



**Agenda Item 8: Planning for SWIM implementation**

**SWIM Interoperability Framework**

(Presented by the Secretariat)

<b>SUMMARY</b>	
<p>This working paper presents the SWIM interoperability framework, as well as its scope, system architecture, user registry, amongst other topics to be considered prior to its implementation.</p>	
<b>REFERENCES</b>	
<ul style="list-style-type: none"> <li>• Annex 15 to the Convention on International Civil Aviation</li> <li>• Doc 9750 Global Air Navigation Plan, Fifth edition</li> <li>• Doc 9854 ATM Operational Concept</li> <li>• Doc 10003 Manual on the digital exchange of aeronautical meteorological information</li> <li>• Doc 10039 Manual on SWIM concept (Disclaimer)</li> </ul>	
<b>ICAO strategic objectives:</b>	<p><i>A - Safety</i>  <i>B – Air navigation capacity and efficiency</i>  <i>E – Environmental protection</i></p>

**1. Introduction**

1.1 Annex 15, Chapter 3, 3.6 introduces the issue of automation, stating that its use is aimed at improving timeliness, quality, efficiency and profitability of aeronautical information services. It further indicates that, for data quality purposes, automation shall:

- a) permit the digital exchange of aeronautical data amongst those involved in the data processing chain; and
- b) use aeronautical information and aeronautical data exchange models designed for global interoperability.

1.2 Doc 9854 states that the ATM system has six ruling principles, one of which is Information. In this regard, it states that the ATM community will largely depend on the provision of timely, relevant, accredited, and quality information in order to collaborate and make decisions based on this information. System-wide information exchange will allow the ATM community to perform its activities and operations in a safe and efficient manner.

1.3 The fifth edition of Doc 9750 incorporates facilities related to system-wide information management (SWIM) in Block 1 of the ASBU methodology, under performance improvement area 2--globally interoperable systems and data.

## 2. Discussion

2.1 The ATM system has seven interconnected operational concepts, where the information services function is concerned with the exchange and management of information used by the various processes and services. This function will ensure the consistency and connection amongst the seven components of the ATM operational concept.

2.2 The ATM community will depend on management of the information shared by the whole system for collaborative adoption of informed decision leading to the best business and operational results. Based on this operational concept, information and not technology will be its main foundation of the ATM system. In order for information management to effectively meet its purpose, information must be interoperable.

2.3 Global interoperability is achieved through the use of common information exchange models for information elements of interest, the use of common information exchange services, and the use of the appropriate technology and standards. These ATM information models have been defined in harmonised conceptual and logical data models. The models describe the data used in different information domains, such as the aeronautical, flight, meteorological and surveillance domains. They also describe the logical format and the structure of the data elements that make up these domains. Similarly, information services must be defined, stating which services are provided, their behaviour, performance levels, and ways to access them.

2.4 The SWIM global interoperability framework has five layers that describe the exchange of information throughout SWIM. The framework is based on various supplementary descriptions of SWIM developed by stakeholders. The layers explain the functions, the mix of representative standards and interoperability mechanisms. This current description of the SWIM global interoperability framework is focused on the technical elements of the ground segment of SWIM and is consistent with the air segment solutions being developed.

2.5 The global interoperability framework (see Figure 1) consists of the following layers:

- a) SWIM-enabled applications of information providers and users all over the world. Individuals and organisations, such as air traffic managers and airspace users, will interact using applications that interoperate through SWIM.
- b) Information exchange services defined for each ATM information domain and for cross-domain purposes, where applicable, following governance specifications as agreed by SWIM stakeholders. SWIM-enabled applications will use information exchange services for interacting.
- c) Information exchange models, which use specific standards for sharing information amongst the aforementioned information exchange services. Information exchange models define the syntax and semantics of data exchanged by the applications.
- d) SWIM information-sharing infrastructure, which provides basic services, such as interface management, request-response and publication-subscription messaging, service assurance, and business service management.

- e) network connectivity provides consolidated telecommunication services, including hardware. This infrastructure comprises all the infrastructure of the interconnected networks of the different stakeholders. These are public/private IP networks.

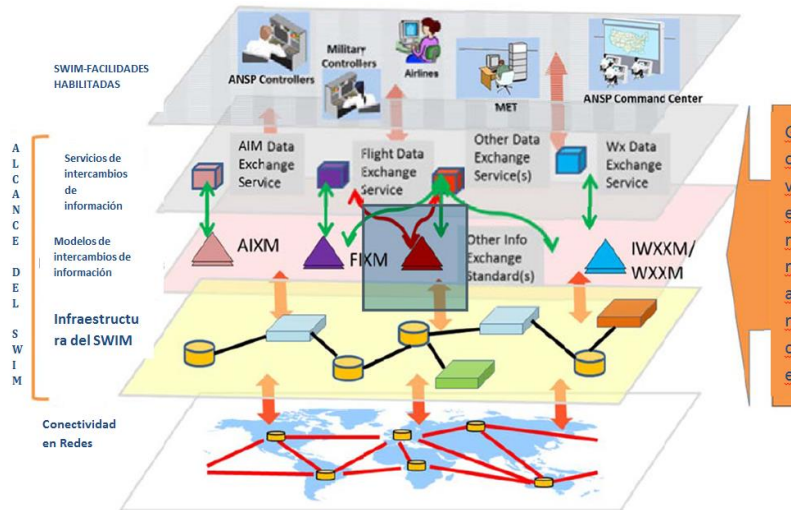


Figure 1- SWIM layers

2.6 The scope of application of SWIM is restricted to the three intermediate layers (*i.e.*, information exchange services, information exchange models, and SWIM infrastructure) and to the governance of these layers.

2.7 Global information exchange services currently identified are related to aeronautical information, meteorological information, surveillance information, and flight information. Additional domain services and combined cross-domain services will probably be defined in the future. The main task of stakeholders in SWIM implementation is agreeing on a set of services for the exchange of a range of options that are suitable for each of these services (for member States with different levels of ATM sophistication) and on information exchange standards.

2.8 The purpose of each layer within the SWIM global interoperability framework is described below:

- a) the highest layer uses a SWIM-enabled application to request an information service. Interoperability is required based on a common understanding of the information used. A SWIM-enabled application is capable of interacting with lower layers through the implementation of interoperability standards;
- b) the information exchange service layer describes the characteristics of the information service in a technologically-neutral manner. For example, a flight route provision service can provide the route of a flight upon request with the flight’s GUFU (Global Unique Flight Identifier). This layer describes the response characteristics, including application-level error conditions (for example, unknown GUFU) and normal response (for example, provision of the route);
- c) the information exchange model layer describes the characteristics of the data used by information exchange services, including the contents, structure and format of the information. To continue with the previous example, the GUFU and the flight route

would be described using data elements that are compatible with the flight information exchange model (FIXM). The combined information exchange service and information exchange model layers define the individual messages at the application level that can be exchanged to deliver the requested service;

- d) the SWIM infrastructure layer provides basic SWIM services, such as interface management, messaging, service security and business service administration. In this layer, the application-level messages required for delivering the information service requested are generated in accordance with a protocol defined for interoperability with the service distributor through interface management functions that also manage performance requirements. Basic messaging services provide functions such as message addressing and assurance. Security services, such as authentication and authorisation, are also provided; and
- e) the message is then conveyed through a global network, where it is delivered to a specified addressee responsible for delivering the application-level message to the SWIM-enabled receiver application.

2.9 It is likely that the SWIM infrastructure and the network connectivity layers will be based on a set of well-defined standards that will not be the main technical barrier to SWIM implementation. The infrastructure will also be gradually implemented and interconnected by actors such as the air traffic management providers. Each stakeholder will define the specific type of SWIM implementation it will apply, provided it is based on the objectives of the SWIM concept and allows for interoperability with other stakeholders.

### 3. **Conclusion**

3.1 The SWIM interoperability framework has five layers. The States shall identify those layers in which they need to participate to a greater extent.

3.2 SWIM implementation is a task that requires the identification of the areas and actors involved. It will be important to define focal points for coordination. Furthermore, governance aspects and user levels shall be taken into account at a State, regional and global level.

### 4. **Suggested action**

4.1 The Meeting is invited to:

- a) review the information provided in this working paper;
- b) take note of the layers considered within the scope of SWIM and their governance; and
- c) suggest actions to be taken by States for SWIM implementation and actions that should be taken at a regional level;
- d) take any other action it may deem appropriate.