INFORMATION MANAGEMENT PANEL (IMP)

FIRST MEETING

Montreal, Canada, 26 to 30 January 2015

Agenda Item 5: Review and elaborate on concepts, utilising a globally interoperable framework for the system-wide availability and management of information required to support flight and ANS system operations.

Presented by Abigail Smith

SUMMARY

This paper provides information on the implementation of System Wide Information Management (SWIM) in the Federal Aviation Administration (FAA) and provides updates on NextGen demonstrations and standards activities.

Action: The meeting is invited to

a) Review the contents of this working paper, discuss the material and provide any feedback;

b) Incorporate as appropriate into future work products

c) Participate in the Mini Global II demonstration

1. INTRODUCTION

1.1 The NextGen vision for System Wide Information Management (SWIM) is to make it possible to have access to real-time, relevant information so that users can respond more quickly and more accurately to information, thereby creating opportunities for collaboration with other Air Navigation Service Provider (ANSPs) and industry.
1.2 In support of the Federal Aviation Administration’s (FAA) NextGen goals to facilitate information management and data sharing in the U.S. National Airspace System (NAS), the SWIM program was established and challenged to reduce the high degree of interdependence among systems and move away from the proliferation of unique, point-to-point application interfaces. The program team has focused on this NextGen objective and deployed SWIM in the NAS, which provides a common infrastructure across multiple systems/services.

1.3 The global need for extensive information sharing among collaborating decision-makers has been described in International Civil Aviation Organization (ICAO) Concepts of Operations (Doc 9854), which was endorsed at ANC-11 and led to the generation of the Flight and Flow Information for a Collaborative Environment (FF-ICE - doc 9965) and endorsed in ANC-12. Flexibility in the distribution of roles and responsibilities in planning and air traffic control is essential to the achievement of dynamic collaborative decision-making. Many FAA systems, non-FAA government systems, or nongovernment systems have information needs which focus on a core set of data requirements and require data access, filtering, and routing processes to deliver the right data, at the right time, to the right authorized consumer. For example, the need by FAA consumers for flight plan, track, and airspace data vary depending on their operational orientation (Terminal, En route, or Traffic Management), whereas some Department of Defense (DoD) systems need only track data, and safety or research organizations need access to archived data for playback analysis purposes.

1.4 Along with the deployment of SWIM in the NAS, NextGen continues to investigate and support standards development, conduct demonstration with our global and industry partners, and apply lessons learned through these activities to continue to enhance SWIM. This paper provides a short summary on these activities.
2. **UPDATE ON NEXTGEN SWIM IMPLEMENTATION STATUS**

2.1 The SWIM infrastructure includes the instantiation of NAS Enterprise Messaging Service (NEMS) on the Enterprise Service Bus (ESB) to support Service Oriented Architecture (SOA) application integration, messaging and standard web services in the NAS, on top of the Internet Protocol (IP) infrastructure.

2.2 The benefits of the availability of NEMS integrated program data are beginning to be realized within the NAS and published securely to external commercial users. Although the FAA started with a federated architecture, the challenges of maintaining multiple applications across numerous locations quickly led to the adoption of an enterprise approach.
2.3 The enterprise approach to SWIM supports our ability to provide secure environments for interchange with users, Research and Development (R&D), and command and control functions. It is also recognized that providing NAS operational data and NEMS capabilities in the R&D and Mission Support environments has substantial corresponding mission value. Operational NAS data made available in the R&D domain, specifically at William J. Hughes Technical Center (WJHTC) R&D enclave, enables many different organizations to experiment and develop applications to utilize the readily available data. New capabilities are developed, tested, and assessed in the R&D domain. These capabilities are primarily targeted for FAA program use, although some are also advantageous for external users, such as Airline Operational Centers (AOC).

2.4 SWIM integrates information producers and consumers to data related to areas such as aeronautical, flight and weather to the NEMS infrastructure in the operational NAS and delivers the information to both internal and external consumers.
2.5 Below are descriptions of several programs that publish valuable NAS situational awareness information to many users. Each of these programs has been working with SWIM to share its data at an enterprise level to authorized NAS and non-NAS users.

2.6 Time Based Flow Management (TBFM) – TBFM, a multi-center capability similar to the Arrival Management (AMAN) capability, optimizes the flow of aircraft into busy airspace. It was installed in all 20 En Route centers in July 2013 to meter aircraft through all phases of flight in order to deliver the correct number of aircraft to airspace sectors and down to the runway at the exact pace at which the aircraft can be accommodated.

2.7 Traffic Flow Management System (TFMS) - TFMData Service describes current and planned traffic flow initiatives in the NAS. This service will provide a means for information consumers to subscribe to traffic management data consisting of both Flight and Flow Data associated with the Traffic Flow Management domain. The Flow Information service under TFMS supports intra-NAS sharing of flow information that describes current and planned traffic flow initiatives in the NAS. Flow Information Public Service (FIPS) will support NAS client subscription to flow information describing several types of traffic flow initiatives (e.g., Flow Constrained Area (FCA), Airspace Flow Program (AFP), Ground Delay Program (GDP), Ground Stops (GSs), Reroutes, and Advisories).

2.8 Weather Message Switching Center Replacement (WMSCR) - The Aviation Weather Center (AWC), a part of the National Weather Service (NWS), provides dedicated 7-day, 24-hour services for aviation, including the generation of advisories on significant weather impacting aviation (e.g., AIRman’s METeorological Information (AIRMETs), Significant METeorological Information (SIGMETs), and Convective SIGMETs). An important ingredient in AIRMETs and SIGMETs is the Pilot Report (PIREP). WMSCR provides new capability to accept and distribute these reports to the AWC. Today, it is estimated that approximately 90% of voice-received PIREPs “fall on the floor.” The WMSCR service provides the capability to greatly increase the coverage of the pilot reported weather product. WMSCR also provides an Altimeter Setting service for the distribution of Altimeter Settings. The PIREP and Altimeter Settings data products are currently being published to NEMS, which distributes these to end-users.

2.9 Aeronautical Information Management (AIM) - The Special Use Airspace (SUA) automated data exchange provided by the AIM program will substantially increase access to current SUA status. Enterprise information sharing will also enable the much more efficient digital distribution of SUA geometry, schedules, and status, including updates for changes in SUA status.

2.10 SWIM Terminal Data Distribution Service (STDDS) - One component of SWIM Terminal Data Distribution Service (STDDS) is the collection and dissemination of Airport Surface Detection Model – X (ASDE-X) information collected from airports via NEMS. The ASDE-X system is part of the FAA Runway Safety Program and provides seamless coverage of the airport movement area, in all weather conditions, promoting Air Traffic Control Specialist (ATCS) situational awareness. The ASDE-X technology supports ATCS situational awareness of airport activity promoting the safe and efficient movement of aircraft and vehicles on the airport surface. This information is also valuable to noncritical systems and users, both inside the NAS and external. The current TFM publication of ASDE-X target position data in XML format published to NEMS once, and NEMS distributes these to all authorized consumers. Other STDDS services are Runway Visual Range (RVR) and Tower Departure Events.
2.11 Operational and Supportability Implementation System (OASIS) - This program provides information which enhances the air traffic specialist’s ability to provide flight plan processing, weather briefing information, and search and rescue services in support of general aviation pilots in Alaska. OASIS also provides weather information via the operations workstations at Automated Flight Service Stations, which enables flight service specialists to more efficiently provide weather and flight information for general aviation pilots.

2.12 Weather and Radar Processor (WARP) - The WARP system is an en route weather system that provides Mosaic Next Generation Weather Radar (NEXRAD) information to air traffic controllers and provides meteorological products to the Center Weather Service Unit (CWSU) meteorologists and Traffic Management Units (TMU). WARP simultaneously and continuously receives, processes, stores, distributes, and displays aviation-related weather information and radar products. Making the WARP weather products available to NAS enterprise and non-NAS authorized users is another example of attaining the NextGen goal of facilitating data sharing to leverage new and existing systems in the NAS.

2.13 NOTAM Distribution Service (NDS) – NDS provides distribution of Notices to Airmen (NOTAMs) that use Open Geospatial Consortium Web Feature Service (OGC WFS) web-services and enables graphical NOTAM representation. NDS provides Aeronautical Information Exchange Model (AIXM) 5.1 compliant data and supports queries of selected types of data that enables 3rd party app development.

2.14 Summary of SWIM Consumers
### Figure 4: Summary of SWIM Consumers

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Data Type / Subscription</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airlines</strong></td>
<td></td>
</tr>
<tr>
<td>American Airlines</td>
<td>ASDE-X / LGA, BOS, MIA</td>
</tr>
<tr>
<td>Delta Airlines</td>
<td>ASDE-X / LGA</td>
</tr>
<tr>
<td>Fedex</td>
<td>ASDE-X / MEM</td>
</tr>
<tr>
<td>JetBlue</td>
<td>ASDE-X / all airports</td>
</tr>
<tr>
<td>United Airlines</td>
<td>ASDE-X / all airports</td>
</tr>
<tr>
<td>USAIR</td>
<td>ASDE-X / PHX, DCA</td>
</tr>
<tr>
<td><strong>Airports, FAA Facilities, &amp; FAA Programs</strong></td>
<td></td>
</tr>
<tr>
<td>Atlanta Airport Authority</td>
<td>ASDE-X / all airports</td>
</tr>
<tr>
<td>San Francisco (SFO) Airport Authority</td>
<td>SFO Airport Surface Surveillance Capability (ASSC) data</td>
</tr>
<tr>
<td>Southern California TRACON</td>
<td>ASDE-X / San Diego, Los Angeles, Long Beach airport data</td>
</tr>
<tr>
<td>CIWS</td>
<td>WMSS NEXRAD / all radar sites</td>
</tr>
<tr>
<td>CRCT</td>
<td>ASDE-X / LGA, EWR, JFK</td>
</tr>
<tr>
<td>OASIS</td>
<td>HWDS / all products</td>
</tr>
<tr>
<td>WARP</td>
<td>Enhanced WINS</td>
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<tr>
<td><strong>Research &amp; Development</strong></td>
<td></td>
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<tr>
<td>Kent State</td>
<td>CIWS / all products</td>
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<tr>
<td>MIT - Lincoln Labs</td>
<td>ASDE-X / all airports, WMSS NEXRAD</td>
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<td>MITRE</td>
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<td>Volpe</td>
<td>ASDE-X / all airports</td>
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<tr>
<td><strong>Industry</strong></td>
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<tr>
<td>Alliance</td>
<td>ASDE-X / MEM, ATL, JFK</td>
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<tr>
<td>ARINC</td>
<td>CIWS / all products</td>
</tr>
<tr>
<td>Lockheed Martin</td>
<td>ASDE-X / ATL, CLT, MSP, DTW, BOS, IAD, LAS</td>
</tr>
<tr>
<td>MOSAIC ATM</td>
<td>ASDE-X / LGA, JFK, BOS, ATL, PHL, EWR, ORD, IAD, CLT; ITWS / all products</td>
</tr>
<tr>
<td>Passur</td>
<td>ASDE-X / all airports / STDDS</td>
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<tr>
<td>Rockwell Collins</td>
<td>CIWS / all products</td>
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<tr>
<td>Sabre</td>
<td>ASDE-X / all airports; ITWS / all products</td>
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<tr>
<td>Veracity</td>
<td>ASDE-X / LGA</td>
</tr>
</tbody>
</table>

3. **GLOBAL STANDARDS AND DEMONSTRATION**

3.1 **Information Exchange Standards**

3.1.1 In keeping with the typical development of standards for aviation, such as the development of Aeronautical Telecommunications Network (ATN) Baseline 2 through Radio Technical Commission for Aeronautics (RTCA), the FAA is actively engaged with the OGC on protocols and standards for exchange of enterprise information. This is in support of the development and maturing of the Flight Information Exchange Model (FIXM), Weather Information Exchange Model (WXXM) standards, and the continued support of the Aeronautical Information Exchange Model (AIXM). This activity includes criteria for managing and versioning exchange standards, conformance monitoring techniques, and internally, developing a strategy to ensure NAS systems adherence to established standards and protocols.

3.1.2 As the FAA continues with its implementation of these standards, it recognizes that the initial versions of the standards are not always backward compatible. As a result, the FAA is also developing, within its enterprise solution, mediation services which will translate between versions and allow internal and external applications to migrate to later versions as the value proposition is met. When the standard is fully mature the need for mediation service will diminish. The advantage of having the service is that it allows forward movement on advanced applications, such as those foreseen in FF-ICE, to evolve.

3.1.3 In addition, the FAA is auditing both proposed elements of the core and extensions for adherence to best practices. The FAA will extend the audits to a cross-standard audit to highlight to the
individual communities the need for consistency across the geospatial aspects of the standard in order to support common applications and services such as geo-carving, indexing etc. Although this is currently an FAA activity, we will bring our findings to the individual OGC configuration management groups to try to encourage global harmonization across nations and information topics.

3.2 Demonstrations

3.2.1 NextGen continues to support the ICAO FF-ICE through demonstration activities with our industry and global partners.

3.2.2 The sharing of information using Aircraft Access to SWIM (AAtS) concepts will leverage the FAA’s SWIM services infrastructure. A fully implemented AAtS will provide a real-time and dynamic, full data exchange mechanism for communications among flight crews, dispatchers, ATM operators, and other NAS users. The full data exchange connection provides SWIM-enabled NAS information to support efficient operational decisions regarding traffic management up to, but not including, those decisions which might directly affect aircraft trajectories.

3.2.3 The down-link of relevant data from the aircraft to the FAA’s systems via the established commercial data link allows the entire NAS to benefit from new real-time information. Both automated and manually input data will be included to better inform TFM and weather models. The Full Data Exchange phase of AAtS focuses primarily on incorporating the downlink of information from the aircraft operators to FAA Stakeholders. The one-way AAtS data exchange capability explored throughout 2013, with ongoing demonstrations in early 2014, provided a solid foundation for the uplink of tailored, on-demand digital NAS information to flight crews.

3.2.4 The FAA is actively working with industry and regulatory personnel on AAtS. It has written regulatory guidance for flight operations in AC00-63A and design guidance in the AAtS Implementation Guidance Document (IGD). This US solution is regional in nature and focuses on connecting US NAS SWIM to aircraft.

3.2.5 The main goal of Mini Global Demonstrations is to demonstrate the use of SWIM and established standards in a seamless transfer of data between air navigation service providers to ultimately promote more efficient operations across multiple Flight Information Regions (FIRs).

3.2.6 In 2014, the FAA and our partners successfully completed the Mini Global Demonstration at the NextGen Florida Test Bed. During this full demonstration, the FAA brought together a large delegation of international partners, aviation industry representatives, academics, and international observers and showcased scripted and semi-live data exchange to support various Mini Global scenarios with the international and national airspace systems. The successful demonstration of Mini Global use cases/scenarios within this architecture validates the technology and readiness for implementation in regional and inter-regional SWIM implementations.

3.2.7 With the successful completion of the first Mini Global demonstration, the FAA plans to move forward with the next iteration of the program, Mini Global II. This demonstration will focus on a private/public global SWIM concept with infrastructure, particularly the global level governance, operations and data sharing between multiple diverse Enterprise Messaging Services (EMS). Global policies, protocols, security, and business sensitivity requirements will be identified to provide mediation between these diverse EMSs. This will be demonstrated in an effort to provide an infrastructure for future applications/services to benefit Global ATM. Mini Global II will continue to support the validation of FIXM/AIXM/WXXM standards by using additional datasets for complex use cases, and address the
backward compatibility of these global exchange standards. New scenarios will be developed around data exchange with a focus on regional traffic flow and utilize 4D trajectories.

3.3 Working through the ICAO ATMRPP, NextGen is contributing to the development of amendments to the Flight Planning provisions and the associated exchange standards in support of the FF-ICE Aviation System Block Upgrades (ASBU) Block 1 module. Given that the ASBU Block 1 target date is 2018, the community need to move aggressively beyond definition and towards implementation. These new flight-planning provisions will enable the submission and management of flight data using the FIXM exchange standard. It is imperative that the provisions allow a globally-phased implementation in which new provisions can co-exist with existing flight planning provisions for some time. The provisions will also incorporate the sharing of 4D Trajectory and related information enabling airspace users to receive feedback during a pre-departure flight planning stage allowing airspace users to better consider anticipated constraints in the development of their filed flight plan. Enhancements necessary to support proposed provisions are actively being investigated. Post-departure, the publication of flight data using SWIM and published exchange standards is actively being developed and deployed.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) Review the contents of this working paper, discuss the material and provide any feedback;

b) Incorporate as appropriate into future work products; and

c) Participate in the Mini Global II demonstration.

— END —
Appendix A
| **AIM SUA Data Exchange**<sup>®</sup>  
**Provides notification and status regarding airspace** | SLA data, dynamically provided in the Aeronautical Information Exchange Model (AIXM) standard | AIXM SUA definitions |
| --- | --- | --- |
| **ITWS Data Publication**<sup>®</sup>  
**Provides specialized weather products in the terminal area** | Airport Lightning Warning  
Configured Alerts  
Forecast Accuracy  
Forecast Contour  
Forecast Image  
Gust Front TRACON Map  
Microburst TRACON Map  
Precipitation 5mn  
Precipitation Long Range  
Precipitation TRACON | Storm Motion (SM) Storm Extrapolated Positions (SEP) 5mn  
SM SEP Long Range  
SM SEP TRACON  
Terminal Weather Text Normal  
Tornado Alert  
Tornado Detections Wind Profile  
Anomalous Propagation (AP) Indicated Precipitation  
AP Status  
Gust Front Estimated Time to Impact | Hazard Text Snm  
Hazard Text Long Range  
Hazard Text TRACON  
ITWS Status Information  
Microburst Automatic Terminal Information Service (ATIS)  
Runway Configuration  
Storm Motion SNM  
Storm Motion TRACON  
Terminal Weather Text Special  
Wind Shear ATIS |
| **CIWS Data Publication**<sup>®</sup>  
**Provides specialized 3D storm related weather information in the Enroute area** | Vertically Integrated Liquid (VIL) Mosaic (1km resolution)  
VIL 2-hr. Forecast  
Echo Tops Mosaic (1 km resolution)  
Echo Tops 2-hr. Forecast  
Satellite Mosaic | Storm Info: Echo Top Tags  
Storm Info: Leading Edges  
Storm Info: Motion Vectors  
VIL Forecast Contours (Std. Mode)  
VIL Forecast Contours (Winter Mode) | Echo Tops Forecast Contours  
Growth & Decay Contours  
Forecast Accuracy: Echo Tops  
Forecast Accuracy: Std. Precip  
Forecast Accuracy: Winter Precip |
| **WMSCR Publications**  
**Provides NWS textual aviation weather products** | Transmission of voice PIREP to WMSCR | Stored PIREPs | Altimeter settings |
| **STDDS**<sup>®</sup>  
**Collects and publishes data from 100+ airports** | ASDE-X streaming data service and Runway visibility data | Surface Movement Events (SME)  
RVR Data | Tower Departure Events (TDE) |

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**Figure 5: SWIM Services**  
*Indicates that a service is currently in progress*