International Civil Aviation Organization

MIDANPIRG/22 & RASG-MID/12 Meetings

(Doha, Qatar, 4 – 8 May 2025)

Agenda Item 5.3: ANS (AIM, PBN, AGA-AOP, ATM-SAR, CNS and MET)

IMPLEMENTATION OF SIMULTANEOUS OPERATIONS ON PARALLEL INSTRUMENT RUNWAYS AT JEDDAH AND RIYADH INTERNATIONAL AIRPORTS

(Presented by Saudi Arabia)

SUMMARY

This paper provides information on the methodology used for the implementation of Simultaneous Operations on Parallel Instrument Runways at King Abdulaziz International Airport (JED) in Jeddah and King Khalid International Airport (RUH) in Riyadh.

With the steady increase of air traffic and considering the Kingdom's Vision 2030 objectives for air transport, the optimization and efficient management of airport capacity is crucial. The introduction of the various modes of Simultaneous Operations on Parallel Instrument Runways, such as Independent Parallel Approaches (IPA), Dependent Parallel Approaches (DPA), and Segregated Parallel Operations (SPO), improve runway throughput and reduce delays.

Action by the meeting is in paragraph 3.

REFERENCE

- ICAO Doc 9643: Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR).
- ICAO Annex 14: Aerodromes, Volume I - Aerodrome Design and Operation.
- ICAO Doc 4444: Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM).
- ICAO Doc 9859: Safety Management Manual (SMM).
- ICAO Annex 11: Air Traffic Services.
- GACA Aviation Safety Regulations (GACARs) Parts 171 and 172.

1. INTRODUCTION

1.1 The management of air traffic growth within the ICAO-MID Region requires innovative and efficient solutions covering the optimization of airport capacity and runway throughputs. The Kingdom of Saudi Arabia, with its rapidly expansion of its aviation sector, particularly at the main international airports, King Abdulaziz International Airport in Jeddah and King Khalid International Airport in Riyadh, faces increasing demands for additional flights from aircraft operators and requests for specific slots during high seasons. As both airports have parallel runways, it presents an advantage to leverage Simultaneous Operations on Parallel Instrument Runways and increase the aircraft movements from/to the two airports.

2. DISCUSSION

MODE OF SIMULTANEOUS OPERATIONS

2.1 King Abdulaziz International Airport in Jeddah (OEJN) and King Khalid International Airport in Riyadh (OERK) are equipped respectively with three parallel instrument runways and two parallel instrument runways. All Runways are distant by more than 2 km which offer the operational flexibility to use each runway for either arrival or departure traffic, or to permit mixed-mode of operations.

2.2 Based on the Runways characteristics and spacing at OEJN and OERK, four distinct modes of Simultaneous Operations on Parallel Instrument Runways are applicable:

- Two modes dedicated to simultaneous approaches.
- one mode for simultaneous departures, and one mode accommodating a mixture of simultaneous approaches and departures.

2.3 The introduction of Simultaneous Operations on Parallel Instrument Runways (SOIR) at OEJN and OERK adopted the following steps:

- developing an aeronautical study covering the concept of operations, and gaps for the introduction of simultaneous operations at OEJN and OERK, considering Saudia Arabia and ICAO requirements for SOIR operations.
- conducting ATC simulations to validate the SOIR concept of operations at OEJN and OERK.
- organizing a consultation with the aerodrome operators and national airlines.
- conducting safety Risk Assessments (SRAs).
- implementation of all safety requirements resulting from the SRAs.
- re-designing of Instrument Flight Procedures (IFPs) to support the SOIR operations (One of the main safety requirements for the introduction of SOIR).
- performing extensive simulations to validate the IFPs and identify the operational procedures for SOIR operations.
- developing operational procedures for SOIR operations.
- conducting extensive training for ATCOs and all affected Operational Staff.
- conducting extensive operational trials to validate all changes and allow ATCOs and pilots to be familiar with the SOIR operations.
- gathering airline feedback and comments, and amending the operational procedures, as required.
- publishing the aeronautical information on SOIR operations in KSA AIP.
- post implementation review.

2.4 The Mode of Simultaneous Operations on Parallel Instrument Runways at OEJN and OERK can be summarized as follows:

- **Mode 1: Independent Parallel Approaches.** These procedures involve concurrent instrument approaches to parallel runways at OEJN and OERK. A key characteristic of this mode is the absence of mandatory separation minima, derived from ATS surveillance systems, between aircraft operating on the extended centerlines of neighboring parallel runways.

- **Mode 2: Dependent Parallel Approaches.** These procedures involve concurrent instrument approaches to parallel runways at OEJN and OERK. Under this mode, there is a need for the application of specific separation minima, derived from ATS surveillance systems, between aircraft operating on the extended centerlines of neighboring parallel runways.

- **Mode 3: Independent Parallel Departures.** independent parallel departures involve the simultaneous commencement of takeoff from parallel instrument runways at OEJN and OERK. Eligibility for this mode is contingent upon specific criteria related to the spacing between adjacent parallel Runways.

- **Mode 4: Segregated Parallel Operations.** Segregated parallel operations entail the concurrent utilization of parallel instrument runways at OEJN and OERK where one runway is dedicated exclusively to instrument approaches and the other for departures. Under this mode, semi-mixed operations may be conducted. This includes configurations where one runway is exclusively used for departures while the other accommodates a combination of approaches and departures, or conversely, one runway is exclusively used for approaches while the other handles both approaches and departures. Furthermore, fully mixed operations are also possible.

SOIR AT JEDDAH - KING ABDULAZIZ INTERNATIONAL AIRPORT

2.5 Since 2009, King Abdulaziz International Airport (Jeddah) became a pioneering entity through the implementation of SOIR Modes 2 and 4. Specifically, SOIR Mode 2, where the prescribed lateral separation minimum of 3 nautical miles, was applied for operations involving the following runway pairs:

- Runways 34R/16L and 34L/16R
- Runways 34L/16R and 34C/16C

2.6 In response to high traffic demand and considering the operational requirements to use the three-runways, based on the Saudi air navigation regulations and requirements, Saudia Arabia initiated an aeronautical study to define the concept of operations, and identify the gaps for the introduction of SOIR at OEJN and OERK. The main objective of this undertaking is to facilitate the implementation of the third runway (Runways 34R/16L and 34C/16C) SOIR Mode 2 operations, targeted for completion by the end of 2025.

2.7 Trial operations for SOIR Modes 1 and 3 commenced in the first quarter of 2025, with full implementation scheduled for the second quarter of 2025 with the following considerations:

- Runways 34R/16L and 34L/16R – Mode 1 & 3;
- Runways 34R/16L and 34C/16C – Mode 3.

RIYADH - KING KHALID INTERNATIONAL AIRPORT SOIR

2.8 In 2014, King Khalid International Airport (Riyadh) is started the implementation SOIR Mode 4, established for operations involving the following runway pairs:

- Runways 33R/15L and 33L/15R.

2.9 In response to high traffic demand and a critical operational requirement for two-runway capacity, the Saudi Arabia initiated an assessment, gap analysis, and aeronautical study. The objective of this undertaking is to enhance mode 4 as well as facilitate the implementation of two-runways SOIR Mode 1, Mode 2 and Mode 3 operations by quarter 3 of 2025 to accommodate traffic growth and diversity of air traffic operations.

2.10 Trial operations for SOIR Modes 2 and for the enhanced mode 4 commenced in the first quarter of 2025. Moreover, trial operation for Mode 1 and 3 will be commenced in the second quarter of 2025, with full implementation scheduled in the third quarter of 2025.

EXPECTED BENEFITS OF SOIR OPERATIONS AT OEJN AND OERK

2.11 The expected benefits of the SOIR operations at OEJN and OERK can be summarized as follows:

- **Increased Airports Capacity:** the SOIR will allow efficient use of parallel runways at OEJN and OERK, enabling a greater number of aircraft movements (takeoffs and landings) within a given timeframe.
- **Reduced Delays:** by increasing the throughput of aircraft operations at OEJN and OERK, SOIR will contribute to a reduction in departure and arrival delays, leading to improved schedule reliability and passenger satisfaction.
- **Enhanced Operational Efficiency:** optimized runway utilization at OEJN and OERK through SOIR will achieve shorter taxiing times for aircraft, potentially reducing fuel consumption and associated emissions during ground operations.
- **Improved Airspace Efficiency:** the SOIR procedures at OEJN and OERK are designed to safely manage simultaneous operations, which can lead to a more streamlined flow of air traffic in the vicinity of the two airports.

ENVIRONMENTAL CONSIDERATIONS

2.12 SOIR operations at OEJN and OERK, incorporated consideration of certain environmental factors, which can be summarized as follows:

- **Potential Increase in Emissions:** while SOIR is expected to optimize ground operations at OEJN and OERK, an increase in the overall number of aircraft movements due to enhanced capacity could lead to a net increase in airborne emissions at both airports (e.g., carbon dioxide, nitrogen oxides, particulate matter) in the long term. Therefore, the CCO and CDO will improve airspace design and will compensate for such increase.
- **Noise Impact:** a higher frequency of aircraft operations at OEJN and OERK might result in increased noise levels in the areas surrounding both airports. Careful planning and noise mitigation strategies were established to manage this impact on local communities.
- **Air Quality:** Increased aircraft emissions at OEJN and OERK can affect local air quality. Air quality monitoring and mitigation measures have been established to ensure that air pollution levels remain within acceptable limits.
- **Sustainable Practices:** Ideally, the efficiency benefits of SOIR should be combined with other sustainable airport practices, like using sustainable aviation fuels, electric ground support equipment, and optimized flight paths, to minimize the environmental impact of each aircraft movement. Specifically for Jeddah and Riyadh.

2.13 In conclusion, the rapid growth and strategic importance of King Abdulaziz International Airport and King Khalid International Airport as major hubs in Saudi Arabia, the implementation of SOIR will significantly enhance their operational capacity where additional flights can be easily accommodated. The assessment of the environmental impact of the increase in the number of movements at OEJN and OERK are on-going to identify additional mitigations, and manage any potential adverse effects associated with increased air traffic. These assessments are considering factors such as noise contours, air quality dispersion modeling, and strategies for minimizing the carbon footprint in conjunction with the implementation of SOIR operations.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) take note of the information presented in this working paper;

b) invite MID States to share information on the implementation of SOIR operations; and

c) invite ICAO MID to include the introduction of SOIR operations at OEJN and OERK in the Mid-Air Navigation Report 2025.

- END -