INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT

OF

THE THIRD WORKING SESSION OF THE SWIM IMPLEMENTATION PIONEER AD-HOC GROUP (SIPG WS/3)

Bangkok, Thailand

01-05 June 2026

The views express in this Report should be taken as those of the working session and not the Organization

Approved by the Working Session and published by the ICAO Asia and Pacific Office, Bangkok

Table of Content

PART I – WORKING SESSION OVERVIEW

PART II – REPORT ON AGENDA ITEM

PART I – WORKING SESSION OVERVIEW

1 Introduction

1.1 The Third Working Session of the SWIM Implementation Pioneer Ad-Hoc Group (SIPG WS/3) was held from **01 to 05 June 2026** in the ICAO Asia Pacific Regional Office, Bangkok, Thailand.

2 Attendance

2.1 The Working Session was attended by **60** participants from **12** Member States/Administrations, and **2** International Organisations, namely Australia, China, Japan, Malaysia, New Zealand, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, United States, Viet Nam, CANSO, and ICAO. The list of participants is provided in **Attachment 1.**

3 Opening of the Working Session

3.1 Dr Amornrat Jirattigalachote, Expert (Director Level), Corporate Strategy and Sustainability Office of Aeronautical Radio of Thailand Ltd., Co-Chair of the SWIM Task Force (SWIM TF) and Mr David Leow, Head (Quality Assurance), Civil Aviation Authority of Singapore and lead of the SIPG, opened the Working Session, welcoming all participants to the SIPG WS/3. David informed the Working Session that there would be a change to the order of business as a result of the SWIM TF/11 Meeting held the week prior.

3.2 Eleven action items were assigned to the SIPG as a result of the discussion in the SWIM TF/11 Meeting, emphasising the necessity for the SIPG to conclude on the Request-Reply Message Exchange Patterns (R-R MEP), the Application Programming Interface (API) gateway architecture, and most importantly, the SWIM routing mechanism. The action items will be transferred to the SIPG Action Item list for closer tracking. **Action WS 3-1**

4 Officers and Secretariat

4.1 Mr David Leow chaired the Working Session with the assistance of Dr Amornrat Jirattigalachote.

4.2 Dr Soniya Nibhani, Regional Officer ANS (CNS) Implementation, together with Ms Jian Xu, Associate Programme Officer ANS (CNS) Implementation and Ms Varapan Meefuengsart, the Programme Assistant from the ICAO Asia and Pacific Regional Office, provided logistics and IT support for the Working Session.

5 Organisation, Working Arrangements, Language and Documentation

5.1 The SIPG WS/3 met as a single body during the session. The working language for the session was English, including all documentation and this Report. The Working Session considered **Three (3)** Working Papers and **Fourteen (14)** Presentations under its **six (6)** Agenda Items. The list of papers and presentations is provided in **Attachment 2.**

PART II – REPORT ON AGENDA ITEMS

1 Agenda Item 1 – Adoption of Agenda

Adoption of Agenda – SIPG Lead (WP/01 and SP/01)

1.1 The provisional agenda was presented in WP/01 and SP/01 of SIPG 3rd Working Session – Agenda and Order of Business. The proposal was accepted, and the following agenda was adopted.

Agenda Item 1: Adoption of the agenda

Agenda Item 2: Update on the implementation timeline and progress of each task

Agenda Item 3: SWIM Technical Infrastructure
- i. Routing mechanism
- ii. Interconnected registries
- iii. API gateway discussion
- iv. SWIM security and identity management

Agenda Item 4: SWIM Testing Methodology
- i. Functional tests
- ii. Integration tests
- iii. Performance tests

Agenda Item 5: Discussions on SWIM Operationalisation
- i. Operationalization Requirements
- ii. Task leads for tasks 9, 10 and 11

Agenda Item 6: Next Meeting Date and Any Other Business

2 Agenda Item 2: Update of the Implementation Timeline and Progress of Each Task

2.1 SIPG Timeline Update

2.1.1 SIPG Lead presented both the previous timeline and the latest revised SIPG timeline. It was noted that Tasks 1, 2, 3, 6 and 7 are now scheduled for completion in June 2026, rather than March 2026 as previously planned. This pushed the completion of the SWIM prototype to May 2027, compared to March 2027 in the previous timeline.

2.1.2 It was noted that the Task 2 completion timeline, based on its 7 levels of testing, was different from what was stated in the SIPG overall timeline. Task 2 clarified that the June 2026 timeline was based on the completion of level 4 testing. Test levels 5-7 would be subsumed under Task 5.

2.1.3 The Working Session was reminded that the FF-ICE ad-hoc group has an expectation of having the SWIM Technical Infrastructure (SWIM TI) available to do FF-ICE R1 operational trials in April 2030. It was suggested that, in order for the FF-ICE Ad-hoc Group to achieve the expected timeline, the FF-ICE Ad-hoc Group was encouraged to consider conducting the test with SIPG starting in April 2027. However, there was a concern that level 4 testing may not be sufficient to support these trials. This led to a lengthy discussion of the different Message Exchange Patterns (MEP) and what was needed to support FF-ICE trials.

2.1.4 The Working Session was also reminded of the need to provide SWIM TF Task 6 inputs for the types of MEP for the list of APAC Common Information Services. It was noted that SIPG needed to decide on the mechanisms that support the different MEPs to be implemented within this SWIM TI. Only then can SIPG provide the input to SWIM TF Task 6.

2.2 Task 2 Update

2.2.1 China provided the Working Session with an update on Task 2. In the update, it was noted that the Publish/Subscribe (Pub/Sub) MEP is natively supported by the hierarchical event broker SWIM TI architecture, and that the asynchronous Request/Reply (R/R) MEP can also be supported with additional configuration. However, the synchronous R/R MEP is not supported.

2.2.2 Task 2 also proposed an APAC SWIM address naming pattern and a message topic format. Examples of how this message topic format can be used were also provided.

2.2.3 A proposal for SWIM message metadata was also presented to the Working Session.

2.2.4 Finally, Task 2 gave an update on the test status for the GEMS participants. The Working Session was informed that currently, all GEMS providers have reached level 3 testing and China and Hong Kong China are now preparing for level 4 testing. It was expected that the other GEMS providers would also be able to complete level 4 testing by the end of June 2026.

2.2.5 SIPG Lead encouraged all GEMS providers to closely coordinate and cooperate with the Task 2 lead to achieve this timeline.

2.2.6 The update from Task 2 generated a lot of discussions regarding the details of the message topic structure and the content of the message metadata. However, the SIPG Lead requested that the discussions be paused, as there is a dedicated agenda item for routing mechanisms.

2.3 Task 3 Update

2.3.1 The Republic of Korea provided an update on Task 3. The Working Session was informed that the working drafts of the R/R MEP guidance material and the REST API Naming and Structure guidance are available for review.

2.3.2 It was noted that the R/R MEP guidance material was presented at the 2nd FF-ICE ad-hoc group Meeting and the SWIM TF/11 Meeting.

2.3.3 During the development of the guidance material, it was decided that the asynchronous R/R MEP will be handed over to Task 2 to continue the exploration since the event broker architecture has the capability to support it. Task 3 will concentrate efforts on the synchronous R/R MEP.

2.3.4 Task 3 lead presented the future plans for Task 3, focusing on synchronous R/R MEP. It was agreed that Task 3 will focus on defining the minimum capabilities for the edge API gateway, the Global API gateway or proxy and on producing the requirements document. Task 3 will coordinate with Task 2 to add support for synchronous R/R MEP to the prototype SWIM TI. Detailed discussions on the requirements for the API gateway would be taken under agenda item 3: SWIM TI.

2.4 **Task 6 Updates**

2.4.1 Malaysia provided an update for Task 6. It was noted that Task 6 referenced the Aviation Common Certificate Policy (ACCP Doc 10169), the Manual on Aviation Information Security (MAIS Doc 10204), and Eurocontrol Specification 170.

2.4.2 The Working Session was informed that the MAIS document established Confidentiality, Integrity and Non-repudiation, and Availability (CIA) as the foundational pillars of aviation information security.

2.4.3 Task 6 lead, updated on the scope of the testing done as well as the testbed PKI structure used for the test. It was noted that the testbed consisted of a Root Certificate Authority (CA) and 2 organisational CAs that were subordinate to the Root CA. Each has its clearly defined PKI roles and responsibilities.

2.4.4 Task 6 further updated on the results of the testing. The detailed results can be found in the Task 6 presentation slides SP/10. It was noted by the Working Session that there are significant overheads to the size of the message payload when it is signed by a certificate and when it is signed and encrypted. For a message size under 10KB, the overheads are about 1000% and about 1230%, respectively. However, if the message size is greater than 10KB, the percentage overhead drops to about 28%.

2.4.5 In addition to message-level security testing, the transport layer was tested with AMOPS and mutual TLS (mTLS). The AMQPS and mTLS are complementary layers and both must be deployed into the APAC SWIM TI.

2.4.6 Task 6 presented the testbed implementation with the requirements set out in the ACCP and MAIS. Out of the 7 requirements, 5 were fully met, 1 was partially met, and 1 was deferred.

2.4.7 Several key findings and recommendations from the Task 6 work were shared with the Working Session. It was suggested that these findings should be shared with the ANS Information Assurance Task Force (ANSIA TF). The SIPG Lead will email Working Package 2 of the ANSIA TF to connect them with Task 6 members so the results of this work can be shared. **Action WS 3-2**

2.5 **Task 7 Updates**

2.5.1 The United States provided an update for Task 7. The Working Session noted that Tasks 7-1: SDS and SDCM publication, Task 7-2: Implementation of SDS 2.0 and Task 7-3: development of the interconnected registries operational scenarios have been completed. The outstanding Task 7-4: testing and demonstration of the operational scenarios is still outstanding. It was suggested that testing and demonstration of operational scenarios be incorporated into SIPG Task 9's functional testing work.

2.5.2 Task 7 lead also updated the Working Session that the SDS v2.0 has been adopted as the standard for interconnected registries and that this version is compliant with the PANS-IM (Doc 10199).

2.5.3 Task 7 also informed the Working Session that there needs to be a minor change to the SDS standard in response to changes in PANS-IM. The changes are to incorporate the "Use Limitations" and "ISD Reference" fields into the standard.

2.5.4 With this update, the Working Session considered that Task 7's work is completed.

3 Agenda Item 3 – SWIM Technical Infrastructure

3.1 API Gateway Demonstration and Discussion

3.1.1 The United States gave a demonstration of the capabilities of the US-FAA API Gateway as being implemented in the US-FAA SWIM. It demonstrated the primary capability of an integrated API Gateway and management solution to route traffic via a secure enterprise API Gateway while leveraging an integrated control plane for development and lifecycle management of APIs. The United States implementation demonstrated both synchronous (REST API) web services and asynchronous web services for integration with event brokers via protocol mediation/webhooks, as well as a developer portal for service discovery. Other capabilities of the API Gateway included the ability to apply a security and access policy for each REST API, configure service levels, and perform performance monitoring.

3.1.2 Following the demonstration, there was a lengthy discussion on the pros and cons of using an API Gateway to support synchronous R/R MEP within the APAC SWIM TI. It was suggested that the SIPG might need each participating State to implement an API Gateway. However, it was quickly decided that imposing such a requirement on the States/Administrations was outside the scope of the SIPG; the SIPG should focus on how synchronous R/R MEP can be supported within the APAC SWIM TI.

3.1.3 It was decided that having the API gateway deployed at the level of the Edge EMS is beneficial to support the synchronous R/R MEP. However, API gateways at the Gateway EMS level might not be needed. Setting up proxies at the GEMS layer would be sufficient to serve as a simple routing mechanism to access the edge API Gateway for synchronous R/R MEP.

3.1.4 Moving forward, Task 3 and Task 2 will coordinate to test the above deployment for supporting the synchronous R/R MEP. **Action WS 3-3** The goal would be to leverage the IP network already established by Task 2 to construct this 2-layered API gateway and gateway proxies at the Edge EMS and Gateway EMS level, respectively. Afterwards, to develop a testing programme similar to what Task 2 has developed to do the initial validation of this architecture for synchronous R/R MEP support.

3.1.5 The SIPG Chair requested that the EEMS providers of Task 2 look into setting up and configuring API gateways, the GEMS providers to look at how proxies can be set up, and for Task 3, lead them. **Action WS 3-4**

3.2 Request/Reply Message Exchange Pattern Discussion

3.2.1 Japan presented on the APAC SWIM TI to implement different MEPs. The presentation first examined the different MEPs, their associated processes and restrictions, how they are typically implemented and the recommended communication protocols to support them.

3.2.2 Japan recapped the APAC SWIM Hierarchical Architecture and some of the agreed principles governing GEMS to GEMS, and EEMS to GEMS connectivity.

3.2.3 The presentation described in great detail how each type of MEP can be supported by the proposed communications protocol and message routing method. It recommends message-header based routing on AMQP for the asynchronous R/R MEP, Topic-based routing for the Pub/Sub MEP, and Path-based routing using a combination of API gateways at the EEMS and proxies at the GEMS and URIs for the synchronous R/R MEP.

3.2.4 Finally, Japan proposed a set of message exchange tests for each of the identified MEPs.

3.2.5 Republic of Korea presented Working Paper 3, highlighting 5 issues related to the synchronous R/R MEP resulting from SIPG Task 3 work.

3.2.6 The issues were as follows:

1. Outstanding decision on using a full mesh or hierarchical architecture to support the MEP
2. Use of API gateways or proxies at the Global level
3. Alignment of the URI naming and structuring convention with the Topics naming convention being considered in SIPG Task 2.
4. There are 2 sub-issues identified under issue 4.
    a. Degree of simplification of REST API URI naming and structuring convention
    b. Alignment of the naming and structuring convention here with those established by other groups (e.g. MET).
5. Alignment between the synchronous and asynchronous R/R MEP in the aspect of implementation.

3.2.7 The Working Session discussed these issues raised by the Republic of Korea in depth, taking each issue in turn. The Working Session made the conclusions defined in subsequent sections on each of the identified issues.

3.2.8 For issue 1, the Working Session decided that the synchronous R/R MEP should be tested on the hierarchical SWIM TI architecture. This was also to leverage the IP connectivity as established by Task 2. **Action WS 3-5** It was noted that a full-mesh hierarchical API gateway implementation had already been tested when the SDS testing was being done in SIPG Task 7.

3.2.9 For issue 2, it was already decided in the earlier discussion on API gateways that API gateways should be used at the EEMS level, while proxies and reverse proxies are configured at the GEMS level.

3.2.10 For issue 3, the Working Session provided the suggestion that where the URI categories coincide with the categories as defined in the Topics, it would be useful to have the same naming convention. However, there was no real need for the structure of the URI to be aligned with the structure of Topics. It was noted that the URI structure as defined in the draft guidance document is sufficient to route the messages in the synchronous R/R MEP. As such, issue 4a is also addressed.

3.2.11 For issue 4b, the Working Session was informed that most implementations of API gateways would be able to take URIs from the MET domain and reroute them to URIs on the APAC SWIM TI. Therefore, there is no real need to align the URI structures and naming conventions. All that is required is an understanding of the URIs in the MET domain or any other information domains, and the ability to map to the APAC SWIM TI URIs.

3.2.12 For issue 5, the Working Session concluded that China, as the lead of Task 2, together with Singapore and Japan, will produce the first draft of guidance material for the implementation of the asynchronous R/R MEP and Pub/Sub MEP, taking as a reference the guidance

document that the Republic of Korea has produced for the synchronous R/R MEP for consistent style and depth. **Action WS 3-6**

3.3 **R/R MEP Guidance Material**

3.3.1 As the R/R MEP guidance material was presented at the SWIM TF/11 Meeting by WP/27, the SIPG Lead directed Working Session participants to review the guidance material offline and to provide any comments or queries directly to the Task 3 Lead, Republic of Korea. **Action WS 3-7**

3.4 **Routing Mechanism discussion**

3.4.1 CANSO presented the concept of topic-based message routing to the Working Session and how it can be applied to the asynchronous R/R MEP. The presentation made it clear that, because of the need for EMSs to exchange data, bridges were needed between the EMSs.

3.4.2 Using flight plan filing as an example, CANSO showed how Topic-based message routing can be used to achieve asynchronous R/R MEP in AMQP.

3.4.3 Singapore presented a comparison of the differences between message header-based routing versus topic-based routing, showing the benefits and drawbacks of each method in a comparison table.

3.4.4 The Working Session had a robust discussion on the various message routing mechanisms and where they are most suitably applied to specific MEPs. The Working Session requested that Singapore provide further explanation on how topic-based routing can work in the APAC hierarchical architecture.

3.4.5 Singapore prepared a new presentation titled SP/12- Topic Routing Mechanism to further elaborate on topic-based routing. It was noted that for topic-based routing, there was a need to be careful in the design of the topics to message queues mapping in order for the messages to arrive at their intended destination. It was also highlighted that different implementation of AMQP v1.0 message broker use different terminologies which require harmonisation and alignment with AMQP v1.0 protocol. It was agreed that Task 2 will review and propose harmonised terminologies. **Action WS 3-8**

3.4.6 The Working Session further deliberated on the new information provided by CANSO and Singapore and made comparisons with the earlier presentation by Japan on message-header based routing to support the asynchronous R/R MEP.

3.4.7 Finally, the Working Session came to the following conclusions.

1. For synchronous R/R MEP, API gateways with path-based routing using URIs will be used.
2. For Pub/Sub MEP, topic-based routing will be used.
3. For asynchronous R/R MEP, the default routing mechanism will be message-header based routing. However, topic-based routing will be tested as part of ongoing SIPG work by China, the Republic of Korea (when the Republic of Korea's CRV connectivity is established), Singapore and Thailand. Any other State that wishes to participate in this trial should make its intention known to Task 2

3.4.8 It was agreed that this decision will be shared with the SWIM TF/12 Meeting by a working paper. **Action WS 3-9**

3.4.9 It was also agreed that the Pub/Sub MEP will use the topic-queue mechanism for guaranteed delivery and the topic-only mechanism for non-guaranteed delivery. **Action WS 3-10**

3.5 **Task 5 Work Breakdown**

3.5.1 Singapore, as the Task 5 lead, indicated to the Working Session that, given the developments in this Working Session, they are not ready to present on their work breakdown structure. Task 5 will provide the work breakdown structure in the monthly SIPG Meeting. **Action WS 3-11**

3.6 **SWIM Security and Identity Management**

3.6.1 The SIPG lead noted that the SWIM TF/11 conclusion was to hand over the SWIM security task to the ANS Information Assurance Task Force (ANSIA TF). As such, this agenda item would also follow. ICAO Secretariat will share this information with ANSIA TF. **Action WS 3-12**

3.7 **Interconnected Registries**

3.7.1 As Task 7 has already completed its work on registry interconnection, there was no longer any need to discuss this agenda item. The five operational scenarios for interconnected registries will be passed on to the SWIM testing tasks, either as part of Task 9 or Task 10. **Action WS 3-13**

4 Agenda Item 4 – SWIM Testing Methodology

4.1 The SIPG Lead presented a proposal for testing the APAC prototype SWIM TI as developed by the SIPG. The testing proposed covered functional testing, integration testing, SWIM registries testing, and performance testing. The proposal only covered, in broad strokes, the plans for each type of testing and their relationships with one another.

4.2 The Working Session sought to clarify the purpose of the testing plan. It was unclear what the objective of such tests was.

4.3 SIPG Lead clarified that, firstly, this test plan was focused on testing the APAC SWIM prototype TI and not focused on testing various information services. The proposed test plan used a selection of information services that covered all MEP types and payloads to test the SWIM TI.

4.4 SIPG Lead further clarified that the purpose of this testing was to generate a consolidated test report to be presented to the SWIM TF. This was to meet the SIPG deliverables of building the SWIM TI prototype and evaluating the capability of this SWIM TI using a selection of information services. Another objective of this testing was to be able to put into record a consolidated test report of all the different types of tests performed on the prototype SWIM TI. Thus, demonstrating to the SWIM Task Force the completion of the SIPG work.

4.5 Secondly, it was also to produce, out of these tests, a set of requirements for the operationalisation of the SWIM TI. The expectation and goal were for this prototype SWIM TI to act as a seed and eventually grow to become the operational SWIM for the APAC region. It was expected that additional requirements would be added to this as deliberations from the SWIM TF and/or other forums, like the ANSIA TF, progress.

4.6 It was noted in the Working Session that there would be a need to develop an **onboarding guide for States** that wish to implement their own SWIM TI and integrate with the APAC SWIM TI. However, it was recognised that this work should be the work of the Governance task in the SWIM TF. The SIPG will submit a working paper to the SWIM TF/12 to highlight this need. **Action WS 3-14**

4.7 Task 5 Lead commented that these activities overlap strongly with what was planned for Task 5 and queried how the work should be assigned between Task 5, Task 9 and Task 10. SIPG Lead acknowledged that the division of work done at the SIPG WS/2 might have been too granular and asked the Task 5 lead to also take on the work initially assigned to Tasks 9 and 10, for which the Task 5 lead agreed. **Action WS 3-15**

4.8 SIPG Lead commented that the task of developing Operationalisation Requirements should take into account all the work being done by the SIPG, and as such should be considered by the whole of the SIPG and not undertaken by a single Task, Task 11. Therefore, it will be a SIPG working paper for a future SWIM TF Meeting. **Action WS 3-16**

4.9 Japan presented the proposal for an APAC SWIM Test Environment and the way forward. This proposal was presented in the SWIM TF/11 Meeting with the conclusion that the Internet-based SWIM Sandbox Environment would be the preferred option.

4.10 Japan presented a 7-step plan to establish the Internet-based SWIM Sandbox.

4.11 Japan reiterated that the purpose of this test environment is to test and validate SWIM information services to be rolled out on the SWIM TI. This is to fulfil the PANS-IM requirement for validation of SWIM information services.

4.12 The proposal presented here is for SIPG's awareness and consideration when developing the guidance materials and reports back to the SWIM TF.

5 Agenda Item 5 – Discussions on SWIM Operationalisation

5.1 Given the detailed discussions and deliberations taken at the Working Session prior to this agenda item. The SIPG Lead decided that the SIPG is not yet ready to discuss operationalisation of the APAC SWIM TI. This work will be taken as part of the SIPG monthly Meeting and become the focal discussion for the SIPG WS/4. **Action WS 3-17**

6 Agenda Item 6 – Next Meeting Date and Any Other Business

6.1 Any Other Business

6.1.1 The Philippines expressed interest in joining the various testing but is unsure if its current CRV bandwidth is able to support. They also expressed that they currently do not have any information services that can be used to be part of the testing.

6.1.2 The Philippines asked the Working Session for suggestions on how they could participate more actively in SIPG work.

6.1.3 The Working Session suggested that the Philippines could join the SIPG work via the Internet. The Philippines could connect as an Internet-based EEMS to another State's EEMS that is then connected to a GEMS on the CRV.

6.1.4 With regard to Information Services, the SIPG Lead informed the Philippines that testing in the prototype SWIM TI is not done with operational Information Services but rather with mock-up or trial information services. SIPG Lead suggested that the Philippines could explore the option of setting up a mock-up information service to participate.

6.1.5 Singapore also suggested that the Philippines could act as an information consumer, which is also another viable way to participate in the SIPG testing work.

6.2 Next Meeting Date

6.2.1 SIPG Lead informed the Working Session that he would like to have the next SIPG WS to be conducted at least a month before the next SWIM TF Meeting, so as to give time to prepare all the material to be submitted to the SWIM TF.

6.2.2 It was decided that the next Working Session date for SIPG WS/4 will be from **5 – 9 April 2027**. The venue is tentatively set for Singapore, pending CAAS management approval, with the fallback venue of the ICAO Regional Office in Bangkok, Thailand.

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