



WORKING PAPER

ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 30: Aviation Safety and Air Navigation Policy

30.2 Latest developments related to the Global Air Navigation Plan (GANP)

**DECARBONIZATION THROUGH IMPROVEMENT OF AIR NAVIGATION SYSTEM TO
REALIZE FUTURE SUSTAINABLE AVIATION DEVELOPMENT**

(Presented by Japan)

EXECUTIVE SUMMARY

Decarbonization is a keyword to the sustainable future development of civil aviation and it should be made in response to corresponding to the growth in air traffic demand. To achieve this, it is considered that the improvement of the air navigation system will play an important role.

This paper introduces Japan Civil Aviation Bureau(JCAB)'s measures through the long-term vision for the future air traffic system in Japan, namely "Collaborative Actions for Renovation of Air Traffic Systems" (CARATS). Information on the CARATS can be also obtained from the following website:

<http://www.mlit.go.jp/common/000128185.pdf>.

Through the CARATS, JCAB has achieved the improvement of air navigation services, which is in alignment with the Global Air Navigation Plan (GANP), resolving many technical challenges in cooperation with stakeholders. However, there are still steps for further improvement, taking the decarbonization perspective into account.

Such improvement is more effective if globally implemented harmoniously with collaboration among contracting states. JCAB considers that each contracting state is encouraged to collaborate further for decarbonization to realize future aviation development

Action: The Assembly is invited to:

- a) note the information contained in this paper;
- b) encourage Member States to exchange information on measures for sustainable development of aviation; and
- c) encourage Member States to further collaborate for decarbonization through the improvement of the air navigation system to realize future sustainable aviation development.

<i>Strategic Objectives:</i>	This working paper relates to the Safety, Air Navigation Capacity and Efficiency, Economic Development of Air Transport and Environment Protection Strategic Objectives.
<i>Financial implications:</i>	None.
<i>References:</i>	Doc 9750, <i>Global Air Navigation Plan</i>

1. INTRODUCTION

1.1 Decarbonization is a keyword to the sustainable future development of civil aviation and it should be made in response to corresponding to the growth in air traffic demand. In order to achieve this, it is considered that the improvement of the air navigation system will play an important role. The Global Air Navigation Plan (GANP) provides the overarching direction for a globally harmonized air navigation system with safe, effective and efficient air traffic. It also offers various measures and technical developments in the form of time-series blocks, such as the aviation system block upgrade (ASBU) and the basic building block (BBB). This will enable states and stakeholders to achieve the safety, sustainable growth, increased efficiency, and responsible environmental stewardship demanded by the global community and economy.

2. DISCUSSION

2.1 In Japan, in order to correspond appropriately to the growth in air traffic demand as well as the diversified needs of users, through the collaboration of industry, academia and government, the future of the air navigation services have been examined from various angles and also based on global trends. In 2010, the CARATS, a long-term vision for the future of air traffic systems, was established. It defines goals and directions for renovation toward 2025, such as improving safety, meeting increasing global aviation demand, increasing convenience, and improving operational efficiency. With the update of the 6th edition of the GANP, the planning horizon of the roadmap had been extended to 2040. JCAB is making a further review about CARATS, emphasizing more on decarbonization.

2.2 The CARATS identifies the following eight directions of renovation in order to achieve the goals, with a core of the trajectory-based operations (TBO):

- a) realization of TBO;
- b) improvement of predictability;
- c) ensuring information sharing for collaborative decision-making;
- d) promotion of performance-based operation;
- e) implementation of satellite navigation in all flight phases;
- f) improvement of situational awareness on the ground and on board an aircraft;
- g) maximum utilization of human and machine capability; and
- h) realization of high-density aircraft operations at busy airports and congested airspace.

2.3 The CARATS is consistent with the ASBU Methodology. JCAB has mapped its planning to respective block upgrade modules in order to ensure the near- and long-term global interoperability of their air navigation solutions.

2.4 Significant measures to realize TBO

2.4.1 It is necessary to respond to the increase in air traffic and reduce CO2 emissions at the same time by improving operational efficiency with renovating air navigation services. JCAB is implementing overall air traffic optimization and improvement for each flight phase in anticipation of future developments in air navigation systems and technological development trends. Typical examples are shown below.

2.4.2 Establishment of TBO concept

2.4.2.1 Collaborative decision-making (CDM) will allow all members of the air traffic management community to participate in the decisions that affect them. Enhancing CDM under the future TBO environment that utilizes 4D trajectory, a wide range of mass data must be shared among as many stakeholders concerned as possible. To this end, an information sharing structure is required. system-wide information management (SWIM) enables stakeholders to share necessary data with each other cost-effectively compared with the conventional style, which requires a dedicated system.

2.4.2.2 SWIM provides the environment where the relevant actors can access the information on aircraft operations at any time. Furthermore, it ensures the reliability of data in order to maintain the trustworthiness of information for CDM.

2.4.2.3 A demonstration project of TBO concept, called multi-regional trajectory-based operations (MR-TBO) project, has started and Japan participates in it (with Canada, Singapore, Thailand and the United States). In this project, key TBO capabilities have been validated in the simulated environment using some operational scenarios. Japan will keep cooperating for the next step of this project.

2.4.3 Improved efficiency in ATC operations en-route

2.4.3.1 In 2020, JCAB launched a five-year plan to reconstruct its domestic airspace to increase air traffic control (ATC) capacity. By vertically dividing the airspace where many transit aircraft pass over, such as flights between Asia and North America, into high and low altitudes, it simplifies the workload of controllers and increases the ATC capacity.

2.4.3.2 In addition, controller-pilot data link communications (CPDLC) will be gradually introduced in the new high altitude sector. The trial operation started in domestic high-altitude airspace in March this year. Although the operation is limited at first, such as communication transfer, the application will be expanded to directions such as route changes (taking time and effort by voice communication) in the future. Also, applicable airspace is considered to be expanded in the future. This will lead to seamless operation and connecting to oceanic airspace, where CPDLC is already mainly used, and realize free routes (user-preferred route (UPR), (dynamic airborne reroute procedure (DARP)) at high altitudes.

2.4.3.3 At the same time, in the oceanic airspace, JCAB will introduce the more efficient operation of Fukuoka flight information region (FIR) by such means as reviewing the airspace and route composition in accordance with performance-based navigation (PBN), promoting operations by performance-based communication and surveillance (PBCS). This will contribute to accelerating decarbonization.

2.4.4 Improved efficiency in ATC operations of take-offs and landings

2.4.4.1 JCAB is introducing more efficient air navigation systems for take-offs and landings. required navigation performance (RNP) to instrument landing system (ILS) enables curved routes and approach routes are assumed to be shortened. So, it will be effective for decarbonization as well as improvement of safety and operational efficiency. Ground Based Augmentation System (GBAS), which JCAB plans to introduce shortly, is assumed to enhance navigation accuracy more. JCAB will keep taking part in the discussion in ICAO.

2.4.4.2 Continuous descent operation (CDO) is the operational procedure with minimum engine thrust in the approach phase and reduces CO2 emission as well as noise. JCAB has introduced this system to three airports (including experimental operation) and will increase the number of airports that support this procedure.

2.4.5 Improved efficiency in ATC operations at airports

2.4.5.1 Similarly, CO2 emissions reduction is achieved by improving operations on the ground. Airport CDM (A-CDM) can significantly reduce aircraft holding times, fuel burn and delays on the ground cooperatively. For example, target start-up approval time (TSAT) operation using visual docking guidance system (VDGS) at Haneda Airport has proven effective operation in a highly congested airport. The implementation of A-CDM in other high-density airports and the upgrading of A-CDM are currently under consideration among relevant stakeholders.

3. CONCLUSION

3.1 For the sustainable development of aviation in the world after COVID-19, it is essential not only to respond to the increase in air traffic capacity but also to work on decarbonization. Measures on operational improvement are more effective if they are globally harmonized and implemented with further collaboration among contracting states from the following viewpoint.

- a) There are measures that will be more effective by being implemented in a wider area with collaboration of ANSPs in each state. (e.g. Free Routes).
- b) There are measures that will be more effective if each contracting state cooperatively introduces the latest equipment (e.g. PBN).

3.2 JCAB will deepen its cooperation with each contracting state for sustainable development of aviation centering on the ICAO framework. JCAB considers that each contracting state is encouraged to further collaborate for decarbonization in order to realize future aviation development.