Building a Sustainable Data Migration Workflow Using FME!

Presenters: Matt Baker (MAC) & Tom Tiner (Arora)

AASHTO GIS-T 2019     April 24, 2019
MSP Airport
Annual Aircraft Operations: 400,000
Annual Passengers: 38 million

Campus: 3,400 acres
Terminals: 3.5 million square feet

20,000 people employed
$13 billion in economic impact
The Metropolitan Airports Commission (MAC) is dedicated to providing services that consistently exceed the expectations of its customers. Whether it’s providing exciting shopping and healthy dining options at Minneapolis-St. Paul International Airport (MSP), plowing snow from one of its seven airports’ runways, designing and building sustainable facilities, or ensuring the organization’s long-term financial strength, the MAC strives to fulfill its vision statement: Providing your best airport experience.

Created in 1943 by Minnesota state law, the MAC is a public corporation providing coordinated aviation services throughout the Twin Cities metropolitan area. In fact, the MAC operates one of the largest airport systems in the nation, which includes MSP and six general aviation airports. Together these airports help drive the region’s economy and job growth while providing quick, easy access to destinations around the globe.

A 15-member board of commissioners appointed by Minnesota’s governor and the mayors of Minneapolis and Saint Paul establishes the commission’s policies. Those policies are implemented by the commission’s senior leadership and staff. The MAC and its airports are funded through rents and fees paid by airport users, not by general tax dollars.
OUR MISSION
Connecting you to your world

OUR VISION
Providing your best airport experience

STRATEGIC PLAN GOALS

SAFETY, SECURIT, PREPAREDNESS
Keep our airports safe & secure

CUSTOMER EXPERIENCE
Delight our passengers

TALENT
Be a model employer

ENGAGEMENT
Grow & enhance the narrative

FOCUS AREAS

Develop new strategies to enhance
FINANCIAL STRENGTH

Grow stakeholder & community ENGAGEMENT

Deliver a seamless “ONE JOURNEY” EXPERIENCE for MSP Passengers

AIR SERVICE
Grow & enhance air service

ECONOMIC
Maintain our competitive cost structure while maximizing our airports’ economic benefit

INNOVATION
Innovate through opportunities in technology & sustainability
GIS at MSP

“Establish a single authoritative data source for all geospatial data”

1990’s

Siloed GIS

Airport Development
Noise Office

2016

Enterprise GIS

Arora
Program Manager
Solution Architect
Data Analyst

Many consultants

= Many CAD & GIS files
Geospatial Data Challenges

- Too Many Standards
- Georeferencing
- Geometry Types
- Topology
- Attributes
- Metadata
Maintain Data (the biggest challenge)

<table>
<thead>
<tr>
<th>Item</th>
<th>Rank Distribution</th>
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<tbody>
<tr>
<td>Resistance to Change</td>
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<tr>
<td>Data Maintenance</td>
<td></td>
</tr>
<tr>
<td>Lack of Funding</td>
<td></td>
</tr>
<tr>
<td>Staff Skills / Expertise</td>
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<td>Out of Date Data</td>
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<tr>
<td>Lack of Management Understanding</td>
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<td>Staff Skills</td>
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<tr>
<td>Lack of Data</td>
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<tr>
<td>FAA Requirements</td>
<td></td>
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<tr>
<td>Lack of Useful Applications</td>
<td></td>
</tr>
<tr>
<td>Poor Accuracy</td>
<td></td>
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<tr>
<td>Training is Unavailable</td>
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2019

<table>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>Data Maintenance</td>
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<td>Resistance to Change</td>
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<td>Data Quality</td>
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<td>Management Understanding</td>
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<td>Too Much Data</td>
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Growing Demand for Spatial Apps

- Basic Viewer
- “Who is Where”
- Lease Management Systems
- Maintenance Management Systems
- Wayfinding
  - Mobile Devices
  - Kiosks
  - Visually Impaired
  - Computer Aided Dispatch
Automated ETL

Extract, Transform, and Load

TKDA

SEH

Kimley-Horn

+  

=  

AUTODESK

FME

esri

Rethinking Infrastructure®

ARORA
Source files & CAD standards
Airport Geodatabase

- AircraftGateStand
- AircraftGateStandArea
- AircraftWindMovementArea
- AirfieldLight
- AirOperationsArea
- AirportAerodromeHeliport
- AirportSign
- Apron
- ArrestingGear
- DescendingArea
- DisplacedThreshold
- FinalApproachTakesOff
- FrequencyArea
- Infield
- MarkingArea
- MarkingLine
- MovementArea
- PassengerLoadingBridge
- RestrictedAccessBoundary
- Runway
- RunwayArrestingArea
- Runway BlastPad
- RunwayCenterline
- RunwayElement
- RunwayEnd
- RunwayHeliportDesignSurface
- RunwayIntersection
- RunwayLabel
- RunwayLabelPolvoan
AC 150/5300-18B Chapter 5 Geographic Format Templates

Full Versions:

- AutoDesk Format - Template
- Bentley (Microstation) Map Format - Template
- ESRI File Geodatabase Format - Template

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<tr>
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<th>Non-Required (# of FCs)</th>
<th>Required (# of FCs)</th>
<th>Critical (# of FCs)</th>
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<tr>
<td>Lines</td>
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<td>20</td>
<td>62</td>
<td>117</td>
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### Crosswalk table (Health Assessment)

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<tr>
<th>Dataset</th>
<th>Feature Class Name in Standard</th>
<th>Geometry FC</th>
<th>Source</th>
<th>Geometry Data Source</th>
<th>CAD Layers</th>
<th>Data Assessment</th>
<th>Populated Attributes</th>
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- **Dataset**
- **Target FC**
- **Geo Type**
- **Source**
- **Source Geo**
- **CAD Layer**
- **Health**
- **Populated Attributes**
Source Files

- Utilities/Airfield/Landside (34)
- Interior (18)
Develop FME Workbench

- Airside
- Landside
- Interior
- Utility

- Popular Transformers used: InlineQuerier, SpatialRelator, SQLCreator, ListConcatenator, PointOnArea Overlayer, FeatureMerger, SchemaMapper, Matcher, AreaBuilder
Data Conversion
Evaluation & Results

- Multiple iterations
- Geometry
- Attributes
- Reports and Examples

MSP – Interior Investigation Results

**General**
- Need interior CAD file name descriptions (to identify the applicable level)
- ETL should not include creating "pseudo" geometry with exception of door points unless approved by MAC

**Specific geometry observations described by target feature class**

1. Baggage Carousel (hhhagfl.dwg) – Poor – numerous polygons are created to represent each baggage carousel which cannot be further dissolved without having a common attribute. Does not seem to have connectivity between conveyor belt and carousel (Indagfl.dwg - A-ECMA-NICN-EXIST).
2. Building Column – Fair - need to add additional layer(s)
3. Door - Good (-points)
4. Elevator - Poor – existing layers defined are line features that do not include bounding polylines; geometry layers that could represent polygons are not listed as layers (and those layers include moving sidewalks)
5. Escalator (Indafl.dwg) – Poor - FB_ELEV (contains elevators as well as escalators) on stair layer and do not have polylines defined to create a polygon feature. A-GENM layer does not seem contain escalators
6. Floor (LTOPdfl.dwg) – Poor – cannot dissolve FM-baseline to create the floor as recommended, as this procedure randomly connects layers. Reviewing FM-baseline features will illustrate gaps that identify spaces that are not "leased".
7. Moving sidewalk – Poor – inconsistency is geometry representation (sometimes horizontal and vertical lines – sometimes only vertical lines) no bounding polylines to create polygons. Some files noted to have layers that contain moving sidewalks, but those files/layers do not include such features.
8. Space – Fair – some "leasing" are on other layers which prohibits the creation of space polygons for those features
9. Stair - Poor - Stairs also exist under the A-FLOR-STRS-EXIST. But Escalators and Moving sidewalks also exist under this layer. No bounding polylines geometry.

**Recommendation**
- Recommended that layering of features identified above are performed in order to create a sustainable FMW for the interior features.
- Schedule conference call to review specific examples and determine next steps
Evaluation & Results

▪ Geometry

Annotation leader lines are included in the V-POWR-FAA-WIRE-ABND (ex30lb.dwg) and thus will be converted as pipes. This layer (V-POWR-FAA-WIRE-ABND) is also identified as a source in both (ElectricalDuctbank) and (ElectricalCable).
Evaluation & Results

Below is a screenshot of a V-STRM line with two different material types (T1-UTIL.dwg). These differing attributes seem to be describing the same line (pipe) from a geometry perspective.

- Attributes
Evaluation & Results

AGIS 18B+ geodatabase

- 26 Feature Datasets
- 359 Feature Classes
- 66 Feature Classes populated
- Approximately 400 attributes
Deployment and Training

- Local vs onsite variables
- Load FMW’s and QC.gdb (version control)
- FME 101
  - Transformers
  - Common Problems
  - Hands on Exercises
  - Walk through of MAC FMWs
Lessons Learned

- Quality Control
- Value of a health assessment
- Importance of data standards
Thank you

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