



**U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

**ORDER
1375.8**

National Policy

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SUBJ: Guidance for Implementing Standardized Maintenance and Monitoring
Data Exchanges

This order establishes requirements for the use of the Maintenance Management Information Exchange Model (MMIXM) by Federal Aviation Administration (FAA) maintenance systems. The standardization of format, structure and context of shared maintenance data will enable developers to build modern, efficient productivity tools. These will provide system users with accurate, comprehensive and timely information, enhancing their ability to support the National Airspace System (NAS).

A handwritten signature in black ink that reads "Jeff Planty".

Jeffrey S. Planty
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Chapter 1. General Information

1. Purpose of this Order. This order establishes requirements for use of the Maintenance Management Information Exchange Model (MMIXM) by the stakeholders listed in Appendix B to enable standardized communication of Operations and Maintenance (O&M) related information between computer systems that support the National Airspace System (NAS). This order:

a. Identifies MMIXM as the standard for communicating O&M information between NAS systems and services within System Wide Information Management (SWIM).

b. Defines the requirements for legacy systems and new NAS investments to use the MMIXM standard for data exchange with each other.

c. Defines the responsibilities of NAS system and service users and managers in the implementation of these data exchange standards.

2. Audience. This order applies to any FAA office that procures, installs, implements and/or supports systems and/or services for the O&M of the NAS.

3. Where Can I Find This Order? You can find this order on the Directives Management website at https://employees.faa.gov/tools_resources/order_notices/. Or go to the MyFAA Employee website, select Tools & Resources and then select Orders & Notices. You may also find this order on the Technical Operations (Tech Ops) Directives Information System (DIS) website at <http://dis.faa.gov/>.

4. Scope of Directive. The information contained herein is applicable to all NAS systems and services that utilize SWIM for the exchange of O&M information with other systems and services.

Chapter 2. Understanding MMIXM

- 1. Introduction.** This chapter provides a general description of MMIXM.
- 2. What is MMIXM?** MMIXM is an FAA data standard to support the exchange of O&M information between NAS systems and services that utilize SWIM.

Data standards are documented agreements on representations, formats, and definitions of common data. The benefits of data standardization are:

- a.** Improved data quality
- b.** Increased data compatibility
- c.** Improved consistency and efficiency of data collection
- d.** Reduced data redundancy, and
- e.** Improved data access

The key components of a data standard are data element names, definitions, and formatting rules. Data standards often include information describing procedures, implementation guidelines, and usage requirements. Additionally, standards may enable electronic reporting, data transfer protocols, or other information that facilitates and promotes widespread use. [1]

The use of standardized information increases the ease of data access between stakeholders, enabling operational benefits such as increased efficiencies and improved situational awareness. MMIXM development is in accordance with the standards and best practices of existing data models in use at the FAA.

This document provides general information about the MMIXM data standard, including genesis, evolution and potential benefits of the product, and defines how it is to be used, implemented and managed. Current technical documents, including the actual standard, are posted to the MMIXM web site at <https://www.mmixm.aero/>.

3. What does MMIXM do? MMIXM harmonizes data exchange between numerous disparate O&M systems into a consistent, usable, familiar and well-documented format. MMIXM facilitates creating, sharing, and integrating O&M data by ensuring that there is a clear understanding of how the data are represented and formatted. MMIXM contributes significantly to the establishment of transformation rules necessary for SWIM data exchange operations for a new generation of O&M-related tools. MMIXM clarifies ambiguous meanings, documents business rules, and provides the foundation for reducing redundant data and improving data integrity, accuracy and consistency.

4. Why is MMIXM needed?

a. NAS O&M activities are supported by numerous databases, applications, services and systems. Each of these often manage similar information in different formats with different contexts. Understanding the data elements in each system typically requires significant study,

making the integration of even two systems problematic and labor intensive. The nature of one-off and stand-alone solutions leads to a number of other inefficiencies in NAS systems and services, including:

- (1) Duplication of business functions
- (2) Lack of authoritative data sources
- (3) Duplication of data entry across multiple systems
- (4) Increased cost to support multiple information exchange formats, software development initiatives and information migration efforts
- (5) Format and language incompatibilities between databases which prevent or severely limit data sharing
- (6) Lack of data integrity

b. Future developers will create productivity tools and SWIM services needed to eliminate these inefficiencies through standardization. MMIXM will provide these developers with the critical data standard that enables:

- (1) Elimination of the need to build custom interfaces between system pairs
- (2) The re-use of parsing and publishing code between existing and new applications
- (3) A single, rich and maintainable reference detailing the context and use of all data elements, which will help eliminate discrepancies in development that often require rework and schedule disruptions
- (4) Lowering the barriers to entry for new developers who lack domain knowledge
- (5) Simplifying the gathering and reporting of maintenance data system-wide

c. The Next Generation Air Transportation System, or NextGen, was born from Public Law 108-176, Vision 100 — Century of Aviation Reauthorization Act in December 2003. One of the goals from this Act is to “integrate data streams from multiple agencies and sources to enable situational awareness and seamless global operations for all appropriate users of the system, including users responsible for civil aviation.” [2] Widespread adoption of MMIXM will help achieve this goal within FAA O&M systems.

5. How is MMIXM used? MMIXM is to support O&M information exchanges, within the SWIM environment. This would include, but not be limited to, asset, training, certification, credentialing, logistics, administrative, financial, maintenance, configuration management, and Remote Maintenance Monitoring and Control (RMMC) information required by NAS systems and services. This group of information elements constitutes the Maintenance Domain. Implementing MMIXM within this domain would result in a single message structure for these information exchanges, and ultimately relief from today’s burden of supporting multiple individual message structures.

MMIXM simplifies and facilitates the documentation of information exchange requirements for future acquisition programs. As these programs mature, they will support the advancement of the

MMIXM data standard, and allow NAS systems and services to interface through a Service-Oriented Architecture (SOA) environment utilizing SWIM. This will provide the efficient and reliable enterprise infrastructure for sharing Maintenance Domain information between dispersed systems that is lacking today.

MMIXM supports the Risk-Based Decision Making (RBDM) initiative through the increased sharing of safety data among FAA organizations. Order 8000.72, FAA Integrated Oversight Philosophy, highlights the critical importance of data sharing: [3]

The RBDM Strategic Initiative leverages the use of consistent, data-informed approaches to enable the FAA to make smarter, system-level, risk-based decisions. (Page 1)

Oversight organizations must integrate oversight through communication, collaboration, and increased data sharing, as applicable; To the greatest extent practical, FAA organizations must use shared information technology support applications, databases, and toolsets... (Page 4)

Robust use of the MMIXM data standard by developers enhances their ability to obtain, manipulate and display data from other systems. MMIXM makes for users to access current and accurate data, increasing situational awareness and reducing the need for phone calls and laborious procedures to move data from one tool to another through their respective user interfaces.

Furthermore, the MMIXM data standard supports the concepts outlined within the Technical Operations Concept of Operations Document 2015, and supports linkages to the following Business and Technology Improvements/Increments (BTI): [4]

a. BTI 505102 Enhanced Enterprise Monitoring

- (1) 505102-02 Automated Flight Inspection Coordination and Scheduling
- (2) 505102-03 Improved Field Spare Logistics
- (3) 505102-04 Improved NAS Asset Logistics

b. BTI 508502 Enhanced Air Traffic Management (ATM) Data Distribution Infrastructure

c. BTI 509107 Enhanced Operations & Maintenance Monitoring, Coordination, and Reporting

6. How is MMIXM related to other information exchange standards? Other information exchange standards include the Flight Information Exchange Model (FIXM), the Aeronautical Information Exchange Model (AIXM), and the Weather Information Exchange Model (WXXM). These models provide an international standard for automated information exchange between systems such as those operated by Air Navigation Service Providers (ANSPs) and flight operators from around the globe. Enabling such automation is a fundamental building block of the SWIM Global Interoperability Framework as described by the International Civil Aviation

Organization (ICAO) SWIM concept document. [5] FIXM enables the flight and flow information exchanges identified by ICAO as part of the Flight & Flow Information for a Collaborative Environment (FF-ICE) concept. AIXM enables the management and distribution of Aeronautical Information Services (AIS) information. WXXM enables the collection, management and distribution of weather information.

The SWIM Governance Policies document [6] requires the use of FIXM, AIXM and WXXM for all SWIM-enabled programs. A similar requirement for the use of MMIXM will be added to the document. While MMIXM is not an international standard and is designed around FAA-specific needs, MMIXM is aligning itself with the others by adopting the cross-XM standards of FIXM and AIXM where appropriate.

The development of MMIXM included evaluation of numerous external standards to select the best practices appropriate to FAA O&M data. The Machinery Information Management Open Systems Alliance (MIMOSA) [7] is a not-for-profit trade association dedicated to developing and encouraging the adoption of open information standards for O&M in manufacturing, fleet, and facility environments. Some aspects of MIMOSA have been incorporated into the MMIXM model design, but MMIXM is tailored more specifically to FAA maintenance and monitoring operational needs.

The development of MMIXM included the collaboration of FAA stakeholders from multiple organizations throughout the various lines of business. Stakeholder involvement is listed in Appendix B.

Chapter 3. Use of MMIXM

1. New Investments.¹ NAS systems and services must conform to the MMIXM data standard in any exchange of data with other systems if they:

- a. Have not achieved Initial Investment Decision,
- b. Are required to provide RMMC capability, and
- c. Will use SWIM for the exchange of Maintenance Domain information.

The exchange of information must be accomplished using messages that are XML-valid against the most recent MMIXM standard as documented on the MMIXM web site (mmixm.aero).

Note: FAA Orders [8] require the evaluation of new NAS investments for RMMC requirements.

2. Legacy Systems. Legacy systems and services that use SWIM and that undergo modification to the structure of their O&M messaging service must be evaluated by the NAS Integration & Support Group (NISG), AJW-13, for a MMIXM conformance feasibility evaluation. The NISG will work with stakeholders on implementation, scheduling, and funding concerns associated with conforming to the MMIXM data standard.

3. Development and Implementation Guidance. The MMIXM web site (<https://www.mmixm.aero/>) [9] provides documents to familiarize stakeholders with the MMIXM data standard including the following topics:

- a. Introduction/primer
- b. High level roles and principles
- c. Implementation guidance with sample implementations
- d. Procedures and practices used in the logical model
- e. Mapping of legacy systems to the model
- f. Data description document

4. Producer Documents. In accordance with SWIM requirements, producers of MMIXM message services must provide consumers and other stakeholders with the appropriate supporting documents, e.g. Web Service Requirements Document (WSRD), Web Service Description

¹ New Investments includes major enhancements/modifications to legacy systems, as well as the implementation of new systems within the NAS.

Document (WSDD), Java Messaging Service Description Document (JMSDD), and must register those services in an FAA-affiliated registry.

5. Authoritative Source.

a. The MMIXM web site (www.mmixm.aero) [9] is the authoritative source of information about the MMIXM model.

b. The SWIM Governance Policies [6] are applicable to MMIXM policies in this order.

6. Roles and Responsibilities.

a. The NISG is the Office of Primary Responsibility for the implementation, maintenance, and enhancements of the MMIXM data standard.

b. The NISG is also responsible for maintaining MMIXM documentation and the web site containing the data standard and associated documentation.

c. The NISG is responsible for performing the evaluation of legacy systems and services messaging structure modifications to determine the need for compliance to MMIXM.²

d. Stakeholders (producers/consumers of information) must coordinate with the NISG in the development of MMIXM-based information exchange services. In addition, stakeholders are responsible for notifying the NISG of existing messaging structure modifications.¹

e. Stakeholders (producers/consumers of information) for the exchange of RMMC information must fund the development of message structure modifications for new investments and legacy systems and services.¹ For all other information exchange conformance funding, the stakeholder (producers/consumers of information) are to coordinate with NISG on funding requirements.

7. Evaluation Criteria. For legacy systems and services identified in Section 2 above, the NISG will use the following evaluation criteria as a guideline to determine if conformance to the MMIXM data standard is required:

a. Conformability of the system data to the MMIXM schema.

b. Estimation of the investment required.

c. Message content and applicability to the O&M domain.

8. Extensions and Non-conforming Data. Should a determination be made that the producer data cannot conform to the MMIXM standard, the producer is required to contact the NISG for guidance prior to submitting a waiver from this order. Maintenance specialists, developers, managers and other stakeholders are generally better served by absorbing and meshing the

² If they involve Maintenance Domain information exchanges within SWIM.

different contexts of information from individual systems than by carving out specialized extensions designed only for a single producer and consumer pair.

To accommodate information elements that the latest MMIXM model does not address, producers may use the name-value pair options in MMIXM. However, producers must engage the NISG to incorporate the relevant information elements into an upcoming release and migrate those name-value pairs into model elements when that release is deployed. The NISG may in some cases determine that information elements should persist as name-value pairs indefinitely.

9. Waivers. Organizations or program offices may submit a request for a waiver from this order. All waiver requests must be submitted to the NISG, for consideration. Approvals for the requested waivers must be granted from the following prior to being approved and presented to the Technical Operations, Operations Support Director for signature:

- a. NAS Integration & Support Group (NISG) Manager
- b. Technical Operations, Operations Support Director

The NISG will post copies of the approved waivers on their Knowledge Shared Network. Any prior waivers granted must be evaluated as necessary to ensure compliance with this policy.

Appendix A. References

- [1] J. Kohn, "Emission Inventories - Applying New Technologies," in 12th International Emission Inventory Conference, San Diego, 2003.
- [2] "Public Law 176, Vision 100 - Century of Aviation Reauthorization Act," United States Government, Retrieved from <https://www.gpo.gov/fdsys/pkg/PLAW-108publ176/html/PLAW-108publ176.htm>, 2003, p. Section 709.
- [3] "Order 8000.72, FAA Integrated Oversight Philosophy," FAA, June 28, 2017.
- [4] "Technical Operations Services Concept of Operations," FAA, 2015.
- [5] "Doc 10039, Manual on System Wide Information Management (SWIM) Concept," ICAO, 2015.
- [6] "SWIM Governance Policies, Version 3.0," FAA, Retrieved from <https://www.faa.gov/nextgen/programs/swim/governance/standards/media/SWIM-Governance-Policy-V3-09142016.pdf>, September 14, 2016.
- [7] "MIMOSA trade association web site," MIMOSA, Available at <http://www.mimosa.org/>, Online.
- [8] "Order 6000.53D, Remote Maintenance Monitoring and Control Interface Development and Implementation," FAA, June 30, 2016.
- [9] "MMIXM web site," FAA, Available at <https://www.mmixm.aero/>, Online.
- [10] "(Draft) Final Shortfall Analysis Report for Automated Maintenance Management System (AMMS), Version 2.1," FAA, April 26, 2018.
- [11] M. D. Team, "Maintenance Management Information Exchange Model (MMIXM) Primer Version 1.0.0," FAA, September 21, 2017.

Appendix B. Stakeholders

Routing Symbol	Name
ADE-110	AFN, Data Management
AJI-223	ATO, Training Technology
AJM-113	ATO, Air/Ground Comm.
AJM-311	ATO, PMO, SWIM
AJM-3122	ATO, Ent. Service Monitoring-PMO
AJR-D	ATO, Data Management
AJW-131	ATO, Maintenance Automation Program Office
AJW-136	ATO, Asset Mgmt. & Supply
AJW-175	ATO, Ops Support RMSET
AJW-177	ATO, Weather
AJW-1B	ATO, NAS QA Group
AJW-261	ATO, Configuration Mgmt.
AJW-2A	ATO, NextGen Facilities
AJF	ATO, Flight Program Services
AJW-13X	ATO, Enterprise Operations Integration Team
AJW-1X	ATO, NAS Technical Services Group
AJW-B62	ATO, TechNet
ALO-400	AFN, Personal Property
AML-044	AFN, Logistics
ANG-B1	AOA, Ent. Info. Management
ANG-C34	AOA, NextGen Weather
AOV-001	AVS, Safety Oversight

Appendix C. Administrative Information

1. **Distribution.** This order will be distributed electronically.

2. Acronyms and Abbreviations

ATM	Air Traffic Management
AIXM	Aeronautical Information Exchange Model
AMMS	Automated Maintenance Management System
ANSP	Air Navigation Service Provider
ATSS	Airway Transportation Systems Specialist
DIS	Directives Information System
FF-ICE	Flight & Flow Information for a Collaborative Environment
FIXM	Flight Information Exchange Model
ISM	In-Service Management
JMSDD	Java Messaging Service Description Document
MIMOSA	Machinery Information Management Open Systems Alliance
MMIXM	Maintenance Management Information Exchange Model
NASEO	NAS Security and Enterprise Operations
NextGen	Next Generation Air Transportation System
NISG	NAS Integration & Support Group
O&M	Operations & Maintenance
RBDM	Risk Based Decision Making
RMMC	Remote Maintenance Monitoring and Control
SOA	Service-Oriented Architecture
SWIM	System Wide Information Management
Tech Ops	Technical Operations
WSDD	Web Service Description Document
WSRD	Web Service Requirements Document
WXXM	Weather Information Exchange