Ministry of Land, Infrastructure, Transport and Tourism
CIVIL AVIATION BUREAU OF JAPAN

Information Management at CARATS

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CARATS
Collaborative Actions for Renovation of Air Traffic Systems

CARATS

History

✈ *2009 ~ 2010   Development of long-term vision*

- Establishment of

    "Study group for Promoting Renovation of the Air Traffic System"

- Development and promulgation of

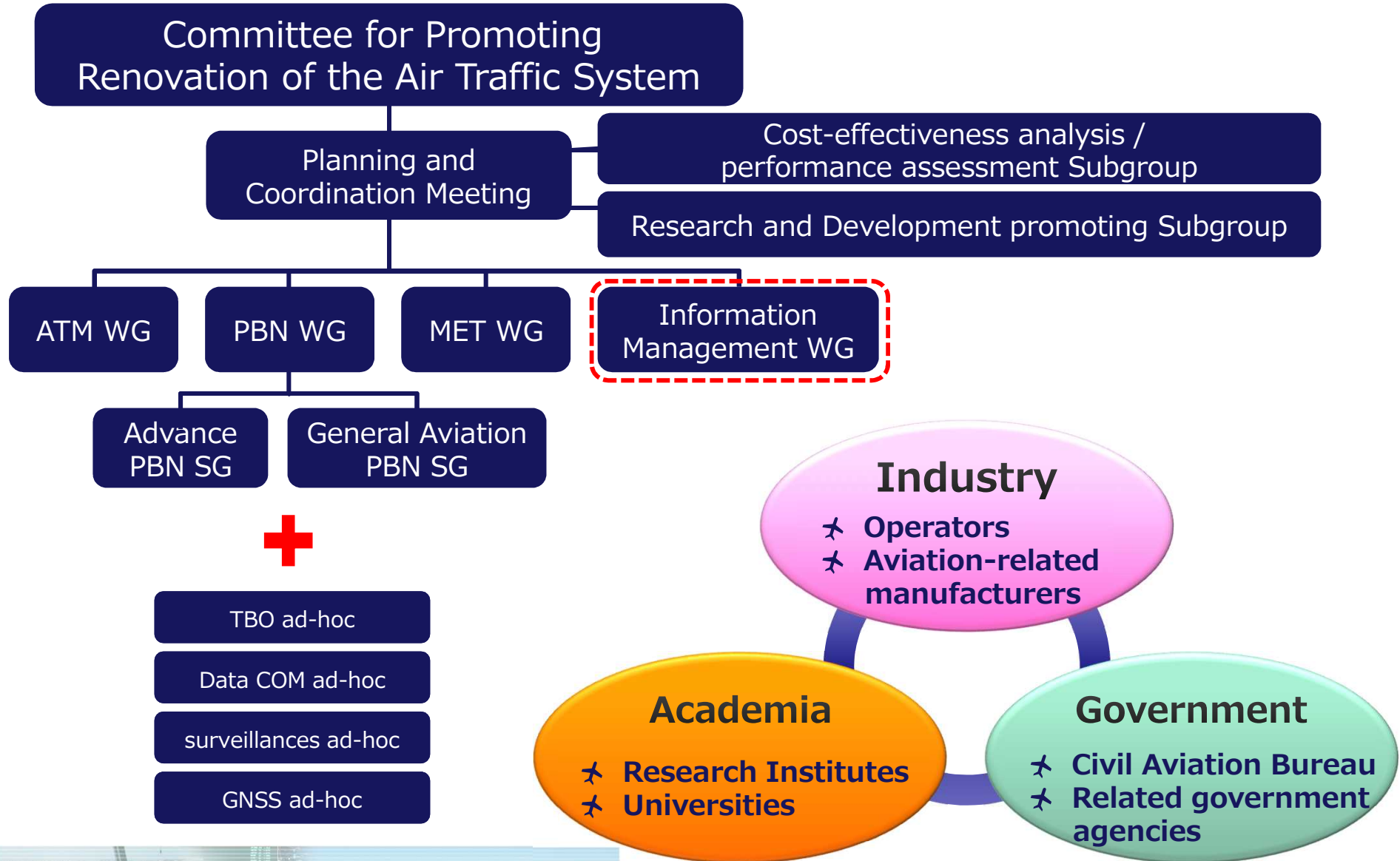   *"Collaborative Actions for Renovation of Air Traffic Systems" (CARATS)*

✈ *2010 ~ 2011 Development of roadmap for each measures*

- Establishment of

    "Committee for Promoting Renovation of the Air Traffic System"

- Consideration of concrete measures and development of roadmap

✈ *2011 ~   Implementation of the measures*

Working Framework

Committee for Promoting Renovation of the Air Traffic System

Planning and Coordination Meeting

Cost-effectiveness analysis / performance assessment Subgroup

Research and Development promoting Subgroup

ATM WG

PBN WG

MET WG

Information Management WG

Advance PBN SG

General Aviation PBN SG

+

TBO ad-hoc

Data COM ad-hoc

surveillances ad-hoc

GNSS ad-hoc

Industry
- ✈ **Operators**
- ✈ **Aviation-related manufacturers**

Academia
- ✈ **Research Institutes**
- ✈ **Universities**

Government
- ✈ **Civil Aviation Bureau**
- ✈ **Related government agencies**

CARATS *Collaborative Actions for Renovation of Air Traffic Systems*
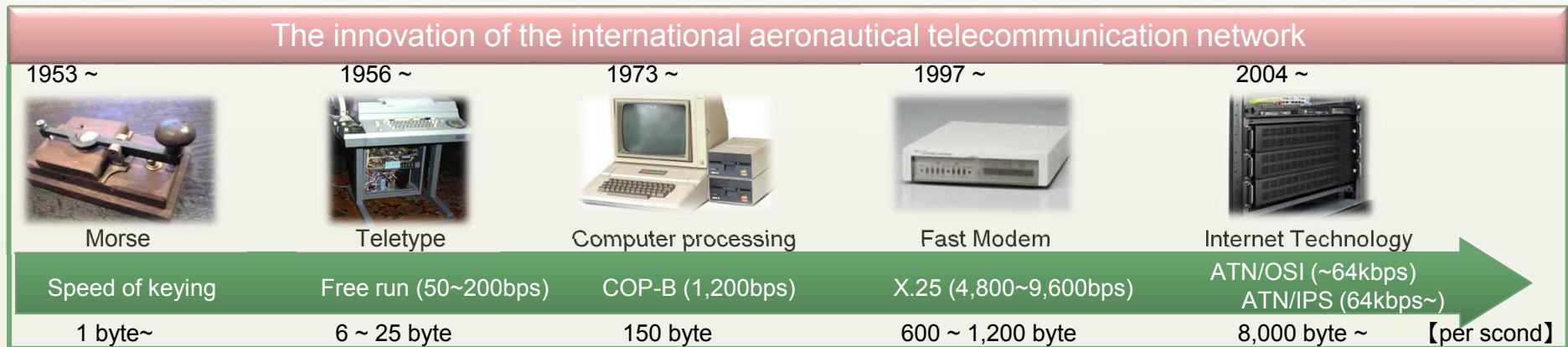
What problem?

Current issues - 1

✈ The ATC and the neighborhood are exchanging information which are such as weather information, aeronautical information and flight plan required for the aircraft operation, through the international aeronautical fixed communication station.

✈ In the case of Japan, we are exchanging information within the Fukuoka FIR that is our responsibility area.
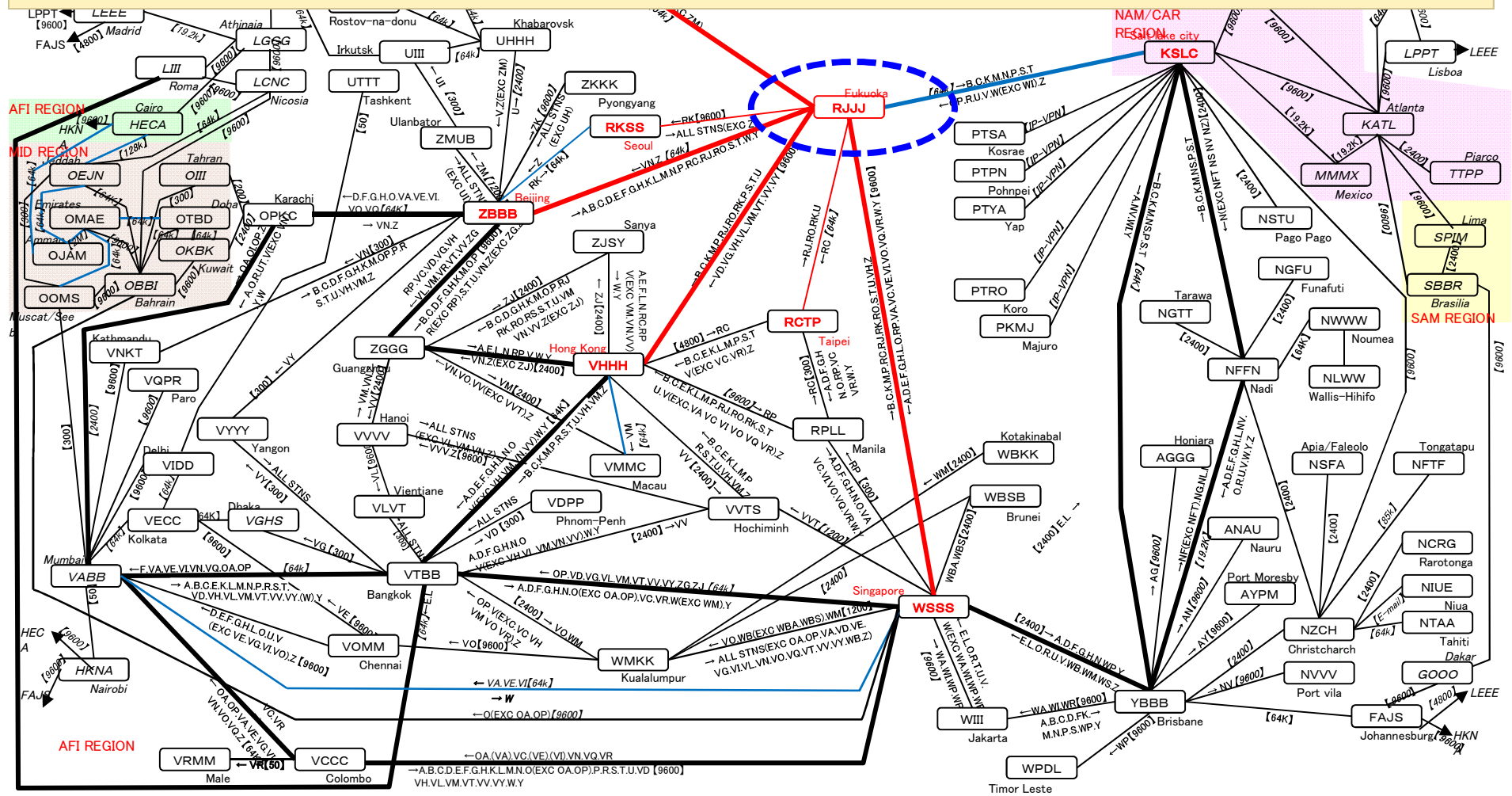
Current issues - 2

Information exchange with ANSP overseas

- With the introduction of development and computer processing for the communication technology, the communication speed is improved, and the amount of data handled is increasing.

The innovation of the international aeronautical telecommunication network

1953 ~	1956 ~	1973 ~	1997 ~	2004 ~
Morse	Teletype	Computer processing	Fast Modem	Internet Technology
Speed of keying	Free run (50~200bps)	COP-B (1,200bps)	X.25 (4,800~9,600bps)	ATN/OSI (~64kbps) ATN/IPS (64kbps~)
1 byte~	6 ~ 25 byte	150 byte	600 ~ 1,200 byte	8,000 byte ~ 【per scond】

- Mechanism of information exchange has not changed from the communication by Morse and teletype. (Use of abbreviations, such as character limit)

```
NNNNZCZC LXA836 031027
FF LPPTSLOT
FF LPPTZTZX LPPCZQZX LPPTTAPO LPAMYWYA LECMZQZX LFFZQZX LSAGZQZX
  LSAZZQZX EDZZZQZX LOVVZQZX LOWWZTZX
031030 LPPTZPZX
(FPL-TAP564-IS
-EA32/M-SR/C
-N0433F310 CARMI 3S CARMI UG52 TBO/N0428F350 UG5 GAI UG57 HUPAR
 UG52 SPR UG60 FRI/N0426F330 UG60 WIL/N0428F310 UG60 ZUE/N0427F330
 UG60 KPT UG4 SBG UR23 STO STAR
-LOWW0309 LOWL
-EET/LECM0025 LFFF0106 LSAG0154 LSAZ0204 EDDU0217 LOYY0238
 REG/CSTNB SEL/BSAJ
 RMK/AIRPORTUGAL564
 DOF/980803)
```

- Performs system processing by analyzing the received text

- For other States, distribute it as simplified text file

- On Flight of the same aircraft, lose the connectivity on the system processing

When each ANSP implementing with advanced systems attempts to cooperate, it become a major barrier

Current issues - 3

Each ANSP is in advanced systems processing only the information within the responsibility of the Flight Information Region (FIR). However, it is not possible to achieve seamless information sharing with other States.

From take-off to landing of aircraft, it can not be managed as a series of information in the Gate to Gate.
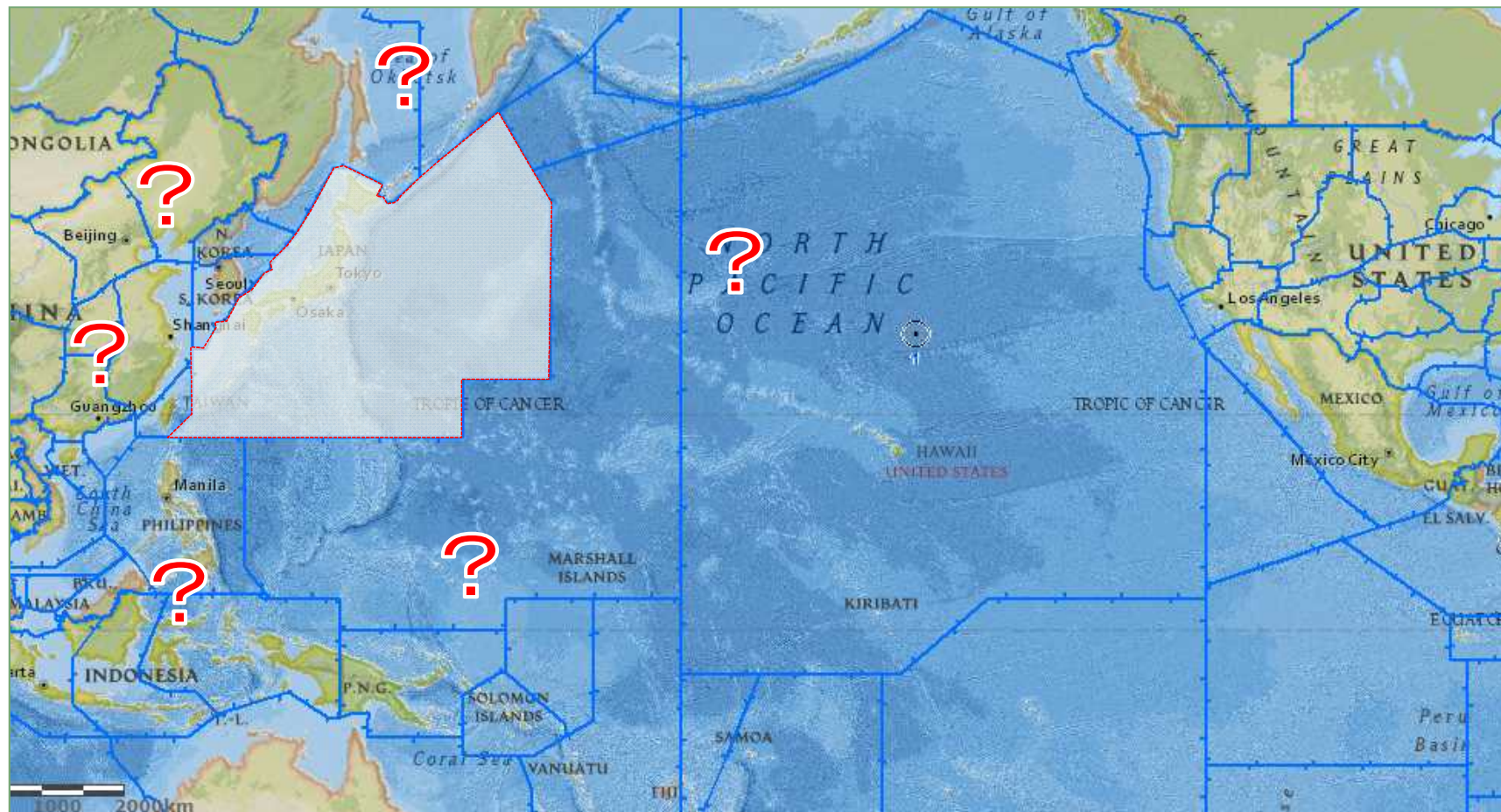
Origin of SWIM

What is SWIM (System-Wide Information Management) ?

The SWIM Concept initially appeared in the ICAO document which is described the concept of the future vision of ICAO, "The Global Air Traffic Management Operational Concept (Doc 9854)". It is stated as follows.

"the migration from the one-to-one message exchange concept of the past to the many-to-many information distribution model of the future, that is, many geographically dispersed sources collaboratively updating the same piece of information, with many geographically dispersed destinations needing to maintain situational awareness with regard to changes in that piece of information"

In addition, we can find the phrase of SWIM in the "Manual on Flight and Flow Information for a Collaborative Environment (FF-ICE) (Doc 9965)" for the first time, and it is stated as follows.

❖ SWIM － integrating all relevant ATM data -

FF-ICE relies on a supporting SWIM environment. SWIM - integrating all relevant ATM data – will form the technical basis for information management of the entire ATM system and be essential for its efficient operation. The corresponding information management solution will be defined at the overall system level rather than individually at each major subsystem and interface level. SWIM aims at integrating the ATM network in the information sense, not just in the system sense.
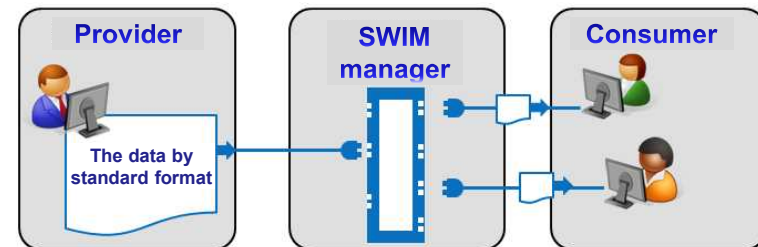
Further more, ICAO are currently planning to issue the document "SWIM Concept" for the realization of SWIM which is described by general requirements.
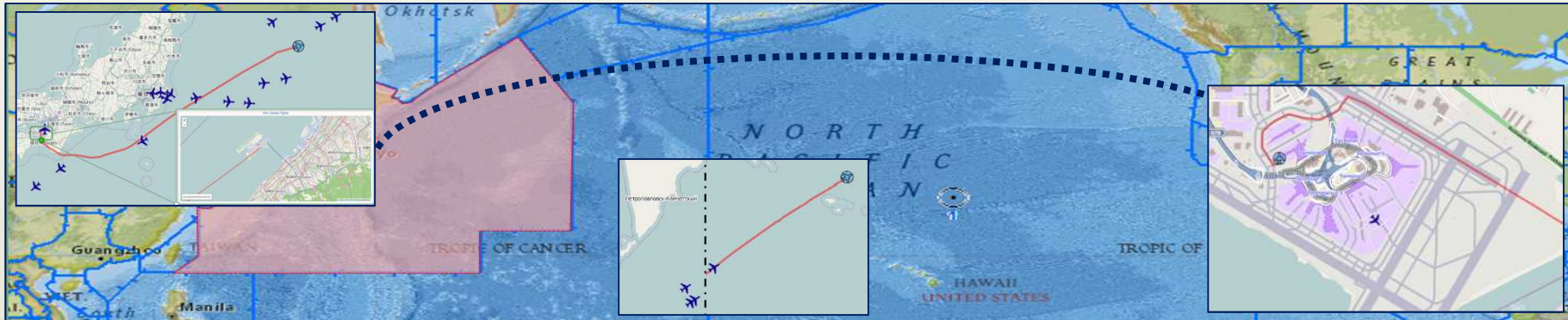
Realize on Mini-Global

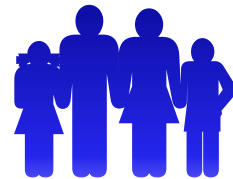## Demonstration of constructing technology for SWIM

In particular, it was demonstrated the effectiveness that the essential information for the aircraft operation was standardized to XML / GML data format(flight information, aeronautical information, weather information, etc.) .

For information of aircraft international flight, it was clarified that the stakeholders can monitor seamlessly from the departure point to the destination.

Aeronautical Information

Flight Information

Weather Information

Standardizing

AIXM
Aeronautical Information Exchange Model

FIXM
Flight Information Exchange Model

WXXM
Weather Information Exchange Model

Integrated Information

The approach in CARATS

The need for re-confirmation of SWIM

- Providing a high quality service by using the advanced systems which processes the collecting information in domestically. Already constructing the enrich circumstance which is utilized information analyzing and processing by the systems. In the view point of domestic, it is difficult to feel the effectiveness of the improvement by implement SWIM.
  As the result, it severe on maintaining a motivation for discussion.

- In technical aspects, the CARATS information management WG does not perform the system developments in directly. The academia perform it, under collaboration. (Research institutes and Universities)

- The Important point in order to understand the ICAO concept is the increasing awareness of members through active discussion of participants.

- Thus, discussion is necessary for synchronize the level of consciousness of all members, because consider that it is not possible to make mature the awareness of loosing the owning data, by swallow the concept.

The provisions of how to proceed SWIM implementation

The CARATS Information management WG developed *the provision how to proceed SWIM implementation* in 2013

In the course to consider the provision, it was possible to synchronize the awareness of all members.

The contents of the provision are as followings;
- Principle toward implementation
- Definition of Stakeholders
- Provision of constructing the communication infrastructure
- The necessity of Governance
- Evolution of operation caused by Governance
- Recognition of the necessity to coexisting with current operation
- Relation on ICAO ASBU, and so on

While it is the concept which does not describe detailed provisions, after the creation of this document, forward-looking initiatives and awareness of the parties has increased.

Work for the realization from concept

Important thing it can not be seen always.

In order to steadily realize the concept, it is necessary to understand the influence on the current operation.

It is not that the most important thing is clearly shown the concept.

From the viewpoint of the responsibility for safety, a method of resolving this issue has to be supplemented as part of the new service.

At this point, by addressing the demonstration, it is possible to see through complex environments. The opportunity is precious.

Benefits of visualization by international demonstration

- Confirm the benefits that can not be adequately represented in the domestic demonstration.

- Verify the optimal technology that can withstand the operation of a global scale.

- Through the experience of the demonstration, prompt the introduction judgment by find the possibility of SWIM.

Future issue

The environment will widely use COTS. So far, each States provide the services by own developed system. While ensuring comprehensive service, it is necessary to evaluate to determine its propriety. In the case of install new services, it is required to define the procedure to configure collaboratively with the generic function.

Currently, each States are ensuring the safety by performing the responsibility district which is defined clarify. This mechanism does not match the structure to ensure safety in the future concept. In the mixed phase and the accomplishment phase, it is necessary to formulate a plan how to hold the responsibility for safety by any way, while always thinking.

For SWIM is expected to SOA adoption as system architecture from its features, some of the IT governance must be adopted to define the information services.

Then, this innovation without changing the explosively will be assumed that it will spread to change the operation over time.