FAA Airport Surveying – Geographic Information System (GIS) Program

Airport Data and Information

By: Chris Criswell, Federal Aviation Administration, Office of Airports

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Federal Aviation Administration

Topics

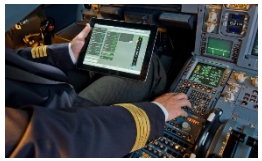
- **Overview of FAA Airport Surveying – GIS Program**
- **Why collect rich, geospatial airport data?**
- **System Demonstration**
- **Questions & Answers**

Airport Data and Information

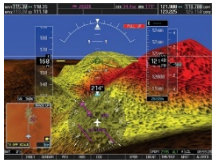
Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight.

•Hazardous Weather

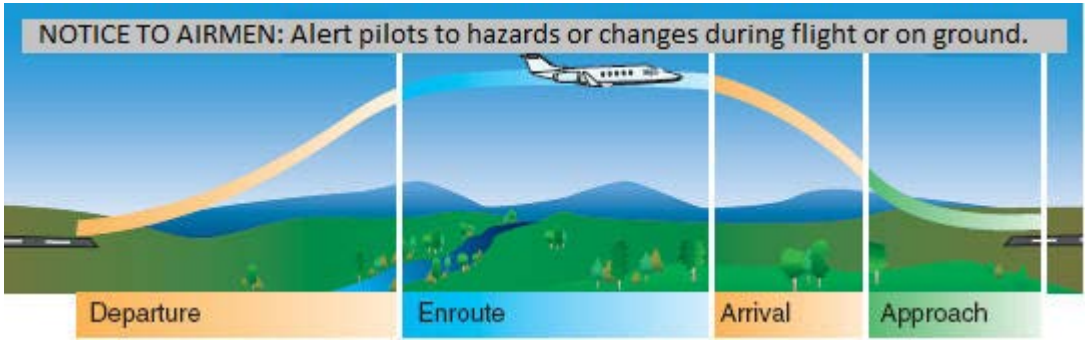
•Data Changes

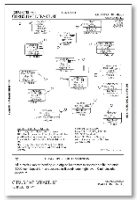


•New Obstructions

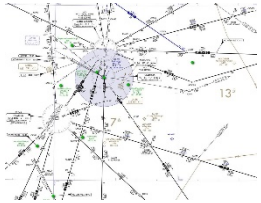


•Taxi and Runway closures

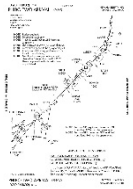




•Airspace Restrictions



•Procedure Changes



Airport Data and Information Users

Internal Users

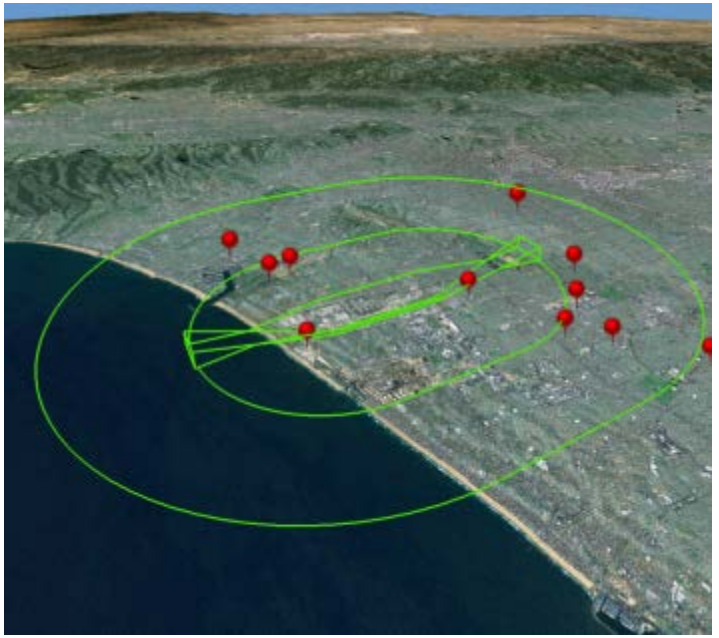
- **Office of Airports**
- **Air Traffic Organization**
- **Mission Support Services**
  - Aeronautical Information Services (AJV-5)
    - Flight Procedures
    - National Flight Data Center (NFDC)
    - Publications (Supplements/Charts)
- **Program Management Office**
  - US Digital / Federal NOTAM Systems
- **Technical Operations**
  - Performance-based Navigation
  - Wide Area Augmentation System (WAAS)
- **Office of Aviation Safety**
  - Flight Standards Services
    - Unmanned Aircraft Systems Integration
    - Flight Technologies & Procedures
    - Aviation Safety GIS
- **Commercial Space Transportation**
- **Next Generation (ANG)**
  - System Wide Information Management (SWIM)

Industry/ External Users

- **Federal Government**
- **U.S. Department of Transportation**
  - Office of Program Development/ GIS Strategic Plan
- **U.S. Department of the Interior**
  - Federal Geographic Data Committee
- **U.S. Department Commerce**
  - National Oceanic and Atmospheric Administration
    - National Geodetic Survey*
    - Marine Charting
- **U.S. Department of Agriculture**
  - National Geospatial Technical Operations Center
- **Industry**
- **Airlines & Avionics Manufactures**
  - Airbus, Boeing, Fore Flight, Garmin, Jeppesen, etc.
- **Universities and Researchers On-Demand**

Airports GIS Vision

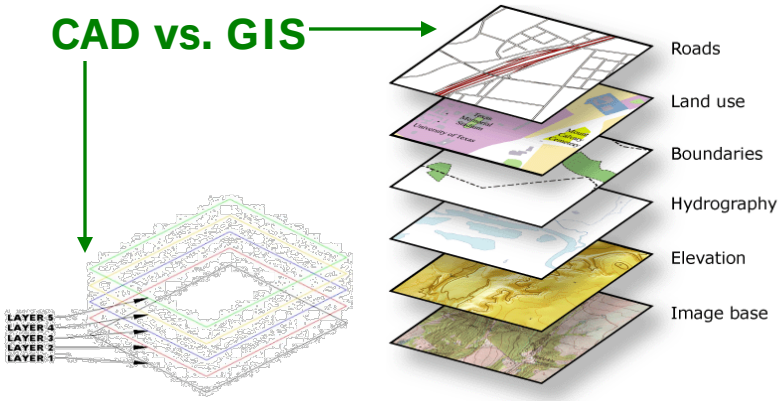
- **Provide an interoperable web-based toolset to electronically collect, collaborate, manage, process, approve, maintain and share airport data addressing the needs of the FAA and its customers *collectively* rather than individually.**



AIRPORTS GIS

WHAT IS GIS?

- In GIS, data is layered like a stack of transparencies



- Data that may come from many different sources is geographically projected, through the use of common datum's and coordinate systems, to align with each other
- Metadata: data about data

Benefits to the Airport?

- A single, web-based database system for verifying and validating data in support of airport design & construction programs
- A GIS planning tool to help airport planners visualize the characteristics of airport facilities & features (runway length, width, surface type)
- A tool to help field personnel address & coordinate airport changes in a timely manner in an integrated environment

Airports GIS Objectives

- **Deployed Airports GIS in 2007**
- **Single portal for airport data entry into the FAA**
  - We had many interfaces and methods for data to be submitted to the AIS, causing confusion and extra workload

- **Eliminate disparate airport data sets**
  - Provide a means to acquire essential data as it is created in a digital form with associated metadata.
  - Takes the first step toward an airport digital dataset.

•What if… the FAA could capture and validate against a defined standard, import data from the ALP, and make it available electronically for whoever needs it?

Airports GIS Objectives (continued)

- **Data standard harmonized with national (Federal Geographic Data Committee) and International standards (AIXM)**

- **Supports Digital Dataset Initiatives**
  - More accurate standards based data for use in airport planning and performance based instrument procedure design
  - Geospatial representation of airports developed to a single standard in a common data format
  - Created a standardized process for conducting airport and aeronautical surveys – Advisory Circulars
  - Previous FAA guidance was not robust enough for the required data. **FLAT FILE (txt files)**

Program Benefits

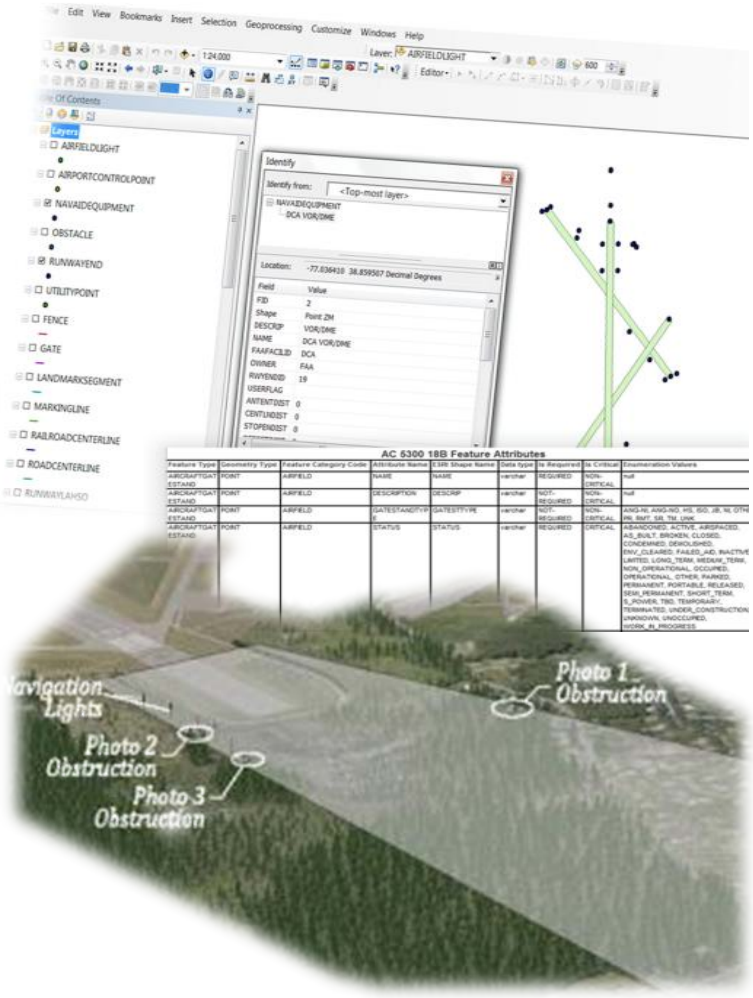
Greater Productivity	**Submission and processing of airport geospatial data**
Dependable	**Data is collected once and then managed through the system ensuring the most current data is readily available**
Connected	**Electronic management and processing of *all* airport data … single access point for managing and updating an airports data**
Best Economics	**GIS is a scalable and interoperable technology allowing others to use and share data without recollecting, because the metadata provides the source, accuracy, collection methodology, etc. of the dataset. Each entity builds on the base data set to meet its own requirements**

Why Implement this Process?

- Common platform for the collection, maintenance and dissemination of airport and aeronautical information and sharing of the data for improved efficiency of airport operations.

- Current initiatives within aviation industry require a data centric airport environment, as opposed to the traditional product based environment.

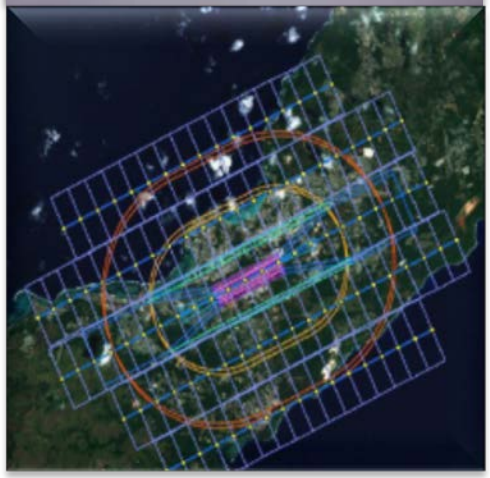
- Focus on **managing** airport and aeronautical data spatially.



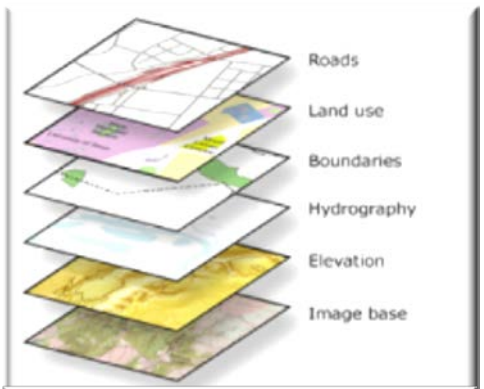
Airports GIS Standards

AC 150/5300-16

AC 150/5300-17



AC 150/5300-18



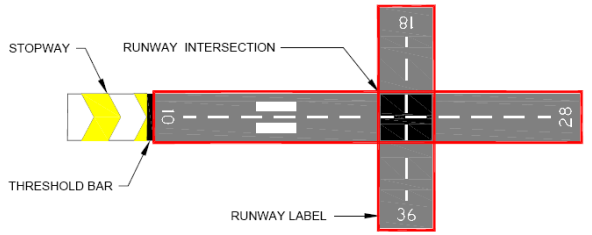
Airports GIS Project Types and Safety Critical Data

- **AC 150/5300-18B is a total of 478 pages.**
  - Chapter 1-4 = 99 pages
  - Chapter 5 = 318 pages of Airport Data Features
  - Appendices = 61 pages
- **Table 2-1**
  - Survey Requirements Matrix
- **Section 4.1.3**
  - Safety-critical data
- **Object Identification Surfaces**
  - Vertically guided approaches
  - Non-vertically guided approaches
- **GIS Schema**

5.4.22. Runway

Definition: A defined rectangular area on an airport prepared for the landing and takeoff of aircraft. [AC 150/5300-13]				
Feature Group	Airfield			
Feature Class Name	Runway			
Feature Type	Polygon			
CADD Standard Requirements				
Layer/Level	**Description**			
C-RUNW-EDGE-	Airfield runway edges			
	Color	**Line type**	**Line Weight**	**Symbol**
AutoDesk Standards	6	Continuous	1	User Defined
MicroStation Standards	5		3	
Information Assurance Level	Restricted			
Equivalent Standards	**AIXM**	*Runway*		Core
	FGDC	*Runway*		
	SDSFIE	*airfield_surface_site*		
Documentation and Submission Requirements	No documentation is required for this feature.			
Related Features				

Data Capture Rules: *In addition to the requirements for runway end collection, capture the runway as a closed polygon limited by the outer edge of the runway edge paint (shoulder side), excluding runway shoulders or stopways. If there are no painted runway edge markings, capture and report the runway as a polygon at its narrowest dimension based on the existing pavement.*



Airports GIS and AC 150/5300-18B

- **Table 2-1**
  - Survey Requirements Matrix
- **Section 4.1.3**
  - Navaids
  - Obstacles
  - Runway End
  - Touchdown Lift Off area
  - Airport Control Points (specifically Airport Elevation, Touchdown Zone Elevation, Displaced Threshold, Stopway End)
  - Runway
  - Stopway
  - Taxiway
  - Visual Aids

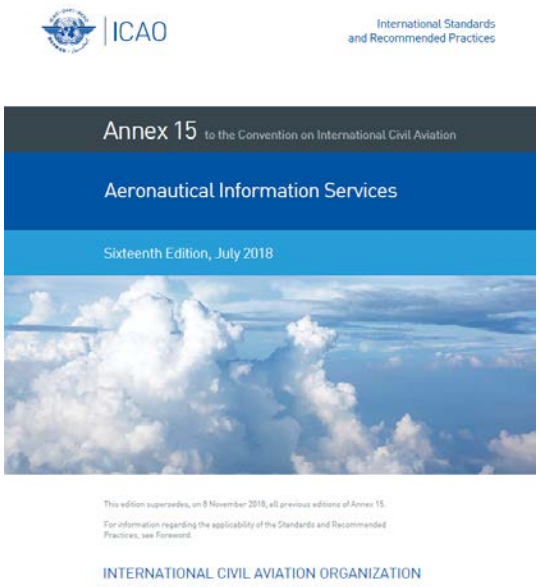
Table 2-1. Survey Requirements Matrix

This table is designed for use in two ways. First, it defines in a general fashion the task required to meet a specific objective. Each task listed is generalized and the process to complete it many contain many other pieces. Users should refer to the text of the referenced AC to ensure that all the required subtasks are completed. The second way to use this matrix is as a checklist to ensure all the required data is collected either before leaving the field or before submitting the data to the FAA.

Intended End Use of the Data ➤ / Required Tasks ▼	AC Reference	Category II or III Operations	Navigational Aid Siting			Airport Layout Plan (ALP)	Airport Obstruction Chart	Construction		Instrument Procedure Development	Pavement Design, Construction, Rehabilitation or Roughness	Airport Mapping Database
			Non-Precision	Precision	Visual			Airside	Landside			
Provide a Survey and Quality Control Plan	150/5300-16/17/18	•	•	•	•	•	•	•	•	•	•	•
Establish or validate Airport Geodetic Control	150/5300-16	•	•	•		•	•	•		•	•	•
Perform, document and report the tie to National Spatial Reference System (NSRS)	150/5300-16	•	•	•	•	•	•			•		•
Survey runway end(s)/threshold(s)	150/5300-18	•		•	•	•	•	•[1]		•	•	•
Monument runway end(s)/threshold(s)	150/5300-18	•		•	•	•	•	•[1]		•	•	
Document runway end(s)/threshold location(s)	150/5300-18	•		•	•	•	•	•[1]		•[1]	•[1]	
Identify and survey any displaced threshold(s)	150/5300-18	•		•	•	•	•	•[1]		•	•	•
Monument displaced threshold(s)	150/5300-18	•		•	•	•[1]	•[1]	•[1]		•		
Document displaced threshold(s) location	150/5300-18	•		•	•	•	•	•[1]		•	•	•
Determine or validate runway length	150/5300-18	•				•	•	•[1]		•	•	•
Determine or validate runway width	150/5300-18	•				•	•	•[1]		•	•	•
Determine runway profile using 50 foot stations	150/5300-18			•[2]		•[2]	•[2]	•[1]		•	•[2]	
Determine runway profile using 10 foot stations	150/5300-18	•		•[2]		•[2]	•[2]	•[1]		•	•[2]	•[2]
Determine the touchdown zone elevation (TDZE)	150/5300-18	•		•		•	•			•	•	
Determine and document the intersection point of all specially prepared hard surface (SPHS) runways	150/5300-18	•				•	•					•
Determine and document the horizontal extents of any Stopways	150/5300-18	•				•	•			•		•
Determine any Stopway profiles	150/5300-18	•				•	•			•		•
Determine if the runway has an associated clearway	150/5300-18	•				•	•					
Survey clearway to determine objects penetrating the slope	150/5300-18	•				•	•			•		•
Determine and document the taxiway intersection to threshold distance	150/5300-18					•						
Determine runway true azimuth	150/5300-18	•		•		•	•			•		•
Determine or validate and document the position of navigational aids	150/5300-18	•	•	•	•	•	•			•		
Determine or validate and document the position of runway abeam points of navigational aids	150/5300-18	•		•	•		•			•		
Determine potential navigational aid screening objects	150/5300-18		•	•	•							
Collect and document VOR receiver checkpoint location and associated data	150/5300-18		•								•	
Perform or validate and document an airport airspace analysis	150/5300-18	•	•	•	•	•	•	•[1]		•		
Collect and document helicopter touchdown lift off area (TLOF)	150/5300-18				•	•	•	•		•	•	•
Collect and document helicopter final approach and takeoff area (FATO)	150/5300-18				•	•	•	•		•	•	•
Collect or validate and document airport planimetric data	150/5300-18					•	•	•	•			•
Determine or validate the elevation of the Air Traffic Control Tower Cab Floor (if one is on the airport)	150/5300-18	•				•	•	•	•			•

Appendix 1
Aeronautical Data Catalogue

- **Airports GIS is essentially a workflow Tool**
  - **Ensures the flow of "safety critical"** aeronautical data and aeronautical information necessary for air traffic management (ATM)
  - Instrument procedure development
  - VFR charting products
  - **Helps identify corrupt, erroneous, late or missing** aeronautical data and aeronautical information
  - **Ensures metadata is provided along with supporting evidence**



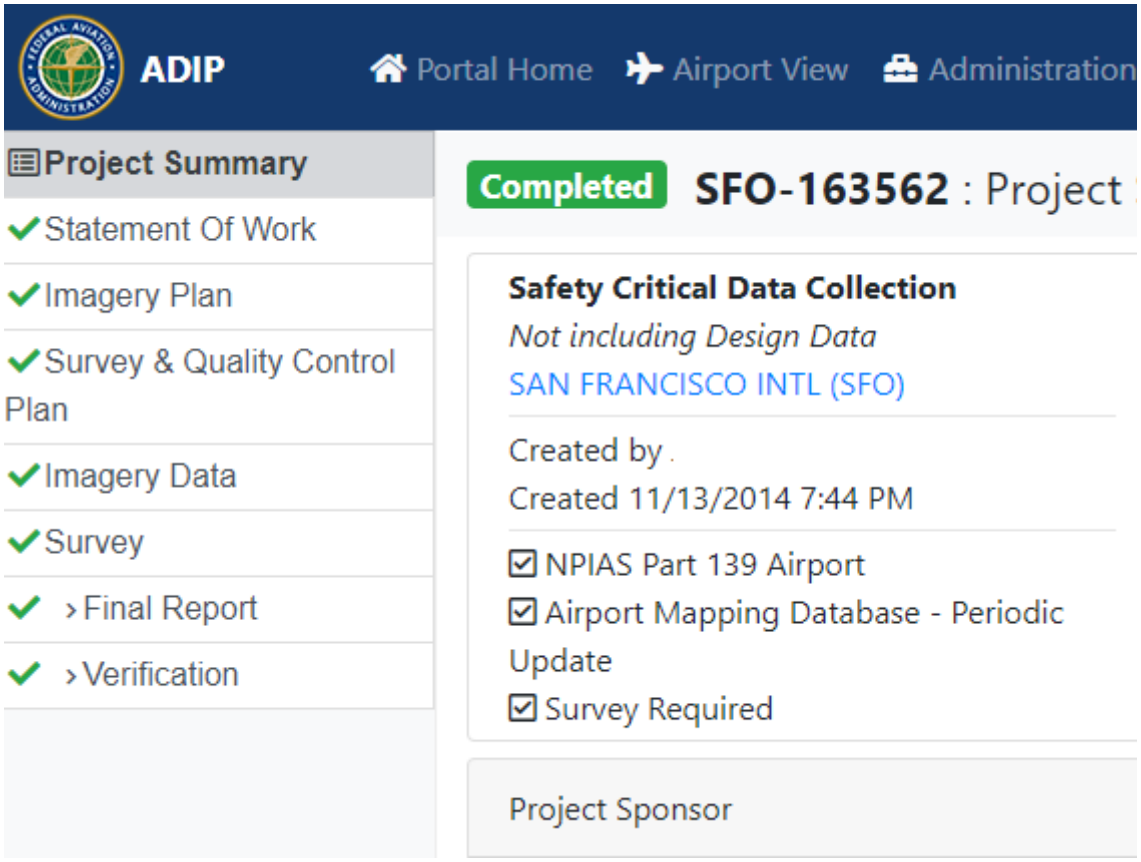
Annex 15 and Aeronautical Data Catalogue

- 4.1.1 The aeronautical data and aeronautical information to be received and managed by the aeronautical information service (AIS) shall include at least the following sub-domains:
- a) national regulations, rules and procedures;
- b**) aerodromes and heliports**;
- c) airspace;
- d) air traffic services (ATS) routes;
- e) **instrument flight procedures;**
- f) radio navigation aids/systems;
- g) **obstacles**;
- h) terrain; and
- i) **geographic information**.

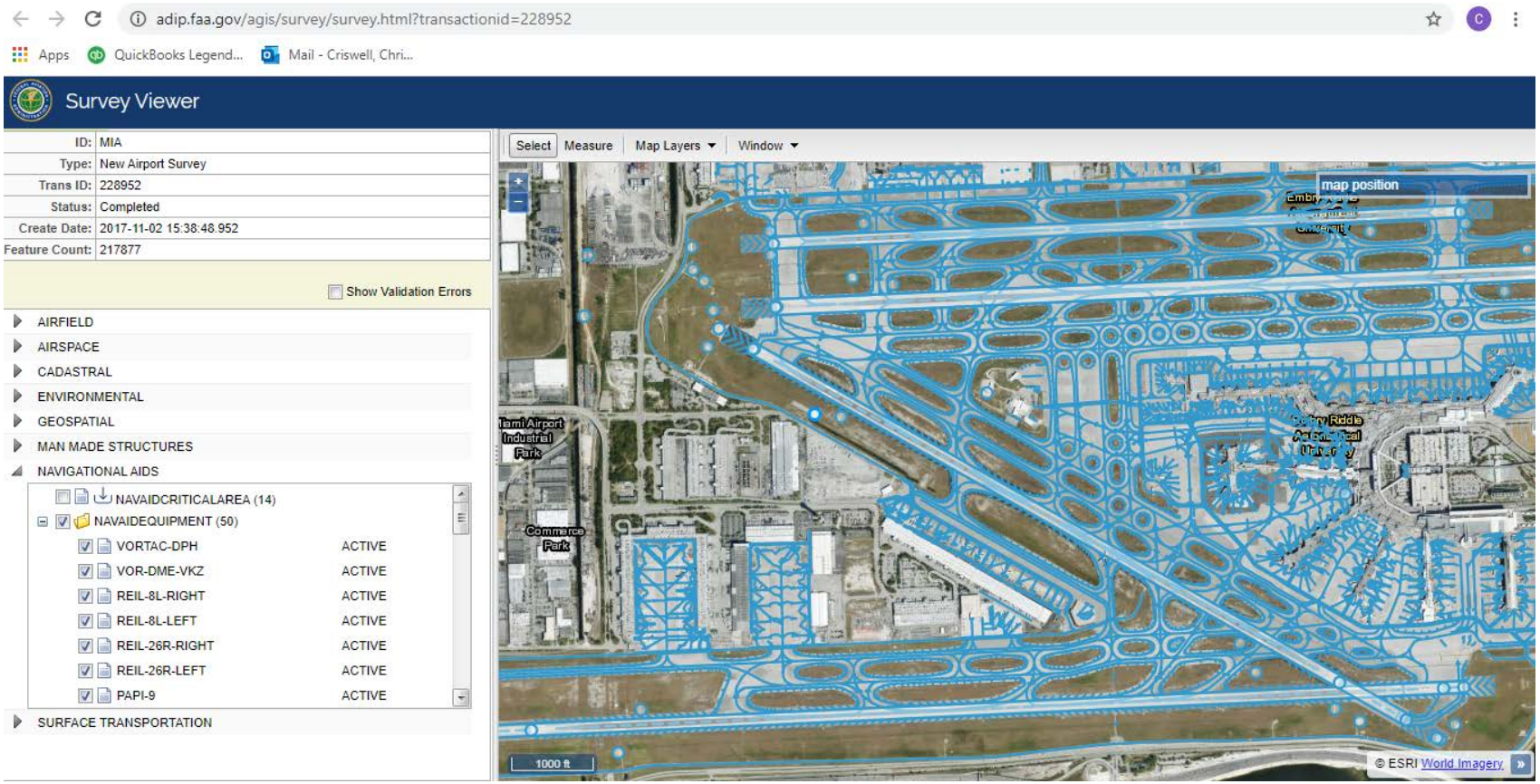
Aeronautical Data Catalog Tables:

- Aerodrome data: Table A1-2
- Instrument flight procedure data Table A1-5
- Radio navigation aids/systems data; Table A1-6
- Obstacle data; Table A1-7 Geographic data;

Airports GIS Workflow



Airports GIS Viewer



Why Change?

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|DME     (14_MFR)               | 422140.0470|-1225201.8010| 1334.0|       |       |       |0721993|
|GS      (14_MFR)               | 422242.4910|-1225224.7530| 1297.1|       |       |       |0721993|
|GS      (14_MFR) PP            | 422241.0590|-1225229.7230|       |       |  400R|   1081|0721993|
|LMM     (14_MFR)               | 422321.0000|-1225250.6000|       |       |      |   3250|0721993|
|LMM     (14_MFR) CLPT          | 422322.5454|-1225249.3030|       |       |    4L|   3250|0721993|
|LOC     (14_MFR)               | 422140.1380|-1225157.8070| 1318.9|       |       |    998|0721993|
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|LOM     (14_MFR) CLPT          | 422702.5454|-1225444.3030|       |       |  221L|  27385|0721993|
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|REIL    (14)                   |            |             |       |       |       |       |0721993|
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|MTI # 2                        | 350343.7826| -895834.7896|       |       |       |       |0721993|
|CPME                           | 350300.2394| -895851.9403|       |       |       |       |0721993|
|RBPM                           | 345414.0699| -895513.5368|       |       |       |       |0721993|
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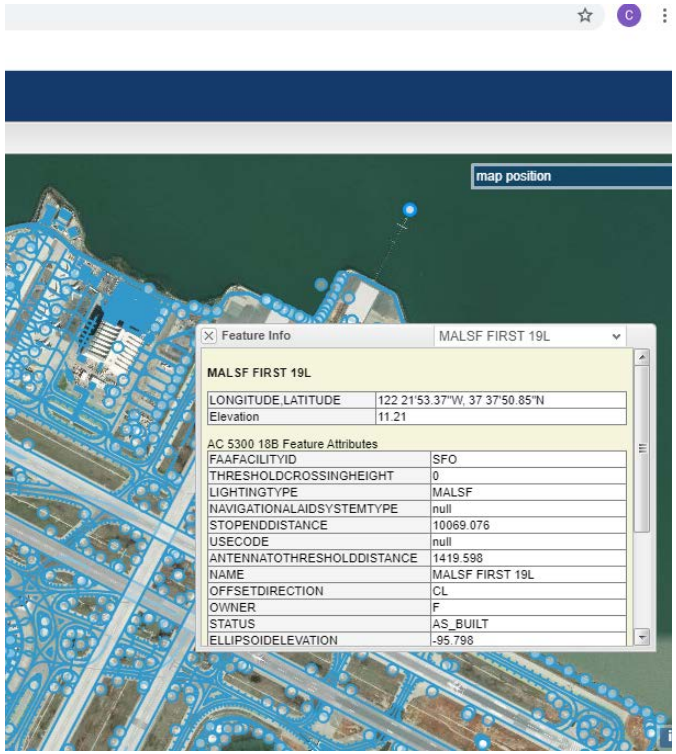
- UDDF (Universal Data Delivery Format) delivered data … it was an outline, it did not tell the whole story!
- Did not provide Metadata
- Did not provide supporting evidence

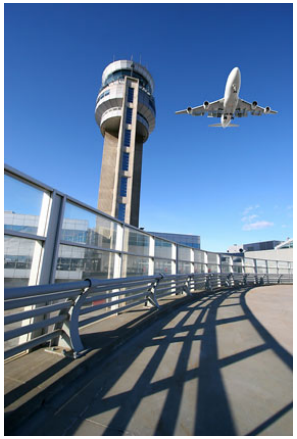
The answer … a rich data set



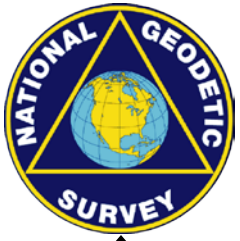
- Geospatial data identifies the geographic location and characteristics of natural or man-made features
- Moving to a geospatial environment allows us to know the geographic location AND the characteristics of a feature.
- A much richer data set …all together in a single place!

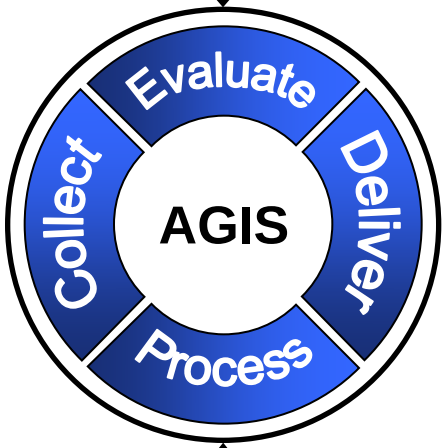
High-Level Operational Concept

Airport Survey Data
AC 150/5300



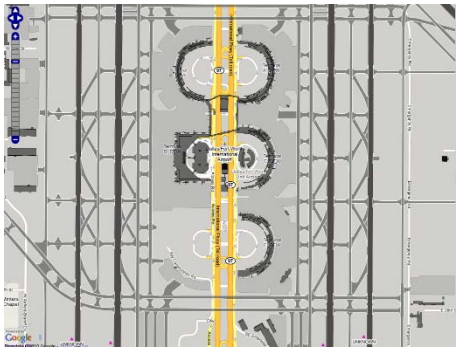
Airport Data Changes





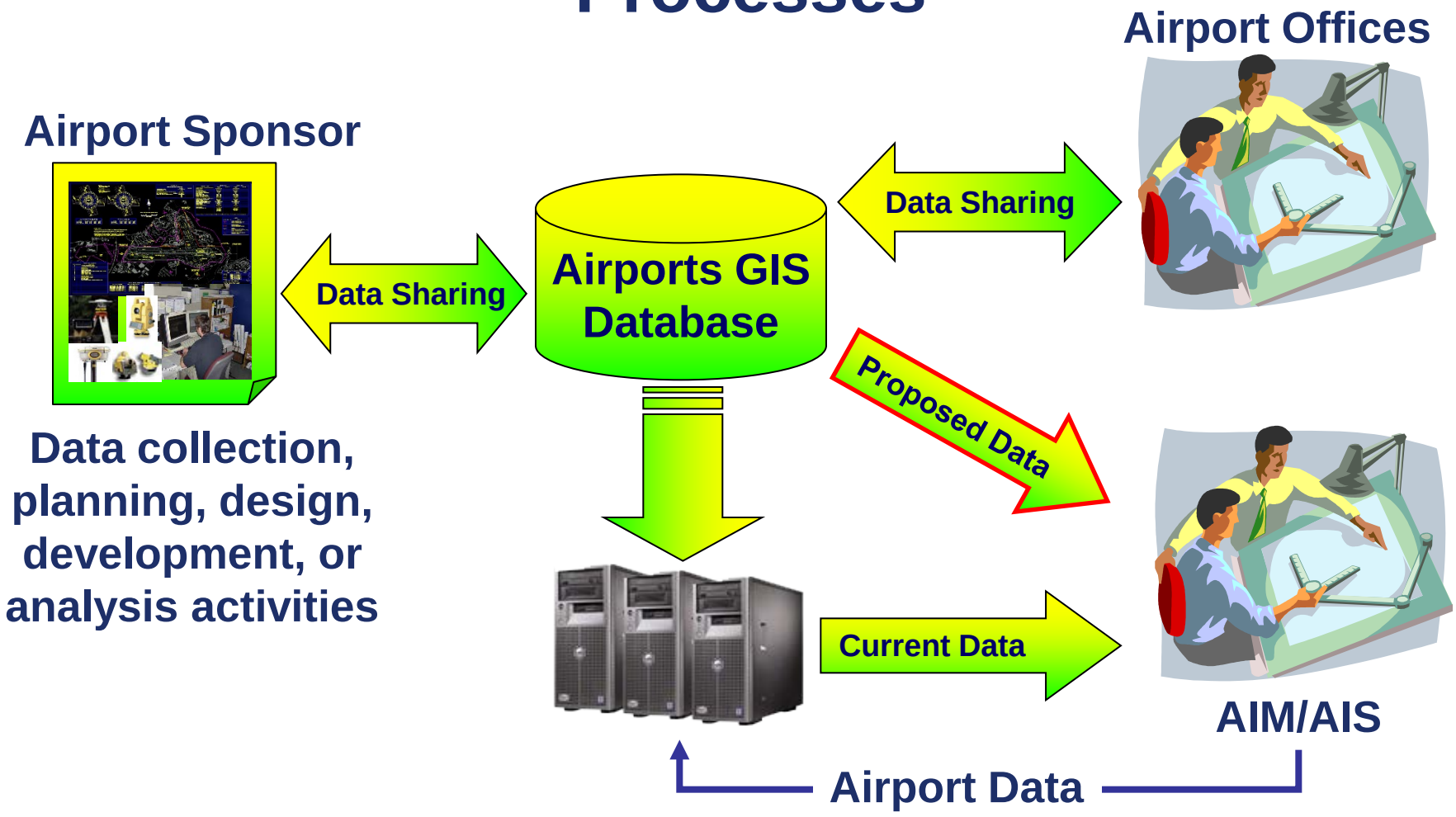
AIM/AIS

Office of Airports

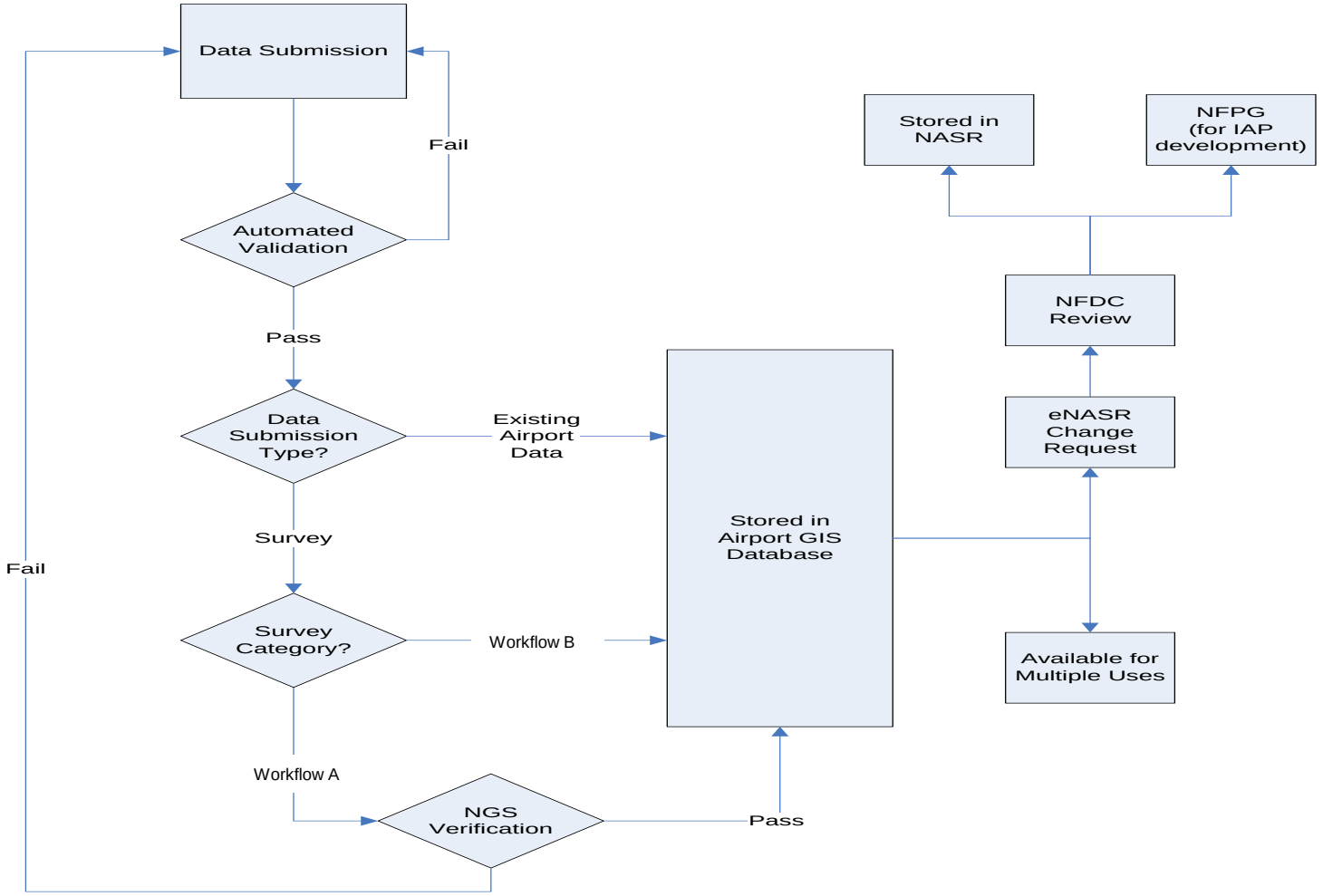


Charting Products and Digital Datasets

Integrating Airports GIS into *Our* Business Processes



Airport GIS – High Level Workflow



Airport GIS – System Demonstration

Airports GIS

Web Application – http://airports-gis.faa.gov

or

http://adip.faa.gov

NEXT STEPS

- **What does the future hold?**

Researching ways to collect airport data more efficiently and cost effectively.

- **RPAS/UAS Technology**
- **Lidar**
- **Satellite Imagery**

Questions & Answers

Contact Information

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Airports GIS

Web Application – http://airports-gis.faa.gov or http://adip.faa.gov