

Our objective in this briefing is to demonstrate some systems that are using AIXM today and also discuss how AIXM will enable even more capabilities in the future. We want to show you these demonstrations as motivation for standardizing on the AIXM data exchange model.

# Topics

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- Enabling AIM through AIXM
- Classical Examples
  - Digital charting
  - Digital AIP production
- New Possibilities
  - Advanced charting features
  - Electronic AIP
  - Geographic interoperability
  - NOTAMS and temporary changes

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The goal of this section is to show how AIM can be enabled through AIXM.

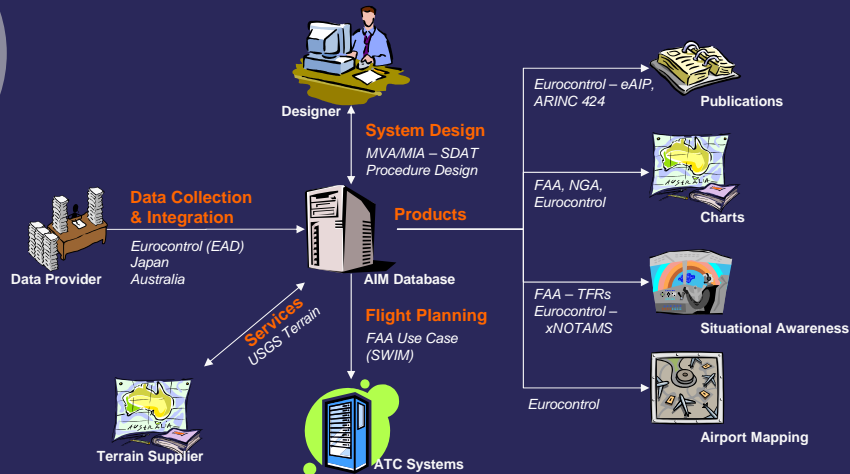
We'll begin by discussing some classical examples:

- 1) Creating digital AIPs
- 2) digital charting.

Next we'll discuss new possibilities. We'll demonstrate geographic interoperability by demonstrating GML and then discuss NOTAMS, xNOTAMS and temporary changes.

# Enabling AIM with AIXM

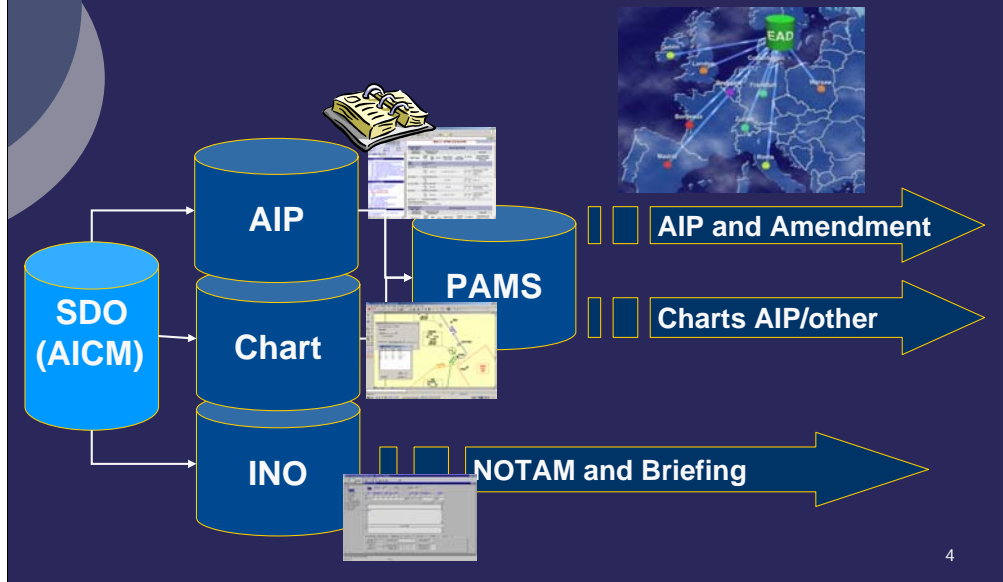
AIXM-based system development and prototyping ongoing today



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As already stated, AICM and AIXM are designed to support the full lifecycle of aeronautical data. This slides shows the various aeronautical information management activities along with use cases, prototypes and production systems that already demonstrate AIXM's use for these different systems. Please see one of us during a break for more information about these case studies, prototypes and production systems.

# European AIS Database (EAD)



The European AIS database provides a central repository of European aeronautical information. States use data entry/edit terminals or database to database system connections (using AIXM) to transmit and update the EAD.

The workflow imposed by the EAD, both for the central database and for the local systems, starts with the update of the SDO (AICM based) database. The data is verified and coordinated on a regional basis. The committed data is then used for creating classical AIS products: AIP, charts. It is also used to produce enhanced electronic AIP and for NOTAM processing.

# EAD - SDO Maintenance

The screenshot displays the 'Static Data Operation' application window, specifically the 'Airspace' maintenance screen. The interface is divided into several sections:

- Search and Filter Section:** Includes fields for 'Effective date' (11-OCT-2004 00:00), 'Type' (FIR), and 'Coded identifier' (UJUV). There are 'Find' and 'Clear all' buttons.
- Version History Table:** A table showing previous versions of the airspace data.

Effective date	Expiration date	Status	Withdrawn
24-JUL-2004 22:00	Permanent	Committed	<input type="checkbox"/>
04-SEP-2003 00:00	24-JUL-2004 22:00	Committed	<input type="checkbox"/>
30-NOV-2002 00:00	04-SEP-2003 00:00	Committed	<input type="checkbox"/>
- Airspace List:** A list of airspaces with columns for 'Type' and 'Coded identifier'. The entry 'UJUV' is selected.

Type	Coded identifier
FIR	UUUU
FIR	UJUV
FIR	UUYH
FIR	UUYV
FIR	UUYW
FIR	UUYX
- Detailed Configuration Panel:** Shows fields for 'Type' (FIR), 'Coded identifier' (UJUV), 'Name' (MOSCOW FIR/CTA), 'Class', 'ICAO location indicator' (UJUV), 'FPL-MSO address', 'Working hours' (24 - continuous service, 24 hours out of 24), 'Upper limit' (999 FL), 'Upper limit Reference' (STD), 'Lower limit' (0 M), 'Lower limit Reference' (HEI), 'Minimum limit', and 'Lower/upper limit'. A dropdown menu for 'Airspace association' is open, showing options like 'Significant point in airspace', 'Airspace border', and 'Authority responsible for airspace'.
- Buttons and Footer:** Includes 'New...', 'New based...', 'Edit/update...', and 'Withdraw...' buttons. The footer shows 'Record: 1/1' and '<OSC>'.

# EAD - SDO Reporting

SDO Reporting - Upper Routes in North/West hemisphere - Microsoft Internet Explorer

Address: <http://www.ead.eurocontrol.nl/sdoreporting/servelet/reportcontrol;sessionId=143c344e22b8104f017483a64502b00c9e23ae39c24?Type=report&time=1>

### Upper Routes in North/West hemisphere

Master GUID	Route Designator	Area Desig.	Start identifier	Type	End Identifier	Type	Effective date
18020613	UN872	LP-EF	BEXAL	WPT	LIGRA	WPT	08-Jul-2004
75061006	UN872	LP-EF	LIGRA	WPT	ESP	VORTAC	08-Jul-2004
18020615	UN872	LP-EF	ESP	VORTAC	FTM	VOR/DME	27-Nov-2003
18020618	UN872	LP-EF	FTM	VOR/DME	ABETO	WPT	27-Nov-2003
18020621	UN872	LP-EF	ABETO	WPT	VIS	VOR/DME	27-Nov-2003
18020623	UN872	LP-EF	VIS	VOR/DME	CANAR	WPT	08-Jul-2004
18020626	UN872	LP-EF	CANAR	WPT	RALUS	WPT	27-Nov-2003
18020629	UN872	LP-EF	RALUS	WPT	BARKO	WPT	20-Aug-2003
18020631	UN872	LP-EF	BARKO	WPT	KORET	WPT	20-Feb-2003
18020633	UN872	LP-EF	KORET	WPT	AVS	VOR/DME	20-Feb-2003
18020636	UN872	LP-EF	AVS	VOR/DME	ATLEN	WPT	20-Feb-2003
18020639	UN872	LP-EF	ATLEN	WPT	TUROP	WPT	20-Feb-2003
18020642	UN872	LP-EF	TUROP	WPT	DEGIS	WPT	20-Feb-2003
18020645	UN872	LP-EF	DEGIS	WPT	ERIGA	WPT	20-Feb-2003
18020648	UN872	LP-EF	ERIGA	WPT	TERPO	WPT	20-Feb-2003
18020651	UN872	LP-EF	TERPO	WPT	KURIS	WPT	20-Feb-2003
18020654	UN872	LP-EF	KURIS	WPT	PEPON	WPT	20-Feb-2003
18020656	UN872	LP-EF	PEPON	WPT	ROLEN	WPT	20-Feb-2003

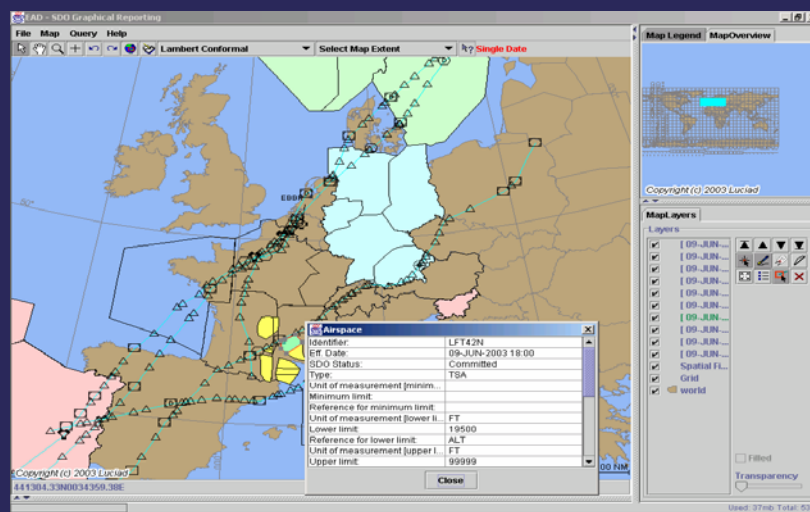
Parameters used for this report:

Effective date: 31-JAN-2005


Aeronautical region: not set (default)

Done Internet

# EAD - SDO Graphical Reporting

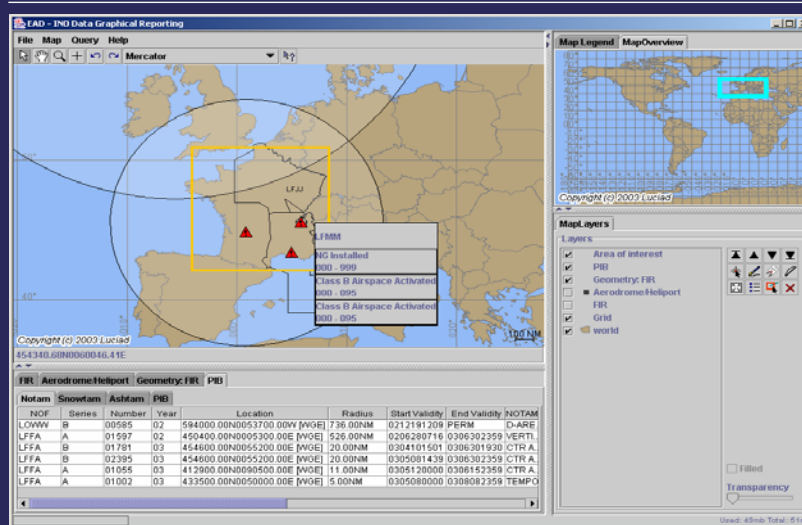


# INO Reporting

	
<b>EAD</b> AERONAUTICAL INFORMATION SERVICES	
Pre-Flight Information Bulletin: <b>ROUTE</b>	VALIDITY (UTC): <b>11 MAR 2003 15:01-12 MAR 2003 14:56</b>
Service Type: <b>FULL</b>	
Date: <b>11 MAR 2003</b> Time: <b>14:00 UTC</b>	Flight Rules: <b>IFR/VFR</b>
Contents: <b>Aerodromes, En-route, Warnings</b>	
Height Limits (lower/upper)	
First: <b>000/999</b>	Other: <b>000/999</b> Last: <b>000/999</b>
ADEP: <b>EDDH</b>	ADES: <b>EDDM</b> Alternates:
FIR: <b>EDWW EDBB EDDF</b>	
Legend: + NOTAM not older than 250days * Different from original - Beginning of the message Item X) - short version of NOTAM text; for full text please contact AIS unit	
<b>AERODROMES</b>	
<b>AERODROME (DEPARTURE)</b>	
<b>EDDH - HAMBURG</b>	
- LOW VISIBILITY TKOF ( LUTO ) IS ONLY AVBL FROM RMY 23.	
<b>FROM:</b> 13 DEC 2001 12:11	<b>TO:</b> 31 DEC 2002 23:59EST
A2128/01	



# INO Graphical Reporting



# EAD – eAIP & AIP Production

The screenshot shows the Adobe FrameMaker interface for editing an AIP document. The main window displays the following content:

**AIP - PORTUGAL**

**ENR 4 RADIO NAVIGATION AIDS/SYSTEMS**

**ENR 4.1 RADIO NAVIGATION AIDS - EN-ROUTE**

Name of station	ID	Frequency/ Channel Value	Hours of operation	Coordinates
ARRUDA	LAR	382.93KHZ	H24	38 09 38.598L 009 02 25.409W
BEJA	BEJ	115.60 MHz	H24	39 07 42N 107 05 30W
VORTIC	TCOM - CH 105K		H24	39 44 54N 009 21 43W

Pop-up windows include:

- DME data:** Fields for Name (CAS), Type (A), Purpose (VOR/DME), Facility (38454N), Latitude (38454N), and Longitude (0092143W).
- VOR associated data:** Fields for Designator (LAR), Name (CAS), VOR type (VOR), Purpose (A), Facility (38454N), Latitude (38454N), and Longitude (0092143W).
- DME Search Criteria:** Fields for Responsible authority (Portugal), Ident, Name, and Type.
- DME Elements:** A table listing elements with columns for Responsible, Ident, Name, and Type.
- Navigation Data:** Fields for Effective Date, Reference Code, and a Help button.

The right-hand pane shows a directory of ENR sections, including ENR 1.8 through ENR 5.1, with ENR 4.1 selected.

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# Electronic AIP - demonstration

The screenshot displays the eAIP website interface. The main content area is titled "ENR 3.2 UPPER ATS ROUTES". It features a table with columns for Route Designator (RNP Type), Significant Point Name, Track MAG, Dist (KM), (COP), Upper limit / Lower limit, Lateral limits (KM), FL series, and Controlling unit (Airspace class). The table lists several routes including UA4, MICRO, WOBAN, EKCOMBE, LIMAD, and VEGAT. A left-hand navigation menu provides access to various sections such as "General (G-GEN)", "ENR 1 National Regulations and Requirements", "ENR 2 Tables and Codes", "ENR 3 Services", "ENR 4 Changes for Aerodromes/Heliports and Air H", "ENR 5", "ENR 6", "ENR 7", "ENR 8", "ENR 9", "ENR 10", "ENR 11", "ENR 12", "ENR 13", "ENR 14", "ENR 15", "ENR 16", "ENR 17", "ENR 18", "ENR 19", "ENR 20", "ENR 21", "ENR 22", "ENR 23", "ENR 24", "ENR 25", "ENR 26", "ENR 27", "ENR 28", "ENR 29", "ENR 30", "ENR 31", "ENR 32", "ENR 33", "ENR 34", "ENR 35", "ENR 36", "ENR 37", "ENR 38", "ENR 39", "ENR 40", "ENR 41", "ENR 42", "ENR 43", "ENR 44", "ENR 45", "ENR 46", "ENR 47", "ENR 48", "ENR 49", "ENR 50", "ENR 51", "ENR 52", "ENR 53", "ENR 54", "ENR 55", "ENR 56", "ENR 57", "ENR 58", "ENR 59", "ENR 60", "ENR 61", "ENR 62", "ENR 63", "ENR 64", "ENR 65", "ENR 66", "ENR 67", "ENR 68", "ENR 69", "ENR 70", "ENR 71", "ENR 72", "ENR 73", "ENR 74", "ENR 75", "ENR 76", "ENR 77", "ENR 78", "ENR 79", "ENR 80", "ENR 81", "ENR 82", "ENR 83", "ENR 84", "ENR 85", "ENR 86", "ENR 87", "ENR 88", "ENR 89", "ENR 90", "ENR 91", "ENR 92", "ENR 93", "ENR 94", "ENR 95", "ENR 96", "ENR 97", "ENR 98", "ENR 99", "ENR 100".

Route Designator (RNP Type)	Significant Point Name	Track MAG	Dist (KM)	(COP)	Upper limit / Lower limit	Lateral limits (KM)	FL series	Controlling unit (Airspace class)	Remarks
UA4 (RNP 4)	Route availability: (1) H24								
▲ MICRO	400500N 1919192W	095 / 254	120 KM		FL 450 / FL 250	18	Odd Even (S) (S)		Ameswell ACC FREQ. 120.300 MHz [Class C]
▲ WOBAN	424030N 0361024W	053 / 233			FL 450 /		Odd Even (S) (S)		[Class C]
▲ EKCOMBE	470812N 026363W	054 / 244	446 KM		/ FL195		Odd Even (S) (S)		Ameswell ACC FREQ. 120.300 MHz [Class C]
▲ LIMAD	484000N 0231300W	054 / 244	163 KM		FL 450 / FL 195		Odd Even (S) (S)		Ameswell ACC FREQ. 120.300 MHz [Class C]
▲ VEGAT	492130N 0210800W								(S)

[www.eurocontrol.int/eaip](http://www.eurocontrol.int/eaip)

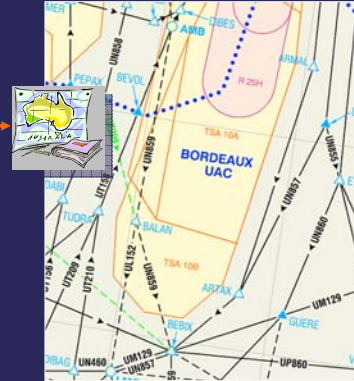
•eAIP Sample:

<http://www.eurocontrol.int/eaip/gallery/content/public/samples/history-en-GB.html>

New possibilities:

•Annotation with NOTAM in force

## Database driven charting



- o Database driven charting
  - Rules based
  - Sophisticated text placement engine
- o Leveraging the latest technology updates

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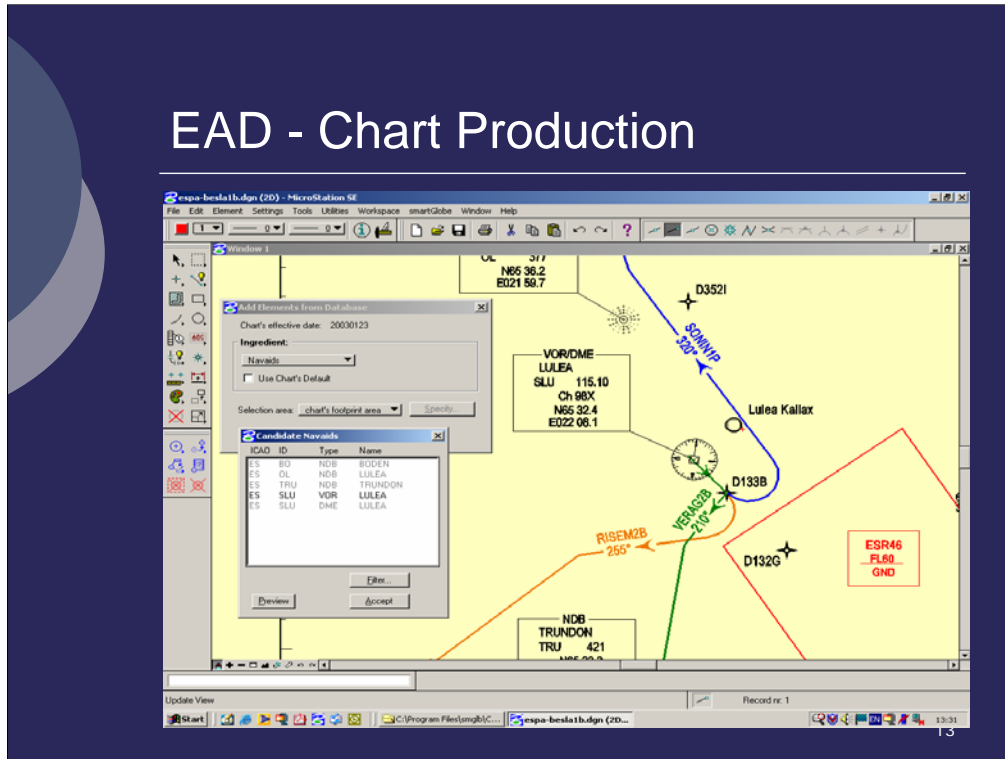
Database driven charting is another technology being enhanced through AIXM. Database driven charting is not new, of course. I see a few companies here that are many years experience in this business. Today, the FAA, EUROCONTROL and NGA are working on new automated charting technology with their industry partners that leverages AIXM. By using AIXM to separate the application layer from the data layer, the charting technology can be ported to and from any aeronautical database.

AIXM with temporary data will enable on the flight charting on demand, we hope. AIXM is not a charting dedicated format; instead, AIXM tries to capture reality. In fact, AIXM is a challenge for database driven charting. It is simple to do database driven charting in product oriented mode it is a bit more difficult but more robust to do it in data oriented mode – use the common data pool.

New kind of charting – such as in the eAIP example of German Military – show previous and new information on the same

Database driven charting combines aeronautical data with sophisticated rule bases to develop charts that look almost identical to conventional charts – with little human cartography support!

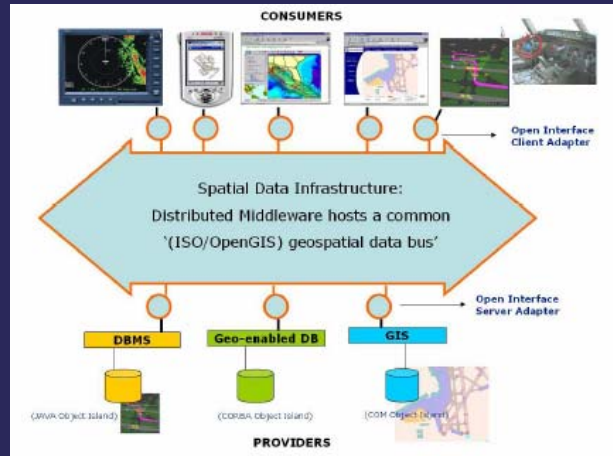
# EAD - Chart Production



New possibilities:

- Visualise changes – see [www.eurocontrol.int/eaip](http://www.eurocontrol.int/eaip) - SVG Charts ([http://www.eurocontrol.int/eaip/gallery/content/public/svg/svg\\_samples.html](http://www.eurocontrol.int/eaip/gallery/content/public/svg/svg_samples.html))
  - Such animated charts could present either a permanent or a temporary change

# Geography Interoperability (Geographic Markup Language - GML)



Taken from "Open Geospatial Information in the Context of Aeronautical Information" by Eurocontrol, March 2005.

- o Supply GIS data from any source to any consumer

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Geography Markup Language is an XML standard for expressing GIS (Geographic Information System) information. GML is an international standard that is increasingly being adopted by GIS vendors and others. AIXM 5 will be built upon GML. We will talk about this more in the next two days. The power of GML is that it enables GIS interoperability so that I can pull GIS data from a variety of data sources without regard for original format. Then I can transmit the information in GML and use it in a variety of different systems like GIS applications, charting applications, situation displays, etc. To illustrate the power of GIS standardization we want to demonstrate two GML viewing products.

## What is a Temporary Flight Restriction (TFR)?



- Airspace restriction for:
- Natural disaster (wildfire)
- Security
- Presidential movement
- Air shows and major sporting events

FDC 4/4328 ZID IL.. FLIGHT RESTRICTION, LAWRENCEVILLE, IL. EFFECTIVE IMMEDIATELY UNTIL FURTHER NOTICE. PURSUANT TO 14 CFR SECTION 91.137(A)(1) TEMPORARY FLIGHT RESTRICTIONS ARE IN EFFECT A AIRCRAFT CRASH ONLY RELIEF AIRCRAFT OPERATIONS UNDER DIRECTION OF INDIANA AIR NATIONAL GUARD ARE AUTHORIZED IN THE AIRSPACE AT AND BELOW 5000 FEET MSL WITHIN A 5 NAUTICAL MILE RADIUS OF 385009N/0873109W AND THE LAWRENCEVILLE /LWV/ VORTAC 057 DEGREE RADIAL AT 005 NAUTICAL MILES. THE INDIANA NATIONAL GUARD, LT COL. COLBURN TELEPHONE 812-877-5278, IS IN CHARGE OF THE OPERATION. THE TERRE HAUTE /HUF/ AFSS, TELEPHONE 812-877-9373, IS THE FAA COORDINATION FACILITY.

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NOTAMS are also an area where AIXM can help. We want to talk to you about a couple of exciting NOTAM prototype and production systems. First at the FAA, we have been developing AIXM-based systems that can fully data model and distribute Temporary Flight Restriction NOTAMS using XML. A Temporary Flight Restriction (TFR) is an airspace restriction put into place for safety or national security reasons including: natural disasters like wildfires, presidential movements and air shows or major sporting events. This example shows a TFR created near the site of an aircraft crash.

## TFR NOTAM Automation Goal

- Challenges
  - Limited NOTAM standardization
  - Manual process for creating NOTAMS
  - Hard to distribute and integrate in geo-spatial ways
- The goal
  - Proof of concept that NOTAMS can be structured and represented in AIXM
  - Deliver multiple geo-referenced products
- AIXM Provides
  - Standardized encoding of TFR NOTAMS
  - Common format delivered into a variety of products to support different users
    - Official traditional NOTAM
    - "Plain Language" view
    - Graphical representations

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Some challenges facing TFR NOTAMS include:

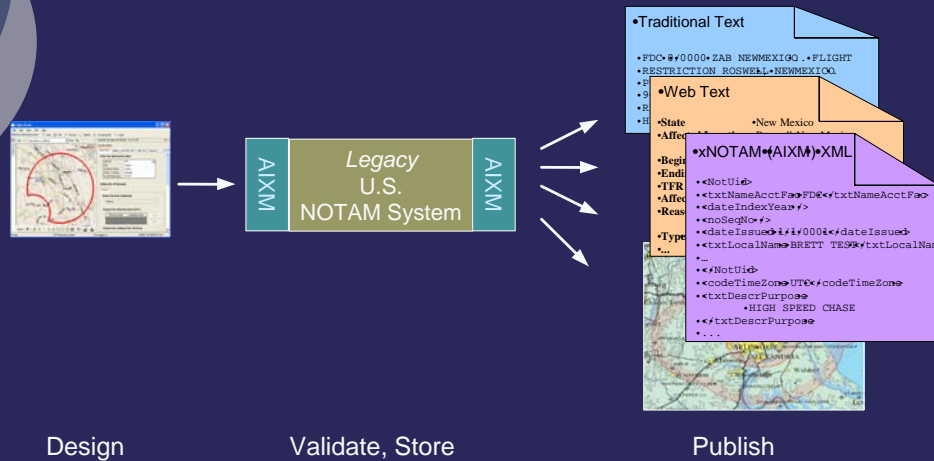
- Limited NOTAM standardization: TFR NOTAM wording is consistent and the formats are poorly defined.
- Time consuming processes for assembling NOTAMS: TFR NOTAM writers rely on manual processes to construct new TFRs.
- Safety issues: NOTAMS are difficult for users to interpret and they are not integrated with other aeronautical products. This means that the end user needs to combine TFR NOTAMS with other aeronautical data to get the complete picture of the airspace system.
- Distribution issues: The system is product based and that limits our ability to create innovative TFR NOTAM products.

The goal was to demonstrate that NOTAMS could be encoded for computer interpretation. To do this work we used XML based on earlier releases of AIXM. In this example AIXM provides a common format for NOTAMS.



# TFR NOTAM System

Wrapping legacy NOTAM system in AIXM



Design

Validate, Store

Publish

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Our data-centric approach to TFR creation can drive a variety of products including those shown on the right: 1) traditional TFR NOTAM text, 2) easy to read Web Text, 3) the NOTAM XML document and 4) graphical mapping outputs like TFR Graphics ([tfr.faa.gov](http://tfr.faa.gov))