



*International Civil Aviation Organization*

**The Second Meeting of the APANPIRG ATM Sub-Group  
(ATM /SG/2)**

Hong Kong, China, 04-08 August 2014

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**Agenda Item 6: AOP, MET, AIM, SAR**

**RESEARCH AND DEVELOPMENT ON INFORMATION MANAGEMENT**

(Presented by Japan)

**SUMMARY**

The Mini-Global demonstration is an FAA project to collaborate with other Air Navigation Service Providers (ANSPs) such as the Civil Aviation Authority of Singapore, the Republic of Korea, NAV Canada, NAV Portugal, the Republic of Korea, AEROTHAI, Aircservices Australia, and Japan Civil Aviation Bureau, to exchange air transportation information by using the SWIM concept and standardized information exchange models. Through the opportunity to participate in this project, currently the primary research and development of SWIM in Japan had been conducted. In this demonstration, semi-live data of practical operations was shared among the member States, and also the scenario-based standardized message exchange between different member States was demonstrated. This paper introduces the JCAB's activities as well as the challenges resulting from the experience so far. It was recognised that Information Management was required in the SWIM environment.

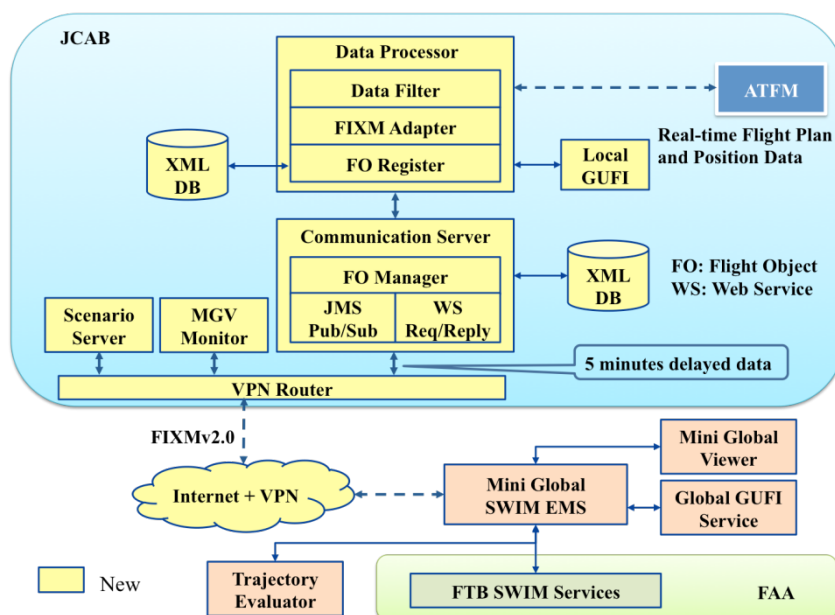
**1. INTRODUCTION**

1.1 In the Mini-Global demonstration, a JCAB team was participating as a member State for this project. The objectives was not just to study and evaluate the System Wide Information Management (SWIM) concept and key technologies, but also to promote international cooperation with other member States for the research and development of the governance for the Information Management in Asia/Pacific region. In this working paper, the activities, experiences and challenges resulting from this project are introduced.

**2. DISCUSSION**

Architecture

2.1 In the Mini-Global demonstration, all member States used the VPN over Internet connecting their own demonstration systems to the Mini-Global SWIM EMS (MG EMS) so that all member States would share the information by using a standardized message format. The demonstration system of Japan was composed of two main subsystems, Data Processer and Communication Server, as shown in **Figure 1**.



**Figure 1:** System architecture

### Data Processor

2.2 ATS messages of aircraft flying within Fukuoka FIR were already unified with the identifier by the operators, who were familiar with the ATS logic even if it was the current format. In this demonstration, as the Data Server was able to receive the flight information from the operational system of handling the unified information, without the need for a new identification, it was possible to build up a database adapted to Exchange Model (XML) in Form, corresponding to the Flight Information Exchange Model (FIXM) concept with the Globally Unique Flight Identifier (GUFU).

2.3 The Air Traffic Flow Management (ATFM) system real-time flight plan and position data was forwarded to the Data Processor. The Data Filter extracted the required data, and then FIXM adapter changed these data from local format into FIXM 2.0 format. The Flight Object (FO) Register received the ID for each flight from the Local GUFU service, and put the flight information into the XML Database (DB).

2.4 This demonstration was not intended to support the operations of a real aircraft. Therefore, it was necessary to organize the governance to share information with an unspecified person beyond the scope of operational use. At this point, it was possible to gain experience in institutional addition to the technical aspects. In the future, it was strongly felt that there was a need for unified governance to share the flight information.

### Communication Server

2.5 For information exchange, both JMS based Publish/Subscribe and Web Service based Request/Reply communication methods are applied. The Java Messaging Service (JMS) based Publish/Subscribe communication is the main method for FIXM information exchange.

2.6 The communication server responses for message exchange between the local system and the MG EMS via the established Virtual Private Network (VPN) connection. The 5 minutes delayed data is utilized in the demonstration. The function of FO manager has two functions. One is to get the publishing flight data from the XML DB and send it to the MG EMS. The other one is to receive the subscribed flight data from the MG EMS and save it into the XML DB.

2.7 Various technologies to carry out functions of the data exchange had been suggested in the SWIM concept draft. For each function according to the purpose, the organizations that would provide the global SWIM ahead of others would be at the leading edge, then it was expected to expansively formulate with the governance from the aspect of Information Management.

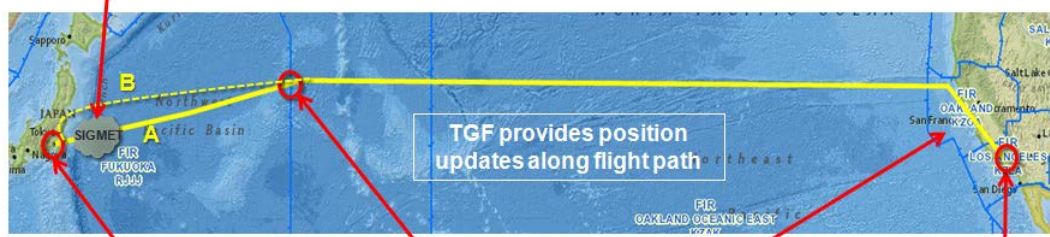
2.8 On the other hand, organizations that request international rule and standard may occur. As a State could plan the deliberate introduction, the standard specification will be required in this point.

Scenario

2.9 By utilizing FIXM, AIXM, and IWXXM, several scenarios are developed and each of them is demonstrating the sharing information on borderless. In **Figure 2**, the scenario of volcanic ash for the flight from Tokyo to Los Angeles is shown. The main purposes of this scenario are to check the basic functions of SWIM based communication, and to confirm the message exchange by FIXM, AIXM and IWXXM.

• Scenario 1: Tokyo, Japan to Los Angeles, USA

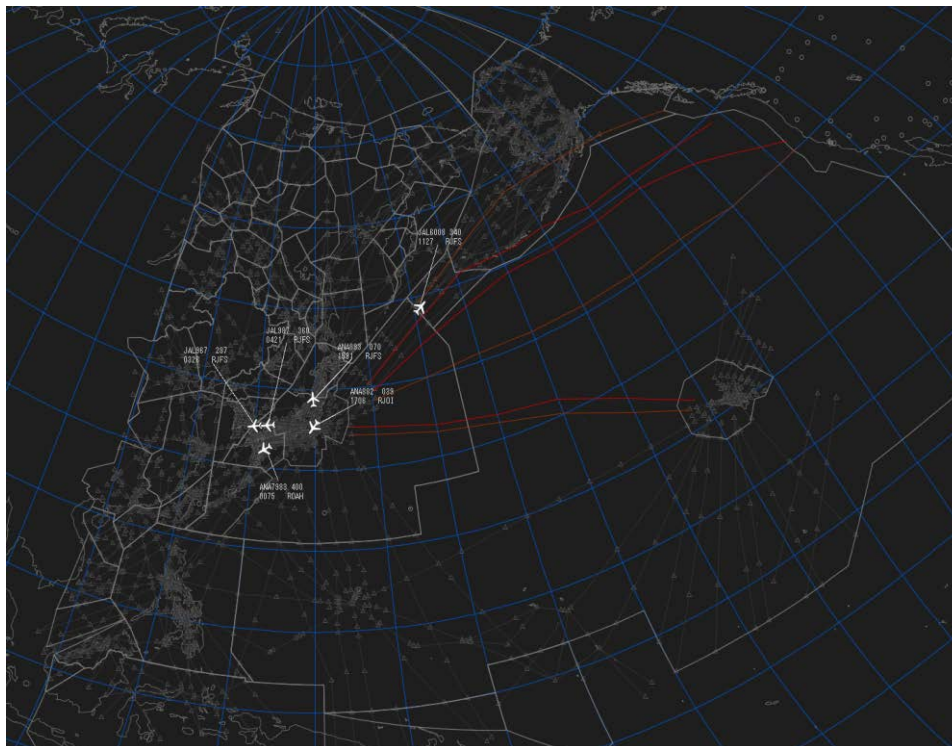
1. SIGMET issued by JCAB for Volcanic ash



2. Trajectory Evaluator used to assess original flight plan (A)
  3. JCAB submits revised flight plan (B)
  4. JCAB provides FO updates with surface information
  5. Boundary coordination using AIDC protocol in FIXM initiated by JCAB
  6. Periodic FO updates from FAA containing; Flight Amendments, Track Information, Flight State
  7. Arrival into LAX
- \*Material provided by FAA

**Figure 2:** Volcanic Ash Scenario

2.10 It will be possible to facilitate the verification of interference between the tracking of aircraft and weather information by using Trajectory Evaluator, before submitting the flight information. Furthermore, the demonstration of continuous monitoring is easy to visually understand by using Mini-Global Viewer. Since the weather information, aeronautical information, and flight information has been standardized by the technology of GML, it will give impression of future concept to the stakeholders related ATM by easy to mapping especially.



**Figure 3:** Flight Monitor

### Conclusion

2.11 Even if Mini-Global demonstration is in preparation, it is effective to verify the requirement for implementation of SWIM concept. Then it is finding a lot of consideration by the experience. We are planning a demonstration at APANPIRG/25 in ICAO APAC region to share this achievement with APAC ATM related personnel.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) encourage to attend APANPIRG/25 who assume the SWIM development to find the SWIM study status and feed back to further understanding of SWIM concept; and
- c) discuss any relevant matters as appropriate.

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