Purpose

Learning Objectives
At the end of this webinar, you will be able to:

• Describe how GIS can be used to help airports realize their land use compatibility goals
• Apply the tools that will help airports and community organizations implement GIS data and applications
• Discuss how to navigate the complexities of the various types of stakeholder organizations involved in airport land use compatibility planning
Five Ways to Get Involved!

1. Join the ACRP IdeaHub community
2. Volunteer for a project panel
3. Prepare a research proposal
4. Answer an ACRP survey
5. Apply the research results

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Today’s Speakers

Randy Murphy
Arora Engineers, Inc.

Presenting

ACRP Report 200

Using GIS for Collaborative Land Use Compatibility Planning Near Airports
Randy Murphy
Principal Investigator

- Geospatial Technical Lead
- Focused on Airport IT solutions for over 25 years
- Has helped numerous airports in the US and abroad implement GIS
- Technical focus on data standards and database design
- Developed airspace analysis tools
- Led development of a U.S. DOT funded Airport Planning & Analysis Tool
- Former ACRP Ambassador
Using GIS for Collaborative Land Use Compatibility Planning Near Airports

Randy Murphy
Arora Engineers, Inc.
ACRP Report 200 Oversight Panel

Daniel P. Bartholomew, Reno-Tahoe Airport Authority, Reno, NV (Chair)
Ataa Aly, San Diego County Regional Airport Authority, San Diego, CA
Scott R. Brummond, Wisconsin DOT, Madison, WI
Andrew Taylor, Cubic Transportation Systems Inc., Alexandria, VA
Diana Umpierre, Pembroke Pines, FL
Daniel White, Fairfax Co. Dept. of Planning & Zoning, Fairfax, VA
Michael Lawrance, FAA Liaison
Christopher J. Oswald, Airports Council International—North America Liaison
Thomas Palmerlee, TRB Liaison
ACRP Report 200: Using GIS for Collaborative Land Use Compatibility Planning Near Airports

- Illustrates how and why GIS is an effective tool for land use compatibility planning around airports
- Provides technical guidance for developing the necessary data and deploying best-of-breed solutions
- Provides several case studies of successful solutions
- Provides a road map for navigating airport, FAA, and local agency organizational structures, procedures, and policies
- Established a framework for and encourages collaboration amongst stakeholders in the land around airports
Many Factors Impact Airports and their Communities

- Encroachment
- Obstacles
- Wildlife
- Noise
- NAVAIDS
- NextGen
Airports Face Challenges

- Encroachment from surrounding communities
- Changes to airspace and obstacles
- New / newly enforced regulation
- Broad and diverse set of stakeholders
Most Recognize the Importance of Collaboration
Many Appreciate / Need / Require Informative and Interactive Maps

**Official Map Regulations**

Adoption of map regulations in support of comprehensive plans and capital improvement programs permits these maps to show the location and extent of existing and proposed public facilities and needs. A potential application of such map regulations would be to encourage compatible development in an area designated for a runway in an airport’s Master Plan.

**Title 55 - Aeronautics**

**CHAPTER 13**

**SECTION 55-13-5.** Public use airport maps; review of plans for development.

The division shall create a map of each public use airport in the State showing airport approach and departure zones, airport safety zones and airport land use zones which a which land use considerations should be made to prevent incompatible uses with aircraft should be updated as needed, but at least every five years.
Some Have Made Interactive Maps Accessible to the Public
GIS Has Helped

- Collect a broad variety of relevant data
- Analyze trends, what-if-scenarios and geographic patterns
- Communicate the results in an intuitive manner
- Foster collaboration
The Problem

GIS has not been used as broadly as it could to address airport land use compatibility problems.
Reasons Behind the Problem

Airport and community planners are often not aware of

- The benefits of using GIS
- How to approach the problem
- How much it costs

GIS Managers, Analysts, and Developers often don’t know

- Where to get data
- How to address underlying needs
Objectives of this Research

- Increase awareness of the benefits of GIS
- Provide guidance on how to get started
- Identify data resources and common functional requirements
- Illustrate success stories
- Foster collaboration

Airport planners who have led the field of airport land use compatibility
GIS Technicians who have implemented award-winning land use tools and established GIS capabilities at a national level
Community and regional planners who have focused on addressing airport needs
Training and outreach Professionals experienced in assimilating technologies into organizational workflows
Prioritization of Land Use Issues

- Air Quality
- UAS
- Solar Panels
- Cultural and Archeological
- Oil & Gas
- Navaid Interference
- Invasive species
- Windfarms
- Utilities
- Populated Areas
- Surface Transportation
- Fauna
- Aircraft Noise
- Obstructions

Relevance to Airports

Degree to which GIS Can Help
Our Deliverables

Guidance

Checklists

Training

Toolkit

Outreach
Acceptance of Federal funding obligates airports to comply with an extensive list of grant assurances

1. General Federal Requirements
2. Responsibility and Authority of the Sponsor
3. Sponsor Fund Availability
4. Good Title
5. Preserving Rights and Powers
6. Consistency with Local Plans
7. Consideration of Local Interest
8. Consultation with Users
9. Public Hearings
10. Air and Water Quality Standards
11. Pavement Preventive Maintenance
12. Terminal Development Prerequisites
13. Accounting System, Audit, and Record Keeping Requirements
14. Minimum Wage Rates
15. Veteran's Preference
16. Conformity to Plans and Specifications
17. Construction Inspection and Approval
18. Planning Projects
19. Operation and Maintenance
20. Hazard Removal and Mitigation
21. Compatible Land Use
22. Economic Nondiscrimination
23. Exclusive Rights
24. Fee and Rental Structure
25. Airport Revenues
26. Reports and Inspections
27. Use by Government Aircraft
28. Land for Federal Facilities
29. Airport Layout Plan
30. Civil Rights
31. Disposal of Land
32. Engineering and Design Services
33. Foreign Market Restrictions
34. Policies, Standards, and Specifications
35. Relocation and Real Property Acquisition
36. Access By Intercity Buses
37. Disadvantaged Business Enterprises
38. Hangar Construction
39. Competitive Access
## Overview of FAA Requirements

### FAA AIP Grant Assurances and Land Use Compatibility

#### 20. Hazard Removal and Mitigation

[The Airport Sponsor] will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards.

#### 21. Compatible Land Use

[The Airport Sponsor] will take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which Federal funds have been expended.
Guide to Organizational Dynamics
Collaborative Roadmap
## Obstruction Analysis

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>GeoType</th>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RunwayEndPoint</td>
<td>Point</td>
<td>Field Survey measurement</td>
<td>Critical point at each runway end that serves as the starting point for critical surfaces with respect to obstruction analysis</td>
</tr>
<tr>
<td>RunwayHelperDesignSurface</td>
<td>Polygon</td>
<td>Derivation from definitions as contained in regulations and guidance, primarily -13</td>
<td>Various surfaces involved in the design of an airport, mostly safety-related. Some of these surfaces are defined as obstacle standards.</td>
</tr>
<tr>
<td>FlightProcedure</td>
<td>Line</td>
<td>Derived from published locations of waypoints/lytoward points and approach procedure plates</td>
<td>Primarily for storage of attribute information required for deriving obstruction surfaces and analyzing obstacles; also useful for visualization of obstruction-related data</td>
</tr>
<tr>
<td>Obstacle</td>
<td>Point</td>
<td>Photogrammetric measurement or field survey</td>
<td>Vertically projecting objects that may interfere with the safe movement of flying and landing aircraft</td>
</tr>
<tr>
<td>ObstructionArea</td>
<td>Polygon</td>
<td>Photogrammetric measurement</td>
<td>Area of regulatory imaginary surface where a group of like objects, like trees or buildings, penetrate the surface</td>
</tr>
<tr>
<td>ObstructionIdSurface</td>
<td>Polygon</td>
<td>Derivation from definitions as contained in federal regulations and guidance</td>
<td>Imaginary, 3D surface against which to compare Obstacle points for various regulatory purposes</td>
</tr>
<tr>
<td>RunwayProtectArea</td>
<td>Polygon</td>
<td>Derivation from definitions as contained in federal regulations and guidance</td>
<td>Obstruction surfaces representing specialized runway protection areas, e.g. Approach Light Plane</td>
</tr>
</tbody>
</table>

### SOFTWARE CAPABILITY

| Function         | Attribute    | Textual Display | Color | CAD/CAM | Database | CAD/3D | GIS/3D | GIS Viewer | GIS Editing | Image Viewer | Image Annotation | Report Generator | Web Application |
|------------------|--------------|-----------------|-------|---------|----------|--------|--------|------------|-------------|--------------|----------------|------------------|-----------------|------------------|
|                  |              | M               | M     | M       | M        | M      | M      | M          | M           | M            | M               | M                | M               |

3D Capabilities are advantageous when the situation of features is directly related to the land use, context, or context area. They can make the current map as displayed on their screen with the option of specifying a title. To be effective, 3D views must render data quickly so that the user can navigate quickly without affecting screen refreshes. This often requires more memory and, in some cases, advanced graphics card, although in some cases, 3D viewing using a web application is sufficiently fast. Although visually
Editable Flier

Land Use Around Airports

Airports and the communities they serve. Airports offer a unique service to local residents and visitors, while bringing jobs, taxes, and growth. Geographically, airports are primed for development around them. Growth around airports can be affected by the location of the airport. These impacts can be mitigated by understanding the airport’s needs and what the community is prepared to handle.

Geographic Information Systems (GIS) can help the airport, local, and regional planners see how effectively and other information that identifies the airport. GIS can be leveraged to understand the airport’s needs, how they interact, and their impacts on a complex area of information. Many GIS is an essential tool for mapping and understanding airport needs.

What Are the Impacts and How Can GIS Help?

Following are a few of the ways in which airports and communities interact and other how GIS can help:

- Noise: Noise from aircraft, particularly the noise of that aircraft, is a concern that is long-term health hazards to nearby residents and businesses. The impact of aircraft noise can be mitigated by understanding what information is needed to help understand, understand, and communicate these results on the better noise analysis

- Airports: Protecting the environment at airports through environmental and natural hazards is important in protecting the skies and the airport. Environmental and natural hazards are important in protecting the skies and the airport.

- Fencing: A variety of other issues can be managed with GIS. Information that is needed to manage noise includes noise, and other factors that affect airport operations. This can be done with GIS.

How to Implement GIS

Get Data

GIS requires relevant data that can be incorporated into a comprehensive understanding of that data. Other data, such as demographics, can be created from data to show patterns and trends that otherwise cannot be seen. For example, the implementation of data systems together with GIS:

- The transportation infrastructure data and regional planning information can be created from data services. In some cases, airport specific
- The infrastructure, and traffic data that is being provided to be utilized by authorized staff and consultants:

Structure the Data

Data can be used in ways that are meaningful and shared in a manner that allows it to be accessed and combined with other data. Data must be reliable, understandable, and adaptable to be beneficial. GIS data is a valuable tool for analyzing and understanding the data that is being used.

Work the Data

Data can be used in ways that are meaningful and shared in a manner that allows it to be accessed and combined with other data. Data must be reliable, understandable, and adaptable to be beneficial. GIS data is a valuable tool for analyzing and understanding the data that is being used.

Publish the Information

While many GIS programs and applications are increasingly being used for business intelligence, there are still many that are used for real-time analysis. GIS data can be published to other applications or other applications for real-time analysis. GIS data can be published to other applications or other applications for real-time analysis.
How Can GIS be applied to Land Use Compatibility Planning Near Airports?
CASE STUDIES
Obstruction Evaluation at ATL
Noise Mitigation at FLL
MAC’s Noise and Operations Monitoring System
DFW – Procedure Studies
Puget Sound Regional Study
FOR ADDITIONAL INFORMATION

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ACRP is an Industry-Driven Program

- Managed by TRB and sponsored by the Federal Aviation Administration (FAA).
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- Conducts research to find solutions.
- Publishes and disseminates research results through free publications and webinars.
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Report 141: Renewable Energy as an Airport Revenue Source
Synthesis 66: Lessons Learned from Airport Sustainability Plans
Synthesis 85: Alternative Fuels in Airport Fleets
Synthesis 93: Sustainability’s Role in Enhancing Airport Capacity
Synthesis 100: Airport Greenhouse Gas Reduction Efforts

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Using GIS for Land Use Compatibility Planning Near Airports

December 10
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