SESAR	Initial	APT
AOP23	Integrated runway sequence for full traffic optimization on single and multiple runway airports	

REG	ASP	MIL	APO	USE	INT	IND	NM	MET	AIS	USP

Subject matter and scope

The efficient use of integrated arrival and departure planning requires the development of early and dynamic planning of arrival and departure sequences into the runway of an airport. Today limitations with static patterns, lack of predictability and high manual workload need to be improved. To reduce extensive queuing in the air and on ground for reduction of airline fuel consumption/cost, there is a need of trajectory-based and early planning for improved operational efficiency.

The concept of Traffic Optimisation on single and multiple runway airports is applicable for all airport layouts that have dependencies between arrivals and departures. This includes runways operated in mixed mode as well as runway layouts with interdependencies between arrivals and departures.

The airport layout may bring constraints on the traffic flow management flexibility and then yield less coupling potential. The single runway and parallel runways in mixed mode is currently recognised to be the most constrained situation.

Optimised integration of arrival and departure traffic flows with the use of a trajectory-based Integrated Runway Sequence address a number of significant operational environments and validations are performed with a variation of industrial prototypes in advanced IBP´s.

The main goal for the Integrated RWY Sequence function is to establish an integrated arrival and departure sequence by providing accurate Target Takeoff Times (TTOTs) and Target Landing Times (TLDTs), including dynamic balancing of arrivals and departures while optimising the runway throughput.

The look ahead Time Horizon e.g. 1 hour is the time at which flights become eligible for the integrated sequence. The Stable Sequence Time Horizon is the time horizon within which no automatic swapping of flights in the sequence will occur, but landing and departure time will still be updated. The value of these time horizons is determined by the local implementation and they are not necessarily the same for arrivals and departures.

The Integrated Runway Sequence is planned before Arrival flights top of decent and linked with Airport CDM procedures for departures. Fine-tuning of Arrival and Departure target times is provided to ensure efficient runway throughput.

NOTE 1: This is an "Initial" objective to provide advance notice to stakeholders. Some aspects of the objective require further validation.

NOTE 2: The SLoAs listed in this document should be addressed to air navigation service providers as well as to airport operators. This is due to the fact that some airports operate their own ground control units for specific areas of responsibility at the airport. Airport operators providing air traffic control services qualify as ANSPs and are therefore covered by the ASP SLoAs. It is up to each implementer to check and select what is relevant to them, depending on local areas of responsibilities

NOTE FOR MILITARY AUTHORITIES: It is the responsibility of each military authority to review this Objective IN ITS ENTIRETY and address each of the SLoAs that the military authority considers RELEVANT for itself. This has to be done on top and above of the review of "MIL" SLoAs which identify actions EXCLUSIVE to military authorities.

Applicability Area(s) & Timescale(s)

Applicability Area (Not yet defined)	See list of airports in MP Level 3 Implementation Plan - Annexes

Timescales:	**From:**	**By:**	**Applicable to:**
IOC used for Analytics functioning only - not for implementation planning	01/01/2020		
FOC used for Analytics functioning only - not for implementation planning		31/12/2030	

References

European ATM Master Plan

OI step -	[TS-0301]-Integrated Arrival Departure Management for Full Traffic Optimisation on the Runway								
	Enablers -	AERODROME -ATC-33	AERODROME -ATC-58	APP ATC 164					

Legend:	WXYZ-001	Covered by SLoA(s) in this objective	WXYZ-002 zzz	Covered by SLoA(s) in another objective Objective covering the enabler	WXYZ-003	Not covered in the Implementation Plan

AOP23	Integrated runway sequence for full traffic optimization on single and multiple runway airports

Applicable legislation

-none-

Essential Operational Changes

Airport and TMA performance

SESAR Solution

PJ.02-08-01 - Integrated Runway Sequence for full traffic Optimization on Single and Multiple Runway Airports

ICAO GANP - ASBUs

- none -	

Deployment Programme

- none -	

European Plan for Aviation Safety

- none -	

Operating Environments

Airport
Terminal Airspace

Stakeholder Lines of Action (SLoAs)

SloA ref.	Title	From	By
AOP23-ASP01	Adapt the local systems so as to enhance the coupled AMAN-DMAN		
AOP23-ASP02	Improve the synchronisation between arrivals and departures		
AOP23-ASP03	Adapt the ATC System to support integrated arrival/departure sequence functionalities		
AOP23-ASP04	Develop appropriate procedures		
AOP23-ASP05	Safety assessment		
AOP23-ASP06	Training		
AOP23-ASP07	System in use		
AOP23-APO01	Adapt the local systems so as to enhance the coupled AMAN-DMAN		
AOP23-APO02	Improve the synchronisation between arrivals and departures		
AOP23-APO03	Develop appropriate procedures		
AOP23-APO04	Safety assessment		
AOP23-APO05	Training		
AOP23-APO06	System in use		

Description of finalised and deleted SLoAs is available on the eATM Portal @ https://www.eatmportal.eu/working/depl/essip_objectives

Expected Performance Benefits

Safety:	Safety maintained while increasing capacity
Capacity:	Increased airport capacity
Operational Efficiency:	Both fuel efficiency as well as CO2/Flight Time Efficiency
Cost Efficiency:	-
Environment:	-
Security:	-

Detailed SLoA Descriptions

AOP23-ASP01	**Adapt the local systems so as to enhance the coupled AMAN-DMAN**	From:	By:

AOP23	Integrated runway sequence for full traffic optimization on single and multiple runway airports

		-	-
Action by:	**ANS Providers**		
Description & purpose:	Enhance the coupled AMAN-DMAN so as to manage mixed mode and dependent runway operations as well as to identify and to resolve complex interacting traffic flows on the runway and possibly within a TMA environment. The Tower ATC system ATCO HMI is to be enhanced to support the display of integrated arrival/departure sequence information and the interactions of the user with it. Integrated Runway Sequence Function will calculate an optimized runway sequence including both arrival and departure flights and be linked to following functionality; • Arrival Management based on arrival Trajectory Prediction to provide estimated arrival landing times, including updates. Upstream En-Route sectors will receive advisories of arrival delay times when applicable. • Departure Management based on Airport CDM procedures to provide estimated take-off times, calculated from airlines preference on readiness with use of target off-block time. To support ATC with an overview of the integrated runway sequence an appropriate HMI presenting the integrated runway sequence order for both arrivals and departures will be provided. This HMI will provide to each ATC role the relevant information on the integrated runway sequence. This HMI may include support functions to enhance awareness and increase controller ability to comply with a predefined integrated runway sequence.		
ATM Master Plan relationship:	[AERODROME-ATC-33]-Coupled sequencing tool enhanced to better handle arrivals and departures		
Finalisation criteria:	1 - Systems have been enhanced		
AOP23-ASP02	**Improve the synchronisation between arrivals and departures**	From: -	By: -
Action by:	**ANS Providers**		
Description & purpose:	Improve the service orchestration between AMAN and DMAN to better synchronise arrivals and departures for the same airport. This addresses the calculation of the integrated arrival/departure sequence based on the different inputs as well as the distribution of the arrival/departure sequence		
ATM Master Plan relationship:	[AERODROME-ATC-58]-Agile synchronisation of arrivals with departure information for the same airport		
Finalisation criteria:	1 - Service orchestration improved		
AOP23-ASP03	**Adapt the ATC System to support integrated arrival/departure sequence functionalities**	From: -	By: -
Action by:	**ANS Providers**		
Description & purpose:	The APP ATC system ATCO HMI is enhanced to support the display of integrated arrival/departure sequence information and the interactions of the user with it An overview of the integrated runway sequence an appropriate HMI presenting the integrated runway sequence order for both arrivals and departures will be provided. This HMI will provide to each ATC role the relevant information on the integrated runway sequence. This HMI may include support functions to enhance awareness and increase controller ability to comply with a predefined integrated runway sequence		
ATM Master Plan relationship:	[APP ATC 164]-APP ATC System adapted to support integrated arrival/departure sequence functionalities in ATCO's HMI		
Finalisation criteria:	1 - Systems have been adapted.		
AOP23-ASP04	**Develop appropriate procedures**	From: -	By: -
Action by:	**ANS Providers**		
Description & purpose:	Develop ATC procedures as appropriate so as to support the integrated runway sequence		
Finalisation criteria:	1 - Procedures have been implemented		
AOP23-ASP05	**Safety assessment**	From: -	By: -
Action by:	**ANS Providers**		
Description & purpose:	A safety assessment of the changes shall be developed in coordination and synchronisation with all concerned stakeholders. This safety assessment shall be delivered to the competent authority.		
Finalisation criteria:	1 - Safety assessment has been developed and delivered to the competent authority.		
AOP23-ASP06	**Training**	From: -	By: -
Action by:	**ANS Providers**		
Description & purpose:	Train the air traffic controller on the traffic optimisation based on the use of integrated runway sequence		
Finalisation criteria:	1 - Training has been completed		
AOP23-ASP07	**System in use**	From: -	By: -

AOP23	Integrated runway sequence for full traffic optimization on single and multiple runway airports

Action by:	**ANS Providers**		
Description & purpose:	Once the systems have been updated, safety assessment delivered and accepted, training has been completed, the system is in operational use.		
Finalisation criteria:	1 - system has been put into service		
AOP23-APO01	**Adapt the local systems so as to enhance the coupled AMAN-DMAN**	From: -	By: -
Action by:	**Airport Operators**		
Description & purpose:	Enhance the coupled AMAN-DMAN so as to manage mixed mode and dependent runway operations as well as to identify and to resolve complex interacting traffic flows on the runway and possibly within a TMA environment. The Tower ATC system ATCO HMI is to be enhanced to support the display of integrated arrival/departure sequence information and the interactions of the user with it. Integrated Runway Sequence Function will calculate an optimized runway sequence including both arrival and departure flights and be linked to the following functionality; • Arrival Management based on arrival Trajectory Prediction to provide estimated arrival landing times, including updates. Upstream En-Route sectors will receive advisories of arrival delay times when applicable. • Departure Management based on Airport CDM procedures to provide estimated take-off times, calculated from airlines' preference on readiness with use of target off-block time. To support ATC with an overview of the integrated runway sequence an appropriate HMI presenting the integrated runway sequence order for both arrivals and departures will be provided. This HMI will provide to each ATC role the relevant information on the integrated runway sequence. This HMI may include support functions to enhance awareness and increase controller ability to comply with a predefined integrated runway sequence.		
ATM Master Plan relationship:	[AERODROME-ATC-33]-Coupled sequencing tool enhanced to better handle arrivals and departures		
Finalisation criteria:	1 - Systems have been enhanced		
AOP23-APO02	**Improve the synchronisation between arrivals and departures**	From: -	By: -
Action by:	**Airport Operators**		
Description & purpose:	Improve the service orchestration between AMAN and DMAN to better synchronise arrivals and departures for the same airport. This addresses the calculation of the integrated arrival/departure sequence based on the different inputs as well as the distribution of the arrival/departure sequence		
ATM Master Plan relationship:	[AERODROME-ATC-58]-Agile synchronisation of arrivals with departure information for the same airport		
Finalisation criteria:	1 - Service orchestration improved.		
AOP23-APO03	**Develop appropriate procedures**	From: -	By: -
Action by:	**Airport Operators**		
Description & purpose:	Develop ATC procedures as appropriate so as to support the integrated runway sequence		
Finalisation criteria:	1 - Procedures have been implemented		
AOP23-APO04	**Safety assessment**	From: -	By: -
Action by:	**Airport Operators**		
Description & purpose:	A safety assessment of the changes shall be developed in coordination and synchronisation with all concerned stakeholders. This safety assessment shall be delivered to the competent authority.		
Finalisation criteria:	1 - Safety assessment has been developed and delivered to the competent authority		
AOP23-APO05	**Training**	From: -	By: -
Action by:	**Airport Operators**		
Description & purpose:	Train the air traffic controller on the traffic optimisation based on the use of integrated runway sequence		
Finalisation criteria:	1 - Training has been completed		
AOP23-APO06	**System in use**	From: -	By: -
Action by:	**Airport Operators**		
Description & purpose:	Once the systems have been updated, safety assessment delivered and accepted, training has been completed, the system is in operational use.		
Finalisation criteria:	1 - System has been put into service		

AOP23	Integrated runway sequence for full traffic optimization on single and multiple runway airports