International Civil Aviation Organization

WORKING PAPER

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ASSEMBLY — 40TH SESSION

TECHNICAL COMMISSION

Agenda Item 28: Aviation safety and Air Navigation Policy

REGIONAL SYSTEM-WIDE INFORMATION MANAGEMENT (SWIM)

(Presented by the 54 Contracting States[2], Members of the African Civil Aviation Commission (AFCAC))

EXECUTIVE SUMMARY

This paper outlines the need to define and incorporate the requirements of the system wide information management (SWIM) global interoperability framework layers (elements) within the ICAO regional air navigation plans (ANPs) in order to achieve a globally harmonized information management network enabled through SWIM as defined in the *Global Air Navigation Plan* (GANP, Doc 9750)

Action: The Assembly is invited to:

a) request ICAO to coordinate globally, through the respective planning and implementation regional groups (PIRGs), to define and incorporate the SWIM global interoperability framework layers (elements) within the respective regional and global ANPs;
b) request ICAO to develop additional guidance not currently contained the *Manual on System- Wide Information Management (SWIM) Concept* (Doc 10039) related to SWIM, specifically based on regional requirements including information services, technical infrastructure, registry and governance for information management, in the interest of globally seamless operations;
c) request ICAO to provide guidance to States and industry to ensure that uniform specifications are available to vendors to support seamless interfacing with existing systems in the context of SWIM; and
d) request ICAO to include in the proposed SWIM governance framework coordination between stakeholders, at regional level to be undertaken in an effort to prevent security breaches and cyber-attacks.

Strategic Objectives:	This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.

[1] English and French versions provided by AFCAC.

[2] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia, Zimbabwe.

References:	Annex 15 — *Aeronautical Information Services* Doc 10066, *Procedure for Air Navigation Services — Aeronautical Information Management* (PANS-AIM) Doc 10115, *Report of the Thirteenth Air Navigation Conference (AN-Conf/13)*, Corrigenda Nos. 1 and 2, and Supplement No. 1 Doc 10039, *Manual on System-Wide Information Management (SWIM) Concept* Doc 9882, *Manual on Air Traffic Management System Requirements* Doc 9854, *Global Air Traffic Management Operational Concept* Doc 9750, *Global Air Navigation Plan*

1. INTRODUCTION

1.1 With aviation technology evolving over the years, the role and importance of aeronautical information has increased significantly. Aeronautical information management (AIM) forms the nucleus of data exchanges within the air traffic management (ATM) community, whether it be static (aeronautical information publication (aip) info - aerodromes, waypoints, airspaces, navaids, routes, etc) or dynamic (Notice to Airmen (NOTAM), flight planning, meteorology, etc).

1.2 The scope of traditional AIM has significantly changed with the Sixteenth Edition of Annex 15 — *Aeronautical Information Services* and new *Procedure for Air Navigation Services — Aeronautical Information Management* (Doc 10066, PANS-AIM) which introduced new aspects for AIM products and services through the definition of various data sets (AIP, terrain, obstacle, aerodrome mapping and instrument flight procedure data sets) as well as the introduction of aeronautical data catalogue requirements.

1.3 The *Global Air Traffic Management Operational Concept* (Doc 9854) and *Global Air Navigation Plan* (Doc 9750) defines information management as the key enabler in achieving the future globally harmonised and interoperable ATM system.

1.4 System-wide interoperability and secured seamless information access and exchange is required to support the future ATM system. The development of the *System Wide Information Management (SWIM) Concept* (Doc 10039) introduced significant changes in the business practices of managing information within the ATM system.

2. DISCUSSION

2.1 In a dynamic and ever-changing technological environment such as aviation, process automation within aeronautical data management has highlighted that more data is being collected at an accelerated rate from various sources.

2.2 This data requires consolidation and validation beyond a human capability to process this data using traditional manual ways (information overload). Multi-media and other non-structured data sources in non-standardised formats are adding complexity when transforming data into information which meets the needs of the user.

2.3 The goal of managing all the aeronautical information, meteorological information, surveillance information, and flight information exchanges within the ATM community is to create a

shared integrated real-time ATM picture, improving safety, efficiency and predictability within an environmentally sustainable manner.

2.4 This will require AIM and all other ATM information management functions to evolve into a generic Information Management environment based on SWIM, in support of all phases of flight, utilising standardised exchange models.

2.5 The AFI Implementation and Infrastructure Subgroup (IIM SG) of the AFI Planning and Implementation Regional Group (APIRG) listed quality management systems (QMS), AIXM and electronic terrain and obstacle data (e-TOD) as some of the key projects to achieve the GANP aviation system block upgrade (ASBU) Performance Improvement Area 2 – Globally Interoperable Systems & Data within the AFI Region.

2.6 Some of the challenges the IIM SG has highlighted include:

2.6.1 ATM applications today comprises of variety applications developed by different service providers and customised based on the client's requirements, which increases interoperability problems.

2.6.2 Although standardised exchange models are being developed, the interpretation of these unique identifiers, the definition of parameter sets (only distributing relevant data) for distribution seems to be different between service providers which increases manual intervention and increase to possibility for data processing delays and data inconsistencies.

2.6.3 Defining the temporality of all data/information exchanged within all exchange models, as not all data/information are managed in-line with the defined aeronautical information regulation and control (AIRAC) cycle.

2.6.4 Current infrastructure makes it difficult and costly for one stakeholder to access, on a timely basis, information originated by another stakeholder.

2.6.5 Message-size limitations with the present infrastructure are limited (e.g. internet protocol (IP) vs aeronautical fixed telecommunications network (AFTN)).

2.6.6 Current point-to-point data exchange links will need to be replaced by a system-wide information exchange.

2.6.7 The definition of connectivity requirements to the identified AFI Regional aeronautical databases. (SWIM infrastructure layer).

2.6.8 As these systems become more automated and integrated, it requires more levels of governance and coordination between stakeholders (within the State and different ICAO Regions) to prevent security breaches and cyber-attacks.

2.7 Globally, ICAO contracting States are at different implementation phases and levels of global as well as regional ANPs. To move towards a SWIM enabled environment, the different layers of the SWIM global interoperability framework defined in Doc 10039 would need to be defined within the global as well as regional ANPs.

2.8 Within the AFI-Region, South Africa along with Kenya, the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) and Nigeria was identified as the regional aeronautical

information databases (SWIM infrastructure layer) in accordance with, APRIG Conclusion 21/14 – AIXM Implementation:

CONCLUSION 21/14: AIXM IMPLEMENTATION

That, in order to comply with the schedule for AIXM implementation based on the project deliverables for the AFI-Region as defined by the IIM/SG, States are urged to comply with the migration process to the identified Regional AIS Regional Databases in accordance with the AFI-CAD Concept.

2.9 Although the AFI regional databases has been captured under APIRG Conclusion 21/14, there is a need to further define this within the regional ANPs as well as global plans. This is to ensure a globally accepted standard is defined and applied in terms of connectivity, accessibility, quality, exchange models and protocols utilised and security of data/information as well as governance requirements between different ICAO Regions.

2.10 In line with the ICAO initiative of the "No Country Left Behind (NCLB)" campaign, defining the different layers of the SWIM global interoperability framework (network connectivity, SWIM infrastructure, information exchange models, information exchange services) within the global as well as regional ANPs will provide an implementation methodology to guide contracting States as well as ICAO Regions to achieve the envisaged future SWIM enabled environment for the exchange of data/information on a global scale.

3. CONCLUSION

3.1 Globally, interoperability challenges are seen as the main inhibitor for the exchange of information/data in a SWIM enabled environment.

3.2 To achieve the SWIM global interoperability framework, as defined in Doc 10039, requires the definition of network connectivity, SWIM infrastructure (regional databases), information exchange models and information exchange services within ICAO regional as well as global ANPs.

3.3 Although all these various exchange models are being developed, data ownership, data provision and data usage rules should be facilitated by developing and implementing a SWIM governance model as interoperability affects almost all stakeholders and their interactions within the ATM system. This includes the definition of rules, roles and responsibilities between all stakeholders in the data/information processing chain, considering the functional criticality of the information they handle.

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