Surface Taxi Information Management with Conformance Monitoring (2034 - 2040)

Efficiency and safety of surface traffic management is increased, with corresponding reduction in environmental impacts, through the use of improved automation support for taxi route planning, electronic exchange of taxi instructions, and automated conformance monitoring of the aircraft to the approved taxi clearance.

A comprehensive view of aggregate traffic flows enables ANSP to project demand; predict, plan, and manage surface movements and generate taxi route clearances for acceptance by the ground controller. The controller can accept and send the taxi route clearance digitally to appropriately equipped aircraft which will decrease frequency congestion on the surface and eliminate hear-back and read-back errors. Automation monitors conformance (position and path) of surface operations and updates the estimated departure clearance times.

OI Benefit

Safety (P): Reduce the likelihood of pilot deviations from a taxi clearance and faster identification of the deviation by the controller decreases the risk of runway incursion and surface collision.

Efficiency (P): Decrease controller workload associated with providing and repeating taxi clearances will increase surface efficiency.

Predictability (S): Improvements in surface efficiency will improve ability to more closely adhere to arrival and departure times.

Increments

Echo
(2031 - 2035)
1

Foxtrot
(2036 - 2040)
1

E [104206-22] Electronic Exchange of Taxi Information (2034 - 2038) (Concept Exploration & Maturation)

F [104206-21] Taxi Conformance Monitoring for Controllers (2036 - 2040) (Concept Exploration & Maturation)

Improved Surface Operations

Increments/Enabling Activities

E [104206-22] Electronic Exchange of Taxi Information (2034 - 2038)

Increment Overview

The electronic exchange of taxi information will enable ground controllers to provide detailed surface movement guidance information to pilots digitally to augment communications currently limited to voice transmission. This capability will support the efficient use of taxiways and ramps and reduce unexpected aircraft deviations on the ground from assigned instructions. Automation supports the generation of the taxi route for the controller to select and send to the aircraft for display on the flight deck.

Increment Status

Concept Exploration & Maturation


Success Criteria


To Be Defined


Implementation Approach


This increment will be accomplished through the exchange of information between the aircraft and FAA tower automation. Specific implementation plans are to be determined.


Benefits


 Access & Equity


 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

Efficiency (S): Increase due to reduced pilot errors or requests for segmented clearances

Safety (P): Ability to electronically recall taxi clearance reduces pilot errors.

System Interactions

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

Primary Systems

TDLS: Tower Data Link System

Avionics Systems

Data Comm Avionics: Data Communication Avionics

Improved Surface Operations

Increments/Enabling Activities

F [104206-21] Taxi Conformance Monitoring for Controllers (2036 - 2040)

Increment Overview

This increment provides automation for assisting ground controllers in monitoring conformance by flight crews to taxi instructions. The automation will issue an alert to the ground controller when the ground surveillance-derived position of a flight is determined to be deviating from the taxi clearance for that flight in the automation.

Increment Status

Concept Exploration & Maturation


Success Criteria

To Be Defined

Implementation Approach

This capability will be provided through upgrades to tower automation. Specific implementation plans are to be determined.

Benefits

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

Efficiency (P): Detection of taxi deviations can prevent difficult to resolve and inefficient surface situations. Workload decrease allows an increase in the number of operations.

Safety (P): Early detection of taxi deviations can prevent and minimize runway incursions

System Interactions

To be determined

To be determined

Improved Surface Operations

OI: [102138] Enhanced Air Traffic Control Tower Services for Airport Operations at Non-Primary Airports (2020 - 2026)

This capability will provide for increased access, capacity and safety at non-primary airports by enabling Air Traffic Control Tower (ATCT) services to be conducted by personnel located at a facility other than a traditional 'brick-and-mortar' ATCT. Use of video situational displays, radio communications and decision support tools would allow controllers to provide ATCT services to the airport and surrounding airspace. This will enable increased throughput at an airport, which may otherwise be operating under one-in one-out rules.

OI Benefit

Capacity (P): Increases capacity of non-controlled airports in IMC conditions by providing ATC services by increasing airport capacity beyond one-in one-out rules.

Safety (P): Enhanced alerting and emergency services beyond normal radar coverage areas.

Access and Equity (P): Increases utilization of existing (airspace and runway) capacity of IFR rated aircraft to non-controlled airports.

Increments

Charlie
(2021 - 2025)

1

C

[102138-01] Establish Air Traffic Control Tower Criteria for Airport Operations at Non-Primary Airports (2020 - 2026)

(Concept Exploration & Maturation)

Improved Surface Operations

Increments/Enabling Activities

C [102138-01] Establish Air Traffic Control Tower Criteria for Airport Operations at Non-Primary Airports (2020 - 2026)

Increment Overview

The FAA will establish criteria for approving non-Federal Remote Tower systems that will be used by personnel located at a facility other than a traditional ‘brick-and-mortar’ tower to provide Air Traffic Control Tower (ATCT) services. This will increase access, capacity, and safety at non-primary airports. Information displays driven by a series of video cameras and/or sensors located on the surface and decision support tools, along with traditional radio communications, will be used by remote tower personnel to provide traffic services. This will enable increased throughput at an airport, which may otherwise be operating under one-in one-out rules.

Increment Status

Concept Exploration & Maturation


Success Criteria

- ✓ 2018 : Identification of certifiable requirement at key site (Leesburg).
- ✓ 2021 : Deemed operationally viable at key site (Leesburg) and/or associated TRACONS and ARTCCs.
- 2025 : System Design Approval (i.e., Certification) of system supporting remote tower at Class D, Visual Flight Rule (VFR) airports.
- 2026 : Operationally Available at a more complex airport Class D, VFR airport.

Implementation Approach

The program will evaluate procedures and technologies, and leverage NextGen surveillance, communications and data sharing technologies as well as optical technologies to provide ATC tower services at airports.

Benefits

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

- Access and Equity (P): Improve access by adding surveillance capability from en route, down to and including, the movement area for these small airports.
- Capacity (P): Providing remote operations at small airports, the throughput, i. e. one-in and one-out operations, will be improved; reducing delays.
- Safety (P): Enables control operations to be conducted with FAA certified controllers located in a remote ground level facility

System Interactions

Non-Federal system acquisitions will be used to support this capability.

To be determined

 External Commitment

 Primary Benefit

 Secondary Benefit

 Operational Available

 Complete

 Access & Equity

 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

 Charlie

 Delta

 Echo

 Foxtrot



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Improved Surface Operations

OI: [104117] Improved Departure Scheduling into Overhead Streams (2015 - 2035)

This operational improvement provides advanced departure flow management scheduling functions to improve overall airport capacity and efficiency. New departure-scheduling automation tools assist traffic managers with improving the flow of traffic at high-density airports. These tools integrate the scheduling of departures from multiple airports into the overhead stream. Advanced capabilities will enable general and business aviation aircraft departing from smaller airports to be scheduled into congested overhead streams through mobile applications.

OI Benefit

- Capacity (P): Capacity is increased through an increased ability to properly schedule departures into the overhead stream.
- Efficiency (S): Through better time based flow management, aircraft are less likely to encounter low altitude vectoring to absorb delay waiting for a slot in the overhead stream.
- Environment (S): More efficient ascent profiles will reduce environmental impacts.
- Predictability (S): Improved planning and management of departure flows improves the predictability of meeting schedule times.

Increments

Echo
(2031 - 2035)
1

E [104117-32] Improved Departure Operations using Mobile Applications (2031 - 2035) (Concept Exploration & Maturation)

Improved Surface Operations

Increments/Enabling Activities

E [104117-32] Improved Departure Operations using Mobile Applications (2031 - 2035)

Increment Overview

General and business aviation and smaller control towers will be able to participate in improved departure scheduling capabilities into en route departure flows using mobile applications, which will increase efficiency and reduce delays. Users will be able to request release into the overhead stream electronically. Smaller towers will be able to use tablet-enabled applications to schedule an approval request for integration of their flights into busy overhead streams in a more-timely manner.

Increment Status

Concept Exploration & Maturation





Success Criteria

To Be Defined

Implementation Approach

This increment will be accomplished through the exchange of information between users' mobile devices with FAA decision support tools. Specific implementation plans are to be determined.

Benefits

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

Efficiency (P): Flight efficiency is increased by enabling tower personnel to manage surface operations to meet self- scheduled, de-conflicted departure times, decreasing taxi and/or wait times prior to departure.

Capacity (S): Makes the best use of availability capacity because timely aircraft departures will increase the probability that these aircraft will seamlessly merge into the overhead stream and not miss assigned slots (early or late).

Predictability (S): The integration of arrival and departure schedules across FAA and user platforms will assist with making more informed operational decisions which will result in better schedule integrity.

System Interactions

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

FMDS (S): To be determined.

SWIM (S): To be determined.

TBFM (S): To be determined.

 External Commitment

 Primary Benefit

 Secondary Benefit

 Operationally Available

 Complete

 Access & Equity

 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

 Charlie

 Delta

 Echo

 Foxtrot






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Improved Surface Operations

Secondary Systems

-  SWIM: System Wide Information Management
-  TBFM: Time Based Flow Management
-  FMDS: Flow Management Data & Services

Improved Surface Operations

OI: [102408] Improved Pilot Awareness on Surface by Providing Location and Alerting Functions (2035 - 2040)

Arrival and departure runway and taxi operations are improved by providing pilots with an enhanced awareness of own ship and other vehicle location on the airport surface. Cockpit traffic displays may incorporate airport moving maps that provide constantly changing views of an airport's runways, taxiways and other obstacles to help pilots identify the aircraft's location on the airport surface. The incorporation of runway status indications and alerting capabilities into the cockpit displays are designed to decrease the likelihood and severity of runway incursions by providing timely runway status indications and alerting. Status indications and alerting also extends to traffic on approach to improve the flight crew's situational awareness of aircraft and vehicle traffic on and in the vicinity of active runways.

Pilots are provided target definition and other information previously provided only to controllers. Both pilots and controllers have a common awareness of vehicle movement items such as location, identification, and speed. Broadcast of aircraft and vehicle position to ground sensors provides a digital depiction of the runway and taxi environment.

Cockpit displays that incorporate moving maps enhanced with decision support system algorithms support surface status indications and alerting (visual, aural) to pilots that may enter into an active runway environment. Air traffic controllers continue to provide air traffic management services to aircraft not equipped with the more advanced capabilities.

OI Benefit

Safety (P): Improved situational awareness and incorporation of runway/taxiway status indications and alerting capabilities into the cockpit displays will decrease the likelihood and severity of runway incursions.

Increments

Echo
(2031 - 2035)

1

E [102408-21] Airport Traffic Situation Awareness with Indications and Alerts (SURF-IA) (2035 - 2040) (Planned)

Improved Surface Operations

Increments/Enabling Activities

E [102408-21] Airport Traffic Situation Awareness with Indications and Alerts (SURF-IA) (2035 - 2040)

Increment Overview

Airport Traffic Situation Awareness with Indications and Alerts (SURF-IA) is intended to reduce runway collision risk and enhance surface safety by providing flight deck indications and alerts of potential or actual traffic conflicts on or near the airport surface. SURF IA adds to the Airport Traffic Situation Awareness application by graphically highlighting traffic or runways on an airport moving map to inform flight crews of detected conditions that may require their attention. Additional auditory attention getting cues are provided for non-normal, hazardous situations to allow flight crews to immediately respond to potential runway safety hazards. Surveillance information will be broadcast at airports with ground surveillance infrastructure to enhance degraded or missing transmissions. The airborne equipment will process valid surveillance information to determine runway safety threats on and close to runways at airports, with and without ground surveillance infrastructure.

Increment Status

Planned

Success Criteria

To Be Defined

Implementation Approach

The avionic upgrades, associated certification and integration with decision support and surveillance systems are to be determined.

Benefits

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

Safety (P): Decreases the likelihood of runway incursions and collisions.

System Interactions

To be determined

To be determined

Improved Surface Operations

OI: [104211] Surface Traffic Management (2016 - 2029)

Departures are sequenced and staged to maintain throughput. Automation generates predicted airport and runway schedules for arrivals and departures providing better demand/capacity balancing. ANSP uses automation to integrate surface movement operations with departure sequencing to ensure departing aircraft meet departure schedule times while optimizing the physical queue in the movement area as well as the ability to save fuel and emissions through the use of virtual departure queues into the movement area. ANSP automation also provides surface sequencing and staging lists for departures and average departure delay (current and predicted). These functions will incorporate traffic management initiatives, arrival demand, and user preferences, as appropriate.

ANSP automated decision support tools integrate departure queues, aircraft flight plan information, runway configuration, expected departure times, and gate assignments. Local collaboration between ANSP and airport stakeholders improves information flow to decision support as well as the ability for aircraft operators to meet their operational and business objectives. The sharing of electronic flight data increases efficiency by providing a method to convey both the strategic and tactical plan to controllers as well as improved amendment and coordination capabilities.

OI Benefit

Flexibility (P): Users will have better information on surface traffic providing more up-to-date flight information that they can use to make more optimal operational decisions.

Efficiency (S): Arrival and departures will be more optimally scheduled resulting in more efficient airport operations.

Predictability (P): The integration of arrival and departure schedules across FAA and user platforms will assist with making more informed operational decision which will result in better schedule integrity.

Environment (S): Reduced fuel and emissions for the use of virtual departure queues, which keeps aircraft at the gate until they are scheduled into the physical departure queue.

Increments







Charlie
(2021 - 2025)








3

C [104211-21] TFDM Scheduler/Sequencer (2024 - 2029) (Development)

C [104211-22] Surface Metering Operations (2024 - 2029) (Development)

C [104211-25] Establish Enhanced Data Exchange with Flight Operators and Airport Operators (2016 - 2023) (Initial Operational Availability)

 External Commitment  Primary Benefit  Secondary Benefit  Operationally Available  Complete 

 Access & Equity  Capacity  Flexibility  Efficiency  Environment  Predictability  Safety **C** Charlie **D** Delta **E** Echo **F** Foxtrot



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Improved Surface Operations

Increments/Enabling Activities

C [104211-21] TFDM Scheduler/Sequencer (2024 - 2029)

Increment Overview

This capability generates predicted airport and runway schedules for arrivals and departures providing better demand/capacity balance and coordination with external systems. These schedules will be determined based on available data including but not limited to: flight operation information, demand information, taxi times, surface parameters, surface surveillance data, and traffic flow management information (e. g., Estimated Departure Clearance Times [EDCTs], departure metering release times, departure airspace constraints, time-based metering arrival data). These predicted schedules will be used to evaluate surface operations for potential capacity imbalances and suggest surface metering programs in order to maintain orderly and effectively managed departure queues balancing surface demand with capacity. The predicted schedules and associated flight-specific status and times will be displayed to ATCT personnel and disseminated to systems external to TFDM, such as TBFM and TFMS, to enable improved collaboration and demand predictions.

Increment Status

Development

Success Criteria

- 2024 : TFDM Scheduler/Sequencer Operationally Available at Build 2 Key Site (CLT). This will satisfy a NAC/NIWG commitment.
- 2025 : Operationally available at 5 additional Configuration A sites. This will satisfy a NAC/NIWG commitment.

















Implementation Approach

TFDM Scheduler/Sequencer will be operationally introduced at CLT Key Site Implementation (Build 2).

Benefits

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

- Efficiency (P): Reduced delay and greater predictability through better compliance to controlled departure times.
- Environment (S): Reduced fuel burn, operating costs, and emissions through shifting delay caused by controlled departure times from the movement area to the gate or non-movement area.
- Predictability (P): Reduced delay and greater predictability through providing more accurate predictions of event and taxi times to TBFM and TFMS.
- Flexibility (S): Users will have better information on surface traffic providing more up-to-date flight information that they can use to make more optimal operational decisions.


-  External Commitment
-  Primary Benefit
-  Secondary Benefit
-  Operational Available
-  Complete
-  Access & Equity
-  Capacity
-  Flexibility
-  Efficiency
-  Environment
-  Predictability
-  Safety
-  Charlie
-  Delta
-  Echo
-  Foxtrot

Improved Surface Operations










- TFDM (P): Provides departure queue and schedule information to aircraft and traffic flow management stakeholders; access to surface metering information is available through TFDM SWIM publication services.
- ASDE-X (S) and ASSC (S): Provides surface surveillance data to TFDM.
- FDIO (S): Provides flight data to TFDM and TFDM sends flight data to FDIO (two-way interface).
- FTI (S): Data sharing to SWIM and timing source for TFDM.
- STARS (S): Provides arrival data to TFDM and is its backup source of flight plan data.
- SWIM (S): TFDM publishes Electronic Flight and Surface Metering Data to SWIM for consumption by users both internal and external to the NAS.
- TBFM (S): Exchanges arrival metering and departure metering data (including call for release times) and provides TMI information (two way interface).
- TDLS (S): Provides flight plan data to TFDM (one-way interface). Pilot acknowledgement of route clearance from Data Comm.
- TFMS (S): Flight Operators provide intent data (e.g. gate data), flight event times, and other CDM data for TFDM scheduling. TFMS will provide TMI, intent data, and flight data to TFDM.

Improved Surface Operations

Primary Systems

 TFDM: Terminal Flight Data Manager

Secondary Systems

-  TBFM: Time Based Flow Management
-  TFMS: Traffic Flow Management System
-  STARS: Standard Terminal Automation Replacement System
-  FTI: FAA Telecommunications Infrastructure
-  SWIM: System Wide Information Management
-  FDIO: Flight Data Input
-  ASSC: Airport Surface Surveillance Capability
-  TDLS: Tower Data Link System
-  ASDE-X: Airport Surface Detection Equipment : Model X

Improved Surface Operations

Increments/Enabling Activities

C [104211-22] Surface Metering Operations (2024 - 2029)

Increment Overview

This increment provides the ability to collaboratively manage the length of departure queues and schedule departure times based on system demand estimates as derived from enhanced data exchange between stakeholders. This will allow operators to hold the aircraft at their preferred location, reducing fuel burn until such time as they move from the virtual queue to meet an assigned departure metering time.

Increment Status

Development

Success Criteria

- 2024 : Operationally Available at Key Site (CLT). This will satisfy a NAC/NIWG commitment.
- 2025 : Operationally available at 5 additional Configuration A sites. This will satisfy a NAC/NIWG commitment.

Implementation Approach

TFDM surface metering capability will be included in the CLT Key Site implementation (Build 2).

Benefits

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

Efficiency (P): Reduce operating costs through shifting delay from the movement area to the gate or non-movement area during times of heavy departure demand.

Flexibility (P): Increased flexibility for airlines in prioritizing flights (in the virtual queue) based on business needs through improved coordination and data sharing between the ATC system and flight operators.

Predictability (P): The integration of arrival and departure schedules across FAA and user platforms will assist with making more informed operational decision which will result in better schedule integrity.

Environment (S): Reduced fuel burn and emissions through shifting delay from the movement area to the gate or non-movement area during times of heavy departure demand.

System Interactions

Improved Surface Operations

- TFDM (P): Provides departure queue and schedule information to aircraft and traffic flow management stakeholders; access to surface metering information is available through TFDM SWIM publication services.
- FDIO (S): Provides flight data to TFDM and TFDM sends flight data to FDIO (two-way interface).
- TBFM (S): Exchanges arrival metering and departure metering data (including call for release times) and provides TMI information (two way interface).
- TFMS (S): Flight Operators provide intent data (e.g. gate data), flight event times, and other CDM data for TFDM scheduling. TFMS will provide TMI, intent data, and flight data to TFDM.
- SWIM (S): TFDM publishes Electronic Flight and Surface Metering Data to SWIM for consumption by users both internal and external to the NAS.
- ASDE-X (S) : Provides surface surveillance data to TFDM.
- ASSC (S): Provides surface surveillance data to TFDM.
- FTI (S): Data sharing to SWIM and timing source for TFDM.
- STARS (S): Provides arrival data to TFDM and is its backup source of flight plan data.
- TDLS (S): Provides flight plan data to TFDM (one-way interface). Pilot acknowledgement of route clearance from Data Comm.

Primary Systems

TFDM: Terminal Flight Data Manager

Secondary Systems

ASSC: Airport Surface Surveillance Capability

SWIM: System Wide Information Management

FDIO: Flight Data Input

STARS: Standard Terminal Automation Replacement System

FTI: FAA Telecommunications Infrastructure

TBFM: Time Based Flow Management

External Commitment

Primary Benefit

Secondary Benefit

Operationally Available

Complete

Access & Equity

Capacity

Flexibility

Efficiency

Environment

Predictability

Safety

Charlie

Delta

Echo

Foxtrot

Federal Aviation Administration

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NextGEN

Improved Surface Operations

Increments/Enabling Activities

C [104211-25] Establish Enhanced Data Exchange with Flight Operators and Airport Operators (2016 - 2023)

Increment Overview

This increment provides architecture, data standards, and policy for FAA to exchange surface data with flight operators and airport operators participating in the CDM process. FAA will make available to Flight and Airport Operators surface flow management data and plans. Flight and Airport Operators will make available updated flight-specific information, including updates of pushback readiness times and parking/gate locations. Policy and procedures will govern how the information is shared, how the data can be used, and the extent of participation by flight operators. Data exchange improves the CDM planning process for airports performing surface scheduling and metering.

Increment Status

Initial Operational Availability

Success Criteria

- 2016 : FAA to receive 11 industry provided data elements from CDM members. This will satisfy a NAC/NIWG commitment.
- 2022 : Surface CDM policies, procedures, and processes to support initial surface data exchange among FOC and Airport Operators will be available at Build 1 Key Site (CLE).

2024 : Flight and Airport Operators will have the ability to exchange surface flow management data and plans with the FAA at Build 2 Key Site (CLT). This will satisfy a NAC/NIWG commitment.

2025 : Operationally available at 5 additional Configuration A sites. This will satisfy a NAC/NIWG commitment.

Implementation Approach

TFMS built capability for AOC/FOC operators to enter new data elements in 2015-2016. Demonstration of this data exchange is under way through the NASA Airspace Technology Demonstration 2 (ATD-2) at CLT. Full functionality will be delivered to CLT via TFDM deployment in 2024. Transition off of ATD-2 functions is currently scheduled for 2024 upon deployment of TFDM to CLT. This is part of TFDM Build 2

Benefits

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

Efficiency (P): Reduced fuel burn and operating costs through departure queue management. Greater ATC productivity through increased exchange of electronic flight data.

Predictability (S): Reduced missed connections through increased opportunity for flight prioritization.

Environment (S): Provides access to fuel-savings and emissions-reducing benefits of surface scheduling/metering

- External Commitment
- Primary Benefit
- Secondary Benefit
- Operationally Available
- Complete
- Access & Equity
- Capacity
- Flexibility
- Efficiency
- Environment
- Predictability
- Safety
- Charlie
- Delta
- Echo
- Foxtrot



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TFMS (P): TFMS will interface with SWIM to exchange data with TFDM.

TFDM (S): TFDM will interface with SWIM to exchange data with TFMS.

SWIM (T): SWIM will provide the infrastructure that will enable TFMS to exchange information with other systems. Also provides infrastructure to provide TFDM data to flight operators and other users.

Primary Systems

TFMS: Traffic Flow Management System

Secondary Systems

TFDM: Terminal Flight Data Manager

Tertiary Systems

SWIM: System Wide Information Management

Improved Surface Operations

OI: [104212] Expansion of Surface Traffic Management (2030 - 2040)

Surface traffic management will be extended to additional sites and new mobile applications will enable increased participation by general and business aviation. The expansion of electronic flight data exchange and surface scheduling to additional sites will enable more optimally synchronized arrival and departure flow schedules including scheduling into the en route environment thereby improving overall NAS demand/capacity balancing. Improved electronic flight data exchange and electronic flight strip implementation increases efficiency by providing a method to convey both the strategic and tactical plan to controllers as well as improved amendment and coordination capabilities. The implementation of mobile applications for clearance delivery and surface collaborative decision making will enable individual flight operators, such as general and business aviation, to more fully participate in surface traffic management thereby improving access, equity, and safety for these operations. These additional flight data elements will become part of the information environment and shared across capabilities in order to evaluate surface operations for potential capacity imbalances and assist with the generation of traffic management solutions to balance demand against available system capacity.

OI Benefit

- Flexibility (P): Users will have better information on surface traffic providing more up-to-date flight information that they can use to make more optimal operational decisions.
- Efficiency (S): Arrival and departures will be more optimally scheduled resulting in more efficient airport operations.
- Predictability (P): The integration of arrival and departure schedules across FAA and user platforms will assist with making more informed operational decision which will result in better schedule integrity.
- Safety (S): Reducing read-back and hear-back errors by providing clearances in a digital form.
- Access & Equity (P): Providing general aviation with the ability to exchange data with the FAA.

Increments

Delta (2026 - 2030)	Echo (2031 - 2035)	Foxtrot (2036 - 2040)
1	2	1
<div>D [104212-28] Expanded Integration of Surface Data (2030 - 2035) (Planned)</div> <div>E [104212-26] Departure Clearances using Mobile Applications (2033 - 2038) (Concept Exploration & Maturation)</div> <div>E [104212-27] Establish Enhanced Data Exchange through Mobile Applications (2033 - 2038) (Concept Exploration & Maturation)</div> <div>F [104212-29] Full Integration of Surface Data (2036 - 2040) (Planned)</div>		

Improved Surface Operations

Increments/Enabling Activities

D [104212-28] Expanded Integration of Surface Data (2030 - 2035)

Increment Overview

The deployment of electronic flight data exchange capabilities to additional sites will enable more optimally synchronized en route, arrival, and departure flow schedules and improve overall NAS demand/capacity balancing. Medium and small hub airports that have important interactions with large hubs, such as proximity or airspace interactions, as well as airports that are experiencing increased demands for service across stakeholder groups, will receive basic surface traffic management capabilities. These capabilities will enable the electronic exchange of flight information with NAS automation systems. Improved electronic flight data exchange and electronic flight strip implementation increases efficiency by providing a method to convey both the strategic and tactical plan to controllers as well as improved amendment and coordination capabilities. The electronic exchange of this information will provide a common surface situational awareness among ATCT personnel, ATC personnel in other FAA facilities, and flight operator/airport authority personnel resulting in more accurate and timely NAS service demand estimates that will improve both tactical and strategic planning.

Increment Status




Planned

Success Criteria

To Be Defined

Implementation Approach


Benefits

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

System Interactions

TFDM (S): TFDM will provide the electronic flight data exchange and surface data capabilities.

Secondary Systems

-  TFDM: Terminal Flight Data Manager

Improved Surface Operations

Increments/Enabling Activities

E [104212-26] Departure Clearances using Mobile Applications (2033 - 2038)

Increment Overview

General and business aviation will be able to use mobile applications to receive a digital message containing their approved pre-departure clearance using mobile applications, which will result in faster flight initiation and improved safety by reducing read-back and hear-back errors. Users will confirm receipt of the departure clearance message with the tower controller.

Increment Status

Concept Exploration & Maturation


Success Criteria


To Be Defined


Implementation Approach


This increment will be accomplished through the exchange of information between users' mobile devices with FAA automation tools. Specific implementation plans are to be determined.


Benefits


 Access & Equity


 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

Efficiency (P): Reducing time associated with exchanging pre-departure clearances over voice.

Safety (S): Reducing read back errors by providing clearances in a digital form.

System Interactions

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


ERAM (S): Potential adaptations necessary to allow additional information to be published, and to fix inconsistencies between voice and digital clearances for route adaptations.

SWIM (T): SWIM will provide a two-way interface between the user and the FAA systems.


TFDM (T): TFDM will send/receive S-CDM data to the mobile apps to participate in surface metering operations


Improved Surface Operations

Secondary Systems

 ERAM: En Route Automation Modernization

Tertiary Systems

 TFDM: Terminal Flight Data Manager

 SWIM: System Wide Information Management

Improved Surface Operations

Increments/Enabling Activities

E [104212-27] Establish Enhanced Data Exchange through Mobile Applications (2033 - 2038)

Increment Overview

Individual flight operators will be able to fully participate in surface collaborative decision making (CDM) using mobile applications. Individual flight operators, such as business and general aviation, will make available updated flight-specific information, including updates of pushback readiness times and parking/gate locations, which will improve the CDM planning process at airports performing surface scheduling and metering. This will enable these operators to more fully participate in surface scheduling and metering.

Increment Status

Concept Exploration & Maturation

Success Criteria

To Be Defined

Implementation Approach

Demonstrating feasibility and benefits through a field test. Capability to be tech transferred to industry and the availability of this capability will be based on industry involvement.

Benefits

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




- Flexibility (P): Provides flexibility to users on identifying opportune time to depart
- Access & Equity (P): Providing general aviation with the ability to exchange data with the FAA.
- Efficiency (S): Arrivals and departures will be more optimally scheduled, resulting in more efficient airport operations at airports general aviation is prominent.
- Predictability (S): The integration of arrival and departure schedules across FAA and user platforms will assist with making more informed operational decisions which will result in better schedule integrity.
- Environment (S): Provides access to fuel-savings benefits of surface scheduling/metering

System Interactions

SWIM (T): A SWIM interface is necessary for a two-way data exchange between the FAA and industry.

Improved Surface Operations

Tertiary Systems

-  TFDM: Terminal Flight Data Manager
-  SWIM: System Wide Information Management
-  TFMS: Traffic Flow Management System

Improved Surface Operations

Increments/Enabling Activities

F [104212-29] Full Integration of Surface Data (2036 - 2040)

Increment Overview

As the NAS transitions to a modern automation architecture and advanced algorithms assist with strategic planning, ubiquitous information will become increasingly important. The ability to exchange electronic flight data from additional sites will improve efficiency for these smaller airports and provide more timely and complete demand estimates that will improve both tactical and strategic planning.

Increment Status






Planned

Success Criteria

To Be Defined

Implementation Approach

Benefits

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

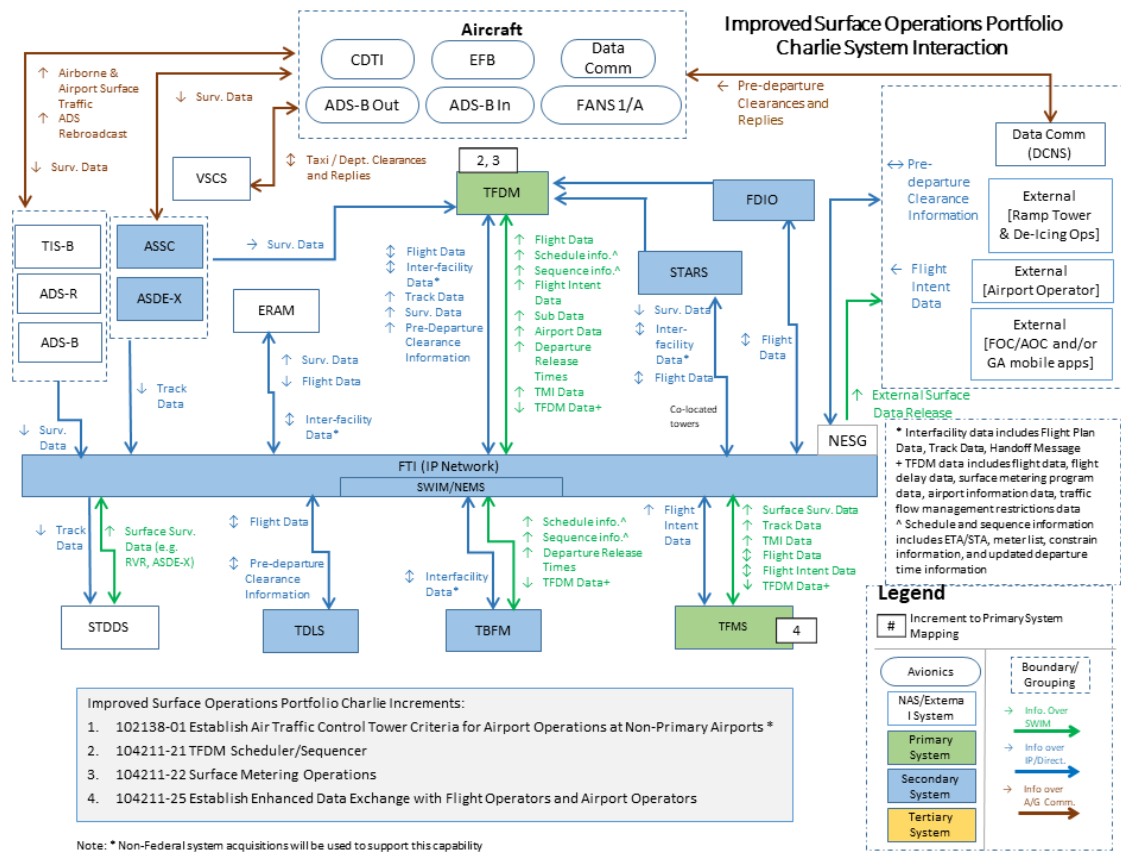
System Interactions

To be determined






Improved Surface Operations

Systems Interactions

The system interactions associated with Improved Surface Operations are depicted in this figure. The increments associated with Improved Runway Safety Situational Awareness provide for improved pilot and controller situational awareness. Ground surveillance is provided by ASDE-X and ASSC, and this picture is shared with external users via an External Surface Data Release infrastructure, including a DDU. Cockpit situational awareness is enhanced by Moving Map with Own-Ship Position and CDTI with TIS-B and ADS-B for Surface. Controller/pilot interactions are conducted via air-ground voice radio and Tower Data Link Services (TDLS) Data Comm.



Improved Surface Operations

Increment	ASDE-X	ASSC	FDIO	FTI	STARS	SWIM	TBFM	TDLS	TFDM	TFMS
 [102138-01] Establish Air Traffic Control Tower Criteria for Airport Operations at Non-Primary Airports										
 [104211-21] TFDM Scheduler/Sequencer	S	S	S	S	S	S	S	S	P	S
 [104211-22] Surface Metering Operations	S	S	S	S	S	S	S	S	P	S
 [104211-25] Establish Enhanced Data Exchange with Flight Operators and Airport Operators 						T			S	P

 Operationally Available

P Primary Systems

 Complete

S Secondary Systems

 In Service System

T Tertiary Systems

 Planned System

A Avionics Systems

 Charlie

2024 Approved Baseline
FOR INTERNAL FAA USE ONLY

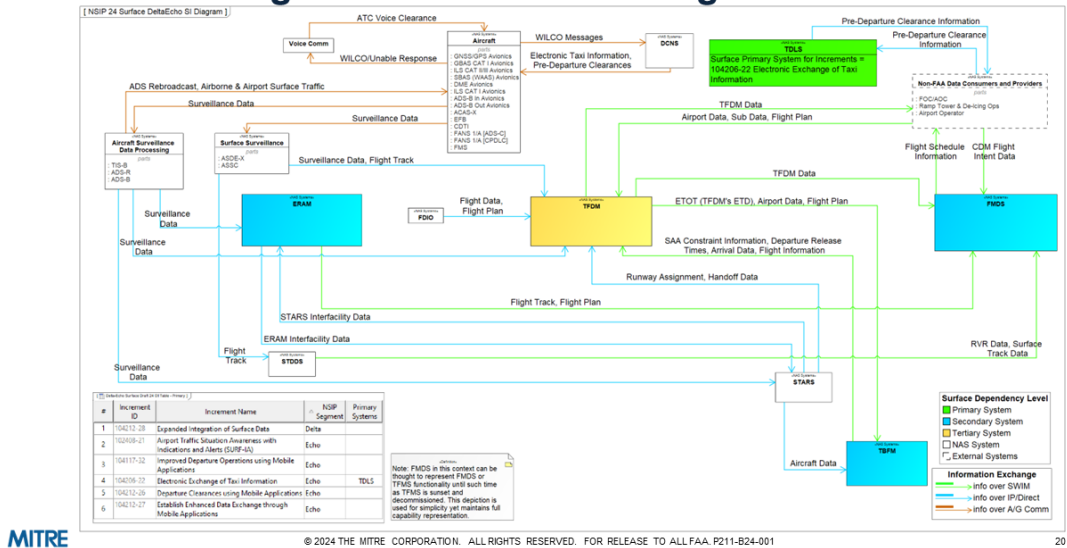


Improved Surface Operations

Systems Interactions

The system interactions associated with Improved Surface Operations are depicted in this figure. The increments associated with Improved Runway Safety Situational Awareness provide for improved pilot and controller situational awareness. Ground surveillance is provided by ASDE-X and ASSC, and this picture is shared with external users via an External Surface Data Release infrastructure, including a DDU. Cockpit situational awareness is enhanced by Moving Map with Own-Ship Position and CDTI with TIS-B and ADS-B for Surface. Controller/pilot interactions are conducted via air-ground voice radio and Tower Data Link Services (TDLS) Data Comm.

Surface SI Diagram – Delta & Echo Segments



Improved Surface Operations

Increment	TFDM
<div><div>D</div><div>[104212-28] Expanded Integration of Surface Data</div></div>	S

 Operationally Available

P Primary Systems

 Complete

S Secondary Systems

 In Service System

T Tertiary Systems

 Planned System

A Avionics Systems

D

 Delta




Improved Surface 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 Segment Alpha 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 increment Situational Awareness and Alerting of Ground Vehicles, AJM-4 is accountable and AAS-300 is responsible for implementation. ARP is responsible for publishing an Advisory Circular for airport purchase/deployment of ADS-B electronics on airport vehicles. For the increment ASDE-X to Additional Airports, AJM-4 is accountable and responsible for implementation. AJM-4 will be supported by AJT-2 in this activity. For the increment Expansion of Surface Surveillance, AJM-4 is accountable and responsible. For the increment Moving Map with Own-Ship Position, AIR-130 is accountable and responsible. AFS-400 also has a responsible role. APO provides support in developing policy regarding incentivization for operators. For the increment CDTI with TIS-B and ADS-B for Surface, AJM-4 is accountable and responsible under the SBS office, including the implementation of TIS-B. AIR-130 and AFS-400 also have responsible roles. APO provides support in developing policy regarding incentivization for operators. For the increment Revised Departure Clearances via Data Comm, AJM-34 is accountable and responsible for implementation, while AJM-21 is responsible for the TDLS integration. AIR-130 and AFS-400 also have responsible roles. AJT-2 is supporting regarding air traffic operations and requirements. APO provides support in developing policy regarding incentivization for operators. AOV is consulted. In the case of the increment External Surface Data Release, there are two phases of implementation and each phase includes several different initiatives. For Phase 1/DDUs, AJM-4 is accountable. Responsible offices are AJM-21 and the SBS Program Office, with support from AJM-22. AOV is consulted. APO provides support in developing an information-sharing policy. For External Data Release Phase 1/Initial Dissemination of Surface Movement Data, AJM-33 is accountable and responsible, with AJM-22 responsible and support from AJM-21. For Provide Initial Surface Management System, PMO Decision Support (AJM-22) is responsible and accountable. The CDM and International Operations (AJR-1) is responsible, and Operations in Terminal and En Route (AJT-2) are supporting, as are AEE and APO.

- 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 Acquisition Program Baseline. To foster a clear line of accountability, two different offices can never be Accountable for the same increment, and Accountability 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 the Accountable 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 Surface Operations

RASCI Matrix	ANG			AOV	APO	AJM			AJT		AFS	AJI			AJV	AAE	APL	ARP	AIR
	B	C5	C7	001	001	22	23	34	2	0	001	1	2	3	0	001	001	001	001
• C [102138-01] Establish Air Traffic Control Tower Criteria for Airport Operations at Non-Primary Airports (2020 - 2026)		A/R	I	C	C				S	R					S				
• C [104211-21] TFDM Scheduler/Sequencer (2024 - 2029) 		S	C		S	A/R			S	S					S	S	S		
• C [104211-22] Surface Metering Operations (2024 - 2029) 		S	C		S	A/R			S	S					S	S	S		
• C [104211-25] Establish Enhanced Data Exchange with Flight Operators and Airport Operators (2016 - 2023) 		S	C		S	A/R			S	S					S	S	S		
• D [104212-28] Expanded Integration of Surface Data (2030 - 2035)																			
• E [102408-21] Airport Traffic Situation Awareness with Indications and Alerts (SURF-IA) (2035 - 2040)	R		A																
• E [104117-32] Improved Departure Operations using Mobile Applications (2031 - 2035)		A/R	C																
• E [104206-22] Electronic Exchange of Taxi Information (2034 - 2038)	R		A																
• E [104212-26] Departure Clearances using Mobile Applications (2033 - 2038)		A/R	C						C		C				C				
• E [104212-27] Establish Enhanced Data Exchange through Mobile Applications (2033 - 2038)		A/R	C																
• F [104206-21] Taxi Conformance Monitoring for Controllers (2036 - 2040)		A/R	C																
• F [104212-29] Full Integration of Surface Data (2036 - 2040)																			

 Operationally Available

 Complete

 External Commitment

C Charlie

D Delta

E Echo

F Foxtrot

Improved Surface Operations

Appendix A

Alpha Increments

Portfolio Overview

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

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

Improved surface operations anticipated benefits are as follows:

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

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

Improved Surface Operations

Portfolio Content Summary Statistics

		Increment Status				
Segment	Total by Segment	Planned	Concept Exploration & Maturation	Development	Initial Operational Availability	Completed
*Alpha (2010 - 2015)	7	0	0	0	0	7
TOTAL	7	0	0	0	0	7
Segment	% by Segment	% by Segment/Increment Status				
*Alpha (2010 - 2015)	100%	0 %	0 %	0 %	0 %	100 %
TOTAL	100%	0 %	0 %	0 %	0 %	100 %

Benefits

Improved Surface Operations

2010	2011	2012	2013	2014	2015
CO: [104209] Initial Surface Traffic Management (2010 - 2016)					
A [104209-16] External Surface Data Release (2010 - 2011) 🚦✅					
A [104209-17] Surface Situational Awareness for Traffic Management (2014 - 2016) 🚦✅					
CO: [102406] Provide Full Surface Situation Information (2011 - 2017)					
A [102406-11] Situational Awareness and Alerting of Ground Vehicles (2011 - 2014) ✅					
A [102406-12] Expansion of Surface Surveillance (2013 - 2017) 🚦✅					
CO: [103208] Improved Runway Safety Situational Awareness for Pilots (2013 - 2016)					
A [103208-11] Moving Map with Own-Ship Position (2010 - 2011) ✅					
A [103208-12] Cockpit Display of Traffic Information (CDTI) with Traffic Information Service Broadcast (TIS-B) and ADS-B for Surface (2010 - 2011) ✅					
CO: [103207] Improved Safety Situational Awareness for Controllers (2012 - 2016)					
A [103207-12] ASDE-X to Additional Airports (2010 - 2011) 🚦✅					

Improved Surface Operations

CO: [104209] Initial Surface Traffic Management (2010 - 2016)

Data from those airports with surface surveillance systems is shared with authorized stakeholders including other NAS domains, other government entities, and non-government operators and entities. This improves coordination and planning throughout the system. This will improve coordination of ATC and TFM actions across several facilities as well as with the aircraft and airport operator stakeholders to improve traffic flows between tower, TRACON, and en route airspace.

CO Benefit

Flexibility (P): Users will have better information on surface traffic providing more up-to-date information that they can use to make more optimal operational decisions.

Efficiency (P): Users will have better information to make more optimal schedule decisions.

Predictability (S): The sharing of surface information across FAA and user platforms will assist with making more informed operational decision which will result in better schedule integrity.

Increments

Alpha
(2010 - 2015)

2

- A [104209-16] External Surface Data Release (2010 - 2011) (Complete)
- A [104209-17] Surface Situational Awareness for Traffic Management (2014 - 2016) (Complete)

Improved Surface Operations

Increments/Enabling Activities

A [104209-16] External Surface Data Release (2010 - 2011)

Increment Overview

The FAA has established a data exchange infrastructure that enables the sharing of surface movement data from selected airports (i.e., those airports equipped with ASDE-X or ASSC and a Data Distribution Unit (DDU)) with authorized stakeholders. The FAA is implementing this data dissemination architecture and is actively sharing surface surveillance data within the movement area with authorized and participating NAS domains, other government entities, and non-government operators and entities. The agency will continue to expand its data sharing architecture to all 44 airports (35 ASDE-X and 9 ASSC) and bolster its ability to reach the entire Collaborative Decision-Making (CDM) community and support future standards and collaborative tools used by the CDM community.

Increment Status

Complete





Success Criteria

- ✔ 2011 : Develop a benefits study on FAA-funded infrastructure to provide surface surveillance in the non-movement area. This will satisfy RTCA TF5 40-AP3.
- ✔ 2011 : Operationally available for ASDE-X airports. (Note: Capability will be expanded to ASSC airports as they become available). This will satisfy RTCA TF5 40-AP5. Operational capability initially available.
- ✔ 2011 : Publish rights and policies. This will satisfy RTCA TF5 40-AP4. This AP is complete.
- ✔ 2013 : Install DDUs at ASDE-X and ASDE-3/ MLAT locations and provide initial data dissemination capability. This will satisfy RTCA TF5 40-AP2.

Implementation Approach

Implementation Approach: The initial infrastructure required for data sharing has been implemented by ATO Program Management in conjunction with Systems Operations. The initial data- sharing infrastructure will be migrating from the present system to TDDS during the Alpha timeframe. This is a change to the underlying data-sharing infrastructure, and will provide equivalent service with future expandability. This change is being coordinated among System Operations Data Release, the SWIM Program, and industry.

Benefits

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

Improved Surface Operations

Capacity (S) Better coordination among the FAA and NAS stakeholders (e.g., flight operators), leading to better NAS response to surface congestion, especially during periods of irregular operations and recovery.

Flexibility (P) - Expanding data sharing architecture to all 44 airports (35 ASDE-X and 9 ASSC) will bolster the ability to reach the entire Collaborative Decision-Making (CDM) community and support future standards and collaborative tools used by the CDM community.

Efficiency (S) - External Surface Data Release supplies surface movement data to external system Users; improving CDM on the surface environment.

System Interactions

External Surface Data Release will interface with ASDE-X (S) and ASSC DDUs to provide surface surveillance data to external users.

STDDS (P): The DDUs are interfaced with a common NAS gateway as the initial data distribution infrastructure, which will be replaced as the distribution architecture migrates to use of STDDS. STDDS will provide the external surface data release for ASDE-X and ASSC DDUs.

This increment will require changes to Airline Operations Center/Flight Operations Center (AOC/FOC) systems to enable this data release.

Primary Systems

ASDE-X: Airport Surface Detection Equipment : Model X

Secondary Systems

STDDS: SWIM Terminal Data Distribution System

ASSC: Airport Surface Surveillance Capability

Improved Surface Operations

Increments/Enabling Activities

A [104209-17] Surface Situational Awareness for Traffic Management (2014 - 2016)

Increment Overview

This capability will provide improved knowledge of surface congestion, surface situational awareness, and should improve coordination of information across FAA facilities outside of the Air Traffic Control Tower (ATCT), to include the Traffic Management Unit for the TRACON, ARTCC, or ATCSCC. This will improve coordination of ATC and TFM actions across several facilities as well as with the aircraft and airport operator stakeholders to improve traffic flows between tower, TRACON, and en route airspace. It will include a display of the current surface situation (e.g., using ASDE-X data).

Increment Status

Complete



Success Criteria

- ✓ 2014 : Surface Visualization Tool (SVT) operationally available SCT and NCT. This has satisfied a NAC/NIWG Commitment.
- ✓ 2015 : SWIM Surface Visualization Tool (SVT) operationally available at C90, I90, SDF, A90, N90, PCT, ZNY, ZLA, and ATCSCC. This has satisfied a NAC/NIWG Commitment.
- ✓ 2017 : Advanced Electronic Flight Strips (AEFS) operationally available at CLT. This will satisfy a NAC/NIWG Commitment.

Implementation Approach















TFDM Program Office will support the implementation of the early implementation strategies.

Benefits

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

- Capacity (P) - This will improve coordination of ATC and TFM actions across several facilities as well as with the aircraft and airport operator stakeholders to improve traffic flows between tower, TRACON, and en route airspace
- Efficiency (P)- Sharing surface situation information with the TMUs in the TRACON, ARTCC, and ATCSCC will improve awareness of surface congestion at major hub airports, greatly streamlining the coordination of corrective action, and improving the resilience of the system.
- Environment (S) - Reduced congestion and improved traffic flow will reduce fuel burn and lower emissions
- Predictability (S) - Improved automation of scheduling events will enhance surface awareness and assist in scheduling adjustment.

System Interactions

-  External Commitment
-  Primary Benefit
-  Secondary Benefit
-  Operational Available
-  Complete
- 
-  Access & Equity
-  Capacity
-  Flexibility
-  Efficiency
-  Environment
-  Predictability
-  Safety
-  Alpha

Improved Surface Operations

TFDM (P) Early Implementation - Advanced Electronic Flight Strip (AEFS) (a prototype electronic system) and SWIMSurface Visualization Tool (SVT) -(A prototype surface situational awareness capability) will beprovided via the TFDM baseline. It will use surface surveillance data output fromASDE-X and ASSC obtained via the SWIMinfrastructure (completed increment). It would also obtain flight data via the AircraftSituation Display for Industry (ASDI). These prototype systems will be used to support an operational insight into the final TFDM requirements and will be removed upon the TFDM implementation.

ASDE-X Airport Surface Detection Equipment: Model X (S) - ASDE-X provides surface surveillance information to the surface situational awareness capability. The ASDI provides real-time air traffic data to the surface situational awareness capability.

TFMS Traffic Flow Management System (S) - Surface data is shared with internal (and possibly external) consumers outside of airport areas using FTI resources.

ASSC Airport Surface Surveillance Capability (S) - ASSC provides surface surveillance information to the surface situational awareness capability.The DDU allows distribution of surface data from ASDE-X and ASSC systems to the surface situational awareness capability.

SWIM System Wide Information Management (T) - DDU's interfaced with the NESG as the initial data distribution infrastructure will be replaced later in the Alpha timeframe by STDDS.

Primary Systems

- TFDM: Terminal Flight Data Manager

Secondary Systems

- TFMS: Traffic Flow Management System
- AEFS: Advanced Electronic Flight Strip
- ASDE-X: Airport Surface Detection Equipment : Model X
- ASSC: Airport Surface Surveillance Capability

Tertiary Systems

- SWIM: System Wide Information Management

Improved Surface Operations

CO: [102406] Provide Full Surface Situation Information (2011 - 2017)

Automated broadcast of aircraft and vehicle position to ground and aircraft sensors/receivers provides a digital display of the airport environment. Aircraft and vehicles are identified and tracked to provide a full comprehensive picture of the surface environment to ANSP, equipped aircraft, and flight operations centers (FOCs). Surface Situation Information will complement visual observation of the airport surface. Decision support system algorithms will use enhanced target data to support identification and alerting of those aircraft at risk of runway incursion.

In addition, non-ANSP functions, such as airport (movement and non-movement areas) and security operations will benefit from information exchange and situational awareness of aircraft and equipped vehicle surface position and movement.

CO Benefit

Safety (P): Increased awareness and display of the airport surface environment increases situational awareness and decreases the likelihood of a surface collision or runway incursion.

Efficiency (S): Improved situational awareness of the airport environment may contribute to increasing efficiency of ground operations.

Increments

Alpha
(2010 - 2015)

2

A [102406-11] Situational Awareness and Alerting of Ground Vehicles (2011 - 2014) (Complete)

A [102406-12] Expansion of Surface Surveillance (2013 - 2017) (Complete)

Improved Surface Operations

Increments/Enabling Activities

A [102406-11] Situational Awareness and Alerting of Ground Vehicles (2011 - 2014)

Increment Overview

FAA certified ADS-B Out equipment is made available for airport vehicles that regularly operate in the movement area. Equipped vehicle target (position and call sign) data is displayed on the surface surveillance equipment in the ATCT (at the 44 airports with ASDE-X or ASSC), airport operations centers, and in aircraft with ADS-B In displays. The vehicle and ASDE-X/ASSC equipment support runway incursion indication and alerting capabilities, so that controllers would be warned of a predicted conflict involving a vehicle.

Increment Status

Complete

Success Criteria

- ✔ 2014 : Establish FAA infrastructure that supports airport vehicle surveillance.
- ✔ 2014 : Ground vehicle equipment and infrastructure are made available for airport procurement to support surveillance capability at any airport in the NAS.

Implementation Approach

In order to achieve the maximum efficiency and safety benefits of ADS-B on the airport surface, surface vehicles as well as aircraft will be equipped with the ability to transmit ADS-B messages. At airports with an existing or planned surface surveillance capability (i.e., ASDE-X or ASSC), this data can be incorporated into the surveillance infrastructure to enhance surface safety and situational awareness for both controllers and pilots. The SBS Program Office, working with Massport at Boston (BOS), has successfully established a “first article” capability for electronics, for ground support vehicles operating in the designated airport movement area. These electronics transmit an ADS-B squitter, either on the 1090ES link or the 978 MHz/UAT link. A follow-on capability was established at Chicago O’Hare (ORD), Denver (DEN) and other airports as driven by the interest of the airport authority at each location. Guidance material has been published for voluntary implementation by other airport operators.

Benefits

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

Safety (P) - This increment will allow ADS-B Out-equipped vehicles to be visible to ASDE-X and ASSC surveillance systems and to be depicted as surface traffic on surface maps for both ATCT and suitably equipped aircraft operators, thus providing enhanced situational awareness and safety

System Interactions

 External Commitment

 Primary Benefit

 Secondary Benefit

 Operationally Available

 Complete

 Access & Equity

 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

 Alpha



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Improved Surface Operations

Site will have either ASSC or ASDE-X. Whichever system is at the site will be the Primary System for this increment.

ASSC (P): ASSC collects surveillance information from equipped surface vehicles in terminal areas to enable a surface situational awareness picture to be formed.

ASDE-X (P): ASDE-X collects surveillance information from equipped surface vehicles in terminal areas to enable a surface situational awareness picture to be formed.

ADS-B (S): ADS-B is an enabler system for surface situational awareness and alerting.

TIS-B (S): TIS-B allows aircraft with ADS-B In and CDTI to form a situational awareness picture of nearby aircraft and equipped surface vehicles.

Electronic Flight Bag (EFB) (A)

Primary Systems

- ASDE-X: Airport Surface Detection Equipment : Model X
- ASSC: Airport Surface Surveillance Capability

Secondary Systems

- TIS-B: Traffic Information Service - Broadcast
- ADS-B: Automatic Dependent Surveillance - Broadcast

Avionics Systems

- EFB: Electronic Flight Bag

Improved Surface Operations

Increments/Enabling Activities

A [102406-12] Expansion of Surface Surveillance (2013 - 2017)

Increment Overview

This capability improves safety by providing controllers with additional information for reducing runway incursions. Situational awareness is improved by utilizing target positions of all transponder-equipped aircraft and ADS-B Out ground vehicles on the airport surface movement area. It also displays aircraft flying within the immediate area of the airport. Eight airports that have ASDE-3/AMASS are planned to be upgraded to ASSC with inputs from multilateration and ADS-B sensors.

Increment Status

Complete



Success Criteria

- ✓ 2016 : Operational at Initial site SFO. This will satisfy a NAC/NIWG Commitment.
- ✓ 2017 : Operationally Available at CLE.
- ✓ 2018 : Operationally Available at CVG.
- ✓ 2019 : Operationally Available at PIT, MCI, PDX, and MSY.
- ✓ 2020 : Operationally Available at ANC.

Implementation Approach

There are nine ASDE-3 locations that did not meet the business case for ASDE-X. It was initially determined, following a safety study, to install multilateration (MLAT) and ADS-B at these nine locations and remove the surface radar. The first key site for ASSC was San Francisco (SFO) in 2016. In February 2016, the JRC approved a strategy to integrate legacy surface radars with ASSC to retain a non-cooperative surveillance capability, mitigating a concern that arose during safety studies prior to deployment at SFO. Implementation through the approved strategy will continue to the remaining sites except ADW. ASSC will provide improved surveillance service that is comparable to service provided by ASDE-X. Data architecture will be established via SWIM. ADW is undergoing safety studies to be re-added to the ASSC baseline without MLAT.















Benefits

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

Efficiency (S) -These systems also provide a foundation for surface efficiency capabilities. This surface surveillance data is intended to be shared with multiple stakeholders via the External Surface Data Release capability.

Safety (P) -Provides enhanced surface surveillance with flight identification information. Expected to improve safety through increased awareness of surface traffic position for ATC.

System Interactions

-  External Commitment
-  Primary Benefit
-  Secondary Benefit
-  Operational Availability
-  Complete
- 
-  Access & Equity
-  Capacity
-  Flexibility
-  Efficiency
-  Environment
-  Predictability
-  Safety
-  Alpha



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Improved Surface Operations

- ASSC (P):Multilateration surface surveillance is expanded to eight additional airports.
- ADS-B (S):ADS-B is an enabler system for the expansion of surface surveillance.
- TIS-B (S):TIS-B allows aircraft with ADS-B In and CDTI to form a situational awareness picture of nearby aircraft and equipped surface vehicles.
- RWSL (S): Integrates airport surface surveillance data to determine vehicle and aircraft location and trajectory (tracks). Automation provides visual signals to pilots and vehicle operators indicating go/no go runway conditions. This interaction is only applicable to SFO.
- STDDS (S):STDDS enables distribution of surface data from ASSC systems deployed at airports. The data distributed by STDDS allows surface situational awareness information to be made available to external consumers in the aviation community.
- SWIM (T): Receives surface surveillance data for dissemination from ASSC via STDDS.
- ADS-B Out Avionics (A): Provides aircraft/vehicle position/target data.
- ADS-B In Avionics (A): Helps provide situational awareness by synthesizing TIS-B data, so tower controllers can see the nearby aircraft and surface vehicles.

Primary Systems

- ASSC: Airport Surface Surveillance Capability

Secondary Systems

- RWSL: Runway Status Lights
- STDDS: SWIM Terminal Data Distribution System
- ADS-B: Automatic Dependent Surveillance - Broadcast
- TIS-B: Traffic Information Service - Broadcast

Tertiary Systems

- SWIM: System Wide Information Management

Avionics Systems

- ADS-B In Avionics: Automatic Dependent Surveillance - Broadcast In Avionics
- ADS-B Out Avionics: Automatic Dependent Surveillance - Broadcast Out Avionics

Improved Surface Operations

CO: [103208] Improved Runway Safety Situational Awareness for Pilots (2013 - 2016)

Runway safety operations are improved by providing pilots with improved awareness of their location on the airport surface as well as runway incursion alerting capabilities. To help minimize pilot disorientation on the airport surface, a surface moving map display with ownship position will be available. Both ground-based (e.g., RWSL) and cockpit-based runway incursion alerting capabilities will also be available to alert pilots when it's unsafe to enter the runway. Additional enhancements may include cockpit display of surface traffic (e.g., vehicles and aircraft) and the use of a cockpit display that depicts the runway environment and displays traffic from the surface up to approximately 1,500 feet above ground level on final approach and will be used by the flight crew to help determine runway occupancy.

CO Benefit


Safety (P): Improved runway situational awareness for pilots reduces the risk of runway incursions and increases safety on the airport surface.


Increments

Alpha
(2010 - 2015)

2

- A

[103208-11] Moving Map with Own-Ship Position (2010 - 2011)  (Complete)
- A

[103208-12] Cockpit Display of Traffic Information (CDTI) with Traffic Information Service Broadcast (TIS-B) and ADS-B for Surface (2010 - 2011)  (Complete)

Improved Surface Operations

Increments/Enabling Activities

A [103208-11] Moving Map with Own-Ship Position (2010 - 2011)

Increment Overview

Cockpit displays, for instance Electronic Flight Bags (EFBs), may incorporate airport moving map displays that provide constantly changing views of an airport’s runways, taxiways, and structures to help pilots identify the airplane’s location on the surface. The Global Positioning System (GPS) provides the capability to depict an accurate own-ship position on the airport surface as the aircraft moves. With moving map displays and own-ship positions, pilots will see exactly where their aircraft are on the airfield, thus increasing situational awareness and compliance with the assigned taxi clearances.

Increment Status

Complete

Success Criteria

✔ 2011 : Operationally available for suitably equipped operators. Operational capability initially available; increment has achieved its success criteria.

Implementation Approach

Operationally available via publication of advisory circular.

Benefits

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

Safety (P) - Primarily proves a safety benefit for pilots. Increases pilots' awareness of their own position and movement on the airport surface, and the location of surrounding traffic, thus enhancing airport surface safety. The benefit is enabled through ground infrastructure, data distribution (TIS-B), and direct aircraft-to-aircraft flight deck capabilities.

System Interactions

Electronic Flight Bags (EFBs), incorporates airport moving map displays that provide constantly changing views of an airport's runways, taxiways, and structures to help pilots identify the airplane's location on the surface.

Primary Systems

-  EFB: Electronic Flight Bag

Improved Surface Operations

Increments/Enabling Activities

A [103208-12] Cockpit Display of Traffic Information (CDTI) with Traffic Information Service Broadcast (TIS-B) and ADS-B for Surface (2010 - 2011)

Increment Overview

Surface traffic information is available via TIS-B for moving-map displays, and available from aircraft operating with approved ADS-B capability. Using TIS-B and ADS-B, surface CDTI will provide a graphical depiction of ground traffic, and qualifying air traffic within close proximity to the runway, which will improve situational awareness for a variety of operations. Surveillance information from ASDE-X (and ASSC when available) will be broadcast in TIS-B and ADS-Rebroadcast (ADS-R) format to be received by suitably equipped aircraft. Note that TIS-B and ADS-R information will be available only at ASDE-X and ASSC airports.

Increment Status

Complete

Success Criteria

✔ 2011 : Operationally available for suitably equipped operators. Operational capability initially available; increment has achieved its success criteria.

Implementation Approach

Operational capability available via suitably equipped aircraft.

Benefits

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

Safety (P) - Provides a safety benefit for pilots. Increases pilots' awareness of their own position and movement on the airport surface, and the location of surrounding traffic, thus enhancing airport surface safety. The benefit is enabled through ground infrastructure, data distribution (TIS-B), and direct aircraft-to-aircraft flight deck capabilities.

System Interactions

Site will have either TIS-B or CDTI. Whichever system is at the site will be the Primary System for this increment.

TIS-B (P) for moving-map displays; using TIS-B and ADS-B(S),

CDTI(P) will provide a graphical depiction of ground traffic, and qualifying air traffic within close proximity to the runway. Surveillance information from ASDE-X (and ASSC when available) will be broadcast in TIS-B and ADS-Rebroadcast (ADS-R) format to be received by suitably equipped aircraft.

 External Commitment

 Primary Benefit

 Secondary Benefit

 Operationally Available

 Complete

 Access & Equity

 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

 Alpha



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Improved Surface Operations

Primary Systems

- CDTI: Cockpit Display of Traffic Information Avionics
- TIS-B: Traffic Information Service - Broadcast

Avionics Systems

- ADS-R: Automatic Dependent Surveillance Rebroadcast

Improved Surface Operations

CO: [103207] Improved Safety Situational Awareness for Controllers (2012 - 2016)

At large airports, current controller tools provide surface displays and can alert controllers when aircraft taxi into areas where a runway incursion could result. Additional ground-based capabilities will be developed to improve runway safety that include expansion of runway surveillance technology (i.e., ASDE-X) to additional airports, deployment of low cost surveillance for medium-sized airports , improved runway markings, and initial controller taxi conformance monitoring capabilities. These ground-based tools will provide a range of capabilities to help improve runway safety for medium- to large-sized airports.

CO Benefit

Safety (P): Improved controller situational awareness increases safety on the airport surface.

Increments

Alpha
(2010 - 2015)

1

A [103207-12] ASDE-X to Additional Airports (2010 - 2011)  (Complete)

Improved Surface Operations

Increments/Enabling Activities

A [103207-12] ASDE-X to Additional Airports (2010 - 2011)

Increment Overview

This increment provides for the completion of programmed ASDE-X installations at 35 airports and enables ATC to detect potential runway conflicts by providing detailed coverage of movement on runways and taxiways. By collecting data from a variety of sources, ASDE-X is able to track surface traffic operating in the airport movement area and obtain identification information from vehicle and aircraft transponders.

The ASDE-X data comes from surface movement radar located on the ATCT or remote tower, MLAT sensors, ADS-B sensors, the terminal automation system, and aircraft transponders. By fusing the data from these sources, ASDE-X is able to determine the position and identification of aircraft and transponder-equipped vehicles on the airport movement area, as well as aircraft flying within five miles of the airport.

Controllers in the tower see this information presented as a color display of aircraft and vehicle positions overlaid on a map of the airport's runways, taxiways, and approach corridors. The system creates a real-time map of the airport movement area that controllers can use to spot potential collisions. This technology is especially helpful to controllers at night or in bad weather when visibility is poor.

ASDE-X Safety Logic (AXSL) is an enhancement to the situational awareness provided to air traffic controllers by ASDE-X. AXSL uses surveillance information from ASDE-X to determine if the current or projected positions and movements of aircraft or vehicles that are being tracked present a potential collision situation. Visual and audible alerts are provided to the controllers that include critical information about the targets, such as aircraft identification and where aircraft and vehicles are on the surface.

ASDE-X has been made operational at all sites; this increment has achieved its success criteria.

Increment Status

Complete

Success Criteria

✔ 2012 : Operationally available at 35 scheduled airports. This will partially satisfy RTCA TF5 40-AP5. Operational capability available; this increment has achieved its success criteria.

Implementation Approach

Operational capability deployed at all 35 selected airports.

Benefits

 Access & Equity

 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

 External Commitment

 Primary Benefit

 Secondary Benefit

 Operationally Available

 Complete



 Access & Equity

 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

 Alpha

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Improved Surface Operations

- Efficiency (S) - These systems also provide a foundation for surface efficiency capabilities. This surface surveillance data is intended to be shared with multiple stakeholders via the External Surface Data Release capability.
- Safety (P) - Provides surface surveillance with flight identification information at 44 airports (35 ASDE-X and 9 ASSC). Expected to improve safety through increased awareness of surface traffic position for ATC.

System Interactions

Surface traffic information is available via TIS-B (P). Using TIS-B and ADS-B, surface CDTI will provide a graphical depiction of ground traffic, and qualifying air traffic within close proximity to the runway, which will improve situational awareness for a variety of operation.

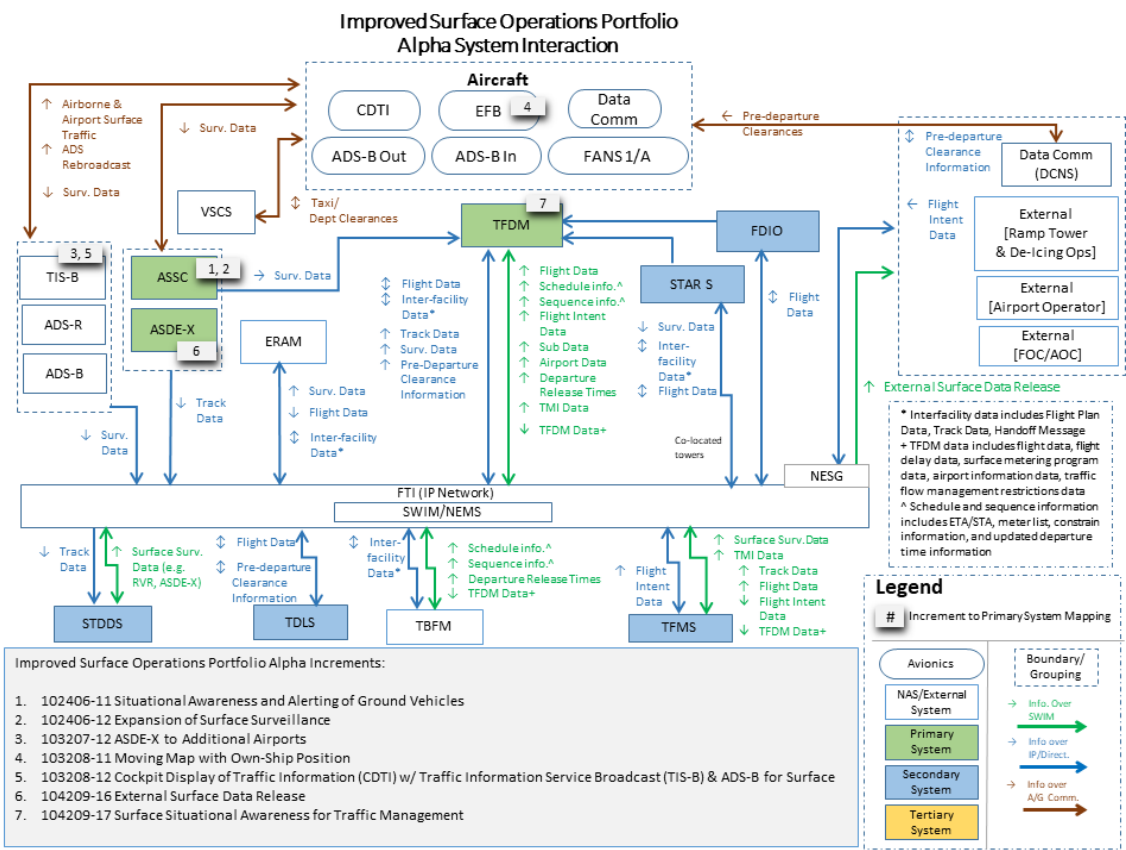
Primary Systems

TIS-B: Traffic Information Service - Broadcast

Improved Surface Operations

Systems Interactions

The system interactions associated with Improved Surface Operations are depicted in this figure. The increments associated with Improved Runway Safety Situational Awareness provide for improved pilot and controller situational awareness. Ground surveillance is provided by ASDE-X and ASSC, and this picture is shared with external users via an External Surface Data Release infrastructure, including a DDU. Cockpit situational awareness is enhanced by Moving Map with Own-Ship Position and CDTI with TIS-B and ADS-B for Surface. Controller/pilot interactions are conducted via air-ground voice radio and Tower Data Link Services (TDLS) Data Comm.



Improved Surface Operations

Increment	ADS-B	ADS-B In Avionics	ADS-B Out Avionics	ADS-R	AEFS	ASDE-X	ASSC	CDTI	EFB	RWSL	STDDS	SWIM	TFDM	TFMS	TIS-B
<div><div>A</div>[102406-11] Situational Awareness and Alerting of Ground Vehicles <div>✓</div></div>	S					P	P		A						S
<div><div>A</div>[102406-12] Expansion of Surface Surveillance <div>✓</div></div>	S	A	A				P			S	S	T			S
<div><div>A</div>[103207-12] ASDE-X to Additional Airports <div>✓</div></div>															P
<div><div>A</div>[103208-11] Moving Map with Own-Ship Position <div>✓</div></div>									P						
<div><div>A</div>[103208-12] Cockpit Display of Traffic Information (CDTI) with Traffic Information Service Broadcast (TIS-B) and ADS-B for Surface <div>✓</div></div>				A				P							P
<div><div>A</div>[104209-16] External Surface Data Release <div>✓</div></div>						P	S				S				
<div><div>A</div>[104209-17] Surface Situational Awareness for Traffic Management <div>✓</div></div>					S	S	S					T	P	S	

Operationally Available

P Primary Systems

Complete

S Secondary Systems

In Service System

T Tertiary Systems

Planned System

A Avionics Systems

A Alpha



Improved Surface 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 Segment Alpha 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 increment Situational Awareness and Alerting of Ground Vehicles, AJM-4 is accountable and AAS-300 is responsible for implementation. ARP is responsible for publishing an Advisory Circular for airport purchase/deployment of ADS-B electronics on airport vehicles. For the increment ASDE-X to Additional Airports, AJM-4 is accountable and responsible for implementation. AJM-4 will be supported by AJT-2 in this activity. For the increment Expansion of Surface Surveillance, AJM-4 is accountable and responsible. For the increment Moving Map with Own-Ship Position, AIR-130 is accountable and responsible. AFS-400 also has a responsible role. APO provides support in developing policy regarding incentivization for operators. For the increment CDTI with TIS-B and ADS-B for Surface, AJM-4 is accountable and responsible under the SBS office, including the implementation of TIS-B. AIR-130 and AFS-400 also have responsible roles. APO provides support in developing policy regarding incentivization for operators. For the increment Revised Departure Clearances via Data Comm, AJM-34 is accountable and responsible for implementation, while AJM-21 is responsible for the TDLS integration. AIR-130 and AFS-400 also have responsible roles. AJT-2 is supporting regarding air traffic operations and requirements. APO provides support in developing policy regarding incentivization for operators. AOV is consulted. In the case of the increment External Surface Data Release, there are two phases of implementation and each phase includes several different initiatives. For Phase 1/DDUs, AJM-4 is accountable. Responsible offices are AJM-21 and the SBS Program Office, with support from AJM-22. AOV is consulted. APO provides support in developing an information-sharing policy. For External Data Release Phase 1/Initial Dissemination of Surface Movement Data, AJM-33 is accountable and responsible, with AJM-22 responsible and support from AJM-21. For Provide Initial Surface Management System, PMO Decision Support (AJM-22) is responsible and accountable. The CDM and International Operations (AJR-1) is responsible, and Operations in Terminal and En Route (AJT-2) are supporting, as are AEE and APO.

- 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 Acquisition Program Baseline. To foster a clear line of accountability, two different offices can never be Accountable for the same increment, and Accountability 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 the Accountable 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.

 Operationally Available

 Complete

 External Commitment

A Alpha



Improved Surface Operations

RASCI Matrix	ANG			AOV	APO	AJM			AJT		AFS	AJI			AJV	AAE	APL	ARP	AIR
	B	C5	C7	001	001	22	23	34	2	0	001	1	2	3	0	001	001	001	001
• A [102406-11] Situational Awareness and Alerting of Ground Vehicles (2011 - 2014)			C				A/R											R	
• A [102406-12] Expansion of Surface Surveillance (2013 - 2017)			C				A/R					S	S	S					
• A [103207-12] ASDE-X to Additional Airports (2010 - 2011)			C				A/R		S			S	S	S					
• A [103208-11] Moving Map with Own-Ship Position (2010 - 2011)			C		S						R	S	S	S					A/R
• A [103208-12] Cockpit Display of Traffic Information (CDTI) with Traffic Information Service Broadcast (TIS-B) and ADS-B for Surface (2010 - 2011)			C		S		A/R				R	S	S	S					R
• A [104209-16] External Surface Data Release (2010 - 2011)			C	C	S	S	A					S	S	S					
• A [104209-17] Surface Situational Awareness for Traffic Management (2014 - 2016)			C		S		A/R		S			S	S	S		S			

Improved Surface Operations

Appendix B

Bravo Increments

Portfolio Overview

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

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

Improved surface operations anticipated benefits are as follows:

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

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

Improved Surface Operations

Portfolio Content Summary Statistics

		Increment Status				
Segment	Total by Segment	Planned	Concept Exploration & Maturation	Development	Initial Operational Availability	Completed
*Bravo (2016 - 2020)	2	0	0	0	1	1
TOTAL	2	0	0	0	1	1
Segment	% by Segment	% by Segment/Increment Status				
*Bravo (2016 - 2020)	100%	0 %	0 %	0 %	50 %	50 %
TOTAL	100%	0 %	0 %	0 %	50 %	50 %

Improved Surface Operations

Operational Improvements/Current Operations & Increments

Benefits

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

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



OI: [104211] Surface Traffic Management (2016 - 2029)

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



External Commitment

Primary Benefit

Secondary Benefit

Operationally Available

Complete ✓

Access & Equity

Capacity

Flexibility

Efficiency

Environment

Predictability

Safety

Bravo

Improved Surface Operations

2016	2017	2018	2019	2020
CO: [104208] Enhanced Departure Flow Operations (2016 - 2019)				
B [104208-12] Revised Departure Clearance via Data Comm (2016 - 2019) ✓				
OI: [104211] Surface Traffic Management (2016 - 2029)				
B [104211-23] Improved Electronic Flight Data Exchange (2019 - 2020) 📶👉				

Planned

OI

Concept Exploration & Maturation

CO

Development

COE/CBTE

Initial Operation Available ✓

Bravo

Complete ✓

External Commitment



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Improved Surface Operations

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

This operational improvement increases efficiencies of departure operations through the improved ability to quickly revise departure clearances in the event that changing weather, winds or system constraints requires amendments to the cleared route pre-departure. This ability will also reduce the risk of airport gridlock that can occur when arrivals continue to land while departures are delayed waiting for revised departure clearances.

Traffic managers will have the ability to create route amendments and send the updated flight data to air traffic controllers for clearance delivery to affected flights. The tower controller will issue the reroute clearance orally to the pilot. With the implementation of data communications, revised departure clearances will be more quickly issued through the ability for air traffic controllers to automatically send revised clearances electronically to equipped aircraft.

CO Benefit

Efficiency (P): Faster execution of revised departure clearances increases airport efficiency and reduces the risk of airport gridlock when revised departure clearances are needed.

Predictability (P): Faster execution of revised departure clearances results in a decrease in departure delays that result when revised departure clearances need to be issued due to changing conditions.

Safety (S): Automated exchange of revised departure clearances between air traffic control systems and the cockpit eliminates manual entry of reroutes, reduces human errors, and improves communication accuracy (i.e., reduced read/hear back errors, reduced loss of communications events) thereby increasing safety.

Increments

Bravo
(2016 - 2020)

1

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

Improved Surface Operations

Increments/Enabling Activities

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

Increment Overview

This increment allows the FAA to rapidly issue departure clearance revisions, due to weather or other airspace constraints, to affected aircraft equipped with Data Comm. Using Data Comm for this capability has both safety and efficiency benefits over the current voice-based method of communications between ATC and the pilot.

Increment Status

Complete

Success Criteria

- ✓ 2016 : Operationally available at key site (SLC).
- ✓ 2019 : Deployment and operational availability at Southwest Florida International Airport (RSW), John Glenn Columbus International Airport (CMH), Charleston International Airport (CHS), Buffalo-Niagara International Airport (BUF), Reno-Tahoe International Airport (RNO), Joint Base Andrews, and Van Nuys Airport (VNY). These locations were chosen with industry’s input and are scheduled to be completed by Q3 CY2019.

Implementation Approach

Strategy is to deploy services incrementally with implementation of basic services at airport towers initially, leveraging existing equipage, and delivering ground system infrastructure for future services (i.e., en route) with initial deployment. Segment 1 Phase 1 includes Departure Clearance (DCL) service in the tower environment, and will be implemented beginning in FY 2016.

Benefits

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

Flexibility (P): Improve recovery from service disruptions, mitigate propagated delay, improve schedule reliability, and enable NextGen capabilities.

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

System Interactions

Improved Surface Operations

TDLS (P): TDLS will require functional and interface modifications to receive revised departure clearances from ERAM and support delivery to equipped aircraft via the NAS Enterprise Security Gateway (NESG) and Data Comm Network Service (DCNS)

ERAM (S): ERAM will require functional and interface modifications to enable revised departure clearances to be generated and sent from en route automation to TDLS.

DCNS (S): DCNS receives revised departure clearances from TDLS and sends to participating aircraft on the surface

FTI (T): FTI provides network transport and NESG services for ground communication between ERAM, TDLS, and DCNS

FANS 1 (A): Avionics system which provides direct data link communication between the pilot and the air traffic controller. Communications include air traffic control clearances, pilot requests and position reporting.

Data Communications Avionics (A)

Primary Systems

TDLS: Tower Data Link System

Secondary Systems

DCNS: Data Communications Network Service

ERAM: En Route Automation Modernization

Avionics Systems

Data Comm Avionics: Data Communication Avionics

FANS 1/A: Future Air Navigation System 1/A

Improved Surface Operations

OI: [104211] Surface Traffic Management (2016 - 2029)

Departures are sequenced and staged to maintain throughput. Automation generates predicted airport and runway schedules for arrivals and departures providing better demand/capacity balancing. ANSP uses automation to integrate surface movement operations with departure sequencing to ensure departing aircraft meet departure schedule times while optimizing the physical queue in the movement area as well as the ability to save fuel and emissions through the use of virtual departure queues into the movement area. ANSP automation also provides surface sequencing and staging lists for departures and average departure delay (current and predicted). These functions will incorporate traffic management initiatives, arrival demand, and user preferences, as appropriate.

ANSP automated decision support tools integrate departure queues, aircraft flight plan information, runway configuration, expected departure times, and gate assignments. Local collaboration between ANSP and airport stakeholders improves information flow to decision support as well as the ability for aircraft operators to meet their operational and business objectives. The sharing of electronic flight data increases efficiency by providing a method to convey both the strategic and tactical plan to controllers as well as improved amendment and coordination capabilities.

OI Benefit

Flexibility (P): Users will have better information on surface traffic providing more up-to-date flight information that they can use to make more optimal operational decisions.

Efficiency (S): Arrival and departures will be more optimally scheduled resulting in more efficient airport operations.

Predictability (P): The integration of arrival and departure schedules across FAA and user platforms will assist with making more informed operational decision which will result in better schedule integrity.

Environment (S): Reduced fuel and emissions for the use of virtual departure queues, which keeps aircraft at the gate until they are scheduled into the physical departure queue.

Increments

Bravo
(2016 - 2020)

1

B [104211-23] Improved Electronic Flight Data Exchange (2019 - 2020) (Initial Operational Availability)

Improved Surface Operations

Increments/Enabling Activities

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

Increment Overview

This increment improves strategic planning capabilities through the integration of flight state information into the NAS. Improved electronic flight data exchange and electronic flight strip implementation increases efficiency by providing a method to convey both the strategic and tactical plan to controllers as well as improved amendment and coordination capabilities. Improved electronic flight data exchange capability will facilitate a common surface situational awareness among ATCT personnel, ATC personnel in other FAA facilities, and flight operator/airport authority personnel. For example, the exchange of aircraft state information will provide FAA, airport authority and flight operator personnel greater awareness of flight status. Improved electronic flight data can be adapted to any facility or tower position based on local preference and national guidelines.

Increment Status

Initial Operational Availability

Success Criteria

- ✓ 2016 : FAA to ingest 11 Data Elements
- ✓ 2022 : Operationally available at Build 1 key site (CLE). This will satisfy a NAC/NIWG commitment.
- 2023 : Operationally available at 3 additional sites. This will satisfy a NAC/NIWG commitment.

Implementation Approach

TFDM will replace AEFS, improve and expand electronic flight data capability and achieve IOC at CLE.

Benefits

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

Efficiency (P): Increased efficiency through the use of electronic flight data to reduce paper strips and the supporting infrastructure.

System Interactions

 External Commitment

 Primary Benefit

 Secondary Benefit

 Operationally Available

 Complete



 Access & Equity

 Capacity

 Flexibility

 Efficiency

 Environment

 Predictability

 Safety

 Bravo



2024 Approved Baseline
FOR INTERNAL FAA USE ONLY



Improved Surface Operations

TFDM (P): Provides departure queue and schedule information to aircraft and traffic flow management stakeholders.

ASDE-X (S) ASSC (S): Provides surface surveillance data to TFDM.

FDIO (S): Provides flight data to TFDM and TFDM sends flight data to FDIO (two-way interface).

FTI (S): Data sharing to SWIM and timing source for TFDM.

STARS (S): Provides arrival data to TFDM and is its backup source of flight plan data.

SWIM (S): TFDM publishes Electronic Flight and Surface Metering Data to SWIM for consumption by users both internal and external to the NAS.

TBFM (S): Exchanges arrival metering and departure metering data (including call for release times) and provides TMI information (two way interface).

TDLS (S): Provides flight plan data to TFDM (one-way interface). Pilot acknowledgement of route clearance from Data Comm.

TFMS (S): Flight Operators provide intent data (e.g. gate data), flight event times, and other CDM data for TFDM scheduling. TFMS will provide TMI, intent data, and flight data to TFDM.

Primary Systems

TFDM: Terminal Flight Data Manager

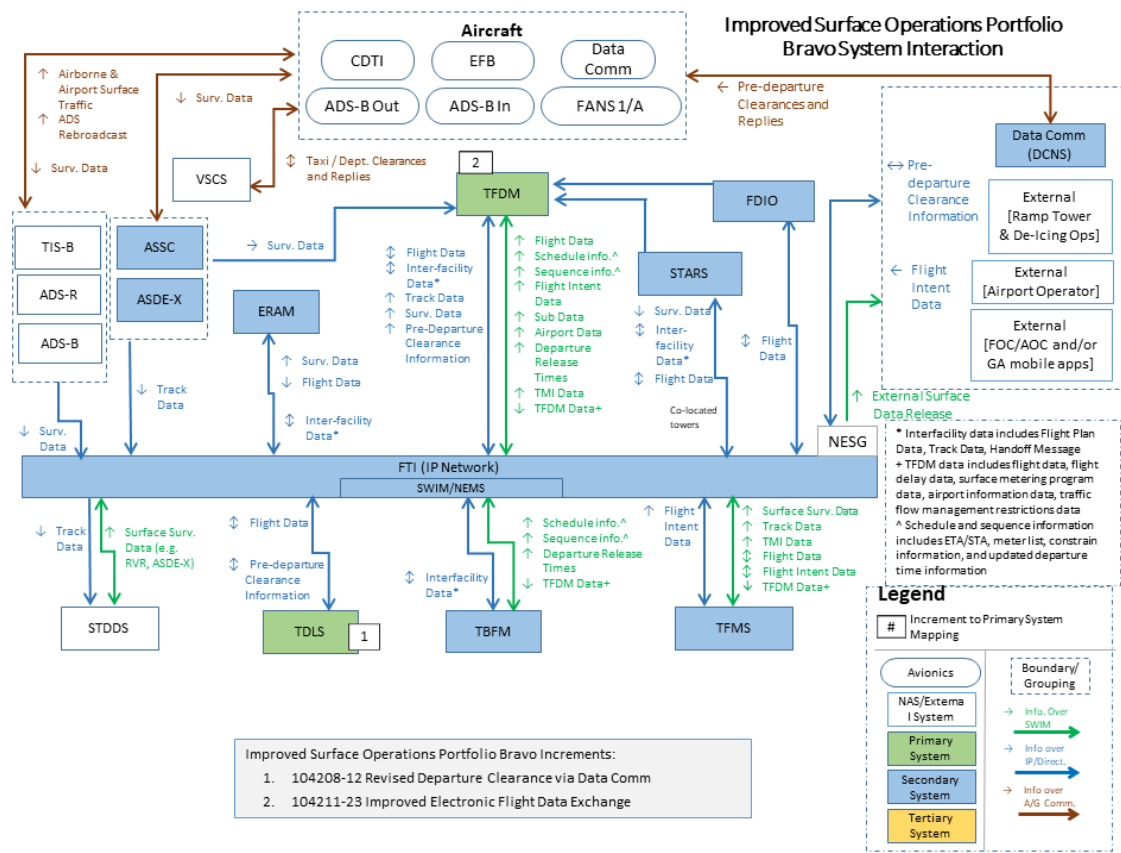
Secondary Systems

- TBFM: Time Based Flow Management
- FTI: FAA Telecommunications Infrastructure
- STARS: Standard Terminal Automation Replacement System
- SWIM: System Wide Information Management
- ASSC: Airport Surface Surveillance Capability
- ASDE-X: Airport Surface Detection Equipment : Model X
- FDIO: Flight Data Input
- TDLS: Tower Data Link System
- TFMS: Traffic Flow Management System

Improved Surface Operations

Systems Interactions

The system interactions associated with Improved Surface Operations are depicted in this figure. The increments associated with Improved Runway Safety Situational Awareness provide for improved pilot and controller situational awareness. Ground surveillance is provided by ASDE-X and ASSC, and this picture is shared with external users via an External Surface Data Release infrastructure, including a DDU. Cockpit situational awareness is enhanced by Moving Map with Own-Ship Position and CDTI with TIS-B and ADS-B for Surface. Controller/pilot interactions are conducted via air-ground voice radio and Tower Data Link Services (TDLS) Data Comm.



Improved Surface Operations

Increment	ASDE-X	ASSC	DCNS	Data Comm Avionics	ERAM	FANS 1/A	FDIO	FTI	STARS	SWIM	TBFM	TDLS	TFDM	TFMS
<div><div>B</div> [104208-12] Revised Departure Clearance via Data Comm </div>			S	A	S	A						P		
<div><div>B</div> [104211-23] Improved Electronic Flight Data Exchange </div>	S	S					S	S	S	S	S	S	P	S

Operationally Available

P Primary Systems

Complete

S Secondary Systems

In Service System

T Tertiary Systems

Planned System

A Avionics Systems

B

 Bravo

Improved Surface 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 Segment Alpha 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 increment Situational Awareness and Alerting of Ground Vehicles, AJM-4 is accountable and AAS-300 is responsible for implementation. ARP is responsible for publishing an Advisory Circular for airport purchase/deployment of ADS-B electronics on airport vehicles. For the increment ASDE-X to Additional Airports, AJM-4 is accountable and responsible for implementation. AJM-4 will be supported by AJT-2 in this activity. For the increment Expansion of Surface Surveillance, AJM-4 is accountable and responsible. For the increment Moving Map with Own-Ship Position, AIR-130 is accountable and responsible. AFS-400 also has a responsible role. APO provides support in developing policy regarding incentivization for operators. For the increment CDTI with TIS-B and ADS-B for Surface, AJM-4 is accountable and responsible under the SBS office, including the implementation of TIS-B. AIR-130 and AFS-400 also have responsible roles. APO provides support in developing policy regarding incentivization for operators. For the increment Revised Departure Clearances via Data Comm, AJM-34 is accountable and responsible for implementation, while AJM-21 is responsible for the TDLS integration. AIR-130 and AFS-400 also have responsible roles. AJT-2 is supporting regarding air traffic operations and requirements. APO provides support in developing policy regarding incentivization for operators. AOV is consulted. In the case of the increment External Surface Data Release, there are two phases of implementation and each phase includes several different initiatives. For Phase 1/DDUs, AJM-4 is accountable. Responsible offices are AJM-21 and the SBS Program Office, with support from AJM-22. AOV is consulted. APO provides support in developing an information-sharing policy. For External Data Release Phase 1/Initial Dissemination of Surface Movement Data, AJM-33 is accountable and responsible, with AJM-22 responsible and support from AJM-21. For Provide Initial Surface Management System, PMO Decision Support (AJM-22) is responsible and accountable. The CDM and International Operations (AJR-1) is responsible, and Operations in Terminal and En Route (AJT-2) are supporting, as are AEE and APO.

- 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 Acquisition Program Baseline. To foster a clear line of accountability, two different offices can never be Accountable for the same increment, and Accountability 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 the Accountable 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.

 Operationally Available


 Complete

 External Commitment

B Bravo



Improved Surface Operations

RASCI Matrix	ANG			AOV	APO	AJM			AJT		AFS	AJI			AJV	AAE	APL	ARP	AIR
	B	C5	C7	001	001	22	23	34	2	0	001	1	2	3	0	001	001	001	001
• B [104208-12] Revised Departure Clearance via Data Comm (2016 - 2019)			C					A/R											
• B [104211-23] Improved Electronic Flight Data Exchange (2019 - 2020) 		S	C		S	A/R			S	S					S	S	S		

 Operationally Available

 Complete

 External Commitment

B Bravo

