

Enabling Information Sharing through Common Services

Flight Information Exchange Model (FIXM) An Overview

Presented To: AT Information Exchange Conference

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Air Transportation Information Exchange Conference - (featuring AIXM, WXXM and FIXM)

August 30, 2011 - September 1, 2011
NOAA Science Center & Auditorium
Silver Spring, Maryland

Introduction



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- The emerging Flight Information Exchange Model (FIXM) is becoming the enabling standard for global interoperability for flight-related data
- This presentation will show the origins of FIXM, its current status, future plans, and ways you can participate in its evolution



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Agenda

- Standardization of Flight Data
 - Flight Object Data Dictionary
 - Flight Data Modeling
- Engineering Needs
 - Unambiguous flight identification: GUF1
 - Flight Data custody
 - Implementation and NextGen
- Demonstrations
 - Past Experiences
 - Current and future needs
- How you can get involved

Flight Information Challenge



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Challenges

- Flight Data is named and defined differently in different domains
- Flight Data is exchanged mostly through tightly coupled, point-to-point interfaces

Our Approach

- Standardize Flight Data names and definitions; provide a globally unique interpretation
- Investigate solutions that enable the exchange of flight data in flexible, manageable, discoverable, and secure ways



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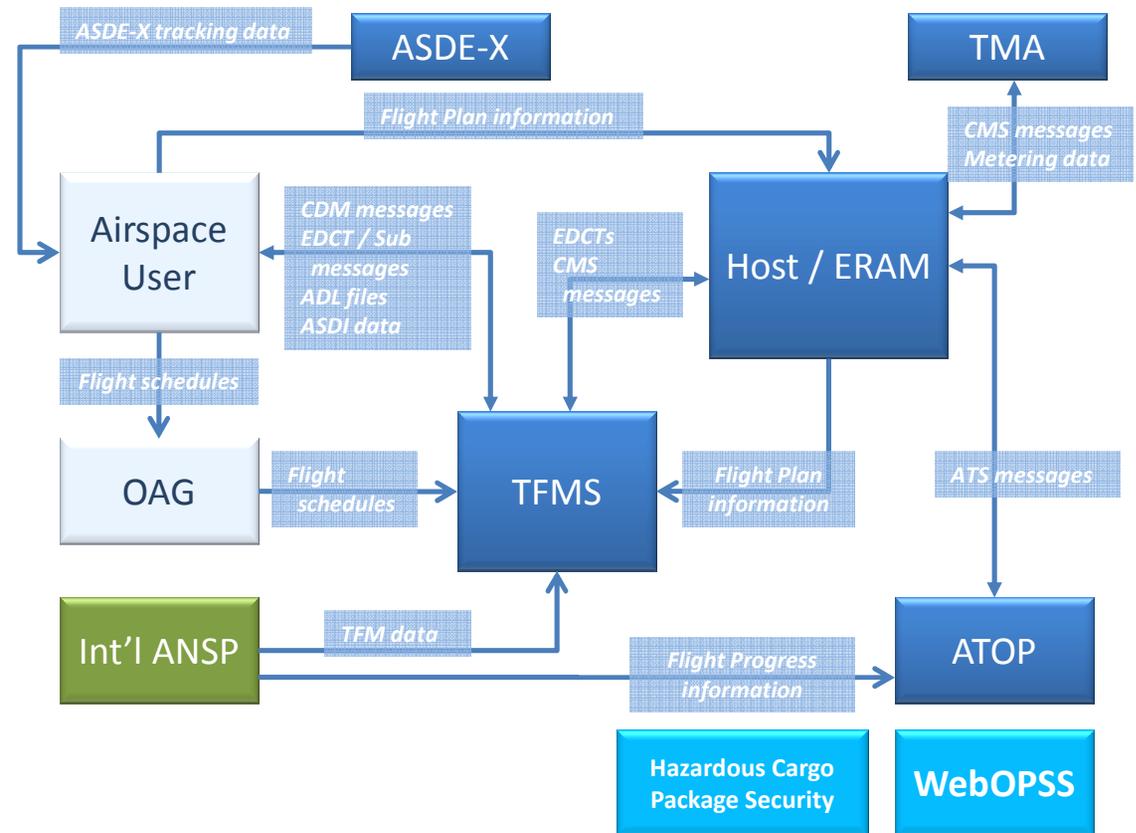
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Standardization starts with creating a Data Dictionary



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- FAA developed a Data Dictionary (DD) as a census of the most common flight-related data:
 - Existing NAS point-to-point interfaces (e.g., Common Message Set, ASDI).
 - Interfaces to other ANSPs (e.g., JCAB)
 - New data elements (e.g., security)

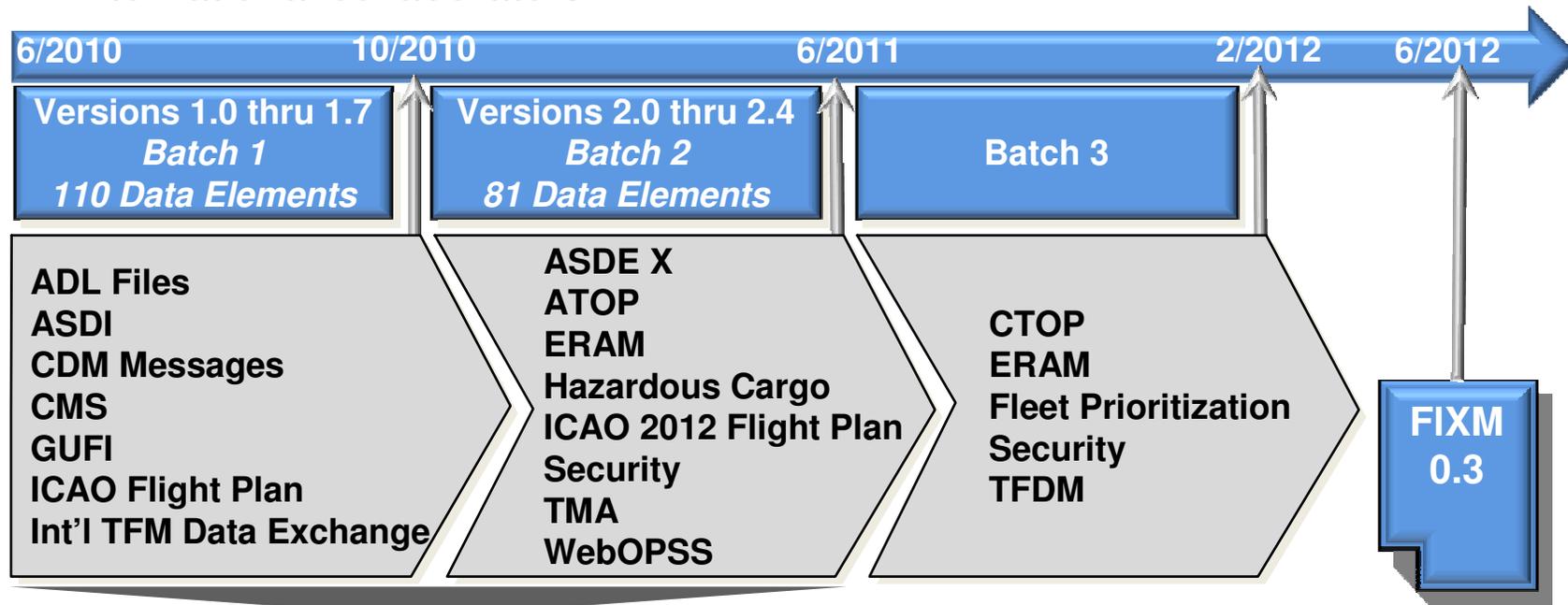


DD was developed iteratively



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- Identified and prioritized Data Elements
- Documented their definition, format, and meaning
- Validated the accuracy of the documented Data Elements through reviews by the FO Working Group, Subject Matter Experts from a variety of domains, international collaborators



Total ≈ 191 Data Elements

** 327 comments have been received throughout the development of the FODD*



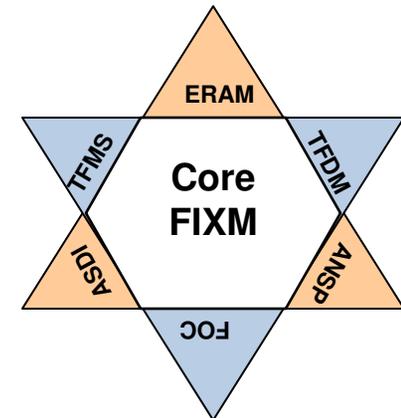
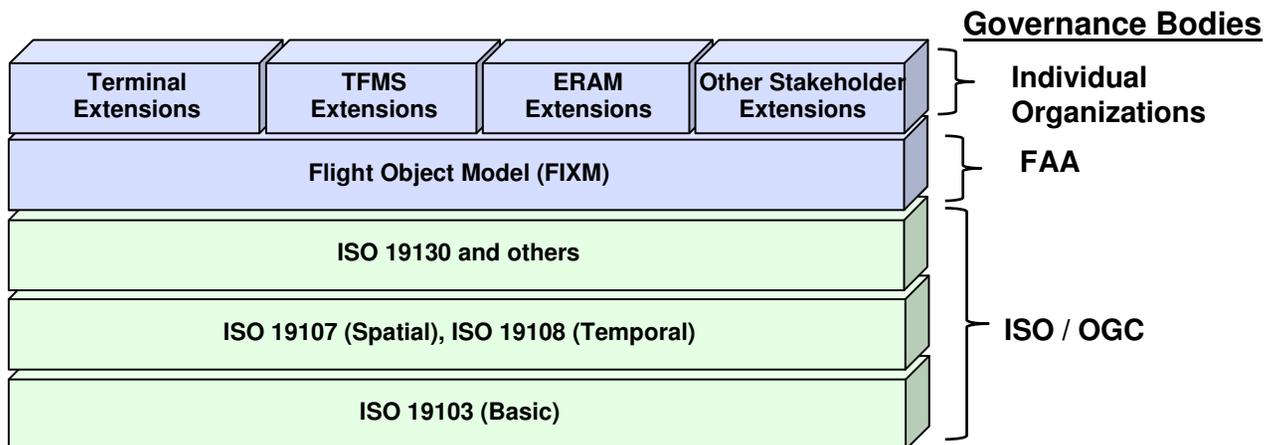
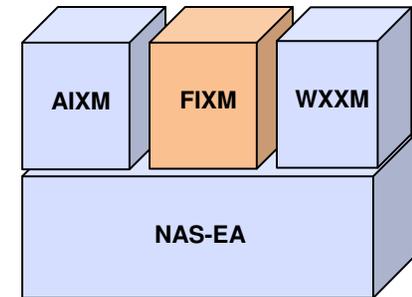
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Added structure with Ontology and Data Modeling



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- A Flight Object Ontology was developed, based on the DD. This ontology formalizes the definitions of Data Elements and the relationships between them
- Conceptual and logical Flight Data Models were created
- The models were harmonized with similar models developed by the NAS Enterprise Architecture team



Notional Core + Extension Model
Does not represent all stakeholders



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Current Status



- The Data Dictionary is in its 3rd major iteration
- The data modeling effort has produced the first iteration of FIXM which consists of a UML class model and associated XML schema



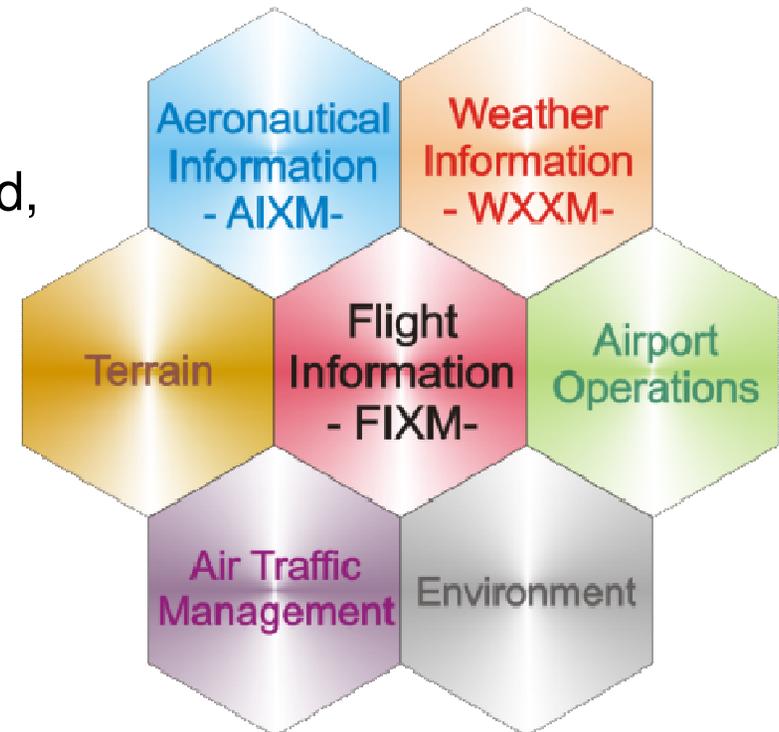
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Future Steps



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- Data Dictionary will be augmented to accurately reflect changes and refinements of the data model
- Data Model will be completed, reviewed, revised and augmented
- Ongoing stakeholder feedback will be adjudicated and the Data Dictionary and FIXM will be updated accordingly
- Further engineering analysis will be conducted, including assistance with implementation issues for demonstration or proof-of-concept projects



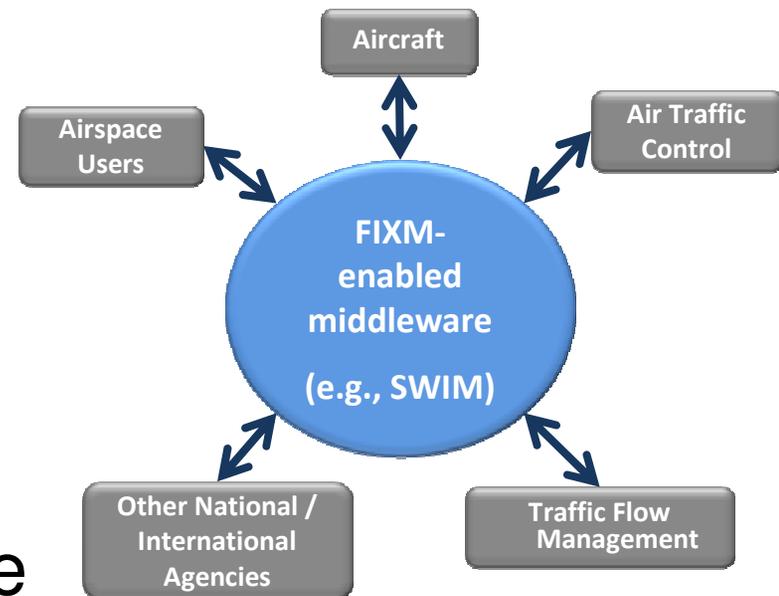
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Engineering Needs: introduction



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- FIXM is the necessary data standard that will ultimately be used by solution sets for the exchange of data
- Engineering analysis is required to understand the challenges and possible solutions for implementing FIXM-enabled systems



Engineering Needs: GUFi

- Current flights are fairly difficult to define in an unambiguous way across multiple aviation domains
- A Globally Unique Flight Identifier (GUFi) must be defined in a way to provide a globally unique (both temporal and spatial) mechanism for naming and identifying flights
- Data correlation problems are examined and alternative approaches are studied
- Potential requirements for a GUFi format have been identified, which support a wide range of future implementation decisions



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Requirements

- Unique world-wide
- Identifies flight leg or flight plan
- Unique for given time range
- Unbound number of GUFIs created in any given time period
- Constant for life-cycle of flight
- Any entity can create unique GUFIs
- Any number of entities to create GUFIs
- Readable by human or machine
- Conform to international standards



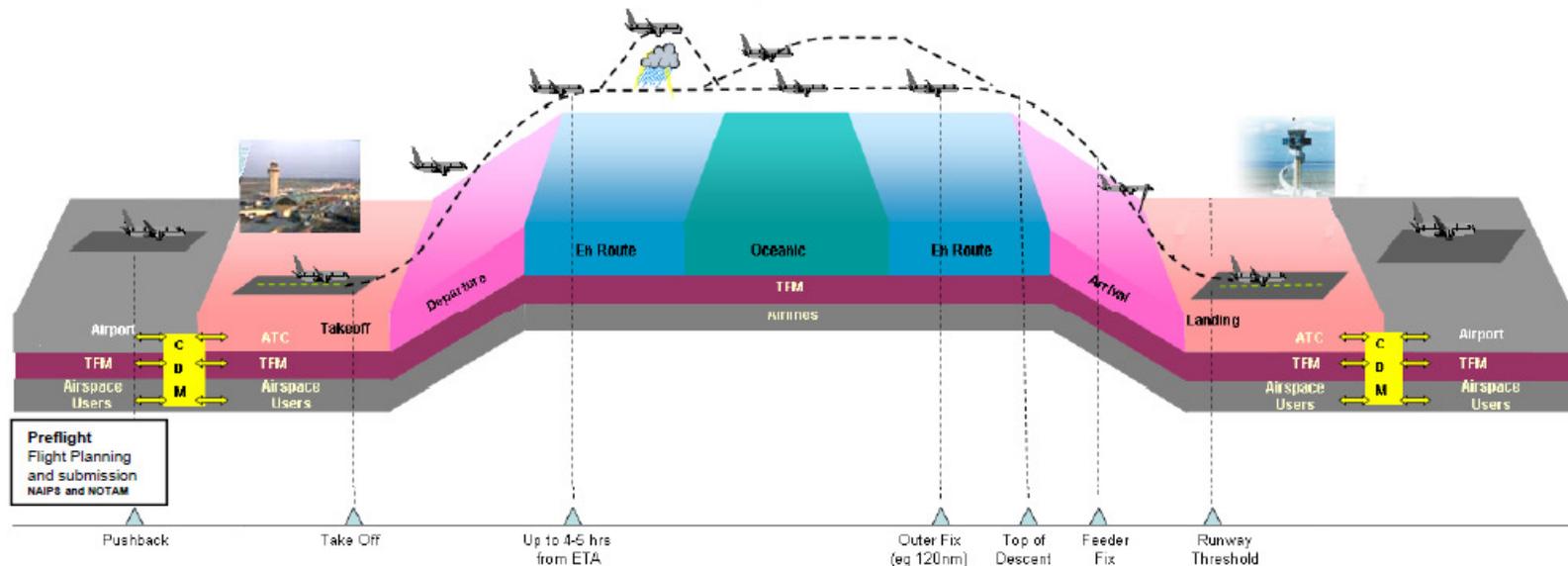
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Engineering Needs: Data Custody



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- Flight data ownership changes through time and space
- The relative value (importance) of data elements changes from domain to domain
- The flight data interchange mechanisms developed must take into account such transitions and changes





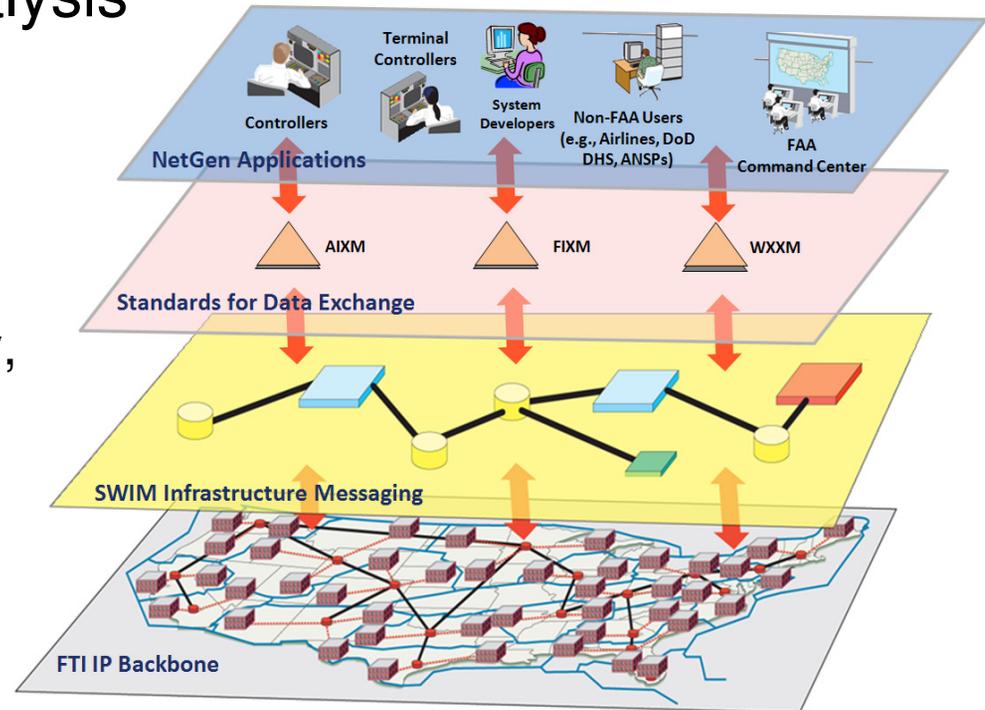
Engineering Needs: Implementation & NextGen

- Any flight data interoperability solution (i.e. Flight Object) must be compatible with and aligned to NextGen operational initiatives
- FIXM may need to be compatible with SWIM – approaches in defining FIXM that facilitate the implementation of flight data services are being investigated
- Some of the engineering issues and implementation alternatives are being analyzed
- Learning from early demonstration



Future Steps

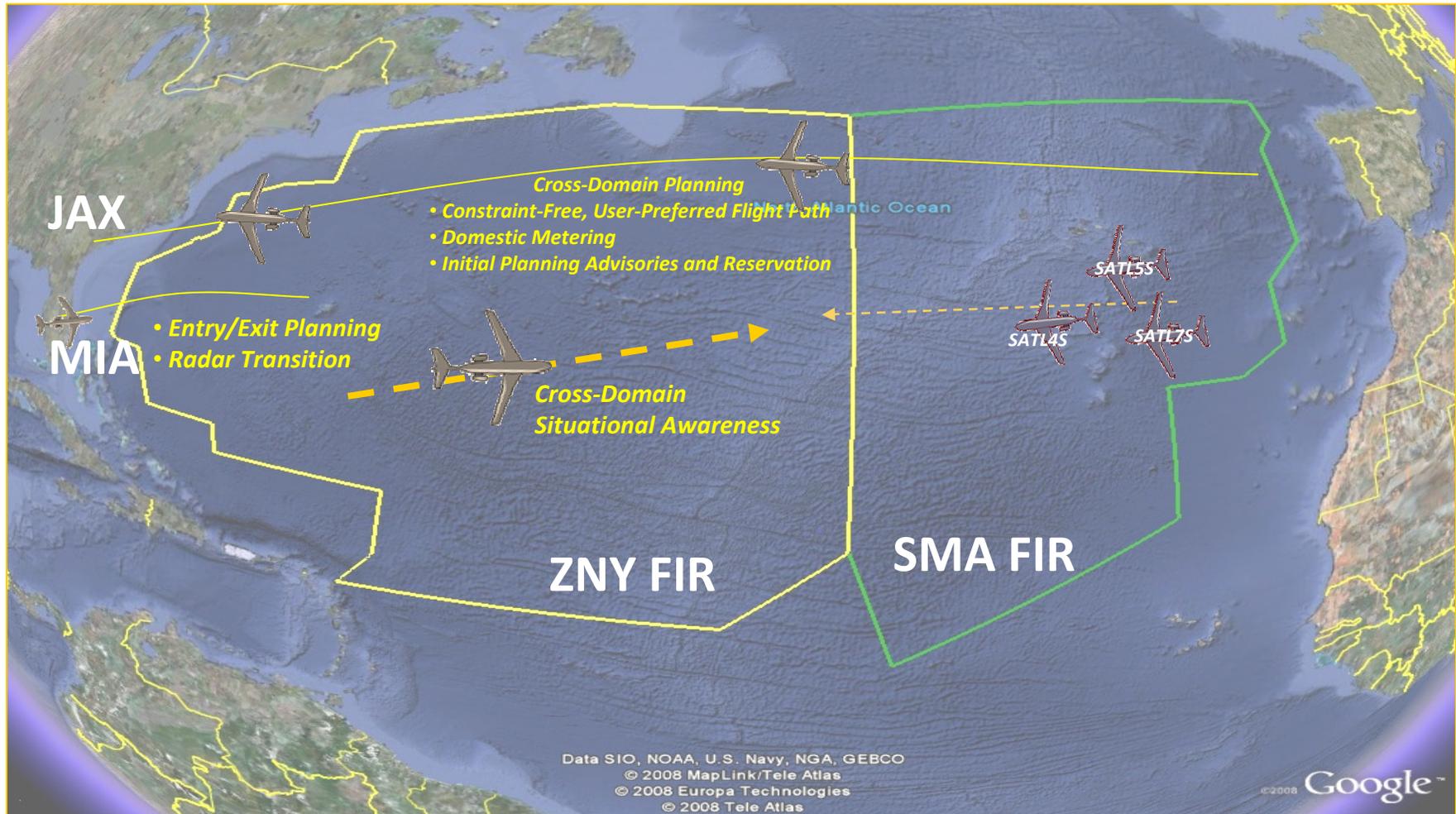
- Further engineering analysis will be conducted
 - Subject based analysis including Data Access Control, Data Exchange Modes, Data Redundancy, User Data Customization, Data Discovery, Data Compression, etc.
 - Engineering Alternatives
 - GUF1 - revision
- Implementation issues will be assisted by concept validation / proof-of-concept work
- Demonstration work



International Flight Data Object (IFDO) Demonstration (03/2009)



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International Flight Data Object (IFDO) Demonstration (03/2009)



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Objective

- Develop a Flight Data set to support information sharing between NAS domestic and international stakeholders

Benefits

- Facilitate better coordination, situational awareness and collaborative decision making

Description

- Atlantic-based demonstration in the Florida NextGen Test Bed (FNTB)
- FAA's ATOP, FAA's ERAM and NAV Portugal's SATL systems were adapted in the lab to exchange FDO



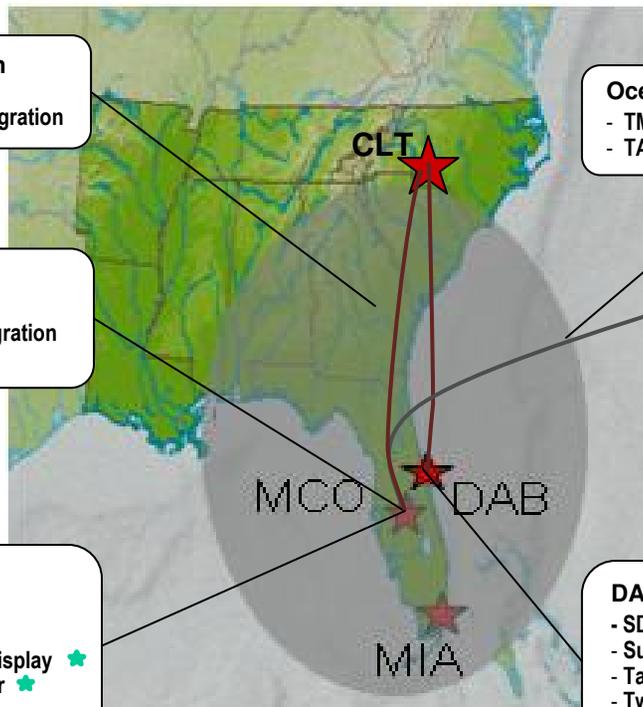
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Surface Exchange Flight Data Object (SEFDO) Demo (11/2009)



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Regional Departure Scenario: MCO/DAB to CLT
 Regional ARR Scenario: CLT to MCO
 International Scenario: LHR to MCO



- TFM/ER Wx integration**
- 4D weather cube
 - Weather Hazard/TBO integration

- MCO Arr/Dep Mgt**
- TMA SWIM Integration
 - TMA, TFM, ERAM integration
 - Terminal Conf Mon ★

- MCO Surface Mgt**
- SDSS/SWIM Enhance ★
 - Dep Mgt ★
 - TwrFit DataMgt, TDDS, Display ★
 - Taxi DL and Conf Monitor ★
 - Surface Data to TFM

- Oceanic/ER TMA**
- TMA service to ocean
 - TA/3D PAM

- Oceanic/ER CFPM**
- FDO Exchange ★
 - CFPM
 - AOC Integration ★
 - FMS Integration

- LHR**
- Surface CDM ★
 - ARR RTA
 - SWIM Integration ★

- DAB Flex Terminal**
- SDSS/SWIM Enhance ★
 - Surf WL Comm DL
 - Taxi DL and Conf Monitor ★
 - TwrFit DataMgt, TDDS, Display ★
 - Real Aircraft, EFB

Next Generation Surface Management Activities

★ IFDO
 ★ SEFDO



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Surface Exchange Flight Data Object (SEFDO) Demo (11/2009)



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Objective

- Analyze Flight Data elements to recommend new content related to surface operations that support collaborative ATM

Benefits

- Integrate awareness of surface operational status into NAS for effective collaborative ATM

Description

- Enable Flight Data exchange between airport surface stakeholders and collaborating ANSP entities and flight operators



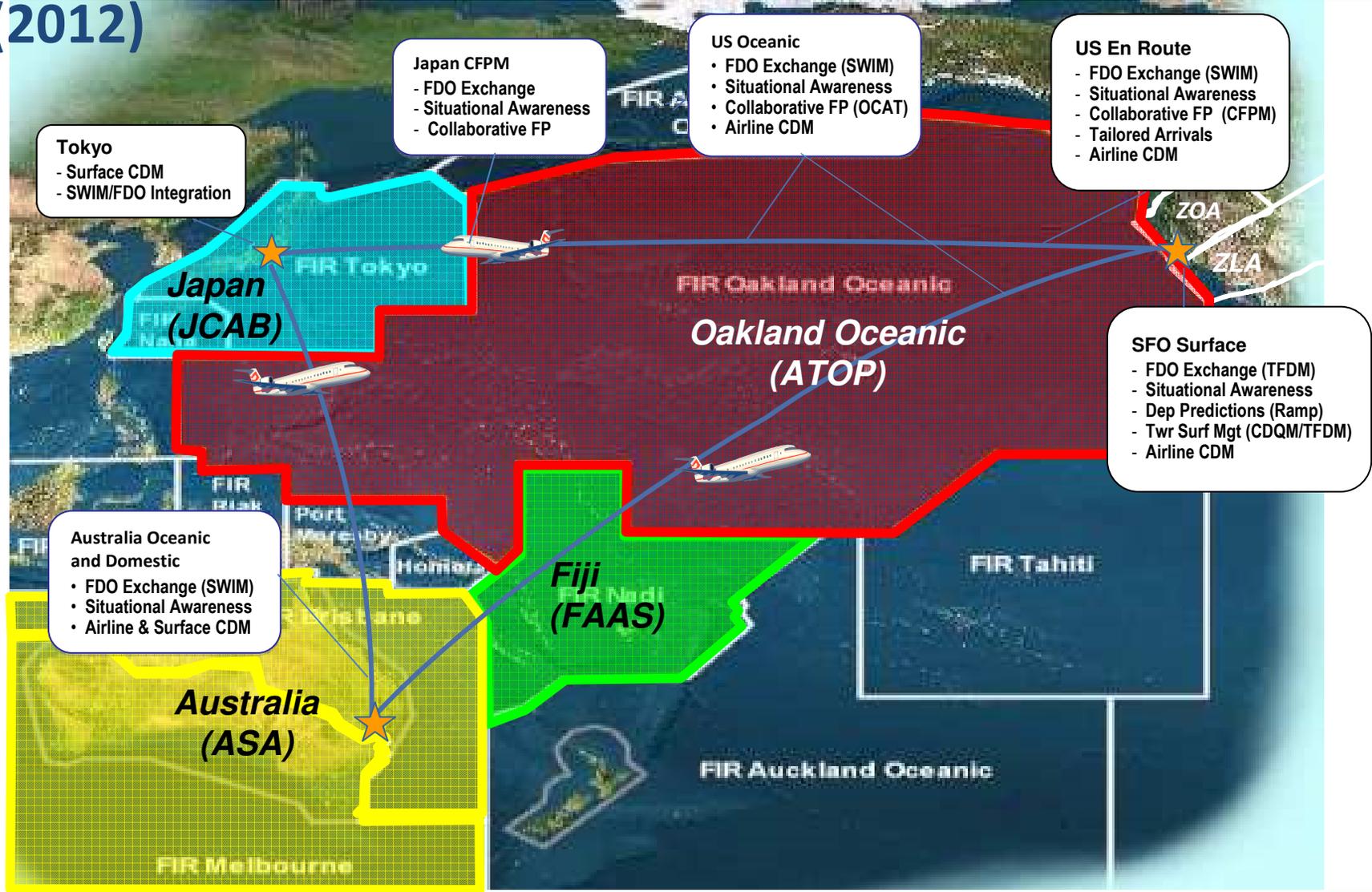
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Asia/Pacific Flight Data Object Demo

(2012)



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Asia/Pacific Flight Data Object Demo



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Objective

- Use FIXM in the demonstration
- Include multiple Pacific ANSPs and a representative airline system

Benefits

- Facilitate better coordination, situational awareness and collaborative decision making among all stakeholders

Description

- Concept lab demonstration held at contractor's lab in Rockville, MD
- FAA's ATOP, Fiji's FAAS systems were adapted to exchange FDO via SWIM-like core services
- FDO "parsers" were developed to emulate representative ASNS and airline systems
- Additional FDO elements included (e.g., Hazardous Cargo, Fleet Prioritization)
- FDO subscription / distribution capabilities were enhanced



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Asia/Pacific Flight Data Object Demo



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Concept Lab Demo consisted of 7 vignettes showing specific aspects:

- **Functionality**

1. Reconstitution
2. Dynamic Updating

- **Common Situational Awareness**

3. Hazardous Cargo
4. Fleet Prioritization

- **Applicability**

5. Conflict Detection / Resolution

- **Flexibility**

6. ICAO 2012 Transition
7. Arrival/Departure Gates



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Collaboration: Multiple stakeholders

- Flight Object Working Group (FOWG) collaboration partners to date are:

International

- Airservices Australia
- Airways New Zealand
- ATNS
- Eurocontrol
- JCAB
- NATS
- NAV CANADA
- SESAR

Domestic

- Various FAA Domains (i.e., Enroute/Oceanic, System Operations, Terminal, and NextGen)
- FAA contractors
- CDM FCT
- NASA
- Airline Dispatcher Federation
- Airlines (i.e., FedEx)
- Jeppesen



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Collaboration: It takes **you!**

- Data Dictionary must be validated against a large population of stakeholders
- The FIXM schema must be validated through practical, “real-life” implementations
- Engineering analysis must be conducted in multiple contexts and environments



What's next?

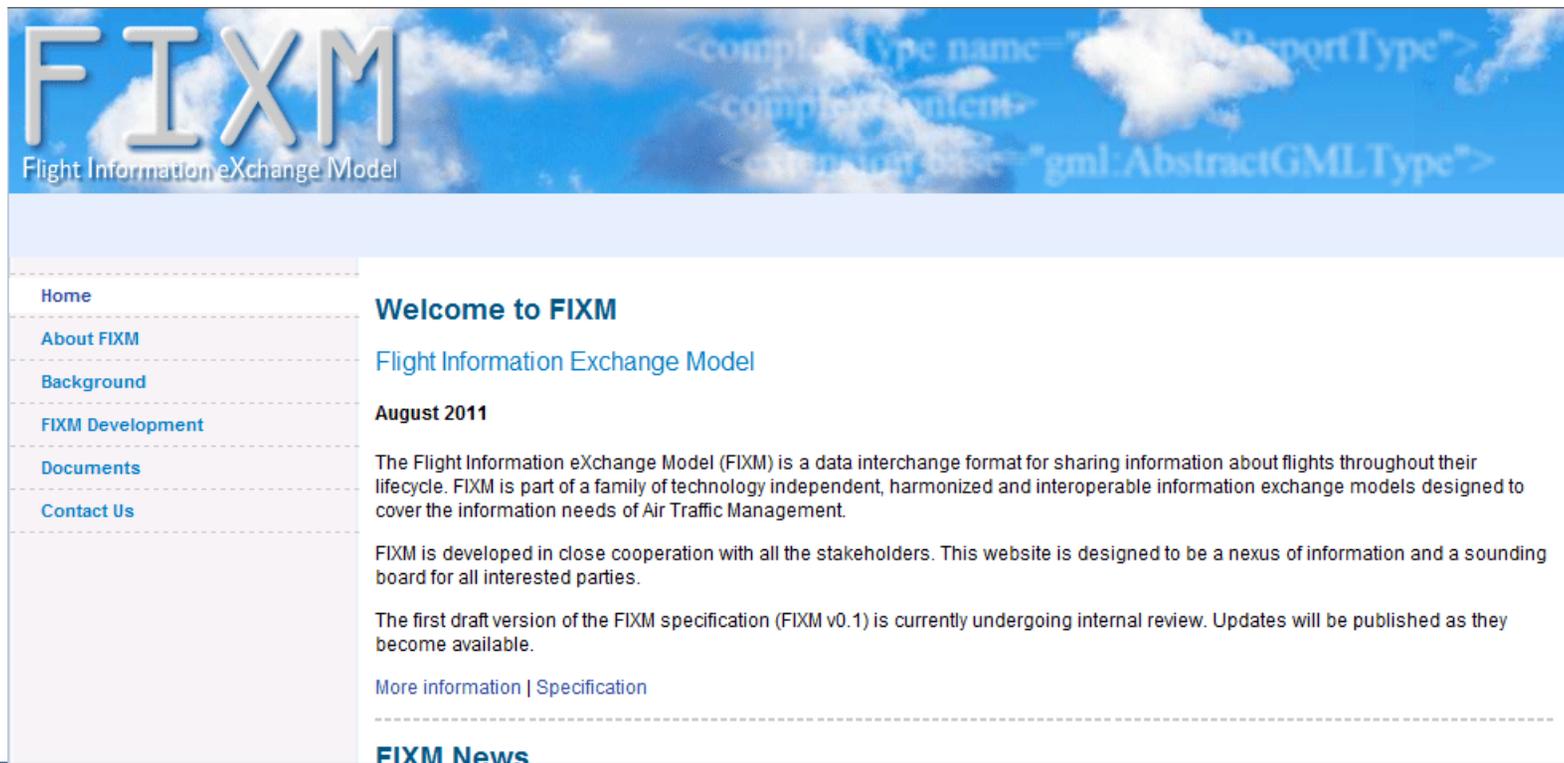
- FODD
 - Batch 3: End of 2011 (draft)/Beginning of 2012 (final)
 - FODD for FIXM 1.0 – Summer 2012
- FIXM
 - Ver. 0.2 (using FODD Batch 2): Winter 2011
 - Ver. 0.3 (using FODD Batch 3): Summer 2012
 - Ver. 0.5 (using FODD for FIXM 1.0): Winter 2012
- Engineering Analysis
 - Various Engineering Analysis (by subject) reports: throughout 2011 and 2012
 - Preliminary Engineering Alternative Analysis Report: Fall 2012
- Asia/Pacific Flight Object Demonstration: Summer 2012

WWW.FIXM.AERO



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- FIXM Web site was launched in mid August, 2011
- Contact us if you'd like to be an active participant in shaping the standard



The screenshot shows the homepage of the FIXM website. The header features the 'FIXM' logo in large, light blue letters, with the tagline 'Flight Information eXchange Model' underneath. The background of the header is a blue sky with white clouds and faint XML code snippets. Below the header is a navigation menu on the left with links: Home, About FIXM, Background, FIXM Development, Documents, and Contact Us. The main content area on the right is titled 'Welcome to FIXM' and 'Flight Information Exchange Model'. It includes a date 'August 2011' and a paragraph describing FIXM as a data interchange format for sharing flight information. Below this is another paragraph stating that FIXM is developed in close cooperation with stakeholders and that the first draft version (FIXM v0.1) is currently under internal review. A link for 'More information | Specification' is provided at the bottom of the main content area.



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Questions & Answers / Feedback



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