ICAO GANP PORTAL

ASBU ELEMENTS

RSEQ SNET SURF

☑ Functional Description | ☑ Enablers | ☑ Deployment Applicability | ☑ Performance Impact Assessment

RSEQ

RSEQ-B0/1	Arrival Management	Operational

☐ Sixth edition of the GANP

Main Purpose
To optimize sequencing for arrivals.

New Capabilities
Arrival management metering and sequencing by ATC is based on inbound traffic prediction information, and decision making support.

Description
This element represents management of arrival sequences, thereby allowing aircraft to fly more efficiently to the necessary fix and to reduce the use of holding stacks, especially at low altitude.

Based on inbound traffic prediction information and decision making support, ATC operational techniques (metering points, speed-control, Time-To-Gain/Time-To-Lose, etc.) will be used to sequence inbound flights at minimum separation on final approach (time or distance based) so as to optimise runway utilization. Time-based metering (as opposed to time-based separations) is the practice of planning a sequence of traffic by time rather than distance. Typically, the relevant ATC authorities will assign a time in which a flight must arrive at the aerodrome or at a specific control point, and/or advises subject flights of speed changes as required to achieve the optimal separation on final approach. Besides inbound traffic predication information, input can include aerodrome capacity, terminal airspace capacity, aircraft capability, wind and other meteorological factors. Time-based metering is the primary mechanism in which arrival sequencing is achieved.

Maturity Level
Ready for implementation

Human Factor Considerations
1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-information benefit	AMET-B0/1 - Meteorological observations products
Relation-information benefit	AMET-B0/2 - Meteorological forecast and warning products
Relation-operational benefit	WAKE-B2/1 - Wake turbulence separation minima based on 7 aircraft groups
Relation-operational benefit	WAKE-B3/3 - Wake turbulence separation minima based on leader/follower static pairs-wise
Relation-operational benefit	WAKE-B2/2 - Time based wake separation minima for final approach
Relation-operational benefit	SURF-B0/2 - Comprehensive situational awareness of surface operations
Relation-operational benefit	SURF-B1/4 - Routing service to support ATCO surface operations management
Relation-operational benefit	ACDM-B0/1 - Airport CDM Information Sharing (ACIS)
Relation-operational benefit	ACDM-B0/2 - Integration with ATM Network function

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Arrival Sequencing Procedure	Local ATM procedure for arrival sequencing	ANSP	2013
Ground system infrastructure	ATC systems	Arrival Sequencing ATC Automation system	Automation for calculating optimum arrival sequence with presentation to ATCOs	ANSP	2013
Training	-	Training requirements for arrival management	ATCO Arrival Sequencing Training - ATCOs trained to use arrival sequencing automation, supported by arrival sequencing procedure. Pilot Time-Based Metering Training - Pilots trained to use airborne system to arrive at waypoint specified by ATCOs at specific timing	ANSP Aircraft operator	2013
Regulatory provisions	SMS	Arrival Sequencing Safety Assessment	Safety assessment of arrival sequencing operation	ANSP	2013

DEPLOYMENT APPLICABILITY

Operational conditions:

Runways and terminal manoeuvring area in major hubs and metropolitan areas.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Reduce holding and low level vectoring	ANSP, Aircraft operator
	Enable dynamic scheduling	ANSP
	Decreased uncertainties in aerodrome/terminal demand prediction	ANSP
	Increase aerodrome throughput	Airport operator, ANSP
	Increase aerodrome capacity	Airport operator, ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator
	Flexibility	Aircraft operator
	Predictability	ANSP, Aircraft operator
Indirect benefits	Fuel consumption	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Apply arrival balancing	+	KPI10: Airport peak throughput
Capacity	Capacity, throughput & utilization	Apply smart sequencing to harmonise final approach speeds (arrival)	++	KPI10: Airport peak throughput
Capacity	Capacity, throughput & utilization	Apply smart sequencing to optimise wake vortex separations (arrival)	++	KPI10: Airport peak throughput
Capacity	Capacity, throughput & utilization	Improve arrival sequencing and metering to fill all arrival slots	++	KPI11: Airport throughput efficiency
Efficiency	Flight time & distance	Apply TTA and en-route speed reduction if traffic is already airborne	++	KPI08: Additional time in terminal airspace
Efficiency	Flight time & distance	Reduce need to fine-tune traffic spacing in terminal airspace (arrival)	++	KPI08: Additional time in terminal airspace

RSEQ-B0/2	Departure Management	Operational

☐ Sixth edition of the GANP

Main Purpose: To optimize departure operations.

New Capabilities: Departure management sequences the aircraft for optimized utilization of ground infrastructure and efficiently meet en-route and destination airport constraints, taking on board user preferences.

Description: Departure management, like its arrival counterpart, serves to optimize departure operation to ensure the most efficient utilization of aerodrome and terminal resources. Slots assignment and adjustments will be supported by departure management automation like department management or departure flow management. Dynamic ATFM slot allocation will foster smoother integration into overhead streams and help airspace users to better meet metering points and comply with other ATM requirements. It will sequence aircraft, based on the ground and airspace structure, wake turbulence, aircraft capability, en-route and destination ATFM constraints, and airspace users' preferences. This will serve to increase aerodrome throughput and compliance with allotted departure time. Where Airport CDM is implemented, departure management will interface with the associated A-CDM processes (including the pre-departure sequencing of A-CDM) in determining optimal departure sequencing.

Maturity Level: Ready for implementation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Departure

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-information benefit	AMET-B0/1 - Meteorological observations products
Relation-information benefit	AMET-B0/2 - Meteorological forecast and warning products
Relation-operational benefit	ACDM-B0/1 - Airport CDM Information Sharing (ACIS)
Relation-operational benefit	ACDM-B0/2 - Integration with ATM Network function
Relation-operational benefit	SURF-B1/4 - Routing service to support ATCO surface operations management
Relation-operational benefit	WAKE-B2/1 - Wake turbulence separation minima based on 7 aircraft groups
Relation-operational benefit	WAKE-B3/3 - Wake turbulence separation minima based on leader/follower static pairs-wise

Relation-operational benefit	WAKE-B3/6 - Time based wake separation minima for departure based on leader/follower static pair-wise
Relation-operational benefit	SURF-B0/2 - Comprehensive situational awareness of surface operations
Relation-operational benefit	APTA-B0/2 - PBN SID and STAR procedures (with basic capabilities)
Relation-information benefit	NOPS-B0/5 - Dynamic ATFM slot allocation

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Departure Sequencing Procedure	Local ATM procedure for departure sequencing	ANSP	2013
Ground system infrastructure	ATC systems	Departure Sequencing ATC Automation system	Automation for calculating an optimum departure sequence with presentation to ATCOs	ANSP	2013
Training	-	Training requirements for departure management	ATCO Departure Sequencing Training - ATCOs trained to use departure sequencing automation, supported by departure sequencing procedure	ANSP	2013
Regulatory provisions	SMS	Departure Sequencing Safety Assessment	Safety assessment of departure sequencing operation	ANSP	2013

DEPLOYMENT APPLICABILITY

Operational conditions:

Runways and terminal manoeuvring area in major hubs and metropolitan areas. It will streamline departure traffic flow and smooth transition into en-route airspace. Automated dissemination of departure information and clearances.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Decreased lead time for departure request	Aircraft operator
	Decrease time between call for release and departure time	Airport operator, ANSP, Aircraft operator
	Enable dynamic scheduling	ANSP
	Increase aerodrome throughput	Airport operator, ANSP
	Increase aerodrome capacity	Airport operator, ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator

Type	Operational description	Benefitting stakeholder(s)
	Flexibility	ANSP Aircraft operator
	Predictability	ANSP Aircraft operator
Indirect benefits	Fuel consumption	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Maintain or improve departure rate of the RWY	++	KPI10: Airport peak throughput
Efficiency	Flight time & distance	Avoid additional holding time after line up caused by departure metering not factored in during pushback planning	++	KPI02: Taxi-out additional time
Efficiency	Flight time & distance	Improve the delivery of departing traffic into the overhead stream	++	KPI02: Taxi-out additional time

RSEQ-B0/3 Point merge Operational

☐ Sixth edition of the GANP

Main Purpose: To allow merging of arrival flows.

New Capabilities: Sequencing using pre-defined legs equidistant from a point that are used for shortening or stretching the arrival path.

Description: This element represents a procedural concept that uses existing technology to merge arrival flows. Its purpose is to improve and harmonize arrival operations by enabling continuous descent operations (CDO) and increasing arrival predictability, thereby enhancing airport capacity and limiting the environmental impact of aircraft emissions. Point Merge is based on a specific route structure that is made of a point (the merge point) with pre-defined legs (the sequencing legs) equidistant from this point that are used for shortening or stretching the arrival path.

Maturity Level: Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? No
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational benefit	WAKE-B2/1 - Wake turbulence separation minima based on 7 aircraft groups
Relation-operational benefit	WAKE-B3/3 - Wake turbulence separation minima based on leader/follower static pairs-wise
Relation-operational benefit	WAKE-B2/2 - Time based wake separation minima for final approach
Relation-information benefit	AMET-B0/1 - Meteorological observations products

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Arrival Traffic Merging Procedure	Local ATM procedure to merge traffic during arrivals	ANSP	2013
Training	-	Training requirements for point merge	ATCO Point Merge Arrival Traffic Merging Training - ATCOs trained to merge arrival traffic using point merge procedure	ANSP	2013
Training	Awareness	Pilot Point Merge Briefing	Pilots briefed on airport's point merge procedure	Aircraft operator	2013
Regulatory provisions	SMS	Point Merge Safety Assessment	Safety assessment of point merge operation	ANSP	2013

DEPLOYMENT APPLICABILITY

Operational conditions:

Runways and terminal manoeuvring area in major hubs and metropolitan areas.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Reduce holding and low level vectoring	Aircraft operator
	Enable dynamic scheduling	ANSP
	Decreased uncertainties in aerodrome/terminal demand prediction	ANSP
	Increase aerodrome throughput	Airport operator, ANSP
	Increase aerodrome capacity	Airport operator, ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator
	Flexibility	Aircraft operator
	Predictability	ANSP, Aircraft operator
Indirect benefits	Fuel consumption	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Apply merging & synchronisation of arrival flows	++	KPI10: Airport peak throughput

RSEQ-B1/1 Extended arrival metering Operational

☐ Sixth edition of the GANP

Main Purpose: To enhance predictability and ATM decision compliance.

New Capabilities: Synchronization between adjacent FIRs, arrival management taking into account extended metering requirements.

Description: Extended metering will enhance predictability and ATM decision compliance. The ATS units will be able to meter across FIR boundaries. Extended metering will enable ATS units to continue metering during high volume traffic and will improve metering accuracy. This will also facilitate synchronization between adjacent FIRs. With extended metering, delays can be shifted to higher attitudes or even to the departure gate, where it can be more efficiently absorbed by incoming flights. This metering will provide extended arrival management, increasing arrival management effectiveness and benefits (e.g. in terms of reduced holding time) while reducing approach ATC workload. Extended metering may set requirements on flights pre-departure, if departing within the arrival metering range of the destination airport.

Maturity Level	Standardization
Human Factor Considerations	1. Does it imply a change in task by a user or affected others? Yes 2. Does it imply processing of new information by the user? Yes 3. Does it imply the use of new equipment? Yes 4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	RSEQ-B0/1 - Arrival Management
Relation-operational benefit	NOPS-B1/8 - Extended Arrival Management supported by the ATM Network function
Relation-information benefit	AMET-B1/1 - Meteorological observations information
Relation-information benefit	AMET-B1/2 - Meteorological forecast and warning information
Relation-operational benefit	APTA-B1/4 - CDO (Advanced)
Relation-information benefit	SWIM-B2/1 - Information service provision
Relation-information benefit	FICE-B3/1 - Flight information management services for enhanced trajectory operations

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Extended Arrival Metering Procedure	ATM procedure for extended arrival metering including exchange of metering information with affected neighboring ATC units	ANSP	2019
Operational procedures	Letter of agreement	Extended Arrival Metering Letter of Agreement	Letter of Agreement or equivalent document outlining procedure to exchange metering information with affected neighboring ATC units	ANSP	2019
Operational procedures	-	Procedure to Reconcile ATFM Constraint with Extended Metering Requirements	ATM procedure for reconciling ATFM constraints with Extended Arrival Metering requirements	ANSP	2019

Ground system infrastructure	ATM systems	Extended Arrival Metering Local ATM Automation systems	ATM automation for calculation and presentation of extended arrival metering to ATCOs and exchange metering information with affected neighboring ATC units	ANSP	2019
Training	-	Training requirements for extended arrival management	ATCO Extended Arrival Metering Training - ATCOs trained to use extended arrival metering automation, supported by extended arrival metering procedure and Letter of Agreement with affected neighboring ATC units, along with Procedure to Reconcile ATFM Constraint with Extended Metering Requirements. Pilot Time-Based Metering Training - Pilots trained to use airborne system to arrive at waypoint specified by ATCOs at specific timing	ANSP Aircraft operator	2019
Regulatory provisions	SMS	Extended Arrival Metering Safety Assessment	Safety assessment of extended arrival metering operation	ANSP	2019

DEPLOYMENT APPLICABILITY

Operational conditions:

Runways and terminal manoeuvring areas in major hubs and metropolitan areas.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Reduction in airborne delay/holding	ANSP, Aircraft operator
	Traffic flow synchronization between en-route and terminal domain	ANSP
	Enables dynamic scheduling	ANSP
	Decrease uncertainties in aerodrome/terminal demand prediction	ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator
	Flexibility	ANSP
	Predictability	ANSP
Indirect benefits	Reduction in fuel burn and environment impact (emission and noise)	Aircraft operator
	Capacity at the airport	Airport operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity shortfall & associated delay	Apply (unplanned) airborne holding to inbound traffic	++	
Capacity	Capacity shortfall & associated delay	Delay take-off of inbound traffic (sequencing & metering measures)	++	
Capacity	Capacity shortfall & associated delay	Slow down inbound traffic during en-route	++	
Efficiency	Flight time & distance	Extend arrival management to a greater radius around the destination airport	++	KPI08: Additional time in terminal airspace

RSEQ-B2/1 Integration of arrival and departure management Operational

☐ Sixth edition of the GANP

Main Purpose To set up detailed integrated arrival and departure sequence for the same runway.

New Capabilities Integration of arrival and departure management sequences into a single runway or dependent runways.

Description A fully integrated and throughput-optimized sequence of arrivals and departures for the same runway (or for dependent runways) is set up by an algorithm considering minimum separations. The sequence is characterized by high planning stability and all controllers working towards delivering this sequence. Thus, in order to meter arrival and sequence pre-departure, controllers will follow Target Take-Off Time (TTOT) and Target Landing Time (TLDT) as closely as possible. Feeder controllers will provide the required gaps in the arrival sequence to allow for the respective departure flights.

Maturity Level Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Departure | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	RSEQ-B0/2 - Departure Management
Relation-operational benefit	AMET-B2/1 - Meteorological observations information
Relation-information benefit	SWIM-B2/1 - Information service provision
Relation-information benefit	SWIM-B2/2 - Information service consumption
Relation-operational benefit	AMET-B2/2 - Meteorological forecast and warning information
Relation-information benefit	FICE-B3/1 - Flight information management services for enhanced trajectory operations
Relation-operational benefit	APTA-B1/4 - CDO (Advanced)
Evolution	RSEQ-B1/1 - Extended arrival metering

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Departure Sequencing Procedure	Local ATM procedure for departure sequencing	ANSP	2013
Ground system infrastructure	ATC systems	Departure Sequencing ATC Automation system	Automation for calculating an optimum departure sequence with presentation to ATCOs	ANSP	2013
Operational procedures	Operations	Extended Arrival Metering Procedure	ATM procedure for extended arrival metering including exchange of metering information with affected neighboring ATC units	ANSP	2019
Operational procedures	Letter of agreement	Extended Arrival Metering Letter of Agreement	Letter of Agreement or equivalent document outlining procedure to exchange metering information with affected neighboring ATC units	ANSP	2019
Operational procedures	-	Procedure to Reconcile ATFM Constraint with Extended Metering Requirements	ATM procedure for reconciling ATFM constraints with Extended Arrival Metering requirements	ANSP	2019
Ground system infrastructure	ATM systems	Extended Arrival Metering Local ATM Automation systems	ATM automation for calculation and presentation of extended arrival metering to ATCOs and exchange metering information with affected neighboring ATC units	ANSP	2019

Operational procedures	Operations	Common Operating Procedure for Departure – Arrival Sequencing Integration	Common Operating Procedure in support of departure and arrival sequencing integration	Airport operator ANSP	2025
Operational procedures	-	Departure – Arrival Sequencing Integration Procedure	Local ATM procedure in support of departure and arrival sequencing integration	ANSP	2025
Ground system infrastructure	ATM systems	Departure – Arrival Sequencing Automation	Automation for calculating optimum departure and arrival sequencing especially for airports with mixed-mode runway used for both arriving and departing flights considering minimum separations applicable	ANSP	2025
Training	-	Training requirements for integration of arrival and departure management	ATCO Departure Sequencing Training - ATCOs trained to use departure sequencing automation, supported by departure sequencing procedure ATCO Extended Arrival Metering Training - ATCOs trained to use extended arrival metering automation, supported by extended arrival metering procedure and Letter of Agreement with affected neighboring ATC units, along with Procedure to Reconcile ATFM Constraint with Extended Metering Requirements ATCO Departure – Arrival Sequencing Training: ATCOs trained to use Departure – Arrival Sequencing Automation supported by Departure – Arrival Sequencing Integration Procedure Pilot Time-Based Metering Training - Pilots trained to use airborne system to arrive at waypoint specified by ATCOs at specific timing	ANSP Aircraft operator	2025
Regulatory provisions	SMS	Arrival-Departure Management Integration Safety Assessment	Safety assessment of integrated arrival – departure management operation	ANSP	2025

DEPLOYMENT APPLICABILITY

Operational conditions:

At aerodrome with existing arrival management and departure management operation, interrelated through significant use of mixed-mode operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Decreased lead time for departure request	Aircraft operator
	Decrease time between call for release and departure time	Airport operator, ANSP, Aircraft operator
	Reduce holding and low level vectoring	ANSP, Aircraft operator
	Enable dynamic scheduling	ANSP
	Decreased uncertainties in aerodrome/terminal demand prediction	ANSP
	Increase aerodrome throughput	Airport operator, ANSP
	Increase aerodrome capacity	Airport operator, ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator
	Flexibility	Aircraft operator
	Predictability	ANSP, Aircraft operator
Indirect benefits	Fuel Consumption	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Introduce integrated arrival and departure sequencing for a single runway or dependent runways of the same airport	++	KPI11: Airport throughput efficiency

RSEQ-B3/2 Arrival management in terminal airspace with multiple airports — Operational

☐ Sixth edition of the GANP

Main Purpose: To provide more efficient arrival management support for TMAs with multiple airports.

New Capabilities: Further development of arrival management in support of TMAs with multiple airports and associated interaction among traffic flows into airports within the same TMA.

Description

In terminal airspace with multiple airports, advisory notices from arrival management operations for these airports need to be harmonized in the form of traffic flows to ensure that bunching does not occur in sectors adjacent to TMAs where inbound routes merge or intersect as well as other sectors in adjacent FIRs.

Maturity Level

Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	RSEQ-B1/1 - Extended arrival metering
Relation-operational benefit	APTA-B1/4 - CDO (Advanced)
Relation-information benefit	AMET-B2/4 - Meteorological information service in SWIM

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Extended Arrival Metering Procedure	ATM procedure for extended arrival metering including exchange of metering information with affected neighboring ATC units	ANSP	2019
Operational procedures	Letter of agreement	Extended Arrival Metering Letter of Agreement	Letter of Agreement or equivalent document outlining procedure to exchange metering information with affected neighboring ATC units	ANSP	2019
Operational procedures	-	Procedure to Reconcile ATFM Constraint with Extended Metering Requirements	ATM procedure for reconciling ATFM constraints with Extended Arrival Metering requirements	ANSP	2019

Ground system infrastructure	ATM systems	Extended Arrival Metering Local ATM Automation systems	ATM automation for calculation and presentation of extended arrival metering to ATCOs and exchange metering information with affected neighboring ATC units	ANSP	2019
Operational procedures	Operations	Mixed Arrival Stream Traffic Sequencing Procedure	ATC procedure to accommodate mixed traffic streams into multiple aerodromes	ANSP	2026
Operational procedures	Letter of agreement	Mixed Arrival Stream Traffic Sequencing Letter of Agreement	ATC Unit Letter of Agreement specifying procedure to accommodate mixed traffic streams into multiple aerodromes	ANSP	2026
Ground system infrastructure	ATM systems	Mixed Arrival Stream Traffic Sequencing ATM Automation systems	ATM automation to support metering of interacting flows of traffic to multiple aerodromes within same terminal airspace	ANSP	2026
Training	-	Training requirements for arrival management for multi-airport terminal airspace	ATCO Extended Arrival Metering Training - ATCOs trained to use extended arrival metering automation, supported by extended arrival metering procedure and Letter of Agreement with affected neighboring ATC units, along with Procedure to Reconcile ATFM Constraint with Extended Metering Requirements ATCO Mixed Arrival Stream Traffic Sequencing Training - ATCOs trained to use Mixed Arrival Stream Traffic Sequencing ATM automation supported by Mixed Arrival Stream Traffic Sequencing Procedure and Letter of Agreement Pilot Time-Based Metering Training- Pilots trained to use airborne system to arrive at waypoint specified by ATCOs at specific timing	ANSP	2026
Regulatory provisions	SMS	Arrival Management for Multi-Airport Terminal Airspace Safety Assessment	Safety assessment of arrival management operation for multi-airport terminal airspace	ANSP	2026

DEPLOYMENT APPLICABILITY

Operational conditions:

In terminal airspace with multiple aerodromes requiring arrival management operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Reduce holding and low level vectoring	ANSP, Aircraft operator
	Enable dynamic scheduling	ANSP
	Decreased uncertainties in aerodrome/terminal demand prediction	ANSP
	Increase aerodrome throughput	Airport operator, ANSP
	Increase aerodrome capacity	Airport operator, ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator
	Flexibility	Aircraft operator
	Predictability	ANSP, Aircraft operator
Indirect benefits	Fuel Consumption	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Increase multi-airport terminal airspace arrival rate	++	KPI10: Airport peak throughput

RSEQ-B3/3 Increased utilization of runway capacity by improved real-time runway scheduling — Operational

☐ Sixth edition of the GANP

Main Purpose: Increase the achieve utilization of runway capacity.

New Capabilities: Uncertainty buffers are reduced to reflect the increased accuracy of constraints in terms of volume and active time as well as increased accuracy in both the aircraft current and future state characteristics.

Description: This element represents the combined efforts in weather forecasting and more refined translations into the characteristics of the severity, size and duration of trajectory interacting weather phenomena, refinement of network operational initiatives through big data analysis and machine learning, and the increased information on the aircrafts current states and intent. This improves the real-time ability to schedule runaway usage without impacting flight efficiency balancing these twin goals at a better equilibrium.

Maturity Level Concept

Human Factor Considerations

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure Arrival

DEPENDENCIES AND RELATIONS

There are currently no dependencies.

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Improve airport capacity utilization (throughput efficiency)	++	KPI11: Airport throughput efficiency

RSEQ-B3/4 Improved operator fleet management in runway sequencing Operational

☐ Sixth edition of the GANP

Main Purpose To improve operator fleet management in runway sequencing by improving the ability of the operator to manage their fleet priorities among their real-time schedule allocation.

New Capabilities The ubiquitous sharing of airspace and flight information as well schedule assignments provides an environment where operators can adjust their flights in the assigned sequence to meet operational and connectivity needs for passengers and cargo.

Description

While a real-time master schedule for runway usage is developed and maintained by the ANSP to assure equity and maximum capacity utilization, users have increased flexibility in resequencing aircraft among their slot assignments. The capability is supported by the sharing of all state information with respect to configurations, traffic initiatives as well as position and intent information on all flights in the planning horizon. This allows the operator to evaluate and test potential sequencing with respect to feasibility increasing the likelihood of ASNSP approval without unceasing workload and complexity to the ANSP's schedule management. This allow the operator to increase their opportunity to meet fleet business objectives which are unknown to the ANS during schedule development. This uses the ability of the operator to use real-time information for their decision making versus increased a priori delivery of business requirements to ANSP as well as increased complexity of ANSP schedule algorithms to have the ANSP deliver against business objectives.

Maturity Level

Concept

Human Factor Considerations

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Departure | Arrival

DEPENDENCIES AND RELATIONS

There are currently no dependencies.

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Flexibility		Improve flexibility of the Air Navigation System	++	

RSEQ-B4/1 Departure management in terminal airspace from multiple airports — Operational

☐ Sixth edition of the GANP

Main Purpose: To provide departure management support for TMAs with multiple airports.

New Capabilities: Further development of departure management in support of TMAs with multiple airports and associated interaction among traffic flows out of airports within the same TMA.

Description: In terminal airspace with multiple airports, departure management operations among airports involved need to be harmonized in the form of traffic flows to enable a more consistent and manageable delivery into En-Route phase of flight. Harmonization among these departure management operations may advise SID-rebalancing in the event of demand-capacity imbalance predicted. Departure sequence may be adjusted if other capacity cannot be utilized.

Maturity Level: Validation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Departure

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	RSEQ-B0/2 - Departure Management
Relation-information benefit	AMET-B2/1 - Meteorological observations information
Relation-information benefit	AMET-B2/2 - Meteorological forecast and warning information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Terminal Airspace Congestion Identification and Mitigation Procedure	Procedure to identify terminal airspace congestion and routing aircraft onto offload departure routes where possible	ANSP	2032
Regulatory provisions	SMS	Departure Management for Multi-Airport Terminal Airspace Safety Assessment	Safety assessment of departure management operation for multi-airport terminal airspace	ANSP	2032

Ground system infrastructure	ATM systems	Terminal Airspace Congestion Identification and Mitigation Procedure automation systems	ATM system supporting identification of terminal airspace congestion and suggesting offload departure route to de-conflict	ANSP	2032
Training	-	ATCO Terminal Airspace Congestion Identification and Mitigation Training	ATCO trained to identify and mitigate terminal airspace congestion, offloading aircraft onto other departure routes where appropriate, based on operational procedure using appropriate ATM automation	ANSP	2032

DEPLOYMENT APPLICABILITY

Operational conditions:

In terminal airspace with multiple aerodromes requiring departure management operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Decreased lead time for departure request	Aircraft operator
	Decrease time between call for release and departure time	Airport operator, ANSP, Aircraft operator
	Enable dynamic scheduling	ANSP
	Decreased uncertainties in aerodrome/terminal demand prediction	ANSP
	Increase aerodrome throughput	Airport operator, ANSP
	Increase aerodrome capacity	Airport operator, ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator
	Flexibility	Aircraft operator
	Predictability	ANSP, Aircraft operator
Indirect benefits	Fuel Consumption	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Increase multi-airport terminal airspace departure rate	++	KPI10: Airport peak throughput
Efficiency	Flight time & distance	Improve the delivery of departing traffic into the overhead stream	++	KPI02: Taxi-out additional time

RSEQ-B4/2 Extended arrival management supporting overlapping operations into multiple airports — Operational

☐ Sixth edition of the GANP

Main Purpose To enable en-route sectors to support extended arrival metering from multiple airports / TMAs.

New Capabilities En-route support to deconflict concurrent arrival management strategies into independent TMAs, with overlapping arrival management horizons and ATFM measures such as Target Times, while also considering non-arrival traffic within the sector.

Description En-route sectors are expected to contribute to the arrival sequencing towards multiple TMA simultaneously with potentially conflicting sequencing constraints. The process integrates information from arrival management systems operating out to extended range with local traffic/sector information and balances the needs of each.

Maturity Level Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

En-route

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	RSEQ-B1/1 - Extended arrival metering
Relation-information benefit	AMET-B2/1 - Meteorological observations information
Relation-information benefit	AMET-B2/2 - Meteorological forecast and warning information
Relation-information need	FICE-B2/9 - Flight information management support for inflight re-planning

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Operations	Extended Arrival Management Conflicting Instruction Detection & Resolution Procedure	Procedure to identify conflicting overlapping instructions from various extended arrival management operations and resolution thereof.	ANSP	2032
Regulatory provisions	SMS	Extended Arrival Management Conflicting Instruction Detection & Resolution Safety Assessment	Safety assessment of procedure to identify conflicting overlapping instructions from various extended arrival management operations and resolution thereof.	ANSP	2032
Ground system infrastructure	ATM systems	Extended Arrival Management Conflicting Instruction Detection & Resolution ATM Automation	ATM automation to support detection and resolution of conflicting extended arrival management instructions.	ANSP	2032
Training	-	ATCO Extended Arrival Management Conflicting Instruction Detection & Resolution Training	ATCOs trained to identify and resolve conflicting overlapping instructions from various extended arrival management operations based on procedure using appropriate ATM automation	ANSP	2032

DEPLOYMENT APPLICABILITY

Operational conditions:

In en route Area Control Centers with supporting multiple overlapping arrival management operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Enable dynamic scheduling	ANSP
	Decreased uncertainties in aerodrome/terminal demand prediction	ANSP
	Efficiency	Airport operator, ANSP, Aircraft operator
	Flexibility	Aircraft operator

Type	Operational description	Benefitting stakeholder(s)
	Predictability	Airport operator ANSP
Indirect benefits	Fuel Consumption	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Capacity	Capacity, throughput & utilization	Apply arrival management	++	KPI10: Airport peak throughput
Capacity	Capacity, throughput & utilization	Improve arrival sequencing and metering to fill all arrival slots	++	KPI11: Airport throughput efficiency
Capacity	Capacity, throughput & utilization	Increase multi-airport terminal airspace arrival rate	++	KPI10: Airport peak throughput
Efficiency	Flight time & distance	Extend arrival management to a greater radius around the destination airport	++	KPI08: Additional time in terminal airspace

SNET

SNET-B0/1	Short Term Conflict Alert (STCA)	Operational

☐ Sixth edition of the GANP

Main Purpose: To assist the air traffic controller in preventing collision between aircraft, using position data from ground surveillance.

New Capabilities: STCA systems alert the controller when a given separation between two aircraft is actually lost or may be lost within a given amount of time.

Description

Surveillance data from ground radars and ADS-B stations is used to track aircraft. For each pair of aircraft which are sufficiently close, a short term conflict alert is raised if at least one of the following tests is true:

- (current proximity test) their current horizontal separation is lower than a horizontal threshold and their current vertical separation is lower than a vertical threshold; or
- (linear prediction test) at any of their future positions within a given amount of time (warning time), as linearly extrapolated from their current track, their horizontal separation will be lower than a horizontal threshold and their vertical separation will be lower than a vertical threshold.

The horizontal and vertical thresholds may be different in each test but are equal or lower than the ATC separation standards for the airspace covered by the STCA system. The warning time for the linear prediction may depend on the control unit specificities but is typically equal to or lower than 2 minutes.

The above parameters may be configured differently in defined geographic areas of the control unit. Additionally, inhibitions of alerts may be set up for a list of aircraft and for defined geographic areas.

On noticing the alert, the controller has to analyse the situation and, if deemed necessary, issue an avoiding instruction to one or both aircraft, with the appropriate emergency phraseology.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-technology option	ASUR-B0/2 - Multilateration cooperative surveillance systems (MLAT)
Relation-technology benefit	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year

Operational procedures	Safety nets	Controller reaction to short term conflict alerts	Procedures for air traffic controllers reaction to short term conflict alerts. References: Doc 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	ANSP	2013
Airborne system capability	Surveillance	Surveillance system capabilities required for short term conflict alerts	SSR mode S transponder with Ext.squitter version 0, version 1 and version 2 ADS-B out compliant with … References: Doc 100xx - Ground-based Safety Nets Manual http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	Airspace user Aircraft manufacturer	2013
Ground system infrastructure	Safety nets	Surveillance ground capabilities required for short term conflict alerts	SSR radar ADS-B in station References: Doc 100xx - Ground-based Safety Nets Manual Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	ANSP Ground systems supplier	2013
Ground system infrastructure	Safety nets	Display for short term conflict alerts	Capability to indicate alerts on the radar screen of the controller working positions. References: Doc 100xx - Ground-based Safety Nets Manual Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	ANSP Ground systems supplier	2013
Training	-	Training requirements for short term conflict alerts	Air traffic controller knowledge and reaction to alerts. References: Indications in Doc 100xx - Ground-based Safety Nets Manual	ANSP	2013

DEPLOYMENT APPLICABILITY

Operational conditions:

STCA systems are applicable in all controlled airspace for all aircraft for which a controller has responsibility for separation or traffic information. Before operational use, the system must have been configured for the target airspace, to maximize the number of relevant alerts while keeping the number of unnecessary alerts to an acceptable level.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	STCA use improves safety by making controllers aware of potentially dangerous situations that may otherwise have been missed or detected later.	ANSP Airspace user
	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve mid-air collision avoidance (safety net)	++	KPI20: Number of aircraft accidents KPI23: Number of airprox/TCAS alert/loss of separation/near midair collisions/midair collisions (MAC)

SNET-B0/2 Minimum Safe Altitude Warning (MSAW) Operational

☐ Sixth edition of the GANP

Main Purpose

To assist the air traffic controller in preventing controlled flight into terrain accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles.

New Capabilities

MSAW systems warns the controller about the increased risk of controlled flight into terrain accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles.

Note: MSAW systems are providing protection on all aircraft in particular those not equipped with Ground Proximity Warning Systems.

Description

Surveillance data (including tracked pressure altitude), flight data (including cleared flight levels) and environment data (including terrain and obstacle data) are input to the MSAW system to generate the alerts to the controller working position.

On noticing the alert, the controller has to analyse the situation and, if deemed necessary, issue an instruction to the aircraft, with the appropriate emergency phraseology.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-operational benefit	SNET-B0/1 - Short Term Conflict Alert (STCA)
Relation-technology benefit	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Safety nets	Controller reaction to minimum safe altitude warning	Procedures for air traffic controllers to react to minimum safe altitude warnings. Reference: Doc 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM); Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP	2013
Airborne system capability	Safety nets	Surveillance system capabilities required for minimum safe altitude warning	SSR transponder compliant with … ADS-B out compliant with … Reference: Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	Airspace user Aircraft manufacturer	2013
Ground system infrastructure	Safety nets	Surveillance ground capabilities required for minimum safe altitude warning	SSR radar ADS-B in station Reference: Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP Ground systems supplier	2013
Ground system infrastructure	Safety nets	Display for minimum safe altitude warnings	Capability to indicate alerts on the controller working position. Reference: Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP Ground systems supplier	2013
Training	-	Training requirements for minimum safe altitude warnings	Air traffic controller knowledge and reaction to alerts. Reference: Doc 100xx - Ground-based Safety Nets Manual	ANSP	2013

DEPLOYMENT APPLICABILITY

Operational conditions:

All controlled airspace for all aircraft.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Avoid controlled flight into terrain (CFIT) and obstacle collision risk	++	KPI20: Number of aircraft accidents

SNET-B0/3	Area Proximity Warning (APW)	Operational

☐ Sixth edition of the GANP

Main Purpose: APW is designed, configured and used to make a significant positive contribution to the prevention of accidents arising from unauthorized penetration of an airspace volume.

New Capabilities: APW systems warn the air traffic controller about unauthorised penetration into the airspace (either restricted or controlled) by a flight (either controlled or uncontrolled).

Description: Surveillance data (including tracked pressure altitude), flight data (including cleared flight levels and RVSM status) and environment data (including airspace volumes) are input to the APW system to generate the alerts to the controller working position(s).

On noticing the alert, the controller has to analyse the situation and, if deemed necessary, issue an instruction to the aircraft, with the appropriate emergency phraseology.

Maturity Level: Ready for implementation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

OPERATIONS

Tactical-During ops

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Safety nets	Controller reaction to area proximity warning	Procedures for air traffic controllers to react to area proximity warnings. Reference: Future amendment of Doc 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM); Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP	2013
Airborne system capability	Safety nets	Surveillance system capabilities required for area proximity warning	SSR transponder compliant with … ADS-B out compliant with … Reference: Doc 100xx - Ground-based Safety Nets Manual - http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	Aircraft manufacturer Aircraft operator	2013
Ground system infrastructure	Safety nets	Surveillance ground capabilities required for area proximity warning	SSR radar ADS-B in station Reference: Doc 100xx - Ground-based Safety Nets Manual - http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP Ground systems supplier	2013
Ground system infrastructure	Safety nets	Display for area proximity warning	Capability to indicate alerts on the controller working position. Reference: Doc 100xx - Ground-based Safety Nets Manual - http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP Ground systems supplier	2013
Training	-	Training requirements for area proximity warnings	Air traffic controller knowledge and reaction to alerts. Reference: Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP	2013

DEPLOYMENT APPLICABILITY

Operational conditions:

All controlled airspace for all aircraft.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Avoid unauthorized penetration of segregated airspace	++	KPI20: Number of aircraft accidents

SNET-B0/4 Approach Path Monitoring (APM) Operational

☐ Sixth edition of the GANP

Main Purpose: APM is a ground-based safety net intended to warn the controller about increased risk of controlled flight into terrain accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles during final approach.

New Capabilities: APM is designed, configured and used to make a significant positive contribution to avoidance of controlled flight into terrain accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles during final approach.

Description: Surveillance data (including tracked pressure altitude), flight data (including concerned sectors) and environment data (including terrain and obstacle data) are input to the APM system to generate the alerts to the controller working position(s).

On noticing the alert, the controller has to analyse the situation and, if deemed necessary, issue an instruction to the aircraft, with the appropriate emergency phraseology.

Maturity Level: Ready for implementation

Human Factor Considerations	1. Does it imply a change in task by a user or affected others? No 2. Does it imply processing of new information by the user? Yes 3. Does it imply the use of new equipment? Yes 4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Safety nets	Controller reaction to approach path monitoring alerts	Procedures for air traffic controllers to react to approach path monitoring alerts. Reference: Future amendment of Doc 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM); Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP	2013
Airborne system capability	Safety nets	Surveillance system capabilities required for approach path monitoring alerts	SSR transponder compliant with … ADS-B out compliant with … Reference: Doc 100xx - Ground-based Safety Nets Manual - http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	Aircraft manufacturer Aircraft operator	2013
Ground system infrastructure	Safety nets	Surveillance ground capabilities required for approach path monitoring alerts	SSR radar ADS-B in station Reference: Doc 100xx - Ground-based Safety Nets Manual - http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP Ground systems supplier	2013

Ground system infrastructure	Safety nets	Display for approach path monitoring alerts	Capability to indicate alerts on the controller working position. Reference: Doc 100xx - Ground-based Safety Nets Manual - http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-ii	Aircraft manufacturer Aircraft operator	2013
Training	-	Training requirements for approach path monitoring alerts	Air traffic controller knowledge and reaction to alerts. Reference: Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP	2013

DEPLOYMENT APPLICABILITY

Operational conditions:

All controlled airspace for all aircraft in final approach.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Avoid controlled flight into terrain (CFIT) and obstacle collision risk	++	KPI20: Number of aircraft accidents

SNET-B1/1 Enhanced STCA with aircraft parameters Operational

☐ Sixth edition of the GANP

Main Purpose: Assist the air traffic controller in preventing collision between aircraft, using position data from ground surveillance and flight intent reported by aircraft.

New Capabilities: Using aircraft intent parameters allows STCA systems to reduce the number of unnecessary alerts, to increase the number of relevant alerts and to alert earlier, compared to the basic STCA system in Block 0.

Description

This enhanced STCA works the same as the basic STCA system in Block 0, but stops the linear extrapolation of the vertical position of an aircraft when it reached the Selected Flight Level information reported from ADS-B or downlinked from Mode S transponders.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-technology need	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)
Evolution	SNET-B0/1 - Short Term Conflict Alert (STCA)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Safety nets	Controller reaction to short term conflict alerts	Procedures for air traffic controllers reaction to short term conflict alerts. References: Doc 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	ANSP	2013
Airborne system capability	Safety nets	Surveillance system capabilities required for enhanced short term conflict alerts	SSR transponder compliant with … ADS-B out compliant with … References: Doc 100xx - Ground-based Safety Nets Manual http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	Aircraft manufacturer Aircraft operator	2019

Ground system infrastructure	Safety nets	Surveillance ground capabilities required for enhanced short term conflict alerts	SSR radar ADS-B in station References: Doc 100xx - Ground-based Safety Nets Manual Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	ANSP Ground systems supplier	2019
Ground system infrastructure	Safety nets	Display for enhanced short term conflict alerts	Capability to indicate alerts on the radar screen of the controller working positions. References: Doc 100xx - Ground-based Safety Nets Manual Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	ANSP Ground systems supplier	2019
Training	-	Training requirements for enhanced short term conflict alerts	Air traffic controller knowledge and reaction to alerts. Reference: Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP	2019

DEPLOYMENT APPLICABILITY

Operational conditions:

Enhanced STCA systems with aircraft parameters are applicable in all controlled airspace for all aircraft for which a controller has responsibility for separation or traffic information. Before operational use, the system must have been configured for the target airspace, to maximize the number of relevant alerts while keeping the number of unnecessary alerts to an acceptable level. It will bring incremental benefits as the number of ADS-B out capable aircraft or Mode S EHS capable aircraft increase.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Enhanced STCA use improves on basic STCA safety benefits by providing more relevant and earlier alerts for aircraft in vertical evolution. It also improves controllers' efficiency by reducing the number of unnecessary alerts for aircraft in vertical evolution.	ANSP Aircraft operator
	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve mid-air collision avoidance (safety net)	++	KPI20: Number of aircraft accidents KPI23: Number of airprox/TCAS alert/loss of separation/near midair collisions/midair collisions (MAC)

SNET-B1/2 Enhanced STCA in complex TMAs Operational

☐ Sixth edition of the GANP

Main Purpose

Assist the air traffic controller in preventing collision between aircraft, using position data from ground surveillance and taking into account possible crew intents linked to traffic patterns and ATC practices in complex TMAs.

New Capabilities

Taking into account traffic patterns and ATC practices allows STCA systems to reduce the number of unnecessary alerts, to increase the number of relevant alerts and to alert earlier, compared to the basic STCA system in Block 0.

Description

This enhanced STCA works the same as the basic STCA system in Block 0, but, in addition of the current proximity test and the linear prediction test, performs the following tests:

- (level-off prediction test) The vertical positions of aircraft in vertical evolution are extrapolated to level-off at the next reasonable FL.
- (turn prediction test) The horizontal positions of aircraft in proximity of a final approach path are extrapolated to turn in alignment with this final approach path.

Care is also taken to setup a specific set of alerting parameters (horizontal threshold, vertical threshold and warning time) for each approach area within the TMAS, where unnecessary alerts could affect runway throughputs.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-technology option	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)
Evolution	SNET-B0/1 - Short Term Conflict Alert (STCA)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Safety nets	Controller reaction to short term conflict alerts	Procedures for air traffic controllers reaction to short term conflict alerts. References: Doc 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	ANSP	2013
Airborne system capability	Safety nets	Surveillance system capabilities required for enhanced short term conflict alerts in complex TMAs	SSR transponder compliant with … ADS-B out compliant with … References: Doc 100xx - Ground-based Safety Nets Manual http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	Aircraft manufacturer Aircraft operator	2019
Ground system infrastructure	Safety nets	Surveillance ground capabilities required for enhanced short term conflict alerts in complex TMAs	SSR radar ADS-B in station References: Doc 100xx - Ground-based Safety Nets Manual Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	ANSP Ground systems supplier	2019
Ground system infrastructure	Safety nets	Display for enhanced short term conflict alerts in complex TMAs	Capability to indicate alerts on the radar screen of the controller working positions. References: Doc 100xx - Ground-based Safety Nets Manual Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-short-term-conflict-alert-stca-part-i-iii	ANSP Ground systems supplier	2019
Training	-	Training requirements for enhanced short term conflict alerts in complex TMAs	Air traffic controller knowledge and reaction to alerts. Reference: Doc 100xx - Ground-based Safety Nets Manual - Details in Eurocontrol documents at http://www.eurocontrol.int/publications/eurocontrol-guidelines-minimum-safe-altitude-warning-msaw-part-i-iii	ANSP	2019

DEPLOYMENT APPLICABILITY

Operational conditions:

Enhanced STCA systems in complex TMAs are applicable in all controlled complex TMAs for all aircraft for which a controller has responsibility for separation or traffic information. The deployment of such an enhanced STCA is necessary in TMAs where the basic STCA would produce an unacceptable level of unnecessary alerts or would fail to produce timely alerts for traffic with frequent trajectory changes. Before operational use, the system must have been configured for the target airspace, to maximize the number of relevant alerts while keeping the number of unnecessary alerts to an acceptable level.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Enhanced STCA use improves on basic STCA safety benefits by providing more relevant and earlier alerts for aircraft in horizontal and vertical evolution. It also improves controllers' efficiency by reducing the number of unnecessary alerts for aircraft in horizontal and vertical evolution.	ANSP Aircraft operator
	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve mid-air collision avoidance (safety net)	++	KPI20: Number of aircraft accidents KPI23: Number of airprox/TCAS alert/loss of separation/near midair collisions/midair collisions (MAC)

SURF

SURF-B0/1	Basic ATCO tools to manage traffic during ground operations	Operational

☐ Sixth edition of the GANP

Main Purpose

To improve safety and efficiency during ground operations by providing proper indications to pilots and vehicle drivers.

New Capabilities

The guiding and routing service is delivered using visual aids and signals on the platform. Information is managed by the controller to provide pilots and vehicle drivers all necessary information to taxi and avoid incursion on the runway.

Description

This element represents the provision of guidance and routing information to the pilot in order to manage the traffic in a safe and efficient way by the controller:

- to confirm the routing of all aircraft and vehicles according to the defined identification procedures;
- to prevent incursions on the runway using visual aids, stop bars in particular.

The Controller monitors and commands the lighting systems.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out Taxi-in

DEPENDENCIES AND RELATIONS

There are currently no dependencies.

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

Runway incursion is traditionally prevented using lighting systems on the Airport. Stop bars and other systems are highly contributing to the fluidity and safety of taxi operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
	Safety of surface operations	Airport operator ANSP Aircraft operator
	Efficiency of surface operations	Airport operator ANSP Aircraft operator
	Improved Management of the platform	Airport operator

Direct benefits Type	Operational description	Benefitting stakeholder(s)
	Prevention of Runway incursion	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of flight crew and vehicle driver	Airport operator, ANSP, Aircraft operator, Ground handling agent

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Efficiency	Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	++	KPI02: Taxi-out additional time
Safety		Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect taxiing (cases of non-conformance with clearance)	++	KPI20: Number of aircraft accidents

SURF-B0/2 Comprehensive situational awareness of surface operations — Operational

☐ Sixth edition of the GANP

Main Purpose: To better maintain ATCO awareness of ground operations.

New Capabilities: The surveillance service of A-SMGCS provides airport traffic situational awareness through the position, identification and tracking of aircraft and vehicle suitably equipped on the aerodrome surface. Information is presented on the controller and airport operator display independent of visibility conditions and controller line of sight.

Description

This service represents the provision of surveillance information to the controller in order to manage the traffic in a more efficient way and allows the controller:

- to confirm the identity of all participating vehicles according to the defined identification procedures;
- to prevent collisions between all aircraft and vehicles especially in conditions when visual contact cannot be maintained;
- to manually correlate (link a target with a call sign) targets for the rare cases where there is an operational need to, e.g. areas of poor cooperative surveillance coverage and the need to track non-cooperative targets such as towed aircraft;
- to detect and indicate the position of potential intruders.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-technology option	ASUR-B0/2 - Multilateration cooperative surveillance systems (MLAT)
Relation-technology benefit	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex Airports, the introduction of SMGCS functions is highly contributing to the safety and efficiency of surface operations by providing to the ATCO the necessary situation awareness to control operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
	Safety of surface operations	Airport operator ANSP Aircraft operator

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Efficiency of surface operations	Airport operator, ANSP, Aircraft operator
	Improved management of the platform	Airport operator
	Prevention of runway incursion	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve collision avoidance during taxi operations (safety net)	++	KPI20: Number of aircraft accidents
Safety		Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect presence of vacating aircraft or vehicles onto the runway protected area	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions

SURF-B0/3 Initial ATCO alerting service for surface operations — Operational

☐ Sixth edition of the GANP

Main Purpose: Detection by the ATCO of potentially unsafe situations with regard to runway operations.

New Capabilities: The ATCO will be provided with a short term conflicting alerting tool (A-SMGCS initial alerting service) that monitors movements on or near the runway and detects conflicts between an aircraft and another vehicle as well as runway incursion by intruders. Appropriate alerts will be visualized on the ATCO display.

Description

This element represents the first step of A-SMGCS alerting service and is based on A-SMGCS surveillance. It takes into account elements such as:

- the runway configuration of the airport (e.g. one, two or more runways);
- the associated procedures (e.g. multiple line ups and reduced separation on the runway when approved by the ATS authorities);
- the position and type of the aircraft and vehicles (e.g. arrival, departure or vehicle) according to the set time parameters and their relative speeds and positions when within or about to enter a predefined area around the runway;
- aircraft in the vicinity of the runway (e.g. on final approach, climb out and helicopters crossing);
- meteorological conditions.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out | Departure | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology option	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-technology option	ASUR-B0/2 - Multilateration cooperative surveillance systems (MLAT)
Relation-technology benefit	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)
Evolution	SURF-B0/1 - Basic ATCO tools to manage traffic during ground operations

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports, the complexity of the infrastructure and the traffic can induce possibility of errors in the management of taxi operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
	Safety of surface operations	Airport operator | ANSP | Aircraft operator

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Prevention of runway incursion	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve runway collision avoidance (safety net)	++	KPI20: Number of aircraft accidents

SURF-B1/1 Advanced features using visual aids to support traffic management during ground operations — Operational

☐ Sixth edition of the GANP

Main Purpose
To improve surface operations with the aim to reduce taxi time and fuel burn, potential mistakes.

New Capabilities
Advanced features including “Follows the Greens” (FTG) and Variable Message Panels are used to optimize routing during taxi operations. The lighting system is used to direct the aircraft, making the guidance safer, as errors are minimized.

Lighting system for other vehicles than aircraft is connected to the SMGCS in order to optimize ground circulation and prevent collision.

Description
Advanced features including FTG and Variable Message Panels are used to optimize routing during taxi operations. The lighting system is used to direct the aircraft, making the guidance safer, as errors are minimized.

Lighting system for other vehicles than aircraft is connected to the SMGCS in order to optimize ground circulation and prevent collision.

Maturity Level
Standardization

Human Factor Considerations
1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out, Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	SURF-B0/1 - Basic ATCO tools to manage traffic during ground operations
Relation-operational need	ACDM-B0/1 - Airport CDM Information Sharing (ACIS)

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports, the management of the platform is introducing numerous changes and an increased complexity in managing maintenance or construction together with ensuring safety and efficiency of operations. The introduction of dynamic aids is highly improving accuracy of the navigation on the surface and as such safety and efficiency.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Safety of surface operations	Airport operator, ANSP, Aircraft operator
	Efficiency of surface operations	Airport operator, ANSP, Aircraft manufacturer
	Improved management of the platform	Airport operator
	Prevention of runway incursion	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of flight crew and vehicle driver	Airport operator, ANSP, Aircraft operator, Ground handling agent

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Efficiency	Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	++	KPI02: Taxi-out additional time
Safety		Improve collision avoidance during taxi operations (safety net)	++	KPI20: Number of aircraft accidents

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Avoid incorrect taxiing (cases of non-conformance with clearance)	++	KPI20: Number of aircraft accidents

SURF-B1/2 Comprehensive pilot situational awareness on the airport surface — Operational

☐ Sixth edition of the GANP

Main Purpose To improve ground operations based on increasing pilot's situational awareness and safety especially at taxiway and runway intersections, as well as for aircraft landing and taking off.

New Capabilities In addition to display of the airport layout (showing taxiways, runways, fixed obstacles) and the own aircraft position, the pilot has an improved situational awareness thanks to the additional display of surrounding traffic (incl. both aircraft and optionally airport vehicles).

Description The pilot can visualize surrounding traffic to be presented on traffic computer and display. Different technologies enable this capability, among which ADS-B OUT/ADS-B IN. In order to maximize the benefits, it is suitable that all aircraft be equipped in a homogeneous manner. However, a transition period can be observed and a partial equipage will result in the display of only the appropriately equipped aircraft.

Maturity Level Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out | Departure | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology need	ASUR-B0/1 - Automatic Dependent Surveillance – Broadcast (ADS-B)
Relation-operational need	CSEP-B1/1 - Basic airborne situational awareness during flight operations (AIRB)

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports, the complexity of the infrastructure and the traffic can induce possibility of errors in the management of taxi operations. Full pilot situational awareness will first compensate possible mistakes from the controllers but also assist in improving the efficient management of taxi operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Safety of surface operations	Airport operator, ANSP, Aircraft operator
	Efficiency of surface operations	Airport operator, ANSP, Aircraft operator
	Improved management of the platform	Airport operator
	Prevention of runway incursion	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of flight crew	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve collision avoidance during taxi operations (safety net)	++	KPI20: Number of aircraft accidents
Safety		Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect presence of vacating aircraft or vehicles onto the runway protected area	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions

SURF-B1/3	Enhanced ATCO alerting service for surface operations	Operational

☐ Sixth edition of the GANP

Main Purpose: The enhanced A-SMGCS alerting service anticipates potential runway conflicts, runway incursion and other hazardous situations on the aerodrome surface.

New Capabilities: Early detection of aircraft and vehicles that are not following given clearances/ instructions or provision of alerts when clearances given by the controller do not comply with local ATC rules/procedures.

Description: The A-SMGCS Alerting service for controllers is complemented with the detection of conflicting ATC Clearances (CATC) given by the controller (e.g. Line-up versus Land on same runway) and with the detection of non-conformance to procedures or instructions (e.g. route deviation). An electronic clearance input means is used by the controller to make the clearances known to the system. Surveillance data and routing information are also used by the logic to generate alerts to the controller.

Maturity Level: Standardization

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out | Departure | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	SURF-B0/2 - Comprehensive situational awareness of surface operations
Evolution	SURF-B0/3 - Initial ATCO alerting service for surface operations
Relation-operational need	SURF-B1/4 - Routing service to support ATCO surface operations management

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports, the complexity of the infrastructure and the traffic can induce possibility of errors in the management of taxi operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Safety of surface operations	Airport operator, ANSP, Aircraft operator
	Prevention of runway incursion	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of ATCO	ANSP

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve early detection of conflicting ATC Clearances (CATC) related to runway usage	++	KPI20: Number of aircraft accidents
Safety		Improve early detection of conflicting ATC Clearances (CATC) related to taxi operations	++	KPI20: Number of aircraft accidents

SURF-B1/4 Routing service to support ATCO surface operations management — Operational

☐ Sixth edition of the GANP

Main Purpose
To improve pre-departure and departure sequencing by provision of accurate taxi times and efficient routing service.

New Capabilities
The A-SMGCS routing service calculates individual routes for mobiles for representation to the controller in order to support the runway sequencing strategy.

Description
The A-SMGCS routing service calculates individual routes for mobiles based on known airport parameters and constraints or following an interaction by the controller. The controller is presented with planned or cleared routes and has means to modify these routes or to create new route if necessary. Information is updated in real time in order to improve predictability of surface operations.

Maturity Level
Standardization

Human Factor Considerations
1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	SURF-B0/2 - Comprehensive situational awareness of surface operations
Relation-operational need	RSEQ-B0/1 - Arrival Management
Relation-operational need	RSEQ-B0/2 - Departure Management

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports, the management of the platform is introducing numerous changes and an increased complexity in managing maintenance or construction together with ensuring safety and efficiency of operations. Appropriate and potentially tailored routing services can highly improve safety and efficiency of airport surface management. When fully consistent with ACDM and Runway sequencing strategies, it clearly contributes to the performance of the airport and surrounding airspace management.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Safety of surface operations	Airport operator | ANSP | Aircraft operator
	Efficiency of surface operations	Airport operator | ANSP | Aircraft operator
	Improved management of the platform	Airport operator
	Prevention of runway incursions	Airport operator | ANSP | Aircraft operator
	Improve situational awareness of ATCO	ANSP
Indirect benefits	Improved efficiency of terminal airspace management and network operations.	ANSP | Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Efficiency	Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	++	KPI13: Taxi-in additional time

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Efficiency	Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	++	KPI02: Taxi-out additional time
Efficiency	Flight time & distance	Introduce 4D planning of taxi-in surface movements	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Introduce 4D planning of taxi-out surface movements	++	KPI02: Taxi-out additional time

SURF-B1/5 Enhanced vision systems for taxi operations Operational

☐ Sixth edition of the GANP

Main Purpose: Allow for improved navigation by visual reference, even during conditions of low-light or weather obscuration such as fog.

New Capabilities: The addition of cockpit enhanced vision capabilities will improve flight crew awareness of own ship position, and reduce navigation errors during periods of reduced visibility. In addition, improved situational awareness of aircraft position will allow for more confidence by the flight crew in the conduct of the taxi operation during periods of reduced visibility and ensure accurate application of received clearances.

Description: Additional avionics add electromagnetic sensors outside the visible light spectrum (e.g., infrared cameras, millimetre wave radar). These sensors will allow for improved navigation by visual reference, even during conditions of low-light or weather obscuration such as fog. Presentation to the flight crew may be through an instrument panel display or via heads-up display (HUD), etc.

Maturity Level: Standardization

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-information benefit	AMET-B0/1 - Meteorological observations products

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports, the capacity of the airport may decrease a lot in LVC due to surface operations. The introduction of enhance vision systems on board aircraft able to recognize lightings and ground indications can highly improve accuracy of the navigation on the surface and as such safety and efficiency and limit negative impact.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Efficiency of surface operations	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of flight crew	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Efficiency	Flight time & distance	Avoid longer taxi-in due to taxi errors	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Avoid longer taxi-out routes due to taxi errors	++	KPI02: Taxi-out additional time
Efficiency	Flight time & distance	Avoid slow taxi-in due to ATC and/or pilot	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Avoid slow taxi-in due to weather conditions	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Avoid slow taxi-out due to ATC and/or pilot	++	KPI02: Taxi-out additional time
Efficiency	Flight time & distance	Avoid slow taxi-out due to weather conditions	++	KPI02: Taxi-out additional time
Efficiency	Flight time & distance	Reduce ATC constraints during low visibility taxi-in	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Reduce ATC constraints during low visibility taxi-out	++	KPI02: Taxi-out additional time

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect presence of vacating aircraft or vehicles onto the runway protected area	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect taxiing (cases of non-conformance with clearance)	++	KPI20: Number of aircraft accidents
Safety		Improve early detection of conflicting ATC Clearances (CATC) related to taxi operations	++	KPI20: Number of aircraft accidents

SURF-B2/1 Enhanced surface guidance for pilots and vehicle drivers — Operational

☐ Sixth edition of the GANP

Main Purpose To improve the guidance of pilots and vehicle drivers on the aerodrome surface. Depending from the level of equipage of aircrafts and vehicles, the operational objective may be achieved either by airport ground equipment or through on-board capabilities.

New Capabilities Automatic triggering of airport ground signs according to the route and clearances issued by ATC.

Description The A-SMGCS guidance service is using the routing service in conjunction with ATCO inputs to allow the automated switching of Taxiway Centreline Lights (TCL) and/or stop bars. The guidance service improves the movement of mobiles on the movement area and reduces the workload of controllers.

Maturity Level Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	SURF-B0/1 - Basic ATCO tools to manage traffic during ground operations
Evolution	SURF-B1/1 - Advanced features using visual aids to support traffic management during ground operations

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports with very demanding traffic, the accuracy of the ground trajectory management is conditioning the overall performance of the management of the platform together with ensuring safety and efficiency of operations. Appropriate and potentially tailored routing services can highly improve safety and efficiency of Airport surface management. When fully consistent with ACDM and Runway sequencing strategies, it clearly contributes to the performance of the Airport and surrounding Airspace management.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Safety of surface operations	Airport operator ANSP Aircraft operator
	Safety of surface operations	Airport operator ANSP Aircraft operator
	Improved management of the platform	Airport operator
	Prevention of runway incursion	Airport operator ANSP Aircraft operator
	Improve situational awareness of flight crew and vehicle driver	Airport operator ANSP Aircraft operator Ground handling agent
Indirect benefits	Improved efficiency of terminal airspace management and network operations	ANSP Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Efficiency	Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	++	KPI02: Taxi-out additional time
Safety		Improve collision avoidance during taxi operations (safety net)	++	KPI20: Number of aircraft accidents
Safety		Avoid incorrect taxiing (cases of non-conformance with clearance)	++	KPI20: Number of aircraft accidents

SURF-B2/2 Comprehensive vehicle driver situational awareness on the airport surface — Operational

☐ Sixth edition of the GANP

Main Purpose

Expansion of situation awareness to vehicle's drivers by the provision of own position and surrounding traffic position on a display in the vehicle. Considered vehicles can be small UAS used for airport specific functions. The vehicle driver is informed about potential and actual risk of collision with aircraft and infringement of restricted or closed areas.

New Capabilities

Information regarding the surrounding traffic (including both aircraft and airport vehicles) during taxi and runway operations is displayed in the vehicle driver's cockpit. The system detects hazardous situations and provides the vehicle driver with the appropriate alert, either generated by the on-board system or uplinked from a centralized airport function.

Description

For the vehicles operating on the manoeuvring area of the airport, a display on-board of the vehicle is showing the surrounding traffic and own position to enhance the situational awareness of the vehicle driver and providing the appropriate alerts to ensure safer operations of vehicles on the manoeuvring area.

Maturity Level

Standardization

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out | Departure | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

There are currently no dependencies.

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports with very demanding traffic, vehicle drivers may have difficulty to get the full situation awareness. The provision of a comprehensive situational awareness and associated alerts through appropriate means associated with appropriate alerts will ensure safety and efficiency of operations.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Safety of surface operations	Airport operator | ANSP | Aircraft operator
	Efficiency of surface operations	Airport operator | ANSP | Aircraft operator
	Improved management of the platform	Airport operator
	Prevention of runway incursion	Airport operator | ANSP | Aircraft operator
	Improve situational awareness of flight crew	Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve collision avoidance during taxi operations (safety net)	++	KPI20: Number of aircraft accidents
Safety		Avoid incorrect entries of aircraft or vehicles onto the runway protected area (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Avoid incorrect presence of vacating aircraft or vehicles onto the runway protected area	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Avoid incorrect runway crossings by aircraft or vehicles (without or contrary to ATC clearance or due to incorrect ATC clearance)	++	KPI20: Number of aircraft accidents KPI21: Number of runway incursions
Safety		Improve runway collision avoidance (safety net)	++	KPI20: Number of aircraft accidents

SURF-B2/3 Conflict alerting for pilots for runway operations Operational

☐ Sixth edition of the GANP

Main Purpose To improve safety during runway operations by providing traffic indication and alerts to pilots and/or vehicle drivers.

New Capabilities The on-board system detects potential and actual risk of collision with other traffic during runway operations and provides the pilot with the appropriate alert.

Description This enhancement represents a key on-board feature to significantly decrease the risk of conflict with any mobile on or near the runway, improving safety on airport surface. Aircraft data is broadcasted with the proper level of performance and quality in order to provide adequate alerts to the pilots.

Broadcasted aircraft data can also be presented on board airport ground vehicles

Maturity Level Standardization

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out | Departure | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element

Evolution	SURF-B1/2 - Comprehensive pilot situational awareness on the airport surface

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

Runway incursion prevention.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Prevention of runway incursions.	Airport operator, ANSP, Aircraft operator
	Improve situational awareness of flight crew and vehicle driver	Airport operator, ANSP, Aircraft operator, Ground handling agent
Indirect benefits	The enabling infrastructure comprising traffic position broadcast as well as Data Link services is serving at least the general operational efficiency of the airport.	Airport operator, ANSP, Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Safety		Improve runway collision avoidance (safety net)	++	KPI20: Number of aircraft accidents

SURF-B3/1 Optimization of surface traffic management in complex situations — Operational

☐ Sixth edition of the GANP

Main Purpose: The objective of this element is to achieve the expected performance of the surface management taking account of all aspects of ground operations.

New Capabilities: Taking in account all aspects of ground operations and based on optimization algorithms, the A-SMGCS routing and guiding service is providing automation for the management of surface traffic in complex situations following ACDM agreed strategies. The controller workload is reduced. The ATCO keeps the ability to be in manual mode.

Description

Using the capabilities provided in the previous blocks, the management of surface traffic in complex situations can be automated. The controller keeps the possibility to operate in manual, semi-automated or automated mode.

Maturity Level

Concept

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? No

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	SURF-B1/3 - Enhanced ATCO alerting service for surface operations
Relation-operational need	SURF-B2/1 - Enhanced surface guidance for pilots and vehicle drivers
Relation-operational need	SURF-B2/2 - Comprehensive vehicle driver situational awareness on the airport surface

ENABLERS

There are currently no enablers.

DEPLOYMENT APPLICABILITY

Operational conditions:

On complex airports with very demanding traffic, full and reliable knowledge of the situation and associated routing services is allowing for automation and optimization of surface management in complex situations and at all conditions.

Main intended benefits:

Type	Operational description	Benefitting stakeholder(s)
Direct benefits	Safety of surface operations	Airport operator | ANSP | Aircraft operator
	Efficiency and predictability of surface operations	Airport operator | ANSP | Aircraft operator
	Improved management of the platform	Airport operator
	Prevention of runway incursion	Airport operator | ANSP | Aircraft operator

Type	Operational description	Benefitting stakeholder(s)
Indirect benefits	Improved efficiency of terminal airspace management and network operations	ANSP Aircraft operator

INTENDED PERFORMANCE IMPACT ON SPECIFIC KPAS AND KPIS

KPA	Focus Areas	Most specific performance objective(s) supported	KPI Impact	KPI
Efficiency	Flight time & distance	Avoid taxi-in additional time resulting from adverse conditions	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Avoid taxi-out additional time resulting from adverse conditions	++	KPI02: Taxi-out additional time
Efficiency	Flight time & distance	Introduce 4D planning of taxi-in surface movements	++	KPI13: Taxi-in additional time
Efficiency	Flight time & distance	Introduce 4D planning of taxi-out surface movements	++	KPI02: Taxi-out additional time