International Civil Aviation Organization

AN-Conf/13-WP/238
27/9/18
English only

WORKING PAPER

THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

Agenda Item 4: Implementing the global air navigation system and the role of planning and implementation regional groups (PIRGs)
4.3: Implementing ASBUs for performance improvement

A PERFORMANCE-BASED APPROACH TO AIR NAVIGATION PLANNING AND IMPLEMENTATION

(Presented by the Republic of Korea)

EXECUTIVE SUMMARY

Emphasizing a performance-based approach to air navigation planning and implementation, this paper presents development of national Key Performance Indicators (KPIs) of the Republic of Korea. It also highlights the importance of development of harmonized KPIs and standardized performance data management process, and necessity to update guidance material on methodology for data collection and analysis to effectively conduct the performance monitoring.

Action: The Conference is invited to agree to the recommendation in paragraph 3.

1. INTRODUCTION

1.1 According to the recommendation of the Eleventh Air Navigation Conference in 2003, as well as the 35th Session of the ICAO Assembly in 2004, a performance-based approach to air navigation planning and implementation was endorsed and the relevant guidance, *Manual on Global Performance of the Air Navigation System* (Doc 9883), was developed in 2008.

1.2 The fifth edition of the *Global Air Navigation Plan* (GANP, Doc 9750) describes a performance-based approach for implementing the aviation system block upgrades (ASBUs). It also introduces a three-phased future development plan for the performance-based approach and potential global key performance indicators (KPIs) in three key performance areas (KPAs) of efficiency, capacity and predictability.

1.3 Emphasizing the application of performance-based approach for air traffic management (ATM) performance improvement, ICAO encourages regions and States to implement their performance framework for air navigation systems on the basis of ICAO guidance and regional performance objectives. It also recommends that States utilize a focussed set of KPIs that provide the means of identifying national shortfalls and prioritizing investments.

2. DISCUSSION

Establishment of national KPIs for a performance-based approach

2.1 The Republic of Korea (ROK) introduced a performance-based approach, including national KPIs focused on the ASBU Block 0, to the national plan, called the *National ATM Reformation and Enhancement Plan* (NARAE), in 2016. Currently, the NARAE has been upgrading with new strategies, updated operational improvement and its detailed implementation plan to modernize national air navigation system. It is expected to introduce new national KPIs as well, reflecting the ASBU Block 1 modules.

2.2 The NARAE is the ROK's national mid/long-term air navigation plan to be achieved over 2013 to 2025. The upgraded NARAE will consist of forty-six operational improvement projects (NARAE modules) to modernize national air navigation system, and its detailed implementation plan, especially focusing on the ASBU Block 0 and Block 1 modules. The forty-six main projects are linked with four Performance Improvement Areas (PIAs): aviation operations; globally-interoperable systems and data; optimum capacity and flexible flights; and efficient flight paths, aligned with ICAO's ASBU PIAs.

2.3 In addition, seventy-nine KPIs have been developing as national KPIs in NARAE to effectively monitor performance and implementation benefit of the each project (Appendix A refers). The KPIs are directly connected with eleven KPAs, namely: access and equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation by ATM community; predictability; safety; and security, aligned with the global KPIs defined in the *Global Air Traffic Management Operational Concept* (Doc 9854) and Doc 9883.

2.4 The KPIs can be utilized for all stakeholders' performance monitoring, including but not limited to, air navigation service providers, regulatory body, airport operators, and airspace users. It will allow States and relevant entities not only to measure operational improvement but also to identify shortfalls and investment priorities of air navigation system. A chosen set of KPIs will also allow relevant stakeholders to identify the gap between the current performance and the expected one, and take action to achieve the desired performance. Therefore, as a clear performance target, defining KPIs and performance metrics is crucial to measure its performance based on accurate data collection and data analysis.

2.5 In addition, the Air Navigation Performance Management Form (Appendix B refers) has been developing to identify the level of implementation and KPIs for each NARAE modules. The form describes each module's performance objective, application target, KPIs, implementation indicator and list of data to be collected for the performance monitoring.

2.6 For successful implementation of performance-based approach, region and States need to consider the four key elements of performance management process: a) identification of the needs, challenge and priorities; b) establishment of performance objectives and KPIs; c) performance monitoring using KPIs; and d) cooperation with stakeholders. Application of performance-based air navigation planning and implementation will increase the operational improvement in air navigation system and facilitate to modernize air traffic management (ATM) system.

Importance of global KPIs development

2.7 The Air Navigation planning and implementation performance framework consists of reporting, monitoring analysis and review activities. To support effective performance monitoring, a set of activities including performance data collection, processing, storage and reporting are crucial. As one

of the core performance data, the KPIs allow to monitor current operation and measure benefits of the ASBU implementation. The globally harmonized KPIs are essential to implement a performance-based approach in global, regional and national level.

2.8 There are two different types of KPAs and KPIs in each respective ICAO documents. In Doc 9854 and Doc 9883, ICAO identified eleven expectations for global ATM system, so called eleven KPAs, and related various KPIs. On the other hand, ICAO introduced a potential set of sixteen KPIs in three KPAs of efficiency, capacity and predictability in the GANP, Doc 9750.

2.9 Considering the importance of performance monitoring in performance-based approach, the current potential KPAs and KPIs in the fifth edition of the GANP should be developed as a complete harmonized form in accordance with those in the *Manual on the Global Performance of the Air Navigation System* (Doc 9883).

2.10 The fifth edition of GANP prescribes a three-phased development plan for updating KPIs and relevant guidance material on data collection and analysis, and establishing a global performance baseline, etc. by 2022 and beyond. For the next edition, ICAO's performance ambitions will be introduced as a high-level statement expressed in a qualitative way, in global strategic level. In global technical level, ICAO is also developing a performance objective catalogue with top-level objectives and various sub-objectives for the updated ASBU framework (AN-Conf/13-WP11 and WP18 refers). These performance ambitions and performance objective catalogue are connected with eleven expectations and KPAs defined in Doc 9854 and Doc 9883.

2.11 ICAO's efforts to advance a performance-based approach are highly valued. For a globally harmonized implementation of a performance-based approach, global KPIs aligned with performance objective catalogue need to be developed in an expedited manner. Continuous efforts for the development of performance objectives and global KPIs will support region and States to implement a performance-based approach smoothly.

Performance-based approach focusing on a performance target

2.12 Although ICAO emphasized the application of a performance-based approach, most of the regional and national performance improvement plan has been set on the basis of implementation target of a particular solution of ASBUs modules, reflecting their needs and priorities. In line with ICAO's performance ambitions and performance objective catalogue, which will be introduced in the sixth edition of the GANP, regions and States need to establish their performance target and relevant KPIs. Moreover, performance monitoring in the regional and national level should be conducted based on accomplishment of an agreed level of performance improvement using KPIs, not only on implementation status on a chosen set of specific ASBUs modules.

Development of guidance on performance data collection and analysis

2.13 The harmonized performance data management process is essential in performance-based approach, e.g., which data should be collected or stored, along with the detailed algorithm to compute performance indicators to monitor and achieve sustainable air navigation performance. Many States have limited capabilities in managing ATM performance data including performance data collection, warehousing and analysis, which are the basic features to performance monitoring and reporting, especially in information rich environment,

2.14 The ROK introduced a performance-based approach, including national KPIs, focused on the ASBU Block 0 in 2016. However, the performance monitoring was not successfully implemented due

to difficulties of data collection and analysis, and immaturity of systematic data management process. Currently, the ROK is developing a performance management process through the data collection, processing and analysis to facilitate performance monitoring. One of the fundamental parts of the process is systematic data collection, where the data are produced and managed by each stakeholder individually, in a collaborative manner. Moreover, the ROK is planning to establish a national legal scheme to collect, exchange, protect and analyse performance data for successful performance-based approach to air navigation planning and implementation.

2.15 Although ICAO provided the guidance on performance management process in Doc 9883, many States, including the ROK, are still facing challenges of performance monitoring and review. Towards a globally harmonized implementation and air navigation improvement, provision of detailed guidance on performance data collection and analysis, with best practices and exemplary models, will facilitate States to implement more effective and conduct easier performance monitoring.

3. CONCLUSION

The Conference is invited to agree on the following recommendations:

a) note the information contained in this paper;

b) request regions and States to reflect a performance-based approach to air navigation planning and implementation, focusing on their performance target and KPIs;

c) request ICAO to continue the development of the harmonized performance objectives and KPIs in an expedited manner to adopt in the early stage of air navigation planning and implementation by States ;

d) agree the necessity of standardized performance data management process including data collection and data analysis methods for globally harmonized implementation of a performance-based approach; and

e) request ICAO to update guidance material in detail, on performance data collection and analysis for effective performance monitoring, with best practices and exemplary models.

— — — — — — — —

APPENDIX A

THE NATIONAL KPIs OF NARAE (DRAFT VERSION)

KPAs	KPIs
KPA01 -Access & Equity (6 KPIs)	• (SURF) % of A-SMGCS implemented airports • (SURF) % of improvement of Air Traffic Controller's blind area • (SURF) % of ADS-B for airport surface surveillance (ADS-B APT) applicable airports in A-SMGCS • (APTA) % of establishment of GNSS based approach procedure at the aerodrome, where it is difficult to establish ground NAVAIDs based approach procedure • (DATM) % of availability of digital aeronautical information by information users via internet-protocol-based tools • (RPAS) % of operation by remotely piloted aircraft in non-segregated airspace
KPA02 – Capacity (13 KPIs)	• (WAKE) % of increase in runway capacity applying six wake turbulence categories • (SURF) % of aircraft operation in low visibility conditions • (RSEQ) % of increase in airspace capacity (TMA) and runway capacity applying time-based metering • (APTA) % of establishment of GNSS based procedure at aerodromes operating precision approach Category I • (CDO) % of establishment of VNAV approach procedures • (FRTO) % of flexible use of airspace • (NOPS) % of availability of ATFM network by airspace users • (AMET) % of acceptance of airspace users' preferred flight trajectory supported by meteorological information • (FICE) % of reduction of air traffic controller's workload on ATC coordination between ATC units by using AIDC, ATN/AMHS or FIXM • (FICE) % of ATC transfer through the AIDC or ATN/AMHS • (ASUR) % of improvement of ground surveillance capacity supported by ADS-B Out or wide area multilateration (MLAT) systems • (TBO) % of reduction of air traffic controller's workload on aircraft sequencing at merging point • (TBO) % of reduction of air traffic controller's workload on ATC clearance delivery and ground control
KPA03 - Cost Effectiveness (4 KPIs)	• (ACDM) % of reduction of fuel burn through saving the air and ground holding time • (DATM) % of improvement of information processing time and management by the implementation of digital aeronautical information system • (SWIM) % of reduction of operation cost on ATM information processing and exchange through SWIM • (ASEP) % of reduction of fuel burn through aircraft own separation using the guidance on flight deck such as AIRB or VSA
KPA04 – Efficiency (18 KPIs)	• (WAKE) % of reduction of delays by optimizing wake turbulence separation between departing aircraft • (WAKE) % of reduction of fuel burn applying six wake turbulence categories • (SURF) % of reduction of average taxiing time through enhanced airport surface surveillance using A-SMGCS, ADS-B APT or EVS • (ACDM) % of reduction of fuel burn through saving the air and ground holding time • (RSEQ) % of reduction of delays and holding time through the integrated AMAN • /DMAN • (RSEQ) % of integrated DMAN/AMAN implemented airports

	• (RSEQ) % of ATC units applying time-based metering using AMAN in connection with RNP/RNAV approach procedures • (APTA) % of reduction of aircraft operation cost through the reduction of flight delays and cancellation • (CDO) % of reduction of fuel burn by implementation of VNAV approach procedure • (FRTO) % of reduced flight length through flexible routing • (FRTO) % of reduction of fuel burn through flexible routing • (NOPS) % of provision of advisory information which adversely affect aircraft operation such as severe weather • (SWIM) % of digital information provision through SWIM • (AMET) % of acceptance of airspace users' preferred flight trajectory supported by meteorological information • (FICE) % of difference between the requested flight level on flight plan and cleared flight level by ATC • (TBO) % of application of traffic synchronization at en-route merging points and terminal airspace through the use of 4D trajectory capability • (ASEP) % of aircraft which is capable of interval management (IM) • (ASEP) % of increase of airspace capacity through precise interval management
KPA05 – Environment (8 KPIs)	• (WAKE) % of reduction of delays by decreased wake turbulence separation • (WAKE) % of reduction of carbon emissions applying six wake turbulence categories • (AMET, TBO, FRTO) % of reduction of fuel burn • (SURF, ACDM, RSEQ, APTA, FRTO, AMET) % of reduction of carbon emission • (ACDM, TBO) % of reduction of noise sensitive areas • (SWIM) % of reduction of paper usage for information processing and transmission • (AMET) % of reduction of route alteration from filed flight plan • (ASEP) % of reduction of carbon emissions due to reduced flight length
KPA06 – Flexibility (4 KPIs)	• (WAKE) % of airports that applied reduced wake turbulence separation on near-parallel runways • (RSEQ) % of airports that applied the dynamic scheduling management • (FRTO) % of flexible use of airspace • (AMET) % of reduction of route alteration from filed flight plan
KPA07 - Global Interoperability (2 KPIs)	• (DATM) % of application of standardized AXIM procedure between adjacent States • (FICE) % of application of standardized FIXM procedure between adjacent States
KPA08 - Participation by ATM Community	• Not developed yet
KPA09- Predictability (8 KPIs)	• (ACDM, RSEQ) % of on-time operation • (ACDM, RSEQ) % of reduction of delays • (CDO) % of establishment of VNAV approach procedures • (NOPS) % of acceptance of airspace users' preferred flight trajectory • (AMET) % of reduction of route alteration from filed flight plan • (AMET) % of reduction of contingency fuel • (AMET) % of fewer reroutes and less variability in associated traffic management initiatives (TMIs) such as metrological constraints • (TBO) % of aircraft with flight management system (FMS)/required time of arrival (RTA) capability
KPA10 –Safety (14 KPIs)	• (SURF) % of reduction of runway incursion/ excursion

	• (RSEQ) % of airports applying AMAN/DMAN in connection with ATFM • (APTA) % of reduction of accidents/incidents/safety events on final approach segment (e.g. occurrence of minimum safe altitude warning (MSAW)) • (CDO) % of reduction of accidents during decent profiles (CDOs) using VNAV • (NOPS) % of reduction of occurrences exceeding the airspace capacity • (DATM) % of increase of data integrity • (SWIM) % of improvement of data accessibility and data quality • (AMET) % of reduction of accidents/incidents due to hazardous meteorological conditions • (AMET) % of fewer reroutes and less variability in associated traffic management initiatives (TMIs) such as metrological constraints • (FICE) % of reduction of ATC's error in relation to coordination with adjacent ATC units • (ASUR) % of improvement of ground surveillance capacity supported by ADS-B Out or wide area multilateration (MLAT) systems • (TBO) % of reduction of the misinterpretations and errors in the interpretation of the complex departure and taxi clearances • (RPAS) % of RPAS equipped with the airborne detect and avoid (ABDAA) system • (ASEP) % of reduction of air traffic controller's workload after introducing IM system
KPA11 – Security (2 KPIs)	• (DATM) % of application of security policy while developing ATM information system • (SWIM) % of improvement of data accessibility and data quality

— — — — — — — —

APPENDIX B

SAMPLE TEMPLATE

Air Navigation Performance Management Form for the NARAE Modules

No.	1-5	NARAE Module	Airport- CDM
PIA	PIA 1- Airport Operation		
Application	Incheon airport, Gimpo airport, Gimhae airport, Jeju airport		
Relevant Stakeholders	ATS units (relevant ACCs, TWRs, and APPs), ATFM unit, airport operators (IIAC, KAC), aircraft operators, ground handling agents		
Performance objective	Optimize airport operations and decisions in a collaborative environment by sharing information between all stakeholders through integrated information system		
KPIs	• (KPA03/04) % of reduction of fuel burn through saving the air and ground holding time • (KPA05) % of reduction of carbon emission • (KPA05) % of reduction of noise sensitive areas (number and/or dimensions of area) • (KPA09) % of on-time operation • (KPA09) % of reduction of delays		
Implementation indicator	$\frac{Number\ of\ ACDM\ Implementation\ airport}{Number\ of\ ACDM\ Implementationa\ Target\ airport} \times 100$		
Data collected	• Value of reduction of fuel burn through saving the air and ground holding time (from aircraft operators) • Value of reduction of carbon emission (from aircraft operators) • Value of noise sensitive areas; number and/or dimensions of area (from airport operators) • Value of on-time operation (from airport/ aircraft operators, and ATC units) • Value of reduction of delays (from aircraft operators)		
Related ICAO ASBU Modules	ACDM B0, ACDM B1		

— END —