



International Civil Aviation Organization

**EIGHTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION
AND SURVEILLANCE SUG-GROUP (CNS SG/18) OF APANPIRG**

Asia and Pacific Regional Sub-Office, Beijing, China
(21 – 25 July 2014)

Agenda Item 5: Aeronautical Mobile Service (AMS)

5.2) Update on status of datalink applications by States

**THE EXAMINATION SITUATION OF THE CONTINENTAL AREA OF DATA LINK
INTRODUCTION IN CARATS**

(Presented by Japan)

SUMMARY

Japan Civil Aviation Bureau (JCAB) reports the outline of the Collaborative Action for Renovation of Air Traffic Systems (CARATS), which is the future roadmap in Japan and has moved the implementation of the measure since 2011. This information paper reports a decision-making in CARATS in FY 2013 to introduce the datalink in continental area of Japan.

1. INTRODUCTION



1.1 Outline of CARATS

Japan Civil Aviation Bureau (JCAB) drafted the "long-term vision about a future aviation traffic system" in September 2010, which sets the target and the direction of renovation towards 2025. To achieve and realize the long term vision, collaboration work with various stakeholders concerning aviation fields are indispensable, so JCAB named the plan as "Collaborative Action for Renovation of Air Traffic Systems, briefly CARATS." These are some of the targets and the directivity of the renovation of the CARATS.

- Improvement of current safety level by 5 times
- Improvement of services level (punctuality and reduction of flight time) by 10%
- Realization of trajectory based operation
- Promotion of performance based operation, etc.

Based on the direction of these renovations, JCAB studied and selected 55 measures, which would become necessity to achieve the target, and drew up the each roadmap of the measures. The CARATS is based on the ICAO global ATM operation concept and working together with the NextGen in the

U.S. and the SESAR in Europe, and sets the target assumed in 2025. In addition Global Air Navigation Plan (GANP) revision 4 and Aviation System Block Upgrades (ASBUs), which were adopted at ICAO assembly in 2013, drew up by referring to the future plan in NextGen, SESAR, and CARATS.

This paper reports detail of the examination's progress of data link communication in continental required for realization of the advanced ATM operational measure.

2. DISCUSSION

2.1 The target advanced operational measure by introduction of data link communication in continental

There were many advanced ATM operational measures which need data link communication. We set up ATM working group to discuss them and started the study in FY2012 and made a decision of the Operational Improvement measures for improvement Air Traffic Control capacity by automation of fixed form communication, which will introduce as ATC acceptance on en-route by Controller Pilot Data Link Communication (Continental CPDLC) in FY2013. (Figure.1)

Continental CPDLC in Japan will be utilized for ATC instructions as follows;

- Direction of next communication frequency
- Direction of a beacon code
- Microphone check (This operation urges cautions to an airplane which is in stack microphone.)
- Altitude, speed and route change (in low density airspace)
- Continuous Descend Operation (CDO descends altitude by idling from high altitude.)
- Time-based metering at fix points (Metering appoints the gate time at fix points.)
- DARP(Dynamic Airborne Re-routing Procedures)

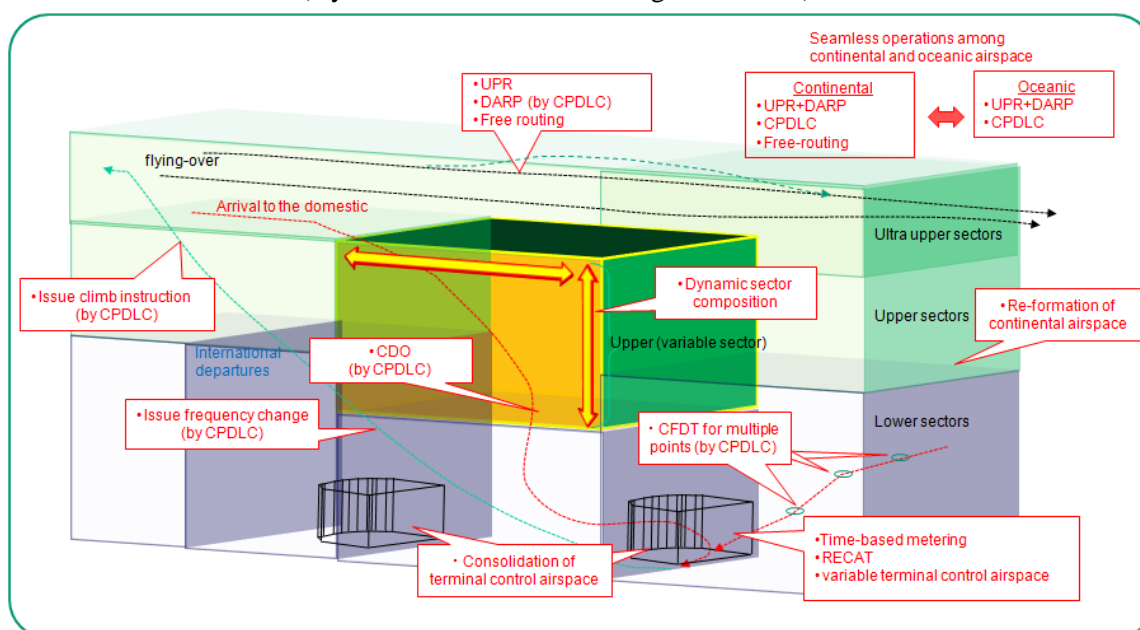


Figure 1. Installation Image of Operational Improvements related to CPDLC in continental area

*Note : Policy of Air Traffic Communication (ATC) by CPDLC
CPDLC will be used in a part of ATC, which is not time-critical. This policy does not prevent
Air Traffic Controllers from using voice communication instead of CPDLC.*

This information by an Air Traffic Controllers operation through "VHF data link (VDL)" becomes ATC instructions by inputting or displaying on the FMS.

2.2 Study to select a communication method (communication application, communication media)

By cooperating with the industrial, administrative and academic sectors, Operational Improvements are studied at the working group consisting of not only the flight operations officer or Air Traffic Control provider but also network providers, manufactures, and the research institutions. Moreover, we had studied to select the best communication method which would have the possibility to embody the operational measures for future by consideration of the trend of ICAO and Europe and the United States, cost of the introduction of the media, comments from the operators.

The study was conducted from the following viewpoints.

- (1) The trend of ICAO and Europe and the United States
- (2) Comparison of merit and demerit in communication application and communication media
 - Communication application: FANS-1/A+, or ATN
 - Communication media : POA or AOA (mode2)
- (3) The trend of the amount demanded and future prediction of data link in continental area
- (4) Requirement of communication quality and confirmation by a congestion simulation
- (5) Comparison of introduction cost
 - Application and media in ground system and avionics
- (6) Installation situation of avionics and a future introductory plan
- (7) Introduction timing of the service

Here are the main results of the study.

2.2.1 (2) Comparison of merit and demerit in communication application and communication media

- We conducted merit and demerit totally by evaluating the each characteristic about communication application, namely FANS and ATN, and communication media, namely POA and AOA.
- After the evaluation, we found that the selection of FANS1/A+ as the application and VDL-Mode2 (AOA) as communication media are the better chose for the compatibility with avionics or communication network, and it turned out that implementability is the highest.

2.2.2 (4) Requirement of communication quality and confirmation by a congestion simulation

We decided to use the standard of the RTCA DO-290 and the EUROCAE ED-120 to assure quality of service for communication performance requirements based on ATC operation. Key performance requirements are as follows:

- Transaction Delay Time; within 10 seconds for 95% messages in DSP (Total time in Air Traffic Service Unit (ATSU) and DSP is defined as 12 seconds or less. And ATSU is assumed to be 2 seconds.)
- Availability; 0.995 in DSP
- Unplanned outages; 6min or less / time, 40times or less / year, Total accumulated time 249min or less/ year
- Notification of the malfunction; 5min or less /each time, etc

Since a data link has an upper limit in communication capacity, we confirmed by simulation whether the capacity is enough even if we introduce the ATC operational measures. (Figure.2)

VDL-Mode2 (AOA) is used by Aeronautical Operational Communication (AOC), so in the simulation we confirmed that total amount of communication data, adding ATC to AOC, does not exceed the upper limit of the transaction delay time. Moreover, it also turned out that it will be in a congestion state at around 2025. As a result of calculating, it turned out that transaction delay time exceeds requirement time (10 seconds) over about 150 aircrafts. At present, though about 110 aircrafts are flying at a moment around Haneda airport within the radius of 200NM, about 30 aircrafts of them are equipped with VDL. In addition, since the number of aircrafts assumed around 2025 can predict about 150 and even if all of these aircrafts communicate by VDL, the transaction delay time is within the requirement time (10 seconds).

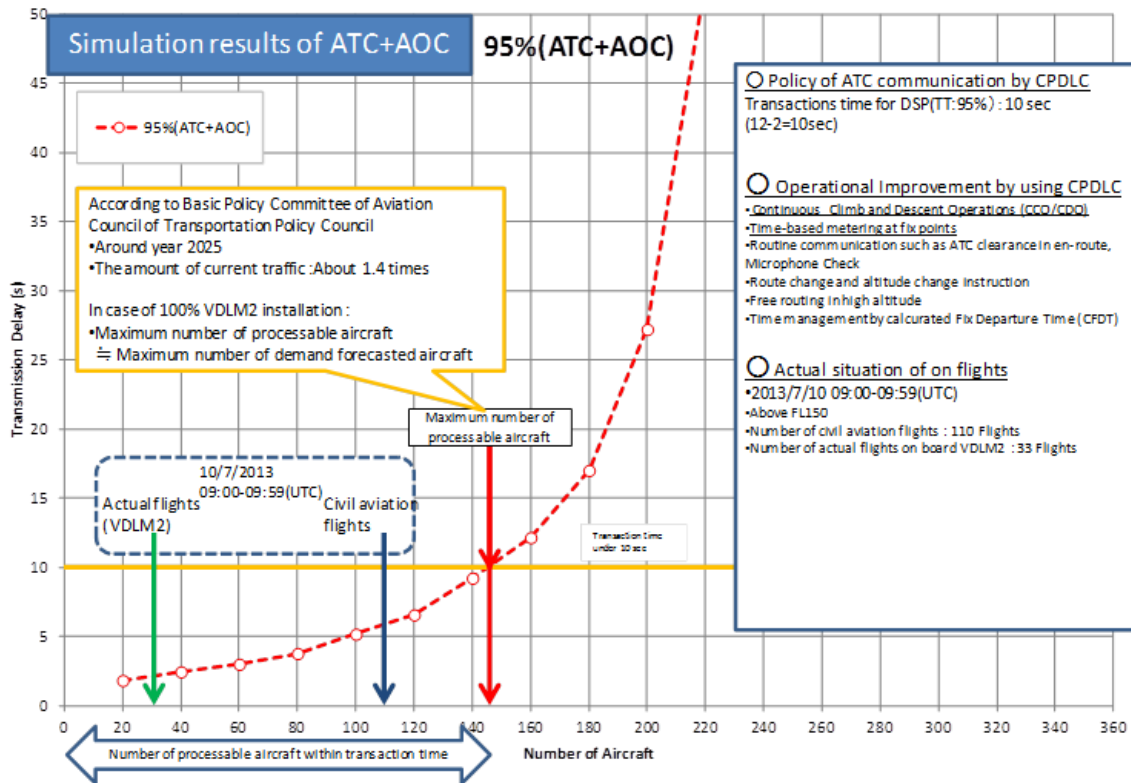


Figure 2. Results of Simulation of VDL-Mode2

2.3 Study result (conclusion)

By evaluating totally with these studies, the conclusion is as follows.

(1) Communication application and communication media with the highest implementability

- FANS-1/A+
 - Advantage of compatibility with FMS, prospect of the increase of avionics, cost of the upgrade of ground systems
- AOA (Mode-2)
 - Taking into the consideration of the high reliability with high-capacity, faster than POA, prospect of the increase of avionics

(2) Introduction timing

- Introduction from 2021
 - Taking into the consideration of the upgrade of integrated ATC system, the increase of capable avionics, and reorganization of airspace.

2.4 Postscript

Determined AOA is already used by AOC for flight-operations-officer communication. By introducing ATC it may also come out some influence in AOC(s), such as delay of a message, etc. It is necessary to handle by assigning the each service carefully. The congestion simulation is a just desk plan, and it also needs to consider the introduction of further ATC measures in future. Therefore, all operational measures cannot implement by AOA and it needs to prevent the introduction of new operational measures. Furthermore we need to study for the introduction of high-capacity of communication method and the introduction of multi frequency in VDL. We will continue to study for the introduction.

2.5 Related information

The latest information about CARATS is available from the Website below.

http://www.mlit.go.jp/en/koku/koku_fr13_000000.html



3. ACTION BY THE MEETING

3.1 The meeting is invited to take note of the CARATS update information; and

3.2 The meeting is invited to take note of the importance of the advance study and this study will be a good example for other States.
