



ICAO

*International Civil Aviation Organization***Sixth Meeting of the Surveillance Implementation
Coordination Group (SURICG/6)**

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Agenda Item 4: Review Report of SURSG/1 Meeting**PROPOSED CONCEPT OF OPERATIONS FOR SURVEILLANCE DATA SHARING**

(Presented by Singapore, Hong Kong China, Thailand and Vietnam)

SUMMARY

This paper presents a proposed outline of the concept of operations for surveillance data sharing.

1. Introduction

1.1 During the first meeting of the Surveillance Study Group (SURSG/1), Singapore, along with Hong Kong China, Thailand and Vietnam (the “Project Team”), is assigned to work out the concept of operations (“CONOPS”) on the sharing of surveillance data among multiple parties using platform such as SWIM platform as Sub-task 2.1 with Singapore as the task lead.

1.2 This paper provides an outline of the CONOPS for consideration by SURSG to be further developed as the regional CONOPS document for surveillance data sharing in SWIM.

1.3 The objective of the CONOPS is to propose the practical modes/models of operation, taking into account of technical, operational, engineering and financial considerations, to achieve surveillance data sharing to support civilian ATS applications that can benefit from surveillance data provided by States/Administrations/ANSPs/external parties (“States”, “states” or “ANSPs” collectively in the rest of this paper without loss of generality).

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2. Discussions**2.1 High level objectives/understanding****2.1.1 Objectives/Purposes**

2.1.1.1 The objective of the surveillance data sharing is to support civilian ATS applications that require surveillance data from other States.

2.1.1.2 States' sovereignty and borders should not be affected by the sharing of surveillance data.

2.1.2 Shared Surveillance Data for ATS Applications and Service Levels

2.1.2.1 It is envisaged that States will have varying needs for the shared surveillance data. Based on the nature of ATS applications, the service levels of shared surveillance data may be roughly classified into two tiers as below:

- a) Tier 1 Data Services – For supporting ATS applications which make use of the shared surveillance data for critical operations such as aircraft separation with performance and reliability specifications to be determined;
- b) Tier 2 Data Services – For supporting ATS applications for less critical operations (e.g. Air Traffic Flow Management (ATFM), situation awareness at FIR boundaries, etc.) with performance and reliability specifications to be determined.

2.1.3 Extent of data sharing

2.1.3.1 Two options can be considered when it comes to the eligibility to receive the shared data is shared.

- a) Option 1: The data will be shared among all the participating users;
- b) Option 2: The contributor to decide which user to receive the data.

2.1.3.2 It is envisaged that option 1 be adopted in the spirit of multiple party data sharing, instead of a traditional bi-lateral data sharing. Option 2 may be considered for specific users if required.

2.1.3.3 Options 1 and 2 are not mutually exclusive options. Technically, there should be no issue in implementation either or both options in the SWIM environment. Option 1 is preferred in the spirit of promoting SWIM towards a connected world for the benefit of the aviation communication, instead of Option 2, which could necessitate traditional bi-lateral or multi-lateral data sharing agreements.

2.1.4 Implementation platform

2.1.4.1 It is proposed that SWIM over CRV be the default means to share the surveillance data in line with the TOR of SURSG.

2.1.4.2 The sharing of surveillance data could be implemented in any of the three SWIM infrastructure models:-

- 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 – one or more ANSP(s) and/or third parties (called “SWIM surveillance data service provider(s)”) may host EMS services available to subscribers such that qualified States/Administrations/Stakeholders may subscribe or publish surveillance data irrespective of their geographical locations but insofar as they can access the data sharing cloud; and
- c) Hybrid model – the co-existence of ANSPs operating their own EMSes (Distributed Model) and/or accessing data exchange services in the Centralized Model.

2.1.5 Types of Surveillance Data to be Shared

2.1.5.1 The sharing of surveillance data is not limited to ADS-B. Considering States already have experience in sharing ADS-B data, apparent lack of data ownership (not counting purchased data by ANSPs) issue, it is proposed that the implementation should focus on the sharing of ADS-B data in this initial stage. With the lessons learnt, this CONOPS would be adjusted to accommodate other types of surveillance data.

2.1.6 Implementation sequence

2.1.6.1 The implementation sequence is thus as follows:

- a) Stage 1 – Tier 1 and Tier 2 ADS-B data sharing; and
- b) Stage 2 (at a much later stage) – Tier 1 and Tier 2 other surveillance data sharing, which would entail a detailed and vastly different study given the complexities, scope and practically, possibly requiring a dedicated study group to engage in the work.

2.1.7 3rd Party/Commercial Participation

2.1.7.1 Consideration should be given to 3rd Party/Commercial participation which may also provide complementary surveillance data (i.e. data not available from participating users), value added services (not necessarily limited to surveillance data), allowing for access to SWIM without owning an EMS, data repository, enhance reliability and resilience, maintenance support, hosting service registration and governance service.

2.1.8 Data Coverage

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2.1.8.1 Considering that the users will be benefiting from the sharing of the surveillance data, the extent and geographical coverage of data shared would need to be determined. Some possible choices are:

- a) Choice 1: Data contributor(s) to share data from all their ADS-B stations (maybe difficult for large States);
- b) Choice 2: Data contributor(s) to share data from at least one of their ADS-B stations (The data from the chosen station may not be useful to other States);
- c) Choice 3: Data contributor(s) to share data from all their international flights (useful for ATFM however it may be challenging to filter);
- d) Choice 4: Data contributor(s) to share ADS-B data from stations that are near the FIR boundaries (useful to cover surveillance gaps);
- e) Choice 5: Data contributor(s) to share data from ADS-B stations that are near to major ATFM hubs (useful for ATFM).

2.1.8.2 It is envisaged that combination of Choices 4 and 5 might be reasonable as a starter of the initiative. Otherwise, Choice 2 may be selected as a minimum. As mentioned in the proposed business model, data contributor could be offered with some incentives in using centralized EMS service(s). Participating ANSPs are thus encouraged to contribute data as much as they could, which can help build up a rich and more comprehensive set of data via the centralized EMSes.

2.2 Responsibilities of Data Contributors

2.2.1 System availability

2.2.1.1 Data contributors are to maintain their equipment up to the standard applicable to their own equipment.

2.2.1.2 Given that surveillance data originated from different surveillance sensors and fused outputs of the sensors would not have same coverage, but when the sensors are considered approximately close, could be considered as backup to each other as defined in their service registry.

2.2.2 Integrity of data

2.2.2.1 Presumably, the data contributors shall not modify the content of the surveillance data except for the following purposes:

- a) ASTERIX Edition upgrading or downgrading
- b) Format conversion to meet the agreed data format for sharing
- c) SAC/SIC amendment
- d) Fusion of data from multiple sensors such as removal of duplicated ADS-B position reports. Any extrapolation of position reports shall not be shared.

2.2.2.2 Time stamp of the surveillance data report shall be based on a reliable time source without any modification by the Data Contributors.

2.2.3 Report Filtering

2.2.3.1 Filtration of flights or other non-civilian flights (e.g. State aircraft) should be allowed with the filters being agreed upon prior to implementation.

2.2.3.2 For ADS-B data, the data contributors shall not perform any data filtering based on ADS-B quality indicators or blacklist. All the ADS-B data shall be shared with users as far as possible.

2.2.3.3 Considering that states will be making the assessment of data usability, and that lower NUC/NIC can still support lower tier operations, it is envisaged that all data can be sent without filtering based on NUC/NIC.

2.2.4 Timeliness / Data Latency

2.2.4.1 The data contributors shall share their surveillance data in the SWIM platform (or other platforms) within a latency value suitable for the ATS applications to be studied and defined under the relevant sub-tasks of SURSG.

- a) Tier 1 Service – The latency of shared surveillance data observed at the user end shall meet with the requirement for critical operations such as aircraft separations. The required standard will be agreed upon subsequently.
- b) Tier 2 Service – The latency of shared surveillance data observed at the user end should be managed to meet an agreed level, say 5 seconds.

2.2.5 Update interval

2.2.5.1 The data contributors shall provide the data without purposely increasing the update interval of the original surveillance sources.

- a) Tier 1 Service – The update rate of shared surveillance data observed at the user end shall meet with the relevant requirements for providing critical operations such as aircraft separations. The standard will subsequently be agreed upon.
- b) Tier 2 Service – The update rate of shared surveillance data observed at the user end should be managed to meet an agreed updating interval, say 30 seconds for ATFM.

2.2.6 Format of the data

2.2.6.1 Contribution of data shall be done in the format agreed upon by the project team. As far as possible, the format should be ASTERIX CAT 21. The latest edition is edition 2.5. However, not all States is able to process the latest edition.

2.2.6.2 Proposed that at a minimum, the data format to be supported is: ADS-B data: ASTERIX Category 21 Edition 2.1.

2.3 Rights and Responsibilities of Users / Data Consumers

2.3.1 Safety related responsibilities

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2.3.1.1 To ensure that the Users can use the surveillance data safely, the following responsibilities will be on the Users:

- a) User shall have the responsibility to decide whether the surveillance data received is suitable for use.
- b) User shall have the necessary contingencies in place, in case of loss of data.

2.3.2 Obligation of Users

2.3.2.1 Considering that the Users will be benefiting from the sharing of the surveillance data, there may be a need to impose a requirement that the users have to also contribute data.

2.3.3 Eligibility to receive shared data

2.3.3.1 There are various options to manage the eligibility to receive shared data such as:

- a) Option 1: The data to be shared among all participating users, be they data contributors or pure consumers
- b) Option 2: A data contributor to decide which user(s) to receive the data and the volume of surveillance coverage
- c) Option 3: By default, only data contributors can be consumers
- d) Others

2.3.3.2 On the options tabled in paragraph 2.3.3.1, there are numerous consideration factors such as benefits to the aviation community, promotion of ICAO initiatives (SWIM, CRV for instance), avoidance of exclusivity, ease of start of project to build up a user base and reduction of complexity, resulting in a CONOPS that is more easily manageable as pre-conditions/pre-requisites in some of the options might elicit second thoughts. It should also be noted that given the flexibility of SWIM infrastructure and the publish-and-subscribe nature, options can be technically applied at a later stage if deemed necessary

2.3.3.3 Even if a data contributor is expected to take reasonable steps to ensure the data integrity and service reliability, onus is on the data consumer with regard to:

- a) whether the surveillance data received is suitable for use; and
- b) availability of contingencies in case of service interruption.

2.3.3.4 Paragraph 2.3.3.3 notwithstanding, integrity of shared data and service reliability are expected to improve with the expansion of user base (including participation from 3rd parties), enhancement and enrichment of services in the evolution of the surveillance data sharing initiative. At start, ANSPs who share their surveillance data would likely provide such with already some reasonable data integrity and service reliability since, to a certain extent, the data being shared is data being used for their own ATS applications.

2.4 Trial Case by Pioneering Members

2.4.1 Given the complexities involved (even for exchanging ADS-B data at start), pioneering ANSPs who are already involved in ADS-B data sharing could showcase the validity and practicality of the initiative.

2.5 Financial

2.5.1 As a default, the users shall be responsible for the cost to connect to the main sharing platform (which could be the SWIM network or central processor(s)). Data contributors should keep track the population of data users so as to ensure their CRV connections are provisioned with sufficient bandwidth for uploading the data for sharing. Given the expected surveillance data of other airspaces in return of the contributed surveillance data of own airspaces, they should be able to justify the additional bandwidth requirements on the CRV connections for both contributing own and receiving other surveillance data. The participating ANSPs can choose to setup its own EMS for data sharing and be responsible for the cost in the initial setup and the on-going maintenance and support. Alternatively, ANSP can choose to subscribe to the commercial centralized EMSes and be responsible for the service subscription fee instead.

2.6 Other Essential Governance Principles

2.6.1 Memberships

2.6.1.1 The members of the data sharing arrangement will be the ANSPs of all ICAO APAC member States, who wish to participate in such arrangement.

2.6.1.2 The Project Team may also consider allowing the airlines, airport operators and service providers to be members of the data sharing arrangement.

2.6.1.3 One option is for the airlines, airport operators and other non-ANSP stakeholders to be provided with secure connections to their respective ANSPs' EMSes for accessing the surveillance data being shared. These users may not have resources to contribute surveillance data and their obligation of contributing surveillance data under the multilateral agreement may not be practical (need to consider other means for the ANSPs and/or surveillance data contributors to recover the associated costs).

2.6.1.4 Another option is for the airlines, airport operators and other aviation stakeholders to directly subscribe to the services from SWIM surveillance data service providers.

2.6.1.5 Sets of requirements/guidelines might need to be formulated to qualify an interested party as a "participating user", which could be any combination of data contributor, Users and 3rd party/commercial participants. Such requirements/guidelines could fall under the purview of Sub-tasks 2.4/2.5.

2.6.2 Collaboration agreement

2.6.2.1 It is recommended that the members sign a multilateral agreement rather than bilateral agreements in line with Option 1 in paragraph 2.1.3.1a).

2.6.2.2 Consideration should be given to the pros and cons of multilateral agreements and bilateral agreement, as well as time and expected difficulties in reaching such agreements.

2.6.3 Operational arrangement

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2.6.3.1 An Operational Group, like that of CRV, might be necessary to administer and supervise the data exchange system, which would be subjected to extent of participation, commitment and 3rd party/commercial participations.

2.6.3.2 After the implementation of this sharing, chairperson of the Operational Group must be appointed to consider and manage the various issues post implementation.

2.6.3.3 To shorten the implementation time and minimise operating costs, a bottom-up, agile approach to exchange surveillance data by leveraging CRV and adopting ASTERIX surveillance data format via some centralized and dedicated EMS and Surveillance Central Data Processor (SCDP) services provided by business entities and/or pioneering participants running their own EMSes to provide dedicated surveillance data sharing services should be adopted. The comprehensive governance framework under SWIM is not required at this moment.

3. Conclusion

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) highlight any concerns or raise any suggestions regarding this CONOPS for the SURSG's consideration.
