



INTERNATIONAL CIVIL AVIATION ORGANIZATION

**TWENTY-SECOND MEETING OF THE
ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP (APANPIRG/22)**

Bangkok, Thailand, 5-9 September 2011

Agenda Item 3: Performance Framework for Regional Air Navigation Planning and Implementation

3.5 Other Air Navigation Matters

**INTRODUCTION OF CARATS:
COLLABORATIVE ACTIONS FOR RENOVATION OF
AIR TRAFFIC SYSTEMS**

(Presented by Japan)

SUMMARY

This paper introduces updates on Japan Civil Aviation Bureau's future ATM concept "CARATS" planning and implementation. The concept, with its ultimate target year of 2025, is being implemented incrementally.

1 INTRODUCTION

1.1 Japan is now facing the harsh realities of population decrease, declining birthrate, and aging population. The environment surrounding the country's international economic and social activities is changing dramatically and becoming more complex. On the other hand, measures to counter global warming are attracting worldwide attention, and Japan is determined to positively address this issue. With this background, Japan needs to draw up and carry out a growth strategy, capitalizing on its strengths in order to sustain its economic growth and enhance its international position.

1.2 Aviation service is a fundamental economic and social infrastructure that supports Japan's growth strategy. It is becoming increasingly important to increase the quantity of domestic and international air service while improving its convenience and environmental friendliness.

1.3 There are various problems with the current air traffic systems such as the concentration of traffic flows in certain airspace and routes arising from limited flexible use of airspace and routes. It is therefore necessary to reform Japan's air traffic systems decisively and strategically for the future.

1.4 Those are reasons why Japan Civil Aviation Bureau (JCAB) has developed a long-term vision for the future air traffic systems named "Collaborative Actions for Renovation of Air Traffic Systems (CARATS)" in coordination with parties concerned. CARATS requires the following collaborative works with various aviation stakeholders:

- (a) Collaboration among industry, academia and government;
- (b) Collaboration between operators and air navigation service provider (ANSP);
- (c) International collaboration to realize seamless air traffic;
- (d) Collaboration among airspace users (civil and military); and
- (e) Collaboration with local communities.

1.5 Furthermore, in renovating the air traffic systems of Japan, it is important to take into account the following characteristics in terms of the actual operational situation, operational environment and needs of air traffic in Japan, compared with those in other states such as the U.S. and European states.

- (a) Air traffic is concentrated in the airports and airspace of the Greater Tokyo Metropolitan Area, which has a number of restrictions on operations and where air traffic control capacity needs to be expanded urgently;
- (b) To remain competitive with other forms of mass transportation, a high level of convenience in aviation is required in terms of punctuality, speed of transport, etc. as the Shinkansen (Bullet Train) and other means of high-speed transportation are well developed;
- (c) Since many airports are located near mountainous terrain or urban areas, there are restrictions on setting departure and approach routes. Furthermore, because there are large areas of oceanic airspace, remote islands, and mountainous areas, the coverage of radio waves for ground-based communication, navigation and surveillance is limited;
- (d) More flexible use of airspace is desired;
- (e) Fukuoka FIR borders a number of FIRs having various operating environments. It is recognized the importance of establishing seamless operation in the region;
- (f) There are many overflights between North America and Asia and the number is expected to increase rapidly;
- (g) Heavy aircraft account for a higher proportion of total aircraft handled in Japan than in other states. (Composition of aircraft types may change due to the operator's responses to the increase of capacity in metropolitan airports and diversifying needs in the future.)

2. CARATS DEVELOPMENT

2.1 In establishing the future air traffic systems, it is necessary to clarify the objectives, considering the needs of operators and aviation users, social and economic trends, etc. The year 2025 is the target year of this vision. In setting objectives, JCAB define specific numerical targets for the following items, taking into account the characteristics of air traffic, social situation, etc., in order to promote policies effectively, while verifying the attainment of objectives of the air traffic systems.

Item	Numerical target
Enhancing safety	Increase safety level by 5 times
Responding to the increase in air traffic volume	Double the air traffic control capacity in congested airspace
Improving user convenience	Improve service level (punctuality and rapidness) by 10%
Increasing operational efficiency	Reduce fuel consumption per flight by 10%
Improving productivity of air traffic services	Improve productivity of air traffic services by 50% or more
Responding to environmental issues	Reduce CO2 emissions per flight by 10%
Strengthen international cooperation	Qualitative evaluation. Contribution made by Japan to establish future air traffic systems in the Asia-Pacific region

2.2 In the existing air traffic systems, there are various problems and limitations including airspace-based ATM operation with its increasing difficulty of maintaining an efficient and orderly air traffic flow, such as continuous delays caused by the concentration of traffic flow in specific airspaces and routes, and the inability to fully optimize entire flight routes from departure to arrival. It is difficult to solve such problems with basis on traditional solutions and approaches. Rather, it is necessary to dramatically change the traditional ATM operational concept and CNS technology in order to achieve the target of the future air traffic systems. In renovating the ATM operational concept and CNS technology, we will focus on shifting to a strategic “trajectory-based ATM operation” from the traditional airspace-based ATM operation, minimizing operational restrictions and optimizing the performance of air traffic as a whole, while also realizing flexible and efficient flights.

(1) Realizing Trajectory-based Operation

We will shift from the current ATM operation, which focuses on ATC based on airspace sectors and air traffic flow management by adjusting departure time, to ATM operation along 4-DT (4-Dimensional Trajectory), which considers the whole of our FIR as one airspace, manages the entire flight trajectory from departure to arrival of all aircraft concerned in an integrated manner, and introduces time-based management in all phases of flight.

(2) Improving Predictability in ATM operation

We will improve the calculation of air traffic control capacity for each of airport and sector and estimation of traffic flow, and establish the trajectory-based calculation method.

We will strive to upgrade meteorological information by preparing meteorological forecasting information specialized for aviation use, and use meteorological data gathered by aircraft.

(3) Promoting Performance-based Operation

In order to appropriately and efficiently, meet various needs of an operator and to achieve flexible 4-dimensional trajectories, the provision of aircraft performance requirements and more advanced ATC operation in line with such requirements are necessary, rather than ATC operation that depends on the traditional specific airborne equipment and ground NAVAIDS. Although performance-based navigation (PBN) such as RNAV has been introduced, operation that gives greater importance to aircraft capability such as high-

precision RNAV enabling curved approaches and more strict assignment of required time of arrival and satellite based navigation will become important.

(4) Realizing Satellite-based Navigation for all flight phases

Aircraft must determine position and time accurately in Fukuoka FIR to ensure precise and flexible 4-dimensional trajectories from departure to arrival. We will introduce satellite-based navigation with more precision, reliability and flexibility in all phases of flight.

We will also enable curved precision approaches instead of the traditional straight precision approach with its limitations, by using more precise, flexible satellite based navigation, thereby enhancing flight safety and convenience, making efficient use of airspace and mitigating noise.

(5) Enhancing Situational Awareness on the Ground and in the Air

Data communication enables air traffic controllers to grasp the intention of the pilot by using detailed aircraft-derived information, and the aircraft can use it to maintain awareness of surrounding aircraft. Furthermore, by introducing air-to-air surveillance, the aircraft can realize self-separation.

(6) Making Maximum Use of the Capability of Humans and Machines

A highly automated and comprehensive ATC support system is indispensable for trajectory-based operation. For more advanced air traffic control, we will create an environment that makes full use of the capacity of human beings and machines, for example, by allowing, a pilot and a controller to focus on providing value-added service, by automating routine communication.

(7) Adequate Information-sharing and Collaborative Decision Making

We will establish a network where all information related to operation is comprehensively managed and necessary information can be accessed by any party when necessary (SWIM: System Wide Information Management). At international level, information sharing and coordinated operation will be encouraged through data exchanges among control facilities.

(8) Realizing High-density Operation in Congested Airports and Airspaces

We will enhance ATC capacity by effectively using airspace through performance-based operations, satellite-based navigation, dynamic airspace management and optimal use of various ATC support systems including take-off and landing order adjustment.

We will also seek to reduce the separation between aircraft by accurate time management, and realize a high-density operation by trajectory-based operations. This will enable us to meet further increases in capacity.

2.3 The English version of “CARATS: Long-term Vision for the Future Air Traffic Systems” can be downloaded from the below website of Ministry of Land, Infrastructure, Transport and Tourism:

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

3. CARATS WORKING ARRANGEMENTS

3.1 In establishing the future air traffic systems, not only JCAB but also all other parties including related ministries and agencies, operators, research institutes, and aviation-related manufacturers must play their roles in a coordinated manner. Therefore, in order to systematically establish the future air traffic systems based on CARATS, JCAB has established a committee, “Committee of Promoting Renovation of the ATS” or simply “CARATS Committee”. The CARATS Committee consists of members representing industry including operators, academia and government. CARATS Committee has defined a roadmap toward 2025 “CARATS Roadmap”. It consists 39 Operational Improvements and 16 Enablers. The short-term measures should be initiated for its implementation step by step, while research and development should be systematically conducted for the long-term measures. CARATS roadmap may be revised as necessary to flexibly cope with changes in circumstances.

3.2 From the Government (JCAB), “CARATS Planning and Implementation Team” (CARATS Team) has established. It consists of 13 core members who are involved in each CARATS program on the daily basis. They should set the future direction based on discussions with the parties concerned and play a leading role in steadily and effectively realizing CARATS with extensive cooperation of all parties. The CARATS Team is also the secretariat for the CARATS Committee. Under the CARATS Committee, there is “Planning and Coordination Meeting” which meet every few months to review update of working groups. There are four Working Groups under the Planning and Coordination Meeting, namely ATM W/G, PBN W/G, Information Management W/G and Weather Information W/G. A separate Cost Benefit Analysis Subgroup has also been established to review the cost benefit aspect of CARATS programs.

3.3 In any case, JCAB is committed to do its best to implement CARATS in a globally interoperable manner, in accordance with ICAO Global ATM document, and in collaboration with regional and global ATM partners.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.

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