



WORKING PAPER

THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

Agenda Item 1: Air navigation global strategy

1.2: Air navigation performance improvement and measurement through the aviation system block upgrades (ASBUs) and basic building blocks (BBBs) framework

THE NECESSITY OF HARMONIZATION FOR IMPLEMENTATION OF NEW OPERATIONS

(Presented by Japan)

EXECUTIVE SUMMARY

This paper recognises the need for appropriate support, evaluation, and an implementation strategy for system-wide information management (SWIM), flight and flow information for a collaborative environment (FF-ICE), and trajectory-based operations (TBO). These new technologies will change the business and system environment of all stakeholders significantly. ICAO is requested to ensure there is an appropriate level of support for the new standards and technological implementations, so that they are applied in an efficient and cost-beneficial manner. In addition, this paper highlights the need to develop a transition strategy that will provide the maximum benefit of these technologies.

Action: The Conference is requested to agree to the recommendations presented in paragraph 3.1.

1. INTRODUCTION

1.1 In today's information exchange environment, limited information and limited exchange can be seen among stakeholders, such as air navigation services providers (ANSPs), aircraft operators, airport authorities, military, and so on. Stakeholders recognize that there is a gap of information between operators and air traffic management (ATM). The gap of ATM information is a hindrance to operators when updating their flight plans, and route negotiations, while ANSPs have a gap of information with operators, which impacts ANSPs' ability to update distributed information such as flight plans by flight management system (FMS) and filed flight plan etc. When looking solely at airports, we see that airport collaborative decision making (A-CDM) has been gradually introduced to assist in the ground operation; however here again, information integration between airports and ATM is limited.

1.2 The information gap does not end at continental boundaries. In a similar fashion, operators find an information gap existing between flight information regions (FIRs) and regions. There are questions: how much updated information can a stakeholder have; how much flight information can be shared between FIRs without overloading the system? Unfortunately, although the latest technologies can support a certain level of information exchange, the sharing of information is still restricted technically and operationally. These information exchange limitations make all stakeholders lose the best use of capacity, and capability.

1.3 Limited area of information, limited data due to the lack of global data formats, limited timeliness and limited interexchange between all stakeholders; it makes us all share information in inefficient and limited ways. We lose opportunities of the utilization of capacity and capability due to limited information. When one can share valuable data between stakeholders in a timely manner, we can utilize our capacity and capability in more efficient ways.

2. DISCUSSION

2.1 The introduction of SWIM and FF-ICE is based on the ICAO *Global Air Navigation Plan* (GANP, Doc 9750). SWIM provides users access to relevant and mutually understood information in an interoperable manner. FF-ICE defines information requirements for flight planning, flow management and trajectory management and aims to be a cornerstone of the performance-based air navigation system. SWIM and FF-ICE will support stakeholders in sharing similar data/information globally, with a high level of automation and integration, and will support the collaborative decision making between stakeholders. In order to achieve the above objectives, a single global governance rule is required. In addition, in order to assure compatibility between system and stakeholder implementations, a clear cost-benefit of these technologies should be presented to stakeholders, which would permit them to justify where their investments towards introduction of new technologies should be directed.

2.2 The further development of SWIM and FF-ICE, hinges on a number of associated aspects. It is important to conduct impact assessments on SWIM/ FF-ICE technology to ensure there will be an operational improvement and benefit on ATM and aircraft operations. For an operational implementation of FF-ICE, all stakeholders should have a common understanding of the development; method of transition, efficiency and usability of FF-ICE, and the associated cost-benefit. In addition, the data required to be exchanged between stakeholders, should be evaluated based on the need, and alternate data sources. A review should be conducted with currently available data with the intended purpose to validate the function through a trial of SWIM and FF-ICE, and future ATM system supporting operational enhancement like capacity and flexibility with FF-ICE information together with new information technology should also be considered under the pressure of limited resources. The goal is to use FF-ICE data to improve airspace operations and increase airspace capacity.

2.3 The introduction of new technologies like SWIM and FF-ICE identifies several critical points, such as the points related to investment, development and cost-benefit as follows:

2.3.1 To date the question remains regarding how FF-ICE will be implemented via SWIM. In order to achieve connectivity, all stakeholders will be required to develop new applications that allow them to connect to the SWIM framework. Once connected to a SWIM platform, FF-ICE would be enabled. However, we understand the development of applications are costly and time consuming. In order to begin assessing whether FF-ICE is achievable, stakeholders need SWIM networks to be established in advance.

2.3.2 In order to achieve benefits from the onset, we understand that there will be an initial expenditure for stakeholders. However, in order to adequately integrate FF-ICE, a long list of requirements will be needed such as; flight plan system upgrades that include in-flight monitor with real-time updates; provision of enhanced information services including aeronautical information service (AIS), meteorological (MET) and airspace; improved trajectory planning; enhanced airspace /airport operations; and the SWIM-enabled enhanced network. The ability for operators to implement these improvements will be directly tied to the achievable cost-benefits. This would also provide an opportunity for operators to ascertain the cost-benefits associated with the implementation, while ANSPs determine the most cost-beneficial avenue to progress beyond SWIM and FF-ICE.

2.3.3 There is also a need for more detailed data descriptions for the subject matter experts who need enough information about the available data elements in the various SWIM feeds to identify value scenarios and build business cases for making the internal investments. Establishing the capability for the future trajectory-based operations (TBO) requires much more than building systems to use and process flight plan trajectories. There are many processes, procedures and a lot of training in addition to a host of other considerations that will have to be addressed in order to bring TBO into daily operations.

2.3.4 In the future, it is envisioned that TBO will permit trajectories to be automatically calculated, which would allow them to be negotiated and agreed upon between operators and ANSPs in advance. However, there will also be a need for an internal system interconnectivity which would permit an airline to manage the required information before it would be shared with external stakeholders.

2.3.5 When considering the aircraft as a SWIM node, aircraft connectivity will be required in order for information to be shared between the cockpit and airline operations centre (AOC), and between the airplane and ATC, for a full TBO concept. But this may also be accomplished utilizing an internal network to SWIM technology. And stakeholders will need to have clarification of the future view of internet protocol (IP)-based technologies for use over SWIM and datalink for cockpit communications, for a stakeholder to consider their investment.

2.4 We can see the impact not only on the system, but also on the processes used by each stakeholder in providing the data over SWIM. For example, timely and accurate information processes to issue AIS information over SWIM will be required for FF-ICE and TBO. Without appropriate information quality (timeliness and accuracy), stakeholders cannot achieve the intended FF-ICE and TBO functionality. These basic quality and process concepts are key to achieving the intended benefits for stakeholders.

2.5 Technology is the enabler to achieve an operational improvement; however, the operational environments of information quality and airspace capacity and flexibility might restrict the benefits from being realized. In order to assure the intended benefits from technology, all stakeholders should evaluate and improve the operational environment. Of note, there will be a need for all stakeholders to consider the emerging issues related to cyber security. Although industry and ICAO have initiated the conversation, the outcome will have a direct impact on SWIM.

2.6 Clear objectives and operational improvements need to be defined and established. In order to maximize the benefit for all stakeholders, we need to consider a regional and cross-regional approach. This should be prioritized and based on key global and regional traffic flows, for both users and ATM.

3. CONCLUSION

3.1 Therefore before promoting SWIM and FF-ICE, the Conference is invited to agree to the following recommendations:

Recommendation 1.2/x — System-wide information management (SWIM)**Recommendation 1.2/x — Flight and flow information for a collaborative environment (FF-ICE) and trajectory-based operations (TBO)**

That the Conference:

- a) request ICAO to continue to develop the required Standards and Recommended Practices (SARPs) and guidance material for supporting early introduction of system-wide information management (SWIM) and flight and flow information for a collaborative environment (FF-ICE);
- b) request ICAO to collaborate with various industry technical standard organizations to develop technical standards which assure interoperability;
- c) request ICAO to identify clear quantitative and qualitative benefits for all aviation system block upgrade (ASBU) modules in the *Global Air Navigation Plan* (GANP Doc 9750) including FF-ICE and SWIM;
- d) request ICAO to establish key performance indicators (KPIs) for the measurement of benefits of all modules;
- e) request ICAO to develop measurement methods for trials to be conducted in a mixed mode environment with those States/ air navigation services providers (ANSPs) that are already prepared to proceed. This will ensure stakeholders are not negatively impacted while further development and refinement of the concept is accomplished; and
- f) request ICAO to develop transition strategy including the environment supporting technology benefit which will support the benefit to all stakeholder investments, including regional and cross-regional approach.

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