International Civil Aviation Organization

A40-WP/85
TE/20
26/7/19

WORKING PAPER

ASSEMBLY — 40TH SESSION

TECHNICAL COMMISSION

Agenda Item 30: Other issues to be considered by the Technical Commission

ADDRESSING CAPACITY CHALLENGES IN THE AIR NAVIGATION SYSTEM THROUGH A COLLABORATIVE GLOBAL NETWORK-CENTRIC APPROACH

(Presented by Finland on behalf of the European Union and its Member States[1], the other Member States of the European Civil Aviation Conference[2]; and by EUROCONTROL)

EXECUTIVE SUMMARY

The paper addresses the need for improvements of the air navigation system to meet a growing airspace and aerodromes user demand, specifically at peak times and in congested areas. It advocates a collaborative global network-centric planning of airspace design, air traffic flow management (ATFM), operational and technical interoperability and thus building a global "network of networks" by better interconnecting regional/sub-regional networks. Implementing such an approach can contribute to the efficient continuity of air traffic flows at global level between ICAO regions as well as within the regions, supporting continuity of flows also during crises. A comprehensive air traffic management (ATM) data exchange across the regions is required.

Action: The Assembly is invited to:

urge States to:

a) support a collaborative global network-centric approach for airspace design, ATFM and operational and technical interoperability to meet growing user demand and to ensure the efficient continuity of air traffic flows at global level between ICAO regions as well as within the regions;
b) speed up the air navigation system modernisation to improve the overall network performance;
c) commit fully to a collaborative approach together with the members of the air navigation community;
d) establish a comprehensive ATM data exchange, including across all ICAO regions, to enable an efficient air traffic management system including planning, design, implementation, operation and performance measurement; and
e) ensure that appropriate performance indicators and metrics are developed, agreed and used in a

[1] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

[2] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Iceland, Republic of Moldova, Monaco, Montenegro, North Macedonia, Norway, San Marino, Serbia, Switzerland, Turkey and Ukraine.

harmonised manner supporting a network-centric planning and operation.

direct the Council to:

f) encourage the fullest possible participation by states and the air navigation community in a collaborative global network-centric planning and operation; and

g) strengthen the role of PIRGs in support of a global network-centric approach and establish structural inter-PIRGs cooperation in this regard.

instruct the Secretary General to:

h) initiate a review of ICAO's *Global Air Traffic Management Operational Concept* (Doc 9854) to reflect the sixth edition of the GANP regarding collaborative cross-border planning and operation of the air navigation system based on a network centric view.

Strategic Objectives:	This working paper relates to Strategic Objective of Air Navigation Capacity and Efficiency
Financial implications:	The activities referred to in this paper will continue subject to the resources available in the 2020-2022 Regular Programme Budget and/or from extra budgetary contributions.
References:	AN-Conf/13 Recommendation 3.3/1 — *Network operations* (NOPS) *Global Air Navigation Plan* (GANP, Doc 9750) *Global Air Traffic Management Operational Concept* (GATMOC, Doc 9854)

1. INTRODUCTION

1.1 The continuous global growth of air traffic poses a significant challenge to the air navigation system. The requirement to safely provide a continuous increase of airspace and aerodromes capacity as well as facilitating user preferred trajectories at defined levels of performance generates the need for a different approach to planning and operations of the air navigation system. Moreover, new entrants are likely to create further demand and may have an impact on existing concepts of operations if capacity challenges are not appropriately addressed. It is also recognised that a system operating at or close to its capacity limits is more susceptible to system disruptions.

1.2 To meet airspace user demand and to ensure the safe, efficient and environmentally sustainable continuity and predictability of air traffic flows at global level between ICAO regions as well as within the regions, specifically at peak times and in saturated areas, there is a need for an increase in the capacity of the air navigation system. The need to find an appropriate balance between capacity, environment and cost-efficiency without compromising safety requires careful consideration. Significant operational harmonisation together with advanced automation can help to balance sometimes-competing expectations. Strengthened global cooperation is key to ensuring the desired level of traffic predictability for both planning and operational phases. Other factors to consider are today's complex and highly dynamic security environment as well as ICAO's "No Country Left Behind" (NCLB) initiative.

2. A GLOBAL NETWORK-CENTRIC APPROACH

2.1 Although there is no simple or single solution to overcome all these challenges, a collaborative network-wide planning and operation, as envisaged by ICAO's Global Air Navigation Plan (GANP), has demonstrated its potential to improve air traffic flow efficiency across flight information region (FIR) boundaries and thus contributes beneficially to the air navigation system. Other regions

share similar experiences.[3] Network-wide planning and operation have not exhausted their potential and further steps are needed, including those necessary to support an evolutionary transformation into a trajectory-based operations (TBO) environment.

2.2 A collaborative network-centric approach focuses on the link between the operational and technical dimensions of the air navigation system including airspace, operations and technology, infrastructure, applications, data services, humans and cost. The intent is to ensure that airspace and aerodrome capacity is optimised according to operational needs, without being limited by FIR or national boundaries. In a future TBO environment, a four-dimensional flight trajectory collaboratively developed, managed and shared would serve as a common reference for decision-making across all stakeholders.

2.3 To better understand the concept and its implications a proper definition of "the network" is key. A network can be defined as: "aerodromes, airspace and interfaces that connect them, air traffic management (ATM)/ communications, navigation, and surveillance (CNS) infrastructure, airspace users, resources and capabilities that together meet a defined level of performance". Its components shall continuously evolve and adapt to reflect their varying impact on the performance of the network. This will support the network optimisation and the achievement of the agreed local and network level performance. Any airport, airspace, route, infrastructure, resource or capability may form a part of the network in the broadest sense and will therefore require the availability of static, strategic and tactical data for the use of all relevant stakeholders. A subset, however, will be critical to performance at any given time and it is this subset that will be the main focus of coordinated network level improvements.

2.4 A logical next step is to extend the scope of regional network-wide planning by linking it initially to adjacent regions. Being able to have a perspective on flight operations across larger areas can make the whole system more efficient and thus better able to support user-preferred trajectories and continuity of flows, particularly during times of crises. The ultimate goal is to enable a collaborative global network-centric planning of airspace design, air traffic flow management, operational and technical interoperability, supporting an interconnection of regional/sub-regional networks across ICAO regions and thus creating a "network of networks".

2.5 A global network-centric approach may also be advantageous when accommodating future needs, including, for example, new entrants or the realization of integrated CNS services, as agreed by AN-Conf/13. Also, it can assist in better implementing ICAO provisions in a harmonized manner globally so that all States may have access to the significant benefits of safe and efficient air transport and thus supporting the NCLB initiative.

2.6 Subject to the endorsement by the Assembly of the sixth edition of the GANP, efforts shall be made to review ICAO's *Global Air Traffic Management Operational Concept* (GATMOC, Doc 9854) with the view to align the two companion documents. Particular attention is to be paid to the significance of a collaborative cross-border planning and operation of the air navigation system based a network-centric view, including an interoperable infrastructure, at global, regional and local levels.

3. COLLABORATIVE DECISION-MAKING

3.1 Strategic and tactical collaboration between the involved members of the air navigation community, including regulators, airspace users, aerodrome operators, air navigation service providers, standardisation organisations, manufacturers and the military, is essential to address the multidisciplinary challenges ahead, in particular where the diverging expectations and interests regarding in particular

[3] See, for example, AN-Conf/13 WPs 40, 86, 109, 202, 237.

capacity, environment and economic impact are balanced to achieve optimum network performance. For example, overall capacity objectives at network level should have priority over a greater freedom for individual flights.

3.2 Today's security environment is complex and highly dynamic and can have considerable impact on aviation. A collaborative process will allow a better common use of resources shared by civil and military aviation, i.e. airspace, facilities and services. This ensures a safe, secure, orderly and efficient civil aviation as well as ensuring that the requirements of military missions are met. Additionally, it assists in addressing the mutually supporting roles of civil and military aviation.

3.3 The role of the ICAO planning and implementation regional groups (PIRGs) in support of global network-centric approach shall be strengthened. A more structured and focused cooperation between PIRGs is required to deliver operational and technical efficiencies at interfaces between ICAO regions in support of more effective continuity of air traffic flows at the global and regional levels.

4. COMPREHENSIVE ATM DATA EXCHANGE

4.1 A comprehensive ATM data exchange is considered a key enabler for an efficient ATM system with regard to planning, design, implementation, operation and performance measurement. It facilitates dynamic and flexible collaborative decision-making between stakeholders including the implementation of improved predictive algorithms and better delay propagation models which are essential components of a well-functioning network traffic flow management system.

4.2 To ensure accessibility and usability of ATM data, an efficient, secure and interoperable data exchange is essential. A technology-neutral and performance-based data exchange specification is considered best suited for interconnection of networks at global and regional levels. Network resiliency, also during crises, requires consideration.

4.3 When considering ATM data exchange in support of a network-centric approach, it appears necessary to take into consideration specific requirements for aerial surveillance sovereignty missions. Special arrangements should set up between data providers, air navigation service providers (ANSPs) and responsible State authorities.

5. MEASURING EFFECTIVENESS

5.1 Network performance expectations should be reached through meeting a set of specific, measurable, achievable, relevant and timely objectives. To verify the effectiveness of improvement measures, including those across all ICAO regions, appropriate performance indicators and metrics need to be developed, agreed and used in a harmonized manner.

6. CONCLUSION

6.1 Airspace and aerodrome capacity constraints should not become limiting factors to global air traffic growth. States, operational stakeholders, including military, and relevant regional organisations should be fully committed to a collaborative network-centric approach and to speed up the air navigation system modernisation, supporting in particular international and cross-border services, where these are needed to improve the overall network performance.

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