Preliminary Investigation (PI-0224)

Caltrans Division of Research, Innovation and System Information

California Airport Land Use Planning Handbook Update: Survey of Practice

Requested by
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Executive Summary

Background

The California Department of Transportation (Caltrans) Division of Aeronautics is preparing to update its 2011 publication California Airport Land Use Planning Handbook (Handbook). This publication provides guidance to California airport land use commissions, which are required to prepare an airport land use compatibility plan for each public use airport in their jurisdiction.

Aircraft accident data informs the policies and practices designed to improve safety in the airport influence area. The updated handbook will provide more accurate, up-to-date and comprehensive accident data, including latitude and longitude information, which Caltrans will use to identify any changes in the accident location patterns described in the previous handbook and to assess recommendations for developing safety compatibility zones, allowable and prohibited land uses, and maximum densities and intensities for each safety compatibility zone.

To assist Caltrans' efforts in updating the 2011 Handbook, CTC & Associates conducted an in-depth literature search to gather information about available sources of current and comprehensive aircraft accident data. An online survey was also conducted to obtain information from other state aviation programs about their experience with aircraft accident data and the practices these agencies use to address safety planning in the airport influence area.

Summary of Findings

Survey of Practice

An online survey was distributed to selected members of the National Association of State Aviation Officials (NASAO) and the American Association of State Highway and Transportation Officials (AASHTO) Council on Aviation who had experience with aircraft accident data and land use planning practices that are used to address safety near airports. Twelve state transportation agencies responded to the survey.

Aircraft Accident Data Collection and Analysis

Three states responding to the survey—Massachusetts, Minnesota and Pennsylvania—collect and analyze aircraft accident data in connection with land use planning near airports. Of the nine agencies not collecting and analyzing aircraft accident data, Georgia Department of Transportation (DOT) reported that it tracks aircraft accidents through notifications from the Federal Aviation Administration's (FAA's) Flight Standards District Offices in the Southern region or from the airport involved in the incident. Information gathered is limited to whether the airport was directly involved in the accident and whether any safety or nonstandard issues contributed to the accident.

The sources of aircraft accident data among the three states are the National Transportation Safety Board (NTSB) (Massachusetts), the FAA (Massachusetts and Pennsylvania), a state emergency management agency (Pennsylvania) and the Caltrans Airport Land Use Planning Handbook (Minnesota). All three states include latitude and longitude data, not an airport reference point, to identify actual accident locations. Massachusetts has regulations in place that require data reporting, however, Pennsylvania considers data reporting a best practice. Brief case studies summarize the data collection and analysis efforts of Massachusetts, Minnesota and Pennsylvania DOTs. In Minnesota, accident data and analyses are correlated

with land use planning practices by the State Aviation Office and made available to local jurisdictions. In Pennsylvania, accident data are retrieved by the State Aviation Office in response to specific requests for information and/or analysis. Massachusetts DOT uses both of these processes (the State Aviation Office correlates accident data and analyses with land use planning practices and retrieves accident data in response to specific requests).

Nonstate-owned airports are included in the data collection and analysis practices of Massachusetts and Pennsylvania. Local jurisdictions access the accident data and analyses from public records requests (Massachusetts and Pennsylvania), the NTSB web site (Massachusetts), an agency-provided spatial data file (Minnesota), internet web sites (Pennsylvania) and published reports (Pennsylvania). In all three states, data is used at the discretion of the local jurisdiction.

Land Use Planning Practices

All 12 state agencies participating in the survey were given the opportunity to provide information related to land use planning practices near airports, including applicable statutes or regulations. Key findings are summarized below by category:

Safety Zones or Clear Zones

- **Minnesota**: Safety zoning is required for projects to be eligible for funding. The Minnesota Administrative Rules address safety zones for three runway approach zones. The agency also has clear zone requirements that are separate from zoning.
- **Pennsylvania**: State law requires airport hazard zoning, and federal grant requirements are also tied to safety zone protection.
- **Tennessee**: During each airport planning project, the agency ensures that structures, homes or other obstructions which would prevent a safe landing area for emergencies or accidents are not within the runway protection zone (RPZ) and runway safety area (RSA). An airport layout plan (ALP) or master plan project will not be approved without a plan in place to resolve any issues within the RSA, RPZ and other safety zones or clear areas. (Without an approved ALP or master plan, the airport cannot fund projects with Airport Improvement Program (AIP) funding.)
- **Washington**: Sample airport zoning overlay regulations available on the agency's web site show the local application of agency guidance.
- **Wyoming**: A priority rating model is used for airport development grants that gives priority to airports which own or control their RPZs.

Density and Intensity Limits for Residential and Nonresidential Land Uses

- **Massachusetts**: The agency doesn't implement practices related to density and intensity limits because it doesn't own any airports. (The agency oversees airports.)
- **Minnesota**: Guidance from the Minnesota Administrative Rules describes limitations on building plots in a runway safety zone, including minimum ratios with respect to the total site area and maximum site populations.
- **Washington**: Sample municipal airport zoning overlay regulations address density limits in general:

  > Densities and land use requirements of the underlying zoning districts are consistent with the NTSB standards and provide for maximum protection to the public, health,

safety and general welfare of the community and of those citizens working and residing within the airport influence area.

- **Wyoming**: Wyoming Statute 10-5-301 gives airport sponsors the authority to regulate and restrict the size and height of buildings up to 0.5 mile from the boundary of the airport and 6 nautical miles along the approach path from the end of an instrument runway.

Zoning Types in Particular Areas of an Airport Influence Area

- **Massachusetts**: Zoning types allowed in an airport influence area are in agreement with FAA current regulations.
- **Minnesota**: The state's administrative rules include guidance for zoning types allowed in an airport influence area. For example:

  Zone A's permitted uses "may include, but are not limited to, such uses as agriculture (seasonal crops), horticulture, raising of livestock, animal husbandry, wildlife habitat, light outdoor recreation (nonspectator), cemeteries, and auto parking."
- **Pennsylvania**: State land use guidelines mirror FAA land use guidelines for developing around public airports.
- **Tennessee**: The Tennessee Code Annotated does not prohibit specific types of zoning; it only prohibits those that are unnecessary and not for documented airport purposes.
- **Washington**: Sample airport zoning overlay regulations show the local application of agency guidance, including development standards that prescribe uses within aircraft accident safety zones.
- **Wyoming**: Type of land use within the airport influence area is not controlled by the agency.

Height Restrictions/Restrictions on Facility or Building Type

- **Massachusetts**: Height restrictions and restrictions on facility or building type are in agreement with FAA airspace reviews.
- **Minnesota and Tennessee**: Restrictions on facility or building type are based on the airport's zoning types.
- **Washington**: Sample airport zoning overlay regulations show the local application of agency guidance, including development standards that prescribe the criteria applied within the boundaries of the overlay district for buildings or structures.

Related Resources

An in-depth literature search of domestic and international resources was conducted to gather information in three areas: sources of aircraft accident data that included the latitude and longitude of an accident location, state and local aviation program practices for gathering and analyzing aircraft accident data, and methods to prevent the creation of new safety problems near airports. The search identified relatively little in publicly available resources related to these topics, particularly with respect to sources of aircraft accident data. Below are highlights of publications and other resources that were identified in this literature search. Complete details and additional citations are available in the **Detailed Findings** section of this report.

Aircraft Accident Data

Domestic and international resources are provided related to data sources and data analysis. In addition to citations about the NTSB aviation accident database and the Aviation Safety Reporting System, this section includes a 2019 FAA report about guidance and resources for using geographic information systems (GIS) for land use compatibility planning near airports. A 2018 FAA completed research project analyzed accidents and incidents that occurred at or near airports and identified actual or potential airport risks related to those accidents and incidents (a final report does not appear to be publicly available).

International citations focus on new approaches to aircraft accident data analysis, including a 2016 journal article that addresses how data mining techniques can be used to understand complex accidents and a 2013 journal article that classifies air crash details based on several parameters, including longitude and latitude.

Land Use Planning and Zoning

A 2018 Airport Cooperative Research Program (ACRP) research project that remains active is evaluating the effectiveness of various zoning laws about height, hazards and land use compatibility at general aviation airports and their surrounding communities. A 2018 FAA publication offers resources to help local governments and airports understand their roles and offer ideas for compatible development. Numerous state resources are provided for compatible land use planning and zoning.

A 2014 Minnesota DOT research synthesis reviewed the airport safety zoning statutes of all 50 states in addition to surveying 32 state aviation and aeronautics offices to better understand their best practices in airport zoning. A current Minnesota DOT airport zoning web site includes the Airport Zoning Information Warehouse, a series of shapefiles that depict areas zoned by a community's current airport safety zoning ordinance. An airport zoning and compatible land use web site in Pennsylvania includes links to a zoning status report, model zoning ordinances, land use compatibility guidelines and a land use tool kit. A 2017 Wisconsin DOT presentation focuses on RPZs, including RPZ alternatives analysis and case studies.

Safety

A research project is underway to develop a research roadmap that will further define and prioritize needed research in airport safety, including strategies and recommendations. A 2016 ACRP report provides a user's guide and risk assessment tool for RPZs. The tool can be used to assess the risk of an aircraft accident within an RPZ and the resulting risk to people and property, based on land use and population density.

Gaps in Findings

A limited number of transportation agencies responding to the survey collect and analyze aircraft accident data in connection with their land use planning near airports. Additionally, the literature search identified relatively little in publicly available resources (domestic or international), especially related to sources of aircraft accident data.

Next Steps

Moving forward, Caltrans could consider:

- Contacting respondents from Massachusetts, Minnesota and Pennsylvania DOTs to learn more about their data collection and analysis practices.
- Following up with respondents from Massachusetts and Pennsylvania DOTs for clarification about FAA regulations and guidelines that are followed for zoning types in particular areas of an airport influence area.
- Contacting the Massachusetts DOT respondent for details about the agency's use of drones in safety zones and clear zones.
- Engaging with other agencies not responding to the survey to potentially identify other agencies with experience in aircraft accident data collection and analysis.
- Reviewing in detail the statutes and regulations related to land use planning practices near airports that were provided by survey respondents.

Detailed Findings

Background

The California Department of Transportation (Caltrans) Division of Aeronautics is preparing to update its 2011 publication California Airport Land Use Planning Handbook (Handbook). This publication provides guidance to California airport land use commissions, which are required to prepare an airport land use compatibility plan for each public use airport in their jurisdiction.

Aircraft accident data and characteristics are important elements of the 2011 Handbook. The application of accident data informs the policies and practices designed to improve safety in the airport influence area around airports. (According to the 2011 Handbook, the airport influence area is the geographic boundary identified in the airport land use compatibility plan.) Approximately 85 percent of the accident data and characteristics in the 2011 Handbook are from the 1980s and 1990s; the remaining 15 percent is from 2000 to 2009. Some of this data lacks the latitude and longitude of events, which Caltrans proposes to add to the updated handbook to improve the quality of the transportation data available to the airport land use commissions.

Accurate, up-to-date and comprehensive accident data will help Caltrans identify any changes in the accident location patterns described in the 2011 Handbook. This data will also be used to assess recommendations for developing safety compatibility zones, allowable and prohibited land uses, and maximum densities and intensities for each safety compatibility zone.

Caltrans is seeking information about the sources of current and comprehensive aircraft accident data. The agency is also seeking information from other state aviation programs about their experience with aircraft accident data and the practices these agencies use to address safety planning near airports. (In this Preliminary Investigation, “near airports” is defined as the airport influence area, or within 2 miles of an airport’s runway.)

To assist with this information-gathering effort, CTC & Associates summarized the results of an online survey of state departments of transportation (DOTs) that examined these agencies’ experience with aircraft accident data and with land use planning practices that are used to address safety near airports. A literature search was also conducted to identify publicly available sources of aircraft accident data; state and local aviation program practices for gathering and analyzing aircraft accident data, including any state laws or regulations that require reporting of this data; and methods implemented to prevent the creation of new safety problems near airports.

Survey of State Practice

An online survey was distributed to selected members of the National Association of State Aviation Officials (NASAO) and the American Association of State Highway and Transportation Officials (AASHTO) Council on Aviation who had experience with aircraft accident data and land use planning practices that are used to address safety near airports. The survey questions are provided in Appendix A. The full text of survey responses is presented in a supplement to this report.

Summary of Survey Results

Twelve state transportation agencies responded to the survey:

- Georgia.
- Iowa.
- Louisiana.
- Massachusetts.
- Minnesota.
- Montana.
- New Mexico.
- Pennsylvania.
- Tennessee.
- Virginia.
- Washington.
- Wyoming.

Only three of these states—Massachusetts, Minnesota and Pennsylvania—collect and analyze aircraft accident data in connection with their land use planning near airports.

Nine state transportation agencies responding to the survey do not collect and analyze aircraft accident data. Respondents from two of these states—Georgia and New Mexico—provided additional information about their agencies' practices related to aircraft accident data:

- Georgia DOT tracks aircraft accidents through the Federal Aviation Administration's (FAA's) Flight Standards District Offices (FSDO) notifications in the Southern region (see **Related Resources** on page 9) or from an airport that contacts the agency directly. The agency's primary concerns include whether the airport was directly involved in the accident and whether any safety or nonstandard issues contributed to the accident.
- Neither New Mexico DOT nor any other agency in the state gathers aircraft accident data.

Some of the respondents from these nine agencies provided limited information related to land use planning practices. Information from these respondents is included in this Preliminary Investigation where available.

Survey results are summarized below in the following topic areas:

- Aircraft accident data collection and analysis.
- Land use planning practices.
- Related resources.

Aircraft Accident Data Collection and Analysis

Three states—Massachusetts, Minnesota and Pennsylvania—collect and analyze aircraft accident data in connection with their land use planning near airports. Information about their collection and analysis efforts is summarized below in four categories:

- Source of aircraft accident data.
- Latitude and longitude data.
- Regulations that require data reporting.
- Analyses of aircraft accident data.

Source of Aircraft Accident Data

Respondents obtain aircraft accident data from the following sources:

Massachusetts: National Transportation Safety Board (NTSB) and the FAA.

Minnesota: Data from the Caltrans Airport Land Use Planning Handbook.

Pennsylvania: Pennsylvania Emergency Management Agency accident alerts and the FAA accident database.

Related Resources:

National Resources

Accident and Incident Data, Federal Aviation Administration, undated.
https://www.faa.gov/data_research/accident_incident/
This web page includes preliminary accident and incident data from the FAA Office of Accident Investigation and Prevention and from final reports issued by the NTSB.

Aviation Accident Database and Synopses, National Transportation Safety Board, undated.
https://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx
From the web site:

> The NTSB aviation accident database contains information from 1962 and later about civil aviation accidents and selected incidents within the United States, its territories and possessions, and in international waters.

Latitude and longitude data are collected as part of the accident/incident information for the NTSB database.

Flight Standards District Offices (FSDO), Federal Aviation Administration, undated.
https://www.faa.gov/about/office_org/field_offices/fsdo/
FSDO facilitates a number of aviation-related functions, including accident reporting.

State Resource

Pennsylvania Emergency Management Agency, Pennsylvania Emergency Management Agency, undated.
https://www.pema.pa.gov/
From the web site: The Pennsylvania Emergency Management Council establishes policy and direction for the emergency management program statewide.

Latitude and Longitude Data

All three states include the latitude and longitude, not an airport reference point, to identify actual accident locations.

Regulations That Require Data Reporting

Of the three states collecting and analyzing accident data, only Massachusetts has regulations requiring that the data be reported.

Related Resource:

702 CMR 6: Aircraft Accidents, Code of Massachusetts Regulations, Massachusetts General Law (MGL), Commonwealth of Massachusetts, 2018.
https://www.mass.gov/files/documents/2017/10/30/702cmr6.pdf
This section of the Code of Massachusetts Regulations (CMR) includes regulations about reporting and notification of aircraft accidents.

Analyses of Aircraft Accident Data

Respondents from the three states selected the options below that best described the analyses their agencies conduct using aircraft accident data:

- Accident data are collected and analyzed/reported by the State Aviation Office because of state ownership of airports.
- Accident data/analyses are correlated by the State Aviation Office with land use planning practices and made available for local jurisdictions.
- Accident data are retrieved by the State Aviation Office in response to specific requests for information and/or analysis.
- The State Aviation Office has no role or requirement for collecting or utilizing aircraft accident data.

In addition to describing the analyses, respondents reported on the following topic areas:

- Data collection and analysis/reporting required by state statute or conducted as a best practice.
- Nonstate-owned airports included in the data collection and analysis.
- Methods used by local jurisdictions to access the accident data and analyses.
- Use of data governed by state statute or at the discretion of the local jurisdiction.

Survey results from Massachusetts (Table 1), Minnesota (Table 2) and Pennsylvania (Table 3) DOTs are summarized below.

Table 1. Analyses of Aircraft Aviation Data: Massachusetts Department of Transportation

Topic	Description
Analyses	• Accident data/analyses are correlated by the State Aviation Office with land use planning practices and made available for local jurisdictions. • Accident data are retrieved by the State Aviation Office in response to specific requests for information and/or analysis.
State Statute/Best Practice	State statute.
Nonstate-Owned Airports Included	Yes.
Methods for Accessing Information	• Public records request. • NTSB web site.
Use by Local Jurisdiction	Discretion of the local jurisdiction.
Additional Information	The Aeronautics inspector conducts the initial analysis, notifies the FSDO, takes witness reports, directs drone operations and briefs the incident commander to secure the site. *Contact*: Aeronautics inspector, 617-412-3692.

Table 2. Analyses of Aircraft Aviation Data: Minnesota Department of Transportation

Topic	Description
Analyses	Accident data/analyses are correlated by the State Aviation Office with land use planning practices and made available for local jurisdictions.
State Statute/Best Practice	N/A.
Nonstate-Owned Airports Included	N/A.
Methods for Accessing Information	The agency provides the spatial data file if it is requested.
Use by Local Jurisdiction	Discretion of the local jurisdiction.

Table 3. Analyses of Aircraft Aviation Data: Pennsylvania Department of Transportation

Topic	Description
Analyses	Accident data are retrieved by the State Aviation Office in response to specific requests for information and/or analysis.
State Statute/Best Practice	Best practice.
Nonstate-Owned Airports Included	Yes.
Methods for Accessing Information	• Public records request. • Internet web site. • Published report.
Use by Local Jurisdiction	Discretion of the local jurisdiction.

Land Use Planning Practices

All of the state agencies participating in the survey were given the opportunity to provide information related to land use planning practices near airports. Most respondents provided some detail about the methods or practices their agencies have implemented to prevent the creation of new safety problems near airports. Below is a summary of survey results in the following categories:

- Safety zones or clear zones.
- Limits on densities and intensities for land uses.
- Zoning types in particular areas of an airport influence area.
- Height restrictions other than regulations imposed by the FAA.
- Restrictions on facility or building type.
- Other land use planning practices.

When available, respondents also provided information about applicable statutes or regulations, publications and other resources related to each topic (see **Related Resources**, page 17).

Safety Zones or Clear Zones

Table 4 below highlights practices related to safety zones or clear zones.

Table 4. Practices and Guidance for Safety Zones or Clear Zones

State	Description
Georgia	The agency does not directly own or control any airport. However, it sometimes assists airports and communities by encouraging and funding zoning ordinances around airports. The agency also objects to construction of objects that are considered a hazard to air navigation and will comment (if requested) on private development around public use airports.
Louisiana	Sections 2:381 through 2:390 of the Louisiana Laws Revised Statutes establish height and zoning regulations. See page 17 for a link to the statutes.
Massachusetts	The agency uses Counter-UAS (unmanned aircraft systems) with drone use.
Minnesota	• Safety zoning is required for projects to be eligible for funding. The following excerpt from Part 8800.2400 of the Minnesota Administrative Rules addresses land use safety zones: Safety zone A: in the approach zones of a runway, safety zone A extends outward from the end of the primary surface a distance equal to two-thirds the runway length or planned runway length. Safety zone B: in the approach zones of a runway, safety zone B extends outward from safety zone A a distance equal to one-third the runway length or the planned runway length. Safety zone C: all that land which is enclosed within the perimeter of the horizontal zone defined in subpart 3, item B and which is not included in zone A or zone B. • The agency also has clear zone requirements that are separate from zoning. An October 2005 Policy Statement provides drawings that illustrate the minimum required clear zones and property interests for airports categorized

State	Description
	according to aircraft served, landing aids available and approach minimums planned or established (see Attachment A). See page 17 for links to state statutes and administrative rules about safety zones and clear zones.
Pennsylvania	State law requires airport hazard zoning, and federal grant requirements are also tied to safety zone protection.
Tennessee	During each airport planning project, the agency ensures that the land within the runway protection zone (RPZ) and runway safety area (RSA) does not contain any structures, homes or other obstructions that would prevent a safe landing area for emergencies or accidents. An airport layout plan (ALP) or master plan project will not be approved without a plan in place to resolve any issues within the RSA, RPZ and other safety zones or clear areas. Without an approved ALP or master plan, the airport cannot fund projects using Airport Improvement Program (AIP) funding because it does not have a current ALP or master plan that shows its future development.
Washington	Sample airport zoning overlay regulations available on the agency's web site show the local application of agency guidance. The sample Douglas County ordinance provides for Runway Protection Zone 1, Inner Safety Zone 2 and Inner Turning Zone 3. See pages 19 through 21 for links to compatible land use guidance and to Revised Code of Washington regulations about safety zones and clear zones.
Wyoming	A priority rating model is used for airport development grants that gives priority to airports that own or control their RPZs. See page 21 for links to information about the agency's priority rating model.

Limits on Densities and Intensities for Land Uses

Table 5 below highlights practices related to limits on densities and intensities for residential and nonresidential land uses.

Table 5. Practices and Guidance for Density and Intensity Limits for Land Uses

State	Description
Georgia	The agency does not directly own or control any airport. However, it sometimes assists airports and communities by encouraging and funding zoning ordinances around airports. The agency also objects to construction of objects that are considered a hazard to air navigation and will comment (if requested) on private development around public use airports.
Louisiana	Sections 2:381 through 2:390 of the Louisiana Laws Revised Statutes establish height and zoning regulations. See page 17 for a link to these statutes.
Massachusetts	Since the agency oversees but doesn't own any airports, it doesn't implement practices related to density and intensity limits.
Minnesota	Section 360.066 of the Minnesota Statutes and Part 8800.2400 of the Minnesota Administrative Rules address zoning standards in residential areas. Nonresidential limits are included in Sections 360.061 through 360.074 of the Minnesota Statutes and Part 8800.2400 of the Minnesota Administrative Rule.

State	Description
Minnesota	An example of the type of guidance included in the administrative rules are limitations on building plots in Zone B, including minimum ratios with respect to the total site area and maximum site populations. See page 17 for links to the statutes and administrative rules.
Pennsylvania	See page 18 for a link to state guidance about land use compatibility, including density and intensity limits.
Washington	References to density limits in sample municipal airport zoning overlay regulations address density generally: Densities and land use requirements of the underlying zoning districts are consistent with the NTSB standards and provide for maximum protection to the public, health, safety and general welfare of the community and for those citizens working and residing within the airport influence area. See pages 19 through 21 for links to compatible land use guidance and to Revised Code of Washington regulations.
Wyoming	Wyoming Statute 10-5-301 gives airport sponsors the authority to regulate and restrict the size and height of buildings up to 0.5 mile from the boundary of the airport and 6 nautical miles along the approach path from the end of an instrument runway. There is no distinction between residential and nonresidential land uses. See page 21 for a link to the statute.

Zoning Types in Particular Areas of an Airport Influence Area

Table 6 below highlights practices related to zoning types that are allowed and prohibited in an airport influence area.

Table 6. Practices and Guidance for Zoning Types in an Airport Influence Area

State	Description
Georgia	The agency does not directly own or control any airport. However, it sometimes assists airports and communities by encouraging and funding zoning ordinances around airports. The agency also objects to construction of objects that are considered a hazard to air navigation and will comment (if requested) on private development around public use airports.
Louisiana	Sections 2:381 through 2:390 of the Louisiana Laws Revised Statutes establish height and zoning regulations. See page 17 for a link to the statutes.
Massachusetts	Zoning types that are allowed in an airport influence area are in agreement with FAA current regulations.
Minnesota	Guidance for zoning types allowed in an airport influence area is included in Sections 360.061 through 360.074 of the Minnesota Statutes and Part 8800.2400 of the Minnesota Administrative Rule. Below is an example of the use restrictions included in the state's administrative rules: Zone A's permitted uses "may include, but are not limited to, such uses as agriculture (seasonal crops), horticulture, raising of livestock, animal husbandry, wildlife habitat, light outdoor recreation (nonspectator), cemeteries, and auto parking."

State	Description
Minnesota	Appropriately sized building plots within Zone B are described as being not less than three acres. Uses specifically prohibited in this zone are identified and include churches, hospitals, schools, theaters, stadiums, hotels and motels, trailer courts, camp grounds, and other places of public or semipublic assembly. See page 17 for links to the statutes and administrative rules.
Pennsylvania	Zoning types allowed depend on the area. Structures and vegetation that exceed approach slopes into public airport runways are prohibited. State land use guidelines mirror FAA land use guidelines for developing around public airports.
Tennessee	In Tennessee, zoning is controlled by the county or city. The Tennessee Code Annotated does not prohibit specific types of zoning; it only prohibits those that are unnecessary and not for documented airport purposes.
Washington	Sample airport zoning overlay regulations available on the agency's web site show the local application of agency guidance, including development standards that prescribe uses within Aircraft Accident Safety Zones. See pages 19 through 21 for links to compatible land use guidance and to Revised Code of Washington regulations.
Wyoming	The agency does not control the type of land use within the airport influence area.

Height Restrictions Other Than Regulations Imposed by the Federal Aviation Administration

Table 7 below highlights practices related to height restrictions other than regulations imposed by the FAA.

Table 7. Practices and Guidance for Height Restrictions Other Than FAA Regulations

State	Description
Georgia	The agency does not directly own or control any airport but does object to construction of objects that are considered a hazard to air navigation and will comment (if requested) on private development around public use airports.
Louisiana	Sections 2:381 through 2:390 of the Louisiana Laws Revised Statutes establish height and zoning regulations. See page 17 for a link to the statutes.
Massachusetts	Height restrictions are in agreement with agency airspace reviews. See page 17 for a link to the Aeronautics airspace review program.
Minnesota	The agency's height restriction rules mirror those of Federal Aviation Regulation (FAR) Part 77 (Safe, Efficient Use and Preservation of the Navigable Airspace). See page 17 for links to Sections 360.061 through 360.074 of the Minnesota Statutes and Part 8800.2400 of the Minnesota Administrative Rules for guidance.
Pennsylvania	Municipal zoning regulations restrict the height of objects around public airports. The state DOT provides two model ordinances for use by municipalities: • Comprehensive Airport Zoning Model (traditional detailed model ordinance). • Airport District Overlay Model (streamlined model with focus on a simple overlay district). These model ordinances are "based on FAR Part 77 (height restrictions gradually change from 0 feet directly at the airport up to about 1920 feet above the airport

State	Description
	runway surface, depending upon the distance from the airport and type of runways in use; height restrictions are broken into five Surface Zones, which are defined by FAA and are a function of the airport's physical and runway feature)." See page 18 for a link to the Pennsylvania DOT publication Airport Zoning Ordinance Workshop, which includes model ordinances and additional guidance for municipalities.
Tennessee	Municipal zoning regulations restrict the height of objects around public airports.
Washington	See pages 19 through 21 for links to compatible land use guidance and to Revised Code of Washington regulations.

Restrictions on Facility or Building Type

Table 8 below highlights practices related to restrictions on facility or building type.

Table 8. Practices and Guidance for Restrictions on Facility or Building Type

State	Description
Georgia	The agency does not directly own or control any airport. However, it objects to construction of objects that are considered a hazard to air navigation and will comment (if requested) on private development around public use airports.
Louisiana	Sections 2:381 through 2:390 of the Louisiana Laws Revised Statutes establish height and zoning regulations. See page 17 for a link to the statutes.
Massachusetts	Restrictions on facility or building type are in agreement with the agency's airspace reviews. See page 17 for a link to the Aeronautics airspace review program.
Minnesota	Required zones have prohibitions on facilities and building types. For example, the state's administrative rules indicate that "Zone A shall contain no buildings, temporary structures, exposed transmission lines, or other similar land use structural hazards, and shall be restricted to those uses which will not create, attract, or bring together an assembly of persons thereon." See page 17 for links to Sections 360.061 through 360.074 of the Minnesota Statutes and Part 8800.2400 of the Minnesota Administrative Rules for guidance.
Pennsylvania	See page 18 for a link to state guidance about land use compatibility, including restrictions on facility or building type.
Tennessee	Restrictions on facility or building type are based on the airport's zoning types.
Washington	Sample airport zoning overlay regulations available on the agency's web site show the local application of agency guidance, including development standards that prescribe the criteria applied within the boundaries of the overlay district for buildings or structures. See pages 19 through 21 for links to compatible land use guidance and to Revised Code of Washington regulations.

Other Land Use Planning Practices

Respondents from Massachusetts and Washington State DOTs described other land use planning practices. Survey results are summarized in Table 9 below.

Table 9. Other Land Use Planning Practices

State	Description
Massachusetts	The agency participates in safety seminars and airport emergency exercises, and provides safety outreach to airports.
Washington	The agency "stay[s] in close coordination with FAA on obstruction analysis."

Related Resources

Below are publications and other resources supplied by survey respondents about their agencies' land use compatibility guidance and practices.

Louisiana

Title 2, Aeronautics, Louisiana Laws Revised Statutes, 2017.
https://law.justia.com/codes/louisiana/2017/code-revisedstatutes/title-2/
Sections 2:381 through 2:390 establish height and zoning regulations.

Massachusetts

MassDOT Aeronautics Airspace Review, Aeronautics Division, Massachusetts Department of Transportation, undated.
https://www.mass.gov/massdot-aeronautics-airspace-review
From the web site:

> Airspace reviews determine whether a construction or alteration project will obstruct the safe-altitude boundaries of a runway or airport, or otherwise interfere with a pilot's ability to fly safely. Some examples of obstructions are solar panels, cranes, wind turbines, and tall buildings, lights, flags or utility poles.

The web site provides a general discussion to help users determine if an airspace review is required and provides a link to request a review.

Minnesota

Sections 360.061 to 360.074, Airport Zoning, Chapter 360, Minnesota Statutes, 2019.
https://www.revisor.mn.gov/statutes/cite/360
Included in this discussion of zoning regulations are airport hazard prevention, minimum standards and land uses.

Part 8800.2400, Airport Zoning Standards, Chapter 8800, Minnesota Administrative Rules, 2007.
https://www.revisor.mn.gov/rules/8800/?keyword_type=all&keyword=8800&keyword_sg=rule&redirect=0.
From the standards: Contained herein are minimum standards for the zoning of public airports as to airspace, land use safety and noise sensitivity.

Minnesota Airport Land Use Compatibility Manual, Office of Aeronautics, Minnesota Department of Transportation, 2007.
https://www.dot.state.mn.us/aero/planning/documents/airportlandusecompatabilitymanual/airportlandusecompatabilitymanual.pdf
Chapter 3, Compatible Airport Land Uses:
https://www.dot.state.mn.us/aero/planning/documents/airportlandusecompatabilitymanual/airportlandusecompatabilitymanual3.pdf
From Chapter 3: This chapter first discusses the two primary categories of compatibility risks to airports: (1) Uses that put too many people on the ground in harm's way (e.g., a dense residential subdivision or gathering place like a sports stadium); and (2) Airspace obstructions (such as tall buildings and towers) and uses that interfere with actual aircraft flight or may distract pilots (such as those that emit smoke). It then presents a detailed compatible land use table that local governments may utilize in their local zoning ordinances and in development reviews to help protect airport operations and the public safety.

Clear Zone Requirements, Policy Statement No. 1, Office of Aeronautics, Minnesota Department of Transportation, October 2005.
See Attachment A.
From the Policy Statement: In order to restrict land uses which may be hazardous to the operational safety of aircraft and protect life and property in runway approach areas, it shall be the policy of the MnDOT Office of Aeronautics that State participation in acquisition, construction, maintenance, operation and improvement be limited to those airports at which adequate clear zones for the ultimate development of the airport have been acquired and maintained. The minimum required clear zones and property interests are shown on the attached drawings for airports categorized according to aircraft served, landing aids available and approach minimums planned or established. The actual property interests to be acquired will be determined upon consideration of land lines, availability of property, severance and other factors affecting compatible land use of the area surrounding the airport.

Pennsylvania

Pennsylvania Airport Land Use Compatibility Guidelines, Bureau of Aviation, Pennsylvania Department of Transportation, March 1996.
https://www.penndot.gov/Doing-Business/Aviation/Planning%20and%20Zoning/Documents/Pennsylvania%20Airport%20Land%20Use%20Compatibility%20Guidlines.pdf
This guidebook presents general guidance for compatible land use near airports.

Airport Zoning Ordinance Workshop, Pennsylvania Department of Transportation, undated.
https://www.penndot.gov/Doing-Business/Aviation/Planning%20and%20Zoning/Documents/AHZ%20Presentation%20with%20Handouts.pdf
This lengthy presentation presents Pennsylvania's Airport Hazard Zoning law, Act 164, "in a simple manner" and "[lays] the foundation for statewide compliance with Act 164 by all impacted Municipalities."

Tennessee

Chapter 6, Airport Zoning, Title 42, Aeronautics, Tennessee Code Annotated, 2019.
http://www.lexisnexis.com/hottopics/tncode (use this link to navigate to Title 42; click on the plus sign to expose the chapters and click on "Chapter 6 Airport Zoning")
This chapter includes airport zoning regulations and restrictions.

Washington

Aviation Land Use Compatibility Program, Washington State Department of Transportation, 2019.
https://www.wsdot.wa.gov/aviation/LandUseCompatibilityOverview.htm
From the web site:

> In 1996, Washington State passed land use legislation (RCW 36.70A.510, RCW 36.70.547). Under this provision of the Growth Management Act (GMA), all towns, cities and counties are required to discourage encroachment of incompatible development adjacent to public use airports through adoption of comprehensive plan policies and development regulations. GMA also identifies airports as essential public facilities. WSDOT Aviation provides a technical assistance program to help communities meet the requirements of the law. The objectives of the program are to:
>
> - Ensure the functions and values of airports are protected and enhanced statewide.
> - Assist towns, cities and counties in meeting update deadlines for comprehensive plans and development regulations.
> - Provide education, workshops and training on best practices to protect airports from adjacent incompatible development and enhance airport operations to meet transportation demand.
> - Showcase the good work of local governments in implementing GMA requirements.

This site offers access to sample goals and policies, model regulations and resources specific to height hazards.

Related Resources:

Note: Washington State DOT's web site indicates that the full version of the January 2011 *WSDOT Airports and Compatible Land Use Guidebook* is available by contacting wrightp@wsdot.wa.gov. Publicly available excerpts from the guidebook are cited below.

The May 2010 draft version of the guidebook is available at https://www.wsdot.wa.gov/NR/rdonlyres/E3CDBE01-9078-47D2-A51B-D50DD8ECA1F8/0/LandUseUpdatedGuidebookSM_V2.pdf. See Appendix E, Learning More About: Describing and Evaluating Airport Safety Concerns, beginning on page 143 of the PDF, for a discussion of aircraft accident data.

Executive Summary: **WSDOT Airports and Compatible Land Use Guidebook**, Washington State Department of Transportation, January 2011.
https://www.wsdot.wa.gov/NR/rdonlyres/EBDC354E-D319-4B0D-81E1-B5CDC8E34B50/0/ExecutiveSummary.pdf
From the executive summary:

> ***What is the purpose of the compatibility planning checklist?***
> WSDOT Aviation has provided a step-by-step checklist to make airport land use compatibility resources easier to use and understand. The checklist communicates state guidelines and best management practices, and directs users to more detailed reference materials.

How should you use this checklist?
This checklist outlines a six step process for airport land use compatibility planning. The steps take you through research and analysis that will help your jurisdiction make informed decisions about airport land use compatibility. The products you develop as you move through the checklist provide background materials that will help the jurisdiction "show their work" by demonstrating how they arrived at their decisions. This type of transparency supports public outreach programs and is useful for supporting local decision-making if challenged before the Growth Management Hearings Boards. This checklist will help you craft defensible, objective policies and zoning regulations.

Chapter 2, Airport Land Use Compatibility Planning Step by Step, *WSDOT Airports and Compatible Land Use Guidebook*, Washington State Department of Transportation, January 2011.
https://www.wsdot.wa.gov/NR/rdonlyres/F8E55952-8EEC-4499-9BCC-DE816FB261F7/0/8-Appendix%20D.pdf
From the introduction: This chapter will take you step by step through the process of identifying and evaluating airport land use compatibility issues that affect your community. Then you will learn how to incorporate the results into the amendment of your comprehensive plan and development regulations. You will also learn about:

- The types of airport and land use data important to your analysis.
- Where to find airport related data for your analysis.
- Specific types of airport land use compatibility concerns.
- Land use strategies available for addressing these concerns as part of the comprehensive plan and development regulations amendment or adoption process.
- The importance of coordination with WSDOT Aviation and the airport and aviation stakeholders in your community.

Note: The ordinance cited below is an example of the type of airport overlay zoning district required in Washington.

Chapter 17.62A, Airport Overlay Zoning District, *Sunnyside Municipal Code*, Sunnyside, Washington, Ordinance 2019-01, passed January 7, 2019.
https://www.codepublishing.com/WA/Sunnyside/html/Sunnyside17/Sunnyside1762A.html
This ordinance describes land use requirements for six safety zones:

- Runway Protection Zone—Zone 1.
- Inner Safety Zone—Zone 2.
- Inner Turning Zone—Zone 3.
- Outer Safety Zone—Zone 4.
- Sideline Zone—Zone 5.
- Airport Operations Zone—Zone 6.

Chapter 36.70, Planning Enabling Act, Revised Code of Washington, Washington State Legislature, undated.
Chapter 36.70: https://apps.leg.wa.gov/RCW/default.aspx?cite=36.70
Chapter 36.70.547: https://app.leg.wa.gov/RCW/default.aspx?cite=36.70.547
Chapter 36.70 provides "the authority for, and the procedures to be followed in, guiding and regulating the physical development of a county or region through correlating both public and private projects and coordinating their execution with respect to all subject matters utilized in developing and servicing land, all to the end of assuring the highest standards of environment for living, and the operation of commerce, industry, agriculture and recreation, and assuring maximum economies and conserving the highest degree of public health, safety, morals and welfare." Chapter 36.70.547 addresses siting of incompatible uses at general aviation airports.

Wyoming

Wyoming Priority Rating Model for Project Evaluation, Wyoming Aeronautics Commission, Wyoming Department of Transportation, 2018.
http://www.dot.state.wy.us/files/live/sites/wydot/files/shared/Aeronautics/Planning/PRM/2018%20Final%20PRM%20Document_Approved_061918.pdf
From the manual: The purpose of the priority rating model is to evaluate and rank projects for planning, budgeting and granting by utilizing objective information to make decisions considering the collective needs of the state's aviation system.

Related Resource:

> **Rules, Regulations and Policies**, Aeronautics Division, Wyoming Department of Transportation, undated.
> http://www.dot.state.wy.us/home/aeronautics/rules_and_policies.html
> Links to information about the agency's priority rating model are available at this web page.

Section 10-5-301, Zoning: Power of Counties, Cities and Towns, Chapter 5, Wyoming Statutes, 2010.
https://law.justia.com/codes/wyoming/2010/Title10/chapter5.html
This statute addresses height restrictions in the airport influence area.

Other States' Airport Zoning Statutes

Florida

Chapter 333, Airport Zoning, 2019 Florida Statutes, 2019.
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&URL=0300-0399/0333/0333.html

Michigan

Act 23, Airport Zoning Act, Michigan Compiled Laws Complete Through PA 47 of 2019, Legislative Council of Michigan, 2019.
http://www.legislature.mi.gov/documents/mcl/pdf/mcl-act-23-of-1950-ex-sess-.pdf

Wisconsin

Airport Zoning Ordinance (Sample), Wisconsin Department of Transportation, October 2011.
https://wisconsindot.gov/Documents/doing-bus/aeronautics/resources/luzone-ord.pdf

Related Resources

An in-depth literature search of domestic and international resources was conducted to gather information about sources of aircraft accident data that included the latitude and longitude of an accident location, state and local aviation program practices for gathering and analyzing aircraft accident data, and methods to prevent new safety problems near airports. The search identified relatively little in publicly available resources related to these topics, specifically sources of aircraft accident data.

Publications and other resources that were identified in this search are organized below in the following topic areas:

- Aircraft accident data and tools.
- Land use planning and zoning.
- Safety.

Aircraft Accident Data and Tools

Data Sources

Domestic

Airport Safety Database and Analysis, Project 22, Partnership to Enhance General Aviation Safety, Accessibility and Sustainability (PEGASAS), Federal Aviation Administration, 2019.
https://www.pegasas.aero/projects/airport-safety-database-and-analysis
From the project summary: The objective is to analyze accidents and incidents that occurred at or near airports and to identify actual or potential airport risks related to those accidents and incidents. The secondary goal is to provide input on the development of metrics for future analysis reports to identify the top risks for airport safety.

Note: A final report for this project, which was conducted during the period June 2016 through June 2018, does not appear to be publicly available. More information about the project is available from the magazine article cited below.

Related Resource:

"Reducing Runway Incursions," Ryan Randall, *Discovery*, Spring 2019.
https://newsroom.fit.edu/wp-content/uploads/2019/01/MK-628-1118_FINALweb.pdf (see page 18 of the PDF)
From the article: Another study was led by Florida Tech College of Aeronautics professor and graduate program Chair Debbie Carstens, who worked with a team from Florida Tech, The Ohio State Center for Aviation Studies and Iowa State University's Program for Sustainable Pavement Engineering. The objective of the research was to analyze accidents and incidents that occurred at or near airports and to identify actual or potential airport safety risks related to those accidents and incidents. The secondary goal was to provide input on the development of metrics for future analysis reports to identify the top risks for airport safety.

The benefit of the research is increased insight into eliminating or mitigating the risk factors that result in incidents and accidents by thorough aggregation of all available airport-safety-related data into one database developed by CSRA Inc. (now General Dynamics Information Technology). The data was categorized using the Commercial Aviation Safety Team and the International Civil Aviation Organization (CICTT) taxonomy for occurrence categories and phases of flight. The database, which is not available to the public, can also allow users to see the top 10 airports with the most runway incursions.

"The research helps to identify where future airport safety initiatives should focus by having data be more meaningful by categorizing it into the database," Carstens said. "What we did as part of that research effort is make sure from these data sources we were able to fill in the CICTT taxonomy so the FAA can compare apples to apples."

Aircraft Accident Reports, National Archives, June 2018.
https://www.archives.gov/research/transportation/aircraft-accidents
This web site offers access to aircraft accident reports, including records of the Civil Aeronautics Board, FAA and U.S. Department of Transportation.

"Aircraft Accident Data Sources and Trends," *ACRP Report 27: Enhancing Airport Land Use Compatibility*, Volume 3, Stephanie Ward, Regan Massey, Adam Feldpausch, Zachary Puchacz, Christopher Duerksen, Erica Heller, Nicholas Miller, Robin Gardner, Geoffrey Gosling, Sharon Sarmiento and Richard Lee, 2010.
http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_027AircraftAccidentData.pdf

Note: References and links to the online-only elements of Volume 3 are available in the description of Volume 1 (see http://www.trb.org/Publications/Blurbs/163344.aspx):

> Volume 3: Additional Resources is made up of three individual components that collectively contain some of the resource documents developed to support the information explored in Volume 1. Volume 3 includes additional detail on specific topics of aircraft accident data and third party risk, and on the economic methodology for assessing the costs associated with incompatible land uses. Volume 3 also includes an annotated bibliography that contains approximately 300 entries related to airport land use compatibility.

Related Resources:

"Land Use Fundamentals and Implementation Resources," *ACRP Report 27: Enhancing Airport Land Use Compatibility*, Volume 1**,** Stephanie Ward, Regan Massey, Adam Feldpausch, Zachary Puchacz, Christopher Duerksen, Erica Heller, Nicholas Miller, Robin Gardner, Geoffrey Gosling, Sharon Sarmiento and Richard Lee, 2010.
Report available at http://nap.edu/22960
From the foreword: *ACRP Report 27: Enhancing Airport Land Use Compatibility* presents a comprehensive account of issues associated with land uses around airports. The report is a comprehensive resource to both airports and local jurisdictions near airports. Volume 1 provides guidance to help protect airports from incompatible land uses that impair current and future airport and aircraft operations and safety. Volume 2 details 15 case studies that targeted a wide range of airports and land use issues. The case study sites include large commercial service, military, and general aviation airports and were geographically diverse. Volume 2 also offers states and local governments examples and a common basis for establishing zoning that protects the public interest and investment in airports. Volume 3 includes aircraft accident data, a framework for an economic assessment of airport costs, and an annotated bibliography.

"Land Use Survey and Case Study Summaries," *ACRP Report 27: Enhancing Airport Land Use Compatibility*, Volume 2, Stephanie Ward, Regan Massey, Adam Feldpausch, Zachary Puchacz, Christopher Duerksen, Erica Heller, Nicholas Miller, Robin Gardner, Geoffrey Gosling, Sharon Sarmiento and Richard Lee, 2010.
Report available at http://nap.edu/17633
This volume provides the case studies described in the foreword from Volume 1.

Aviation Accident Database and Synopses, National Transportation Safety Board, undated.
https://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx
From the introduction: The NTSB aviation accident database contains information from 1962 and later about civil aviation *accidents* and selected *incidents* within the United States, its territories and possessions, and in international waters. Generally, a preliminary report is available online within a few days of an accident. Factual information is added when available, and when the investigation is completed, the preliminary report is replaced with a final description of the accident and its probable cause. Full narrative descriptions may not be available for dates before 1993, cases under revision, or where NTSB did not have primary investigative responsibility.

Program Briefing, Aviation Safety Reporting System (ASRS), undated.
https://asrs.arc.nasa.gov/overview/summary.html
From the summary: The ASRS collects, analyzes, and responds to voluntarily submitted aviation safety incident reports in order to lessen the likelihood of aviation accidents.

ASRS data are used to:

- Identify deficiencies and discrepancies in the National Aviation System (NAS) so that these can be remedied by appropriate authorities.
- Support policy formulation and planning for, and improvements to, the NAS.
- Strengthen the foundation of aviation human factors safety research.

Related Resource:

ASRS Database Online, Aviation Safety Reporting System, undated.
https://asrs.arc.nasa.gov/search/database.html
From the web site: The ASRS database is the world's largest repository of voluntary, confidential safety information provided by aviation's frontline personnel, including pilots, controllers, mechanics, flight attendants, and dispatchers. The database provides a foundation for specific products and subsequent research addressing a variety of aviation safety issues.

Data Analysis

Domestic

Improved Data Quality and Analysis Capabilities are Needed as FAA Plans a Risk-Based Approach to Safety Oversight, Report to Congressional Requesters, U.S. Government Accountability Office, May 2010.
https://www.gao.gov/new.items/d10414.pdf
From the introduction: To increase the safety, capacity, and efficiency of the national airspace system, the Federal Aviation Administration (FAA), in cooperation with aviation industry stakeholders and other federal agencies, is developing a new, technologically advanced air traffic management system—the Next Generation Air Transportation System (NextGen). At the same time, FAA is attempting to further enhance aviation safety by shifting to a new data-driven,

risk-based safety oversight approach, which industry and international air traffic management organizations are also adopting. Under this new approach, called a safety management system (SMS) approach, FAA will continue to use data on aviation accidents and incidents—referred to collectively as safety events—to identify and address their causes. In addition, under SMS, FAA plans to use aviation safety data to identify conditions that could lead to safety events and to address them through changes in organizational processes, management and culture. Furthermore, SMS will allow FAA to test the impact of NextGen changes on aviation safety and to identify safety vulnerabilities and mitigating measures.

"Analyzing Relationships Between Aircraft Accidents and Incidents: A Data Mining Approach," Zohreh Nazeri, George Donohue and Lance Sherry, *International Conference on Research in Air Transportation*, 2008.
https://pdfs.semanticscholar.org/d392/018b8fa28140800fe88cdcf6cf1d09869c4b.pdf
From the abstract: In this research we employed a data mining technique to conduct a holistic analysis of aircraft incident data in relation to the accident data. The analysis identifies relationships between the accident and incident data and finds patterns of causal and contributory factors which are significantly associated with aircraft accidents.

FAA Aviation Safety Information Analysis and Sharing (ASIAS), Federal Aviation Administration, undated.
https://www.asias.faa.gov/apex/f?p=100:2:::NO
The web site provides links to the following aviation safety databases, including:

- FAA Accident and Incident Data Systems (AIDS).
- NASA Aviation Safety Reporting System (ASRS).
- Bureau of Transportation Statistics (BTS).

International

"Large-Scale Data Analysis on Aviation Accident Database Using Different Data Mining Techniques," A.B. Arockia Christopher, V. Shunmughavel Vivekanandam, A.B. Antony Anderson, S. Markkandeyan and V. Sivakumar, *The Aeronautical Journal*, Vol. 120, Issue 1234, pages 1849-1866, December 2016.
Citation at https://www.cambridge.org/core/journals/aeronautical-journal/article/largescale-data-analysis-on-aviation-accident-database-using-different-data-mining-techniques/CA5A6324149BE09D7746989CB72466ED
From the abstract: This paper aims to address how data mining techniques can be used to understand complex system accidents in the aviation domain. Decision trees are considered to be the one of the most powerful and popular approaches in knowledge discovery and data mining. The objective is to develop a classification model for aviation risk investigation and reduction using a decision tree induction method that enhances the ability to form decision trees and thereby proves that the classification accuracy of decision trees is greater. Different feature selectors are used in this study in order to reduce the number of initial attributes.

"A Novel Approach to Analyze and Predict Aircrash in Aviation," N. Sivaram and T. Santha, *International Journal of Advanced Research in Computer Science and Electronics Engineering,* Vol. 2, Issue 3, March 2013.
ijarcsee.org/index.php/IJARCSEE/article/download/352/318
From the abstract: Air crash details of data are classified based on the parameters like longitude, latitude and country, which helps to analyze the flight departing. After analyzing the data of flight details will be analyzed based on clustered classes using CART algorithm. The data pertains to accidents involving flights within database were analyzed against accident databases and the results were compared. Decision tree drawn to get the analyzed data in

increasing order ranked the findings by the factor support ratio, the result are displayed revise in text format.

"Assessment of Local Aircraft Crash Risk: Application of a Cluster Analysis as a Statistical Method for Detecting Similar Airports," Christoph Thiel and Hartmut Fricke, *Third International Conference on Research in Air Transportation*, pages 199-206, June 2008.
http://www.icrat.org/icrat/seminarContent/2008/local_aircraft_crash_risk.pdf
From the abstract: The assessment of local aircraft crash risks in the vicinity of airports is of primary importance in numerous safety studies relating to the determination of Third Party Risk due to aircraft accidents. This paper presents an approach of determining local aircraft crash rates by means of a cluster analysis. This statistical method detects similarities between airports in consideration of safety relevant parameters.

Land Use Planning and Zoning

Below are national and state land use planning guidelines and airport zoning resources, including a 2014 Minnesota DOT research synthesis (see page 27) that reviewed the airport safety zoning statutes of all 50 states in addition to surveying 32 state aviation and aeronautics offices to better understand other states' approaches to airport zoning. (*Note*: Links in this document were active at the time of publication.)

National Guidance

Project in Progress: ACRP Project 04-22: Evaluating Compatibility Zoning at General Aviation Airports, start date: May 2017, completion date: August 2018.
Project description at https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4245

Note: While the completion date is listed as August 2018, a final report does not appear to be publicly available and this research continues to be listed as "active."

From the project objective: The objective of the research is to evaluate the effectiveness of the various zoning laws that pertain to height, hazards and land-use compatibility around general aviation airports and their surrounding communities.

The report should address the following issues at a minimum:

- Definition of what is considered an "effective" zoning law and why;
- Comparison of airports and their community's perspective on the effectiveness of existing zoning;
- Evaluation of state and local zoning and/or other laws and regulations;
- Comparison of airports with and without zoning laws to protect airports;
- Lessons learned in ensuring and establishing effective zoning; and
- Up to a 4-page brochure that can stand alone that lists the attributes of effective zoning that airport managers can use when working with their community.

Compatible Land Use: Airports, Federal Aviation Administration, December 2018.
https://www.faa.gov/airports/environmental/land_use/
From the web site: The compatibility of airport land uses is important to both the local government and the airport. Ensuring this compatibility requires understanding how an airport

functions and how it can impact or be impacted by the community that surrounds it. These resources help local governments and airports understand their roles and offer ideas for compatible development.

"Challenges to Implementing Successful Land Use Strategies at Airports," Mary Vigilante, *Challenges to Implementing Successful Land Use Strategies at Airports Conference*, April 2018.
Citation at https://trid.trb.org/view/1600623
From the abstract: This conference sought to bring together airport planners with a direct connection to airport management and community planners to discuss land use planning around airports. … The first plenary session focused on the airport planning context and the second plenary session focused on the planning jurisdiction context. The remainder of the event included … breakout sessions in which participants worked together to develop a strategy to address the land use challenges of a fictional airport and jurisdiction.

ACRP Report 38: Understanding Airspace, Objects and Their Effects on Airports, Leigh Fisher, 2010.
Report available at https://www.nap.edu/14454
From the foreword: The Guidebook first lists and describes the key airspace protection criteria and how they are to be applied, including Federal Aviation Regulations Part 77; United States Standard for Terminal Instrument Procedures (TERPS); Advisory Circular 150/5300-13, Airport Design; and one-engine-inoperative (OEI) requirements. The Guidebook then clarifies the roles and responsibilities of key stakeholders, including the FAA, the airport, local authorities who issue building permits, and developers. The Guidebook concludes with recommendations for best practices for airports, local planning and zoning agencies, and developers that should significantly mitigate airspace-building development conflicts.

State Practices and Guidance

Multiple States

Airspace Protection and Land Use Zoning: A Nationwide Review of State Statutes, Minnesota Department of Transportation, February 2014.
http://www.dot.state.mn.us/research/TRS/2014/TRS1401.pdf
From the introduction: Airport owners are responsible for protecting airports from hazards that could interfere with the safe operation and navigation of the aircraft they serve. Airport owners must comply with various state and federal regulations designed to prevent obstructions to airspace and to ensure compatible land uses around airports. States use several methods to achieve this compliance, including requiring permits for tall structures and establishing airport zoning. Airport zoning generally falls into two categories: height limitation zoning and land use zoning. Most states empower local governments to adopt and enforce airport zoning ordinances, and some states require it. MnDOT is analyzing Minnesota's existing statutes and rules regarding airport safety zoning to determine whether updates are needed. MnDOT is especially interested in identifying how other states approach the issue of requiring local governments to enact land use zoning. This synthesis serves as a step toward identifying other states' approaches to airport zoning and will help inform future updates to Minnesota statutes and rules.

California

Sacramento International Airport Land Use Compatibility Plan, Sacramento Area Council of Governments, December 2013.
https://www.sacog.org/sites/main/files/file-attachments/smf-1-front_chapters_1-2-2013-12-12-complete.pdf
Section 3.3 (page 2-24 of the report, page 50 of the PDF) addresses safety compatibility issues and policy considerations.

Florida

Airport and Airspace Protection and Zoning, Florida Department of Transportation, 2019.
https://www.fdot.gov/aviation/compland.shtm
This web site provides access to statutes relevant to land use and airports and notes that, due to a 2016 amendment of Florida statutes, "the current Airport Compatible Land Use Guidebook contains significant portions of text and graphics that are inconsistent with the provisions of the new Chapter 333 and should not be relied upon to amend existing Airport Zoning Regulations. The Airspace and Spaceports Office is in the process of revising the Guidebook to conform to Chapter 333 but is not scheduled to be completed until the end of the calendar year."

Related Resource:

> **Documents and Publications**, Aviation and Spaceports Office, Florida Department of Transportation, 2019.
> https://www.fdot.gov/aviation/flpub.shtm
> This web site provides numerous links to Florida DOT publications on airport land use, air space protection, zoning and airport planning.

Idaho

Idaho Airport Land Use Guidelines, Division of Aeronautics, Idaho Transportation Department, July 2016.
https://itd.idaho.gov/wp-content/Aero/Publications/LandUse_Guidelines.pdf
From the purpose statement: This document is an update to Appendix C: Airport Land Use Guidelines, completed by Idaho Transportation Department Division of Aeronautics (ITD Aero) as part of the 2010 Idaho Airport System Plan (IASP). The purpose of this updated guidebook is to provide a more streamlined document to educate airport owners/operators (airport sponsors), local planning and zoning representatives, local elected officials, and the general public in order to better understand the unique aspects of airports as they relate to compatible land use planning throughout the state. This guidebook also provides recommended techniques and mechanisms to assist these stakeholders in developing and implementing effective compatible land use measures around their airports and their community.

Minnesota

Airport Zoning, Minnesota Department of Transportation, 2019.
https://www.dot.state.mn.us/aero/planning/zoning.html
This web site provides information related to airport zoning in Minnesota, including the Airport Zoning Information Warehouse, which is a series of shapefiles that depict areas zoned by a community's current airport safety zoning ordinance.

Chapter 9, Aviation Investment Direction and Plan, *2040 Transportation Policy Plan*, Metropolitan Council, January 2015.
http://www.dot.state.mn.us/aero/planning/sasp/Aviation%20Chapter%20from%202040-TPP-Complete-Plan.pdf
The 2040 Transportation Policy Plan "sets policies based on goals and objectives for the regional transportation system" in the Twin Cities metro area. This chapter briefly references safety zoning considerations in aviation planning.

Noise Contours and Land-Use Zoning, Metropolitan Airports Commission, undated.
https://www.macnoise.com/our-neighbors/noise-contours-land-use-zoning
This web page briefly addresses safety zone compatibility and provides a link to obtain more information about a safety zone analysis of airports operated by the commission.

Nevada

Protecting Nevada's Investment in Public Airports From Incompatible Land Use Development—A Framework for Action, Nevada Department of Transportation, January 2009.
https://www.nevadadot.com/home/showdocument?id=3560
From the executive summary: The purpose of this document is to provide the Nevada Department of Transportation (NDOT) a framework for the continuing discussion of potential statewide actions to protect the investment in Nevada's public use airports from the effects of incompatible development in areas surrounding the airports. This document explores various aspects of this issue including what several other states have accomplished, as well as the range of remedies that are available generally and in the State of Nevada. The document concludes by setting forth an initial series of actions that are intended to increase awareness of this issue and use of the available remedies. Also identified are longer-term actions that are intended to determine the effectiveness of the applied remedies and need for future legislative changes, if such actions are required.

In addition to reviewing State of Nevada legislation pertaining to planning, zoning and other elements for controlling land use in the vicinity of airports, the study looked at similar legislation in several other states, specifically California, Georgia, Oregon, Texas, Washington, and Wisconsin. All of these states, including Nevada, use Federal Aviation Administration (FAA) airport design standards for safety, as well as federal criteria for noise and controlling the height of objects. Such conformity is generally required within each state because as a condition for receiving FAA airport improvement grants each airport sponsor must agree to use these criteria as the basis for protecting the airport investment. The State of California stood out by conducting additional research regarding aircraft accident impact areas which was used to create a set of safety compatibility zones that are added to the federal criteria. The States of Washington and Oregon have, or are embracing, the addition of California-like safety zones.

Pennsylvania

Airport Zoning and Compatible Land Use, Pennsylvania Department of Transportation, undated.
https://www.penndot.gov/Doing-Business/Aviation/Planning%20and%20Zoning/Pages/Airport-Zoning-and-Compatible-Land-Use.aspx
This web site provides links to several documents related to airport zoning and compatible land use, including a zoning status report, model zoning ordinances, land use compatibility guidelines and a land use tool kit.

South Carolina

Airport Compatible Land Use Evaluation (CLUE) Tool User Guide for Trial Area, South Carolina Aeronautics Commission, undated.
http://www.scaeronautics.com/CLUE/Help/CLUE_Tool_Trial_UserGuide.pdf
From the introduction: [The Airport Compatible Land Use Evaluation (CLUE)] tool allows for a more efficient exchange of development information, and the ability for the public and planning entities to "test" certain development scenarios (if located within an Airport Safety or Land Use Zone) for compatibility prior to submission to the SCAC [South Carolina Aeronautics Commission] for review.

Related Resource:

> **South Carolina Airport Compatible Land Use Evaluation (CLUE) Tool**, South Carolina Aeronautics Commission, undated.
> http://www.scaeronautics.com/clue/trialarea
> This web page, called the "Trial Area," gives property owners and developers access to the CLUE Tool.

Wisconsin

"Runway Protection Zones: Alternatives Analysis Case Studies," Matt Malikci, Diann Danielsen and Hal Davis, *Airport Operations and Land Use Seminar*, Wisconsin Department of Transportation, 2017.
See Attachment B.
This presentation addresses the basics of RPZs, land use compatibility, RPZ alternatives analysis, lessons learned from case studies and how to avoid RPZ problems.

Wisconsin Airport Land Use Guidebook, Wisconsin Department of Transportation, June 2011.
https://wisconsindot.gov/Documents/doing-bus/aeronautics/resources/arptlusguibk.pdf
From the preface: The goal of this guidebook is to protect communities and airports from incompatible land use that could negatively affect the safe operation of airports and pose hazardous consequences to the public. In this guidebook, stakeholders will find information and resources that may help them direct the future development of their communities and airports. Stakeholders who might find this guidebook useful include airport and community planners; airport owners and managers; zoning administrators; local, state, and regional agency officials; developers; legislators; and the general public.

Tools and Modelling

ACRP Research Report 200: Using GIS for Collaborative Land Use Compatibility Planning Near Airports, Arora Engineers, Inc., 2019.
Report available at https://www.nap.edu/catalog/25464/using-gis-for-collaborative-land-use-compatibility-planning-near-airports
From the introduction: The goal [of this research] is to be able to effectively apply GIS as a collaborative tool to address land use compatibility planning needs. … Organizations that have effectively used GIS for land use compatibility planning were identified for case studies that were developed to convey successful approaches to other practitioners. … The preliminary research resulted in a prioritization of land use impacts more relevant to a broad set of airports that could be effectually addressed with GIS. The data, capabilities, software, and hardware needed to effectively apply GIS [were] also identified through further investigation of the case

study organizations. In addition, literature identified earlier in the project was referenced to identify data needs and sources of land use applications.

Safety

National Guidance

Research in Progress: ACRP Synthesis 11-02/Task 36: Research Roadmap on Safety Issues, Theresia H. Schatz, start date: May 2019, expected completion date: April 2020.
Project description at https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4638
From the project description: Airport safety at airports of all types and sizes can share the same mission or similar missions in their day-to-day policy and long-term planning. These missions include, for example, emergency management training, airport safety management systems, airport terminal incident response planning, and runway protection zone (RPZ) and runway safety areas (RSA) risk assessment tools, among others. Understanding these common missions can be helpful in organizing and understanding where there are knowledge gaps. A research roadmap will further define and prioritize those areas of further research in the area of safety. The objective of this research is to develop a research roadmap in the area of safety. The roadmap should recommend priorities and timing, set a strategy and provide a rationale for the recommendations.

National Plan of Integrated Airport Systems (NPIAS) 2019-2023, Report to Congress, Federal Aviation Administration, October 2018.
https://www.faa.gov/airports/planning_capacity/npias/reports/media/NPIAS-Report-2019-2023-Narrative.pdf
Chapter 2 (beginning on page 13 of the report, page 23 of the PDF) includes a discussion of safety considerations for airport systems.

Alternative Energy

ACRP Synthesis 28: Investigating Safety Impacts of Energy Technologies on Airports and Aviation, Stephen Barrett and Philip Devita, 2011.
Report available at https://www.nap.edu/catalog/14590/
From the abstract: This synthesis study is intended to inform airport operators, aircraft pilots, planning managers, energy developers, legislators and regulators responsible for aviation safety, land use compatibility, airport planning and development, and airport financial self-sustainability about existing literature, data, and ongoing research on physical, visual, and communications systems interference impacts from energy technologies on airports and aviation safety. The energy technologies that are the focus of this report are: Solar Photovoltaic Panels and Farms; Concentrating Solar Power Plants; Wind Turbine Generators and Farms; and Traditional Power Plants. Information used in this study was acquired through both published and preliminary sources and interviews with experts in the fields of aviation and energy.

Risk Assessment Tools

ACRP Research Report 168: Runway Protection Zones (RPZs) Risk Assessment Tool Users' Guide, Hamid Shirazi, Jim Hall, Beattie Williams, Stephen Moser, Dorothy Boswell, Marshall Hardy, Richard Speir, Endri Mustafa, Robin Jones, Mark Johnson, Colleen Quinn, Patrick Hickman, Stephanie Ward, David Ramacorti, Morgan Turner, Joanne Landry and Ali Mosleh, 2016.
https://www.nap.edu/catalog/24662/runway-protection-zones-rpzs-risk-assessment-tool-users-guide
From the abstract: This Users' Guide and risk assessment tool have been developed to help airport operators conduct risk assessments in RPZs. The tool can be used to assess the risk of an aircraft accident within an RPZ and, based on the output, assess the risk to people and property, based on land use and population density. Chapters address risk assessment and safety risk management; gathering software tool input data; getting started with the software tool; understanding analysis results; case study; RPZ risk mitigation strategies; and airport safety management system and RPZ risk.

Contacts

CTC contacted the individuals below to gather information for this investigation.

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Appendix A: Survey Questions

The following survey was distributed to selected members of the National Association of State Aviation Officials (NASAO) and the American Association of State Highway and Transportation Officials (AASHTO) Council on Aviation who had experience with aircraft accident data and land use planning practices that are used to address safety near airports.

Aircraft Accident Data

Note: Responses to the question below determined how respondents completed the survey:

- *Respondents who answered "no" were directed to the **Land Use Planning Practices** section in the survey.*
- *Respondents who answered "yes" were directed to the remaining questions in the survey.*

Does your agency gather and analyze aircraft accident data in connection with its land use planning near airports?

- No.
- Yes.

1. Please identify the source(s) of the aircraft accident data your agency gathers and analyzes.
2. Does the data include the latitude and longitude to identify actual accident locations, not an airport reference point?
    - No.
    - Yes.
3. Do any laws or regulations in your state require reporting of aircraft accident data?
    - No.
    - Yes (please describe these laws or regulations).
4. Please identify the analyses your agency conducts using aircraft accident data. Select all that apply.
    - Accident data are collected and analyzed/reported by the State Aviation Office because of state ownership of airports. (Respondents who selected this option were directed to Questions 4A and 4B below.)
    - Accident data/analyses are correlated by the State Aviation Office with land use planning practices and made available for local jurisdictions. (Respondents who selected this option were directed to Questions 4C and 4D below.)
    - Accident data are retrieved by the State Aviation Office in response to specific requests for information and/or analysis. (Respondents who selected this option were directed to the **Land Use Planning Practices** section.
    - The State Aviation Office has no role or requirement for collecting or utilizing aircraft accident data. (Respondents who selected this option were directed to the **Land Use Planning Practices** section.)

4A. Is the data collection and analysis/reporting required by state statute or conducted as a best practice?

- State statute.
- Best practice.

4B. Are nonstate-owned airports included in the data collection and analysis?

- No.
- Yes.

4C. How do local jurisdictions access the accident data and analyses? Select all that apply.

- Public records request.
- Internet web site.
- Published report.
- Other (please describe).

4D. Do local jurisdictions use the data according to state statute or at their discretion?

- State statute.
- Discretion of the local jurisdiction.

Land Use Planning Practices

Please describe below each of the methods or practices your agency has implemented to prevent the creation of new safety problems near airports. Include in your response a discussion of any applicable statute or regulation.

- Safety zones or clear zones.
- Limits on densities and intensities for **residential** land uses.
- Limits on densities and intensities for **nonresidential** land uses.
- Zoning types **allowed** in particular areas of an airport influence area.
- Zoning types **prohibited** in particular areas of an airport influence area.
- Height restrictions other than regulations imposed by the Federal Aviation Administration.
- Restrictions on facility or building type.
- Other practice (please describe).

Wrap-Up

1. Do you have any documentation you can share with regard to your agency's **use of aircraft accident data**? If available, please provide links to documentation or send any files not available online to carol.rolland@ctcandassociates.com.
2. Do you have any documentation you can share with regard to your **agency's land use practices designed to avoid safety problems near airports**? If available, please provide links to documentation or send any files not available online to carol.rolland@ctcandassociates.com.
3. Please use this space to provide any comments or additional information about your previous responses.

POLICY STATEMENT NO. 1

CLEAR ZONE REQUIREMENTS

Minnesota Department of Transportation
Office of Aeronautics

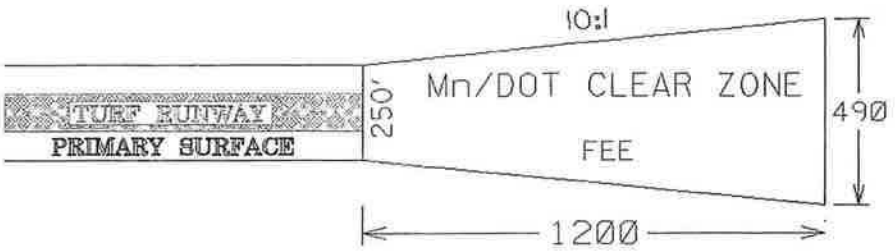
In order to restrict land uses which may be hazardous to the operational safety of aircraft and protect life and property in runway approach areas, it shall be the policy of the Mn/DOT, Office of Aeronautics, that State participation in acquisition, construction, maintenance, operation and improvement be limited to those airports at which adequate clear zones for the ultimate development of the airport have been acquired and maintained.

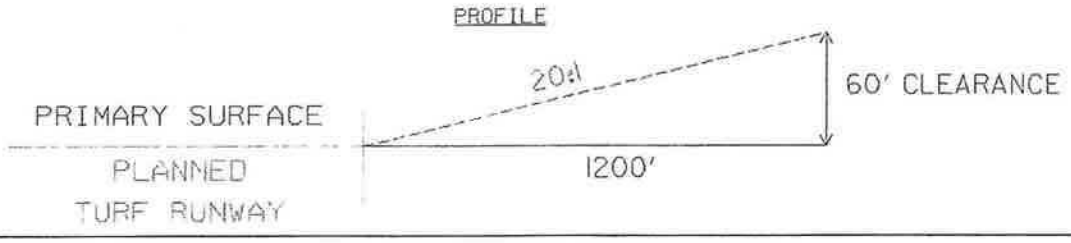
The minimum required clear zones and property interests are shown on the attached drawings for airports categorized according to aircraft served, landing aids available and approach minimums planned or established. The actual property interests to be acquired will be determined upon consideration of land lines, availability of property, severance, and other factors affecting compatible land use of the area surrounding the airport.

Exceptions to this policy may be made in the case of routine maintenance projects, emergency, terrain limitations, unusual cost, or other consideration for the safety and convenience of the public as determined by the Commissioner of Transportation.

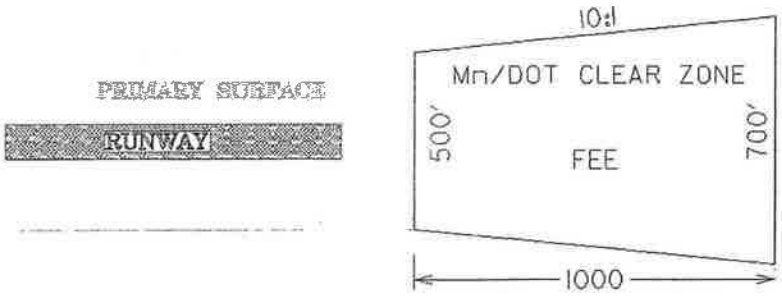
10/4/2005

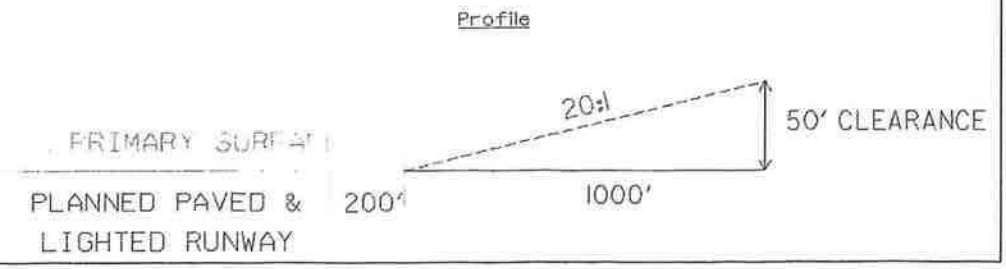
VISUAL UTILITY - TURF RUNWAY





VISUAL UTILITY

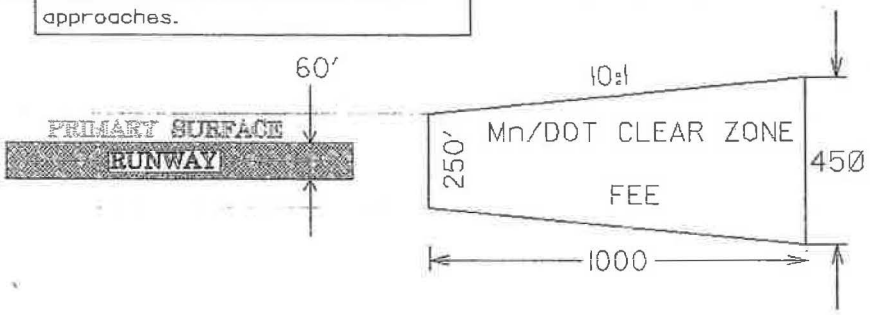




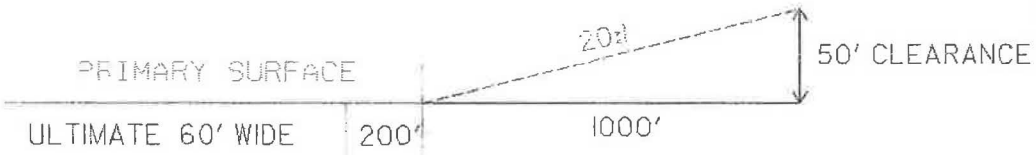
VISUAL UTILITY (PLANNED ULTIMATE)

FEDERAL FUNDING ONLY (SMALL AIRCRAFT EXCLUSIVELY)

This protection does not facilitate expansion or future instrument approaches.

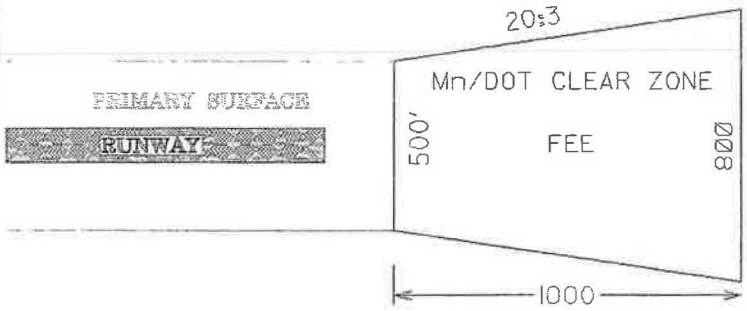


PROFILE

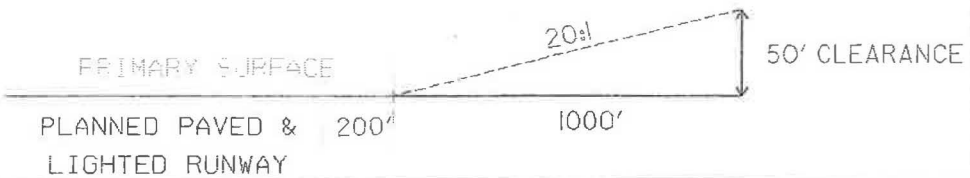


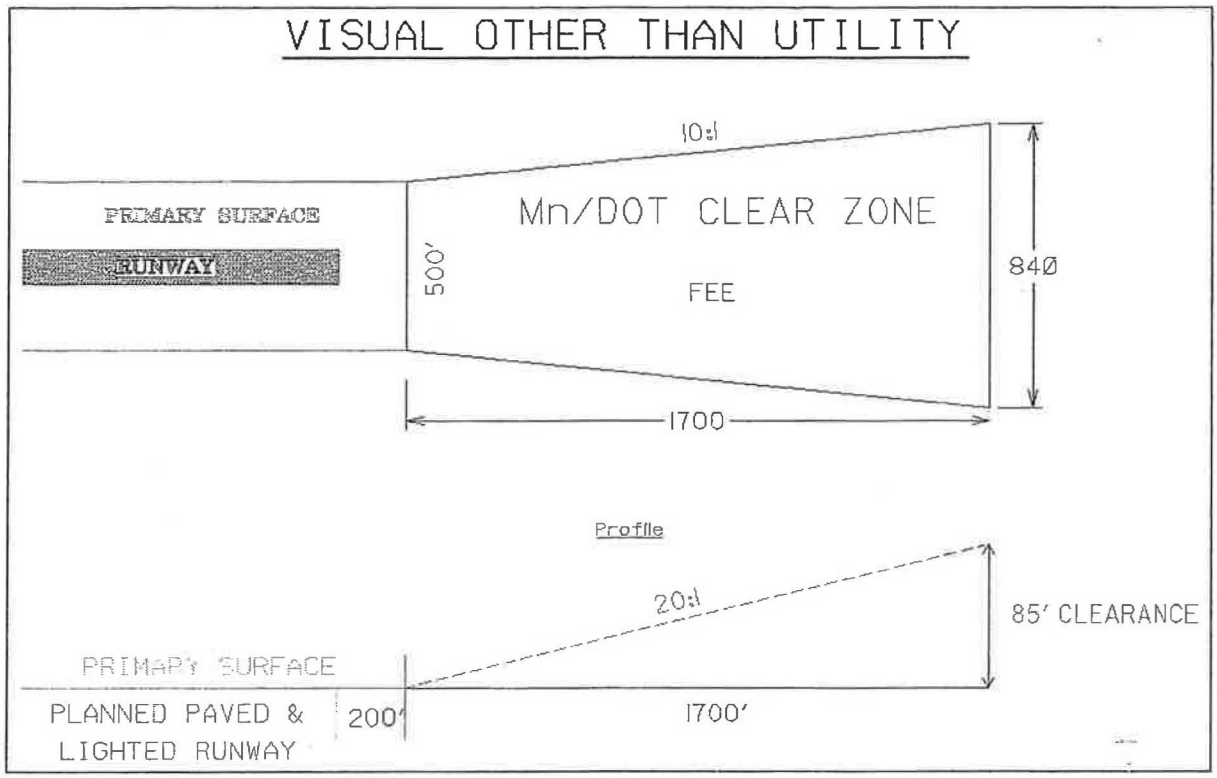
NON-PRECISION INSTRUMENT UTILITY

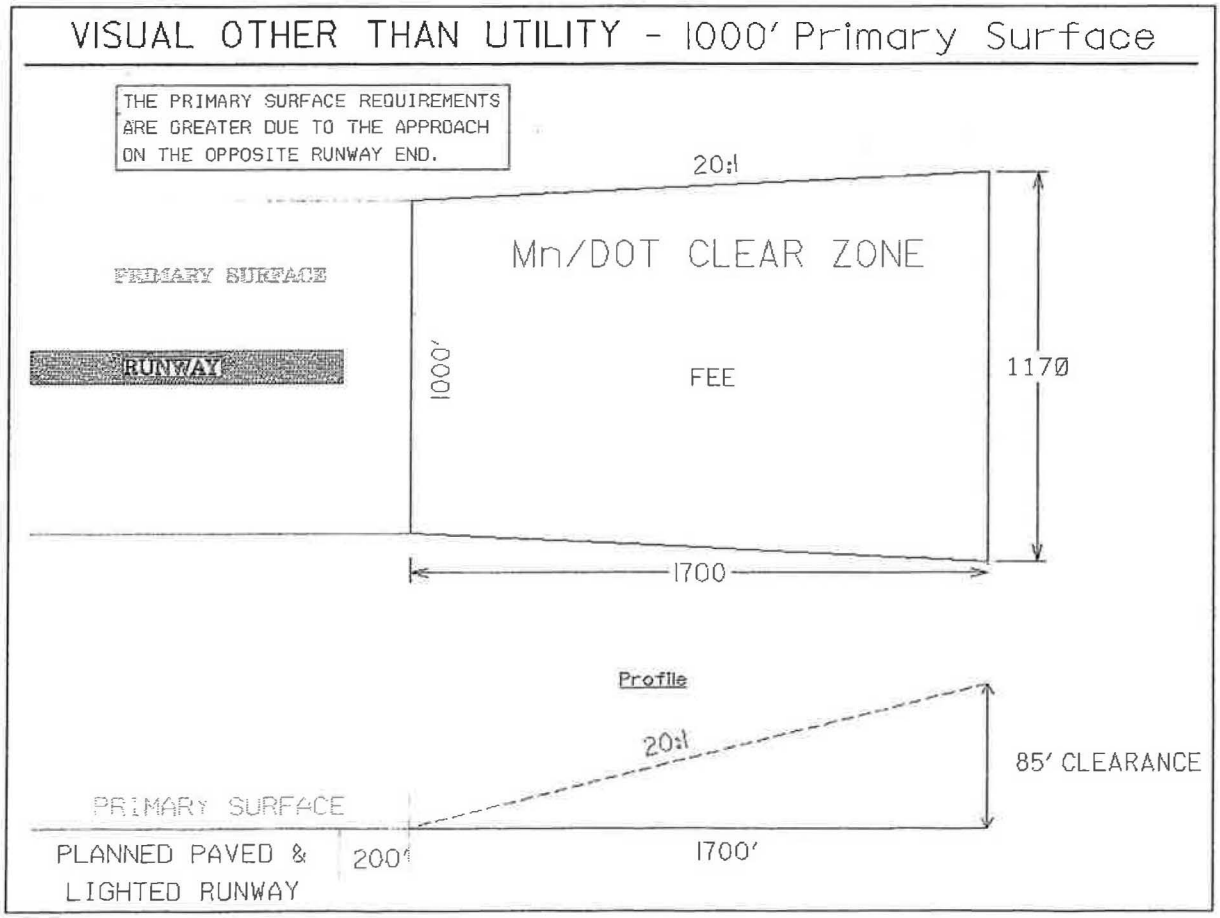
(NOT LOWER THAN 1-MILE VISIBILITY)

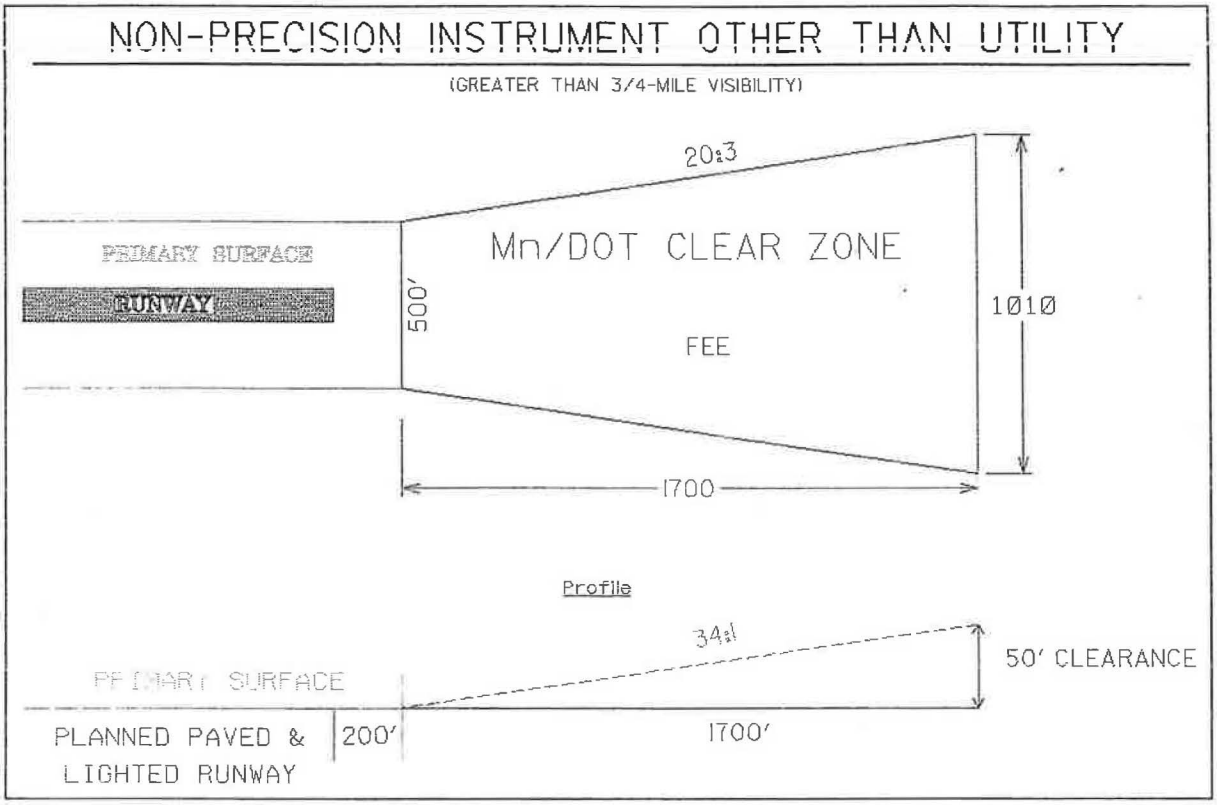


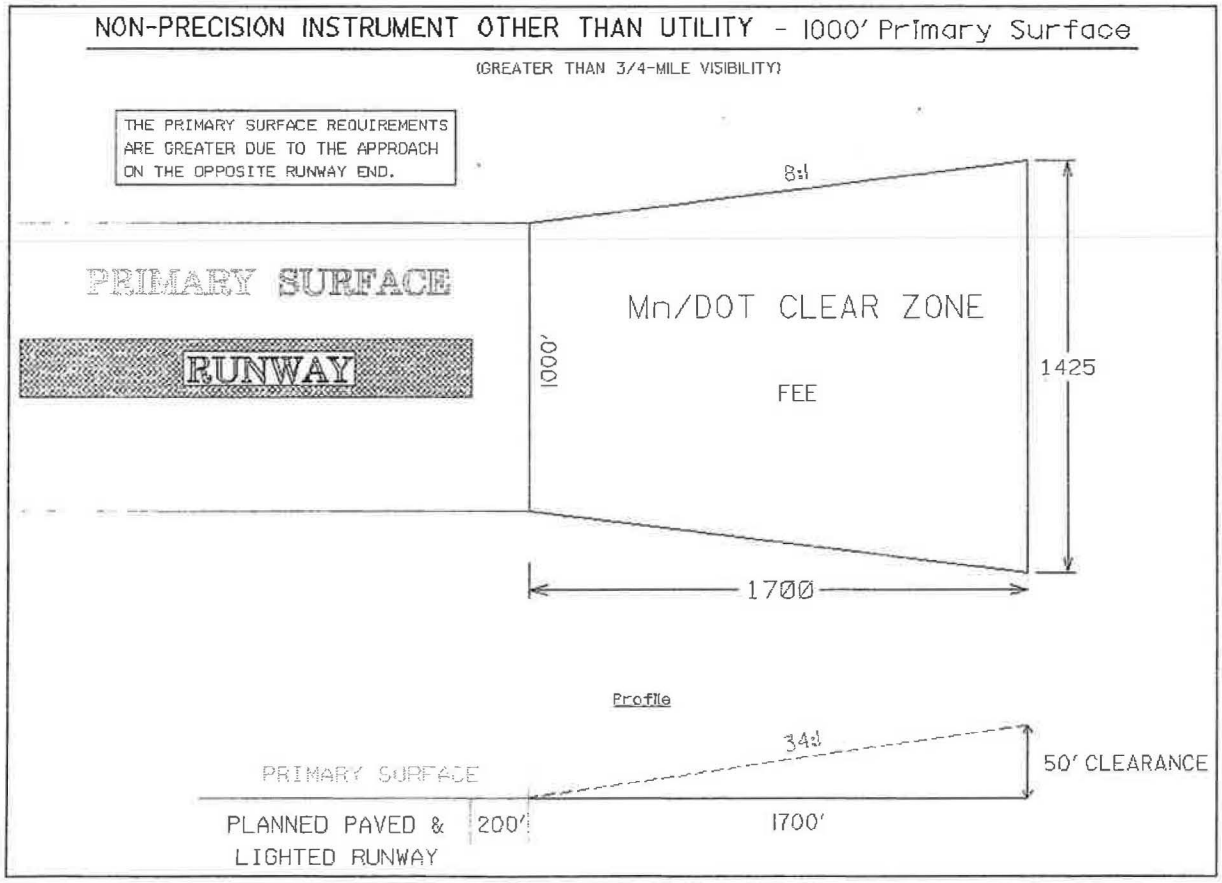
Profile

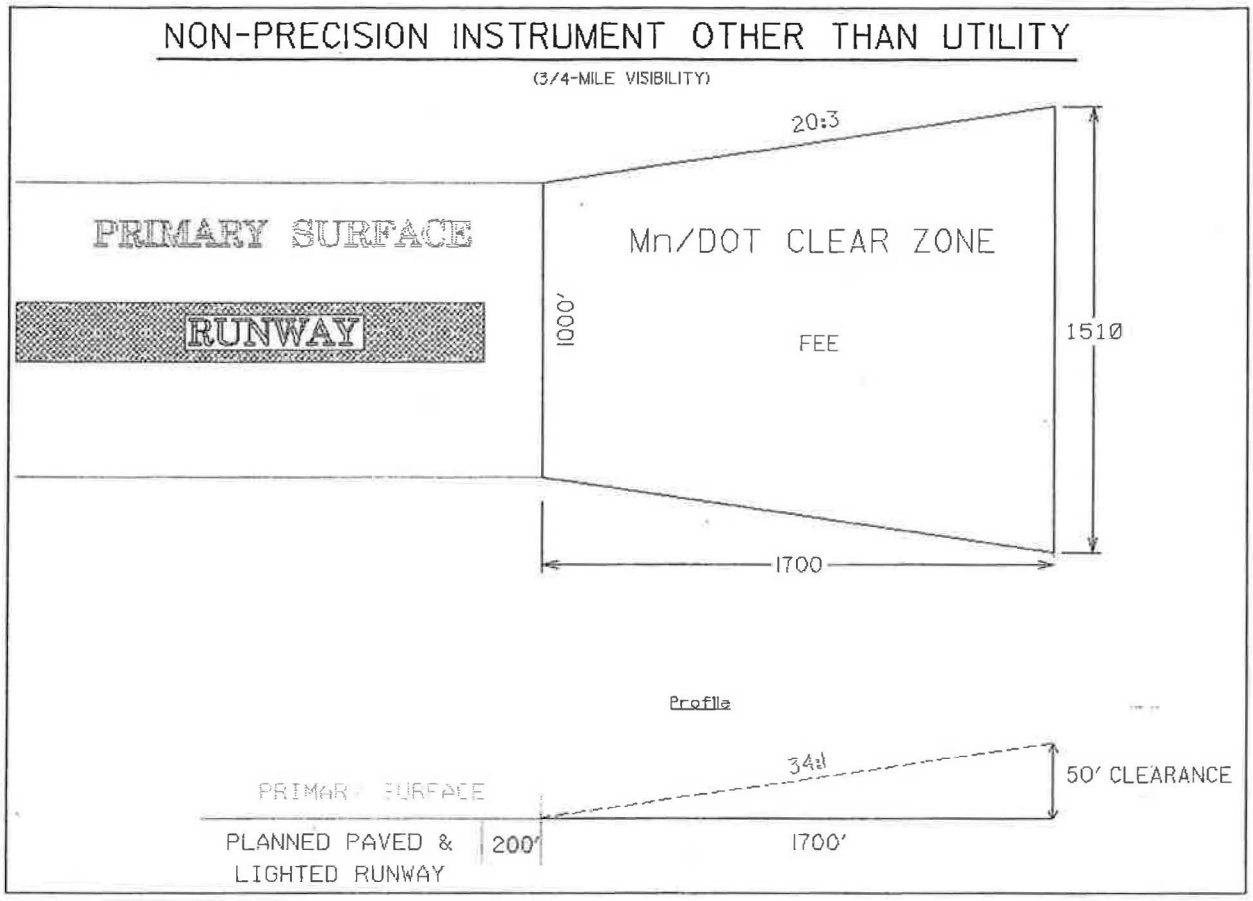


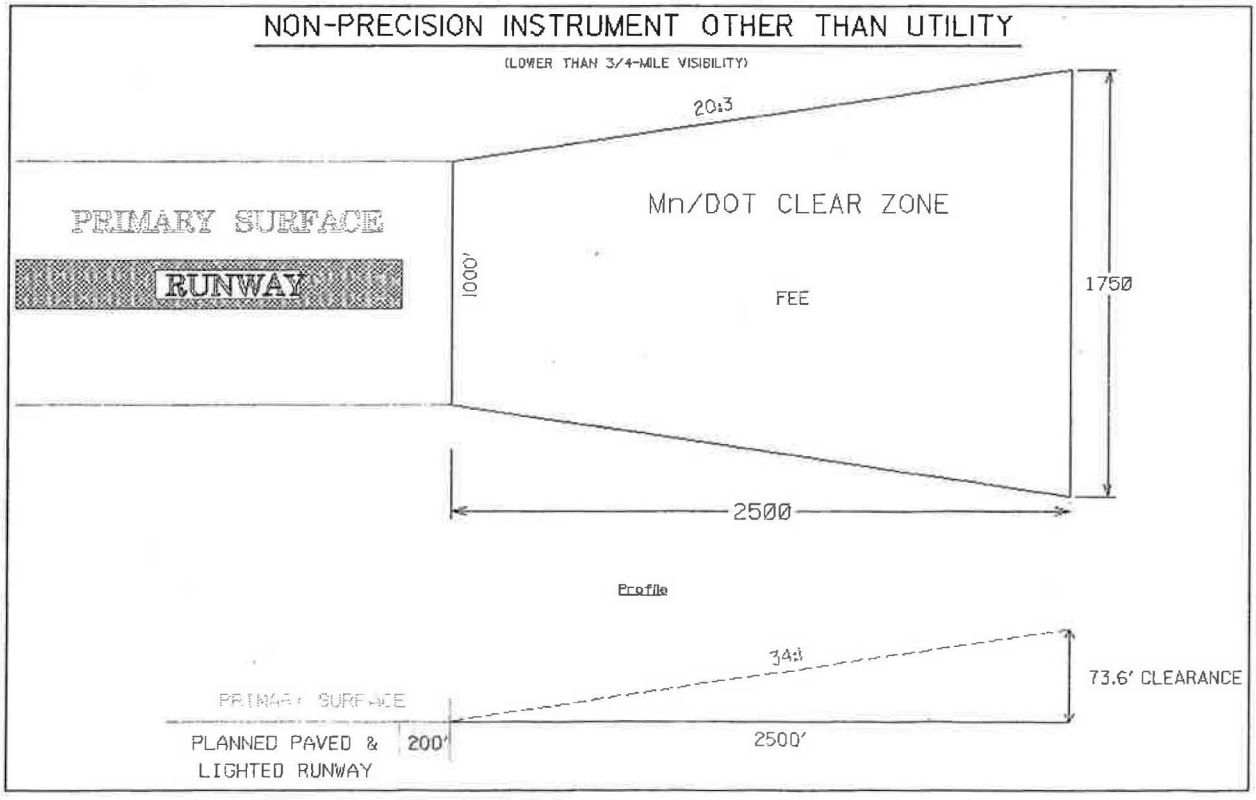

VISUAL OTHER THAN UTILITY
10:1
PRIMARY SURFACE
RUNWAY
Mn/DOT CLEAR ZONE
FEE
500'
840
1700
Profile
20:1
85' CLEARANCE
PRIMARY SURFACE
PLANNED PAVED &
LIGHTED RUNWAY
200'
1700'

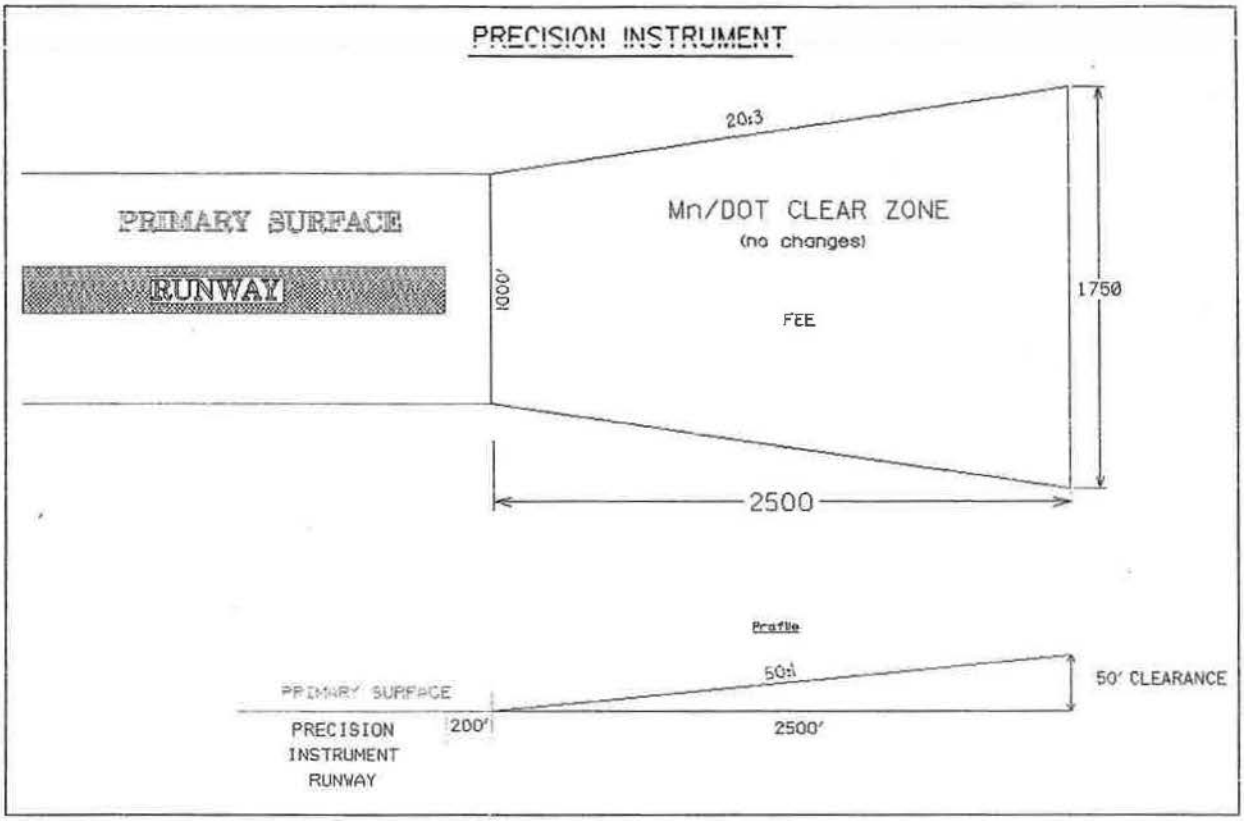

VISUAL OTHER THAN UTILITY - 1000' Primary Surface
THE PRIMARY SURFACE REQUIREMENTS
ARE GREATER DUE TO THE APPROACH
ON THE OPPOSITE RUNWAY END.
20:1
PRIMARY SURFACE
RUNWAY
Mn/DOT CLEAR ZONE
FEE
1000'
1170
1700
Profile
20:1
85' CLEARANCE
PRIMARY SURFACE
PLANNED PAVED &
LIGHTED RUNWAY
200'
1700'


NON-PRECISION INSTRUMENT OTHER THAN UTILITY
(GREATER THAN 3/4-MILE VISIBILITY)
20:3
PRIMARY SURFACE
RUNWAY
Mn/DOT CLEAR ZONE
FEE
500'
1010
1700
Profile
34:1
50' CLEARANCE
PRIMARY SURFACE
PLANNED PAVED & LIGHTED RUNWAY
200'
1700'


NON-PRECISION INSTRUMENT OTHER THAN UTILITY - 1000' Primary Surface
(GREATER THAN 3/4-MILE VISIBILITY)
THE PRIMARY SURFACE REQUIREMENTS ARE GREATER DUE TO THE APPROACH ON THE OPPOSITE RUNWAY END.
8:1
PRIMARY SURFACE
RUNWAY
Mn/DOT CLEAR ZONE
FEE
1000'
1425
1700
Profile
34:1
50' CLEARANCE
PRIMARY SURFACE
PLANNED PAVED & LIGHTED RUNWAY
200'
1700'


NON-PRECISION INSTRUMENT OTHER THAN UTILITY
(3/4-MILE VISIBILITY)
20:3
PRIMARY SURFACE
RUNWAY
Mn/DOT CLEAR ZONE
FEE
1000'
1510
1700
Profile
34:1
50' CLEARANCE
PRIMARY SURFACE
PLANNED PAVED & LIGHTED RUNWAY
200'
1700'


NON-PRECISION INSTRUMENT OTHER THAN UTILITY
(LOWER THAN 3/4-MILE VISIBILITY)
20:3
PRIMARY SURFACE
RUNWAY
Mn/DOT CLEAR ZONE
FEE
1000'
1750
2500
Profile
34:1
73.6' CLEARANCE
PRIMARY SURFACE
PLANNED PAVED & LIGHTED RUNWAY
200'
2500'


PRECISION INSTRUMENT
20:3
PRIMARY SURFACE
RUNWAY
Mn/DOT CLEAR ZONE
(no changes)
FEE
1000'
1750
2500
Profile
50:1
50' CLEARANCE
PRIMARY SURFACE
PRECISION
INSTRUMENT
RUNWAY
200'
2500'

Runway Protection Zones

Alternatives Analysis Case Studies

Matt Malicki – Airport Engineering Section Chief

Diann Danielsen – Airport Land Program Manager

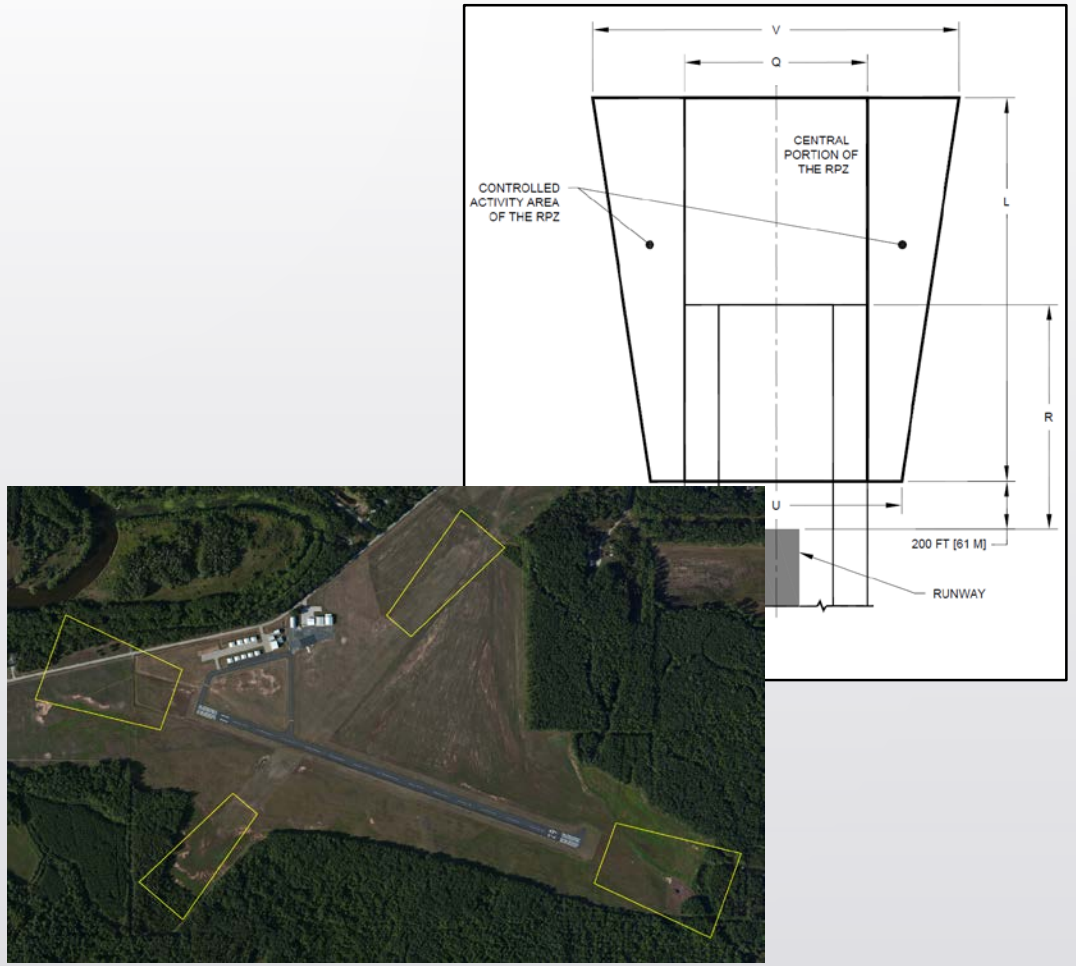
Hal Davis – Airport Compliance Program Manager

Overview

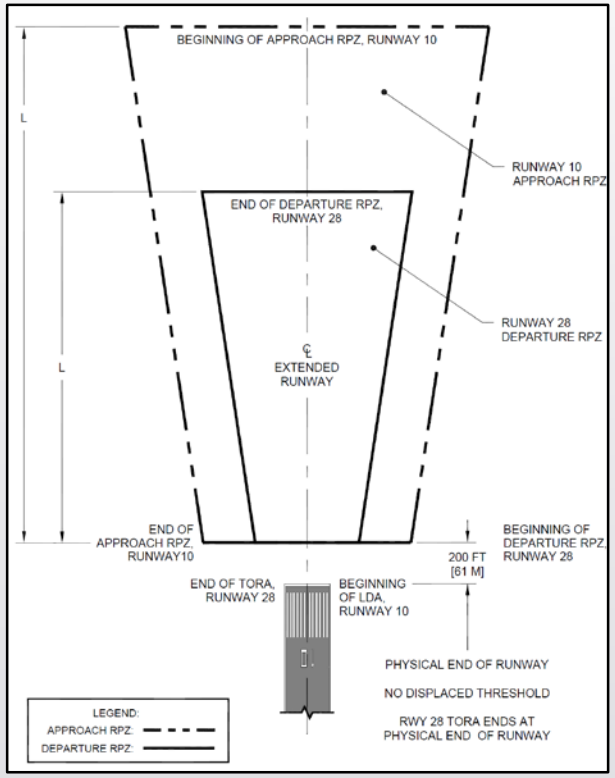
- RPZ Basics
- Land Use Compatibility
- RPZ Alternatives Analysis
- Lessons Learned from Case Studies
- Avoiding RPZ Problems

RPZ Basics

- Enhance the protection of people and property on the ground.
  - Prevent the creation of hazards to aircraft.
  - Prevent additional damage to persons and property on the ground in the event of an aircraft accident.
  - Prevent noise issues.
- Central Portion
  - Extended Object Free Area
- Controlled Activity Area



RPZ Basics



- Trapezoid located off the end of all runways.
  - Starts 200' from Paved Runway
  - Starts at Runway end for Turf
- Approach and Departure RPZs
- RPZ Dimensions
  - Dimensions determined by:
    - Critical Design Aircraft
    - Approach Visibility Minimums
  - 1,000ft, 1,700ft, or 2,500ft long

Land Use Compatibility

Compatible Land Uses

- Farming
- Irrigation Channels
- Airport Service Roads
- Underground Facilities
- Unstaffed Navigational Aids



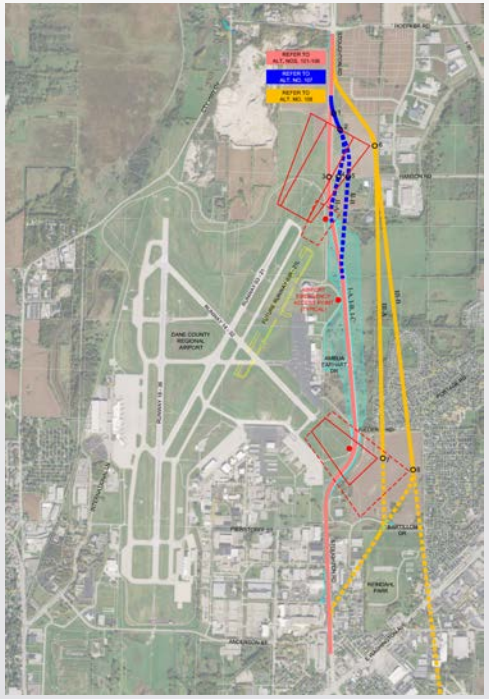
Incompatible Land Uses

- Buildings and Structures
- Recreational Activities
- Transportation Facilities
- Fuel Storage Facilities
- Hazardous Material Storage
- Wastewater Treatment Facilities
- Above-Ground Utilities

RPZ Alternatives Analysis

- 2012 FAA Memorandum: *Interim Guidance on Land Uses within a Runway Protection Zone*
  - Established the RPZ Alternatives Analysis Process
- Triggering Events
  - Airfield Project within an RPZ
  - Change in Critical Design Aircraft
  - New or Revised Instrument Approach
  - Local Incompatible Development in the RPZ (either new or reconfigured)

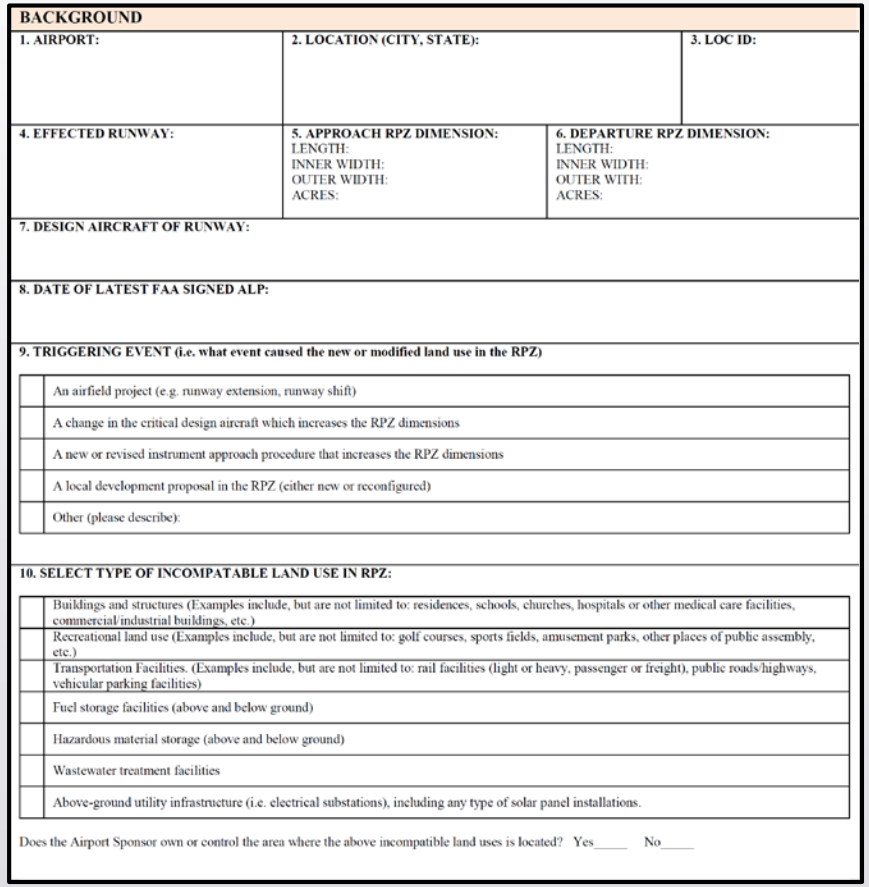
RPZ Alternatives Analysis Process



- Identify and Document Full-Range of Alternatives
  - Avoid introducing land use issues
  - Minimize the impact
  - Mitigate the risk to persons and property on the ground

RPZ Alternatives Analysis Process

- Each alternative must include:
  - Description
  - Full cost estimate
  - Practicability assessment
  - Identify all Federal, State and Local agencies involved
  - Analysis of specific portions and percentages of the RPZ impacted
- Analysis of Sponsor control of land in the RPZ
- Identify the preferred alternative



BACKGROUND

1. AIRPORT:	2. LOCATION (CITY, STATE):	3. LOC ID:

4. EFFECTED RUNWAY:	5. APPROACH RPZ DIMENSION: LENGTH: INNER WIDTH: OUTER WIDTH: ACRES:	6. DEPARTURE RPZ DIMENSION: LENGTH: INNER WIDTH: OUTER WITH: ACRES:

7. DESIGN AIRCRAFT OF RUNWAY:

8. DATE OF LATEST FAA SIGNED ALP:

9. TRIGGERING EVENT (i.e. what event caused the new or modified land use in the RPZ)

	An airfield project (e.g. runway extension, runway shift)
	A change in the critical design aircraft which increases the RPZ dimensions
	A new or revised instrument approach procedure that increases the RPZ dimensions
	A local development proposal in the RPZ (either new or reconfigured)
	Other (please describe):

10. SELECT TYPE OF INCOMPATABLE LAND USE IN RPZ:

	Buildings and structures (Examples include, but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)
	Recreational land use (Examples include, but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.)
	Transportation Facilities. (Examples include, but are not limited to: rail facilities (light or heavy, passenger or freight), public roads/highways, vehicular parking facilities)
	Fuel storage facilities (above and below ground)
	Hazardous material storage (above and below ground)
	Wastewater treatment facilities
	Above-ground utility infrastructure (i.e. electrical substations), including any type of solar panel installations.

Does the Airport Sponsor own or control the area where the above incompatible land uses is located? Yes____ No____

RPZ Alternatives Analysis Process

- Who develops the RPZAA depends on the triggering event:
  - RPZAA for an airport project will be developed as part of the project.
  - RPZAA for a third party development should be paid for by the third party
    - If the airport has no control, the airport may still need to evaluate its own alternatives
- In all cases, the RPZAA will be submitted by the Airport Sponsor.
- Initially submitted to BOA for review.
- Once satisfied, BOA will forward to FAA.
- Reviewed by FAA District Office, Regional Office, and Headquarters

Lessons Learned from Case Studies

- Cases studies have involved:
  - On Airport
    - Runway Realignment
    - Change in Class of Critical Aircraft
  - Off Airport
    - New Public Access Road for Hospital
    - Improvements to State and County Trunk Highways

RPZAA Lessons Learned: On-Airport

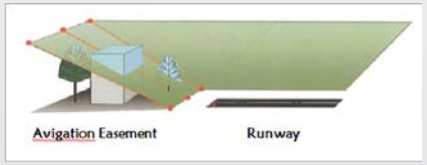
- Complete the RPZAA as a Part of the Environmental Process
- Start Coordination Early
- Develop Book-Ends Alternatives
  - Do-Nothing
  - Money is No Object to Meet all Standards
- Create Maps for Each Alternative
- Include All Alternatives Considered
  - If Eliminating an Alternative, State Why it is Not Reasonable and Feasible
  - Cost and Environmental Impacts are Considerations
- Choose a Preferred Alternative that Meets Project's Purpose and Need, Yet Improves the RPZ (if practicable)
  - State Why the Preferred Development is a Benefit to the Airport

RPZAA Lessons Learned: Off-Airport

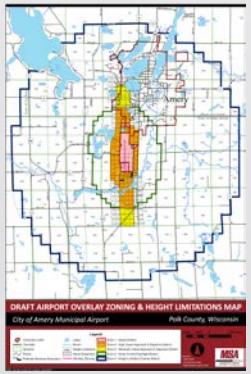
- No control is no excuse for inaction.
  - Sponsors should always be trying to improve RPZ control.
- May require coordination with other departments and municipalities.
- Development of analysis may require professional services.
- Can be very controversial.
  - Difficult for proponent to understand
  - Can garner political attention
- Not a fast process.

What is RPZ Control?

- Purchase property
- If purchase is not practical, clear zone easement
- If clear zone easement is not practical, avigation easement



- If property rights cannot be obtained, ordinance or written agreement



- FAA Recommends airport owners obtain the strictest RPZ control possible….a sufficient interest in land to protect RPZ from obstructions and incompatible land use.
- Control can come in a variety of forms:
  - Property Rights (fee ownership or restrictive easement)
  - Zoning Ordinance
  - Written Agreements
- The entire RPZ should be protected

RPZ Control through Property Rights

Fee Simple

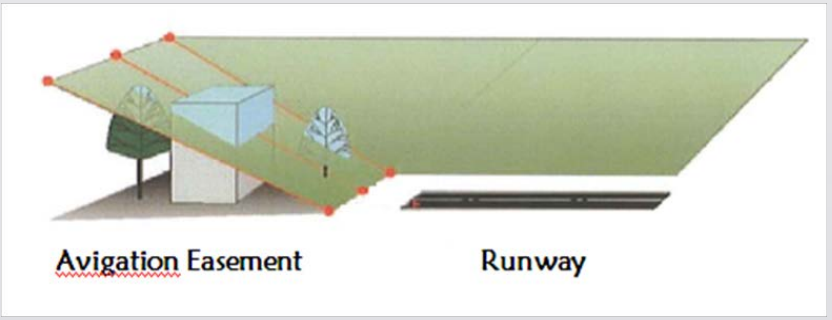
- FAA: "Normally the airport will acquire fee title to all land within airport boundaries and for the RPZ"
- Acquiring fee ownership is less expensive and less disruptive in the long run since the property rights are only acquired once.
- Airports that do not own the entire RPZ should consider acquiring the land if there is any possibility that an incompatible land use could occur.

Experience shows that airports that attempt to control an RPZ via easement, end up acquiring fee simple interest later.

RPZ Control through Property Rights

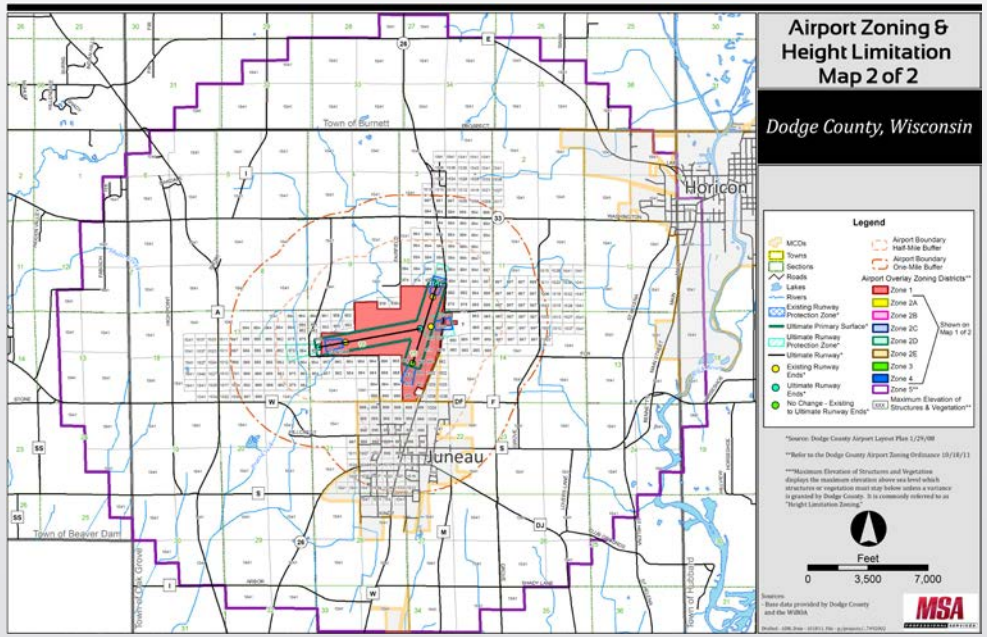
Restrictive Easement

- An Easement is a property right the airport can acquire over land owned by others
  - Typically – not always - "Runs with the Land"
- Easement must secure …
- Right of flight with the inherent noise and vibration above the approach surface
- Right to remove existing obstructions from airspace
- Restriction against future obstructions
- Restrict incompatible land uses (e.g. lights, radio interference, wildlife attractants)



RPZ Control through Zoning Ordinance

- If obtaining property rights is not practical, then use an ordinance
- Most effective for short term control or immediate corrective action
- Tends to be less effective than property rights because zoning may not be sufficiently restrictive
- Zoning is often controversial to adopt and enforce
- Zoning can change over time



How can you avoid these situations?

1. Control your RPZ.
   - Purchase the strongest possible permanent property rights.
   - Clear the RPZ of incompatible land uses and keep it clear.
2. Enforce the RPZ control that you have.
   - Enforce regularly and consistently.
   - Put offenders on notice, in writing, that they must cease and desist the offending use.
3. Inform permitting/zoning authorities and other local officials.
   - Purpose and importance of RPZ protection
   - Compatible and incompatible land uses/obstructions
   - Airport obligation to object to incompatible land uses with the RPZ when not sponsor-controlled.
   - Initiate or request rezoning to prevent incompatible land uses.

Final Thoughts

- Confirm Ownership Early
  - Roads are often assumed to be owned by the maintainer
  - Who owns underlying fee interest in a roadways in the RPZ can significantly impact the review and determinations of an RPZ alternatives analysis
- Development on airport-owned RPZ land may require a land release request for a change in property interest.
  - RPZ Alternatives Analysis is completed first and followed by land release or concurrent use request
  - One approval does not necessarily assure the other.

Questions