



ICAO

*International Civil Aviation Organization***Twenty Fourth Meeting of the Communications/
Navigation and Surveillance Sub-group (CNS SG/24)**

Web-conference, 30 November – 4 December 2020

Agenda Item 6: Surveillance

6.2 Other surveillance related issues

COLLABORATION IN SHARING OF SURVEILLANCE DATA IN SWIM

(Presented by Hong Kong China and Singapore)

SUMMARY

This paper presents some key considerations leading to a proposal of a Commercial-ANSP collaboration scheme in sharing and enriching surveillance coverage for the region to benefit the aviation community and accelerate the implementation of SWIM. Through the discussion of the key consideration factors, this paper intends to elicit members' views and consensus towards a unified approach in sharing surveillance data for the region.

1. INTRODUCTION

1.1 With the CRV community expanding, a few member states are already exchanging ATS messages/information such as AMHS messages and voice over CRV. Respectively at CRV OG/5 meeting in Jan and SWIM TF/3 meeting in May 2019, it was concluded that SWIM data was to be carried over CRV. At APANPIRG/30 in November 2019, Asia/Pacific Regional FIXM extension for ATFM was confirmed, paving the way and affirming the development efforts by various members working towards the first SWIM application for exchange of ATFM data in FIXM format over CRV.

1.2 The importance and benefits of surveillance cannot be overstated for safer and effective air traffic control and more efficient air traffic flow management. The sharing of surveillance data is expected to benefit the aviation industry in the APAC region given a more comprehensive and much wider map of surveillance coverage in the region. For instance, extended surveillance would enable ANSPs to see traffic further ahead, facilitating the planning and implementation of ATFM planning and measures.

2. PROPOSAL

2.1 This working paper explores a Commercial-ANSP surveillance data sharing collaborative approach to expand surveillance coverage as a SWIM service. In tabling this proposed collaborative approach, this paper also includes pros and cons of the approach and some major consideration factors in hope of eliciting further discussion by members towards a more balanced approach and therefore yielding greater consensus and support from members.

3. A QUICK RE-VISIT TO THE SWIM INFRASTRUCTURE MODELS

3.1 At CRV OG/5, Hong Kong China presented a working paper on the following three infrastructure models as potential implementation of SWIM infrastructure in the region:

- a) Distributed model – each ANSP operates its own Enterprising Message Services System (EMS) that interconnects with other EMSes in the region, through which the ANSP can publish (upload) or subscribe (download) data;
- b) Centralized model – a third party may host EMS services available to subscribers such that qualified States/Administrations/Stakeholders may subscribe or publish SWIM data irrespective of their geographical locations but insofar as they can access the CRV cloud; and
- c) Hybrid model – the co-existence of ANSPs operating their own EMSes (Distributed Model) and ANSPs accessing SWIM services in the Centralized Model.

3.2 Same as for IWXXM and FIXM services, the sharing of surveillance data could be implemented in any of the three infrastructure models above.

4. DISCUSSION

Surveillance Data to be Shared

4.1 For ANSPs, surveillance data usually comprises data from conventional radar (primary, secondary mode A, C, S), surface movement radar (airport coverage), MLAT data (with relatively limited coverage) and ADS-B data. To quicken the realization, or at least, the consideration of sharing of surveillance data, ADS-B data is singularly proposed for the following considerations:

- a) Concern of sensitivity of surveillance data – it is common that radar systems might return with non-civil or sensitive surveillance data that is not normally shared to an external party.
- b) Ownership of data – as ADS-B is self-initiated and broadcast to all by aircraft, there does not appear to be legal complexity arising from distribution and subsequent processing/manipulation of such data by member states.
- c) Accountability of correctness of data – an ANSP which distributes ADS-B data as received should not be held liable for the inaccuracy of the ADS-B since by nature, the accuracy of ADS-B hinges on the on-board electronics and the constellation of GPS satellites visible to the aircraft with the assumption that a contributing ANSP must not alter the data that it is distributing unless there are specific circumstances, which should form a discussion topic in the proposed Study Group (see paragraph 4.15)

Commitment of a Contributing ANSP

4.2 While it might be excessive to demand that a contributing ANSP meet a certain level of availability in supplying the surveillance data, applications by other ANSPs taking advantage of the surveillance data would become increasingly dependent and expectant of the unfailing availability of such data. These two opposing requirements notwithstanding, the likelihood or impact of data unavailability should not be significant since:

- a) first and foremost, the ANSP's surveillance system normally would be built with redundancy and therefore high availability required of a surveillance system for ATC.
- b) depending on the number of contributors and their geographic separations, during the outage of shared surveillance data from one ANSP, some of the void could be taken by another ANSP due to overlapping coverage.
- c) feeding of surveillance data from commercial participation could also form a map of basic coverage in the region.

Eligibility to Access Shared Surveillance Data

4.3 A fundamental consideration is the factor(s) that would induce an ANSP to contribute its ADS-B data other than the benefits from more comprehensive surveillance in the region through sharing particularly if such benefits apply to contributing and non-contributing ANSPs if it is assumed that the shared surveillance data service is available to all parties who can access the regional SWIM. This assumption of general availability is a desirable since:

- a) unrestricted access to the shared data would help quicken the expansion of CRV community and launch of SWIM services in line with the spirit of global connectivity and data sharing behind ICAO's ASBU initiatives. It goes without saying that if only contributing ANSPs would be able to access the shared data, it would lower the appeal of this initiative and without a substantial community showing interest or support at the beginning, the initiative might be difficult to take off for lack of sustained interest and efforts and the sharing scheme might at best end up as a few participants sharing surveillance among themselves as if in an exclusive club.
- b) consideration needs to be given to ANSPs who do not see an immediate use of the shared data and do not have immediate plans to install ADS-B ground systems as conventional radar data already serves their need.
- c) for contributing ANSPs who already own their surveillance systems, the cost of uploading surveillance data for sharing should be small compared to capital cost or operation and maintenance (O&M) cost of their already operating surveillance systems. Nevertheless, some measures could be taken in addressing the continuous link cost suffered by contributing ANSPs as discussed in paragraph 4.15 below.

Infrastructure – Surveillance Central Data Processor

4.4 At its simplest, a model for sharing surveillance data is illustrated in Figure 1 below.

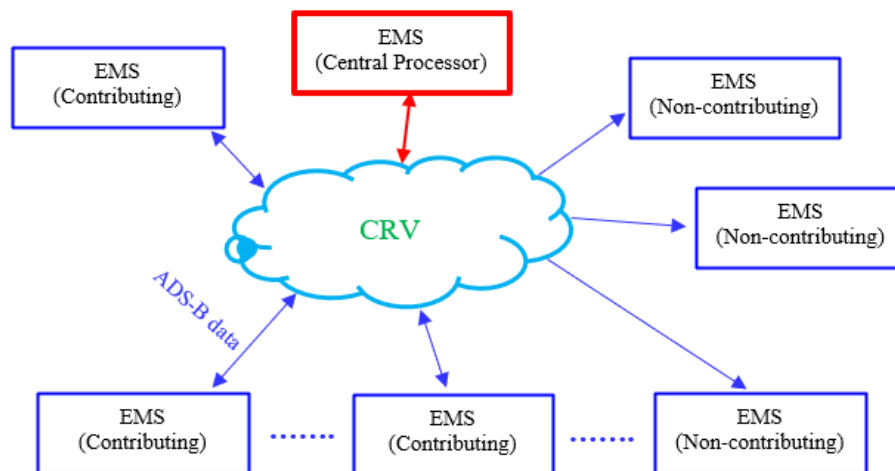


Figure 1 - Proposed Model of Surveillance Data Sharing in SWIM with Centralized SCDP

4.5 In *Figure 1*, an essential role in the model is the Surveillance Central Data Processor role. The Surveillance Central Data Processor (SCDP) filters and collates surveillance data feeds from contributing ANSPs and outputs user-selectable data streams as advertised in the service registry. Whereas a centralized registry for all SWIM services might not be available in the near future, this SCDP would have to host the service registry and exercise any governance rules if they exist. From system perspective, the SCDP will be designed with redundancy and resilience in mind to achieve high availability. And the SCDP would also be served with high-bandwidth CRV links to be able to receive and serve surveillance data to other ANSPs. The SCDP function is embedded in the Red-framed “EMS (Central Processor)” in *Figure 1*, which is suggestive of a single party processing and managing the surveillance data sharing service as might be the case of the Business Model discussed under paragraph 4.11.

4.6 Whereas individual ANSPs could be sharing surveillance data among themselves without the need for centralized SCDP services for various reasons or considerations, there could be multiple SCDPs operating at some of such ANSPs. Such a scenario is illustrated in *Figure 2* below. This Business Model is discussed under paragraph 4.8.

4.7 With commercial participation, a hybrid Business Model consisting of the two models to be discussed in following paragraphs is not unlikely as the surveillance data sharing initiative is put into practice. Regardless of the eventual development, there remains the underpinning and necessary single standard of data model to be used for exchange of surveillance data in SWIM.

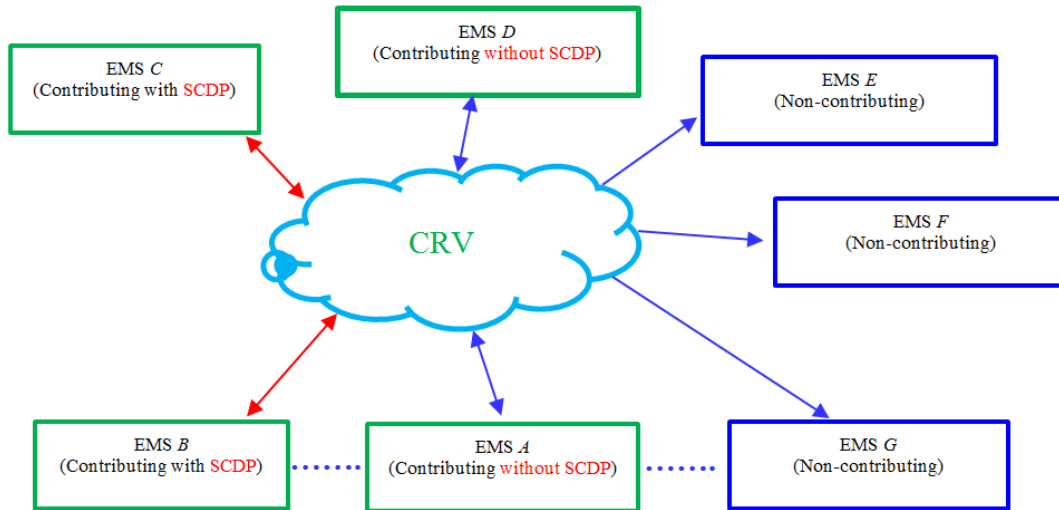


Figure 2 - Proposed Model of Surveillance Data Sharing in SWIM with Individual SCDPs

Business Model – ANSP(s) as CP Operator

- 4.8 The party, say, an ANSP (or ANSPs), that will be operating the SCDP likely will have to:
- a) bear the costs from:
 - (i) the setup and development of the SCDP;
 - (ii) on-going system O&M operation; and
 - (iii) on-going CRV subscription for the required additional bandwidth or additional CRV links.
 - b) commit resources in ensuring high availability of the SCDP services for the long term;
 - c) shoulder the burden of responding to reports of issues and their resolution.

4.9 Even if a party(ies) is willing to provide the SCDP services, the ensuing discussion and coordination among members on the sharing scheme (including perhaps costs), hardware provisions, network configuration, etc. from across the region would likely be a lengthy process.

4.10 From perspectives of cost, commitment of efforts and resources and lead time in realizing the proposed data sharing, the business case for an ANSP(s) to play the SCDP role might not be strong. On the contrary, some of such concerns could be addressed if there is commercial participation.

Business Model – Commercial Concern(s) as SCDP Operator with ANSPs’ Collaboration

4.11 There seems to be interests in the private section in providing ADS-B data originated from terrestrial or space-based ADS-B systems. As a matter of fact, in June 2020, the CRV OG was reviewing Aireon’s application to serve its Space-Based ADS-B data to PNG. Clearly, the more SWIM services or services carried over CRV, the sooner a significant user base is built up, which will feed further momentum in the launching of more SWIM services.

4.12 With a commercial concern(s) as SCDP operator and the assumption of subscription-based charges, the issues of commitment to resources, accountability and upfront costs could be shifted to the commercial provider while a shorter lead time to service availability is to be expected.

4.13 Cost wise, however, it would be dependent on the availability of competition, the commercial concern's pricing strategy as well as the receptiveness of the aviation community in the region and could be meaningfully discussed at this juncture.

4.14 It has to be clarified that unless CRV OG and/or SWIM TF rules out such services, potential providers of surveillance data or other SWIM services would be launching them according to their own agenda with or without such collaboration. What is proposed here is a potential collaboration scheme such that ANSP's surveillance data would enrich the commercial concern's coverage by way of the strategic locations of an ANSP's receiver sites and would also provide an additional layer of data source redundancy.

4.15 To increase the appeal of its service by incorporating more data sources, the commercial concern could provide incentives to contributing ANSPs to offset its cost in sharing its data. It is therefore incumbent on members to deliberate if members would take a collective and unified approach in this collaborative scheme or, to the other extreme, such that members would simply go their own ways and agree with individual concern(s) to share its surveillance data in ways that best meet members' interests. There is of course the consideration of fairness to all (ANSPs and commercial concerns alike). To move the potential scheme forward, the following is suggested:

Suggestion

Establishment of a Study Group led by Surveillance Implementation Coordination Group (SURICG) and supported by experts in SWIM, CRV and ATFM etc. and under the guidance of ICAO APAC to advise CNS Sub-group on the best approach for regional surveillance data sharing, including the exchange model for surveillance data in SWIM.

5. Discussion at 4th Meeting of SWIM Task Force (SWIM TF/4)

5.1 Contents of this paper were presented as WP/13 at the recently held SWIM TF/4 meeting on 3-6 November 2020, which had generated enthusiastic discussion of the proposal including the establishment of a Study Group under SURICG on surveillance sharing as reflected in the draft SWIM TF/4 Report that as an action (ACTION Item 4-4) to nominate members to join the Study Group Task to further explore initiative.

6. ACTION BY THE MEETING

6.1 The meeting is invited to:

- a) consider the Commercial-ANSP collaboration scheme proposed in this paper (chiefly paragraphs 4.12-14) and the various consideration factors leading to this potential scheme;
- b) consider the potential developments in surveillance data, particularly ADS-B data SWIM carried over CRV; and
- c) support the establishment of the Study Group comprising surveillance experts and experts in relevant areas such as SWIM and ATFM to recommend solutions on regional surveillance data sharing to provide surveillance from "departure to destination".
