INTERNATIONAL CIVIL AVIATION ORGANIZATION

ICAO NACC REGIONAL OFFICE

AUTOMATION SYSTEM AND INTEGRATED TELECOMMUNICATIONS FOR AIR NAVIGATION SERVICES/ SYSTEM-WIDE INFORMATION MANAGEMENT (SWIM) WORKSHOP (AUTO/SWIM)

SUMMARY OF DISCUSSIONS

ICAO NACC REGIONAL OFFICE, MEXICO CITY, MEXICO
21 TO 24 APRIL 2014

Presented by the Secretariat

April 2014

Automation System and Integrated Telecommunications for Air Navigation Services/System-Wide Information Management (SWIM) Workshop (AUTO/SWIM)

Summary of Discussions

Date: 21 to 24 April 2014

Venue: ICAO NACC Regional Office, Mexico City, Mexico

Participants: The workshop was attended by 48 representatives from 11 States and 13 international organizations from the NAM/CAR/SAM Regions.

1. Introduction

1.1 The workshop was conducted by the International Civil Aviation Organization (ICAO). The objectives of the workshop were:

a) Provide an overview of the latest Air Traffic Control (ATC) system automation, implementation of functionalities such as Air traffic services inter-facility data communication (AIDC), Controller-pilot data link communication (CPDLC), and situational awareness improvements with radar/ Automatic dependent surveillance - broadcast (ADS-B) data sharing, as well as how the State ATC system is approaching the ICAO System-Wide Information Management (SWIM) concept;

b) Provide operational guidance and assistance for implementing automated applications;

c) Provide information on aspects to be considered in planning and implementation of SWIM, CPDLC, AIDC, system automation interconnection, and situational awareness enhancements;

d) Serve as a forum for exchange of questions and doubts between System Manufacturers/ Service Providers and users;

e) Identify planning/implementation concerns and lessons learned from other users/Manufacturers; and

f) Provide feedback for regional implementation plans, target/metrics and Air Navigation Implementation Working Group (ANI/WG) Task Force activities (NAM/CAR Regional Performance based Air navigation Implementation Plan (RPBANIP) follow-up).

1.2 The event followed-up on and supported the implementation of Regional Performance Objectives (RPOs) of the NAM/CAR RPBANIP RPO 4: Improve Situational Awareness; RPO 6: Optimization and Modernization of Communication Infrastructure; RPO 7: Implementation of Aeronautical Information Management (AIM); other data processing related RPBANIP RPOs; and ICAO Aviation System Block Upgrades (ASBUs) B0 modules: B025/FICE - Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration; B040/TBO - Improved Safety and Efficiency through the initial application of En-Route Data Link; and B102/SNET - Increased Effectiveness of Ground-Based Safety Nets, applying ICAO Standards and Recommended Practices (SARPs) and other ICAO reference material. The final event programme and presentations/documentation are available at: http://www.icao.int/NACC/Pages/meetings-2014-cpdlc.aspx

1.3 The workshop was attended by a total of 48 participants from 10 States from the NAM/CAR Regions, 1 SAM State, 3 international organizations and 9 industry representatives. The list of participants is attached in the **Appendix.**

1.4 Mr. Jorge Fernandez, Deputy Director of ICAO NACC Regional Office on behalf of Mrs. Loretta Martin, Regional Director of the ICAO NACC Regional Office, welcomed the participants, highlighted the objectives of the event, the importance of automation as infrastructure for the Air Navigation Services (ANS) and ASBU implementation, wished the participants a successful meeting and opened the event. Mr. Julio C. Siu, Regional Officer, Communications, Navigation and Surveillance, and Mr. Raul Martinez, Regional Officer, Aeronautical Information Management, carried out the coordination and facilitation of the event.

2. Workshop Development

2.1 The first day started with Presentation P/01, where ICAO provided an overview of the event with the objectives, methodology and workshop programme.

2.2 Under P/02, COMSOFT introduced their PRISMA Air Traffic Management (ATM) automation solution, which features a comprehensive set of highly sophisticated functional modules that form an advanced ATM solution. PRISMA offers integrated processing and user interfaces for en-route approach and tower control, including the processing support for remotely located approaches and towers. The presentation highlighted the data flow and cooperation of the individual data streams within PRISMA and how the modules cooperate. Using the PRISMA modules, the architecture of the system can be perfectly tailored for different operational and technical requirements, including multi-site installations offing multiple redundancy levels.

2.3 Under P/03, INDRA briefed the participants on their AIRCON 2100 automation system, which brings together INDRA's 30-year long experience in the deployment of ATM automation systems in over 40 countries around the world. AIRCON is able to adapt to any Air Navigation Services Provider (ANSP) requirements regarding AIDC, regardless of the regional Interface Control Document (ICD) in force for the user. AIRCON is being more and more able to automatically configure advanced AIDC coordination interfaces and has extensive experience and a large record in the deployment of data link interfaces providing Automatic Dependent Surveillance - Contract (ADS-C) and CPDLC. INDRA recognizes the importance of integrating all these functions in the most seamless way for the Air Traffic Controller (ATCO), and has strived to put in place a Human Machine Interface (HMI) that can adapt to ATCO workflow at any Air Traffic Service (ATS) unit (Area Control Centre (ACC)/Approach Control Office (APP)/Aerodrome Control Tower (TWR)).

2.4 Under P/05, Thales informed of the main features of its worldwide leading TopSky – ATC automation system, suited for applications ranging from tower approach to en-route control, from oceanic airspaces to high density traffic areas, and both civil and military. TopSky - ATC covers more than 100 Flight Information Regions (FIRs) and 40% of the world's airspace. Thales is playing a significant role in Single European Sky ATM Research (SESAR) flight object validation exercises, including the development of Flight information Exchange model (FIXM) standards. By supporting the exchange of trajectory information between ATC Centres, FIXM standards will move us closer to global interoperability and subsequent capacity increases. Finally it was highlighted that TopSky – ATC meets all the requirements for ASBU Block 0 and the currently defined operational requirements for Block 1 is fully compliant with all international and European standards and already integrating the output of both SESAR and NextGen projects (for example SESAR i4D), including the latest evolutions:

- Operational Communications, Navigation and Surveillance (CNS)/ATM such as Multi-sensor data fusion of radar, ADS-B and Wide Area Multilateration (WAM), and the processing and fusion of all relevant downlinked data
- Realistic calculation of aircraft 4D trajectories based on controller inputs and external data (as weather, surveillance data, CPDLC messages, coordination data, flow management messages, Flexible Use of Airspace(FUA) messages)
- Optimized safety nets and monitoring aids the controller can rely on data link in use worldwide for communication (DCL, CPDLC) and surveillance (ADS-C) on both, Future Air Navigation System (FANS) and Aeronautical Telecommunication Networks (ATN)
- Improved interoperability in supporting automated inter-FIR/inter-sector or civil/military coordination/transfer through data exchange in accordance with standards (AIDC, On-line Data Interchange (OLDI))
- Various visual tools as a support for decision making (What if, MTCD, AMAN/DMAN, Vertical Aid Window, Stack Manager…)

2.5 Under P/06, INDRA commented that for the last few years, it has been adding relevant features from its bespoke systems in Europe to AIRCON's product baseline, most of which are a direct result of the company's involvement in the SESAR JU. With the addition of the Flight Data Server (FDS) to AIRCON's architecture, INDRA is paving the way for the future handling of the Flight Object (FO) through a Flight Object Server (FOS). INDRA had a first successful validation of FO exchange to/from Karlruhe Upper area control centre (UAC) and Maastricht UAC in November 2011, and has been validating new FO-related features since. FOs will realize the IOP-G concept which, together with the i4D concept, will allow for greater flow management and planning capabilities by ATS units – all of this being enabled by the use of extended versions of ADS-C and CPDLC. INDRA is thus a pioneer in these new developments, and envisions AIRCON to include them as baseline features by 2020.

2.6 Under P/07, ERA presentation highlighted that the ADS-B deployments are still well ahead of aircraft avionics, therefore one of the key issues is to bridge this gap. Besides, the validation of aircraft self-reported information needs to be accepted. Multilateration as a proven technology working with Mode A/C/S transponders and deployed by a number of ANSPs can provide a migration path and complement the ADS-B deployments. The combined MLAT/ADS-B system ensures high integrity and is a cost-effective solution as a full alternative or gap filler to the Secondary Surveillance Radar (SSR).

2.7 Under P/08, Frequentis presentation outlined the challenges faced by ANSPs with their migration to SWIM and how Frequentis, by being involved with SESAR and OGC in defining all major building blocks that constitute SWIM, can assist ANSPs to facilitate this migration.

2.8 Under P/09, IDS Tech Inc. informed on the Aeronautical Collaborative Ring (ACR), which is the company's SWIM-compatible solution for data collaboration between all aviation stakeholders. The focus of the discussion was on the 'de-coupling' of point-to-point communications and data exchange systems and replacing them with a scalable Enterprise Service Bus (ESB) to provide secure interoperability between all types of applications. Furthermore, the ACR translators provide the capability for legacy systems to also be interoperable with the SWIM environment to reduce the costs of implementing new enterprise systems and allow ANSPs to commence a migration to SWIM immediately.

2.9 Under P/10, SELEX described the range of SELEX ES AGDL supported applications highlighting their qualities in terms of scalability, flexibility and adherence to standards. More details were then provided on CPLDC and AIDC applications. High level architecture and practical examples of how orders are integrated with the Controller Working Position were provided for CPLDC. For AIDC, the general concept and the set of messages that are supported by SELEX implementation were described. Additional details were provided regarding management of error cases and system configurability.

2.10 Under P/11, SELEX provided a description of the SWIM concept and how SWIM is addressed in the SESAR work packages. More details were provided regarding the SWIM technical infrastructure, its constituents (the so-called SWIM Nodes) and how they are being designed in SESAR. The presentation then focused on the Swim-Box which is SELEX ES implementation of a SWIM node. Different details on Swim-Box architecture, capabilities and flexible deployment were provided. The presentation showed concrete examples of how Swim-Box has been and is being used in the context of SESAR, the different SELEX ES SWIM enable prototypes and existing systems. The presentation ended with screenshots of SELEX ES SWIM Viewer, a demonstrator of what is possible to achieve by using SELEX ES Swim-Box platform.

2.11 Under P/12, Rockwell Collins ARINC presented an overview on FANS (CPDLC/ADS-C) and its voice and data communication services, which enable satellite, VHF and HF transmissions between the aircraft, the Federal Aviation Administration (FAA) and airline operation centres for commercial airlines, airport communications and information systems and access control solutions. The FANS overview included information about the two main implementations of CPDLC – FANS and ATN and the differences between European and USA regulations.

2.12 Under P/13, ICAO provided an overview of the valid references for implementation in air navigation matters as agreed by the 12th Air Navigation Conference (ANConf/12), the A38 and highlighting the implementation of the ASBU methodology as adopted in the NAM/CAR RPBANIP and worked by the ANI/WG and other regional implementation groups. AIDC and CPDLC current implementation status, regional plans and milestones were also discussed.

2.13 Under P14, SITA highlighted that ATC use of data link has as main requirements to enhance safety and efficiency on ATM. Monitoring and communication are critical in those large areas not covered by radars and with low voice quality radio communications, where operating aircrafts are already equipped for the use of data link. SITA reminded the audience the ATC use of data link background on ICAO since the creation of the FANS Committee in 1985 until today. The reasons and benefits for ANSP and airlines to use FANS 1/A were addressed and the infrastructure that supports such service provision was explained. Similarly, SITA introduced its AIRCOM infrastructure comprehending VHF and satellite networks besides ground network and its components such as Aircraft Communication Addressing and Reporting System (ACARS) processors, ATN routers, FANS gateways and the associated human resources to support service provision to all users (aircraft and ANSP). SITA presented the scenario for CPDLC implementation in Europe where a data link mandate is in place, which can be considered as an advanced data link context as it uses ATN over VHF Digital Link (VDL) Mode 2 technology, as defined by ICAO. European ANSP and airlines users are on a race to match the mandated schedule. SITA provides support to them by offering its ATN service and associating with those ANSP who want to be in control of air ground data link infrastructure. Finally, SITA addressed the current status for ADS and CPDLC implementation in the Americas and how CAR/SAM ANSPs such as DGCA Chile, DGCTA Argentina, DINACIA Uruguay, COCESNA, DSNA France (Cayenne ACC) and DECEA Brazil are developing their implementation plans. In Brazil, the SIRIUS programme also envisages the implementation of continental CPDLC until 2018, based on VDL Mode 2 infrastructure being installed by SITA to provide VHF data link coverage above FL 245.

2.14 Under P15, NAV CANADA delivered a presentation which outlined the safety and service improvement benefits gained through their extensive use of data link technology. The experience obtained through multiple data link applications in the Gander Oceanic Control Area (OCA) of the North Atlantic (NAT) Region contributed to the successful implementation of CPDLC throughout the Canadian domestic FIRs. It was further emphasized that effective data link implementation involves coordination of ANSP efforts with communication service providers, operators, and adjacent authorities to work toward the seamless transfer of data link-equipped aircraft across FIR boundaries.

2.15 The Meeting was informed on the implementation progress and the benefits obtained from automated systems, particularly with AIDC and OLDI implementation, introducing the discussion of Filed Flight Plan (FPL):

- Under P16, Mexico presented the features of their new ATS System – TopSky from Thales, with a processing version denoted MEDISIS. A full architecture description was provided, as well as the system implementation status, which is currently implemented in the Merida ACC and will be soon implemented in the other ACCs. A description on the progress of ADS-B receivers was shown, as well as the SIAAT System for control tower operations which is operational in 41 Control Towers.
- Under P17, the ANI/WG AIDC Task Force rapporteur briefed the Meeting on the details in the creation of this Task Force, its responsibilities, current members, the work programme under execution, the status of their deliverables and the last results from the NACC/WG/04 meeting.
- Under P18, Cuba presented results of their Flight Plan monitoring 14 months post-implementation of the ICAO FPL2012, including lessons learned, and highlighting:

  - high percentages of messages rejections observed mainly from FPLs filed from the SAM and CAR Regions
  - rejected messages not necessarily due to ICAO FPL2012.
  - errors due to lack of compliance with ICAO Doc 4444 and Annex 11

  To this extent, the Meeting recommended that a regional analysis should be conducted to identify the core sources or flight filers causing the problems.
- Under P19, COCESNA presented the activities for their 3-phased AIDC/OLDI implementation in Central America, describing the operational benefits to be achieved, the technical feasibility in the Central American ATS System and the Regional telecommunication network. 2 OLDI (La Mesa and El Coco) and 2 AIDC (La Habana and Merida) are scheduled to be implemented in 2014 with CENAMER as phase 1. Phases 2 and 3 were described for future AIDC/OLDI implementation with the rest of Central American ATS units and Colombia, Ecuador and Panama.
- Under P20, Mexico presented their current AIDC implementation status where their EUROCAT-X systems are available in the Mexico, Monterrey and Mazatlan ACCs; however, the implementation is not fully operational due to the low number of operation requesting this service. However, due to the system upgrade to Topsky, tests are being carried out and news are being scheduled particularly for Mazatlan ACC and Oakland ACC.

2.16 On the fourth day, the FPL discussion continued with P04 by CANSO that presented an ICAO Flight Plan 2012 post-implementation survey, including responses from 62 ANSPs. The main findings were:

- Improved understanding among air operators for Field 10 and Field 18 associations
- Improved understanding among operators for use of CHG, DLA, CNL messages
- Involve ANSPs early in the planning process to identify and develop and design detailed global system specification requirements
- Design and identify system specifications with provisions for scalability; e.g. emerging and future Performance-Based Navigation (PBN) services, A380 change from /H to /J, ICAO alternative to /HAZMAT and other Field 18 data sets, etc.
- Validate procedures for air navigation services (PANS) ATM amendment changes with business case impact statements prior to promulgation of State Letter
- Need for stability in ICAO provisions and inability to perform Ad hoc system changes outside ANS upgrade cycle (typically 10 years)
- Develop ICAO provisions through regular multi-disciplinary expert groups, i.e. panels with a full consultative process and prior to issuance of State Letter
- That ICAO resolves the A380 wake turbulence category classification as a priority and publish the same as a PANS ATM amendment. This affects FPL filings and application of separation standards
- Variations continue to exist. Need of a consolidated global list of State variances for reference and in order to control and pre-empt FPL rejection
- Migrate from the use of ‘converter solutions’ were implemented as an interim solution and to fully meet Amendment 1 changes
- Minimize the requirement for region specific fields (e.g. /RVR)
- Global standardization of Field 18 codes and sequence – primarily, the use of PBN concatenations
- Compatibility and adaptability for future changes in PBN capability (advanced Required Navigation Performance (RNP)) as a globally accepted update
- Avoid the use of non-ICAO fields (e.g. TCAS, HAZMAT)
- Ensure that fields such as /DOF do not get rejected in regions where it is not used
- Globally recognized provisions for the A380 wake category: alignment with other ICAO Publications - PANS ATM Doc 4444 and Doc 8643 – *Aircraft Type Designators*
- Increase character Field length in Item 15 for long-haul route acceptance
- Increase character Field length in Item 7 for flight number
- Need of a higher awareness of ICAO activities and transition into ASBU Module B-FICE

2.17 Under P/21, Cuba presented the AIDC implementation advances and concluded that the implementation of the AIDC has shown the benefits provided from the point of view of safety and efficiency. With the capacity expansion of the automation interface with ACC Havana and Miami ARTCC, there has been a reduction in the workload of the controllers in the Havana ACC sectors. Cuba is currently undergoing development and transition to a new automated ATM system, called RACOM-M, which, among other features, will include classes I, II and III of the NAM ICD.

2.18 Under P/22, ICAO briefed on the status of availability and capacity of the regional telecommunication networks (MEVA, E/CAR AFS and CAMSAT) as well as national network, highlighting their current modernization phase as IP networks and the readiness of this infrastructure to comply with the ATN applications and future needs.

2.19 Under P/24, ICAO emphasized the use of automation in Annex 15 with Amendment 37. New paragraphs are added to address consistency in the delivery formats and provide performance requirements in order to enable digital data exchange and the use of aeronautical information and data exchange models to be globally interoperable. Recommendations are provided concerning the performance requirements for the aeronautical information model used and the aeronautical data/information exchange model (e. g. Aeronautical Information Exchange Model (AIXM)) that should be used.

2.20 Under P/25, ICAO emphasized the high level of radar data sharing activities in the CAR Region, including the implementation references, the different bilateral agreements carried out and the multilateral arrangements in the E/CAR area. Emphasis was made on data quality and integrity, the regional registration of interrogator codes for Mode S radars, the compliance with ASTERIX code for data exchange, resuming the action plans for radar data sharing with Venezuela and the current activities in the CAR Region for improving situational awareness.

2.21 Under P/26, COCESNA presented the current status of the exchange activities of radar data that it performs, with adjacent ATS of the Mexico and Habana FIRs units, in terms of radar data sharing between Mexico-COCESNA and Cuba-COCESNA. It was also mentioned that this radar data exchange is intended to improve the provision of ATS services in the border zones between the Mexico, Habana and Central American FIRs, to increase the availability, reliability and service of surveillance coverage.

2.22 Under P/27 COCESNA informed about main recommendations on the C Automation Programme and improvements to the situational awareness as follows:

- To review progress of deliverables of project C, together with the AIDC, Air Traffic Flow Management (ATFM) and ADS-B working groups, to obtain an adequate measure of the progress that exists today on implementation guidelines
- Conduct surveys of automated alarms with the States on the situational awareness ATM improvements, so that they are consistent with the objectives set out in the project
- Carry out a survey on reducing the number of operational errors by taking as reference (before and after) the entry in operation of the implementation guides for the CAR/NAM Regions

2.23 Similarly, under P/28, COCESNA highlighted considerations on the automated alarms as follows:

- The implementation of electronic alarms in automated systems of COCESNA greatly contributes to the improvement of situational awareness of the air traffic users
- The main recommendation was to encourage the sharing of knowledge of the capabilities and features of the electronic alarm in the automated systems, so that with this knowledge, it can be guaranteed that the features resulting from interest between States or ANSP constitute a basis or support for new requirements or enhancements to the automated systems.

3. Conclusions/ Recommendations

3.1 From the discussions and presentations, the participants agreed on the following conclusions and recommendations:

AUTOMATION/ GENERAL

a) For the implementation of air navigation matters, all the NAM/CAR States should follow the Global Air Navigation Plan (GANP), its Technology Roadmaps and the ICAO ASBU methodology.

b) Global efforts by the industry are being carried out for system interoperation like the iTEC (FDP) Consortium as well as the new initiatives and common work for the ASBU implementation, for example i4D trajectory, where data link and automation played a key role.

c) Emphasis on the coordination with adjacent regions to expedite the implementation (follow up on agreed action plans) should be carried out by ICAO and the States.

d) High level of automation and availability of system interoperability (Data link System, AIDC compatible FDP, multi-sensor-surveillance data sharing, etc.) was identified in the NAM/CAR Regions.

e) RPBANIP version 3.1 shall be used as the regional NAM/CAR implementation reference and supported by regional implementation groups.

AIDC

f) Need to include ICD comparison with ASIA/PAC and ICD development by the Inter-Regional AIDC Task Force for the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and the North Atlantic Systems Planning Group (NAT SPG) to look for more consolidation for a common ICD.

g) Several automation Systems (INDRA, THALES and SELEX) are using the AIDC functionality based on the Asia/Pac version 3.0 (2007).

h) States and Territories need to update their planning and implementation status in the AIDC Implementation Regional Plan

i) The coordinated FPL analysis as a regional effort with ANSP/IATA/CANSO continued

CPDLC

j) Need for an operational use of the GOLD Document to define CPDLC phased implementation, message and service selection.

RADAR AND SURVEILLANCE IMPROVEMENT

k) All NAM/CAR States/Territories should use the ASTERIX for exchange of data.

l) Emphasis should be made on data integrity and reliability for radar data exchange.

m) The new technique of space-based ADS-B for surveillance improvements in remote areas should be considered.

n) Full support to ADS-B implementation activities and the readiness of the automated systems for its processing.

SYSTEM ALARMS/WARNINGS

o) The new version of the automation system looks for more human acceptance, avoids nuisance of alarms and enhances its use.

p) All ANSPs need to review the implementation status and effective use of their existing automated system alarms and warnings to ensure their accurate operation

AIM/SWIM

q) SWIM is becoming a reality for Information Management, Data/Information models, Registry and new concepts for a Service-Orientated Architecture (SOA) approach.

r) In terms of SWIM implementation, AIXM is a safe investment for a truly global interoperable ATM, with operational implications of automation in AIM

s) One of the main reasons for automation is the reduction and/or elimination of human error. So far, it has been successful in the elimination of important type of errors. But in other safety-risk cases, what has taken place is a displacement of error. Experience indicates that while automation eliminates many errors, it may increase the potential for large impact errors.

t) In the AIM automation process, it is important to take into consideration human factors such as: poor interface human-machine, reversion of technical documentation, lack of training, attitudes towards automation, motivation and job satisfaction, decision errors, automation intimidation/distrust in systems, vulnerability to gross error, workload management and suitability of the training supervision (On the Job Training (OJT)).

OTHER MATTERS

u) Based on the system automation progress shown in the workshop, other applications were identified: such as flow management, 4D trajectory concept, etc.

v) The Meeting was informed by IDS Tech of their negotiations with Curaçao and Trinidad and Tobago to create the first stage of a regionally interoperable data sharing and disaster recovery solution as a foundation for establishing the regional SWIM concept, which will lead into the future SWIM and seamless airspace concept.

3.2 States/Territories/international Organizations should follow-up on the conclusions/recommendations resulted from this Automation System and Integrated Telecommunications for Air Navigation Services/System Wide Information Management (SWIM) Workshop (AUTO/SWIM), under the work programme of the ANI/WG. Conclusions/recommendations will also be reported to GREPECAS.

— END —

– APPENDIX –

AUTO/SWIM

International Civil Aviation Organization
Organización de Aviación Civil Internacional
North American, Central American and Caribbean Office (NACC)
Oficina para Norteamérica, Centroamérica y Caribe (NACC)
Automation System and Integrated Telecommunications for Air Navigation Services/System-Wide Information Management (SWIM) Workshop
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