AIM Modernization!

Strategic Goals

Provide a 'one stop shop' for <u>digital</u> aeronautical information services necessary for flight operations

- **Improve safety**
  - Interpretation, accuracy, quality
- **Improve efficiency**
  - Easier to filter, sort, query
- **Support NextGen**
  - Situational awareness, flight planning, …

- **Internationally harmonized**

NOTAM
Special Activity Airspace
Altitude Reservations
Airport Field Conditions
GPS/RAIM
Temporary Flight Restrictions

Why Modernize NOTAMS

Stakeholder and User Needs

Pilot's Perspective

NOTAM System Modernization:

The Pilots' Perspective

Report summarizing input from the

Pilot Input to NOTAM System Modernization Working Group

May 2008

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- **"Last line of defense" for safety**
- **Typically have less time to review NOTAMs than other customers**
- **NOTAM data not filtered or prioritized**
- **Digitize NOTAM data**

Dispatcher's Perspective

Field Conditions Data:

The Airline Dispatchers' Perspective

Report summarizing input from the

Dispatch Aviation Safety Action Program (ASAP)
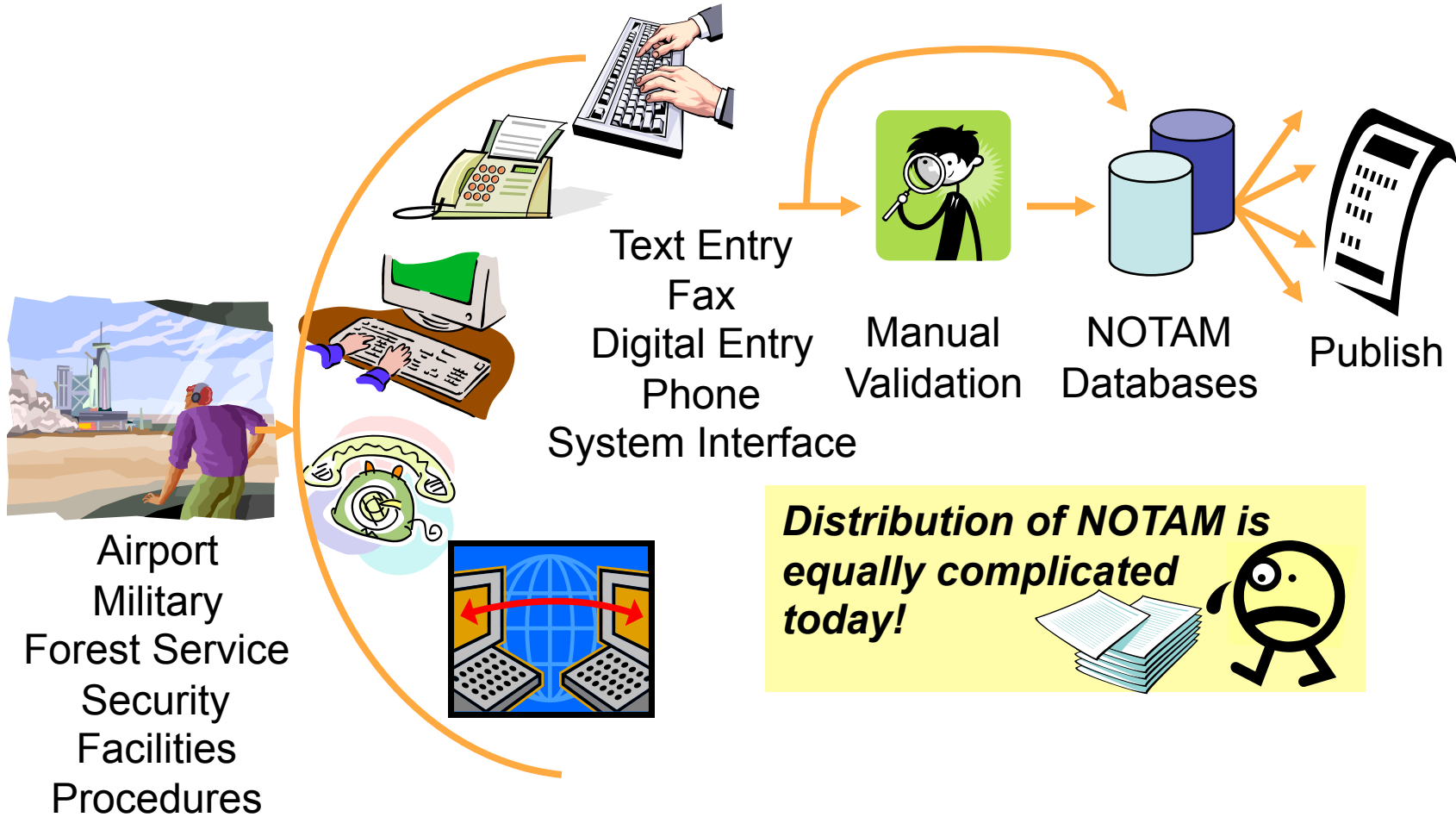
Field Conditions (FICON) Working Group

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- **Airport field condition data incomplete and requires coordination with multiple sources**
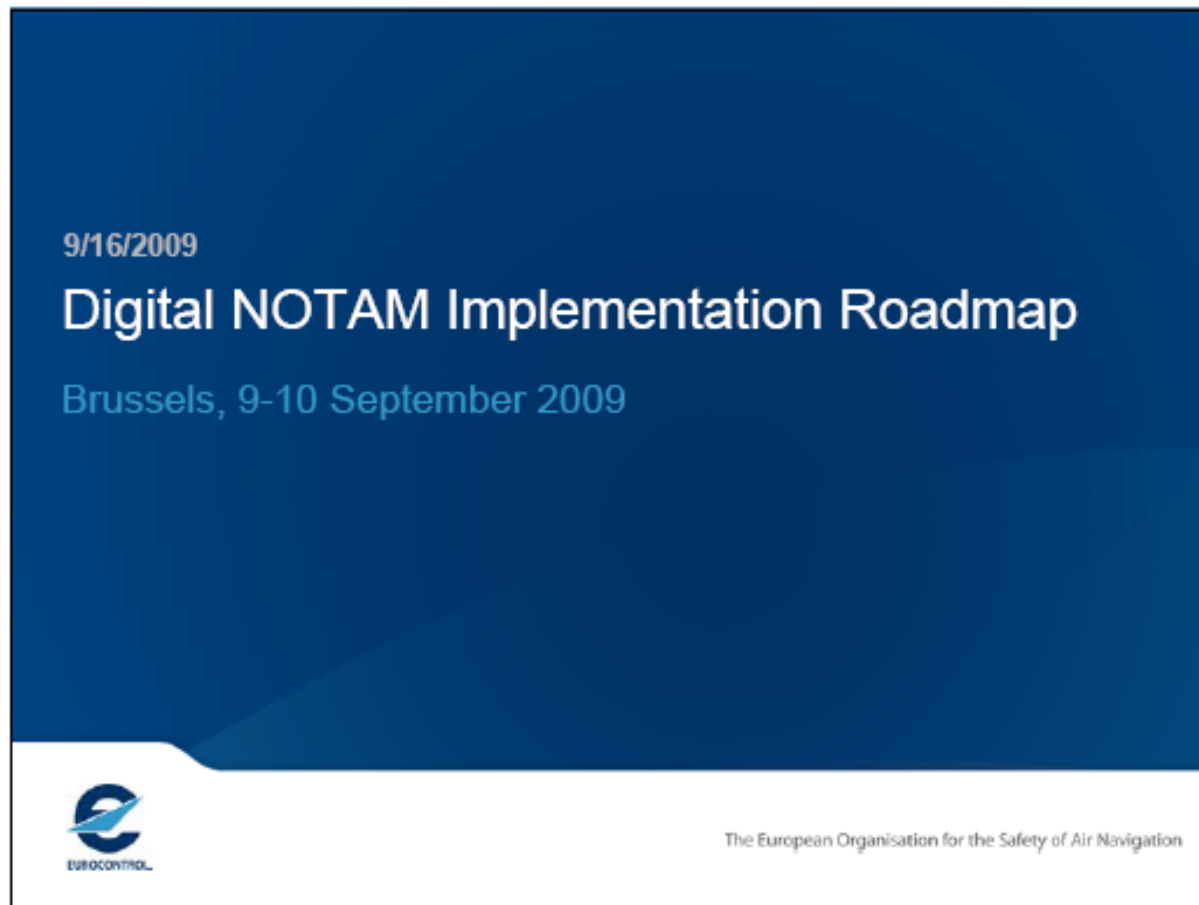- **Standardize content and format of data**

FAA's Perspective

Airport
Military
Forest Service
Security
Facilities
Procedures

Text Entry
Fax
Digital Entry
Phone
System Interface

Manual
Validation

NOTAM
Databases

Publish

Distribution of NOTAM is equally complicated today!

2009 Digital NOTAM Workshop
EUROCONTROL

9/16/2009

Digital NOTAM Implementation Roadmap

Brussels, 9-10 September 2009

EUROCONTROL

The European Organisation for the Safety of Air Navigation

International progress and harmonization

- US, Japan, Europe, …

Stakeholder commitments and needs

http://www.eurocontrol.int/aim/public/standard_page/xnotamws_2009.html

KLM

The airlines expect that Digital NOTAM will not only make the information easier to process but will also improve the quality of the information.

Thank you for your attention

Lufthansa Systems

Safety and efficiency of the ATM system [increases] by system wide availability of harmonized and standardized data.

# DOD Air Mobility Command
A User's Perspective

- **Aviation operations are more reliant upon digital data than ever**

- **Digital data facilitates opportunities for success**

- **Detractors from seamless implementation of digital data**

- **Highlight the need for standardized aeronautical data**

Airbus

D-NOTAM enhanced integration : examples

D-NOTAM RWY closure information interpreted by airborne system and graphically displayed
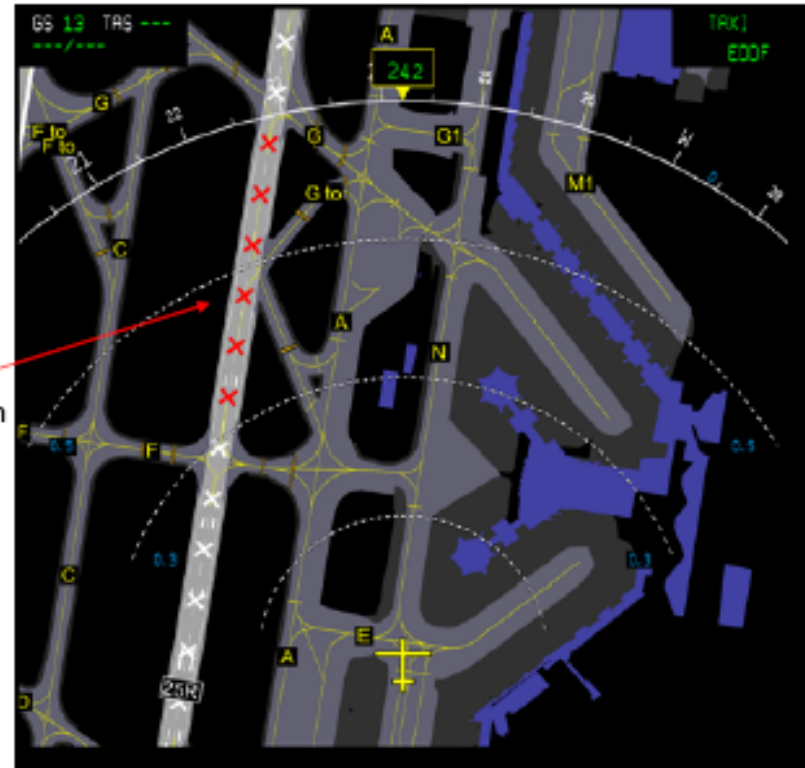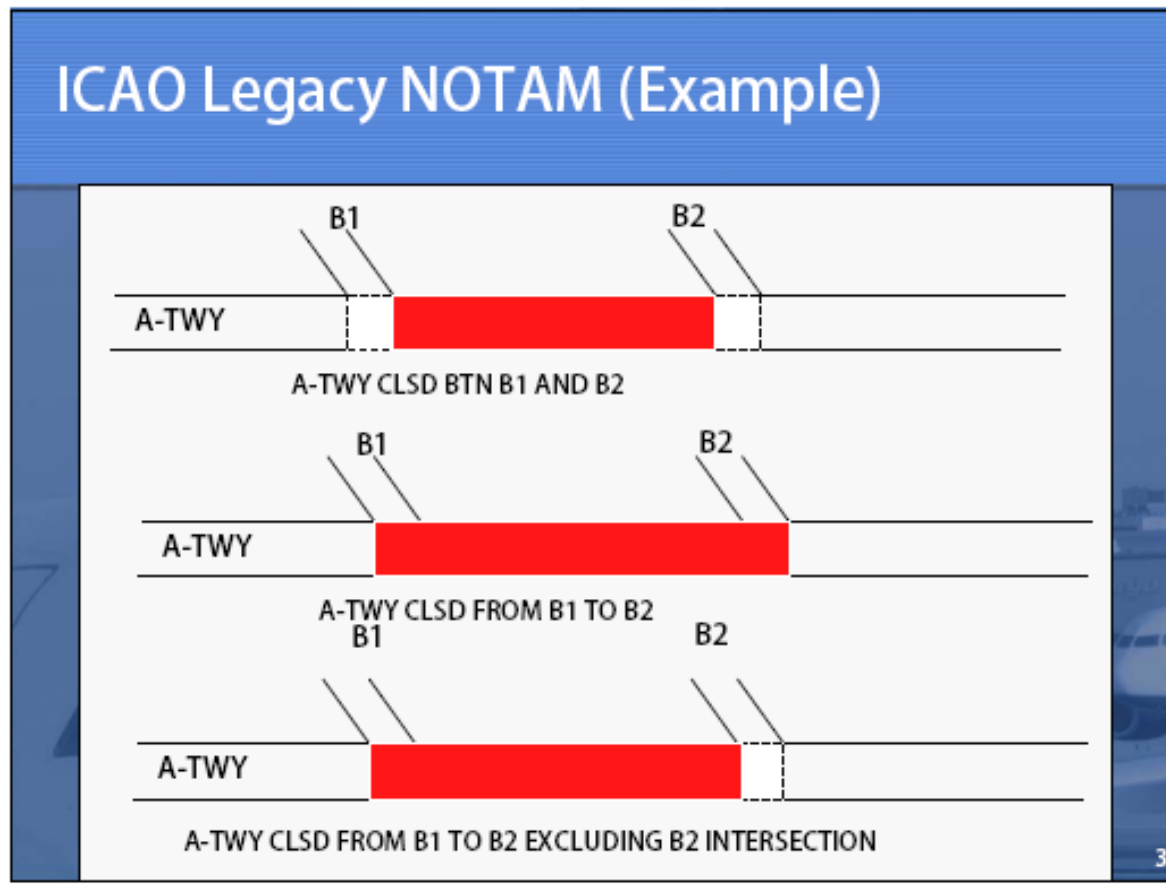
From Flysafe research project

Airbus thinks Digital NOTAM will be of high interest when available for pilots, increasing efficiency and safety,
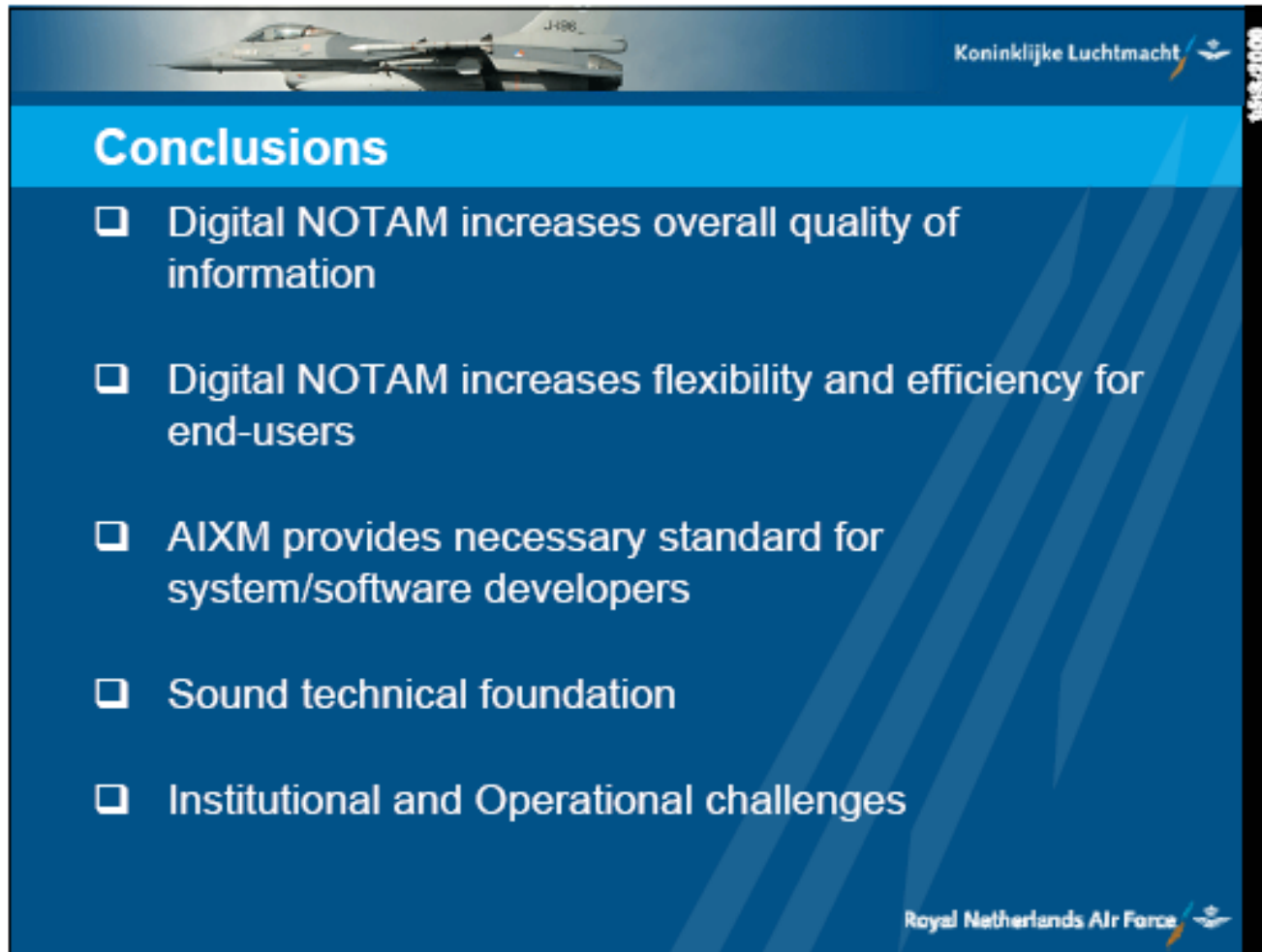
Japan Civil Aviation Authority

ICAO Legacy NOTAM (Example)

B1   B2

A-TWY

A-TWY CLSD BTN B1 AND B2

B1   B2

A-TWY

A-TWY CLSD FROM B1 TO B2

B1   B2

A-TWY

A-TWY CLSD FROM B1 TO B2 EXCLUDING B2 INTERSECTION

Digital NOTAM solution to "NOTAM confusion"

Reduce cost impacts to airlines

Initiating study project

Royal Netherlands Air Force

From Paper to Digital

Concepts in the modernization of aeronautical information at the FAA and globally

Introduction concepts

- **Products are presentations (Views) of data**
  - Effective at date of publication
- **The primary users of [paper] products are humans**
  - Machines have to interpret products to extract underlying data
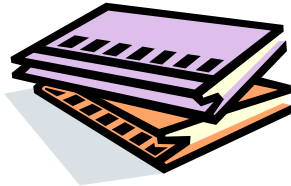
Publications
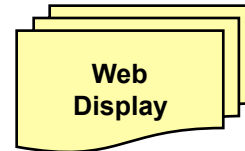
Web Display   Hypertext

- **The real value is in the data**
  - The product is just the presentation

What is a NOTAM?

- **Notice that the published information has changed**

- **NOTAM – Notice to Airmen**
  - ABC 09/027 ABC RWY10/28 CLSD 10/28 200809120400 200909220400
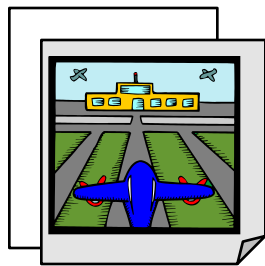
12 Sep 0400 GMT
22 Sep 0400 GMT

+

+

Aeronautical Information Identification & Operation

Period of Validity
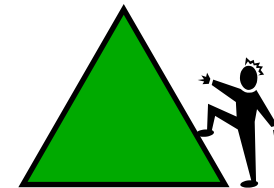
Geometry

Message

Another notice
Military Airspace Status

- **SUA Status – Special Use Airspace status**
  - Buckeye Military Operation Area (MOA)
    - Activated 0900 to 1300 on Sep 9 2006

Buckeye MOA Activated

+

9 Sep 2006 0900 to 1300 GMT

+

MOA boundary

Aeronautical Information Identification & Operation　　**Period of Validity**　　**Geometry**

Message
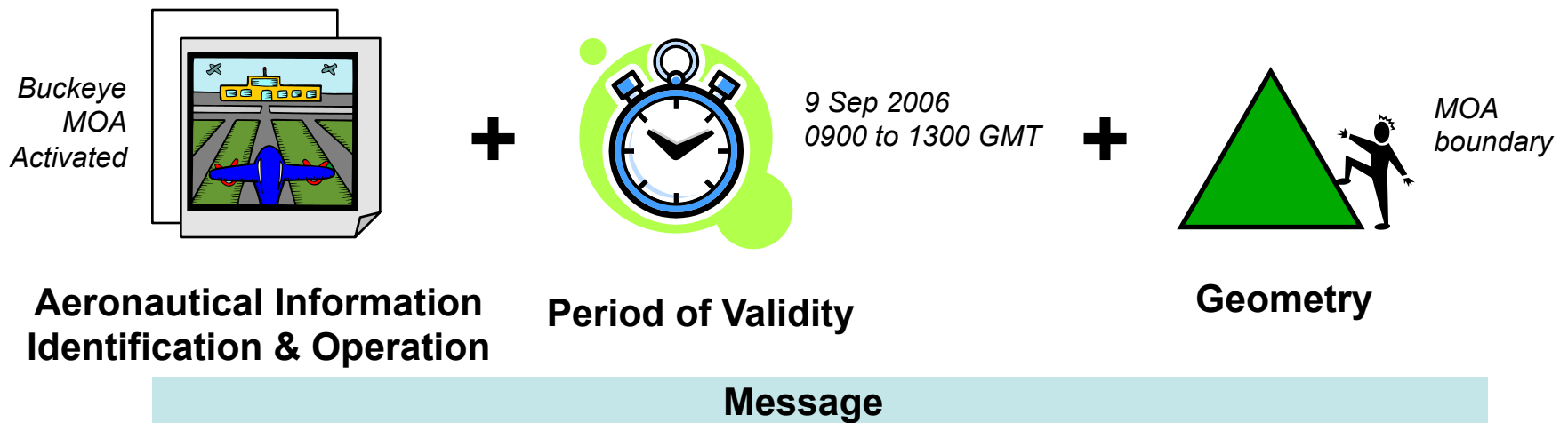
What about other FAA products?

- **Products (Historically Text based)**
  - NOTAM: Runway is Closed for a certain time
  - SUA: Buckeye MOA is Active for a certain time
  - CARF: Temporary Restricted Airspace
  - GPS/WAAS: GPS Unreliable in Coverage area until further notice

- **Common Themes**
  - Identification and Operation [<u>What</u>]
  - Period of Validity [<u>When</u>]
  - Geometry [<u>Where</u>]

- **The examples above all describe something that is happening to a piece of airspace, but it could be an airport, navaid or any other component of the National Airspace System (NAS)**

New data cannot be depicted in traditional NOTAM products

ACTIVE Interference

Centered At:
N33° 00.0', W117° 00.0'

At Altitude(s) with Radius:
4000, 7.0NM
10000, 7.0NM
25000, 6.0NM
40000, 4.0NM

Effective:
2007-07-26 00:00:00.0 to 2009-12-31 23:59:59.0

OK

N33° 00.0', W117° 00.0'

◆ Airport
● Capital
No Outages
Predicted Outages
Selected Outage
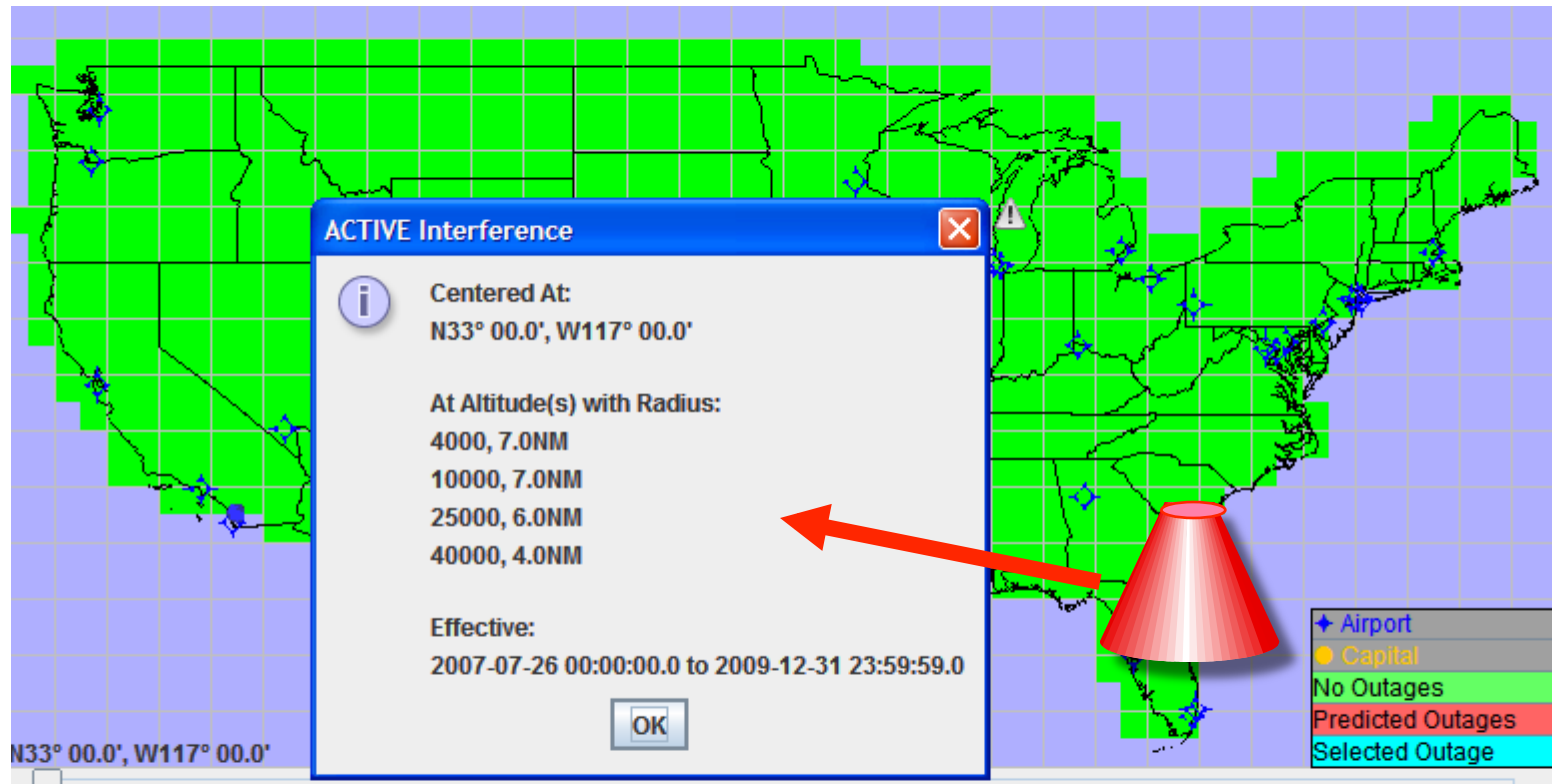
GNSS Interference for Performance Based Navigation

Summary of Concepts

- **Common method for communicating status of aeronautical information**
  - SAA, NOTAM, CARF, GNSS/RAIM
- **Computer language for communicating digitally**
  - Who, What, Where
- **Benefits users and stakeholders**
  - One stop shop, computer-assisted evaluation, improved filtering and sorting

Web Site
www.aixm.aero

- Design Documents
- Model Details
- AIXM 5 Forum
- Digital NOTAM

AIXM History

A Strategy for Co-operative Change
GLOBAL AIS
Congress & Exhibition
27-29 June 2006

AIXM Forum member
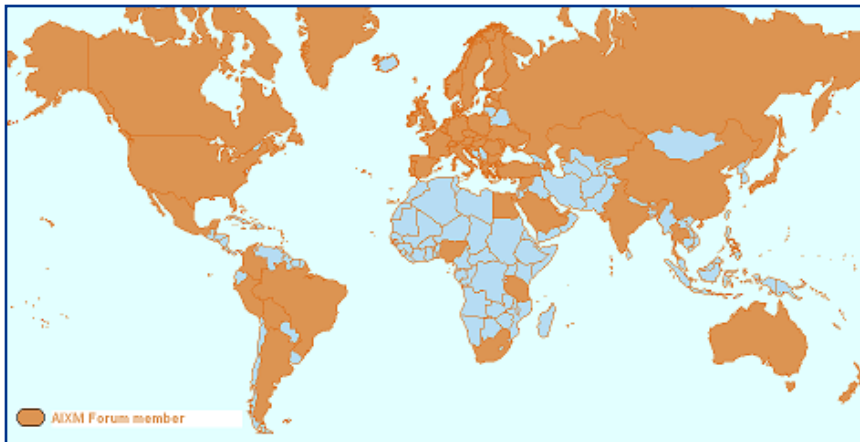
- **Global Standard for Aeronautical Information**
  - 1990's Initiated by EUROCONTROL (AIXM 3.x)
  - 2003-2005 Partnership with FAA (AIXM 4.x)

  2006 Global AIM Congress and the announcement of AIXM 5

  2006-2007 Progressive adoption – Japan, Canada, US, others…

  2008 AIXM 5 Release

  2009 the Digital NOTAM concepts

AIXM components

UML

Temporality Concept

Geometry

XML Schema
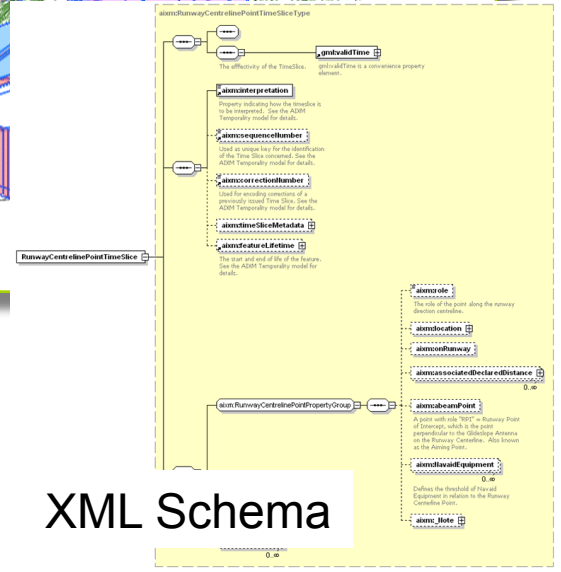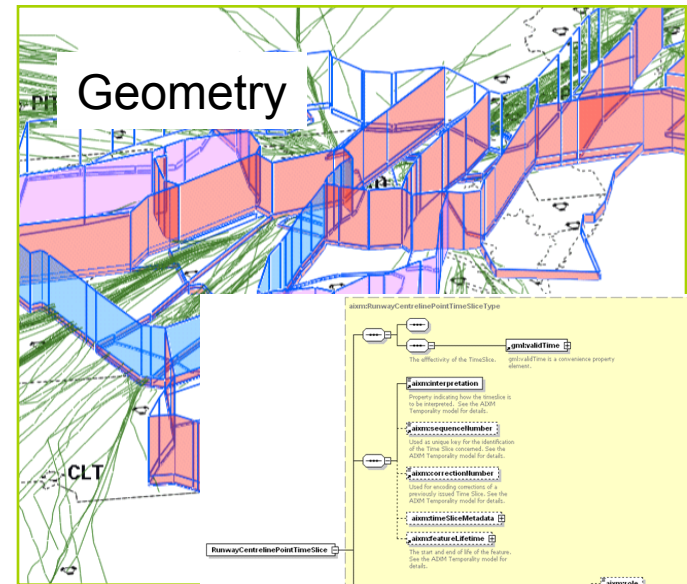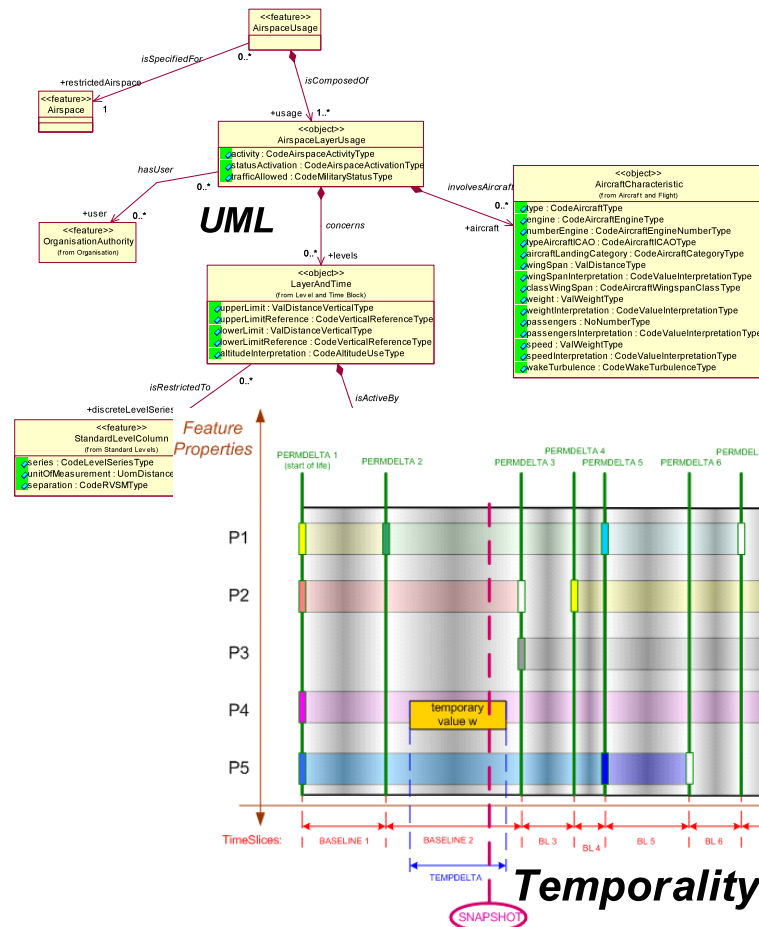
NOTAM Modernization

Transition to Digital NOTAM (AIXM) and ICAO compliance

AIM Modernization - Plan

**Technical
- *Future Systems*
- *SWIM compliance*
- *Legacy support*

Policy
- ICAO compliance
- Digital capture and delivery

AIM

Modernization

Outreach
- Education
- Human factors analysis
- Stakeholder working group

Safety
- Minimize stakeholder impacts
- System transitions

Business Case
- Investment cost
- Benefits
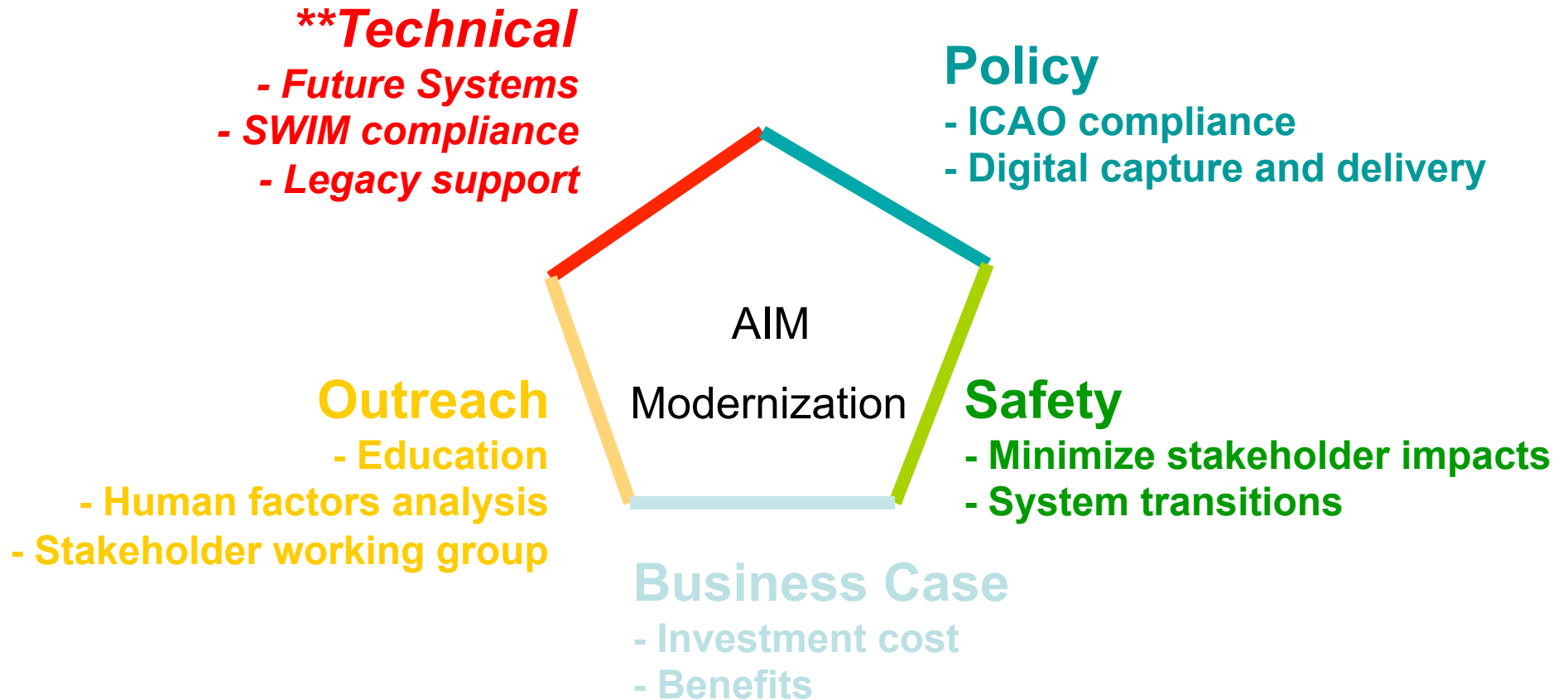
New Concept of Operations

DATALINK

- Web
- External
- ADAM

Web service (AIXM)

Originator

Federal NOTAM System (FNS)

Web Page Service (AIXM) & Legacy Formats

AIM

Originate NOTAMs at the Source

Capture digitally (AIXM via templates)

FAA Validates and Publishes

Integrated permanent and temporary information
Computer readable
Electronic distribution to stakeholders
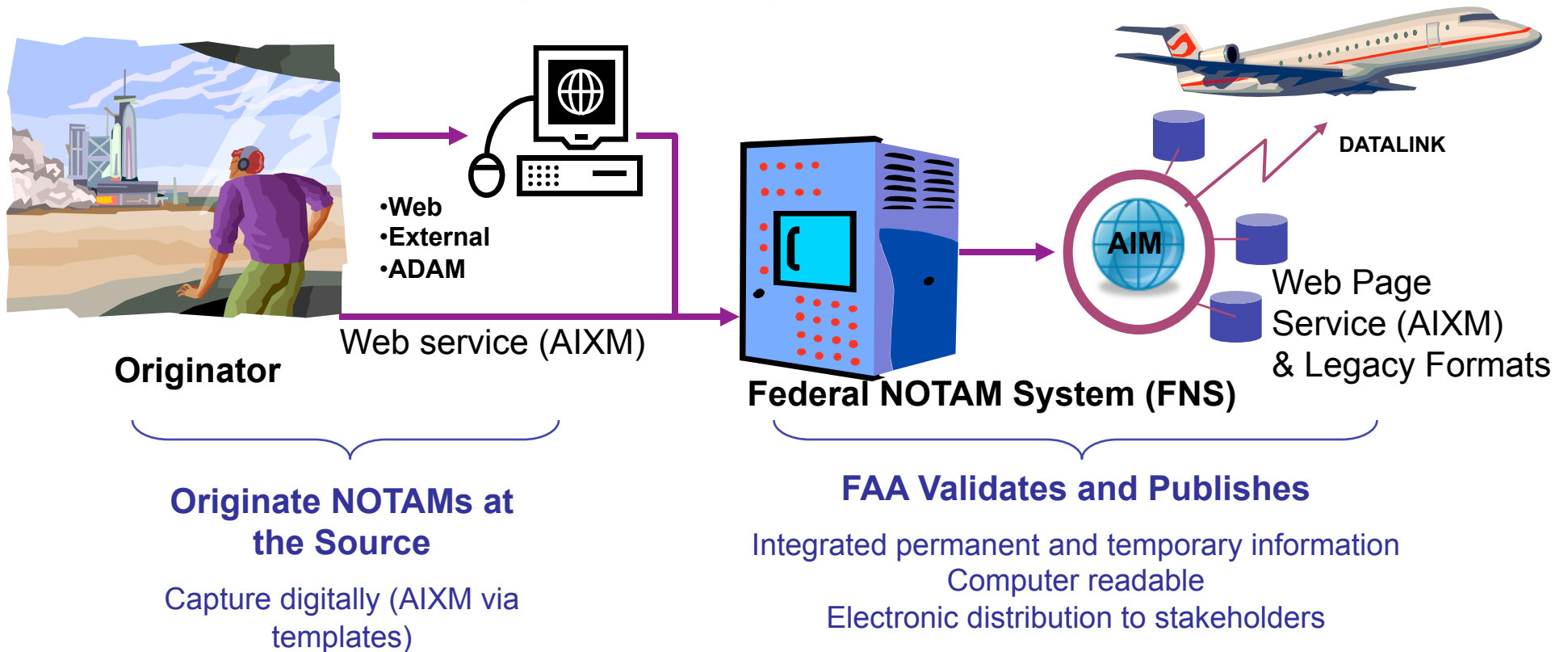
AIXM = Aeronautical Information Exchange Model

The Digital Goal

- **Sort - <u>Order</u> the data**
- **Filter – <u>Extract</u> with geographic, temporal, or logical criteria**
- **Transpose – <u>Convert</u> data to graphic**
- **Alert - <u>Evaluate</u> the data and take action**
- **Fuse – Ability to <u>merge</u> multiple datasets**

Multiple views of data

View A →

Traditional US NOTAM format:

!MCN CCO 14/32 CLSD/PARL TWY 3000X75 AVBL DAY VMC/NO TSNT/NO PLA/NO STUDENT

View C →

Geo-referenced Display:

5/3232

5/3232

View B ←

Plain Language NOTAM Format

NOTAM Number:	**5/3232**
Issue Date:	Nov 10, 2005
Location:	Newnan Coweta County Airport (CCO)
Beginning:	Effective immediately
Ending:	Until further notice
Affected Area(s):	
Runway:	*14-32*
Status:	Closed
Taxiway:	*14-32 Parallel*
Status:	Open
Length:	3000 ft
Width:	75 ft
Operating Hours:	Sunrise to Sunset
Usage Restrictions:	*14-32 Parallel*
Flight Rules:	Visual
Pilots:	Certified Only (No Students)
Restriction:	No practice low approaches

Data enables Functions — *Query*   *Filter   Transform   Alert*

Initial Policy Change
Effective January 28, 2008

- **Created keywords for all Domestic NOTAMs for improved sorting and parsing**
  - AD
  - NAV
  - RWY

  - AIRSPACE
  - OBST
  - SVC

  - APRON
  - (O)
  - TWY

  - COM
  - RAMP
  - (U)

The "D" NOTAM
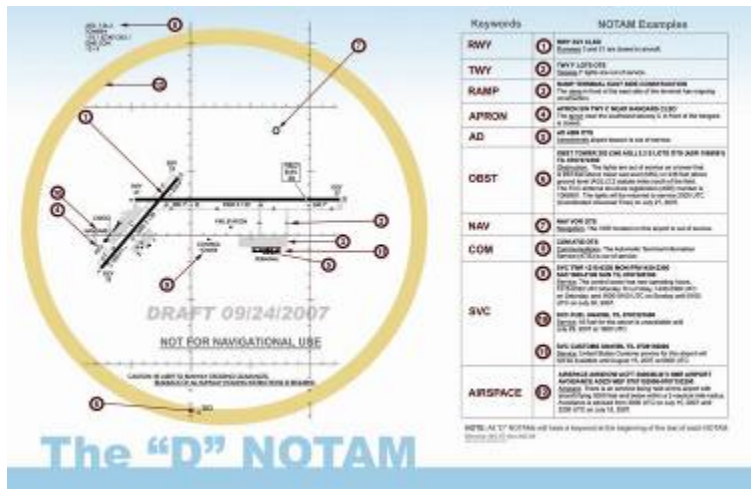
- **Runway condition**
  - !MIV 05/123 MIV **RWY** 10/28 CLSD 0709021200-0709021600
- **Taxiway status**
  - !RDU 05/123 RDU **TWY** A CLSD BTWN A1, A2 TIL 0709011600
- **Ramp status**
  - !MEM 05/123 MEM **RAMP** PAEW FEDEX CARGO EAST

NOTAM Policy Goals

- **ICAO Compliance**
  - Joint Canadian and United States approach
- **Coverage for all NOTAM types currently issued in the US**
  - Safety of flight information
- **Accommodate 650K annual issued NOTAM**
  - Minimize roll-over 9999 >> 0001
- **Accommodate transition to Digital NOTAM**
- **Accommodate distribution and visualization requirements of all stakeholders**

Preliminary Hazard Analysis (PHA)

- **FAA Safety Management System (SMS) Process**
  - Hazard Identification
  - Existing Controls
  - Hazard Severity
  - Hazard Likelihood
  - Hazard Mitigation

Hazard Analysis Outcome

- **H1.0 - User failed to obtain NOTAM.**

- **H2.0 - User Retrieves and Uses Corrupted NOTAM (without awareness)**
  - NOTE: Corrupted data includes NOTAM data that failed to be cancelled appropriately.

- **H3.0 - For a given Military Altitude Reservation (ALTRV), one or more users receive different information than the others.**

Federal NOTAM System mitigates all these hazards to low risk

Quantified Benefits

- **Reduction in accidents caused by NOTAM interpretation**
  - $2.8M annually

- **Efficiency for NOTAM entry**
  - Airport Operators - $0.3M annually
  - Flight Services - $1.8M annually

- **Efficiency in data collection and interpretation costs – situational awareness**
  - Airline dispatch - $2.0M annually
  - Pilot/Flight Planning (General Aviation) - $*XX*M annually

- **Efficiency in system operations**
  - US Government - $4.0M annually

Conclusions

- **NOTAM Modernization is a step towards overall transition to digital aeronautical information**
  - Special Activity Airspace
  - GNSS/RAIM
  - …
- **Industry Day**
  - Discuss FAA's modernization strategy