International Civil Aviation Organization

Thirteenth Meeting of The Performance Based Navigation Implementation Coordination Group (PBNICG/13)

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Agenda Item 6: States' Minimum Operational Network (MON)

Minimum Operational Network (MON) in Pakistan

(Presented by Pakistan)

SUMMARY

This paper outlines a strategic framework for a state-level Minimum Operational Network (MON). The MON serves as a resilient, ground-based, and autonomous backup network which should support continued aircraft operations during the time when satellite based navigation is not available due to Radio Frequency Interference, space weather activities etc.

1. INTRODUCTION

1.1 A Minimum Operational Network (MON) is a strategic framework designed to guarantee continuous, safe, and resilient navigation services during emergency outages or unintended disruptions to support aircraft navigation.

1.2 In Pakistan, establishing a MON is critical to back up the vulnerabilities of Global Navigation Satellite Systems (GNSS) Radio Frequency Interferences (RFI), which have been encountered during last few years.

2. DISCUSSION

2.1 The Council while considering the GNSS interference issue in its decision C-DEC234/11 has encouraged Member States to consider, as appropriate and practical, retaining or implementing a Minimum Operational Network (MON) of ground-based navigation and surveillance infrastructure to ensure operational safety as well as sufficient airspace capacity during times of GNSS interference, and to explore equipping aircraft with GNSS-independent systems, where feasible.

2.2 Pakistan has been among the early APAC states implementing PBN. Pakistan submitted its first PBN implementation plan in 2009 which covers implementation of PBN approach and terminal procedures at all possible airports. Pakistan completed its target of implementation in 2017. As the existing navigation infrastructure was not supporting the DME-DME area navigation, airspace concept was based on use of RNP 1 for terminal applications and RNP APCH for approach phase of flight relying on the use of GNSS. RNP 1 connectivity was also provided to the ILS facilities available at various airports.

2.3 The subject of rationalizing the navaid infrastructure was deliberated at times and considering the possible vulnerability, Pakistan decided to maintain its ground-based navigation infrastructure for some time till the full confidence is established. The primary goal of Pakistan's decision was to become "satellite-resilient" instead of "satellite-dependent". While the GNSS was used for safety and efficiency, the backup infrastructure (MON) enabled safe Instrument Flight Rules (IFR) operations, maintaining a minimum capability for En-route navigation and terminal arrivals.

2.4 Pakistan has maintained its conventional navigation infrastructure based on VOR/DME network to support navigation in enroute phase as well as terminal/approach phase of flights. These VOR/DME facilities not only enable the aircraft to navigate during enroute phase of flight but also allow compliance with RNAV 5 requirements for aircraft with inertial back-up within Pakistan airspace. The details of VOR/DME facilities available are:

1) Karachi “KC”	8) Lahore “LA”
2) Nawabshah “NH”	9) Islamabad “BTR”
3) Panjgur “PG”	10) Old Islamabad “RN”
4) Rahim Yar Khan “RK”	11) Peshawar “PS”
5) Multan “MT”	12) Zhob “ZB”
6) Quetta “QT”	13) Dera Ismail Khan “DI”
7) Sialkot “SLT”	14) Gwadar “GW”

2.5 ILS facilities are also available and being maintained to support Precision Approach operations at major aerodromes of Karachi, Lahore, Islamabad, Quetta, Peshawar, Multan, Faisalabad and Sialkot with CAT III operations at Lahore and Islamabad. At small airports supporting turboprop IFR operations, NDBs have been maintained for conventional navigation backup in such scenarios.

2.6 The decision was not limited to navigation perspective. A network of 09 ADS-B sensors have been deployed to have surveillance coverage of grey areas and for redundancy which may have impact due to GNSS spoofing / jamming. However, Mode S SSR and PSR still serve as primary sensor (GNSS independent surveillance sources) for the provision of surveillance-based air traffic services during GNSS RFI events. The primary network of 06 MSSR & 03 PSR constituted the MON in the area of surveillance:

1) Karachi MSSR / PSR	4) Lakpass MSSR
2) Lahore MSSR / PSR	5) Rojhan MSSR
3) Islamabad MSSR / PSR	6) Pasni MSSR

2.7 Pakistan based on the aspects highlighted above, considers that current navigation and surveillance infrastructure available in Pakistan is sufficient and provides an appropriate level of resilience to support safe ATS and contingency IFR operations during GNSS interference and consistent with the intent ICAO Council Decision C-Dec 234/11.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.