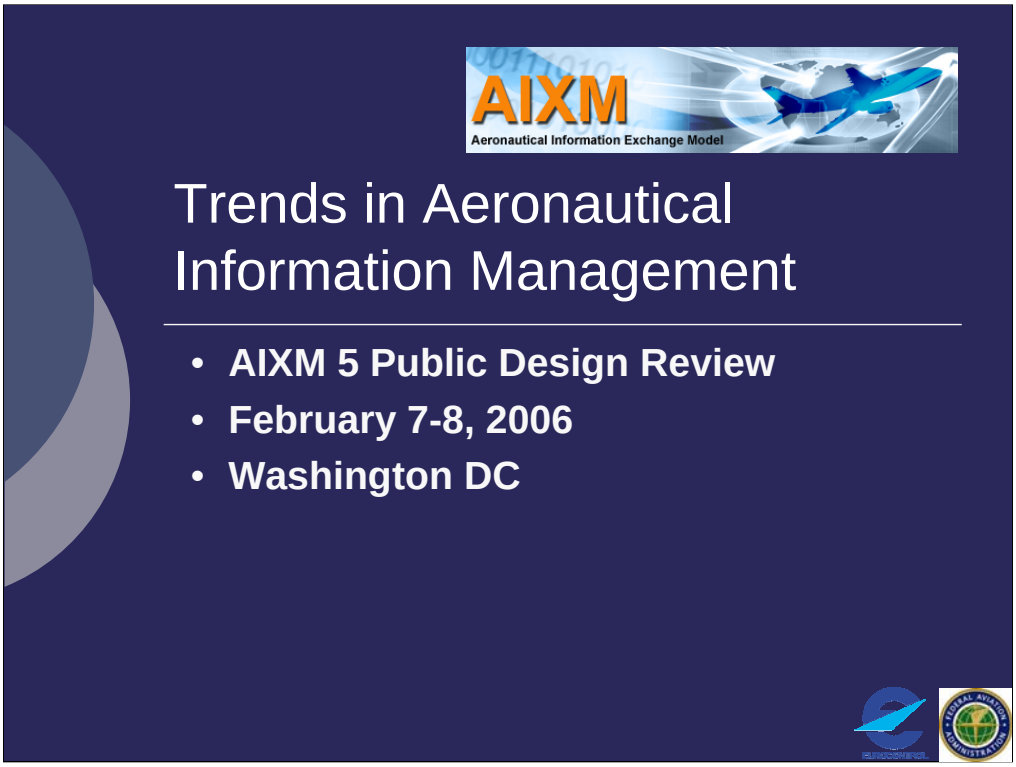


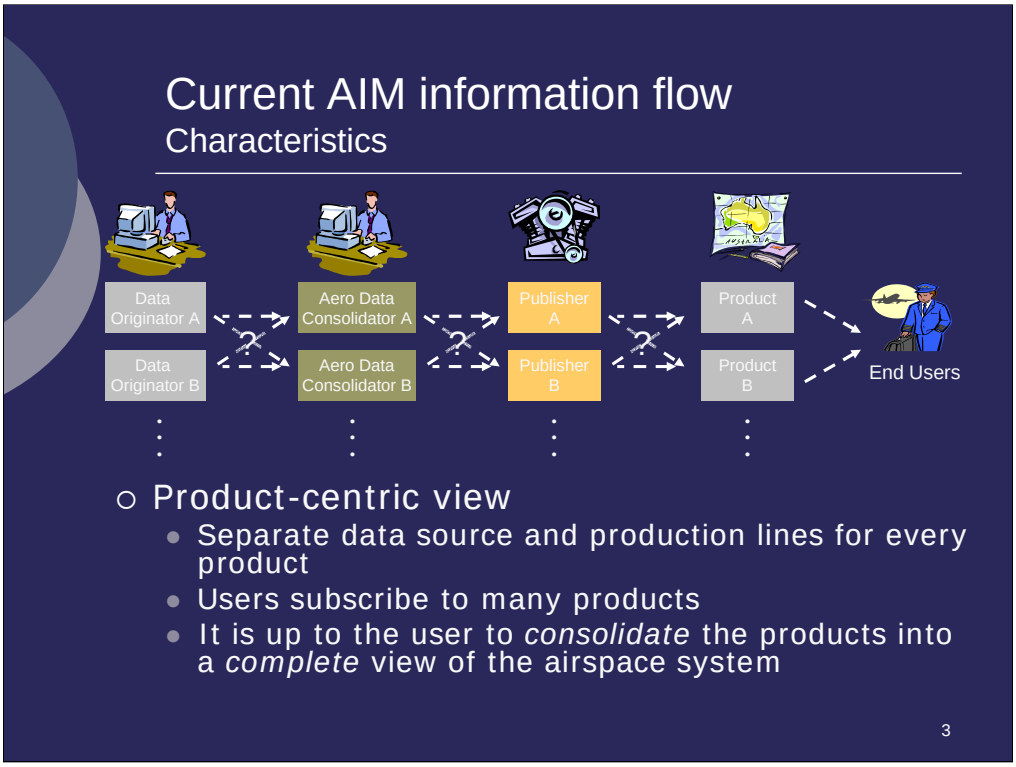
Our objective in this briefing is to tell you about an emerging standard for aeronautical data exchange and to explain how this exchange model enables use to move closer towards an integrated aeronautical information management system. Let's begin by discussing current and future trends in aeronautical information management.

Current aeronautical information flow
Characteristics

- Data issues
  - Data chain disconnects
  - Non-standard data quality requirements
  - Paper and form based.

2

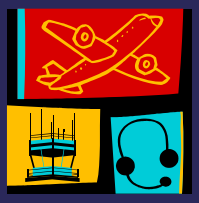
How can we describe aeronautical information flow today? Generally aeronautical information flows are poorly understood and based on paper. The data chain that connects data suppliers to end users can sometimes be confusing and disconnected. These data disconnects can lead to data quality issues that must be manually evaluated and corrected by the aeronautical consolidators and publishers.



Today's aeronautical systems tend to be product based: Each product may have its own data sources and transformations. Very little is shared between products and this can lead to different product synchronization problems. Users have to subscribe to many different data sources to get a complete understanding of the aeronautical system.

Trends in aviation systems

- Demand for integrated systems
- Capacity and resource constraints demand new efficiencies
- Demand for situational awareness tools



Each of these trends rely on timely access to high quality aeronautical data

4

A number of trends can be observed in the aviation industry.

1. The aviation system is becoming more integrated. More and more systems are coming online and these systems are integrated and interrelated.
2. Capacity and resource constraints are driving aviation system users to look for new ways to gain efficiencies.
3. As data becomes more available and as GIS advances into the aviation domain, we are seeing more use of aeronautical data for situational awareness tools.

Each of these trends places demands on aeronautical data.

Aviation system trends

Change driven by multiple integrated systems

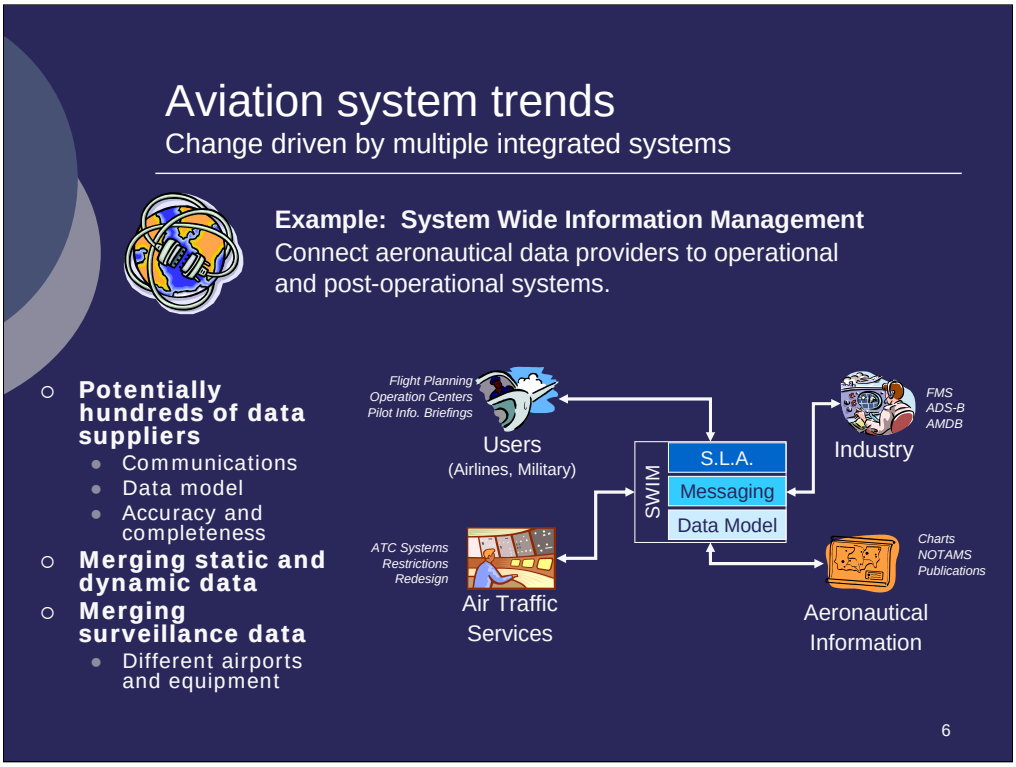
Flight planning systems
System Wide Information Management (SWIM)
Automated charting
Others…

- Creates new system dependences
  - Challenges of point to point system integration
  - Increased data integrity requirements
    - Where does data come from? How was it changed? Accuracy?
  - Common understanding of aeronautical data
    - Lexicon, feature identification

5

The first trend is increasing system integration. Our flight planning systems, charting systems and other new air traffic control systems are becoming increasingly integrated and interdependent. Within the FAA we have a concept of SWIM (System Wide Information Management), the FAA's strategy of managing information in a service oriented architecture.

Increased system integration is creating new dependences. Today systems are generally integrated point to point. As the number of systems increases, point to point integration is costly and impractical to maintain. There are increased data integrity requirements. Systems need to have assurances about where data comes from, how it was changed and its accuracy and quality. Finally communicating systems need a common understanding of aeronautical data this includes a common dictionary and a common approach for identifying features.



In aviation today there are potentially hundreds of data suppliers that need to merge static and dynamic data together. How do we manage a system containing hundreds of inputs and outputs? Traditional system integration approaches will not be cost effective or successful at these large scales.

Within the FAA we are moving to a concept of System Wide Information Management (SWIM). SWIM is intended to provide a layered architecture to information management including a common data model, common messaging approach and information assurance through service level agreements.

Aviation system trends

Change driven by capacity and resource constraints

Traffic flow restrictions – Flights to KJFK must be 50 nm in trail

Airspace Access – Military airspace, temporary restrictions

System outages - NOTAMs

- Creates demand for real time information
  - Just in time demand simulations to handling changing operational environment
  - Real time, computer updates to system access restrictions and rules
  - Real time, computer updates on system outages

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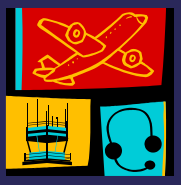
The second aviation trend is change driven by capacity and resource constraints. Air traffic service providers are increasingly managing traffic flows through strategic traffic flow restrictions. Military and other special activities can lead to airspace access restrictions. Systems outages such as NOTAMs can also reduce capacity in the system. Airlines and air service providers have a vested interested to accommodate these restrictions and maximize the safety and efficiency of traffic flow in the restricted operating environment.

To achieve efficiencies in a constrained environment, stakeholders need real time information on changing operating conditions so that they can do forecasting simulations and adjust their use of the airspace system. Rules, access restrictions and system outages (NOTAMs) need to be encoded so they can be interpreted by computer.

Aviation system trends

Change driven by demand for situational awareness



Preflight Information Briefings – Electronic Flight Bag
Situational displays – ADS-B, Aerodrome Mapping
Others…

- Creates demand for geospatial data
  - Integration of CNS and aeronautical data
    - Aircraft locations on a moving map
  - Geospatial positioning accuracy
  - Aeronautical data geometry and topology

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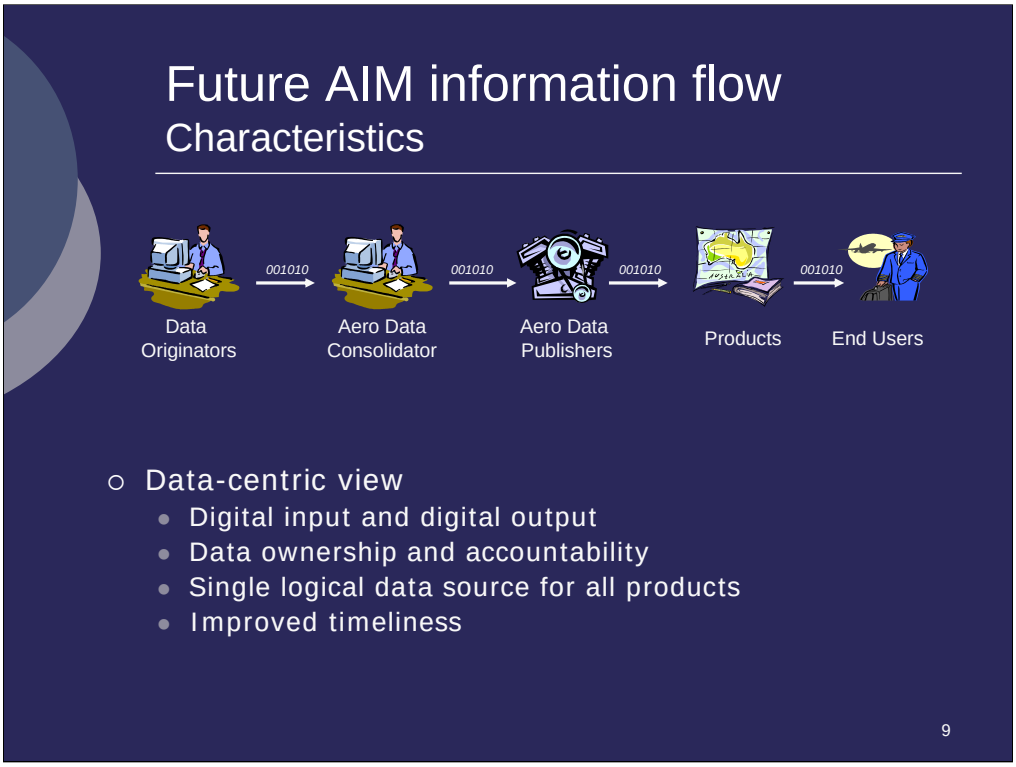
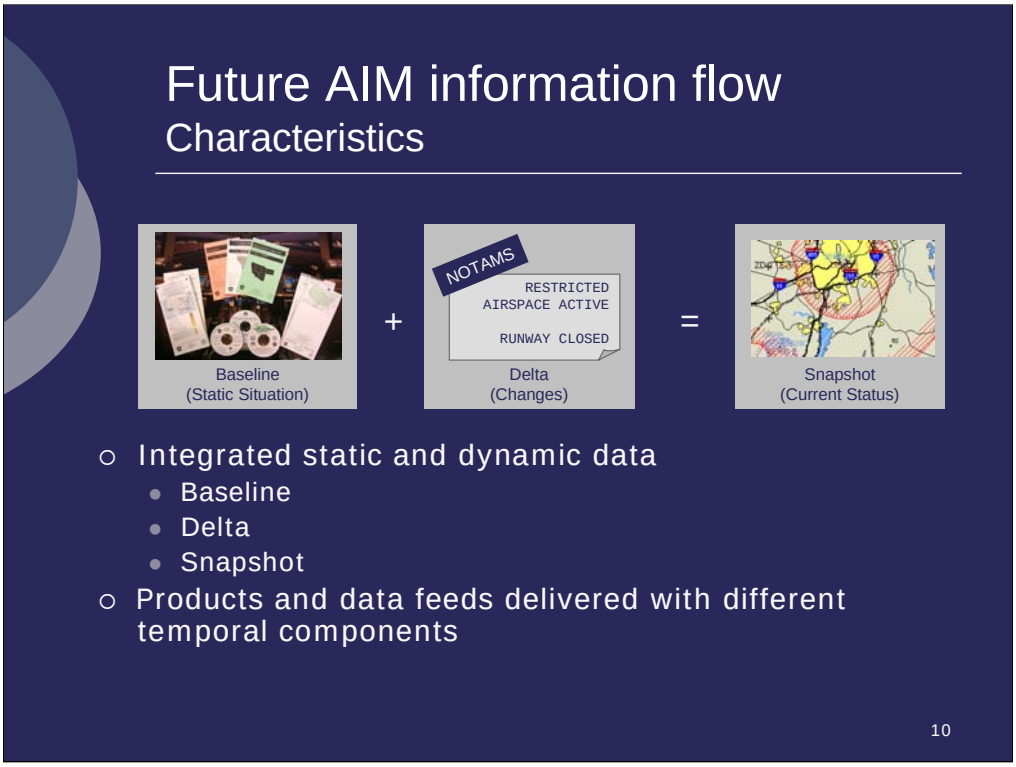
The final aviation system trend is changes driven by the demand for situational awareness. There seems to be increasing emphasis on collaborative decision making and ensuring that all aviation stakeholders have a real time view of the airspace systems. Example systems include pilot information briefings, electronic flight bag, situation displays and aerodrome mapping applications.

This trend creates a demand for geospatial data that can integrate communication, navigation and surveillance information with aeronautical data. Geospatial position accuracy becomes key. Aeronautical data geometry and topology are essential so that situational awareness can include information on the airspace system.



The trends in aviation systems are driving Aeronautical Information Management modernization. The future of AIM information flow is data centric with digital input and outputs. Data ownership and accountability issues are resolved. A single logical data source is used to create a consistent set of products for the end users. Finally digitizing AIM data flow should enable more timely access to information.



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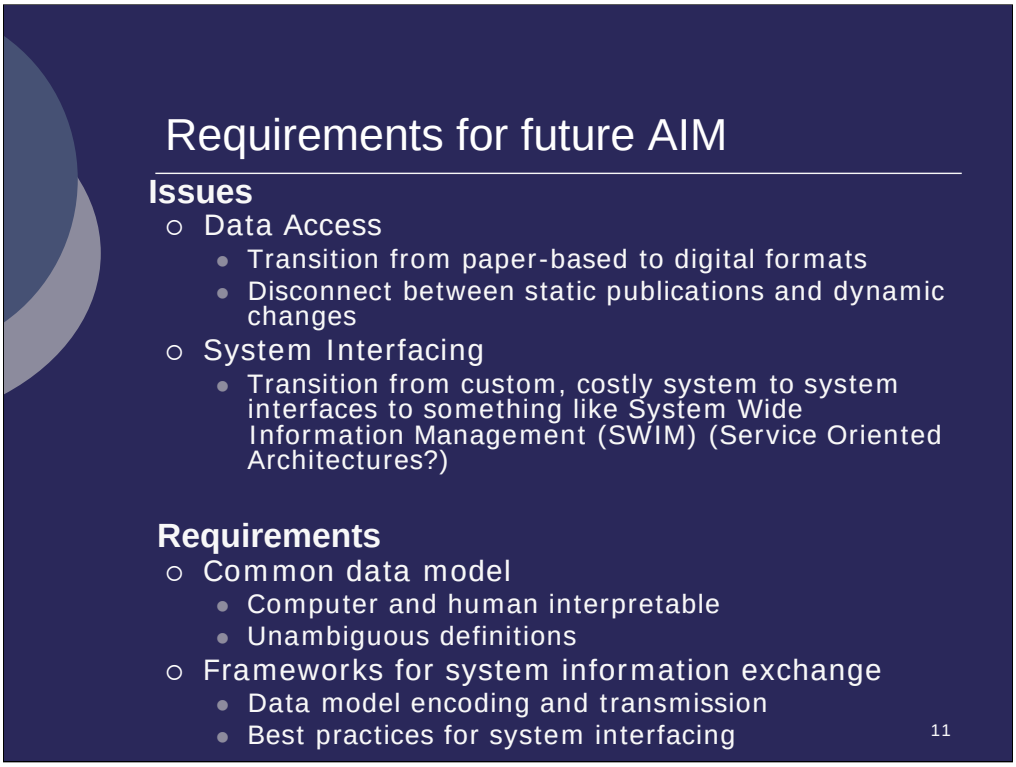
The future AIM will be able to integrate static and dynamic data. Today most AIM systems deal with static data, which we call Baseline data. Baseline data includes the charts, terminal procedure publications and AIPs that are traditional aeronautical services. Temporary changes, called Deltas, are normally described using NOTAMS. Today NOTAMS are text based descriptions of changes that are rarely coupled back to the static database. Finally the combination of the Baseline information and the Delta information provides a view of the current system state. The current status of the system is described as a Snapshot.



Consequently, achieving the future AIM system requires resolving two significant issues: Data access and System Interface.

•Data Access. We need to transition our systems from paper-based to digital formats. We need to eliminate disconnects between static and dynamic aeronautical data.

•System interfacing. We need to transition from custom, costly point to point interfaces to something like the SWIM with common data models, common messaging and common service level agreements.

Fundamental requirements are:

•Common data model for aeronautical data that is human and computer readable.

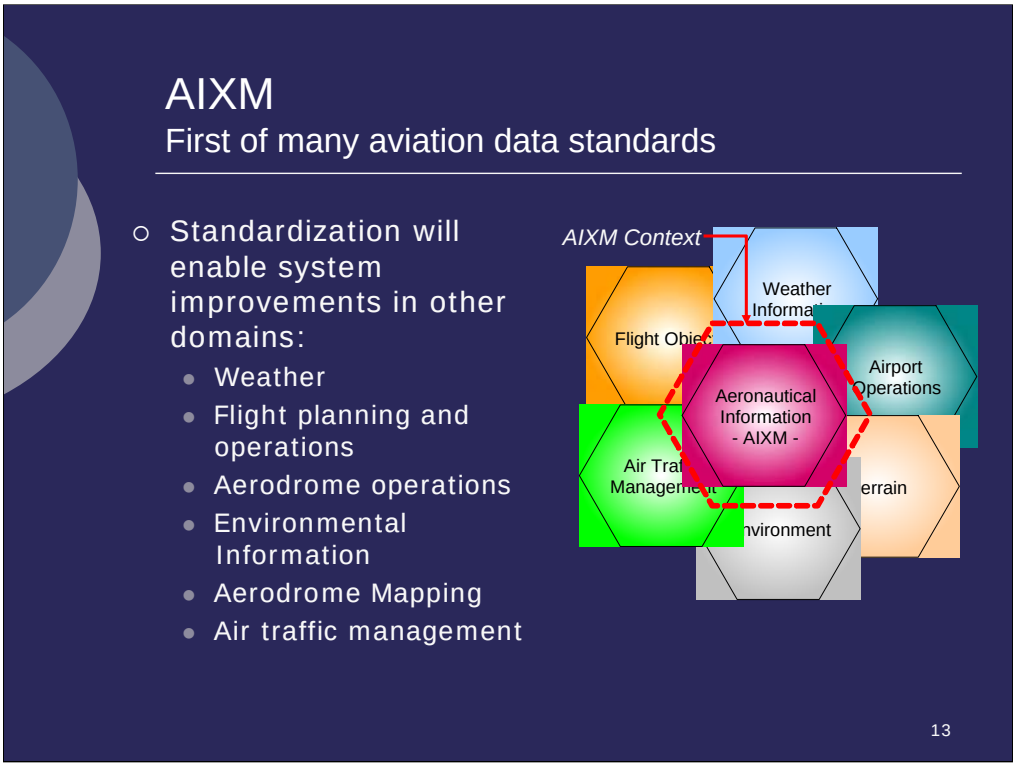
•Frameworks for system interface exchange. This includes a data model for encoding and transmitting information and best practices for system to system interfacing.

AIXM
Enabling the future AIM

- Standards for data modeling are crucial for enabling the future AIM
  - Computer-enabling systems
- AIXM is the standard for aeronautical data

12

AIXM enables the future of AIXM. Standards for data modeling are crucial for realizing the future AIM. AIXM is the standard for aeronautical data.



AIXM and its system to system exchange framework is intended to be the first of many aviation data standards. It is hoped that future data standards will leverage AIXM. Other candidate domains include:

•Weather

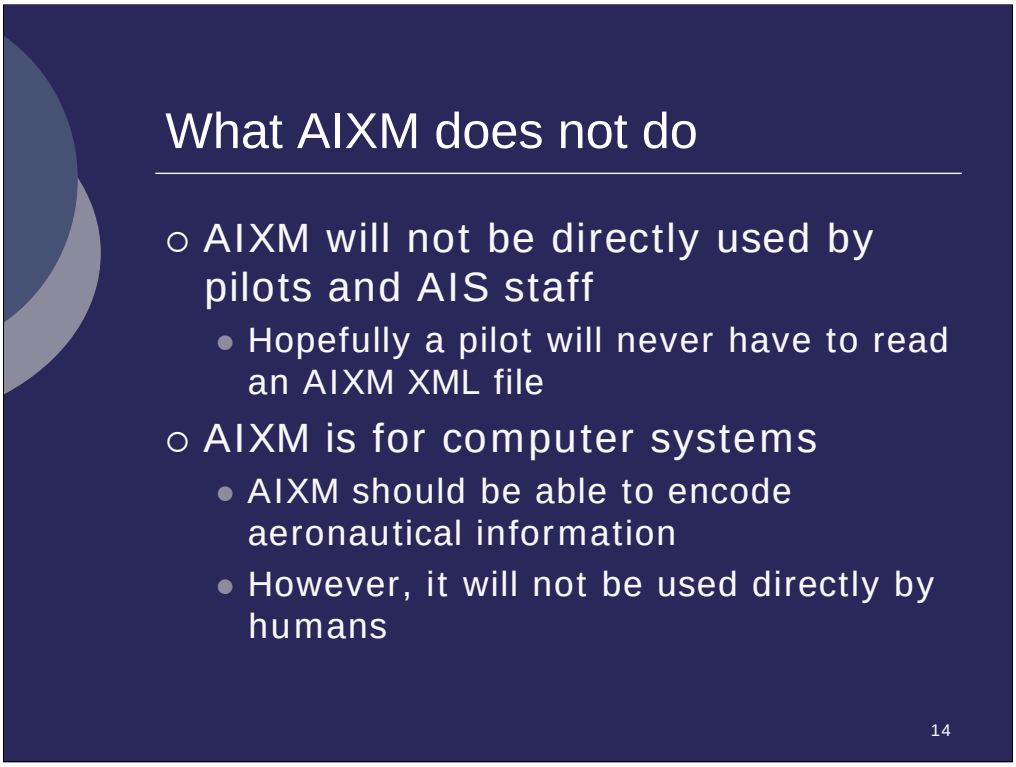
•Flight planning and operations

•Aerodrome operations

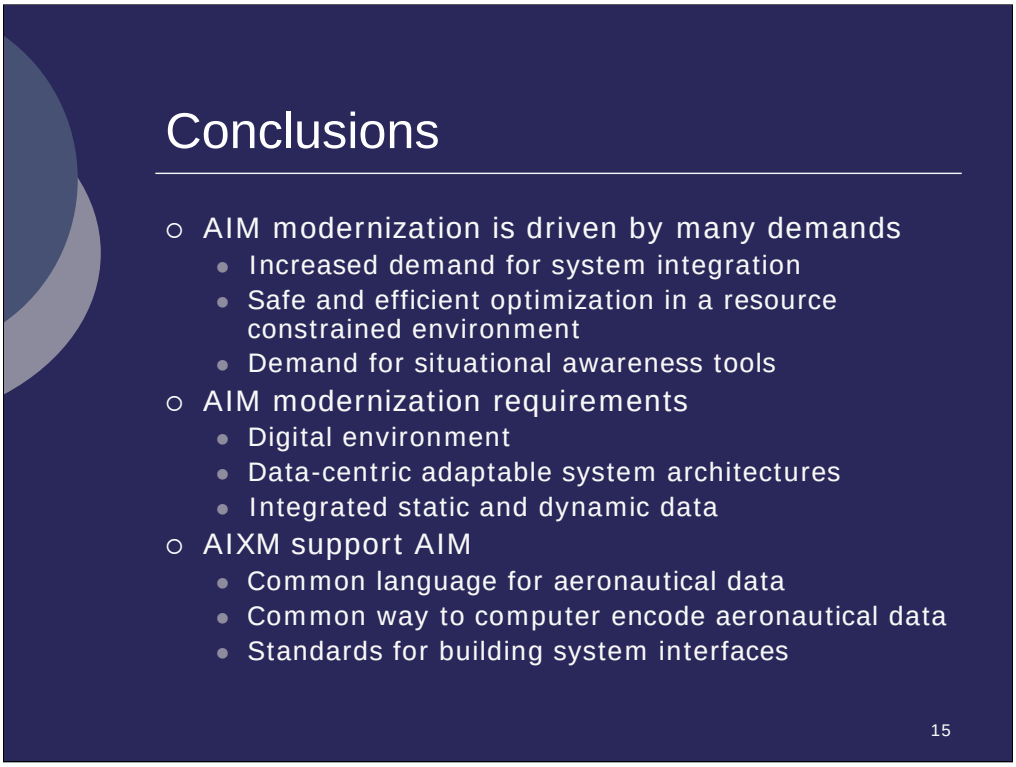
•Environmental information

•Aerodrome mapping

•Air traffic management



Often there is confusion about what AIXM is for. Keep in mind that AIXM is for the computers to make sure that our diverse systems can communicate correctly. AIXM will never be directly used by pilots, AIS staff or other humans. AIXM should be able to encode the aeronautical information that we transmit manually today; however it will not be used directly by humans.



To conclude:

AIM modernization is driven by many demands. We talked about three today: 1) Increased demand for integrated systems, 2) Desire to operate safety and efficiently in a resource constrained environment and 3) Demand for more situational awareness tools.

To support these trends, AIM must modernize to provide higher quality, more timely access to aeronautical. AIM requirements include 1) Move to a digital environment, 2) data centric architectures that are adaptable and can produce a wide range of data outputs and products and 3) systems that can work with static and dynamic data.

AIXM enables AIM by providing an international , standards based foundation. AIXM supports AIM by providing a common language for aeronautical data and a common way to encode aeronautical information for computer interpretation. Finally AIXM includes a set of guidelines for building system interfaces.