Washington State
Department of Transportation

ADMINISTRATIVE MANUAL

Airports and Compatible Land Use Guidebook

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Aviation Division

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Executive Summary

One of the main challenges facing aviation today is the encroachment of incompatible land uses near and around airports. Development of incompatible land uses can degrade airport operations, impede airport expansion, and reduce quality of life for airport neighbors. Encroachment is a key factor contributing to escalating operating costs and restriction of airport operations. It has even resulted in closures of numerous general aviation airports in the United States.

The *Airport and Compatible Land Use Program Guidebook* is designed to help airports, communities, and jurisdictions work cooperatively and proactively toward preventing incompatible development around airports in Washington State. Jurisdictions can use the tools and resources found in the guidelines to develop policies and development regulations that discourage the encroachment of incompatible land use adjacent to public use general aviation facilities. It does not prescribe a one size fits all approach to land use compatibility planning, rather it provides recommended best management practices for local land use jurisdictions. The guidebook will be revisited and updated on a regular basis to reflect new and emerging best management practices for aviation land use compatibility planning.

Washington's Airport System

The *Washington Aviation System Plan* (WASP) encompasses 138 public-use airports that have statewide significance.

Washington has 65 airports listed in the 2009–2013 National Plan of Integrated Airport Systems (NPIAS). Airports on the NPIAS are deemed as having national significance and are eligible for federal funding. The high number of non-NPIAS airports in Washington has important funding implications because these airports are not eligible to receive federal grants for facility improvements and land use compatibility measures.

Of the 138 public-use airports in Washington, almost 80 percent are publicly-owned, either by municipalities, including port and airport districts, or by the state. Policy decisions involving publicly-owned airports in the state are typically made by elected officials of the entity owning the airport.

Funding to develop, maintain, and operate airports is derived from a variety of sources including user fees, revenues from land and facility leases and rents, local government funds, and federal and state grants. For those airports in NPIAS, a substantial proportion of development and major maintenance funding comes from the FAA grant program. State grants serve a similar function for the smaller NPIAS airports and others in the state airport system.

Why should communities work to protect public-use airports?

The state's system of 138 public use airports contributes significantly to its economy and serves a variety of roles and functions. Airports provide unique transportation access as part of Washington's multi-modal transportation system. They are crucial on a local, statewide, national, and global level as they efficiently move people and goods, promote business and commerce, and contribute to a better quality of life.

Washington's airports serve a wide range of transportation, economic and emergency activities, including:

- Business travel
- Tourism
- Freight, express, and mail services
- Agricultural
- Disaster management
- Firefighting
- Emergency medical transportation
- Aviation-related business
- Search and rescue
- Access to remote communities
- Recreation

Why is land use compatibility a concern for airport preservation?

Airport activities affect adjacent areas.
Most people are familiar with the negatives associated with proximity to an airport. The effects generated by airports affecting adjacent properties may include:

- Noise
- Vibration
- Smell
- Light
- Low-flying aircraft
- Safety risks – real and perceived
- Future increases in airport operations

Adjacent land uses also affect airport activities.
Fewer people understand the effect that adjacent land uses can have on airport activities. Development around an airport can reduce property available for operations and safety areas, create obstructions to the airspace needed for aircraft to safely approach and depart the runway, reduce clear airspace needed to support advanced technologies, and generate opposition to existing and future airport activities.

These conflicts often degrade usefulness of an airport and have severe consequences for communities.
Ultimately, incompatible development reduces opportunity for economic development, reduces transportation access, reduces the value of public investment in airport infrastructure, and reduces quality of life for communities.

Encroachment of Incompatible Land Uses

Encroachment of incompatible land uses is a key factor contributing to constraints on expansion and restrictions on operations of airports in the U.S. In many cases, it can even lead to airport closures.

Why is encroachment occurring?

- Washington‘s population has doubled in the last 30 years.
- Urban areas are expanding and communities are pursuing denser development.
- Local land use authorities are either unaware of or not compliant with the requirements of Washington’s Growth Management Act.
- Property adjacent to the airport may have services extended to it and be affordable due to its proximity to the aviation facility.
- Many airports are surrounded by flat, undeveloped land that is attractive for development because the land, in many cases, is served by utilities and other infrastructure.
- Communities underestimate the adverse impacts of incompatible land use development on airport operations.

What is WSDOT’s role in planning for airport land use compatibility?

RCW 37.70.547 of Washington’s Growth Management Act requires towns, cities, and counties to discourage development of incompatible land uses adjacent to public use airports through adoption of comprehensive plan policies and development regulations.

WSDOT Aviation’s role under the Growth Management Act is to address this issue by advocating for the preservation of public use airports and providing decision makers with the best available information about airport land use compatibility. The state’s program emphasizes airspace protection and discourages residential development, schools, hospitals, and other medical facilities adjacent to airports, especially in the extended centerline of the airport runway. The program identifies most industrial and commercial land uses as airport-compatible. WSDOT does not have regulatory authority over land use decisions; however, we offer a technical assistance program to help towns, cities and counties address aviation issues.

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.

Step 1: Getting Started and Gathering Data

In this step, you will begin your work on airport land use compatibility planning by laying a foundation for your process. Your other major task in this step will be to gather the airport and land use data that will enable you to address airport land use compatibility issues.

You will know you have been successful when:

- You have conducted formal consultation with aviation stakeholders.
- You have identified applicable state laws.
- A process is in place to help stakeholders work together.
- You can describe the airport's role, features, and activity.
- You know what land uses exist around the airport and what land use plans are in place.
- You have identified the initial study area.

Step 1: Products

- Record of consultation meeting
- Creation of a compatibility planning working group.
- Findings that outline your airport land use compatibility planning responsibilities under state law.
- Understanding of the airport's context within the community, state, and nation.
- Inventory of airport facilities, activities, and services for use in subsequent land use compatibility planning steps and in the transportation element of the comprehensive plan as well as the capital facilities element, when applicable.
- Summary of data regarding compatible and incompatible land uses around the airport.
- Map of the initial study area.

Step 2: Delineate the Airport Influence Area

Now that you have learned about the airport and its setting and have created a framework for your planning process, the next step is to define the area you need to consider for land use compatibility planning.

You will know you have been successful when:

- You can define the noise, airspace protection, and safety impacts of the airport and know what areas in the airport environs are affected.
- You have designated an airport influence area.

Step 2: Products

- Map of noise contours (if applicable).
- Overall boundary of the airport influence area.
- Map of the airport influence area.
- Airport airspace map showing FAR Part 77 *Imaginary Surfaces and Elevations*.
- Map of compatibility zones applicable to each runway end.

Step 3: Identify Compatibility Concerns

You have set a foundation that described key information about your airport and community. You have also identified the airport influence area that is relevant. Now it is time to examine the level of compatibility in your community. This step will help you understand the various issues involved in determining compatibility.

You will know you have been successful when:

- You have determined the compatibility status of existing land uses in the airport influence area.
- You have identified potential compatibility conflicts that could arise from future development.
- You have identified the particular compatibility concerns that will require further review in the next step.

Step 3: Products

- List of current community policies affecting land use development in the airport influence area.
- Evaluation of current compatibility status.
- Identification of potential future compatibility conflicts.
- List of specific compatibility issues to be addressed by new policies.

Step 4: Prepare Comprehensive Plan

Steps 1 through 3 led you through the research and analysis needed to describe and assess the interactions between airports and surrounding land uses. You now know what constitutes compatible land uses around your airport and have identified key challenges to prevention of more incompatible uses. What are your options for addressing those challenges? This step will help you think through the various compatibility strategies available, then evaluate and incorporate the best strategies into the draft of your comprehensive plan.

You will know you have been successful when:

- You have weighed the comparative advantages and disadvantages of available planning strategies.
- You have identified preferred planning strategies.
- You have decided upon specific compatibility criteria.
- You have fully considered airport land use compatibility measures in your comprehensive planning process and incorporated compatibility policies into the draft comprehensive plan where appropriate.
- You are ready to circulate the proposed comprehensive plan for review and adoption.

Step 4: Products

- List of current policies affecting airport land use compatibility in your community whether positively or negatively (Worksheet 4A).
- Assessment of the adequacy of current policies (Worksheet 4B).
- Evaluation of alternative compatibility strategies (Worksheet 4C).
- Draft of specific compatibility criteria.
- Adjustment of airport influence area boundary if necessary (Worksheet 4D).
- Draft comprehensive plan policies.
- Draft comprehensive plan land use map.

Step 5: Adopt the Comprehensive Plan

This short step takes the comprehensive plan update you prepared in Step 4 through the adoption process. Particular emphasis is given to gaining support for the airport land use compatibility measures you have incorporated into the draft plan.

You will know you have been successful when:

- Airport stakeholders feel that their concerns regarding compatibility matters have been understood and appropriately considered in the comprehensive plan update.
- You have gained public acceptance of the importance of airport land use compatibility planning.

- WSDOT Aviation provides comments supporting the compatibility measures you propose to take in your comprehensive plan update.
- Your community's decision-makers have adopted a comprehensive plan update that contains appropriate measures to protect the airport from encroachment by incompatible land uses.

Step 5: Products

- A strategy to gain public and decision-maker support of the compatibility measures.
- Information materials describing the importance of the airport and airport land use compatibility.
- An adopted comprehensive plan incorporating airport land use compatibility measures.

Step 6: Implement the Airport Land Use Compatibility Policies

Congratulations! You have shepherded airport land use compatibility matters through the research and analysis process to successful reflection of the concerns in your draft comprehensive plan update which has now been adopted by your community's decision-makers. But, you can't stop there. The one final step involves preparing implementing regulations, getting them adopted, and then using them on a day-to-day basis to ensure that compatibility concerns continue to be recognized and avoidable conflicts do not occur.

You will know you have been successful when:

- You have proposed revised development regulations to implement the policies.
- You have begun to put the policies to use.

Step 6: Products

- Draft and adopted implementing regulations such as an airport overlay zoning ordinance that contains the specific compatibility criteria to be met
- Identification of continuing actions and specific points in the development review process where airport land use compatibility concerns will be addressed

Public Outreach

WSDOT Aviation conducted an extensive public outreach process to obtain feedback on the *Airports and Land Use Compatibility Program Guidebook*. Among its outreach efforts, WSDOT released a draft copy of the guidebook on May 6 at the annual Washington Airport Managers Association meeting in Wenatchee. Airport sponsors, elected officials, local planners, and other airport groups were invited to review and comment on the draft guidebook. The 30-day review period began on Monday, May 10.

Stakeholders were also encouraged to recommend real or hypothetical land use challenges for the guidebook's scenarios section. WSDOT staff selected several scenarios and wrote appropriate responses to the challenges presented.

Additionally, WSDOT held four community meetings across the state to obtain feedback on the guidebook. The meetings were scheduled as follows:

- Monday, May 24, 3–5 p.m., Arlington Airport office, 18204 59th Drive NE, Arlington, WA 98223
- Tuesday, May 25, 3–5 p.m., Port of Chehalis Office, 321 Maurin Road, Chehalis, WA 98532
- Wednesday, May 26, 3–5 p.m., Yakima Library, downtown branch, 102 N Third Street, Yakima, WA 98901
- Thursday, May 27, 3–5 p.m., Spokane Library, downtown branch, 906 West Main, Spokane, WA 99201

WSDOT incorporated comments received during the 30-day comment period and re-released the draft guidebook for an additional 10 day final public comment period on Tuesday, October 26.

Use Your Resources

This guidebook gives you concrete tools to assist you in your planning efforts. Remember that effective, proactive land use planning benefits all parties and interests. It is important that local jurisdictions, planners and airports work cooperatively to achieve their planning goals.

WSDOT Aviation is also a resource. The department provides technical assistance that supports and facilitates informed decision making. You can contact our planning department for airport land use compatibility technical assistance at 360-651-6300. More information about WSDOT Aviation's Land Use Compatibility Program is located at www.wsdot.wa.gov/aviation/planning.

Acknowledgements

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Chapter 1 An Overview of Airport Land Use Compatibility Planning

Introduction

This chapter provides a high-level overview of airport land use compatibility planning and its relationship to community comprehensive planning. The intent is to give the reader a basic understanding of what is meant by "compatibility" in the context of airports and neighboring land uses. The material presented here sets the stage for the compatibility planning process outlined in Chapter 2.

In this chapter, you will learn about:

- The different types of airports in Washington State.
- What types of development are incompatible with airports.
- How incompatible development can affect airports.
- How to deal with compatibility issues.

All airports that serve general aviation activity are considered "general aviation airports" under the Growth Management Act (GMA).

Airports in Washington State

This guidebook focuses on Washington's 138 public-use, general aviation airports and seaplane bases, as state law is directed at protecting them from incompatible land use. Washington's airports are part of the communities they serve and are integral parts of the state's transportation system. Airports range in size from the busiest airline airports in the metropolitan areas to community airports serving businesses and other private aircraft to small landing strips in outlying locations. There are airports in virtually every county and in or near most cities and towns in the state. The state's airports provide a wide range of services to pilots, passengers, and the general public.

Economic Importance of Airports

Airports are valuable transportation assets and economic engines. They are crucial on a local, statewide, and national level as they efficiently move people and goods. Many businesses depend on the fast and convenient links to places, people, and products that airports provide.

The magnitude of this impact is impressive: approximately 17 million passengers now land and take off from a Washington airport every year and more than 600,000 tons of air cargo pass through our state airports. According to a 2001 study, the aviation system contributes 170,000 jobs, $4 billion in wages, and $18.5 billion in sales output to the Washington economy each year.

At the 2006 Washington State Governor's Economic Development Conference, transportation was identified as one of several proposed future growth strategies for Washington. Transportation, including air, rail, port, and highway, was also described as critical to continued economic development and success of the state in the global economy. The governor's strategic economic plan stressed the importance of long-term planning for Washington's transportation needs and the continued development of its economic future.

Kenmore Air Harbor SPB

Kenmore Air Harbor SPB is one of Washington's 16 commercial service airports that provide scheduled passenger service. The seaplane base is home to Kenmore Air, which operates an average of 80 daily arrivals and departures. The airport also acts as a U.S. Customs Service Port of Entry. The Lake Union base serves over 70,000 resident and international passengers annually. The seaplane base contributes significantly to the state's economy and offers unique access to locations both foreign and domestic.

WSDOT's 2001 economic study is in the process of being updated. Look for the newest data on the WSDOT Aviation website at: www.wsdot.wa.gov/aviation

These conclusions were again emphasized by the Washington State Aviation Planning Council in its July 2009 report. The Council recognized that:

> "The importance of Washington's aviation system is even greater than the revenue, employment, and sales data suggest. The state's aviation system is an essential function of its overall transportation system, which is the backbone of a vibrant and healthy economy."

📖 Long-Term Air Transportation Study (LATS), *Recommendations of the Washington State Aviation Planning Council*, July 2009. www.wsdot.wa.gov/nr/rdonlyres/6caf7b7b-37b8-44d3-b259-ab020b1ad995/0/council_report_print_070109_lowres.pdf

📖 See the General Aviation Manufacturers Association report *General Aviation's Contribution to the U.S. Economy* (May 2006) available at: www.nasao.org

Airport Types and Roles

Aviation is broadly classified under three categories: airline, general aviation, and military. Airlines provide scheduled commercial service for passengers or air cargo. Flying by private aircraft, both corporate and business, is considered general aviation. Airline and general aviation activity together comprise civil aviation. The third category, military, consists of flights by aircraft operated by the various branches of the U.S. military.

Airports can be divided into the same three categories. However, just because an airport is placed in a particular category does not mean that it exclusively serves that type of aviation. For example, airports that offer scheduled passenger service are usually called commercial or primary service airports. However, all commercial or primary service airports in Washington also serve general aviation and may have some military flights as well. Even some military airports in the country are joint-use, although most—including all the ones in Washington—are restricted solely to military aircraft.

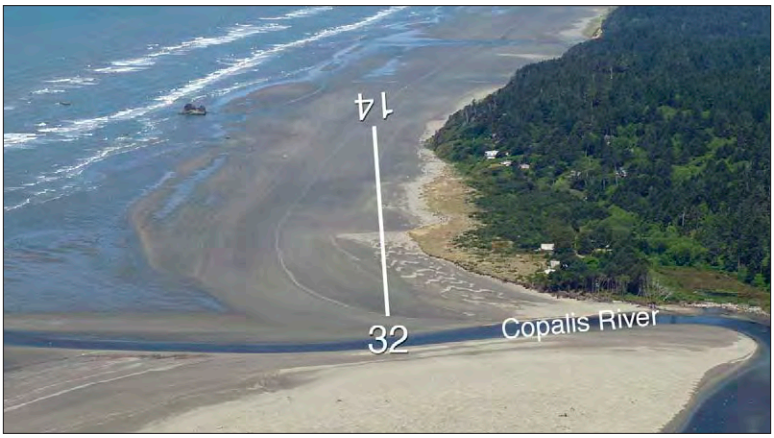
General aviation airports serve many roles in support of a wide range of users including:

- Local companies that use aircraft for essential business travel.
- Businesses that provide aviation-related services at the airport to pilots and their aircraft.
- Specialized aviation businesses or functions such as aerial photography, agricultural applications, and transmission line inspection.
- Flight instructors and students.
- Visiting pilots and their passengers traveling to the local community for business, personal, or recreational reasons.
- Sheriffs and police departments with air patrol and support units.
- Pilots and aircraft owners that fly for personal business or recreational purposes.

Military Airports

While the focus of this guidebook is on civil airports, the importance of military air bases to nearby communities should not be overlooked. These facilities are essential for national defense. In addition, they often are the primary economic generators of their communities. Maintenance of compatible land uses is a factor considered when decisions are made to continue, realign, or close a military base. RCW 36.70A.530 requires jurisdictions to notify the commander of the military installation of its intent to amend its comprehensive plan or development regulations that address lands adjacent to military installations to ensure those lands are protected from incompatible development.

Copalis State Airport



Located on the beach in Grays Harbor County, Washington. It is the only airport in the U.S. that is located on an ocean beach. Landing is only available during low tide.

Airports and Disaster Relief

Washington's airports are critical resources during emergencies. General aviation airports and aircraft also play central roles in post disaster response. Airports provide a base for a variety of emergency functions. Additionally, airports are especially important when emergencies or disasters damage or prevent the use of other transportation modes. Emergencies may include extreme weather, earthquakes, flooding, wildfire, mudslides, tsunamis, forest fires, volcanic activity, etc.

Aviation facilities and aviation assets may serve emergency functions, including:

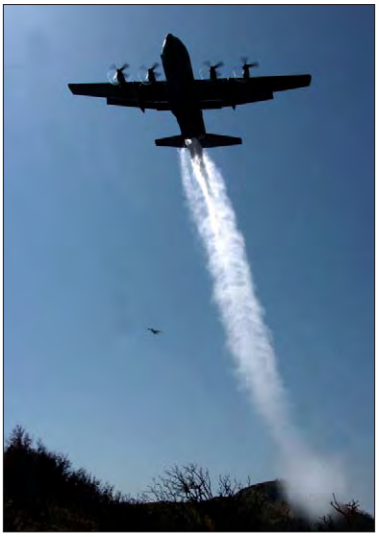
- Emergency air medical transportation
- Rapid insertion of medical teams and relief workers
- Evacuation
- Firefighting
- Search and rescue operations
- Logistical and supply chain support to surrounding communities
- Base of operations
- Access to communities when ground transportation is disrupted

The importance of Washington's air transportation in post disaster response is accentuated by the state's unique geographic and topographical features, which produce an unusually high reliance on aviation. Given this fact, maintaining a healthy and robust aviation system is key to our state's ability to respond swiftly in times of need.

Chehalis, Washington

Search and Rescue

Fire Suppression



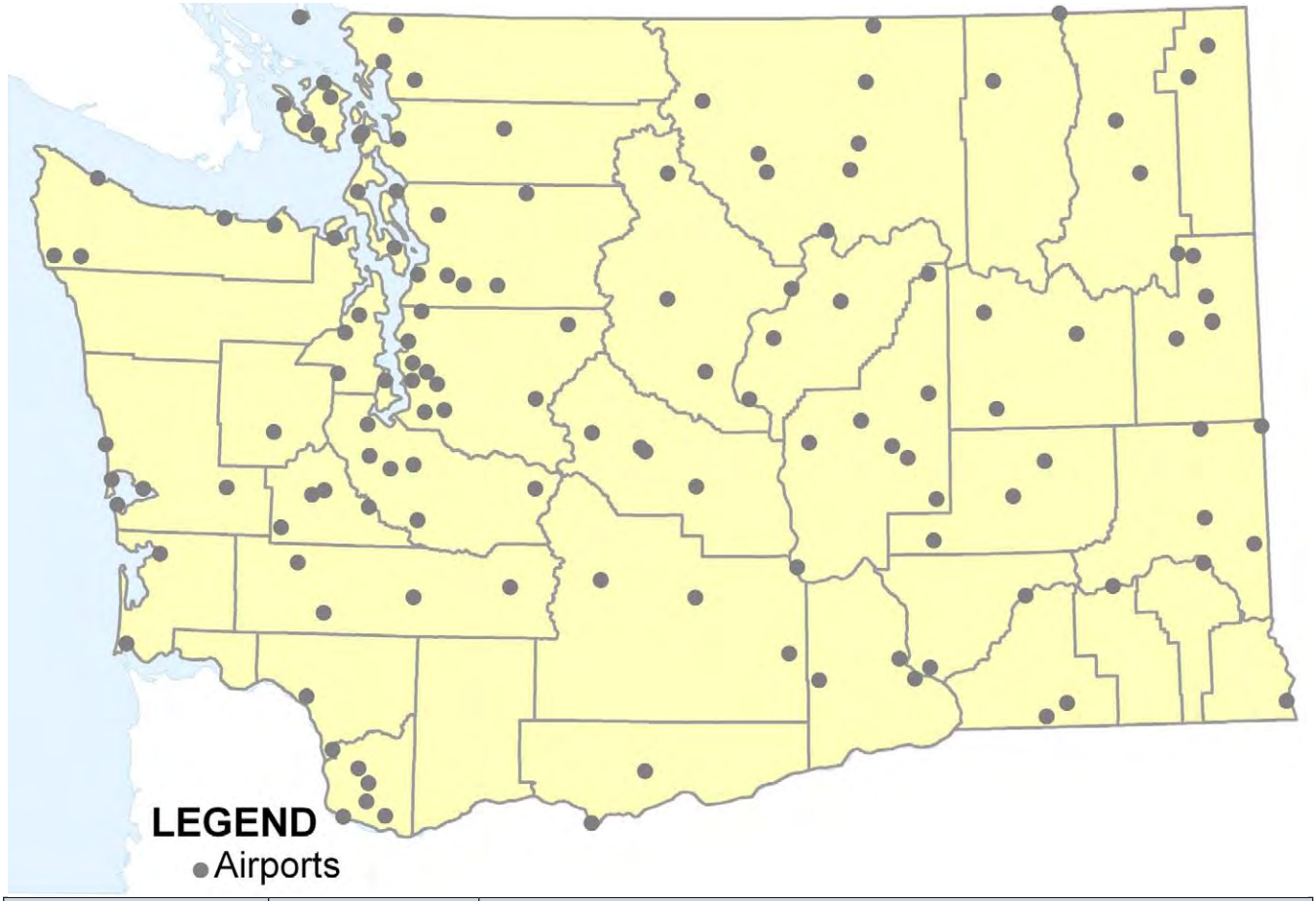
Mt. St. Helens

State and National Aviation Systems

Each airport in our state is part of a greater aviation system, just as individual roads are part of an extensive highway system. Both the state and federal governments have identified and classified the airports that have particular importance within the state and national aviation systems.

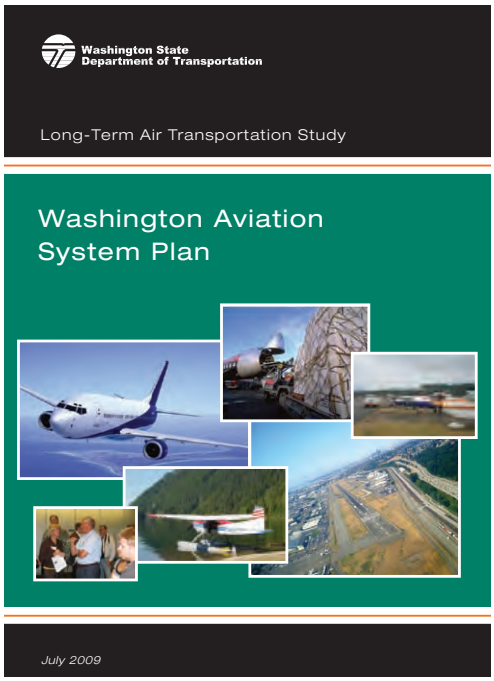
An airport's sponsor's acceptance of federal or state grant funds obligates the sponsor to meeting certain grant assurances as described in this chapter.

Table 1-1



Classification	No. of Airports	Description
Commercial Service	16	Accommodates at least 2,500 scheduled passenger enplanements per year for at least three years.
Regional Service	19	Serves large or multiple communities; all NPIAS Relievers; at least 40 based aircraft and 4,000-foot-long runway (some exceptions).
Community Service	23	Serves a community; at least 20 based aircraft; paved runway.
Local Service	33	Serves a community; fewer than 20 based aircraft; paved runway.
Rural Essential	38	Other land-based airports, including residential airparks.
Seaplane Bases	9	Identified by FAA as a seaplane base, unless it is a commercial service airport.
System Total	**138**	

Washington Aviation System Plan



The *Washington Aviation System Plan*, or WASP, encompasses public-use airports that have statewide significance. The 2009 WASP includes 138 airports.

The WASP divides public-use airports into six classifications based on the characteristics of the airport and geographic area it serves. The WASP classification of airports is used to help set airport improvement funding assistance consistent with the level of service provided.

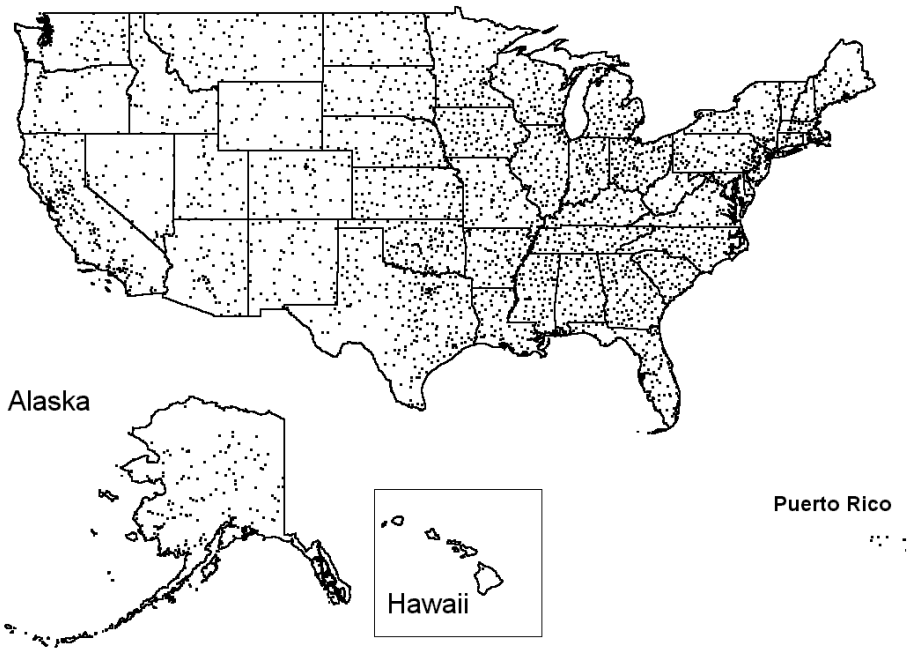
All airports in the state's aviation system, whether large or small, may play an essential role in disaster mitigation and later recovery efforts.

The number of airports in each of the six classifications is shown in Table 1-1.

National Plan of Integrated Airport Systems

Nearly half of all public use airports in Washington are considered to be nationally significant. This national system of airports is known as NPIAS, the *National Plan of Integrated Airport Systems*. The NPIAS is largely used to determine an airport's eligibility to obtain federal improvement grants under the Airport Improvement Program (AIP). It also includes estimates of the amount of AIP money needed to fund infrastructure development projects that will bring the NPIAS airports up to current design standards and add capacity to the system. The FAA is required to provide Congress with a five-year estimate of AIP eligible development every two years.

NPIAS Airports



📖 A copy of the NPIAS can be found at: www.faa.gov/airports_airtraffic/airports/planning_capacity/npias

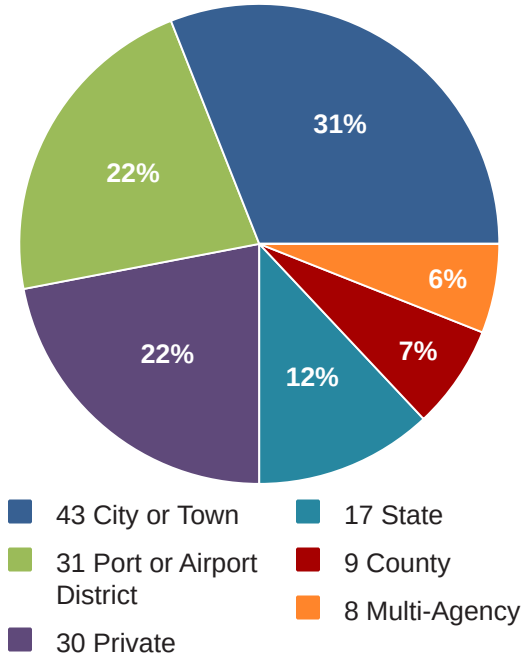
Under the federal airport classification system, airports are designated as primary airports, commercial service, reliever, or general aviation based upon the type of service they provide to the community. Airports that are designated primary airports provide scheduled passenger service and have more than 10,000 annual enplanements. Commercial service airports have between 2,500 and 10,000 annual enplanements. Reliever airports provide general aviation access to large metropolitan areas attracting smaller GA aircraft away from busy commercial airports to enhance the commercial airports' efficiency, capacity, and safety. Washington has 65 airports listed in the 2009–2013 NPIAS.

Airports that do not receive federal funding are often referred to as non-NPIAS airports. These airports generally serve smaller towns and cities, provide access to remote locations, or serve recreation areas. These airports are typically funded by the state or through private funding.

Who operates Washington's airports?

Of the 138 public-use airports in Washington, almost 80 percent are publicly owned, either by municipalities, including port and airport districts, or by the state. Several airports are owned by a combination of public entities. The state-owned airports are mostly small facilities which provide essential services to recreational or remote areas. Most of the privately owned, public-use airports also are classified as rural essential or seaplane bases.

Public-Use Airports by Ownership



Policy decisions involving publicly-owned airports in the state are typically made by elected officials of the entity owning the airport. Day-to-day operations are generally administered by an airport manager. Larger airports usually have a full-time manager, frequently supported by other staff, while low-activity airports may have a volunteer manager, part-time contractor, or local official who serves as airport manager in addition to other roles in local government.

Funding to develop, maintain, and operate airports is derived from a variety of sources including user fees, revenues from land and facility leases and rents, local government funds, and federal and state grants. The proportion of funding coming from each of these sources varies from airport to airport. Larger airports are more likely to be self-supporting than the small ones with few aircraft or services. For those airports in NPIAS, a substantial proportion of development and major maintenance funding comes from the FAA grant program. State grants serve a similar function for the smaller NPIAS airports and others in the state airport system.

State law authorizes formation of public port districts for the purpose of supporting economic development. Ports are quasi-governmental entities that may own land and often operate a variety of public infrastructure, including airports. There are 75 port districts in Washington State.

com•pat•i•ble
Capable of existing or working together in a harmonious or agreeable manner or in combination with another activity.

Airports and Surrounding Land Uses

What is compatibility?

Most people are familiar with the negatives associated with being located near an airport, particularly such things as noise, vibration, odors, and accident risks. Fewer people understand the effect that adjacent land uses can have on airport activities. Development around an airport can have direct adverse consequences to airport safety, efficiency, operation, and economic viability. Tall buildings, towers, power lines, and even tall trees can be hazardous obstructions for landing and departing aircraft. In addition, development near an airport may reduce property available for aviation operations and safety areas. Indirectly, incompatible development can lead to demands for limitations on the airport activity. Ultimately, incompatible development around public use airports may result in loss of the facility. History shows us that incompatible development has the following consequences:

- Reduces the public's access to air transportation and the benefits it provides.
- Reduces the value of public investment in airport infrastructure.
- Reduces opportunity for economic development and diminishes a communities capacity to deal with natural and human caused disasters.
- Reduces quality of life for people living in developments located near airports.

Communities can address airport land use compatibility in a variety of ways based on the specific characteristics of an individual airport facility as well as numerous other factors that are unique to their area. Approaches that may work well in outlying communities may be impossible to achieve in urban locations. To determine the best approach for any particular airport and community, the types of land use interactions must first be understood.

Evergreen Field

These photos show the spread of urban development around Evergreen Field in Vancouver, Washington. The airport closed in summer 2006 to make way for a mixed-use development including retail, office, and residential units after the original owner passed away and his heirs sold the land to developers.

Types of Land Use Interactions Between Airports and Communities

Airports and nearby communities interact in a variety of ways, both physical and economical. Economically, airports can be important attractors of business and income to a community. The physical interactions are the focus here, and particularly the interactions that occur between all types of airports and communities:

- The airport influence area is the area where an aircraft flies during the final phases of flight. This area is most impacted by noise, light, vibration, fumes, and low-flying aircraft.
- Noise addresses the areas of concentrated impacts that are most disruptive to land use activities.
- Airspace protection deals with aspects of land uses that can cause or contribute to aircraft accidents.
- Safety is concerned with the consequences of accidents when they occur.

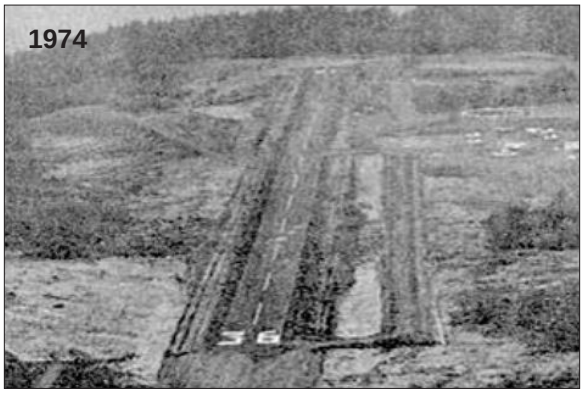
Encroachment of Incompatible Land Uses

Encroachment of incompatible land uses is a key factor contributing to constraints on expansion and restrictions on operations of airports in the U.S. In many cases, it can even lead to airport closures.

Why is encroachment occurring?

- Communities underestimate the adverse impacts of incompatible land use development on airport operations.
- Washington‘s population has doubled in the last 30 years.
- Urban areas are expanding and communities are pursuing denser development.
- Local land use authorities are either unaware of or not compliant with the requirements of Washington’s Growth Management Act.
- Property adjacent to the airport may have services extended to it and be affordable due to its proximity to the aviation facility.
- Many airports are surrounded by flat, undeveloped land that is attractive for development because the land, in many cases, is served by utilities and other infrastructure.

Anacortes Airport



Consequences of Incompatible Land Uses Near Airports

Consequences to the aviation system and its users:

- Delays and constraints to airport development, leading to limitations on system capacity.
- Restrictions on aircraft operations, leading to system delays and travel time penalties.
- Constraints to runway approach protection, leading to runway capacity constraints and safety risks.
- Litigation and related costs.
- Increased development costs.
- Lost value of public investment.
- Increased risk of aviation accidents caused by the presence of tall structures, visual obstructions, and wildlife attractants.

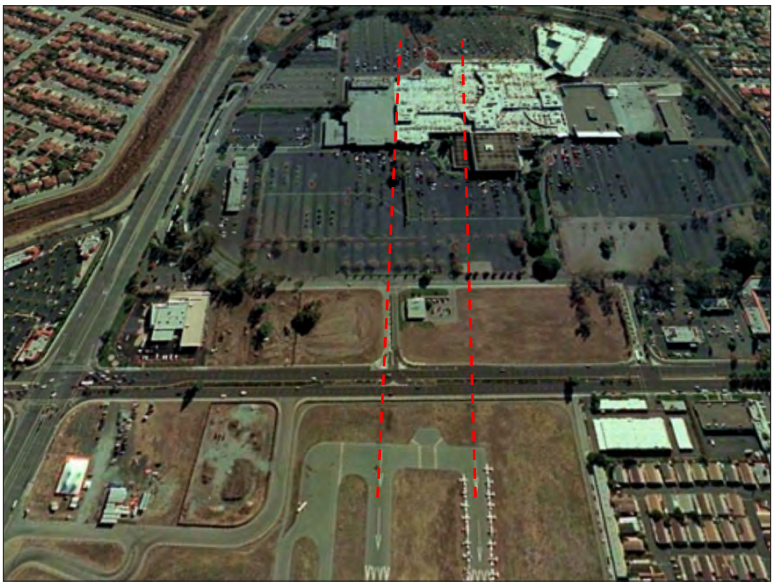
Consequences to people who live near airports:

- Exposure to noise.
- Exposure to emissions.
- Exposure to aviation accident risk.
- Decline in transportation access.
- Consequences to concerned local and regional jurisdictions.
- Local and regional economic impacts due to constraints on airport growth.
- Irresolvable political disputes.

What land use types pose concerns?

Some types of compatibility conflicts between airports and land uses are obvious. Houses and schools, for example, are generally incompatible near airports for reasons of noise, safety, fumes, vibration, and low-flying aircraft. Others are not as readily recognized or understood—uses that concentrate people in locations where aircraft accident risks are greatest, tall structures that impinge upon airport airspace, or features that attract birds or animals to areas where aircraft operate. Some examples of the obvious and not-so-obvious compatibility conflicts are listed in Table 1-2.

Reid-Hillview Airport San Jose, California



High intensity uses along the extended runway centerline can pose a substantial risk. In this example, a mall was constructed along the extended centerline for two parallel runways.

In general, to avoid compatibility conflicts, land uses closest to the ends of runways should ideally consist of open areas, agricultural land, commercial or industrial uses. Professional offices and mixed use commercial development can also be compatible if located farther away from the runway ends.

Because of noise and impacts within the airport influence area, single-family residential uses are best kept away from anywhere that aircraft are regularly flying to reach or leave the airport. Often, multi-family residential can be a better option than single-family in locations where aircraft accident risks are low, but noise impacts are present.

For additional discussion of compatibility conflicts, see Chapter 3.

Table 1-2
Compatibility Concerns Represented by Particular Land Uses

Land Use Type	Compatibility Concerns
Single-Family Residential	• Noise can be disruptive in outdoor areas as well as indoors with open windows. • Aircraft overflight can be annoying, especially where ambient noise levels are low such as in suburban or rural areas.
Multi-Family Residential	• Noise can be disruptive in outdoor areas as well as indoors with open windows, although less sensitive than for single-family residential. • High density presents concern for safety of residents in areas exposed to significant risk of aircraft accidents.
Schools K-12	• Noise can disrupt the learning environment. • Special concerns for safety of children in areas exposed to significant risk of aircraft accidents.
Hospitals/Nursing Homes	• Special concerns for safety of patients and the elderly in areas exposed to significant risk of aircraft accidents.
Retail Centers	• Large numbers of people could be at risk from aircraft accidents if the use is located in areas exposed to high levels of aircraft accidents.
Business Parks	• Safety concerns for places with high-intensity uses. • Tall buildings can be airspace obstructions.
Assembly Facilities	• Large numbers of people could be at risk from aircraft accidents; outdoor stadiums have greatest exposure.
Industrial Uses	• Smoke, steam, and thermal plumes can be hazards to flight. • Tall structures can be airspace obstructions. • Possible release of hazardous materials if damaged during an accident.
Agricultural Uses	• Potential wildlife attractants as well as a source of dust and smoke.
Water/Natural Areas	• Potential wildlife attractants.
Power Plants	• Smoke, steam, and thermal plumes can be hazards to flight. • Tall structures can be airspace obstructions. • Potential disruption of service if damaged during an accident.
Critical Community Infrastructure (emergency services and communications)	• Potential disruption of service if damaged during an accident.

Addressing the Land Use Compatibility Issue

First, it is important to recognize that the responsibility for airport land use compatibility does not rest just with WSDOT Aviation or any other single party. Many participants have a role to play in the process and a stake in its outcome.

The process can be thought of as puzzle with each participant as having a part of a puzzle—the planning effort is not complete without every piece. The responsibilities for preserving and enhancing airport land use compatibility rest at all levels of government as well as with the private sector. Each entity has its own distinct role to play.

Who is responsible for airport land use compatibility?

The responsibilities for preserving and enhancing airport land use compatibility rest at all levels of government as well as with the private sector. Each entity has its own distinct role to play. While the respective responsibilities—and the limitations on authority—are largely defined by law local planning depends on participation from a diverse range of interests and stakeholders to define community needs and identify solutions. Participation is critically important for influencing outcomes. It is the nature of the planning process that interests that are not represented are often not addressed. Airport advocates wishing to preserve aviation facilities should ensure their place at the table so they can work cooperatively with other citizens and local leaders to educate them about the importance of air transportation for their community.

This section outlines the primary roles of each of the players. A further look at the legal framework behind the different roles is contained in the final section of this chapter.

WSDOT Aviation's responsibilities under the Growth Management Act include addressing land use and airport compatibility concerns. The state agency having overall responsibility for overseeing implementation of the act is Growth Management Services (GMS), a unit of the Department of Commerce Local Government Division. GMS provides technical and financial resources to help local governments to undertake planning and other work essential to their compliance with provisions of the act.

Washington State Department of Transportation

The State of Washington has a lead role in promoting land use compatibility around the airports in the state. This role derives from the state's broad interest in all modes of transportation in recognition of the benefits that transportation brings the state and its citizens. The specific responsibility as the primary steward and advocate of the state's aviation interests is assigned to WSDOT Aviation. WSDOT Aviation's role extends to advocating for promotion of safe air transportation, preservation of aviation facilities, provision of airport capacity to meet demand, and technical assistance.

Washington State Department of Transportation

State law addressing airport hazards dates back to the mid 1940s. Chapter 14.12 RCW focuses on obstructions to airport airspace and gives counties and cities the power to adopt and enforce airport hazard zoning.

> "It is hereby found that an airport hazard endangers the lives and property of users of the airport and of occupants of land in its vicinity, and also, if of the obstruction type, in effect reduces the size of the area available for the landing, taking-off and maneuvering of aircraft thus tending to destroy or impair the utility of the airport and the public investment therein."

While not exclusively directed at airports or airport land use compatibility, broader legislative attention to land use planning matters took place with the enactment of the Growth Management Act (GMA) (RCW 36.70A) in 1990. The basic purposes of the act are identified through 13 GMA goals. These goals were identified with the purpose of addressing uncoordinated and unplanned growth, that may otherwise pose a threat to the environment, sustainable economic development, and to the health, safety, and public welfare of residents of the state.

Legislation adopted in 1996 was aimed more specifically at airport land use compatibility. RCW 36.70.547 and other sections that refer to it (including RCW 35.63.250, 35A.63.270, and 36.70A.510) requires towns, cities, and counties to "discourage the siting of incompatible uses" adjacent to general aviation airports through adoption of comprehensive plan policies and development regulations. *Note: In the context of this statute, all airports that serve general aviation, meaning all public-use airports in the state, are considered to be general aviation airports.* Formal consultation with WSDOT Aviation is required before such plans and regulations may be adopted or amended. Additionally, WSDOT Aviation is tasked with providing technical assistance to the communities and aviation stakeholders to help them meet the requirements of the law. (See Appendix __ for more details on the consultation process.)

The technical assistance includes establishing airport land use compatibility guidelines. WSDOT Aviation does not have regulatory authority over land use decisions, however, cases decided by the state's Growth Management Hearing Boards direct local government to "give substantial weight to WSDOT Aviation's comments and concerns related to matters affecting safety at general aviation airports." (See Stephen Pruitt and Steven Van Cleve vs. Town of Eatonville, heard by the Central Puget Sound Growth Management Hearings Board [CPSGMHB; Case No. 06-3-0016].)

In conclusion to the *Long-Term Air Transportation Study* (LATS) in July 2009, the Washington State Aviation Planning Council recommended policies that clarify Washington's position and responsibility in relation to its local, regional, and federal aviation partners as the primary steward and advocate for protecting Washington State's aviation system interests.

> "The challenge of meeting Washington's aviation capacity is shared between many entities including the FAA, local and regional agencies, airlines, and publicly and privately owned airports. The Council believes that the State needs to exercise a leadership role as the primary steward for a healthy and viability aviation system. In this role, it will provide the FAA with support to help it better manage the national aviation system and clarity about its funding priorities. The state will also provide policy direction and support local and regional agencies in fulfilling their distinct aviation roles."

📖 More information about WSDOT Aviation is available at: www.wsdot.wa.gov/aviation
📖 Growth Management Hearings Board Decisions are available at: www.gmhb.wa.gov

Federal Aviation Administration

The FAA plays a very focused role in airport land use compatibility. Its involvement stems from its primary areas of responsibility—the safe and efficient operation of airports and the national aviation system. In these matters, the FAA role is preeminent. Federal law preempts local regulations in the area of aircraft safety, navigable airspace, flight operations, and noise control.

Even in these fields though, the FAA's authority is directed primarily at the operators of airports and aircraft. The FAA has little ability to prevent the development of incompatible land uses near airports. However, the FAA strongly encourages local jurisdictions to protect airports through their local land use authority. The U.S. Constitution reserves to the states the authority over local land use matters. Thus, the FAA cannot dictate the decisions made by airports and local land use entities, it can only influence them—albeit sometimes very strongly. The two mechanisms by which the FAA most strongly influences local land use decisions are through regulations designed to protect airport and en route airspace; and via its grant program.

FAA Grant Program

As authorized under the Airport and Airway Improvement Act of 1982, the FAA's grant program—the Airport Improvement Program (AIP)—provides the majority of funding for facility improvements and land acquisition for airports within the NPIAS. In exchange for receipt of grant funding, however, airports must promise to take steps, to the extent possible, to prevent creation of airspace hazards and incompatible land uses. The FAA can withhold funds from a grantee or require repayment of funds if the grant assurances are not met. The grant assurance language is quite general, but two particular assurances address the actions that the FAA expects the airport sponsor to take. The grant assurances say that the airport sponsor must agree that:

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

21. **Compatible Land Use.** It will take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which Federal funds have been expended.

📖 The full set of FAA grant assurances is available at: www.faa.gov/airports/aip/grant_assurances

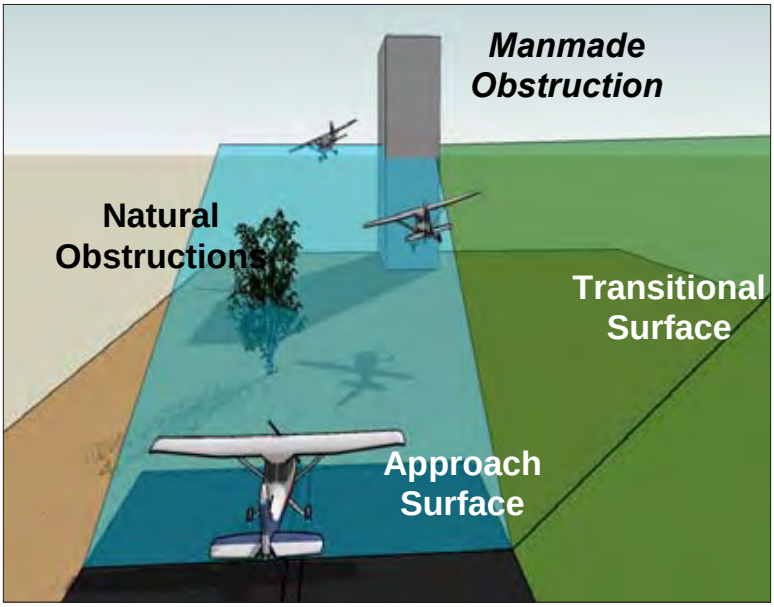
Airspace Protection

The other way in which the FAA gets involved in local land use actions is with regard to protection of airport and en route airspace. However, beyond the obligation that the FAA puts on airports when they accept grant funds, the agency does not have the authority to prevent airspace hazards from being created. This is a local responsibility and is not mandatory. The FAA's function is to set the standards used to determine whether tall structures would adversely affect the airspace and, additionally, to evaluate individual proposals relative to these standards. Other airspace hazards include smoke, glare, wildlife, and electronic signals. The standards and the review process are both defined in Part 77 of the Federal Aviation Regulations (14 CFR Part 77).

The one facet of the federal regulations that does create a mandatory local responsibility is the notification process. Part 77 requires that notification be submitted to the FAA before any tall structure is constructed or erected that could penetrate the airspace surfaces defined in the regulations. Certain other land use features or activities are also subject to the notification process (for example, uses involving electro-magnetic radiation or laser lights). The notification responsibility rests with the project proponent, not the local government agency that has approval authority. Substantial fines can be levied for failure to comply with the notification requirements.

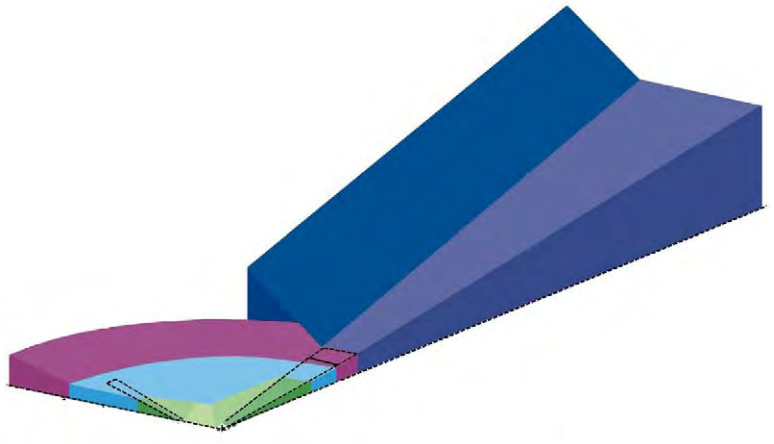
📖 See U.S. Code Title 49, Sections 44718, Structures Interfering with Air Commerce and 46301(a), Civil Penalties.

Airspace Protection



It is important to note that the FAA relies on local jurisdictions with land use authority to protect critical airspace. The FAA has no direct land use authority and must rely on local decision makers to protect airspace from both naturally occurring and man-made airspace obstructions.

FAR Part 77 Imaginary Airspace Surfaces



www.wsdot.wa.gov/aviation/planning/civapimagsurf.htm

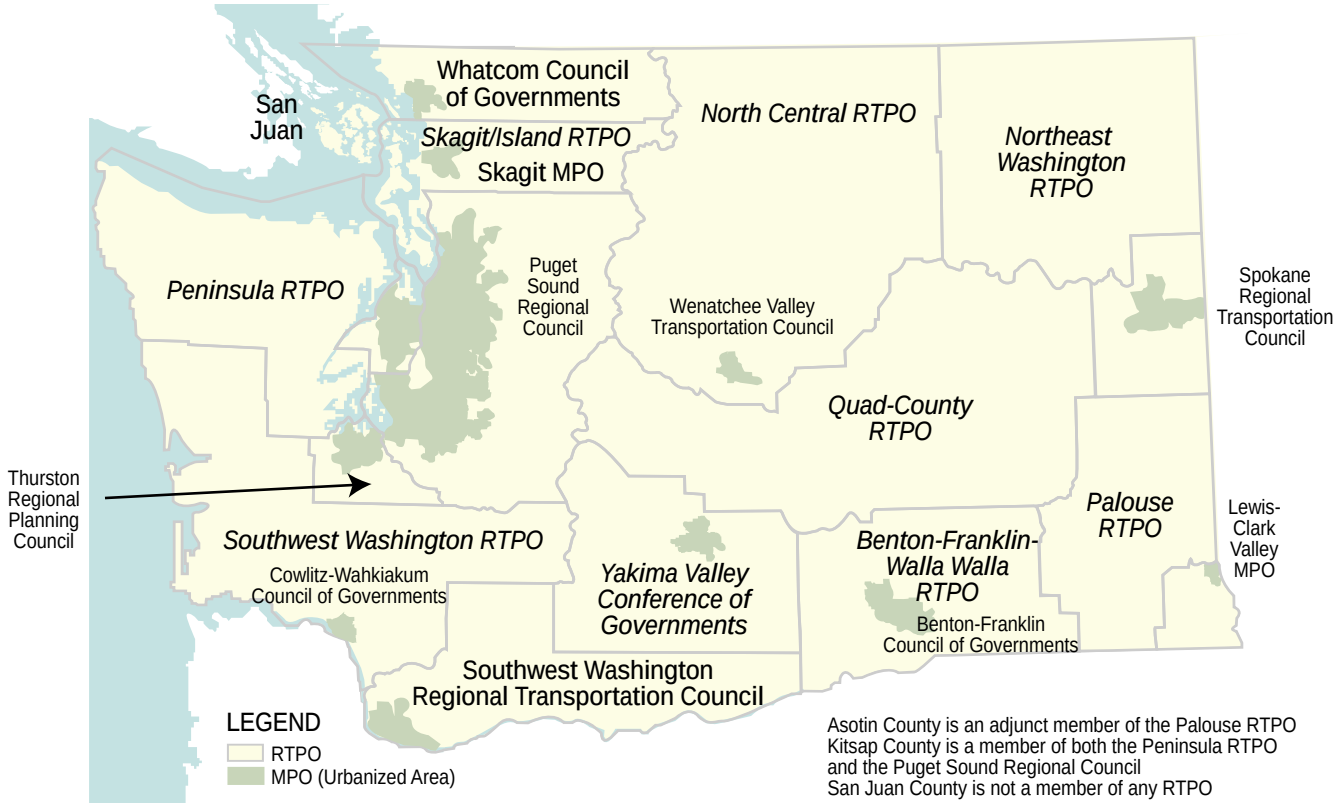
Regional Transportation Planning Organizations

Regional Transportation Planning Organizations (RTPOs) occupy a special niche in the overall spectrum of agencies having responsibilities for airport land use compatibility planning in Washington. As enabled by state law, RTPOs are voluntary associations of local governments within a county or contiguous counties. They were authorized as part of the 1990 GMA to ensure local and regional coordination of transportation plans. RTPO members include cities, counties, WSDOT, tribes, ports, transportation service providers, private employers, and others. Among the duties taken on by these organizations is review of local countywide planning policies and the transportation-related provisions in local comprehensive plans.

The level of involvement of RTPOs in airport land use compatibility planning varies from one organization to another. As the RTPO for the state's most populated area, the Puget Sound Regional Council (PSRC) specifically reviews airport compatible land use policies as part of its comprehensive plan review and certification process. The process requires cities and counties to report on actions taken to discourage the siting of incompatible land uses near airports. PSRC also offers technical assistance to local planners to assist them in identifying key airport land use compatibility issues and to help in developing policies and planning provisions to address those issues.

More information about Washington's Metropolitan Planning Organizations (MPOs) and RTPOs, including information about the review and certification process, is available at: www.wsdot.wa.gov/planning/regional/

Regional and Metropolitan Transportation Planning Organizations



Local Government

To a great extent, the ultimate responsibility for airport land use compatibility rests with local government bodies—towns, cities, and counties. Although local comprehensive plans, plan policies, and regulations must be consistent with state law and countywide planning policies, local government has discretion to determine how development occurs within the community. Also, the federal preemption doctrine does not affect the local government's ability to use its police powers, particularly land use controls, to anticipate, abate, mitigate, and otherwise respond to other land use concerns provided they are reasonable and do not restrict airport operations.

The local government level is where day-to-day decisions are made on whether development proposals are compatible with airport activity. Airport compatibility issues may be addressed in a variety of local planning documents.

Countywide Planning Policies – Counties develop these policies in cooperation with their cities. The policies provide a common framework for local planning efforts within each county. Countywide planning policies address numerous issues, including siting major public capital facilities, defining transportation strategies and facility needs, and facilitating joint planning. Basic airport land use compatibility goals and intergovernmental coordination mechanisms should be addressed.

Comprehensive Plans – Comprehensive plans guide land use development within towns, cities, and counties. They determine where development is or is not desirable and set the tone for the development size and intensity. The plans are the centerpiece of local planning and the starting point for the planning of individual projects. Development regulations—zoning, subdivision, and other controls—must be consistent with comprehensive plans. State agencies are required to comply with comprehensive plans and development regulations of jurisdictions planning under the GMA. Establishment of land use patterns to avoid compatibility conflicts with airports must be a consideration in preparation of these plans.

What is a Comprehensive Plan?

The comprehensive plan expresses a community's vision about itself and what it would like to become. The plan forms the policy framework from which all future community planning actions will be judged, and it is the starting point for any discussion regarding local land use. It enables the community to compare how it looks now with what it wants to look like in 20 years.

The comprehensive plan[1] is developed cooperatively by elected officials, the planning commission, planning staff, and the public. Consultants are often engaged for all or part of the work effort. Elected public officials adopt the plan following a series of public hearings. The time range for the comprehensive plan is generally 20 years. Periodic amendments every five to seven years are usually required. Comprehensive plans generally cover the following topic areas or elements:

- Capital Facilities
- Land Use
- Utilities
- Transportation
- Economic Development
- Natural Resources
- Rural (county comprehensive plans only)
- Housing
- Parks and Recreation

[1]Adapted from *What is a Comprehensive Plan?* by David Martineau, Planning Director, City of Colville. Presented at the Spring 2006 meeting of the Washington State Community Airports Association (CAA), Wenatchee, Washington.

Sub-Area Plans – These planning documents address a portion of a municipality. They address a smaller geographic area than the comprehensive plan, but often influence airports depending on their scope and approach. Limits on development in areas subject to airport impacts should be described.

Development Regulations/Zoning – These regulations are set by local jurisdictions to implement the comprehensive plan. They specify the types, intensity, and density of activities that may take place in a given location and establish limits on the physical size and shape of the development. Specific limitations on the number of occupants, the heights and overall sizes of structures, and requirements for sound attenuation are appropriate elements of local zoning.

Environmental Review – This is a formal process for soliciting public comment on the effects of a particular development proposal or planning effort. The procedural and analysis requirements are set forth in the State Environmental Policy Act (SEPA). The SEPA process provides a way to identify possible environmental impacts that may result from governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilities, or adopting regulations, policies or plans. Information provided during the SEPA review process helps agency decision makers, applicants, and the public understand how a proposal will affect the environment. This information can be used to change a proposal to reduce likely impacts, or to condition or deny a proposal when adverse environmental impacts are identified. As part of a SEPA document regarding development near airports, the compatibility of the proposed development with airport activities should be addressed.

Under the National Environmental Policy Act (NEPA), similar environmental review requirements are established at the federal level. NEPA comes into play with regard to actions by federal agencies including the provision of grants for airport improvements. Local land use actions are not subject to NEPA.

- For additional information regarding SEPA and its process visit: www.ecy.wa.gov/programs/sea/sepa/e-review.html
- Information about the NEPA process can be found at: www.epa.gov/compliance/basics/nepa.html
- For more information about the planning process in Washington State, see the Department of Commerce Short Course on Local Land Use Planning at: www.commerce.wa.gov/site/395/default.aspx

Airports

Airports are the only participants in the airport land use compatibility process that have the ability, although limited in many ways, to address the issue from two perspectives—through their long-range planning of future airport development and with actions affecting day-to-day operation of the airport.

Chief among actions in the first category are decisions regarding the configuration of the airport. Airports can decide whether to build or extend a runway, for example. They also can purchase property either to eliminate highly incompatible land uses or to prevent future incompatible development. Funding is typically the major limitation, however, acquisition of property within runway protection zones is eligible for FAA grants.

An airport master plan is the primary mechanism by which airports determine the future direction of airport development. These development actions can have direct implications on the airport's impacts on nearby land uses. The master planning process also can affect airport impacts more indirectly by not seeking to attract types of aircraft that generate the greatest impacts. Airports, though, cannot exclude aircraft based on noise or safety and ultimately it is the pilot's decision as to whether the aircraft can safely operate at the airport.

In terms of day-to-day operations, airports can seek the cooperation of local pilots to identify noise sensitive areas and to help spread the word to avoid overflying these locations to the extent practical and safe. Airports also can work with the FAA to modify manner in which aircraft are flown at the airport. There are significant limitations as to what types of modifications are acceptable to the FAA, but changes to such things as traffic pattern locations, instrument approach procedures, and preferential runway designation may be open to consideration.

Airport Users

Airport users, especially aircraft owners, operators, and pilots, have an informal but important role in airport land use compatibility matters. Foremost, when operating their aircraft, they should do so safely and in a manner that minimizes noise impacts on the land uses below. Individual pilots should encourage other pilots to do the same. Beyond these actions, airport users need to be engaged in planning for their airport and the surrounding community. Participating in public meetings and speaking out regarding compatibility concerns is essential.

Airport Master Plan and Airport Layout Plans

Two distinct, yet interrelated, types of plans used to guide airport development are the Airport Master Plan (AMP) and Airport Layout Plan (ALP).

An AMP is a comprehensive document intended to guide development on an airport. The planning period is normally 20 years. A typical AMP will contain most of the aviation-related information needed to prepare a land use compatibility plan. Almost all AMPs will contain:

- An inventory of airport facilities.
- Data on current and forecast activity levels.
- Assessment of future development needs and alternatives for meeting the needs.
- Text and drawings describing proposed improvements.

The AMP itself or an accompanying environmental document also will usually contain depictions of current and projected noise contours.

An ALP is a conceptual map depicting current and proposed airport features including runways, taxiways, navigational aids, buildings, aircraft parking areas, and other infrastructure. Airport property boundaries and the limits of required clear areas such as runway protection zones and runway object free areas are shown as well. Data tables (sometimes on a separate sheet) provide additional information about the airport runways, approaches, and other features, as well as the critical aircraft that the airport is designed to accommodate.

Additional drawing sheets typically will illustrate the airport airspace (FAR Part 77 surfaces), the runway approach surfaces and any obstructions to them, and details of the airport terminal or building area.

Even airports that do not have a current AMP may have a current ALP. ALPs are typically updated more regularly than AMPs. In addition to being listed in the NPIAS, to be eligible for FAA grant funds, an airport must have a current ALP approved by the FAA. Completion of an ALP is also an eligibility requirement for WSDOT Aviation's grant program.

See FAA Advisory Circular 150/5070-6B, *Airport Master Plans*, to learn how the master plan process works, including how your airport can apply for federal funds when/if eligible.

Legal Framework for Compatibility Planning

The legal tools needed to address airport land use compatibility issues are provided by a variety of state and federal laws, regulations, and legal decisions. Some of this framework sets mandatory requirements for airports or local land use entities. Other pieces merely enable airport or local action, but are not mandatory. Ultimately, the responsibility for ensuring compatibility between an airport and surrounding land uses rests with the airport operator and its neighboring land use jurisdictions.

Summarized in this section are the major state laws, regulations, and state Growth Management Hearings Board decisions that have an important bearing on airport land use compatibility and the issues discussed earlier in this chapter.

Aeronautics Laws

Laws pertaining to aeronautics are mostly gathered under Title 14 RCW.

- **RCW 14.07 and 14.08** ***Municipal airports act*** – Adopted in 1941 and amended in 1945, the act provides for the acquisition and sponsorship of airports by Washington cities, towns, counties, port districts, and airport districts.
- **RCW 14.12** ***Airport zoning*** – This act establishes definitions and criteria, and allows local jurisdictions to adopt zoning controls to protect critical airspace from buildings, structures, or other airspace obstructions. The law provides direction and guidance to cities and counties on how to manage airport hazards.

Planning Enabling Act

Washington's Planning Enabling Act (Chapter 36.70 RCW) is a set of state laws that describe planning authorities and responsibilities for towns, cities, and counties. Sections particularly applicable to airport land use compatibility planning include the following:

- **RCW 36.70.320** ***Comprehensive plan*** – Under this section, counties are required to prepare a "comprehensive plan for the orderly physical development of the county, or any portion thereof…" RCW 35A.63.060 establishes similar comprehensive planning requirements for cities and towns. The two required elements of comprehensive plans are a land use element and a circulation element (RCW 36.70.330). Other elements are optional (RCW 36.70.350).
- **RCW 36.70.547** ***General aviation airports*** – This section mandates that:

  "Every county, city, and town in which there is located a general aviation airport that is operated for the benefit of the general public, whether publicly owned or privately owned public use, shall, through its comprehensive plan and development regulations, discourage the siting of incompatible uses adjacent to such general aviation airport."

Plans may only be adopted following formal consultation with airport owners and managers, private airport operators, general aviation pilots, ports, and the aviation division of the department of transportation. WSDOT Aviation is also tasked with providing technical assistance to local agencies preparing plans and regulations consistent with this section.

This section applies to every county, city, and town, whether operating under Chapter 35.63, 35A.63, 36.70, or 36.70A RCW, or under a charter.

Growth Management Act

Adopted in 1990, the GMA (Chapter 36.70A RCW) was enacted in response to rapid population growth and concerns with suburban sprawl, environmental protection, quality of life, and related issues. The act expands the Planning Enabling Act requirements for comprehensive planning in the state's most populous and rapidly growing counties. Twenty-nine counties are either required to fully plan under the GMA or have chosen to do so. These counties make up about 95 percent of the state's population. The remaining ten counties have limited planning requirements under the act.

Several sections are important to airports.

- **RCW 36.70A.070** ***Comprehensive plans – mandatory elements*** – This section lists eight elements that must be included in comprehensive plans. Most of the elements potentially affect airports in that they guide the development that may occur in nearby areas. The land use element is particularly significant to land use compatibility matters and the rural element also may be consequential to some airports. The transportation element requires an inventory of facilities and services needs, including general aviation airports "to define existing capital facilities and travel levels as a basis for future planning."

  For airports located near the edge of urban areas, airport land use compatibility should be considered in determining the location of the urban growth boundary.

- **RCW 36.70A.110** ***Comprehensive plans – Urban growth areas*** – Each county that is required or chooses to plan under the GMA must designate an urban growth area or areas within which urban growth is to be encouraged and outside of which growth can occur only if it is not urban in nature. Urban growth area boundaries must be reviewed at least every ten years and adjusted as necessary to accommodate the urban growth projected to occur in the county for the succeeding 20-year period (RCW 36.70A.130).

- **RCW 36.70A.200** ***Siting of essential public facilities – Limitation on liability*** – This section deals with essential public facilities that are typically difficult to site. Airports are explicitly identified as an example of this type of facility. Others include state education facilities, state or regional transportation facilities, state and local correctional facilities, solid waste handling facilities, and in-patient facilities including substance abuse facilities, mental health facilities, group homes, and secure community transition facilities. Counties and cities planning under GMA must have a process for identifying and siting essential public facilities. No local comprehensive plan or development regulation may preclude the siting of essential public facilities.

- **RCW 36.70A.210** ***Countywide planning policies*** – Recognizing that counties are regional governments within their boundaries and that cities are primary providers of urban governmental services within urban growth areas, this section establishes requirements for adoption of countywide planning policies. Such policies are to serve as a countywide framework from which county and city comprehensive plans are developed and adopted and made consistent with each other. Specific topics to be covered by the policies are listed.

  Although airport land use compatibility is not explicitly listed as a topic for countywide planning policies, the statutes allow topics other than those listed to be addressed.

- **RCW 36.70A.510** ***General aviation airports*** – This section requires cities and counties planning under RCW 36.70A.040 to adopt and amend comprehensive plans and development regulations to address land use compatibility adjacent to airports consistent with RCW 36.70.547.

Findings of the Washington State Growth Management Hearings Boards

The following four decisions are ones most directly relevant to airport land use compatibility matters. The implications are noted here along with a brief indication of the topic addressed by the decision.

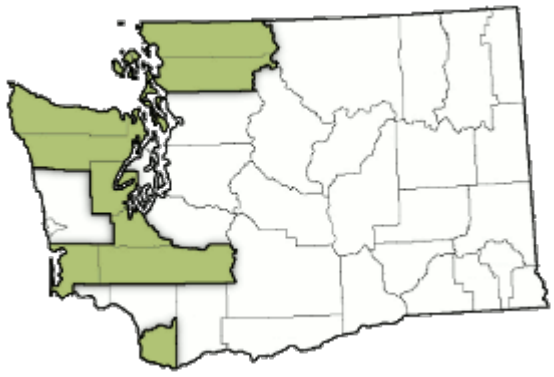
- ***Stephen Pruitt and Steven Van Cleve vs. Town of Eatonville* – Central Puget Sound Growth Management Hearings Board (CPSGMHB; Case No. 06-3-0016)** – Legitimized WSDOT's role in defining the compatibility policies that need to be incorporated into a community's comprehensive plan. Guidelines developed by WSDOT could include minimum standards that would be given great weight by growth management hearing boards. However, these guidelines would be recommendations and not regulatory in nature.
- ***State of Washington Department of Corrections and Department of Social and Health Services vs. City of Tacoma* – Central Puget Sound Growth Management Hearings Board (CPSGMHB; Case No. 00-3-0007)** – Expansion of essential public facilities must also be accommodated by local agencies. A community's comprehensive plan therefore must support planned expansion of any airport that lies within the area covered by the plan. Guidance for expansion of airport facilities, volume of traffic, and changes in aircraft fleet mix can be taken from an airport's master plan. Where a current airport master plan does not exist, the required facility planning can be done as a component of development of the comprehensive plan.
- ***Port of Seattle vs. City of Des Moines* – Central Puget Sound Growth Management Hearings Board (CPSGMHB; Case No. 97-3-0014)** – The requirement to accommodate expansion of essential public services includes necessary supporting facilities and services. While this is likely to be most important at larger commercial service airports, it clearly establishes that comprehensive plans must facilitate all elements necessary for an airport to function. At commercial airports this could include such off-airport facilities as rental car facilities, airport shuttle businesses, air freight consolidators, and airline catering companies.

Jurisdictional Regions for the Growth Management Hearings Boards

Eastern Panel

The eastern region includes all counties and cities east of the crest of the Cascade Mountains which are required to plan or choose to plan under the Act.

Western Panel



The western region includes all counties and cities west of the crest of the Cascade Mountains which are required to plan or choose to plan under the Act, but are not within the Central Puget Sound Board's jurisdictional boundaries

Central Puget Sound Panel

The Central Puget Sound region includes King, Snohomish, Pierce, and Kitsap Counties and the cities within those counties.

Maps only depict counties fully planning under the GMA.

- ***Hapsmith et al vs. City of Auburn* – Central Puget Sound Growth Management Hearings Board (CPSGMHB; Case No. 95-3-0075c)** – Although this decision specifically addresses mitigations for a new essential public facility, it suggests that the external impacts of these uses need to be addressed. Compatibility policies contained in comprehensive plans can be viewed as a form of mitigation in that they are intended to minimize the noise and safety effects of airports. This case does not provide any guidance on the substance of mitigation. However, it does legitimize including mitigation of impacts as one more reason to include compatibility policies in comprehensive plans.

Additional decisions of interest include these:

- Local jurisdiction required to consult with airport prior to adoption of comprehensive plan amendments having an effect on the airport.
  - Son Vida II v. Kittitas County, EWGMHB 01-1-0017 (FDO March 14, 2002)
  - NFRD v. City of Yakima, EWGMHB 02-1-0009 (FDO December 5, 2002)
  - McHugh v. Spokane County, EWGMHB 05-1-0004 (FDO December 16, 2005)
- High-density residential zones adjacent to airports are inappropriate/incompatible uses; jurisdictions must preclude uses non-compatible with an airport to comply with GMA.
  - CCARE v. Anacortes, 01-2-0019 WWGMHB (FDO December 12, 2001)
  - Klein v. San Juan County, 02-2-0008 WWGMHB (FDO October 18, 2002)
  - Futurewise v. Whatcom County, 05-2-0013 WWGMHB (FDO September 20, 2005)

📖 For more information about state laws and Growth Management Hearings Board decisions affecting airport land use compatibility, see Mead & Hunt's briefing paper, Implications of the Designation of Airports as Essential Public Facilities. That report, along with numerous other resources on this topic, is available in the appendices resources section. Also, more information about decisions of Washington's Growth Management Hearings Boards are available on their website at: www.gmhb.wa.gov

Chapter 2 Airport Land Use Compatibility Planning Step by Step

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.

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 best management practices and directs users to more detailed reference materials.

How should you use this checklist?

This chapter outlines a six-step process for airport land use compatibility planning and provides a checklist that takes you through each step. 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 Board. This checklist will help you craft defensible, objective policies and zoning regulations.

Step by Step Compatibility Process

This guidebook is not just for beginners! The step-by-step method described in the following pages is a cyclical process that can be used to review and update goals, policies, and regulations as needed. Such review is appropriate during comprehensive plan updates as well following completion of significant airport planning efforts, such as the master plan or airport layout plan.

How will WSDOT use this checklist?

WSDOT's interest is to preserve the airport as part of the state transportation system. Our role is to provide technical assistance recognizing the uniqueness of every individual community and airport. We will focus on reviewing the community's airport land use compatibility goals, policies, and regulations proposed for adoption. We use our technical expertise to assist communities in making fully informed decisions. If WSDOT identifies deficiencies or inconsistencies within preferred policies or development regulations, we will address them in our official comment letter. WSDOT's comments to a local jurisdiction may:

- Express support for strong elements in the community's goals, policies, and regulations.
- Point out advantages and disadvantages of the community's preferred approach.
- Clarify technical elements that have been misinterpreted.
- Raise issues that might not have been addressed.
- Suggest that additional information be provided to explain and support decision making.
- Recommend alternatives.

Steps	Tasks and Goals	Products
Step 1: Getting Started and Gathering Data	• Formal Consultation • Identify applicable state laws. • Inventory airport's attributes. • Evaluate existing land uses. • Inventory land use plans. • Define area for initial study area.	• Consultation record • Documentation of applicable state laws • Inventory of airport facilities, activities, services and context. • Summary of land uses inventory • Map of initial study area
Step 2: Delineate the Airport Influence Area	• Review airport, aircraft, and topographic features. • Delineate the airport influence area. • Define impacts within the airport influence area.	• Airport influence area boundary. • Airspace map (FAR Part 77 Imaginary Surfaces and Elevations) • Map of areas impacted by airport operations • Inventory of topographic features or constraints
Step 3: Identify Compatibility Concerns	• Examine the level of compatibility • Determine the compatibility status of existing land uses in airport influence area. • Identify compatibility challenges.	• List of current community policies. • Evaluation of compatibility status. • Identification of potential compatibility conflicts. • List of specific compatibility issues to be addressed by new comprehensive plan policies
Step 4: Develop the Comprehensive Plan	• Weigh comparative advantages and disadvantages of planning strategies • Identify preferred planning strategies • Consider airport land use compatibility • Draft comprehensive plan compatibility policies	• List of current policies affecting airport land use compatibility positively • Assessment of adequacy of current policies • Evaluation of alternative compatibility strategies • Draft of compatibility policies. • Adjustment of airport influence area boundary if necessary • Draft comprehensive plan policies. • Draft comprehensive plan land use map
Step 5: Adopt the Comprehensive Plan	• A strategy to gain public and decision-maker support of the compatibility measures • Provide opportunity for public review • Gather comments from WSDOT Aviation • Adopt a comprehensive plan with appropriate measures to protect the airport from incompatible land use	• Information materials describing the importance of the airport and airport land use compatibility • An adopted comprehensive plan that incorporates airport land use compatibility measures • Supporting record of process and methodology
Step 6: Implement the ALUC Policies	• Draft and adopted implementing regulations • Public participation process • Develop continuing process to evaluate airport land use compatibility	• Development regulations that implement the comprehensive plan policies • Zoning map • Continuing process to evaluate compatibility concerns • Record of process and methodology

Step 1: Getting Started and Gathering Data

In this step, you will begin your work on airport land use compatibility planning by laying a foundation for your process and identifying study area. Answering the questions listed here will enable you to define and understand the objectives of the process and who should be involved. Your other major task in this step will be to gather the airport and land use data that will enable you to address airport land use compatibility issues.

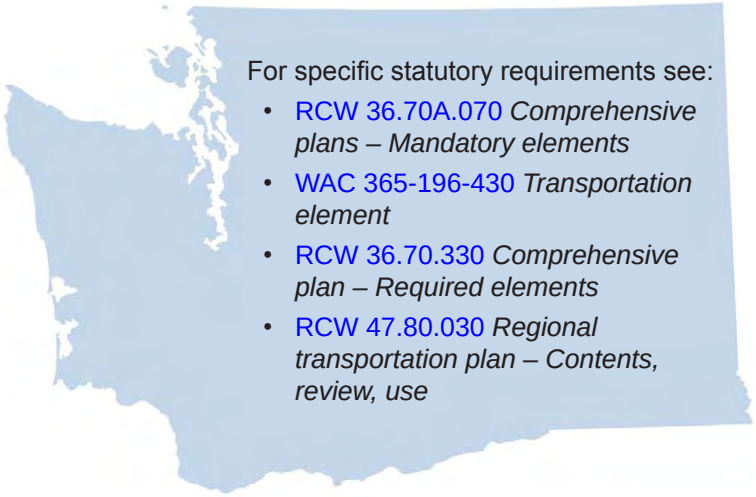
Laying the Foundation

You will know you have been successful when:

- You have identified applicable state laws.
- A process is in place to help stakeholders work together.
- You can describe the airport's role, features, and activities.
- You know what land uses exist around the airport and what land use plans are in place.
- You have identified the study area.

What are your jurisdiction's responsibilities?

Washington state law (RCW 36.70.547) requires all towns, cities, and counties in the state to discourage development of incompatible land uses near general aviation airports through adoption of comprehensive plan policies and development regulations. The lead role in compatibility planning for any particular airport thus belongs to the town, city, or unincorporated county jurisdictions that control the land uses around the airport. A primary purpose of this guidebook is to help the entities satisfy the statutory requirement. However, the manner in which compatibility planning objectives are achieved will not be the same from one jurisdiction to another. Characteristics of the community and its natural environment, as well as those of the airport, will dictate different approaches.



To begin the planning process, local planners should answer these questions:

- **Which particular state laws affect your jurisdiction's planning responsibilities related to airports?** Many of the laws apply to all jurisdictions, while others are relevant only to certain types. Chapter 1 briefly describes the most significant statutes and provides links to the full text. Use Worksheet 1A to note your observations and questions as to how the state laws apply to your jurisdiction.

- **Beyond the basic requirements of state law, what are the primary purposes and objectives to be achieved in compatibility planning for the airports in your jurisdiction?** Are there specific issues to be addressed that are arising either because of changes at the airport or development pressures nearby? List the top three objectives in Worksheet 1B.

- **What particular challenges do you expect to face during the compatibility planning effort?** Has the airport been controversial and generated community opposition? Is data about the airport readily available or will special effort be needed to get information? In Worksheet 1C, identify three top challenges.

- **How do you intend to accomplish the compatibility planning study?** The outcome of the study ultimately must be reflected in the comprehensive plan and development regulations, but will the study be done as part of the comprehensive plan update or is a separate effort needed? In most cases, the analysis of compatibility issues can be done as a task within the overall comprehensive plan update process. However, if the compatibility planning issues involved are complex, a separate study may be warranted. Any such separate study would need to be completed, or largely so, in advance of the comprehensive plan update so that its recommendations can be incorporated.

- **What efforts did you take to identify the initial study area to address compatibility adjacent to the airport?** (The initial study area is the area necessary for your initial land use compatibility planning study.)

- **Can the work be done by the jurisdiction's staff or comprehensive planning consultant or is a specialized consultant needed?** With the help of this guidebook and WSDOT Aviation's Technical Assistance Program, planning staff should be able to address compatibility planning matters themselves. Some jurisdictions with highly complex airports may use a consultant that specializes in airport land use compatibility planning.

Formal consultation and who should be involved in airport land use compatibility planning?

State law requires that comprehensive planning be early, continuous, and collaborative. In addition, RCW 36.70.547 explicitly requires "formal consultation" with aviation interests prior to adoption of a comprehensive plan or development regulations dealing with airport land use compatibility. Several stakeholders—airport owners and managers, private airport operators, general aviation pilots, ports, and the aviation division of the department of transportation—are specifically identified in state law. Other interests whose input may be helpful include the airport's aviation service providers (fixed-base operators), airline and air taxi operators, public and private emergency response providers, local business owners, regional agencies (RTPO and/or MPO), the State Department of Commerce, the FAA, and community representatives.

An aviation working group or advisory committee can be a helpful tool for jurisdictions planning for airport land use compatibility. Not only does this type of group provide a method for meeting public involvement and consultation requirements, it is also a way to form long-lasting relationships that extend beyond airport land use compatibility planning. The group can be used to give input on relative advantages and disadvantages of various approaches and communicate with stakeholder groups about progress of work.

Department of Commerce
Innovation is in our nature.

Other resources on citizen participation in the planning process are provided by Department of Commerce Growth Management Services at: www.commerce.wa.gov/site/420/default.aspx

What do I need to know about the airport?

Once you have determined what needs to be accomplished and who should be involved in the compatibility planning process, you next need to collect essential data about the airport. This data falls into three general categories:

Planners need this information in order to address land use compatibility adjacent to airports. Also, decision makers need this information to understand the role of the airport in the community for transportation and economic development. Collecting and communicating these airport facts is an essential part of the compatibility planning process.

Another use for the data you gather about the airport is in completing the transportation inventory element of the community comprehensive plan and the regional transportation plan. The transportation inventory should catalog air transportation facilities and describe their role as part of the multi-modal transportation system. Future plans for the facilities should also be identified.

Identification of future airport improvement needs is particularly necessary for towns, cities, and counties that own or operate an airport. State law requires that most of these entities include a list of planned airport improvements within their capital facilities plan.

Airport Context – Who owns the airport? What roles does it play within the state and national aviation systems and within the local community? Who uses it?

Airport Activity – What types of aircraft use the airport and what is the level of activity? Where do aircraft normally fly as they approach and depart the airport?

Airport Features – What physical components of the airport are significant to land use compatibility? What are the locations and sizes of these facilities? What is the projected future airport configuration?

Airport Information – Where can one find airport information for airport land use compatibility planning?

Airport Land Use – What do you need to know about land use? What information about existing and planned land uses in the airport influence area does one need? Where can one find land use documents, policies, databases, maps, and other information?

Airport Context

The first thing you should learn about the airport is how it relates in a functional sense to other airports and to the community where it resides—in other words, what is its context? Some of the questions listed here will not necessarily help you in developing compatibility policies, at least not in a direct sense.

However, what the answers will tell you is something about the importance of the airport both within the state and national airport systems and within the overall fabric and economy of your community. This information will aid in obtaining public support for the compatibility policies as discussed in Step 5.

1. **Who owns or "sponsors" the airport? Who runs it?**
   This is an indicator of your primary partner in airport land use compatibility planning. Even before starting work on your study, you should contact the airport manager to get input on the work scope and issues that should be addressed.

   Airport contact information can be found at:
   www.wsdot.wa.gov/aviation/AirportDirectory/default.htm

2. **What previous planning studies have been done for the airport?**
   Gathering this information at the outset of your work is essential. Earlier studies will help you answer many of these airport inventory questions. An airport master plan, airport layout plan drawings, FAR Part 150 study, environmental studies for a master plan or individual projects, and other planning studies, to the extent that they have been done, should contain valuable information needed for compatibility planning around the airport. Any economic studies concerning the airport also may be useful. Obtain copies of each of these.

3. **What is the state classification of the airport?**
   WSDOT Aviation categorized airports into state classifications in the Long-Term Air Transportation Study (LATS). This classification is an indicator of the role the airport plays in the state system and the types of facilities and services needed to serve that role. It also includes facility, service, and operational performance objectives that were developed for each airport classification level as basis for prioritizing state funding to airports.

4. **Who uses the airport?**
   Obtain information about the users of the airport. Many communities are surprised by the number of businesses located on the airport or that require proximity to it to support their activity. The airport's importance to emergency response services such as police, fire, aeromedical, and search and rescue, and disaster relief also may not be widely recognized. Airport users and businesses have a vested interest in having compatible land uses around the airport. They will be supporters of strong land use compatibility measures.

5. **What is the airport's role in the community?**
   How does the airport fit into the goals of the community and the region? Has your community adopted specific policies regarding the role of the airport? How is the airport perceived by the general public? Have compatibility problems or other issues become major controversies? Knowing this status will help you understand the challenges you

may face in establishing compatibility policies for the airport. Information can be obtained from airport staff, community groups, newspaper articles, meeting minutes, and other such sources.

6. **Does the airport connect with other transportation modes?**
As with the airport role, this question again examines a facet of the airport's relationship to the community and region. Is the airport an integral part of a multi-modal transportation system within your community and region or is it disassociated with the transportation network? What links does the airport have with public transportation and freight movement systems? What are the opportunities for better inter-modal connections?

7. **What is the airport's economic contribution to the community?**

Corporate Aircraft

Airports contribute significant direct and indirect economic benefits to the local economy. Only the largest and busiest airports typically pay their own way solely from direct airport revenues and from income derived from land uses on property not needed for aviation uses. As with the contributions of other modes of transportation, most airports provide services that are essential to the economic vitality and social fabric of their communities. If an economic study has been done of your airport, review its findings and use the data in support of the need for protecting the airport from encroachment by incompatible land uses.

If this data is not available, other means of showing the airport's contribution to the local economy include:

- Document the number of public and private employees on the airport through interviews with agencies and businesses based there. If you can ensure confidentially, it may also be possible to document the gross payroll of those employed on the airport.
- If your community has a branch of a regional or national business, staff from the main office may be flown to your community on a regular basis in company or chartered aircraft. This is particularly likely if your community does not have scheduled passenger service.
- If there are local manufacturers or distributors that ship their products via one of the small-package shippers at the airport (e.g., UPS), you should be able to document this through interviews with the shipper or manufacturer.

- Outside of metropolitan areas, medical specialists are sometimes flown in on a regular basis. Discussions with the commercial aviation-service providers (fixed-base operators) at the airport or staff at the local hospital can help you determine whether this exists in your community.

Airport Activity

For the most part, an airport's effects on surrounding land uses are created not by the airport itself, but by the activity that takes place there. The questions below will serve as a checklist for the types of airport activity data you will need. See the following section for suggestions on where to find this information:

1. **What is the composition of aircraft operations?** Is the airport used strictly by general aviation aircraft or are there also scheduled airline flights or operations by military aircraft?

2. **What types of aircraft use the airport and how often?** Obtain information on the mix of aircraft types that are based at the airport as well as those that regularly visit (transient aircraft). As discussed in Step 2, different aircraft types (business jets, propeller airplanes, helicopters) have different flight characteristics and create different noise and safety issues for surrounding lands. Gather information on the number of takeoffs and landings made by each type. For the critical aircraft, identify the specific models (e.g., which specific business jets use the airport). Also consider what types of aircraft are expected to use the airport in the future. Does the airport support flight school activity, medical services, or parachute activity?

Commercial Operations

Military Operations

3. **How many passengers does the airport serve?** If the airport has airline service, get data on the number of passengers who board there (passenger enplanements). If applicable, also obtain data on cargo tonnage shipped.

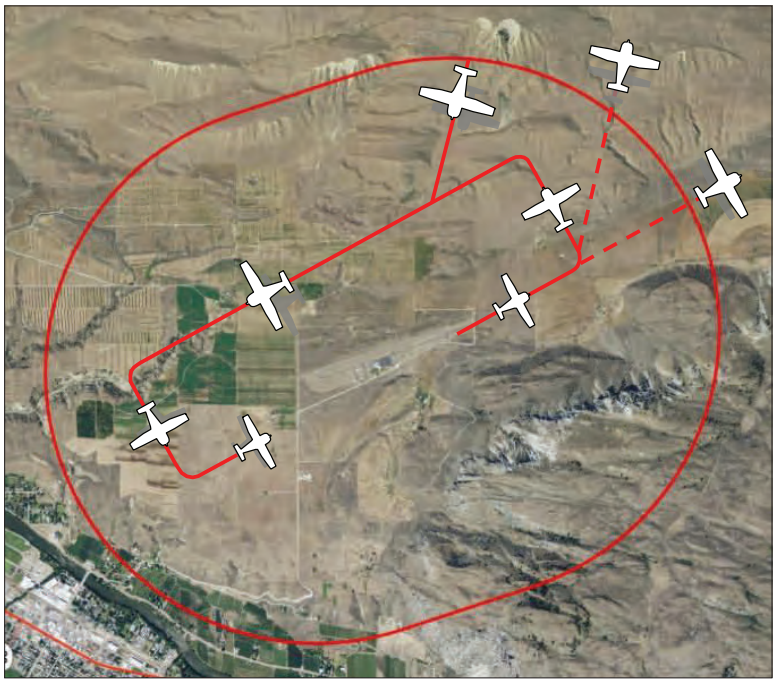
4. **What is the distribution of aircraft operations by time and runway?** Get data or estimates of how much each runway is used at night (defined as 10:00 p.m. to 7:00 a.m.) versus during the day (7:00 a.m. to 10:00 p.m.). Find out how often each runway is used and in which direction. Determine if there are significant seasonal variations in these numbers. Ask if anything is expected to cause these percentages to change in the future.

5. **Are there frequent aircraft maintenance operations at the airport?** Maintenance testing of aircraft requires use of high power settings with an accompanying increase of noise levels.

Maintenance Operations

6. **What routes do aircraft fly as they approach and depart the airport?** Federal regulations AC No. 90-66A define the recommended shape of the traffic patterns used by general aviation aircraft as they approach and depart most airports, but the specific size, altitude, and other characteristics may vary to meet local needs. Map the typical routes aircraft fly and consider that different aircraft (especially helicopters) may follow different routes. Seek information from the airport manager and pilot community on how often each route is followed.

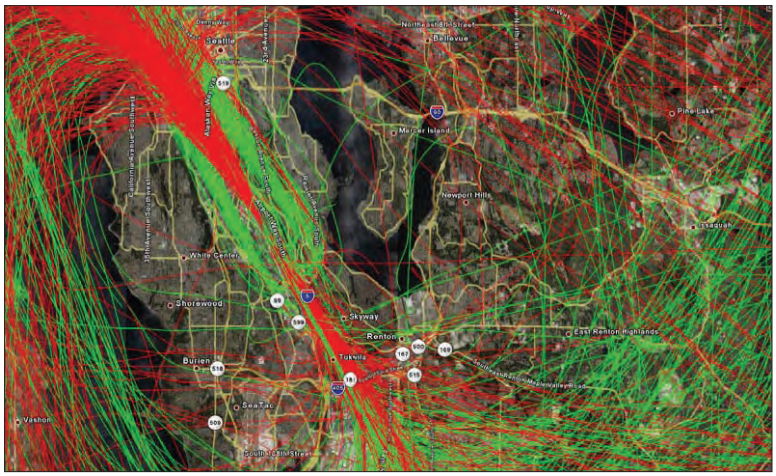
Generalized Traffic Pattern for Tonasket Municipal Airprot



7. **What deviations from the normal traffic pattern are typical at the airport?** While certain primary traffic corridors are defined, deviations occur. Some of these variations are permanent ones dictated by the airport's proximity to other airports, high terrain, or noise-sensitive land uses. These usually are indicated in pilots' guides or are posted at the airport. Others are individual instances resulting from pilot techniques, other aircraft in the pattern, wind conditions, and other such factors.

8. **Does the airport receive noise complaints?** Most airports probably get at least a few complaints. Busy airports may get enough that they record and map them in a formal manner. Knowing the geographic source of complaints can be useful when drafting compatibility policies for the airport. Most airports receive the majority of noise complaints not from locations overflown on a regular basis, but from places where overflights are more random events.

Auburn Municipal Airport Radar Tracks

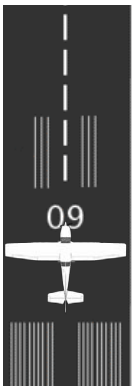


Radar Tracks: This diagram shows aircraft flight tracks captured by radar. The image illustrates the variability of typical flight routes.
(Photo courtesy of Renton Municipal Airport.)

Airport Features

In order to accurately identify and map the airport's impacts on nearby land uses, you need to know the airport's physical configuration.

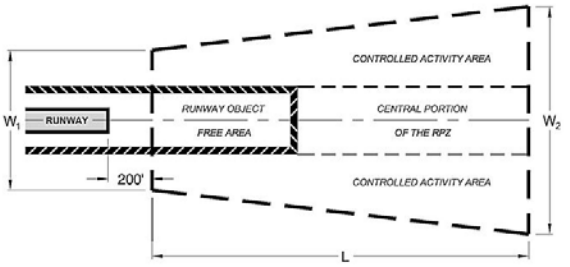
1. **What are the characteristics of the landing surface?**
   Indicate the length, width, and surface type for each runway at the airport and whether the runway is lighted for nighttime use. These features determine what types of aircraft can operate at the airport. For paved runways, data on the pavement strength also can be useful to know in that pavement strength limits the aircraft that can use the airport. Ascertain the length of any displacement of the landing thresholds from the runway ends. Find the official latitude and longitude coordinates of the runway ends and displaced thresholds. This data is essential to mapping of runways and associated airport impacts relative to surrounding geographic features. Entering the data into a GIS database is desirable.



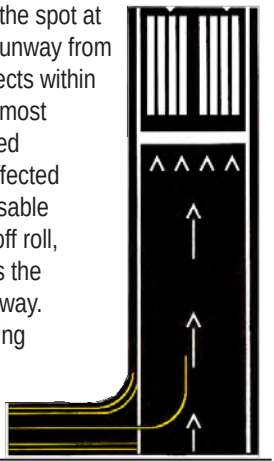
2. **What types of approach capabilities does each runway end have?**
   Runway approaches are either visual or instrument. Visual approaches require good visibility conditions. When visibility is poor or cloud ceilings low, use of an instrument approach procedure is necessary. These procedures are established by the FAA and often require special facilities (navigational aids) at the airport. Also, aircraft must be properly equipped and pilots must be certified for instrument flight. Different types of instrument approach procedures provide varying capabilities in terms of the minimum weather conditions in which the procedures are usable. Instrument approach capabilities are particularly important to scheduled airline service and corporate aircraft operators. These users depend upon being able to land even when clouds lie over the airport.

Instrument Approach Plate

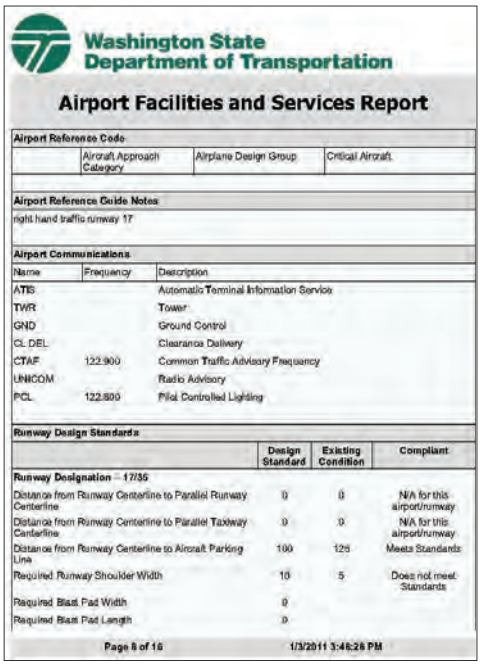
The runway protection zones (RPZs) and object free areas (OFAs) are probably most important. Also look for building restriction lines (BRLs) shown on the airport layout plan as they indicate how close buildings can be to a runway. These areas generally should be on airport property. However, if they aren't, then your compatibility policies and regulations should limit development to ensure that it is consistent with the Airport Master Plan and FAA guidelines.



A displaced threshold moves the spot at which aircraft land down the runway from the end of pavement. Tall objects within the runway approach are the most common reason for a displaced threshold. Even though the affected portion of the runway is still usable for aircraft to begin their takeoff roll, a displaced threshold reduces the usability and safety of the runway. This is one reason why avoiding obstructions to runway approaches is so important.



3. **Which design standards apply to the airport and does the airport meet these standards?**
The FAA defines design standards for runways in accordance with the airport reference code (ARC) applicable to that facility. The ARC reflects characteristics (size and approach speed) of the critical aircraft expected to use the facility and the type of approach capability available. The design standards determine not only the runway dimensions, but also the sizes of critical clear areas surrounding the runway. These areas are important for the safety of aircraft occupants in case the aircraft lands short of the runway, overruns the far end, or deviates off to the side. It is equally important that these areas be kept clear of people and buildings because of the risks involved. Other FAA standards determine the heights that structures, trees, and other objects near the airport can reach without becoming obstructions to the airport airspace. Design deficiencies and existing airspace obstructions should be identified during this inventory process.



Washington State Department of Transportation

Airport Facilities and Services Report

Airport Reference Code			
	Aircraft Approach Category	Airplane Design Group	Critical Aircraft

Airport Reference Code Notes:
right hand traffic runway 17

Airport Communications

Name	Frequency	Description
ATIS		Automatic Terminal Information Service
TWR		Tower
GND		Ground Control
CL DEL		Clearance Delivery
CTAF	122.900	Common Traffic Advisory Frequency
UNICOM		Radio Advisory
PCL	122.800	Pilot Controlled Lighting

Runway Design Standards

	Design Standard	Existing Condition	Compliant
Runway Designation – 17/35			
Distance from Runway Centerline to Parallel Runway Centerline	0	0	N/A for this airport/runway
Distance from Runway Centerline to Parallel Taxiway Centerline	0	0	N/A for this airport/runway
Distance from Runway Centerline to Aircraft Parking Line	180	125	Meets Standards
Required Runway Shoulder Width	10	5	Does not meet Standards
Required Blast Pad Width	0		
Required Blast Pad Length	0		

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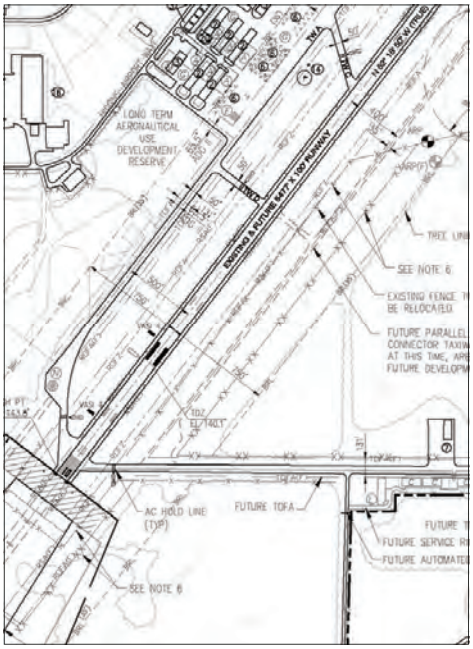
WSDOT's Airport Information System Airport Facilities and Services Information Report has data on airport design standards for most airports in Washington

4. **What is the plan for future development at the airport?**
Airports that receive funding from WSDOT Aviation and the FAA must complete 20-year plans that forecast future activity and catalog future development needs. If an airport master plan has been adopted for the airport, descriptions of the planned improvements and a detailed capital improvement program listing each project typically would be included. Also in an airport master plan should be an airport layout plan and other drawings showing where the improvements are proposed. Planned changes to runways or instrument approaches can have implications that should be considered in land use compatibility planning.



Also check the airport master plan or airport layout plan for any new or upgraded instrument approach capabilities planned for the airport.

One of the performance objectives specified in LATS is that airports classified as commercial, regional, or community should have instrument approach capabilities.

Airport Information

Where can I find this information about airports?

The sources outlined here should provide the bulk of the airport information you will need for airport land use compatibility planning. However, do not expect to find all the data in a single place. Be prepared to spend some time seeking out the information. Documents and databases are the first places to turn, but interviews with airport management and other people familiar with the airport and its operations are usually necessary. Remember, jurisdiction should already have the majority of information required to enguage in their compatibility planning efforts.

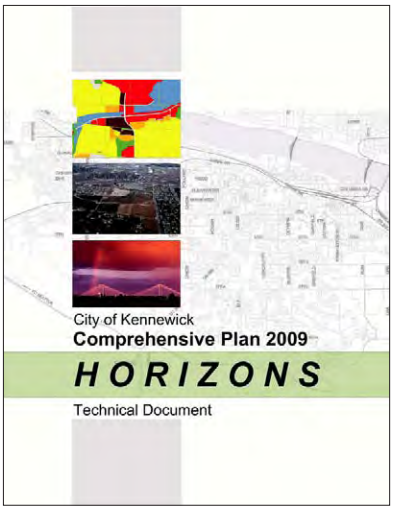
WSDOT's Airport Information System

This is a comprehensive database of descriptive information about airports in the state. Data included in the airport information system is provided by airports and updated on an annual basis. The database contains a wide range of information on each airport in the Washington Aviation System including airport runway, facility, and service data, number and type of based aircraft, and capital development projects.
www.wsdot.wa.gov/aviation/allstateairports/default.htm

Airport Master Plan

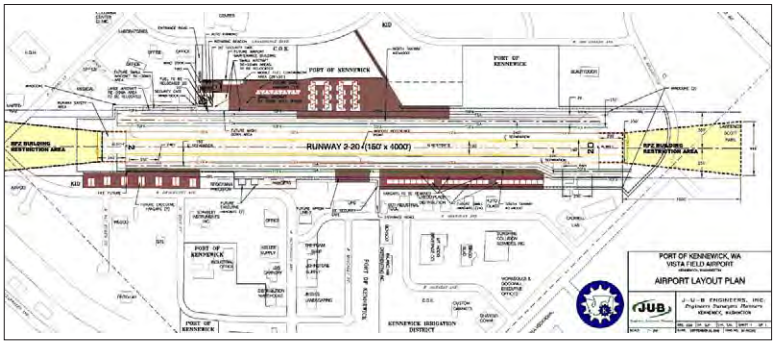
An airport master plan (AMP) is a comprehensive document intended to guide development on an airport. The planning period is normally 20 years. A typical airport master plan will contain most of the aviation-related information needed to prepare a land use compatibility plan. Normally, an AMP is formally adopted by the airport sponsor—the entity that owns or operates the airport. It also may be adopted by reference in the comprehensive plan. Master plans for specific airports may be available on the WSDOT Airport Information System's webpage at:
www.wsdot.wa.gov/aviation/allstateairports/default.htm

City of Kennewick's Comprehensive Plan



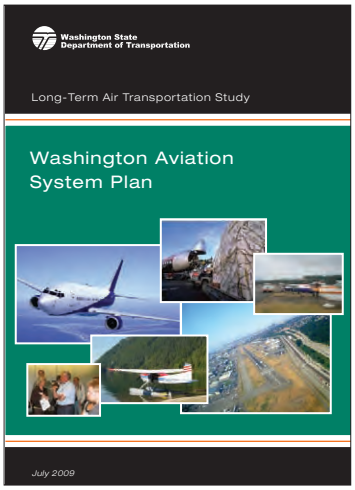
Airport Layout Plan

An airport layout plan (ALP) is a set of drawings showing the existing and planned configuration of airport facilities and the airspace around the airport. An ALP set is often accompanied by a short narrative report describing key features of the plan set. Airport layout plans are typically updated more regularly than airport master plans and even airports that do not have a current airport master plan may have a current ALP. A current ALP is prerequisite to obtaining airport improvement funding from FAA or WSDOT.



Statewide Aviation System Plan

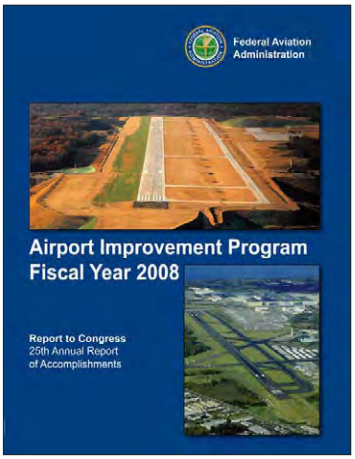
WSDOT Aviation System Plan



The purpose of the *Long-Term Air Transportation Study* (LATS) is to understand what capacity currently exists in aviation facilities and what will be needed to meet future demand for air transportation. There are 138 public use airports within the system. Approximately 65 of these airports are also recognized in the national air transportation system. The Aviation Planning Council report, Aviation System Plan, and supporting technical documents includes an existing airport capacity/facility assessment, 25-year demand/market analysis, airport forecasts to 2030, statewide aviation policies, and implementation recommendations. www.wsdot.wa.gov/aviation/systemplan/default.htm

National Plan of Integrated Airport Systems

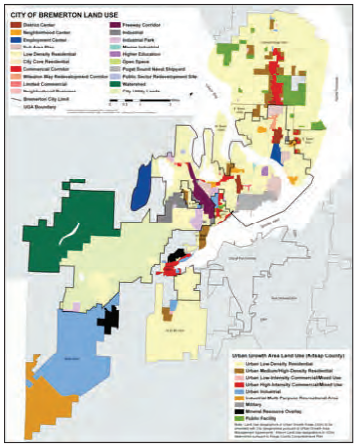
AIP 2008



The *National Plan of Integrated Airport Systems* (NPIAS) identifies more than 3,300 airports that are significant to national air transportation and thus eligible to receive federal grants under the Airport Improvement Program (AIP). It also includes estimates of the amount of AIP money needed to fund infrastructure development projects that will bring these airports up to current design standards and add capacity to congested airports. FAA is required to provide Congress with a five-year estimate of AIP eligible development every two years.

Comprehensive Plan

Comprehensive Plan Map



The comprehensive plan is the starting point for any planning process and the centerpiece of local planning. Development regulations (zoning, subdivision, and other controls) must be consistent with comprehensive plans. State agencies are required to comply with comprehensive plans and development regulations of jurisdictions planning under the GMA. Many comprehensive plans are posted online. Your jurisdiction may be included on the Municipal Research Center's (MSRC) website at: www.mrsc.org/codes.aspx

Interviews

Sometimes the best way to collect information is to reach out to people who have personal knowledge about the airport. This is particularly true with respect to some of the airport activity data. Even though this data may not be recorded, these people may be able to provide usable estimates.

Airport Manager – The airport manager is usually the best overall source of data on airport activity and for supplemental information on airport facilities.

Other Airport Staff – At larger airports, other staff are likely to have more detailed knowledge of particular information such as activity data or noise issues.

Fixed Base Operators – Particularly at smaller airports, the day-to-day operation of the airport may be delegated to a fixed base operator (FBO) who has a business at the airport.

Air Traffic Control Personnel – If the airport has a control tower, interviewing the personnel will often yield excellent information on aircraft operations, runway usage, and traffic patterns. Tower personnel sometimes will even have recorded data on aspects of airport activity that are not included among the compiled data available on the FAA or state website.

Flight Instructors and Other Pilots – Pilots, and particularly flight instructors, who regularly fly at the airport often have the best sense of where traffic patterns are located, the types of aircraft that use the airport, the distribution of activity among runways, and other operational characteristics of the airport.

Passenger Airline and Air Cargo Operators – If the airport manager does not have data on passenger and cargo activity, direct contact with these users may be necessary at airports where this use is present.

Tim Brooks, Kenmore Air's Vice President of Flight Operations, explains the operational characteristic's of Kenmore Air Harbor's established airspace corridor to city staff and onlookers.

Airport staff can be an asset in evaluating the current operational characteristics of an airport.

Documents and Databases

These printed documents and online databases contain extensive amounts of data, not all of which will be directly relevant to the compatibility planning task. Nevertheless, it is important to check out each source to glean important information about the airport in your community.

Specialized Users – Where special functions such as aerial firefighting, search and rescue, disaster management, aeromedical transport, or crop dusting take place at the airport, contact with the users will provide information on their activities and possibly additional insight into airport operations as a whole. Talking to military personnel also may be warranted if military activity is a significant component of the airport use.

Airport Land Use

What do I need to know about land uses around the airport?

The other side of the airport land use compatibility planning coin is the land use side. To be able to identify where compatibility conflicts already exist and to develop policies to avoid new problems, you need to gather information about existing and planned land uses in the airport influence area. If you are working through the compatibility planning process in this guidebook as part of a comprehensive plan update, you presumably have the necessary information readily at hand. With the copious amounts of land use documents, policies, databases, maps, and other information available for most communities, the challenge is to focus on the information that is most pertinent to airport land use compatibility issues. Here are some of the items you should assemble. The information will be used when you get to Step 4.

Most of the land use map data you will need should have been collected during your comprehensive plan updates or rezone activities. This information may also be available in your local or regional geographic information system

An Individual parcels map demonstrates the jurisdiction's the current parcel configuration. In many cases, large parcels have greater development potential. Smaller parcels are often limited to types of development they can accommodate due to their physical constraints. Parcel maps are available through your local jurisdiction and in many cases available online.

Parcels

Bellingham International Airport

A Topographic map is a map that shows and names prominent natural and cultural features. These maps primarily provide the user with an understanding of the areas geographic configuration and elevation of the terrain's topography. They may be used to identify features that shape development, increase exposure to aviation impacts, constraint airport operations, or represent an area with potential for conflict. They may be obtained from your local jurisdiction, USGS, or free online through open source software such as ArcGIS Explorer®

Topographic Map

Did you know that topographic maps come in a variety of scales? Planners and land use stakeholders will find maps at 1:24 and 1:250,000 to be most useful in compatibility planning.

Scale of Map	Distance on Map and Distance on the Ground
1:24	1 inch = 2,000 feet
1:250,000	1 inch = about 4 miles
1:500,000	1 inch = about 8 miles
1:1,000,000	1 inch = about 16 miles

An Existing Land Use map demonstrates the current utilization of an area. For example, an area may be zoned for a use, such as residential, but only 20 percent of the area may be actively developed for it. Theses map may also identify important features such as hospitals, school K-12, day cares, sporting arenas, adult care facilities, above ground storage of hazardous or flammable materials, and libraries. Existing land use maps are available through your local jurisdiction.

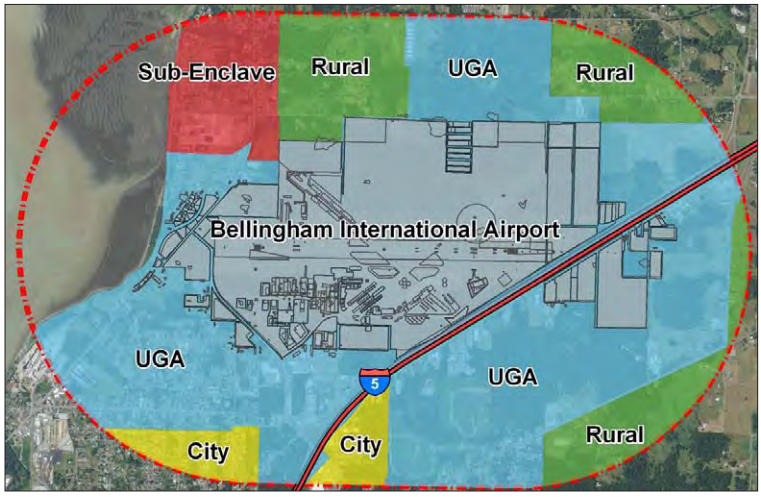
An Environmental Sensitive Areas map is a graphic representation of our natural surroundings. Maps may depict natural features, geological hazard, shorelines, flood plains, wetlands, flora, soil types, aquifers, and fish and wildlife habitat. The GMA contains a provision requiring cities and counties to designate and take measures to protect natural areas of critical ecological value.

A Comprehensive Plan Map is a graphic representation of a community's current and future vision for itself. These maps designate areas appropriate for different uses. These uses may include residential, commercial, industrial, agricultural, mixed use, forest resources lands, and historic districts.

Existing Land Use Map

Environmental Sensitive Areas Map

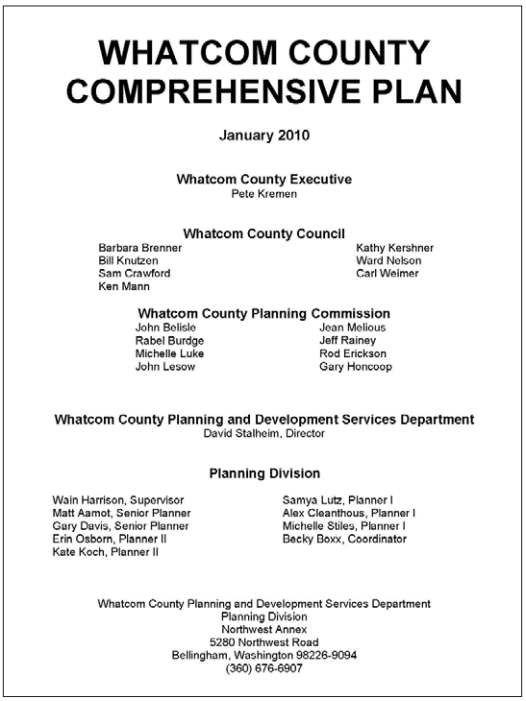
Comprehensive Plan Map



The Municipal Research Center is a private, non-profit organization that has comprehensive plans and zoning ordnances available at: www.mrsc.org/codes.aspx#city

What is the ambient noise level? It is the background noise level absent identifiable individual sounds. Knowing this level is important because noise is usually experienced differently in a quiet, rural setting than in a bustling commercial center or noisy industrial area.

Comprehensive plans guide regulations and development decisions within the airport's influence area, so be sure to inventory applicable goals and policies that affect development adjacent to the airport. Applicable goals and policies are often found in the comprehensive plans' land use, transportation, and capital facilities elements. Be sure to check with your local planner regarding any applicable sub area plans.



WHATCOM COUNTY COMPREHENSIVE PLAN

January 2010

Whatcom County Executive
Pete Kremen

Whatcom County Council
Barbara Brenner
Bill Knutzon
Sam Crawford
Ken Mann
Kathy Kershner
Ward Nelson
Carl Weimer

Whatcom County Planning Commission
John Belisle
Rabel Burdge
Michelle Luke
John Lesow
Jean Melious
Jeff Rainey
Rod Erickson
Gary Honcoop

Whatcom County Planning and Development Services Department
David Stalheim, Director

Planning Division
Wain Harrison, Supervisor
Matt Aamot, Senior Planner
Gary Davis, Senior Planner
Erin Osborn, Planner II
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Michelle Stiles, Planner I
Becky Boxx, Coordinator

Whatcom County Planning and Development Services Department
Planning Division
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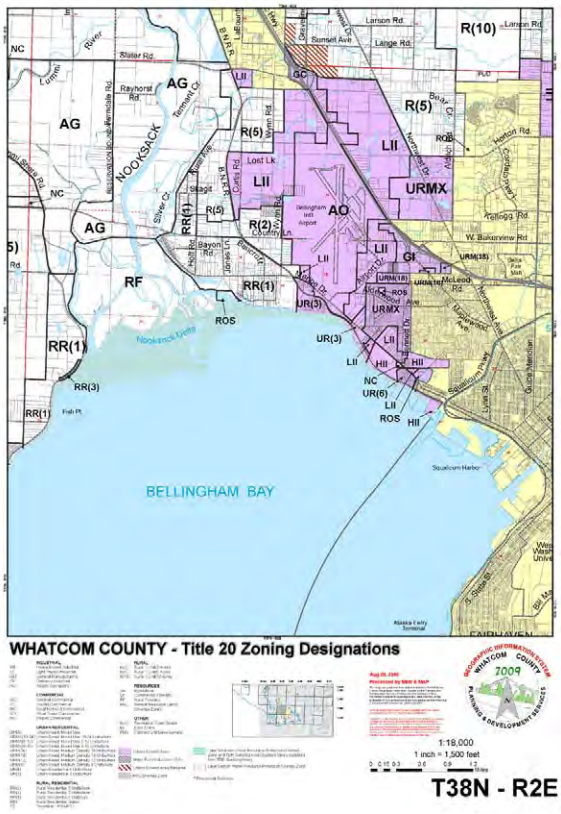
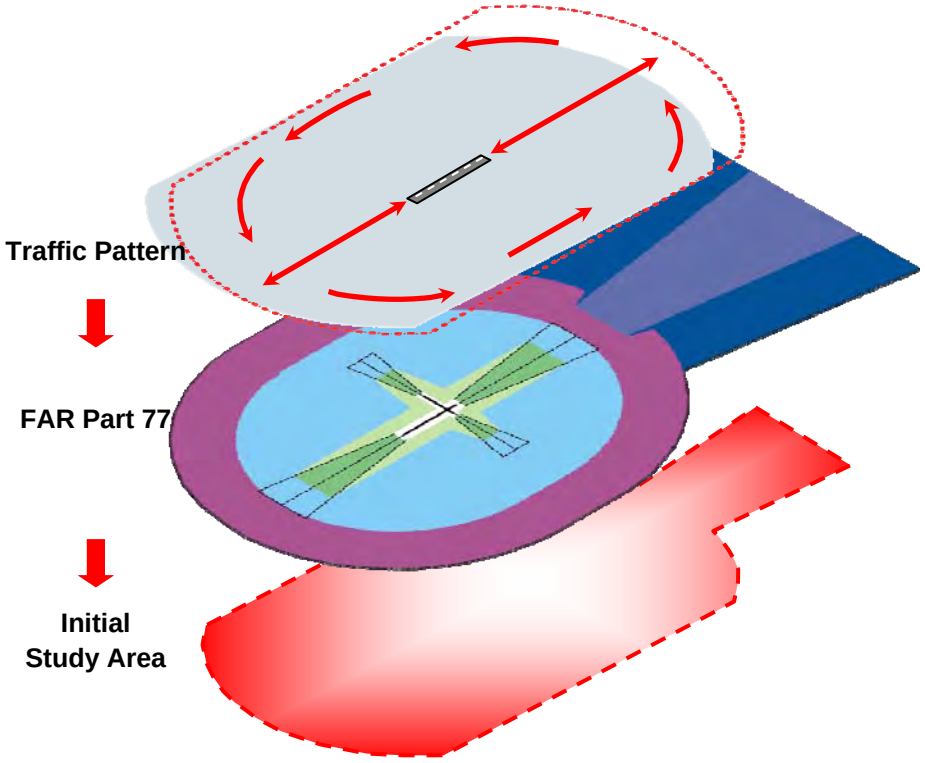
Applicable zoning ordinances and zoning maps, including airport overlay, should be assembled. Zoning ordinances define the categories, uses, and standards of development permitted within a particular land use designation. The zoning map demonstrates the spatial distribution of the zoning classifications. These ordinances typically categorize land uses into several different classifications. Usually included are residential, commercial, industrial, institutional/governmental, parks/open space, and agricultural.

Zoning Map



Initial Study Area

To determinate the area necessary for your initial land use compatibility planning study, use the airport's traffic pattern and FAR Part 77 *Imaginary Airspace Surfaces*. In most cases, these aeronautical factors will identify areas where normal aircraft operations occur and where conflict could potentially arise. The initial study area will be used in the following step to identify the airport influence area and access impacts associated with normal airport operations.



Step 1: Products

- Creation of a compatibility planning working group.
- Findings that outline your airport land use compatibility planning responsibilities under state law.
- Understanding of the airport's context within the community, state, and nation.
- Inventory of airport facilities, activities, and services for use in subsequent land use compatibility planning steps and in the transportation element of the comprehensive plan as well as the capital facilities element, when applicable.
- Summary of data regarding compatible and incompatible land uses around the airport.
- The initial study area for land use compatibility planning.

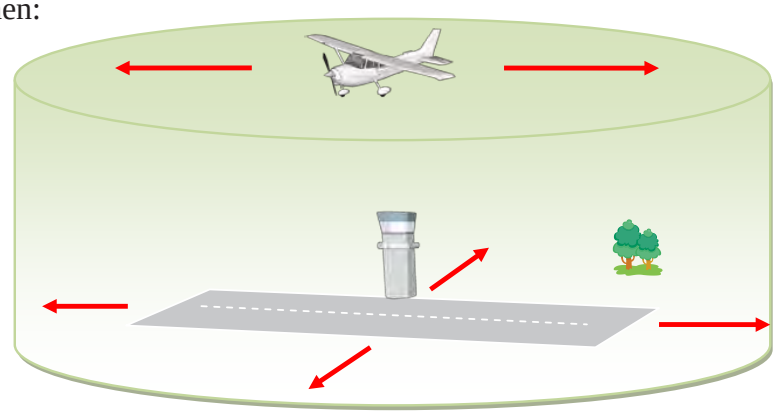
Step 2: Delineate the Airport Influence Area

Now that you have learned about the airport and its setting and have created a framework for your planning process, the next step is to define the area you need to consider for addressing land use compatibility. This is the airport influence area. How do you determine the size of the influence area? The boundaries differ for each airport based on its unique characteristics. The key is to think about all areas where existing or future aircraft operations at the airport may interfere with the development and use of the land, as well as where land uses can impair the development and use of the airport. The most significant effects are direct physical impacts such as those brought about by noise or tall structures.

For tips on how to identify and assess the airport influence area, see Appendix C.

You will know you have been successful when:

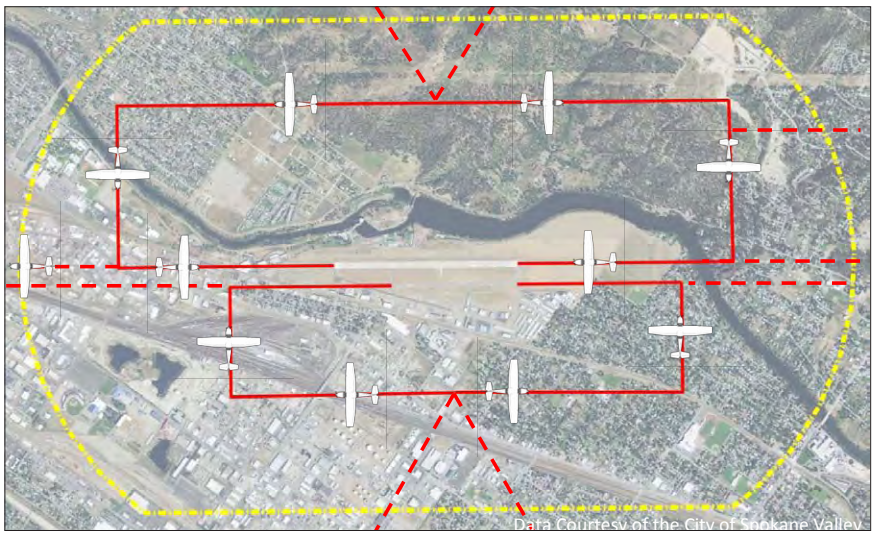
- You can define the airport influence area, traffic pattern, airspace protection, and safety impacts of the airport and know what areas in the airport environs are affected.
- You have designated an airport influence area.



What is the airport influence area?

An airport's influence area is the area within which the airport's impacts may adversely affect the use of land or the land uses may adversely affect development and use of the airport. To avoid airport land use compatibility conflicts, certain types of land uses should be encouraged, while other should be avoided. Some land uses may also require various degrees of restriction to encourage and promote compatible land use development within the airport influence area. If an airport expands or changes its functions so that new impacts on surrounding land uses are created, then the community and airport should work cooperatively to mitigate these impacts.

Felts Field's Traffic Pattern

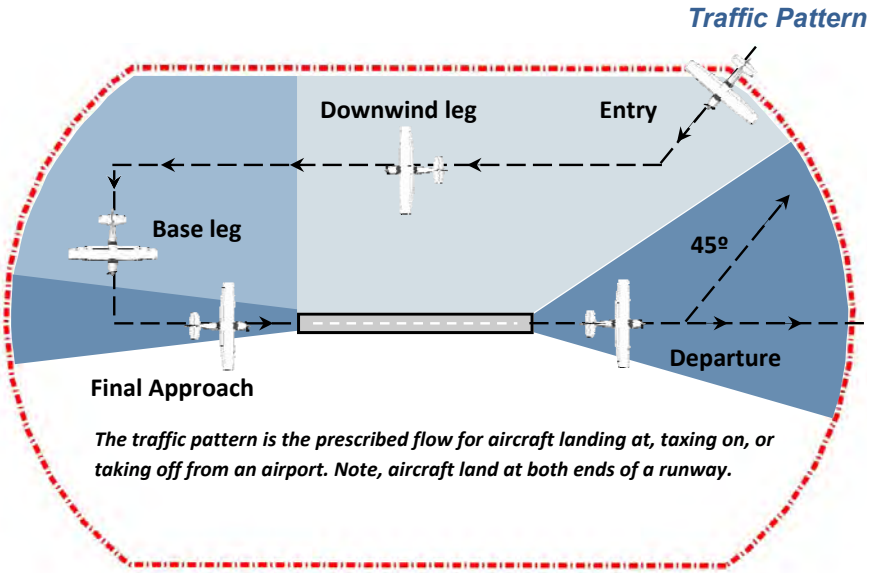


For tips on how to identify and assess the airport's traffic pattern and fleet mix, see Appendix C.

Although airports and surrounding land uses each have effects on the other, the delineation of an airport influence area is driven primarily by aeronautical factors. To a lesser degree, topography may also be a factor. The airport influence area should not be drawn to deliberately include or exclude a particular land use. It should be drawn based on where the airport's impacts occur. Start with the initial study area identified in Step 1, and delineate the airport influence area by assessing the following:

- Aircraft operations.
- Topography.
- Impacts of noise, light, vibration, and low-flying aircraft.
- Historic accident data.
- Interviews with aviation stakeholders.
- Flight tacks or radar tracks (if available).

For tips on how to identify and assess the airport influence area, see Appendix C.



Phases of flight within the traffic pattern generally consist of the entry, downwind leg, base leg, final approach, and departure. The width of typical general aviation airport's traffic pattern is generally 5,000 feet. Individual aircraft flight tracks within the traffic pattern will vary according to aircraft performance, wind, weather, piloting technique, topography, and aircraft weight. It is critical to understand that aircraft operate in a dynamic environment. They all do not fly along the same euclidian path. Planners should contact airport managers, staff, pilots, and FBO to gather additional information on the operational characteristics of their community airport

As indicated in Chapter 1, four types of impacts are of concern in airport land use compatibility planning—noise, airspace protection, safety, and aviation affects within the airport influence area. To determine the size and shape of the airport influence area, the geographic extent of each of these impacts must first be determined. A typical influence area for a general aviation airport will extend approximately one mile in all directions from the airport runways, but can be larger or smaller depending on the airport traffic pattern and approach characteristics. Busy airports and ones that have instrument approach capabilities will usually have a larger airport influence area.

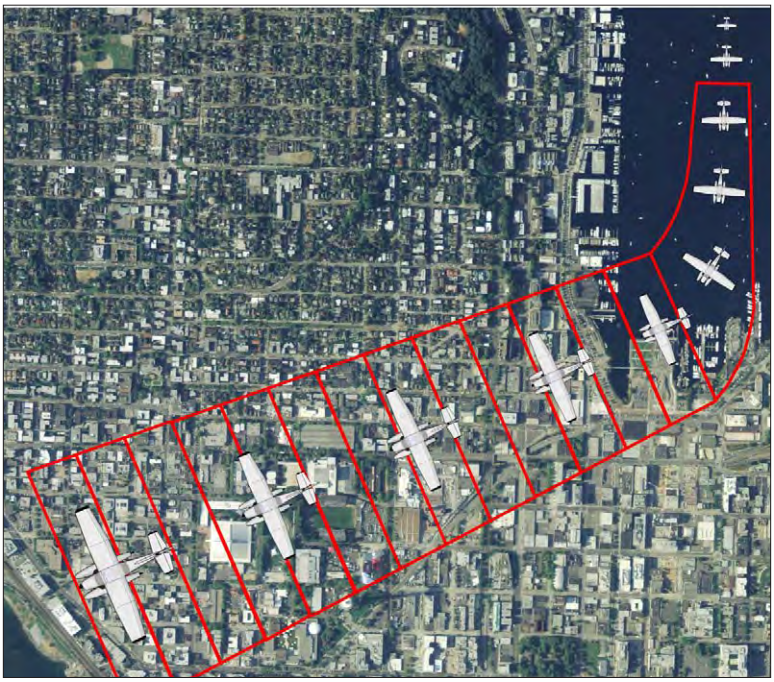
Seaplane Bases

What should be considered when determining the airport influence area for seaplane bases?

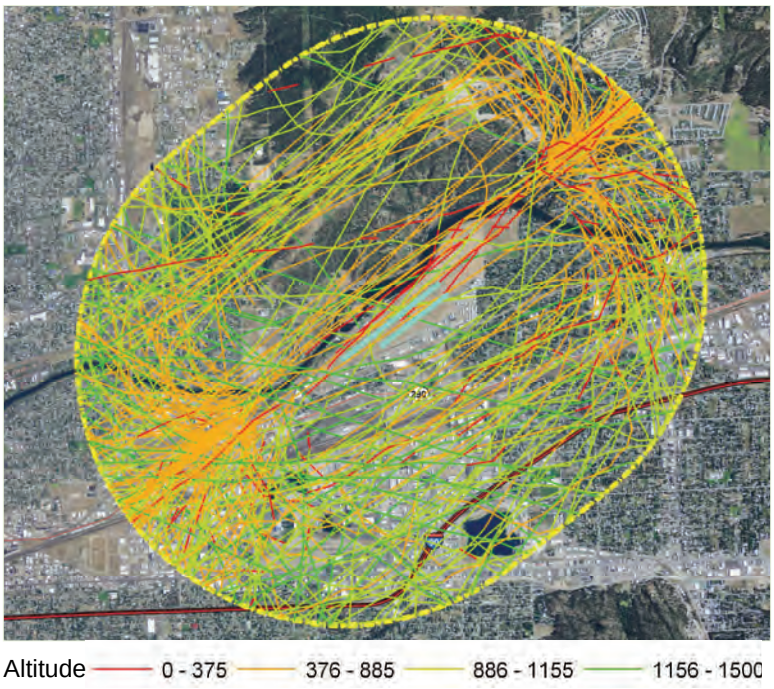
- Location and alignment of the area used for takeoffs and landings.
- Any areas along the standard arrival and departure routes where aircraft will be below 1,000 feet AGL.
- Estimates of how often different routes are used.
- FAR Part 77 *Imaginary Surfaces*.
- Land-based services areas.

The primary difference between sea and land airports is in defining the takeoff and landing area. It is much less clearly defined for seaplane facilities. Once defined, however, the same compatibility planning factors apply as for land airports.

Establish Airspace Corridor Kenmore Air SPB



Felts Field Aircraft Operations by Altitude



What are the airport's impacts on surrounding land uses?

Impacts Within the Airport Influence Area

Noise, vibration, light, fumes, and low-flying aircraft are the primary impacts of the airport influence area. The key to assessing these impacts is knowing where aircraft fly as they use the airport. However, because aircraft do not all fly in exactly the same places or at the same altitude, obtaining this information can prove challenging. Airport managers and pilots, particularly flight instructors, will usually be your best sources for flight track and overflight area information. If your airport is located near a large airport that has a control tower, you might be able to get actual radar track data from its radar facility. "Near" can be 50 miles away or more, provided that no high terrain is situated between the two airports.

For more information on the aircraft operations and impacts, see Appendix C.

Noise Complaint History – Scottsdale Airport, Arizona

Year	Annual Operations	Number of Noise Complaints
1967	10,000	Not measured
1985	170,000	834
1998	210,000	570
2003	190,000	8,719

This data from Scottsdale Airport, Arizona, illustrates the point that noise complaints are usually more closely related to development patterns than to the volume of aircraft operations. As residential development encroached on the airport, the number of complaint increased more than ten-fold. Meanwhile, the airport had taken major steps to limit noise impacts and make submitting complaints easier.

Once you have mapped the flight routes, your next challenge is to decide what overflights are significant. For a typical general aviation airport, the airport influence area should at a minimum include the normal traffic pattern and adjacent locations regularly overflown by aircraft as they enter or leave the pattern. If the airport has instrument approach procedures, a more extended area may be affected by aircraft flying at altitudes below that of the normal traffic pattern. Also, faster airplanes—primarily turbo-props and business jets—tend to fly wider and longer patterns than slower, single-engine propeller planes. Helicopters fly a much lower pattern and have a higher noise footprint than most aircraft.

The noise levels produced by individual aircraft overflights also may be a useful determinant of the overflight area boundary. The difficult issue, though, will be to decide what noise level is significant. Aircraft, particularly jets, can generate peak outdoor noise levels high enough to interfere with speech communication a surprising distance from the airport—potentially many miles.

Another factor to consider when determining the extent of the airport influence area is the geographic distribution of noise complaints. Although only the busiest airports usually maintain complaint logs, most airport managers will be able to describe hot spots for noise complaints. It is interesting to note that complaints do not usually come from the most impacted areas, as people in those locations expect to be affected. Rather, the annoyance that underlies complaints usually result from unusual activity or single noise events. Concentrations of complaints from certain areas may suggest that something happening there is causing an identifiable impact. On the other hand, scattered complaints from locations beyond where aircraft normally fly are probably just random events that need not be considered in delineating the overflight impact area.

[1]Cumulative noise exposure itself is a far from a perfect predictor of annoyance. A single noise event, produced by an individual aircraft at a particular point, can be perceived by some as intrusive and cause conflict between neighbors.

[1] *The Schultz Curve 25 years Later: A Research Perspective,* Sanford Fidell

Noise Impacts

When we talk about airport noise impacts, we are referring to noise levels that range from noise that cause environmental impacts to noise levels that are an irritant. Noise can disrupt the normal activities of people and sometimes animals as well. As indicated in Chapter 1, for some airport land use compatibility planning purposes, we often measure these impacts in terms of DNL contours. DNL is a cumulative measure of noise that takes into account both the loudness of noise events and how often they occur. The lowest DNL at which impacts to noise-sensitive land uses, particularly residential uses, become significant depends upon airport characteristics, ambient noise levels in the surrounding community, and other factors. As a general rule, it is up the communities to set thresholds for determining compatibility criteria by using the framework of Washington State law and both state and federal guidance.

Some significant thresholds to consider when establishing noise compatibility criteria for new development near your airport may include 50, 55, or 60 dB. For most general aviation airports, including ones with limited airline activity.

In each of these scenarios, there may be instances in which the respective noise barely reach beyond the airport boundaries. These circumstances should not be taken as a sign that the airport has no noise-related impacts. Noise and single event noise,—which are an important component of the airport influence area—will still occur and be disruptive over a wider area. Especially in quiet communities, noise impacts should be given substantial weight in land use planning around airports.

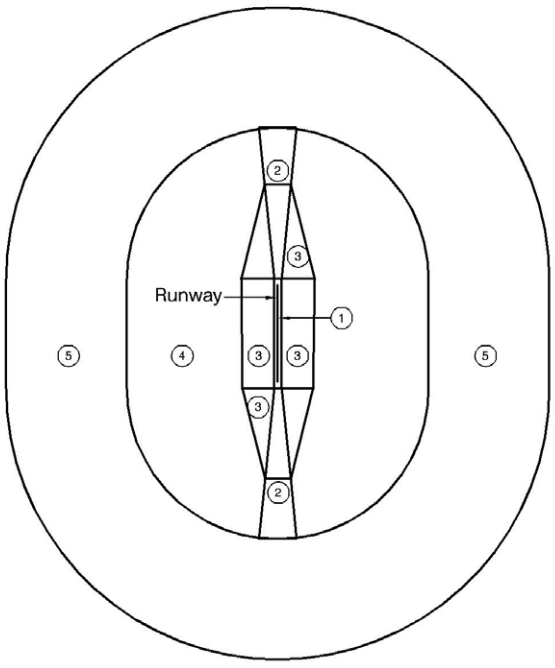
Airspace Protection Requirements

As noted in Chapter 1, airspace protection requirements address land use features that can cause or contribute to aircraft accidents. Most critical among such hazards are tall objects that penetrate the navigable airspace around an airport. However, other physical, visual, and electronic land use features can also create airspace hazards. FAA standards dictate the boundary of the area required for airport airspace protection.

With respect to tall objects that may affect the airport navigable airspace, the requirements are defined in Federal Aviation Regulations (FAR) Part 77 *Objects Affecting Navigable Airspace*. A map showing the airport's airspace "imaginary surfaces" is usually prepared as part of the airport master plan or included with the set of airport layout plan drawings. If this map is not available, then one will need to be created.

The TERPS surfaces used in the design of instrument approach procedures (see Chapter 1) also may be critical at some airports. TERPS surfaces are highly complex, however, and take special expertise to draw. Moreover, any changes to an instrument approach procedure—whether because of new technology or a new obstruction—likely will result in changes to the

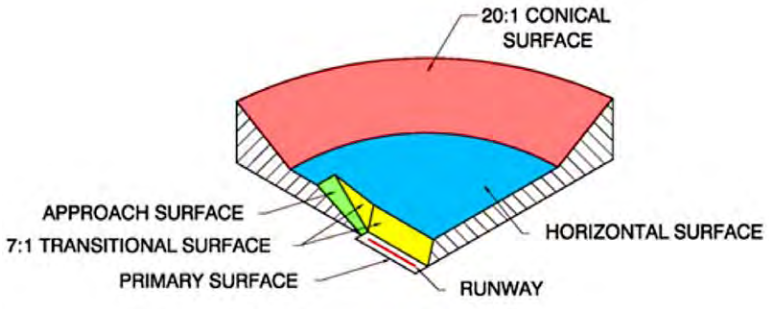
FAR Part 77 Imaginary Surfaces



1. Primary Surface
2. Approach Surface
3. Transitional Surface
4. Horizontal Surface
5. Conical Surface

surfaces. Generally, you can rely on the FAR Part 77 *Surfaces* for compatibility planning, but make sure that the project applicant submits Form 7460 to the FAA as required by federal law (see Step 6) for any proposed object near the airport that meets the notification requirements, particularly if the object will be taller than its surroundings.

FAR Part 77 Imaginary Surfaces Cut Away



The FAA also has criteria defining how close landfills and other uses known to attract birds should be allowed near airports. For visual hazards such as smoke or glare and electronic hazards that can disrupt aircraft communication or navigation, the criteria are less precise. These types of conflicts can be site specific and often are only addressed after they arise.

See these FAA documents for more information:
Federal Aviation Regulations Part 77 (14 CFR Part 77), Objects Affecting Navigable Airspace
http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&sid=cef54e5ded0ce244bbfe6ec32f6a63e8&tpl=/ecfrbrowse/title14/14cfr77_main_02.tpl
Advisory Circular 150/5200-33B, Hazardous Wildlife Attractants On or Near Airports
www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.information/documentnumber/150_5200-33b

Historical Accident Locations

Under this heading, we are concerned with the historical pattern of aircraft accidents and the consequences that result when something causes an aircraft flight to end at a location other than on a runway. Our concern is primarily for the people and property on the ground near airports, but potential consequences for the occupants of aircraft are important as well. The consequences can range from fatal accidents to successful emergency landings where no one is hurt and little or no damage occurs—and the outcome often depends upon land use characteristics at the point where the aircraft lands.

Davenport, Washington

Safety is a difficult compatibility impact to measure. Unlike noise impacts, which occur to some degree with every aircraft flight, safety deals with events that happened only occasionally and with much less predictability than noise. To get a handle on what might happen if an accident occurs, we look at what has happened in the past. In particular, we are interested in where accidents have occurred relative to the airport runway. Locations where accidents have historically been most concentrated represent the places where land use compatibility measures to reduce the potential consequences are most essential.

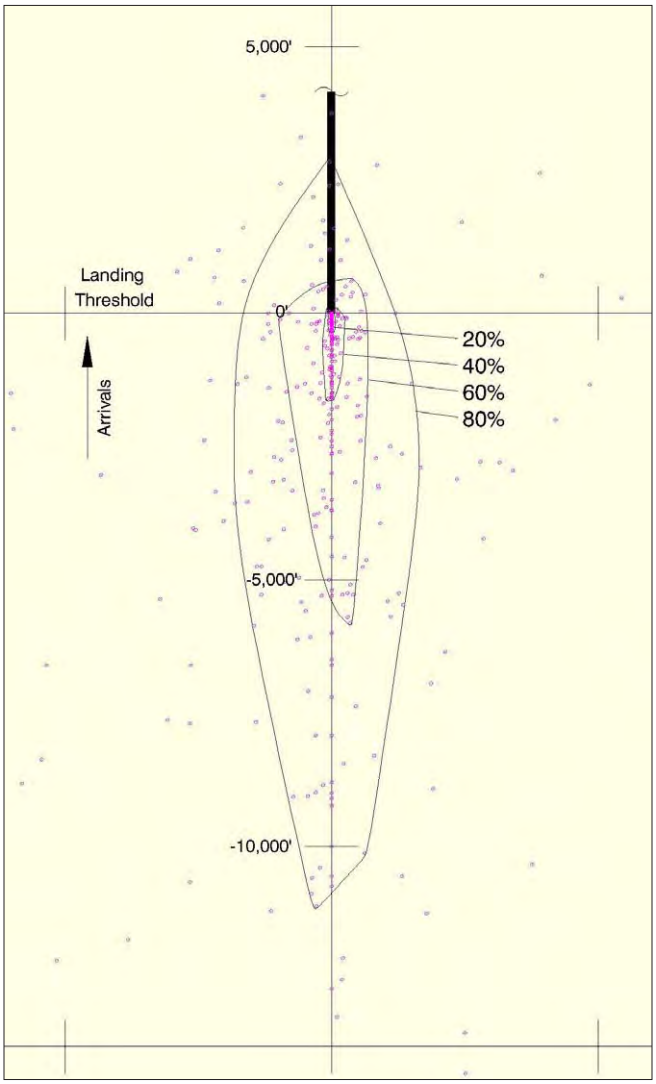
Remember WSDOT's compatibility zones address noise, safety, height hazards and land use to meet the requirements of Washington State law while California's safety zones primarily address safety.

To date, the most comprehensive examination of the topic of accident locations is contained in the 2002 edition of the *California Airport Land Use Planning Handbook* published by the California Department of Transportation Division of Aeronautics. The California handbook uses the general aviation accident scatter diagrams described in Appendix E of this guidebook to identify sets of up to six safety zones. The sizes and shapes of the safety zones reflect varying degrees of aircraft accident concentrations and also take into account the manner in which aircraft fly as they land and takeoff (where they fly and turn and the altitude at which they normally would be). Different safety zone sizes and shapes are suggested depending upon the runway length and type of aircraft presumed to use the runway.

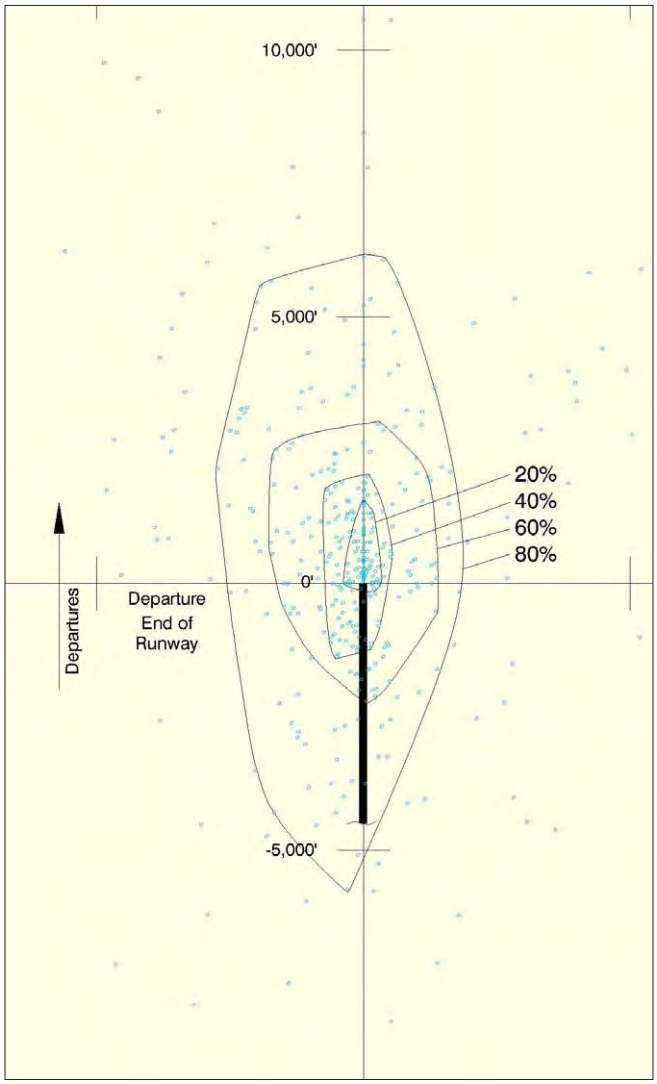
Most critical among the safety zones is Zone 1, which encompasses the runway protection zone (RPZ) and land along the edges of the runway. RPZs are where the highest concentrations of off-runway accidents take place. FAA standards define the dimensions of RPZs and the criteria for land uses within them. The function of RPZs is "to enhance the protection of people and property on the ground." The FAA encourages airports to control the land uses in RPZs, preferably though acquisition of the property though easements or zoning may suffice. When owned by the airport, the center portion of the RPZ must be clear of all objects (except certain navigational facilities) and only very-low-intensity uses such as automobile parking are acceptable elsewhere. These standards are strongly recommended even when the RPZ is not fully on the airport.

While Safety Zone 1 contains the highest concentration of historical accident points, data from the *California Airport Land Use Planning Handbook* indicates that only about 20 percent of off-runway, near-airport accidents occur in this area. Significant accident potential thus exists in other parts of the airport environs—it is just more dispersed. Of the other zones, Safety Zone 2 is most important as it encompasses the second highest concentration of accident points. The concentrations in the other zones diminish from there. Land use compatibility criteria for each safety zone should be set in accordance with these relative concentrations of accidents. The greatest restrictions should apply within Safety Zone 1 and reduced limitations farther from the runway ends.

General Aviation Accident Distribution Contours



All Arrivals



All Departures

Source: California Airport Land Use Planning Handbook (2002)

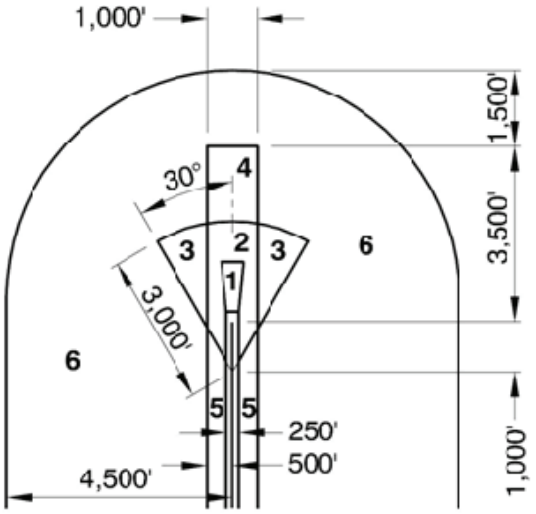
Zone		Example 1: Runway Length Less than 4,000 Feet			Example 2: Runway Length 4,000 to 5,999 Feet			Example 3: Runway Length 6,000 Feet or More		
		% of Points	Acres	%/Acre	% of Points	Acres	%/Acre	% of Points	Acres	%/Acre
Arrival Accident Sites										
	Primary Surface	29%	—	—	2%	—	—	11%	—	—
Zone 1:	Runway Protection Zone	27%	8	3.35	26%	49	0.53	25%	79	0.32
Zone 2:	Inner Approach/Departure Zone	15%	44	0.34	9%	101	0.09	12%	114	0.11
Zone 3:	Inner Turning Zone	2%	50	0.04	5%	151	0.04	6%	131	0.05
Zone 4:	Outer Approach/Departure Zone	3%	35	0.07	5%	69	0.08	8%	92	0.09
Zone 5:	Sideline Zone	1%	—	—	3%	—	—	1%	—	—
Zone 6:	Traffic Pattern Zone	10%	—	—	11%	—	—	21%	—	—
Total:	Zones 1-6 + Primary Surface	87%	—	—	79%	—	—	85%	—	—
Departure Accident Sites										
	Primary Surface	9%	—	—	9%	—	—	16%	—	—
Zone 1:	Runway Protection Zone	17%	8	2.09	14%	49	0.28	13%	79	0.17
Zone 2:	Inner Approach/Departure Zone	28%	44	0.63	11%	101	0.11	3%	114	0.02
Zone 3:	Inner Turning Zone	5%	50	0.10	9%	151	0.06	8%	131	0.06
Zone 4:	Outer Approach/Departure Zone	2%	35	0.06	4%	69	0.06	3%	92	0.03
Zone 5:	Sideline Zone	8%	—	—	8%	—	—	5%	—	—
Zone 6:	Traffic Pattern Zone	24%	—	—	37%	—	—	39%	—	—
Total:	Zones 1-6 + Primary Surface	94%	—	—	91%	—	—	86%	—	—
All Accident Sites										
	Primary Surface	18%	—	—	15%	—	—	13%	—	—
Zone 1:	Runway Protection Zone	21 %	8	2.65	21%	49	0.40	20%	79	0.26
Zone 2:	Inner Approach/Departure Zone	22%	44	0.50	10%	101	0.10	8%	114	0.07
Zone 3:	Inner Turning Zone	4%	50	0.08	7%	151	0.05	7%	131	0.05
Zone 4:	Outer Approach/Departure Zone	2%	35	0.07	5%	69	0.07	6%	92	0.07
Zone 5:	Sideline Zone	5%	—	—	5%	—	—	3%	—	—
Zone 6:	Traffic Pattern Zone	18%	—	—	23%	—	—	29%	—	—
Total:	Zones 1-6 + Primary Surface	91%	—	—	85%	—	—	85%	—	—

Notes:

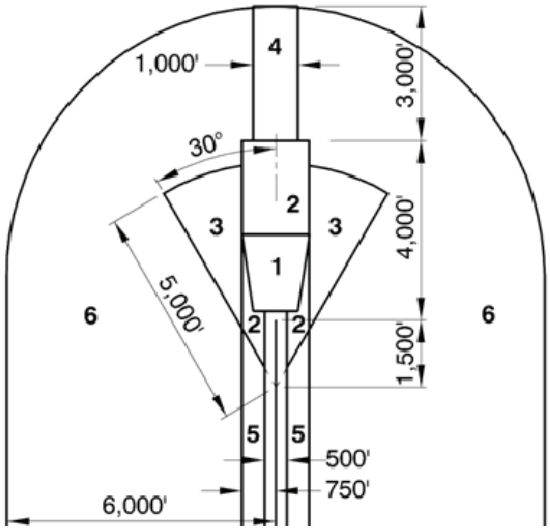
- Totals may not equal the sum of the numbers above because of mathematical rounding.
- Accident site locations as indicated in expanded general aviation aircraft accident database.

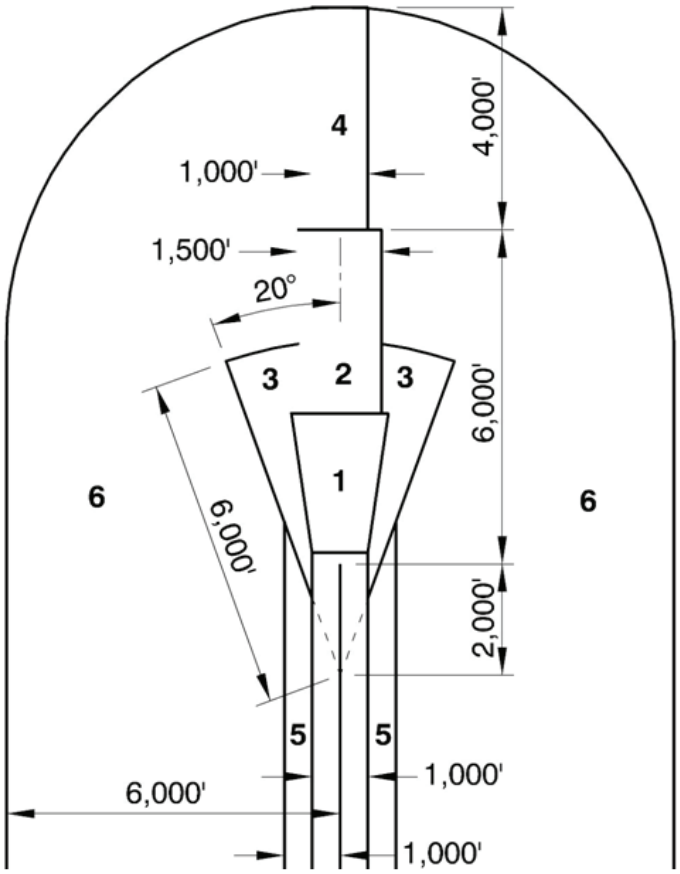
Source California Airprot land Use Planning Handbook (2002)

Example 1:
Runway Length Less than 4,000 Feet



Example 2:
Runway Length 4,000 Feet to 5,999 Feet





*Accident data and zone geometries are based upon the California's Airport Land Use Planning Handbook for public use airports.

Source California Airprot land Use Planning Handbook (2002)

FAA Advisory Circular 150/5300-13 is available online at: www.faa.gov/airports/resources/advisory_circulars/

National Transportation Safety Board website at: www.ntsb.gov/ntsb

Step 2: Products

- Map the airport traffic pattern and airport approach/departure areas for the different types of aircraft using the airport.
- Map of aircraft flight impact area and in applicable cases noise contours.
- Use data identifying potential historic accident locations.
- Airport airspace map showing FAR Part 77 *Imaginary Surfaces and Elevations*.
- Delineate the airport influence area.

Step 3: Identify Compatibility Concerns

You have set a foundation that described key information about your airport and community. You have also identified the airport influence area that is relevant. Now it is time to examine the level of compatibility in your community. This step will help you understand the various issues involved in determining compatibility.

You will know you have been successful when:

- You have determined the compatibility status of existing land uses in the airport influence area.
- You have identified potential compatibility conflicts that could arise from future development.
- You have identified the particular compatibility concerns that will require further review in the next step.

What is the land use character of the airport influence area?

Once you have identified the influence area, the next step is to understand the land use conditions within that area. What are current land uses? What types of development are allowed under existing development regulations? The following factors should be taken into account when assessing existing conditions in the airport influence area:

Dorothy Scott Municipal Airport

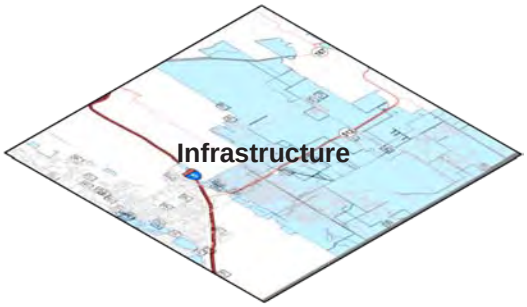
New residential development adjacent to Dorothy Scott Municipal Airport

"Density" vs. "Intensity"
As used for airport land use compa-tibility purposes, "density" refers to residential development and is measured in dwelling units per acre. "Intensity" applies to nonresidential uses and is measured in people per acre.

Create a series of maps to support your inventory of the influence area. Pay special attention to vacant or agricultural lands planned for development. Also identify areas where redevelopment could result in greater residential densities or nonresidential intensities.

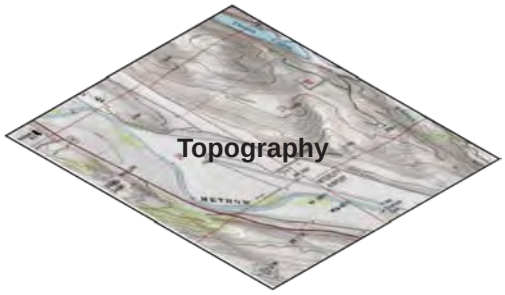
- **Existing Land Uses** – Describe the function, condition, and height of existing structures within the airport influence area. Note typical types of uses and age of uses where possible. Also describe the residential density and nonresidential development intensity. Identify and describe vested development proposals where possible.

- **Infrastructure** – Review existing and planned infrastructure in the airport area—particularly water, sewer, major roadways—to assess what type of future development it will support.



- **Allowed Land Uses** – Describe what land uses might be allowed under a maximum build-out scenario based on current comprehensive plan policies and development regulations. Also take note of where there are large parcels that can be subdivided under current policies and regulations. Note potential density and intensity where possible.

- **Topography/Geography** – Provide a general description of land features within the airport influence area. Of particular interest are features that constrain future development: steep terrain, lakes, flood zones, environmentally sensitive habitats, etc.



What is the current compatibility status?

Although the focus of this compatibility planning process is on preventing new incompatible land uses from being created, knowing the airport's compatibility status relative to existing land uses can be helpful. Sometimes it is essential to make sure that existing problems do not become worse. In other instances, infill development similar in character to the existing uses may be reasonable. Also, knowing the current compatibility status will help you to look for opportunities where incompatible uses could be converted to more compatible ones through local policies.

Mixed-use development may be appropriate depending where it is located and what type of uses are involved. A good mixed-use development might include offices, retail, and multi-family residential.

Table 2-2 provides a general guide to the compatibility of various uses that may be found around the airport. You will be able to make a more detailed assessment of the land use compatibility status once you have drafted specific compatibility criteria in Step 4.

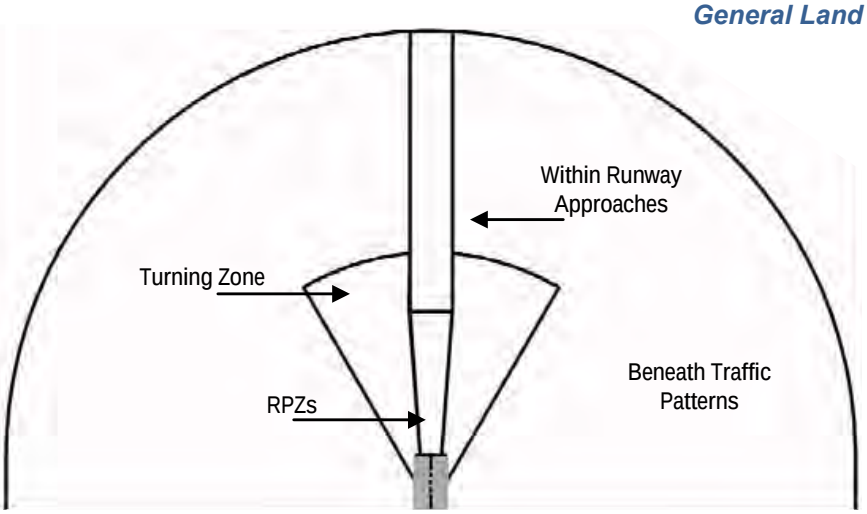
Now inventory the uses that exist within the airport influence area. Are these uses clearly compatible or incompatible with the airport? Flag the uses that could potentially be incompatible or that you are uncertain about.

Use Worksheet 3A to summarize your information.

To the extent that land uses are compatible with the airport, you will want to ensure that policies are in place to continue that status. This is especially true in locations on the edge of urban areas where pressures are greatest for conversion of agricultural lands to urban uses. Airport compatibility must be considered when drawing or modifying urban growth area boundaries. As for existing incompatibilities, there may not be a lot that can be done to remedy them, but some actions may be possible. For example:

- Are there areas that may be transitioning to other uses or exhibit mixed-use character near the airport where industrial or other compatible uses can be encouraged and incompatible uses phased out?
- Are there prospects that the airport could obtain federal or state funds to influence or buy the most highly impacted lands close to the runway ends and convert the areas to compatible uses?
- Can the airport obtain funds to install sound attenuation in noise-impacted residences and schools in locations where conversion to other uses is impractical? This option would be available only to the busiest airports with considerable jet traffic.

Table 2-2
General Land Use Acceptability



	Airport Proximity:	RPZ	Within Runway Approaches	Turning zone	Beneath Traffic Patterns
Typical Land Use Types	In General…	Only low heights and few or no people.	Limited building height and number of people; no noise-sensitive uses.	Limited building height and number of people; no noise-sensitive uses.	No noise sensitive uses.
	Agricultural	Compatible if not wildlife attractant or produces airspace obstructions.	Compatible if not wildlife attractant.	Compatible if not wildlife attractant.	Compatible if not wildlife attractant.
	Power Plants/ Transmission Lines/Roads	Generally incompatible.	Compatible if does not produce airspace or visual obstructions.	Compatible if does not produce airspace or visual obstructions.	Compatible.
	Parks/Recreation	Incompatible.	Compatible if low intensity.	Compatible if low intensity.	Compatible.
	Stadiums	Incompatible.	Incompatible.	Incompatible.	Generally incompatible.
	Industrial	Compatible if low-activity, warehousing, mini-storage, etc., provided the use does not produce airspace obstructions.	Compatible if does not produce airspace obstructions or have bulk amounts of hazardous materials.	Compatible if does not produce airspace obstructions or have bulk amounts of hazardous materials.	Compatible if does not produce airspace obstructions.
	Retail/Service Uses/Mixed Use	Incompatible.	Compatible only if low intensity.	Compatible.	Compatible.
	Dining/ Entertainment	Incompatible.	High-intensity and outdoor areas incompatible.	Outdoor areas generally incompatible.	Outdoor areas generally incompatible.
	Offices/Industrial Parks	Incompatible.	Compatible if low intensity.	Compatible.	Compatible.
	Places of Worship	Incompatible.	Incompatible.	Generally Incompatible.	Compatible if low intensity.
	Residential	Incompatible.	Incompatible.	Incompatible.	Generally incompatible.
	Schools K-12/Day Care Centers	Incompatible.	Incompatible.	Incompatible.	Incompatible.
	Hospitals/Nursing Homes	Incompatible.	Incompatible.	Incompatible.	Incompatible.

What potential compatibility conflicts are on the horizon?

Here is where your efforts stand to reap the greatest benefits in terms of enhancing airport land use compatibility. Questions you should ask include:

Much of this exercise relies upon a review of the designations indicated in your comprehensive plan land use map. However, other maps in the comprehensive plan also may indicate proposals such as new roads that could lead to new incompatible uses.

- Where could uses allowed by current plans and zoning be developed, yet potentially be incompatible with the airport?
- Are there plans to extend utilities, roads, and other infrastructure into an area to support development that would be incompatible with the airport?
- Are there locations within the airport influence area where redevelopment is planned? Will the redevelopment result in uses that would be incompatible because of density/intensity, noise, height, or other factors? Can the redevelopment be directed toward uses that are compatible with the airport?
- Are there vacant or underdeveloped sites that have infill development potential within these areas? Would such development be too incompatible with the airport to consider or could it be acceptable given the character of the surrounding land uses?
- To what extent can reuse of existing buildings result in more intense occupancy? Can a vacant building shell be used in a manner that might be incompatible with the airport? For example, can an office or religious institution go into a building originally planned as industrial or warehouse space?
- What controls do you have over the heights of cell towers, antennas, and other buildings or structures that could be airspace obstructions?

Use Worksheet 3B to understand how the jurisdiction's plan for future development in the airport influence area will affect compatibility concerns: increase, decrease, or remain the same? Identify issues that have the potential to become conflicts in the future.

What compatibility concerns need to be addressed?

Now, list in Worksheet 3C the specific issues that must be addressed to ensure that development of incompatible land uses is avoided in the airport influence area. You will use this list in Step 4.

Step 3: Products

- List of current community policies affecting land use development in the airport influence area.
- Evaluation of current compatibility status.
- Identification of potential future compatibility conflicts.
- List of specific compatibility issues to be addressed by new policies.

Remember to take into account future expansion plans for the airport as identified in an airport master plan or airport layout plan.

Be sure to look forward at least 20 years when evaluating the implications of airport impacts. To what extent will the community grow over this time period? Are there compatibility concerns that may arise in the long range that may not be evident from a short-term perspective? These issues may be particularly significant for airports whose influence area includes lands near urban growth boundaries.

Step 4: Develop the Comprehensive Plan

Steps 1 through 3 led you through the research and analysis needed to describe and assess the interactions between airports and surrounding land uses. You now know what constitutes compatible land uses around your airport and have identified key challenges to prevention of more incompatible uses. What are your options for addressing those challenges? This step will help you think through the various compatibility strategies available, then evaluate and incorporate the best strategies into the draft your comprehensive plan.

You will know you have been successful when:

- You have weighed the comparative advantages and disadvantages of available planning strategies.
- You have identified preferred planning strategies.
- You have decided upon specific compatibility criteria.
- You have conducted an assessment of the airport and included information on the airport in the transportation circulation element of the comprehensive plan.
- You have fully considered airport land use compatibility measures in your comprehensive planning process and incorporated plan policies to address land use compatibility and encroachment into the draft comprehensive plan where appropriate.
- You have reviewed comprehensive plan map and circulation element and have designated land uses within the airport influence areas that are compatible with the airport and addressed land use encroachment of incompatible development.
- You are ready to circulate the proposed comprehensive plan for review and adoption.

What does it mean to discourage development of incompatible land uses?

State law requires towns, cities, and counties to "adopt comprehensive plans and development regulations to discourage development of incompatible land uses adjacent to public use airports." What does that mean to you? It means that your jurisdiction must take actions necessary to preserve investment in transportation infrastructure and protect the airport as an essential public facility.

Communities can address airport land use compatibility in a variety of ways based on the characteristics of the individual airport facility as well as numerous other factors that are unique to each location. The following two principles—developed based on WSDOT's experience and expertise with airport land use compatibility—guide our technical assistance program:

- To discourage encroachment, communities must take proactive steps to prevent the proliferation of incompatible land uses adjacent to public-use airports. Existing conditions should be maintained or improved to prevent future incompatible development.
- To adopt effective goals, policies, and regulations, communities must conduct an assessment of airport operations, identify unique community characteristics, review best management practices, and analyze data and available research to make informed decisions that can be supported by the record.

As you begin drafting compatibility policy and map for the airport and melding those policies into the comprehensive plan for your community, you must look first at the impacts generated by the airport as identified in Step 2. Your task does not stop there, however. Compatibility planning seldom takes place in a vacuum where existing land uses and future development expectations around the airport can be ignored. Policies that may be appropriate for a rural airport surrounded by farmlands are likely to be unacceptable in an urban environment. The analyses you have done in Step 3 thus will significantly affect how you proceed with Step 4.

Community Airport

Case Study: After completing a two million dollar runway and taxiway reconstruction project at a public-use airport in Washington State, the local jurisdiction approved two single family residential developments within the airport's approach.

A jurisdiction's comprehensive plan drives a community's development pattern. Good comprehensive plan policies can also promote compatible development, while poor policies can promote the proliferation of incompatible uses that inevitably limit the potential and utility of the transportation asset.

What compatibility policies are already in place?

If the airport you are addressing is owned by your jurisdiction or physically located within its boundaries, chances are that your current comprehensive plan acknowledges it in some manner. If only portions of the airport influence area overlap your community's territory, then the comprehensive plan may make little or no mention of the airport's impacts. The absence of explicit compatibility policies may implicitly be a policy that allows or even promotes incompatible development.

Remember the guiding philosophy of "Do no more harm." The number one goal of airport land use compatibility planning is to support continuation of existing compatible land uses around airports and prevent encroachment by new incompatible uses. Beyond that, any feasible actions that can be taken to reduce or eliminate existing conflicts are desirable as well.

Review the land use planning documents gathered during Step 1. In Worksheet 4A, list the existing comprehensive plan text, goals, policies, and development regulations affecting the airport influence area. Also note any implicit policies or land use map designations that may affect future land use compatibility.

Next, assess the effectiveness of the comprehensive plan.

- Does the plan address air transportation and provide a summary of the airport and airport operations?
- Do the current policies help prevent incompatible land use development in the airport influence area or do they tend to promote this development?
- To what extent have policies intended to prevent incompatible development been inadequate to the task? Why? Are there loopholes in the policies that allow compatibility goals to be circumvented?

- Are the policies clearly defined or are they open to a wide degree of interpretation?
- Do the current policies provide a good starting point for more detailed and thorough policies or do you need to start from nothing?
- Is comprehensive plan land use map consistent with the current policies and does it discourage incompatible land uses within the airport influence area. Are there other types of land uses that would be more appropriate and compatible with the airport?
- Does the circulation map identify the airport and airport access?

In Worksheet 4B, write statements of fact that document your findings. These statements provide evidence of your work on airport land use compatibility and may be used to support adoption of policies and regulations, and may also be referenced in any proceedings of the Growth Management Hearings Board.

What strategies can be used to respond to compatibility planning challenges?

Every community faces certain challenges in planning for airport land use compatibility. In almost every case, communities must decide how to balance a range of competing interests in order to protect the airport, preserve quality of life, and meet the requirements of state law.

Avoid, ***minimize***, and ***mitigate*** is a principle used in planning to address adverse impacts of development. This principle is a hierarchical approach—the idea is to first avoid negative impacts when possible. When it is not possible to avoid adverse effects, the second part of the strategy is to minimize the effects to the greatest degree possible. The third step, used in cases where the adverse impacts are truly unavoidable, is to mitigate the negative effects by offsetting the impacts in some way. This approach can be used in airport land use compatibility planning as well. This guidebook provides tools to empower local jurisdictions to prevent development of incompatible land uses adjacent to airports. However, where it is not possible to prevent such development, the tools may also be used to minimize and mitigate the effects.

Table 2-4 lists a series of challenges you may encounter as you prepare compatibility policies and incorporate them into your comprehensive plan. For each of these challenges, the table identifies one or more basic strategies that can be used to address these challenges. Most jurisdictions will utilize a combination of techniques to implement their compatibility programs. Note that some strategies may be appropriate for your community, while others will not be. Also, different strategies are applicable to different circumstances. Specifically, some strategies are preventative, meaning that they are designed to avoid new incompatible development. Other strategies are mitigation techniques, meaning that they are used to minimize the negative effects of incompatible development when such development already exists or is unavoidable.

These strategies are not intended to represent specific policies or criteria. Think of them more as tools. Most are discussed in Chapter 3.

Which approach is right for you?

There is no single right way to approach these issues—although there are some wrong ones—and WSDOT does not endorse a particular approach for every community. Rather, what is most critical is that every community evaluate the options that are available and make informed decisions about the right course of action that will meet its stated goals and policies and uphold the requirements of the Growth Management Act (RCW 36.70A) and RCW 36.70.547.

As you consider the various options for addressing compatibility challenges, think about the advantages and disadvantages for your airport and your community. How would use of each technique influence the efficacy of your airport land use compatibility program? How would the approach work in your community?

Table 2-3 rates the level of compatibility in the airport influence area. This will help you set expectations for the kinds of amendments that may be needed to achieve airport land use compatibility in your community.

Table 2-3
Compatibility Status

	Green	Yellow	Red
Airport Influence Area Land Use Characteristics	Few opportunities for incompatible development given existing policies and regulations.	Some incompatible development already exists; some opportunity for new incompatible development based on existing policy and regulations.	Significant amount of existing and potential future incompatible development.
Strategy	Keep a good thing going.	Proceed with caution.	Change direction.
Action	Perform a review of existing land use map, policies, and regulations for key elements of compatibility. Amend comprehensive plan and development regulations as necessary for continued success.	Consider course corrections to prevent new incompatible development. Consider down-zoning or rezoning to a more compatible use to achieve airport land use compatibility objectives.	Planning as usual will not discourage incompatible land use. A new direction is needed to protect the airport.

The next worksheet takes you through the process of evaluating various strategies available and settling on the best approaches. It is important as you evaluate each approach to remember the principles that guide airport land use compatibility planning: How does each approach serve (or detract) from these planning principles? What should the specific compatibility criteria be?

Table 2-4
Compatibility Challenges and Strategies

Challenge / Strategy	Encourage Airport to Buy Property	Prohibit the Use	Limit Residential Density	Limit Usage Intensity (people per acre)	Avoid Highly-Risk Sensitive Uses	Avoid Noise-Sensitive Uses	Encourage Development Clustering	Encourage Transfer of Development Rights	Consider limited criteria exceptions	Require Preservation of Open Land	Restrict Heights of Structures	Prohibit Bird & Wildlife Attractants	Require Avigation Easement Dedication	Require Recorded Deed or Plat Notice	Recommend Disclosure During Real Estate Transactions	Establish Coordination Mechanism
Expansion of UGA to encompass all or part of the airport influence area is proposed							X	X		X	X			X	X	X
The airport influence area encompasses all of a town or city					X				X		X	X				X
The airport influence area encompasses multiple jurisdictions								X								X
The airport area is in a GMA and extensive new development is unavoidable			X	X	X	X	X	X						X	X	
Airport influence area is almost completely developed and there is a demand for infill			X	X	X	X	X	X					X	X	X	
Redevelopment is planned for part of airport influence area					X	X					X					
Land near the airport is needed for residential development		X	X				X	X		X			X	X	X	
There are existing residential areas near the airport and a new school is needed		X		X												
The community's commercial core area is within runway approach zone				X	X						X		X			
Some of runway protection zone is private property	X			X					X	X	X	X	X			
Planned new high-intensity development near runway approaches would put people at risk			X	X												
Little open land remains near the airport							X			X						
High terrain exceeding FAR Part 77 standards exists near the airport									X	X	X		X			
Property is so close to runway that FAR Part 77 height criteria doesn't allow buildings	X	X					X		X				X			
Tall buildings could be located near the airport		X						X			X		X			
Cell towers and antennas are not restricted in the airport environs		X									X		X			
Existing uses in the airport area attract birds or other wildlife												X				X
Airport compatibility conflicts with siting requirements for other essential public facilities located nearby					X											X

What should the compatibility policies be?

Things to Consider

Rural Environment

You have decided upon the compatibility strategies that will work best for your community. Next you will need to prepare specific compatibility policies. How detailed you choose to make the policies will depend upon the issues you are facing. In outlying areas where little development is expected, providing general development parameters (such as height limits or maximum number of people per acre) may be sufficient. Where much development will be occurring, a detailed list of acceptable and unacceptable land uses and conditions to be met if the use is marginal may be necessary.

Urban Environment

Another major decision to be made at this point is how restrictive your compatibility criteria should be. Again, the choice may depend upon the existing character of the airport environs. For example, it may be a simple decision to have policies precluding high-intensity development in outlying rural areas because such development is unlikely to occur anyway. In developed or developing locations, the point at which the line is drawn for acceptability with regard to airport impacts can be controversial. Questions you should consider in making this choice include:

- Is the development not likely to occur for reasons other than airport compatibility restrictions?
- What is the community's current image of the airport? Is it seen as a good neighbor?
- Are existing uses that might seem to be incompatible felt to be acceptable in your community given the community characteristics, relationship with the airport, and other factors?
- What are the community's expectations for and acceptance of growth in airport activity and the additional impacts that might result?
- What assurances can be given to protect the viability of the airport if relatively relaxed compatibility criteria are established?
- What realistic and economically viable uses of the land would remain with the compatibility restrictions in place?

- Could highly restrictive criteria cause some private property to be unusable and thus raise concerns that the policies could be deemed a taking?
- Would restrictive criteria render large areas of existing development as nonconforming to the compatibility criteria? What implications would this have?
- Should infill areas be treated differently than larger sites and ones on the edges of urbanized areas?
- Are different parts of the airport environs sufficiently different in land use character that different compatibility criteria should be applied?

To avoid takings issues, you usually will want to allow a single-family dwelling to be built on a legal residential lot of record.

📖 For more about takings, review this advisory Washington Department of Commerce publication: qa.cted.wa.gov/_cted/documents/id_1068_publications.pdf

Basic Criteria

Table 2-5 is intended as a starting point for your preparation of specific compatibility criteria. It provides basic, qualitative criteria for different types of airport environs from outlying to developed. Your criteria will most likely need to be more detailed and quantitative.

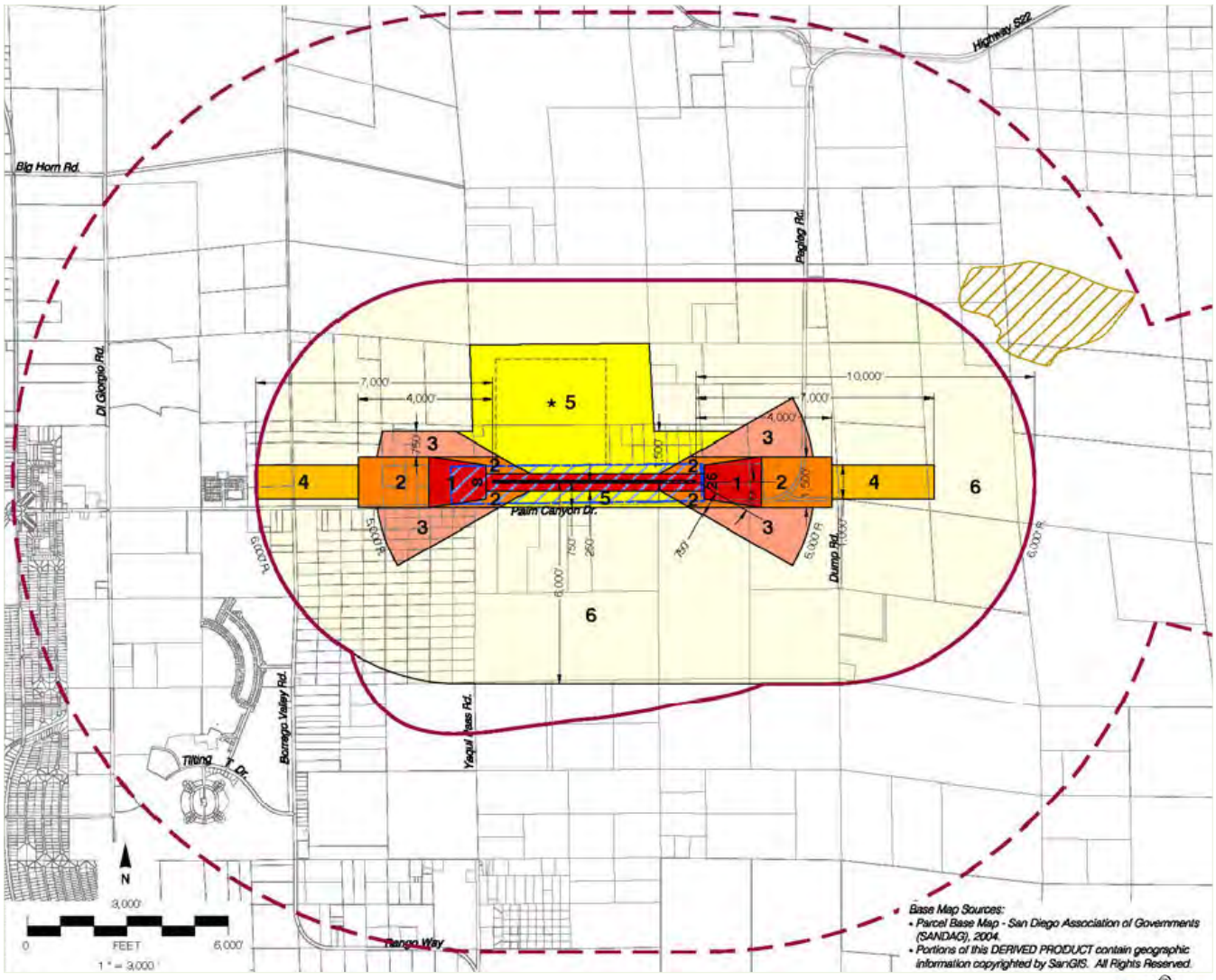
With regard to the four primary compatibility factors, some key points to remember are:

- **Noise** – No new noise-sensitive uses should be permitted within the high impact areas defined by the airport traffic pattern. This especially includes residential uses, but other uses with outdoor activities are also incompatible. Remember that noise impacts extend beyond the runway approach and departure areas into the airport influence area. Avoid noise-sensitive uses such as low residential, K-12 schools, hospitals, and adult care facilities. Where residential uses are to be accommodated, multi-family residential or mixed use is preferable to single-family because of the typically greater background noise, fewer outside walls through which outside noise can intrude, and less amount of outdoor living space. Consider establishing some form of buyer awareness program to alert prospective new residents to the occurrence of noise.
- **Affects Within the Airport Influence Area** – Vibration, fumes, noise, and an element of fear from low-flying aircraft all contribute to annoyance and other impacts associated with the airport influence area.
- **Airspace Protection** – You can generally use FAR Part 77 standards as the guide for determining allowable heights for new structures, but be sure to take into account any plans for runway extensions or new types of instrument approach procedures. Work with the airport and the FAA to determine acceptable heights in places where the ground itself exceeds the standards. Also be sure to address other hazards to flight. Uses that attract birds into the airport airspace or wildlife onto the runways are a particular concern. Other hazards include land uses that generate steam or smoke, produce glare, or otherwise interfere with the view of pilots and ones that could generate electrical interference with aircraft navigation or communication signals.
- **Safety** – Uses that attract concentrations of people into small areas near airports are not wise planning, especially in locations close to the ends of runways. New K-12 schools, hospitals, and other uses in which the occupants are young or infirm should not be allowed. Uses involving quantities of hazardous or explosive materials also do not belong near airports.

Seek to cluster development in a manner that leaves some flat, open land where small aircraft could make an emergency landing if necessary.

Can the airport influence area size be adjusted?

Most of the time, the airport influence area will consist of a combination of the areas affected by each of the four preceding factors. In some instances though, there are reasons for making adjustments. This should be done by going back to the four individual factors and reconsidering the underlying assumptions. Simply expanding the influence area boundary when no impacts occur and no compatibility criteria would apply within part of the area would serve little purpose. Oppositely, to omit locations where identified impacts warrant some form of compatibility policies would be contrary to the purpose of compatibility planning.



Source: Borrego Valley Airport, Land Use Compatibility Plan, December 2006

Table 2-5
Characteristics of Existing Influence Area Environs

Characteristics of Existing Influence Area Environs	**Rural** *Existing land use is agricultural or rural; few buildings; new development not anticipated.*	**Limited Development** *Existing development is scattered or low-intensity with little new development anticipated.*	**Developing** *Extensive vacant or underutilized land with urban development potential.*	**Developed** *Fully or mostly developed; potential redevelopment.*
Runway Protection Zone	• Airport should control land consistent with design standards. • Height restrictions. • Avoid new buildings. • Avoid new roads.	• Airport should control land consistent with design standards. • Height restrictions. • Avoid new buildings. • Avoid new roads.	• Airport should control land consistent with design standards. • Height restrictions. • Avoid new buildings. • Avoid new roads.	• Airport should control land consistent with design standards. • Height restrictions. • Infill uses if low intensity. • Avoid new roads.
Parallel to Runway	• Aviation-related development preferred. • No new residential tracts. • Non-residential uses acceptable, industry preffered. • No new schools, hospitals, nursing homes, etc. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or other wildlife. • Encourage keeping land agricultural, undeveloped, or in airport-related uses.	• Aviation-related development preferred. • No new residential tracts. • Low intensity non-residential uses acceptable. • No new schools, hospitals, nursing homes, etc. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or other wildlife. • Encourage keeping land agricultural, undeveloped, or in airport-related uses.	• Aviation-related development preferred. • Low/moderate intensity non-residential uses acceptable. • No new residential tracts. • No new schools, day care centers, nursing homes, etc. • No new shopping centers or places of public assembly*. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or wildlife. • Encourage light industrial and other low-intensity uses or airport-related uses.	• Aviation-related development preferred. • Low/moderate intensity non-residential uses acceptable. • No new residential tracts. • No new schools, day care centers, nursing homes, etc. • No new shopping centers or places of public assembly*. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or wildlife. • Encourage light industrial, commercial, and other low-intensity non-residential uses.
Approaches/ Extended Runway Centerline	• Aviation-related development preferred. • Low-intensity industry or other non-residential uses acceptable. • No new residential tracts. • No new schools, day care centers, nursing homes, hospitals, etc. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or wildlife. • Encourage continuation of agricultural and related uses.	• Low-intensity industrial or other non-residential uses acceptable. • No new residential tracts. • No new schools, day care centers, nursing homes, hospitals, etc. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or wildlife. • Encourage continuation of agricultural and related uses.	• Low/moderate-intensity industrial or other non-residential uses acceptable. • No new residential tracts; infill discouraged. • No new schools, day care centers, nursing homes, hospitals, etc. • No new shopping centers, industrial uses with high concentrations of people, places of public assembly*. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or wildlife. • Encourage light industrial, office, and other low-intensity uses.	• Low/moderate-intensity industrial or other non-residential uses acceptable. • Residential as infill acceptable. • No new schools, day care centers, nursing homes, hospitals, etc. • No new shopping centers, industrial uses with high concentrations of people, places of public assembly*. • Tall structures restricted to protect airspace. • Caution regarding land uses that attract birds or wildlife • Encourage light industrial, office, and other low-intensity uses.
Traffic Pattern	• Maintain existing minimal development conditions to maximum extent practical. • No new schools, day care centers, nursing homes, hospitals, etc. • Encourage continued agricultural uses, and industrial uses.	• No new residential subdivisions. • No new schools, day care centers, nursing homes, hospitals, etc. • Encourage continued agricultural and agriculture-related commercial or industrial or other low-intensity commercial uses.	• No new residential subdivisions. • Encourage nonresidential uses except for ones with very high intensities (such as sports arenas). • Favor moderate to high-density or mixed use development if residential is necessary. • Caution regarding land uses that attract birds or wildlife.	• No new residential subdivisions. • Encourage nonresidential uses except for ones with very high intensities (such as sports arenas). • Favor high-density residential or as infill or mixed use redevelopment. • Caution regarding land uses that attract birds or wildlife.

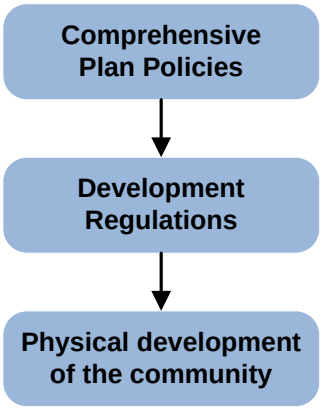
**Places of worship, auditoriums, outdoor sports arenas, etc.*

What should be added or changed in the comprehensive plan?

The comprehensive plan establishes the policy foundation that guides the physical development of a community. Towns, cities, and counties in the state each should adopt a comprehensive plan and following the state's enabling legislation or growth management legislation as appropriate. Policies directed toward ensuring airport land use compatibility in the community must be an integral part of these plans. These policies should be evident in:

- The goals that the community seeks to achieve with regard to future development and the manner in which the airport and provisions for land use compatibility around it fit into these goals.
- Description of the types of airport land use compatibility standards that future development will need to meet.
- Comprehensive plan map designation of lands near the airport for types of development that will be compatible with the airport.
- Identification of the specific tools that will be used to ensure implementation of the compatibility standards.

How Comprehensive Plans Drive Development



Goals

It is critically important that a community's goals for air transportation facilities and adjacent land uses be expressed in the comprehensive plan. Values and strategies included in the comprehensive plan filter down through all other planning decisions, from zoning to issuing building permits. The land use, transportation, capital facilities, and economic sections are all appropriate places to discuss airports and land use compatibility.

The goals should cover a range of issues that express the value of the airport to the community, as well as the community's commitment to preserving the airport consistent with its value. At a minimum, the goals should:

- Recognize the multiple roles of the airport in the community, its contribution to the community's economy, and the services it provides to the community's businesses, residents, and visitors.
- Recognize the airport as an essential public facility.
- Recognize the airport as part of the multi-modal transportation system.
- Signal the community's intent to discourage development of incompatible land uses adjacent to the airport.
- Signal the community's intent to protect the airport's airspace.

Compatibility Policy Identification

The basic objectives of the compatibility criteria for each of the four compatibility concerns should be identified in the comprehensive plan. Indicate which of the strategies you selected earlier in Step 4. Also, the airport influence area boundary that you have defined should be presented in the comprehensive plan together with a discussion of the factors on which it is based.

At least a basic level of compatibility policies should be included in the comprehensive plan to ensure that they are not overlooked during reviews of individual development proposals. Highly detailed criteria may be better suited to inclusion in a separate policy document or within development regulations or within an airport compatibility overlay component to the zoning ordinance. If the complete strategies and policies will appear in the comprehensive plan rather than in other policy documents, then maps of the impact areas for the four individual compatibility factors would need to be included as well.

The following example goals/policies are offered to assist local communities in the development or amendment of comprehensive plans. We recommend that local jurisdictions insert policy language into several sections of their comprehensive plan including sections for general land use, capital facilities, economic development, essential public facilities, and the transportation element.

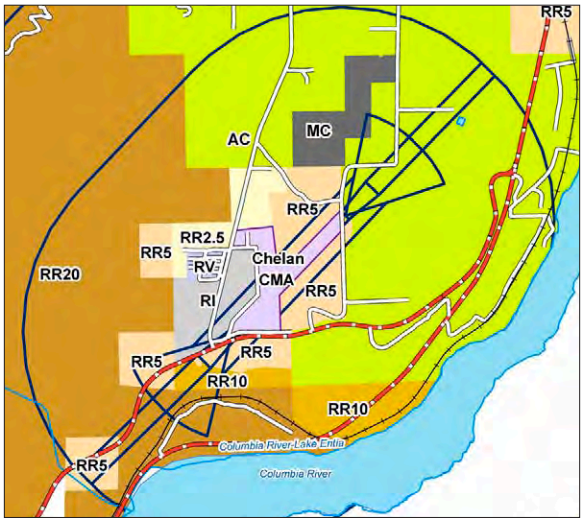
- Recognize (name of airport) as an essential public facility and discourage land uses that may promote incompatible development adjacent to the (name) airport.
- Protect the viability of the airport as a significant economic resource to the community by encouraging compatible land uses, densities, and reducing hazards that may endanger the lives and property of the public and aviation users.
- Encourage the protection of the (Name) Airport from adjacent incompatible land uses and/or activities that could impact the present and/or future use of the airport as an Essential Public Facility (EPF), endanger the lives of people on the ground and/or promote inadvertent growth of incompatible land uses. Incompatible land uses may include residential, multi-family, height hazards, uses that attract large concentrations of people, wildlife hazards, and special uses such as schools, hospitals, and nursing homes, and explosive/hazardous materials.
- Encourage the adoption of development regulations that protect the airport from height hazards by developing a Height Overlay District that will prohibit buildings or structures from penetrating FAR Part 77 *Imaginary Surfaces*.
- Encourage open space/clear areas and utilize zoning criteria within key safety areas adjacent to the airport to facilitate protection of the airport as an essential public facility, and reduce safety risk exposure to people on the ground and in the air. Applicable criteria may include promoting cluster development to promote open space/clear areas, locating structures away from the extended centerline of the runway, discouraging public assembly, transfer of development rights, and other applicable strategies. When possible promote contiguous open space parcels, especially in areas with smaller parcel size configurations.

Land Use Map Designations

Designating land uses that will be compatible with the airport impacts in a particular location is key to the success of the whole compatibility planning process.

- **Agricultural Uses and Related Uses** – How much of these types of undeveloped or minimally developed uses can be continued? Especially outside of urban growth boundaries, this should be a high-priority choice.
- **Residential Uses** – Residential land uses are a particular concern. Is new low-density residential development, especially any new subdivisions, proposed for locations where it would be incompatible with the airport? If so, are other more compatible uses possible such as high-density multifamily or mixed use?
- **Noise- and Risk-Sensitive Uses** – Where are schools, hospitals, and other sensitive uses planned to be located? If these uses already exist, can expansion be limited? Are there any critical community infrastructure uses—such as power plants and communication facilities—planned in the airport influence area that could be built elsewhere instead?
- **Other Nonresidential Uses** – Take a close look at industry, commercial, and other nonresidential uses that potentially have high concentrations of people. Are any such uses proposed within the compatibility zones close to the runway? If so, what can be done to limit the intensity? Also make certain the building heights allowed for these uses would not result in airspace obstructions.

Land Use Map Designations, Chelan Municipal Airport



Agricultural Uses, Arlington Municipal Airport

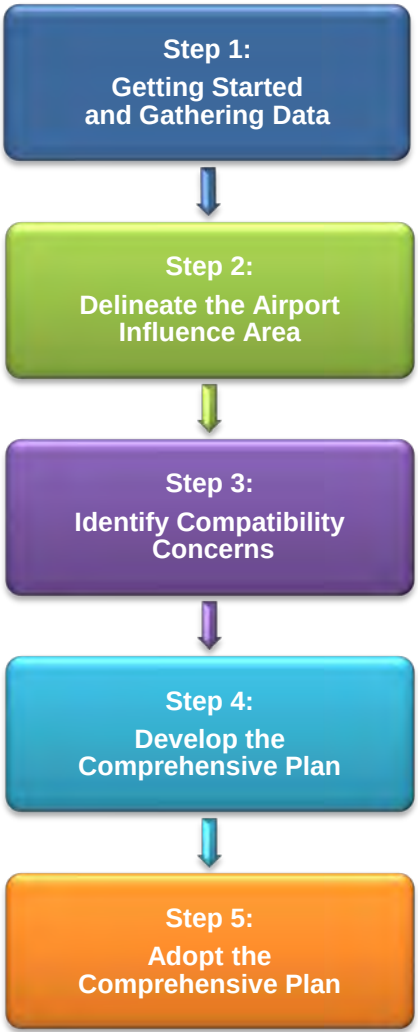
Noise Sensitive Use With Potential for Expansion, Spokane, WA

Step 4: Products

- Revisit Worksheet 3C and review the list of current policies affecting airport land use compatibility in your community and conduct and assessment of the adequacy of the current policies improve compatibility (Worksheet 4A).
- Evaluation of alternative compatibility strategies (Worksheet 4B).
- Draft of specific compatibility criteria (Worksheet 4C).
- Adjustment of airport influence area boundary if necessary (Worksheet 4D).
- Draft comprehensive plan policies.
- Draft comprehensive plan land use map.

Step 5: Adopt the Comprehensive Plan

This short step takes the comprehensive plan you prepared in Step 4 through the adoption process. Particular emphasis is given to gaining support for the airport land use compatibility measures you have incorporated into the draft plan.



At this point, you should have completed the following tasks:

- Identified the airport and airport operations within the transportation element.
- Finalized the delineation of the airport influence area boundary.
- Identified policies necessary to address compatibility and the airport.
- Defined strategies and identified appropriate land use measures on the comprehensive plan map to address compatible land uses adjacent to the airport.

You will know you have been successful when:

- Airport stakeholders feel that their concerns regarding compatibility matters have been understood and appropriately considered in the comprehensive plan.
- You have gained public acceptance of the importance of airport land use compatibility planning.
- WSDOT Aviation provides comments supporting the compatibility measures you propose to take in your comprehensive plan.
- Your community's decision makers have adopted a comprehensive plan that contains appropriate measures to protect the airport from encroachment by incompatible land uses.

Does WSDOT Aviation need to review the draft comprehensive plan?

Under RCW 36.70.547, "all proposed and adopted plans and regulations shall be filed with the aviation division of the department of transportation within a reasonable time after release for public consideration and comment." Beyond this requirement, as you begin work on preparing your draft comprehensive plan, it is important that you coordinate with WSDOT Aviation. We can provide technical assistance and help you identify measures that may be appropriate in your community to address airport land use compatibility issues you will need to consider during your comprehensive plan process.

Information collected for the transportation inventory can be expanded as public outreach materials to educate community members about the airport. For example, a brief fact sheet or flyer describing activities supported by the airport and future activity anticipated at the airport can be a great resource for raising awareness about the role of the airport in the local, regional, and state transportation system.

What public participation is needed for policy adoption?

Planning Staff

City of Spokane planning staff working with Spokane International Operations Manager on a new airport Overlay

By the time you reach this step, you should have thoroughly examined airport land use compatibility issues and incorporated appropriate measures into the draft comprehensive plan. Airport land use compatibility planning now becomes one of many issues that the public and decision makers will evaluate during the process leading to the adoption of the amended comprehensive plan. Thus, the formal public participation process for compatibility planning should be the same as for the comprehensive plan and implementing regulations.

Airport land use compatibility planning has its own unique group of stakeholders, and these stakeholders may not always be active participants in the comprehensive planning process. Chapter 1 described the stakeholders most likely associated with airports and the importance of involving them in the process.

How can you gain public and decision-maker support for airport land use compatibility measures?

Planning Commission

For people closely involved with aviation, the importance of airport land use compatibility planning is probably obvious. To other people, it may not be as evident or they may view it as less of a priority than other community planning objectives. In order for the airport land use compatibility measures you have developed to be successfully implemented, the people who have the authority to make decisions or the ability to sway those decisions must be convinced.

One way of doing this is to demonstrate why compatibility is important not just to the airport, but also to the community's residents and businesses. This topic was covered in Chapter 1. Simply put, development that unnecessarily puts people where they will be exposed to significant airport impacts, experience reduced quality of life or incur increased risk is poor planning.

Another approach is to focus on the economic importance of the airport to the community. This topic has already been touched upon several times in this guidebook. From a statewide perspective, some additional points to consider are:

- Airports, aviation, and industries related to aviation in Washington have an impact on the economic well-being of communities throughout the state. Airports and aviation-related industries create thousands of jobs and provide millions of dollars in income and sales each year.

- According to a WSDOT study conducted in 2001, airport operations, aviation-related businesses, air travel, visitor spending, and special aviation events in Washington generate an estimated $19.6 billion annually in total economic activity, support over 176,900 full- and part-time employees statewide, and produce $14 billion each year in employee wages and benefits for state residents.
- Capital spending by local airports also contributes to the economic well-being of local and regional economies. While not generally an annual expenditure, spending on capital improvements in the year 2000 generated an additional $137.9 million in output, supported over 1,400 jobs and produced $42 million in employee wages and benefits for state residents.

To bring these points home at a local level, preparation of an airport economic analysis focusing on your airport may be worth considering. Such studies can document several types of economic benefits:

- They measure the new economic benefits that the region accrues because of the airport.
- They provide a metric for comparison to other public projects in terms of rate of return on investment.
- They show the net benefit of dollars flowing into the local economy from outside of the community because of the airport.


For more on the WSDOT Aviation economic impact study, see: www.wsdot.wa.gov/aviation/econimpacts


For more information on comprehensive plans and adoption process, see: www.commerce.wa.gov/site/303/default.aspx

Step 5: Products

- Public Outreach Plan with a strategy to provide opportunities for the public and decision maker to become engaged in the comprehensive plan and process.
- Information materials describing the importance of the airport and airport land use compatibility.
- An adopted comprehensive plan incorporating airport land use compatibility strategies, policies, land use map, and supporting documentation.

Step 6: Implement the ALUC Policies

Congratulations! You have shepherded airport land use compatibility matters through the research and comprehensive plan adoption process. You have successfully reflected the concerns in your comprehensive plan, which has now been adopted by your community's decision makers. But, you can't stop there. The one final step involves preparing implementing regulations, getting them adopted, and then using them on a day-to-day basis to ensure that encroachment of incompatible land use concerns for the airport will continue to be addressed and avoided.

You will know you have been successful when:

- You have evaluated the development regulations and revised them to implement the comprehensive plan, policies, and land use map.

What implementing regulations are needed?

Once your comprehensive plan has been amended, it is time to determine what types of regulatory tools you will need to implement the plan. Most likely, unless the compatibility issues you face are simple, your existing development regulations will not contain all the tools necessary to ensure consistency with the amended comprehensive plan. These details will need to be included in an amendment to your community's development regulations. Primary among these is your zoning ordinance, but subdivision and environmental impact regulations, and other implementing regulations also may need to be reviewed and revised to reflect the comprehensive plan policies on airport land use compatibility.

The purposes of development regulations are to establish land use controls on land covered by the comprehensive plan. In addition to defining specific types of land use, the development regulations establishes the density and intensity of land uses, building and structure height, setbacks, subdivision control, permitting processes, and other aspects of property use. Development regulations are required to be on file with the local jurisdiction and available to the public.

Development regulations put policy into action. It is important that the regulations implement the policy, not start a new direction. Make sure to provide adequate detail in the regulations to help the development community understand what is required.

Other than where direct conflicts need to be eliminated from the comprehensive plan text and maps, implementation of compatibility policies could be accomplished almost entirely through conventional zoning, airport overlay ordinance, and a height hazard overlay ordinance. Use Worksheet 6A to confirm that you have addressed all the compatibility criteria in your implementing regulations.

Traditional Zoning Ordinance

Zoning ordinances are the most common regulatory tool used by local government throughout the country to manage land use and development. Traditional zoning ordinances typically involve two components: text and a map. The text defines the categories, uses, and standards of development permitted within a particular land use designation. The map demonstrates the spatial distribution of the zoning classifications.

Historically, zoning has been used as a land use control technique to segregate incompatible land uses and establish standards for the type and intensity of use. Zoning ordinances typically categorize land uses into several different classifications. Usually included are: residential, commercial, industrial, institutional/governmental, parks/open space, and agricultural. The exact classifications will vary from jurisdiction to jurisdiction. Zoning is also used to regulate the density and intensity of uses, and the manner in which structures can be placed on the site—setback distances, lot coverage, and allowable height. Parking and landscaping requirements for each land use classification are typically specified in the zoning ordinance as well.

📖 Click here to review your jurisdiction's development regulations: www.mrsc.org/codes.aspx

How can zoning be used to promote airport land use compatibility?

To discourage the encroachment of incompatible land uses within the airport influence area, jurisdictions can develop regulatory tools that limits or discourages uses such as residential development and promotes compatible commercial, agricultural, light industrial, and mixed-use development. Parcels within the airport influence area should, at a minimum, be maintained at their current level of compatibility or rezoned for a more compatible use. Parcels should not be rezoned to allow a more incompatible use. Remember, jurisdictions are required to discourage incompatible development, not encourage its proliferation through passive zoning regulations.

Overlay Zoning Ordinance

Overlay zoning is a regulatory tool that identifies special zoning standards that provides additional standards and/or modifies standards in the base zoning district map and text. The overlay district can share common boundaries with the base or underlying zone or cut across the underlying zone boundaries. Additionally, overlay zones are usually created to be applied within smaller geographic areas to protect a specific resource or guide development within a special area.

Overlay zoning is a highly useful and efficient tool for addressing land use compatibility within an airport influence area. Common requirements may include building heights, bulk and density standards, lot sizes, provide incentives to attract uses or prohibit uses or activities that may impact the airport. By creating an airport overlay zone, the underlying zoning criteria for property within the airport influence area can be modified to ensure compatibility with the airport. This method also allows communities to keep their existing base zoning in place adjacent to the airport rather than creating new base zoning districts. In this way, the need to create zoning district to specifically address industrial commercial, or other such classifications specific to the airport influence area can be avoided. Several types of overlay districts have been successfully used to address land use compatibility. The two most commonly used in Washington State have included an overlay district to address height hazards using FAR Part 77 *Imaginary Surfaces* and a separate overlay to implement the land use compatibility zones addressed in Appendix F.

Critical Concept
To be successful in implementing both an airport overlay and traditional zoning, the two strategies must have and maintain a give-and-take relationship. This means you cannot change the underlying zoning without due process or cause, such as a change in circumstance or operations. Jurisdictions should establish a clear record of their methodology and goals regarding efforts to achieve a more compatible environment though the use of both tools.

Land Use Protection/Airport Compatibility Overlay

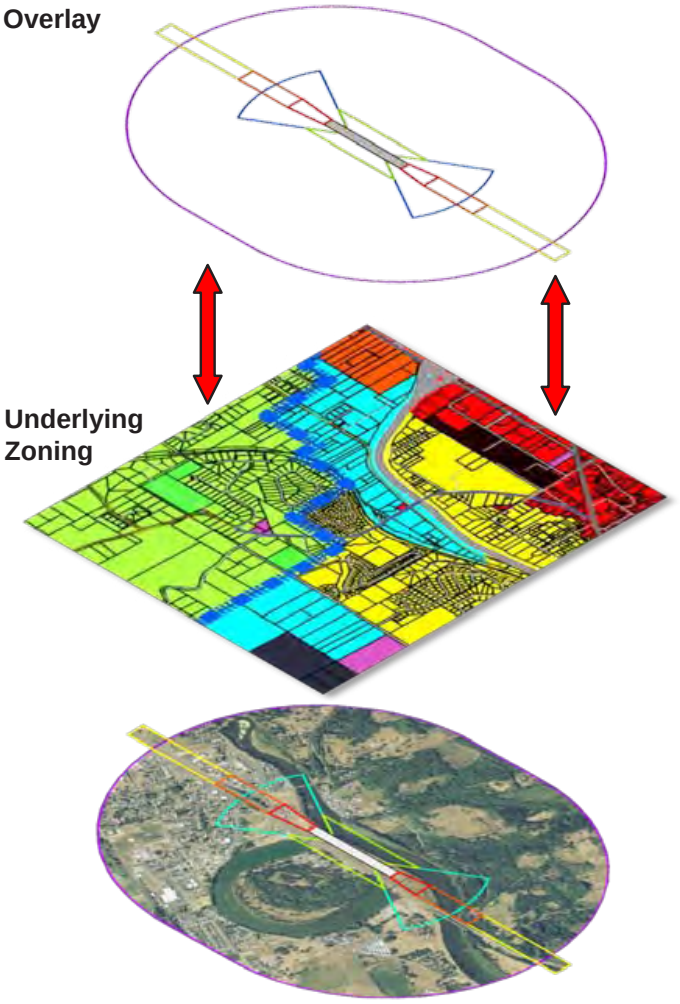
An airport overlay can be used to protect the viability of the airport as an essential public facility by discouraging incompatible development and encouraging compatible land uses. As the name implies, the overlay district is laid over the existing zoning districts and modifies the density and land use requirements of the underlying zoning districts. An overlay should also address:

- Wildlife attractants.
- Light, smoke, and glare.
- Electromagnetic interference.
- Storage of hazardous materials.
- High intensity and special function uses.

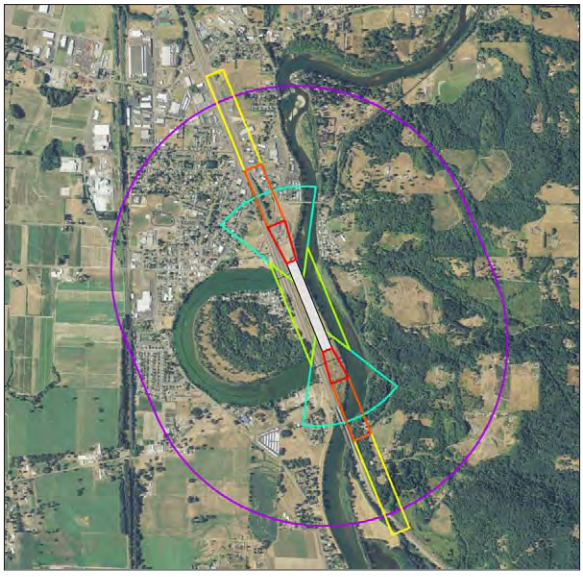
Typically, airport overlays address the issues of noise, light, vibration, safety, and low-flying aircraft through a series of compatibility zones. WSDOT recommends variations of the compatibility zones to take into account different runway lengths, types of approach procedures, traffic pattern location, and other factors.

As shown in Appendix F, the suggested zones are larger for longer runways that accommodate larger, faster aircraft than for short runways used only by light aircraft. The six zones can be characterized as follows:

Symbiotic Relationship

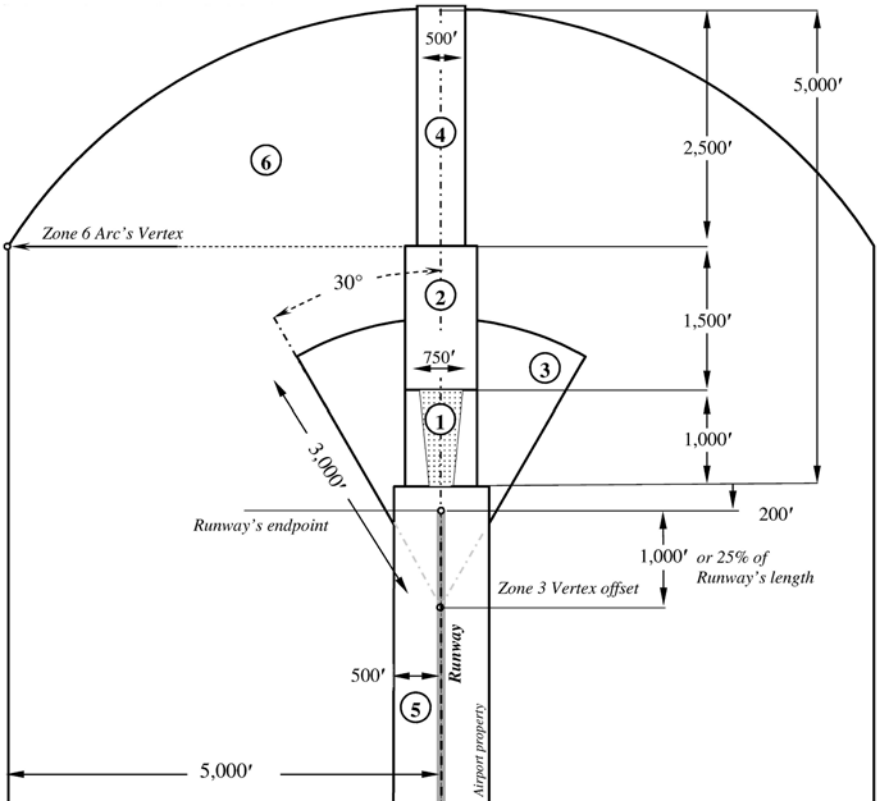


Airport Compatibility Overlay



- **Compatibility Zone 1** – This zone encompasses the runway protection zone (RPZ) at each end of the runway and should use the RPZ dimensions established in accordance with FAA standards. Also included in the zone are the strips of land immediately adjacent to the runway where FAA standards preclude structures.

WSDOT Compatibility Zones



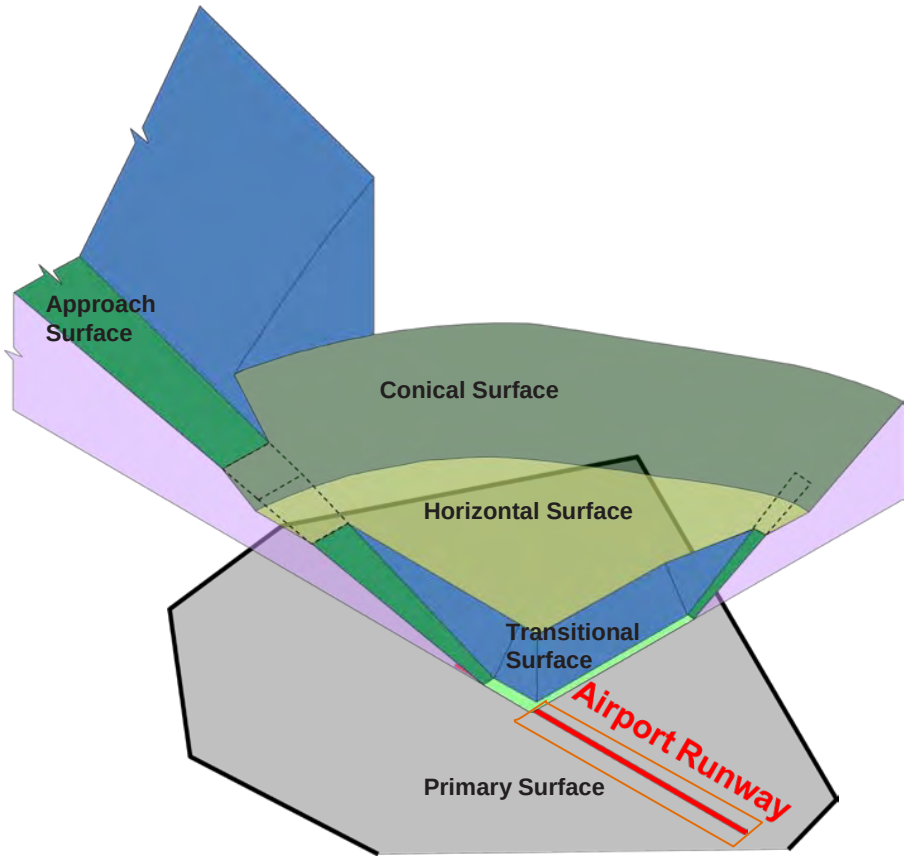
- **Compatibility Zone 2** – This zone wraps around and extends beyond Zone 1 along the runway centerline. Next to the RPZ, it represents the area where the risk of aircraft accidents is the greatest. On departure, aircraft are typically at full power in the initial phase of climb. On approach, they are at low altitude as they prepare for landing.
- **Compatibility Zone 3** – This zone is a wedge-shaped area lying along the sides of Zone 2. When operating visually, departing aircraft may begin turning over this area to fly toward their destination or to remain in the traffic pattern. Arriving aircraft often overfly this area as well, especially if they are flying a tight pattern.
- **Compatibility Zone 4** – This area lies beyond Zone 3 along the extended runway centerline. Aircraft flying straight out or in overfly this area at low altitude. The zone is particularly significant on runways where much of the operations are on instrument procedures and at busy airports where elongated traffic patterns are common.
- **Compatibility Zone 5** – Lying in narrow bands along each side of the runway, aircraft do not normally fly over the sideline zone. The principal risk is from aircraft that lose directional control while landing or just after takeoff.
- **Compatibility Zone 6** – The final zone contains the remainder of the airport environment where aircraft fly as they approach and depart the airport or are engaged in flight training. In area, Zone 6 is typically larger than the other zones combined.

Each airport is unique. Thus, it is essential to adjust compatibility zones to fit the airfield configuration, usage characteristics, fleet mix, topography, and other factors associated with a specific airport.

Airspace Protection/Height Limit Overlay

Development regulations put policy into action. It is important that the regulations implement the policy, not start a new direction. Make sure to provide adequate detail in the regulations to help the development community understand what is required.

FAR Part 77, *Objects Affecting Navigable Airspace*, establishes standards for determining obstructions to the airspace necessary for safe aircraft operations. To do this, the regulations define a set of airspace protection surfaces referred to as "imaginary surfaces." The sizes and shapes of the surfaces are determined by the airport's runway configuration, the weight of the aircraft each runway can accommodate, and the type of approach procedure (visual, non-precision, or precision) at each runway end. There are five types of surfaces that should be considered:



- **Primary Surface** – It is longitudinally centered on a runway and, if the runway is paved, extends 200 feet beyond the runway ends.
- **Approach Surfaces** – These surfaces begin at the end of the primary surface and extend from 5,000 feet to as much as 50,000 feet if the runway has a precision approach. The surface slopes upward at a horizontal-to-vertical ratio of 20:1, 34:1, or 50:1.
- **Transitional Surfaces** – These surfaces are situated along the edges of the primary and approach surfaces. They have a slope of 7:1 running at right angles to the runway centerline.
- **Horizontal Surface** – As the name suggests, this surface is a horizontal plane. Its elevation is 150 feet above the highest point on the airport runway(s) and it extends either 5,000 or 10,000 feet from the runway.
- **Conical Surface** – Extending outward and upward from the periphery of the horizontal surface, the conical surface has a slope of 20:1 for a horizontal distance of 4,000 feet.

Objects that are too tall may constitute airspace hazards. By holding objects to heights that remain below the FAR Part 77, land use jurisdictions can ensure that constraints are not placed on the length of the runway usable for aircraft takeoffs and landings or on the runway's instrument approach procedures.

How can an airspace protection/height limit overlay be used to promote airport land use compatibility?

Use the airspace definitions provided in federal law to identify FAR Part 77 *Surfaces* for your airport, and include in the development regulations language that prohibits penetration of these surfaces. Provide a map and instructions to assist community members, airport managers, and planning staff with implementing the regulations.

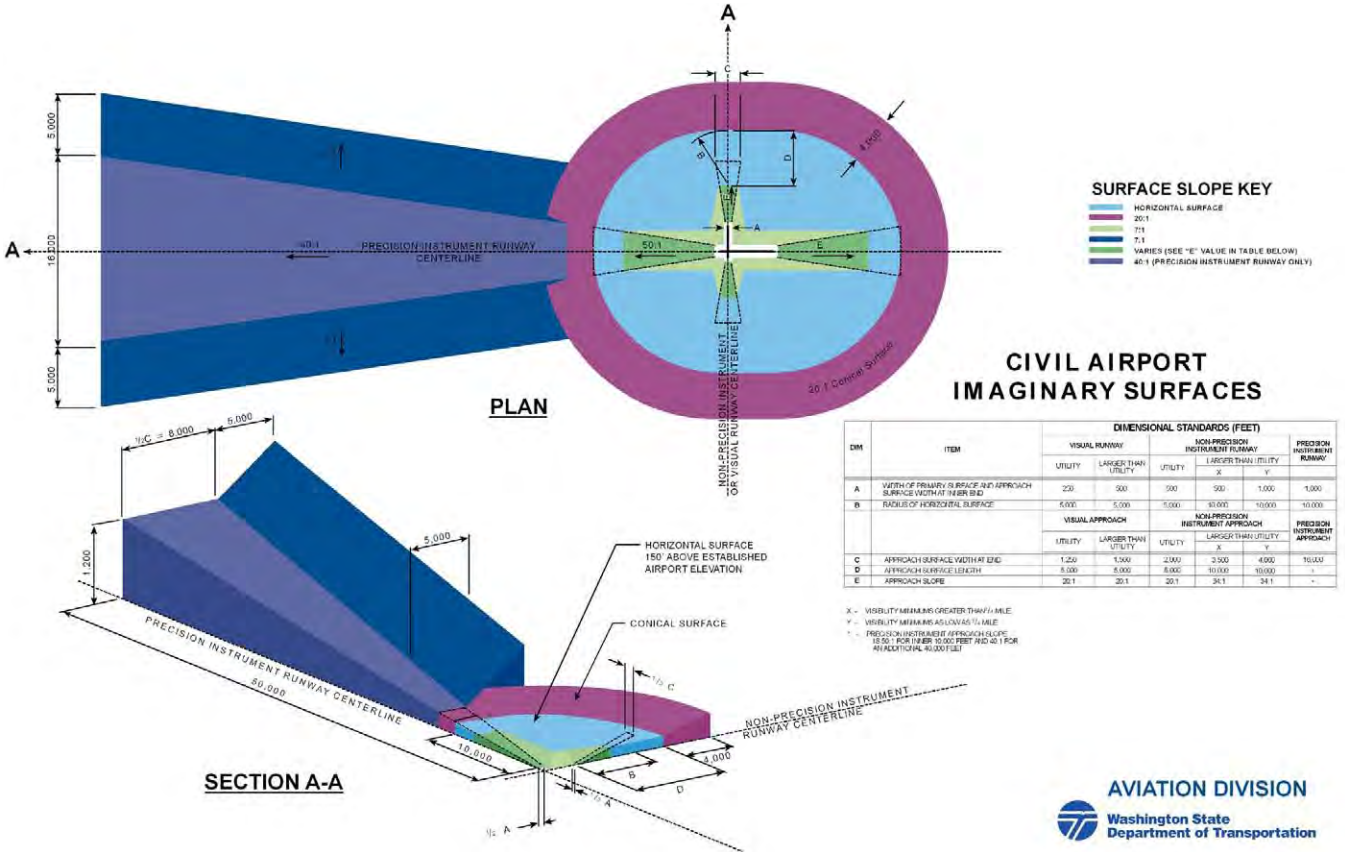
📖 The airspace assessment worksheet is located on page D-7.

The FAA relies on local jurisdictions with land use authority to keep critical airspace clear of obstructions. *RCW 14.12* Airport Zoning gives local jurisdictions the authority to develop and adopt airspace regulations.

Harvey Field, Snohomish County

Airspace obstructions, as seen above, can severely limit the utility of an airport by displacing the runway's threshold and limiting the ability of air-craft to develop supplicated instrument approach procedures necessary for most business aircraft.

FAR Part 77 Imaginary Surfaces



See *Appendix D* for a diagram of FAR Part 77 Imaginary Surfaces and a chart of the surfaces' dimensions.

How can the zoning ordinance be used to promote airport land use compatibility?

Tools to promote compatibility can include conventional zoning, overlay zoning, or a combination of both. Use of the airport overlay relies on the base zoning district or underlying zoning district and standards identified in the overlay zoning to prohibit or restrict land use features and activities within the airport influence area. Use the overlay to address issues such as:

- Tall structures and development that would penetrate critical airspace surfaces identified in FAR Part 77.
- Stormwater or other facilities (such as stormwater or agricultural operations) that may attract hazardous wildlife. The overlay may direct staff to use a specific standard such as the *Washington Aviation Stormwater Manual* to address stormwater issues on or off airport property.
- Interference with air navigation (i.e., smoke, electromagnetic interference).
- Special function uses such as K-12 schools, hospitals, nursing homes, and other similar uses.
- Large gathering of people or areas of public assembly such as sporting arenas, fair grounds, and stadiums.
- Above-ground bulk storage of fuel, explosive, or hazardous chemicals within the airport approach or other sensitive areas.
- Noise-sensitive uses.
- Reflective building materials. The overlay may suggest reducing light and glare by limiting the type of materials or requiring special conditions such as downward shaded lighting equipment.

The best approach to promoting compatibility is using a combination regulatory tools. For example, the use of zoning overlay's rely on and have a symbiotic relationship to the underlying zoning districts and regulations. Additionally, there are two types of zoning overlays that are designed to achieve different purposes. One that is designed and shaped to address critical air space surfaces depicted in federal regulations FAR Part 77 *Imaginary Surfaces* and the other that addresses compatibility zones or the general operating environment of the airport.

Consider establishing the following regulations to address land use compatibility in the airport influence area.

- Traditional or performance based zoning regulations.
- Compatible land use overlay.
- Height hazard overlay.

Other Types of Zoning Tools

Form-Based Codes

Form-based zoning codes differ from traditional zoning in that they focus on the size and shape of buildings rather than on the way the land is used. The codes often include drawings illustrating how buildings should relate to the public spaces around them. While not highly widespread in application, form-based codes are becoming more common particularly for the more highly developed, core areas of cities and where redevelopment to more intensive uses is desired.

How can form-based codes be used to promote airport land use compatibility?

Form-base codes have pluses and minuses in terms of their relationship to the objectives of airport land use compatibility planning. They might be beneficial in setting height limits, defining building types that offer better protection in the event of an aircraft accident, and in setting criteria for open land areas where an emergency landing could be made. On the other hand, they typically do not address occupancy types that are at the heart of conventional zoning and compatibility planning. Nevertheless, by incorporating provisions addressing usage intensities and noise sensitivity, form-based codes could be an ideal mechanism for promoting airport land use compatibility in urban communities.

Conditional Use Permit

Conditional use permits are typically used by local jurisdictions to allow a use or activity that may need additional scrutiny to ensure that the activity is compatible with neighboring land uses. Use may be tailored to meet the limitations of the site or mitigate impacts. Conditional uses are decided by the governing body, hearing examiner, board of adjustment, or similar body.

Conditional use permits and variances to the code should be reviewed and allowed only if they will not pose a safety hazard or are found to be compatible with the airport.

Variances

Variances are also decided by the a hearing examiner, board of adjustment, or similar body. A variance authorizes the landowner to vary a condition or standard in the development code. There are often used to vary a setback, height limitation, or dimensional standard. The local governing body determines whether to grant a variance request based on criteria outline in state statues and local regulations. The Planning Enabling Act details several prerequisites that must be met before a variance may be granted. These include:

- Special circumstance of the subject property (including size and shape or surroundings). Strict application of the zoning ordinance would deprive the property owner of rights or privileges enjoyed by other owners of properties in the vicinity and under identical zone classifications.
- The granting of the variance will not be materially detrimental to the public welfare or injurious to the property or improvements in the vicinity and zone in which the subject property is located.

Nonconforming Uses

A nonconforming use is a use that existed lawfully prior to the adoption or amendment of a zoning ordinance, but does not comply with present zoning provisions. Many local jurisdictions generally protect existing legal nonconforming uses of buildings, structures, premises, or fixtures if they continue unchanged. However, communities may use a variety of methods to prohibit or limit the expansion of nonconforming uses.

Docketing Process

How to recommend changes to your jurisdiction's comprehensive plan and development regulations.

Docketing is a process by which parties recommend changes to comprehensive plans and development regulations. Jurisdictions compile and maintain a list of suggested changes and consider them on an annual basis. The docket process allows parties to note deficiencies and recommend changes. These suggested changes are reviewed by the jurisdictions and made available for review by the public. There is no fee for submitting the docket form in some jurisdictions. This process allows for public input on policy affecting land use compatibility.

What actions are necessary to ensure continued implementation of the policies?

To conclude this six-step process, a final point to remember is that your work does not end with adoption of a comprehensive plan and implementing regulations that incorporate airport land use compatibility planning measures. The criteria must continue to be applied on an ongoing basis.

Among the continuing actions are:

- Make sure that compatibility criteria are not buried in the planning policies and implementing regulations so that planners do not overlook them. Flagging parcels affected by airport compatibility criteria with an airport overlay zoning designation is a way of helping to ensure that the criteria are noticed. Consider incorporating the compatibility criteria into a geographic information system (GIS) to make the criteria quickly evident.

Local jurisdictions are strongly encouraged to conduct a preliminary analysis to determine if the project meets local height regulations and FAR Part 77 *Standards*. This preliminary analysis should be done prior to when the project applicant submits Form 7460 to the FAA. If the project would penetrate a FAR Part 77 *Surfaces* and thus be an airspace obstruction, jurisdictions should require the applicant to propose alterations to the proposal.

- Pay attention not just to the finished height of structures, but also to any add-on features such as antennas that would increase the overall height. Also consider construction cranes or other temporary objects that could be airspace obstruction if near the airport. The height of trees could be another concern. Be certain that project proponents submit proper notification (Form 7460) to the FAA for an aeronautical study in accordance with FAR Part 77 requirements.
- Do not overlook proposed changes of use of existing buildings. A proposal to change a low-intensity or vacant building to one with many occupants, or to a use that is noise sensitive, or would allow the occupancy of adult or child care facility could encourage incompatible uses or activities and conflict with the comprehensive plan.

Step 6: Products

- Draft and adopt implementing regulations such as an airport overlay zoning ordinance that contain the specific compatibility criteria to be met.
- Identify continuing actions and specific points in the development review process where airport land use compatibility concerns will be addressed.

Chapter 3 Airport Land Use Compatibility Implementation Strategies and Toolkit

Introduction

This chapter describes a collection of additional land use strategies and tools that you can use to implement the airport land use compatibility measures you selected as you worked through the steps outlined in Chapter 2. Some of these are tools you use on a daily basis: comprehensive plans and zoning ordinances. But, how do you specifically use the strategies you have learned together with tools for addressing airport land use compatibility issues? The first two sections of this chapter will provide you some guidance. Then in the latter part of the chapter, you will find various tools that can be applied to more individualized compatibility problems or during the approval process of specific projects. A final section at the end of this chapter outlines several planning scenarios that put the various tools to use. Also take a look at the guidebook appendices for additional information on airports and aircraft operations.

In this chapter, you will learn about:

- **Comprehensive Plan** – Where compatibility issues can or should be addressed. What land uses should be planned for near airport and what ones should be avoided.
- **Zoning Ordinances** – Aspects of airport land use compatibility planning that should be addressed in a traditional zoning ordinance. Airport overlay zones and other types of zoning that can be employed to address compatibility concerns.
- **Tools for Addressing Specific Compatibility Factors** – Guidance on specific criteria to use with regard to noise, overflight, safety, and airspace protection.
- **Other Tools** – These include some special tools that planners and airport managers can employ to promote compatibility.
- **Scenarios** – Some examples of how tools might be applied in particular situations.

Addressing Particular Land Use Types

A central component of all comprehensive plans is the land use map. The land use map identifies proposed land uses and future geographic pattern in the community. For most communities, the majority of the land will show designations that simply represent what already exists on the ground indicating that no changes or infill development are contemplated. Where this is the case, there is little that the airport land use compatibility program efforts will change other than to encourage sustainable development practices or redeveloped to attract more compatible uses.

The greatest opportunities for promoting airport land use compatibility are within the portions of the airport influence area. These areas provide more flexibility on the type and location of new or redevelopment issues. A brief assessments of the positive and or negative factors associated with various land use type has been provided below as well as identified in Table 2-4 in Chapter 2. The degree to which land uses may be impacted by airport operations are based on a number of factors including sensitivity to noise, safety, airspace intrusion, and land uses characteristics.

Agricultural Uses

Most agricultural uses are compatible with airports. However, some activities can attract wildlife which may pose a significant safety hazard.

- Slaughter yards, rendering plants, feed lots, and other similar activities are a significant wildlife attractant and should be strongly discouraged
- Caution should be taken with some fruit and vegetable bearing crops. They may be incompatible near runway approaches because of the height of trees and food source for wildlife. Seed crops may attract waterfowl or flocks of birds.
- Agricultural septic lagoons and similar by-products used to enhance crop yields should be reviewed.

Aviation Compatible Agricultural Use

Arlington Municipal Airport leases its RPZ for landscaping business, production of sod.

Residential Uses

Residential land uses are generally considered incompatible when located within the airport influence area. However, some high-density residential development can co-exist and compliment the airport depending on their location, density, and intensity of other uses around them.

- No new residential development should be allowed inside any runway protection zone or runway approach.
- Outside the urban growth boundary, scattered, large-lot, agricultural-related residences are acceptable. Generally they are lot sizes of five acres or greater. However, dwelling units should be strongly discouraged within the runway protection zone or runway approach.
- Inside the urban growth boundary:
  - New low to medium residential development should be discouraged within the airport influence area, especially under the airport traffic pattern(s).
  - New high-density multifamily development may compliment the airport if located in areas that do not have a high safety risk such as at the end of the runway or within the runway approach/departure area.
  - Mixed-use development or redevelopment of an area to accommodate a mix of land uses can be compatible when located in areas that that do not have a high safety risk such as at the end of the runway or within the runway approach/departure area.

Substantial Residential Encroachment

Substantial residential encroachment around Hoskins Field, Olympia, Washington.

Special Function Uses

Special function uses generally include children, elderly, the infirmed, or others regarded as having comparatively little control over their own lives. Land uses may include K-12 schools, hospitals, nursing homes, convalescent centers, and other similar uses.

Special Function Use

K-12 schools represent a highly vulnerable use and should be prohibited near airports.

- Proposed new uses should be located outside of the airport influence area and more specifically should not be permitted at the end of the airport runway, approach/ departure areas, or within the airport traffic pattern (Compatibility Zones 1-6).
- Care should be taken to preclude uses such as hospitals where patients remain overnight. Should not be situated in approach compatibility zones.
- Substantial expansions or remodels of existing special function uses should include the addition of zoned sprinkler systems, additional exist doors, and enhance safety coordination plans with emergency providers.

Parks and Recreational Facilities

Most passive and active parks and recreation facilities are compatible when located within the airport influence area. Care should be taken not to locate facilities within the runway approach or sideline areas of the airport. Additionally, it is strongly recommended that active recreation facilities such as ball parks, football or soccer fields, and other similar uses that attract large groups of people should be discouraged from locating in the runway protection zone, runway approach to the airport, and sideline areas of the airport (Compatibility Zones 1, 2, and 5).

Commercial, Retail, and Business Office Uses

Most commercial, retail, and business office uses are compatible with airport operations. Compatibility is dependent on the concentration of people per square foot and the intensity of the use. For more information on the types of activities and restriction, see Appendix F, Table F-2.

- Business office-type uses, particularly those having only one or two floors, are generally acceptable throughout the airport influence area except in and near the runway protection zone (Compatibility Zones 1 and 2) Taller buildings may present airspace obstruction issues as well as be too intense (too many people) for good safety.
- Retail commercial spaces are generally acceptable in most areas adjacent to the airport depending on the intensity of uses and concentration of people.
- Major retail shopping centers and big-box stores should not be located in Compatibility Zones 1, 2, and 5.
- Lodging facilities are generally compatible with airports and often located near airports providing accommodations for the traveling public. These uses should be prohibited in Compatibility Zone 1 and depending on the airport Compatibility Zone 2.

Industrial Uses

Most industrial uses are compatible with airport operations. Compatibility is dependent on the concentration of people per square foot and the intensity of the use. For more information on the types of activities and restriction, see Appendix F, Table F-2.

The compatibility of heavy industry depends on the facility. Tall smokestacks or structures, steam, smoke, thermal plumes, glare, electromagnetic interference, and storage or use of large amounts of hazardous materials are incompatible when located in areas that may disrupt flight operations to and from the airport. Warehouse and storage facilities are excellent uses within Compatibility Zones 1 and 2 due to their low concentration of people.

Sport Stadiums and Other Large Assembly Facilities

Uses that allow high concentrations of people should be avoided within the airport influence area. These uses generally include sports stadiums, multiplex theaters, large places of worship, shopping centers, town centers, and other areas that promote the assembly of large concentrations or groups of people.

- Uses should be avoided in Compatibility Zones 1-5 and allowed with caution in Compatibility Zone 6.
- Outdoor arenas and amphitheaters can be particularly incompatible because no structure provides protection from a light aircraft accident; noise intrusion can also be an issue.

Utilities, Communications, and Emergency Response Facilities

Critical facilities that could be made inoperable if struck by an aircraft should not be situated in the approach (Compatibility Zones 1 and 2).

Other Hazards to Flight

Wildlife Attractants

Among other physical hazards to flight, wildlife strikes represent the most widespread concern. Measures based upon Federal Aviation Administration FAA guidance should be established to prevent creation of known types of conflicts and to enable mitigation of unanticipated problems. Particular attention should be paid to any proposed use that could create an increased attraction for birds and other wildlife. These uses include landfills, stormwater detention facilities, refuge containers, and certain agricultural uses that may attract birds or other wildlife that may pose hazards to aircraft in flight and people on the ground.

Tacoma Narrows Airport

Waterfowl, gulls, and raptors represent 77 percent of reported bird strikes causing damage to aircraft in the US. Over 70 percent of all strikes occur within 500 vertical feet within the airport traffic pattern. (Photo courtesy of the Tacoma News Tribune)

The FAA recommends that uses known to attract birds—sanitary landfills and certain types of crops being primary examples—be kept at least 5,000 feet from runways used only by piston-powered aircraft. For runways used by turbine-powered aircraft, the distance increases to 10,000 feet.

📖 FAA rules and regulations concerning these hazards are found in FAA Order 5200.5A, Waste Disposal Sites On or Near Airports, and Advisory Circular 150/5200-33, Hazardous Wildlife Attractants On or Near Airports.

- **FAR Part 139** – FAA regulations associated with wildlife hazards are addressed in FAR Part 139 (14 CFR 139) *Certification of Airports*. Section 139.337 requires holders of Airport Operating Certificates (or air carrier airports) to "take immediate action" to address potential wildlife hazards once they are identified.

  📖 Available at: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/title14/14tab_02.tpl

- **Grant Assurances** – While none of the standard grant assurances explicitly addresses mitigation of bird and wildlife hazards, three establish requirements that can broadly be applied to the issue. These assurances require airports to:

  1. Operate and maintain the facilities in a safe and serviceable condition (no. 19).
  2. Remove, lower, relocate, mark, light, or otherwise mitigate existing airport hazards and prevent the establishment or creation of future airport hazards (no. 20).
  3. Take appropriate action to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations (no. 21).

Beyond these two sources, federal guidance is advisory. Several FAA advisory circulars address particular aspects of the issue.

- ***Wildlife Hazard Management at Airports: A Manual for Airport Personnel*** **(July 2005)** – FAA's most thorough reference document. The manual includes background information, agencies and organizations involved in wildlife hazard management at airports, and applicable legislation, regulations, and policies as well as direct and indirect controls for addressing potential hazards.

  📖 Available at: http://wildlife.pr.erau.edu/englishmanual/2005_faa_manual_complete.pdf

- **AC 150/5200-32A,** ***Reporting Wildlife Aircraft Strikes*** **(December 2004)** – Explains the importance of reporting collisions between aircraft and wildlife and describes FAA's Bird/Other Wildlife Strike Reporting system. Provides instructions on how to report a wildlife strike in paper or electronic format, and provides links to wildlife strike reporting mechanism.

  📖 Available at: www.faa.gov/documentLibrary/media/advisory_circular/150-5200-32A/150_5200_32A.pdf

Additional guidance regarding mitigation of wildlife hazards is available from WSDOT Aviation. In 2009, the Aviation Division, in coordination with WSDOT Environmental Services and the FAA, developed a stormwater design manual to assist in the design, construction, and maintenance of stormwater facilities on and near airports. The manual focuses on design modifications to decrease the attractiveness of stormwater facilities to wildlife rather than active wildlife removal measures.

📖 Available at: www.wsdot.wa.gov/aviation/airportstormwaterguidancemanual.htm

Thermal Plumes

An additional, little recognized, physical hazard to aircraft flight are thermal plumes generated by power plants. Invisible unless the heated air turns to steam, the plumes from large facilities can create unstable air at the altitude that airplanes or helicopters fly when near airports. Power plants and other facilities that generate large thermal plumes should be avoided within airport traffic pattern areas.

Visual Hazard

Visual and Electronic Interference

Criteria defining land use characteristics that can cause visual or electronic hazards to flight are more qualitative in nature—the FAA has not set any precise standards. In general, visual hazards to flight include sources of dust, steam, smoke, or glare that can impair pilot visibility, as well as distracting lights that can be confused for airport lights. Electronic hazards are ones that can cause interference with aircraft communications or navigation. While it is not always possible to prevent these types of hazards to flight from occurring, awareness of the potential can often enable reduction or mitigation of the most serious problems.

Tools That Address Specific Airport Land Use Compatibility Factors

Compatibility Strategies

Density and Intensity Limits

Establishment of criteria limiting the maximum density (number of dwellings) or people per acre is the most direct method of reducing the potential severity of an aircraft accident. In setting these criteria, consideration must be given to the two different forms of aircraft accidents—those in which the aircraft is descending, but is flying and under directional control of the pilot and those in which the aircraft is out of control as it falls (also see later discussion of clustering).

Limits on usage intensity—the number of people per acre—must take into account both types of potential aircraft accidents. To the extent that accidents and incidents are of the controlled variety, then allowing high concentrations of people in a small area would be sensible, as long as intervening areas are less populated. However, concentrated populations present a greater risk for severe consequences in the event of an uncontrolled accident at that location. Limiting the average usage intensity over a site reduces the risks associated with either type of accident. In most types of land use development though, people are not spread equally throughout the site. To minimize the risks from an uncontrolled accident, the criteria should also limit the extent to which people can be concentrated and development can be clustered in any small area.

Open Land Requirements

Creation of requirements for open land near an airport addresses the objective of enhancing safety for the occupants of small aircraft forced to make an emergency landing away from a runway. If areas are sufficiently large and clear of obstacles, open land can be valuable for light aircraft anywhere near an airport.

For large and high-performance aircraft, however, open land has little value for emergency landing purposes and is useful primarily where it is an extension of the clear areas immediately adjoining a runway.

Tools for Enhancing Compatibility

Tools for Addressing Specific Airport Land Use Compatibility Issues

The land use compatibility tools described in the first part of this chapter are ones that apply broadly throughout a community and typically are employed during the comprehensive plan amendment process. The group of tools outlined here may be enabled through the comprehensive plan or zoning ordinance, but are more narrowly focused in their application. Typically, they will come into play with regard to a specific land use development proposal.

Airport Development Review Committee

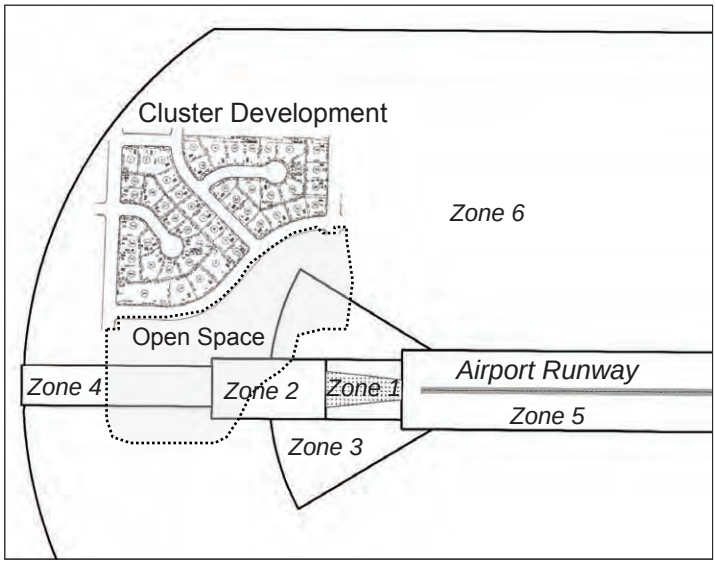
An Airport Development Review (ADR) committee is a volunteer board appointed by the airport or local jurisdiction that ensures compliance with the jurisdiction's goals, policies, and implementation regulations. Committee members volunteer their time and expertise to ensure that development within the airport influence area is compatible with the current and future airport environment.

How can an ADR committee be used to promote airport land use compatibility?
Use the ADR committee to review proposed development within the airport influence area. Draw upon local skills and expertise in regards to airport operations and planning. Be sure to include a variety of stakeholders. The goal of the committee is to assess the compatibility of proposed uses in relation to the jurisdiction's goals, policies and development regulations. Have the committee meet once a month to review applications and make recommendations to the jurisdiction's planning staff. The committee may be used to review planned unit developments, variances, and conditional-use permits.

Clustering of Development

Clustering is the grouping of a particular development's structures on a portion of available land. This reserves a significant amount of the site as protected open space. Cluster developments are appropriate for all types of development activity. They may be used in conjunction with commercial, industrial, mixed-use, and residential development. The advantage of this land use technique to the community is that it preserves open space and critical areas. The advantage to the developer is the opportunity to construct at a higher intensity or height and a lower cost of infrastructure and the ability to develop open space for passive uses.

Cluster Development



Cluster developments may be used to move development away from areas that experience greater aviation impacts: noise, light, vibration, risk, fumes and low-flying aircraft.

How can cluster development be used to promote airport land use compatibility?
Clustering has several advantages for airport land use compatibility planning. It can be especially valuable with respect to safety if portions of the remaining undeveloped land are not just free of buildings, but also relatively flat and clear of other large objects such as trees and poles. If large enough—about a football field in size—these "open land" areas can potentially serve as emergency landing spots for small aircraft. For residential uses, clustering the dwellings into multifamily buildings can make them less susceptible to noise intrusion.

One caution to recognize with clustering is that its use should be limited to areas that have frequent airport operations and in areas where the potential for aircraft accidents is elevated, such as the runway approach. Providing open land areas can enhance the prospects for successful near-airport emergency landings when the aircraft is under control while descending. However, many accidents involve aircraft that are out of control and will strike whatever is in their path. Allowing a high concentration of people in the high-risk compatibility zones is not wise.

Transfer of Development Rights

A transfer of development rights (TDR) program is a market-based mechanism that promotes the voluntary transfer of growth from places where a community would like to see less development, to places where a community would like to see more development. The owner of a site within a sending area retains property ownership, but gives up all or part of the rights to develop the property. The owner of a site within a receiving area may purchase transferable development rights from an owner of property in the sending area. This allows the sending area owners to obtain value for the property and the receiving area owner to develop the receiving property to a greater density or intensity than would have otherwise been permitted.

How can TDR be used to promote airport land use compatibility?
Use a TDR program to:

- Designate sending areas for residential development rights within the airport influence area. Target aviation environments impacted most by airport operations.
- Keep critical areas clear of all development—residential, commercial, industrial, etc.
- Designate receiving areas for residential development rights outside the airport influence area.
- Increase density and allow greater structure heights adjacent to transit hubs.
- Encourage infill development to maximize preexisting infrastructure such as power, water, and sewer.
- Promote compatible commercial and industrial development.
- Promote preservation of open space by sending incompatible activities to appropriate locations.

Infill Development

Every jurisdiction across the state has property that is either vacant or underdeveloped relative to its potential use as identified in the comprehensive plan and zoning maps. Infill is the practice of developing or redeveloping vacant or under utilized land in the midst of a community, especially land that is surrounded by existing uses similar to the ones proposed. This may mean further subdivisions of existing parcels to accommodate additional growth, redevelopment of under-utilized property to increase its density or intensity, or simply creation of new development on vacant land. Infill is often a desirable goal since it utilizes existing infrastructure and reduces development pressure on other lands within the airport influence area. In many cases, infill development results in a higher residential density or mixed-use commercial office development.

Vacant Land With Infill Potencial

How can infill development be used to promote airport land use compatibility?

Use infill development to maintain or increase the current level of community compatibility. When appropriate, use infill development to encourage transitions within the community to a more harmonious environment. Promote the addition of mixed-use, commercial, light industrial or, when left with no viable alternative and in an appropriate environment, multifamily. Always remember, residential development should be avoided in critical aviation environments. In an urban environment, creative zoning designations may be employed that allow the addition of a mixture of land uses. For example, a commercial or business office classification may be added that allows existing land to be developed for convenience retail, art studios, office, auto sales, and many more. Use infill development to maintain preexisting commercial and industrial uses or redevelopment of areas that may be transitioning to more intense uses.

From a practical standpoint, it is usually impossible to prevent a small, vacant piece of property from being developed in the same manner as its neighbors. Compatibility conflicts unrelated to the airport would occur. Still, it is important not to let infill become the rationale for permitting extensive new airport-incompatible development to move forward. An acreage limit and other qualifications should be set on infill development.

Consider establishing the following conditions for infill uses:

- Limit the size to 20 acres.
- Require the site to be two-thirds surrounded by existing uses similar to the one proposed.
- Restrict the new development to a density and/or intensity no greater than that of the surrounding uses.

Redevelopment

Property With Redevelopment Potential

As older, established communities grow and change over time, there often is a need to remove all or most of the existing structures so that something new can be constructed. Redevelopment can be a powerful tool for revitalizing deteriorating, under-utilized property. However, when the property proposed to be redeveloped is occupied by an existing airport-incompatible land use, every effort should be made to use this as an opportunity to enhance airport compatibility.

Basically, unless a site is small and cannot qualify as infill, redevelopment should be considered the same as new development. The proposal should be required to meet all of the applicable airport land use compatibility criteria.

Mixed-Use Development

Mixed Use Seattle, WA

Mixed-use development is the combination of commercial, industrial, office, residential, institutional, or other uses in a building or group of buildings. In theory, this practice promotes cost-effective transportation alternatives and a more walkable, sustainable, vibrant, and livable community.

How can mixed-use development be used to promote airport land use compatibility?
Mixed-use developments are compatible with aviation because they often have higher background noise levels that tends to mask aircraft noise and the expectations of people working and living there are different than that of lower density uses. Mixed-use developments may be either used to transition a pre-existing development area to a more aviation-compatible environment, or to promote compatibility in new developments within non-critical aviation areas, such as beneath the downwind leg of the traffic pattern. To achieve a more aviation-compatible environment, jurisdictions should carefully review mixed-use criteria implementing this technique. Mixed-use criteria should include:

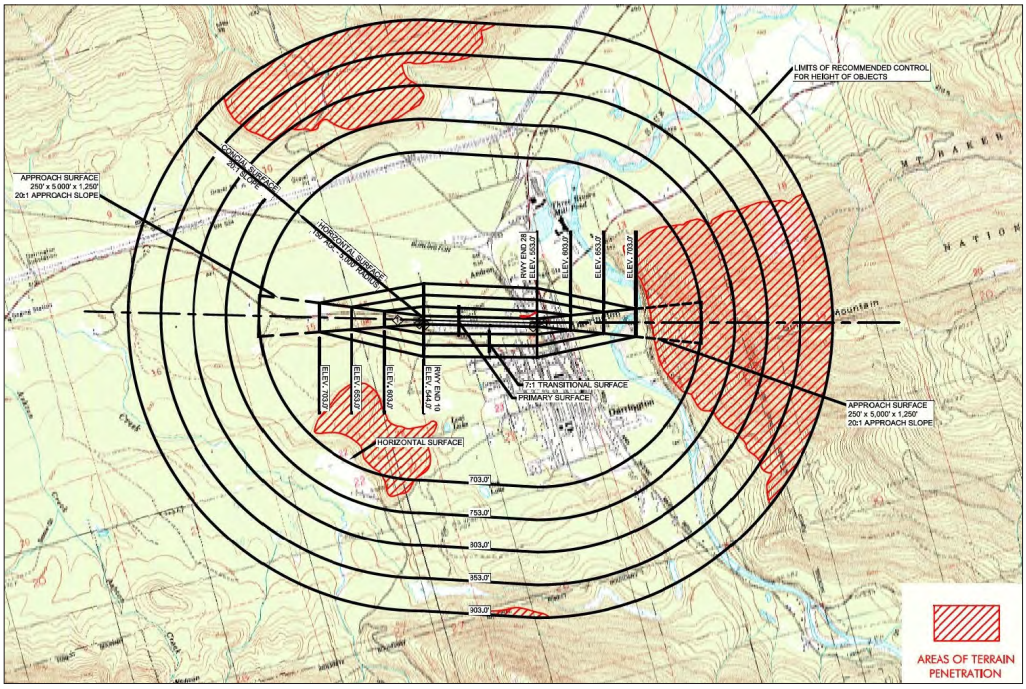
- Combination of different type of uses and activities.
- Compatibility with existing and planned airport operational environments.
- Adequate infrastructure in place.
- Sufficient public facilities and public services.
- Served by adequate transportation infrastructure.

Airport Stormwater Design Manual (ASDM): Discouraging Wildlife Attractants

Stormwater and other hazardous wildlife attractants near airports pose a significant safety risk. In fact, about 75 percent of all civil aviation air strikes occur near airports. Waterfowl, gulls, and raptors represent 77 percent of reported bird strikes causing damage to aircraft in the U.S. In 2009, WSDOT Aviation, in coordination with WSDOT Environmental Services and the FAA, developed a stormwater design manual to assist in the design, construction, and maintenance of stormwater facilities on and near airports. The manual focuses on design modifications to decrease the attractiveness of stormwater facilities to wildlife rather than active wildlife removal measures.

How can an Airport Stormwater Design Manual be used to promote airport land use compatibility?
Use the *Airport Stormwater Design Manual* to implement stormwater best management practices within the airport influence area. Require that any new stormwater detention facilities within the approach meet or exceed recommendations found in WSDOT's airport stormwater manuals.

Wireless Communication Facilities Codes



Over the last decade, Washington State has seen an unprecedented growth in wireless communication facilities. Unfortunately, most jurisdictions lack development regulations governing the siting of wireless communication facilities communication towers and other tall structures that can be hazards to aviation. Wireless communications antennas—because of their height and relative inconspicuousness from a fast-moving aircraft—can adversely affect airport airspace. The frequent location of these facilities on ridge lines and other high terrain can pose conflicts with aviation airspace even when situated well away from an airport. The potential for electronic interference with aircraft communications also should be examined in the siting of the antennas.

How can a wireless communications facilities ordinance be used to promote airport land use compatibility?

Jurisdictions can craft ordinances to address the siting of wireless communication facilities. Ordinances can be designed to minimize airspace obstruction by directing the design, location and construction of communication facilities adjacent to aviation facilities.

Many jurisdictions have imposed modest height limitations for most of their zoning districts. If the local jurisdictions current regulations prohibit buildings or structures heights of over 35 feet, the local jurisdiction may not need to adopt a height hazard overlay district to regulate airspace hazards. The jurisdiction should review height standards within the airport influence area to determine the best means to avoid airspace obstructions.

Jurisdictions should:

- Work with stakeholders to identify pre-approved areas for cell towers.
- Expedite the process for cell tower companies.

A wireless communications ordinance should include:

- A definition of wireless communication towers.
- Prohibit penetration of the FAA's FAR Part 77 *Imaginary Surfaces*.
- Require co-location of communication facilities/structures to accommodate multiple communication antennas—new towers should not be built until it is demonstrated that no existing towers or structures (such as rooftops, water towers) can accommodate the equipment.
- Designate approved and prohibited locations.
- Designate:
  - Maximum allowable height in geographic locations.
  - Setbacks.
  - Compliance with various standards such as the Uniform Building Code, National Electric Code.

Notice of Proposed Construction (FAA Form 7460)

The principal mechanism by which the FAA monitors obstructions to airports and critical airspace is through the Notice of Proposed Construction FAA Form 7460-1. The notification requirements are specified in the application and in Subpart B of the Part 77 regulations. Specifically, notification is required, with certain exceptions, for any proposed object that would have a height exceeding an imaginary surface extending outward and upward from a runway at a slope of:

Does your project need to file a 7460? The FAA's Notice Criteria Tool will assist you in identifying purposed projects that meet the notice criteria. www.oeaaa.faa.gov/oeaaa/external/gistools/gisaction.jsp?action=shownonoticerequiredtoolform

- More than 50:1 for a horizontal distance of 10,000 feet at airports where no runway is longer than 3,200 feet; or
- More than 100:1 for a horizontal distance of 20,000 feet at airports having a runway longer than 3,200 feet.

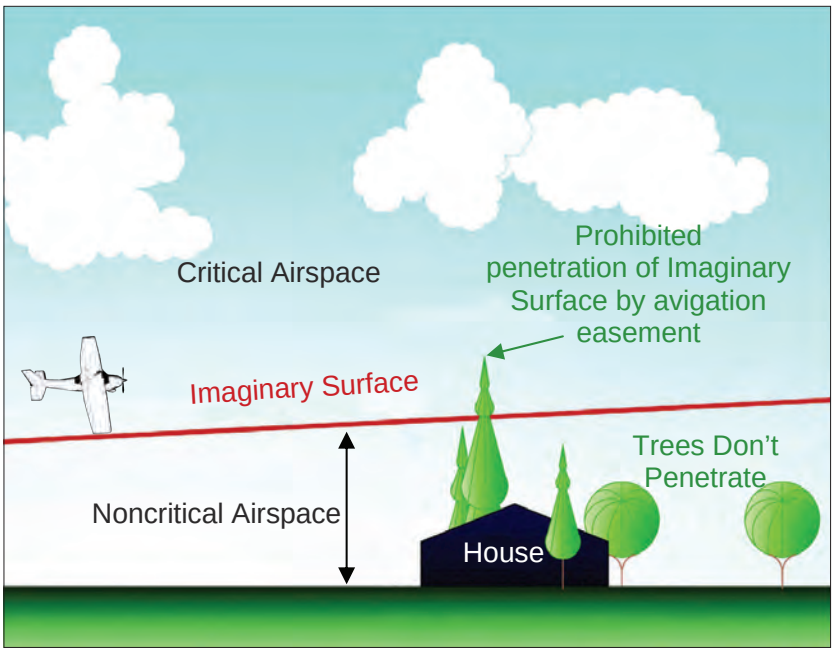
Note that these notification slopes are shallower than those of Subpart B, which are used to identify obstructions. Exceptions to the notification requirements are made for objects in developed communities where the proposed object would be shielded by existing structures or terrain of equal or greater height.

Additionally, any object taller than 200 feet requires FAA notification, regardless of the object's proximity to any airport. Also important to understand is that federal law places the burden for FAA notification of development near airports on the proponents of such development, not on the local land use jurisdiction. The role of local jurisdictions is to alert project proponents of the notification requirements.

Avigation Easements

As with any type of easement, an avigation easement is a conveyance of specified property rights from the owner of the property to another party. Avigation easements are recorded with the title to the underlying properties and run with the land—that is, they remain in effect even with sale of the property.

Avigation Easements May Be Used To Protect Critical Airspace



Source: California Airport Land Use Planning Handbook, 2002 / Mead & Hunt

In most cases, avigation easements are owned by the entity owning the airport. The airport may obtain the easements either through purchase or via dedication. An avigation easement typically gives the easement owner the right to fly aircraft over the property at a low altitude and to cause noise, vibrations, exhaust particle emissions, and other impacts associated with normal flight. Limits on the heights of structures, trees, and other objects are also usually established by avigation easements. To enforce these limits, an avigation easement may give the easement owner the right to enter the property to remove or reduce the height of objects that exceed the height limits.

In addition to the specific rights that avigation easements convey, another function they serve is as a form of buyer awareness that carries with it a degree of legal protection for the airport. By having an avigation easement on their property, property owners cannot easily argue politically or through litigation that the airport generates unacceptable noise levels or creates other impacts. While useful in this way, avigation easements do nothing to change the fundamental incompatibility of residential and other inappropriate land uses—they do not address the quality of life people experience.

Another important limitation of avigation easements is that they normally do not restrict the underlying use of the property. Thus, the property could still be used for other type of land use that may or may not be incompatible with airport activity in ways other than height. Where airports wish to prohibit specific land uses—or, conversely, only allow specified uses—they sometimes acquire a type of easement sometimes called an approach protection easement. In practice though, approach protection easements are only occasionally used because their cost is usually not much less than for fee title acquisition.

How can avigation easements be used to promote airport land use compatibility?
Short of fee title property acquisition, airport ownership of an avigation easement is the most certain means of ensuring protection of the runway approaches from too tall objects. For property located close to runway approaches where common structures, trees, and other objects could penetrate the airport airspace, a common practice is to require that the property owner dedicate an avigation easement to the airport as a condition for local approval of property development.

An additional benefit to avigation easements is that they serve as a form of buyer awareness tool as described in the next section. Caution should be exercised, however, in attempting to require avigation easement dedication in locations where buyer awareness is their only purpose. Their most appropriate use is for locations where height limits are substantial or where significant constraints on the development or use of the property are necessary for noise or safety reasons.

Other Tools for Enhancing Compatibility

In addition to the tools identified elsewhere in the guidelines, fly friendly procedures, noise insulation, and property disclosure may be appropriate when used in conjunction with traditional zoning, overlays districts, TDRs or a combination of regulations and incentives. These tools are often used by jurisdictions to .....

Fly Friendly Procedure

A fly friendly procedure is a voluntary noise abatement program that helps airports reduce their noise footprint within the community. They are educational programs that promote recommended piloting practices and navigation techniques to help minimize impacts on surrounding land uses. Fly friendly procedures are advisory in nature and serve to help pilots be better neighbors.

They are not:

- A tool to discriminate against aircraft propulsion systems (i.e., jets).
- A way of giving preferential treatment to specific aircraft types (i.e., fixed wing, rotorcraft).
- A way to limit commercial service or interstate commerce.
- A way to supersede Federal Aviation Regulations that govern flight or the pilot in command's responsibility for safety air navigation.

Harvey Field's voluntary noise abatement procedure.

How can fly friendly procedures be used to promote airport land use compatibility?
Working toward a more aviation compatible environment is everyone's responsibility and by implementing voluntary fly friendly procedures airport sponsors and pilots can help minimize aviation impacts on surrounding land uses. Airport sponsors can work with the pilot community on ways to minimize aircraft impacts near noise sensitive uses and residential development.

Fly friendly procedures may:

- Designate a preferred runway for all traffic.
- Identify the preferred pattern for fixed wing aircraft.
- Identify the preferred pattern for rotor aircraft.
- Identify overflight areas to avoid.
- Recommend a pattern altitude.
- Recommend a reduced power setting on takeoff, as soon as safe and practical.
- Encourage use of the full runway to gain maximum altitude before overflying adjacent neighborhoods.
- Recommend a climb-out distance and turn to avoid sensitive areas, if at a safe and appropriate altitude.

Noise Insulation

Noise insulation is a mitigation measure that may be utilized in existing structures. For airports that qualify under the FAA's Part 150 program, noise insulation may be an appropriate course of action. However, it should not be used as a mitigation measure in new residential development. It is important to note that it does not provide for compatibility outside the structure and therefore does not meet the intent of RCW 36.70.547. As discussed before, outside activity is a substantial aspect of single-family residential development.

Buyer Awareness Tools

As indicated in previous chapters, the guidebook describes different types of impacts found in the airport influence area. The guidebook also provides a range of actions or tools that can be used to promote compatible land uses. However, rarely do communities have the opportunity to wipe the slate clean and start over with new development or redevelopment patterns. More than likely communities are planning around existing development patterns that may have pockets of land uses that may or may not be compatible when located adjacent to airports. In these cases, options are available to enhance the public's knowledge and understanding of airport impacts through buyer awareness measures.

Jurisdictions across the state have developed different notice requirements and although variations are sometime created, measures designed specifically for the purpose of promoting buyer awareness fit mostly into two categories:

- Aviation Disclosure Notice
- Aviation Easements
- Real Estate Disclosure Statement.

Avigation easements can also serve as a means to disclosed the airport location and aviation impacts. However, this devise primarily used by the airport sponsor to protect critical flight paths. More information on avigation easement is discussed above.

Aviation Disclosure Notices

The aviation disclosure notice is a tool that is used by local land use jurisdictions to disclose the proximity of the airport and airport operations to property that may impact or be impacted by the airport and airport operations. The notice is generally recorded with the County Auditor for noise sensitive uses or uses that may be affected by low-flying aircraft, odor, vibration, and other aviation related impacts. Aviation notice requirements are generally set forth within the local jurisdictions development code, such as the subdivision regulations and or zoning regulations. The following criteria is generally used to apply the disclosure requirements.

Proposed Notice Procedures for New or Existing Lots of Record

Proposed New Lots of Record – As a condition of approval for major and short subdivisions, binding site plans, or similar documents, a note should be required on the face of the final plat map as a condition of approval of the subdivision if the proposed subdivision is located within the airport influence. Plat maps are then recorded with the County Auditor during the normal subdivision process.

Existing Lots of Record – As a condition of new development on existing lots of record, an aviation disclosure notice should be recorded with the County Auditor. The notice would be recorded for all new development/building permit activity, substantial remodels (as defined by the local jurisdiction), conditional use permits, and special use permit within the airport influence area.

Many jurisdictions require a disclosure notice for areas within the airport influence area (5,000 feet from the airport runway) that have noise sensitive uses such as residential uses. Others require notice within horizontal and approach surfaces identified within FAR Part 77 *Imaginary Surfaces*, while other may require notice within the entire airport influence area.

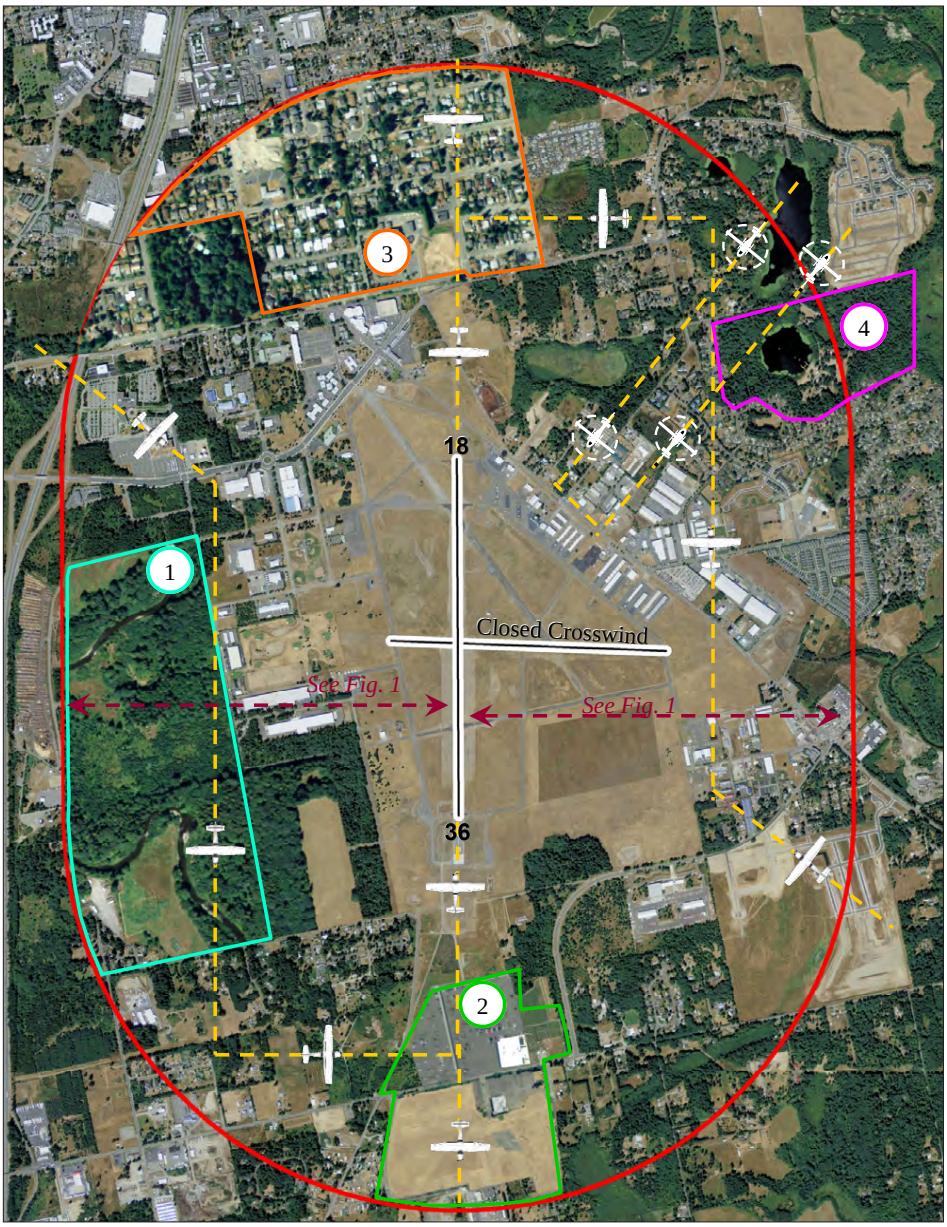
Disclosure During Real Estate Transactions

Some states have established statutory guidance with regard to disclosure of external impacts on a property such as noise, odors, natural hazards, and proximity to undesirable land uses. Airport proximity and the presence of frequent aircraft overflights may be one of the conditions to be disclosed during the sale or lease of residential property.

Disclosure is an obligation between private parties and normally not something that state or local governments can dictate. Nevertheless, WSDOT Aviation encourages counties, cities, and towns that have airports in their jurisdictions to identify the area within which airport proximity disclosure would be appropriate and to make this information known to real estate agents and others who are regularly involved in facilitating real estate transactions.

Land Use Compatibility Scenarios

The following land use scenarios and graphic have been developed to assist local jurisdictions in the decision-making process. Many scenarios, described and illustrated below, represent compatibility challenges that communities may face.



Aircraft Traffic Pattern

Airport Elevation
500′ MSL

Traffic Pattern Altitude
1,000′

Runways
Runway 18/36
Crosswind: Closed

Current Approach Type
18 Visual
36 Visual

Future Approach Type
18 visual
36 Non Precision

Operations
Current: 50,000
Future (20 years): 85,00

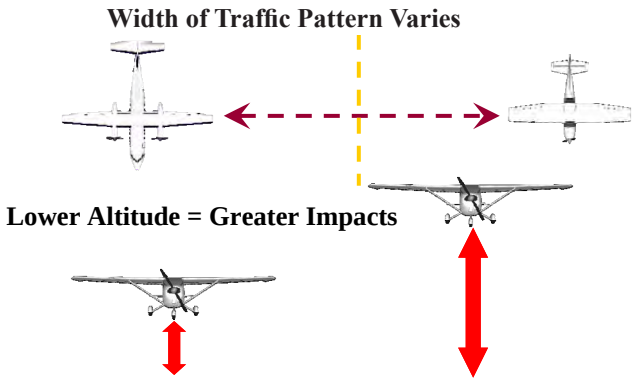
Commercial Service
NA

Air Cargo
NA

Military
NA

Fleet Mix
Single Engine: 99
Twin Engine: 7
Jet: 4
Helicopter: 5
Ultra Light: 2

Always consider the airport's current and future characteristics: runway lengths, approach capabilities, fleet mix, etc.



Remember the traffic pattern diagram describes the flow of aircraft as they enter the airport traffic pattern, parallel to the runway, turn and make their final approach to land the aircraft. This pattern also demonstrates the general departure path for aircraft. The width of the pattern depends on a number of variables, including the performance and design standards of the aircraft, wind, weather, piloting technique, topography, and aircraft weight. These will help you in assessing potential impacts and weighing alternatives. See Appendix Section C for additional information about aircraft traffic patterns.

Compatibility Scenarios

When engaging in the airport land use compatibility planning process, always practice the guiding philosophy of do no more harm. Since planners are rarely handed a clean slate to work with, jurisdictions should acknowledge current incompatibilities and move forward from that point on. Whenever possible, jurisdictions should strive to create a more harmonious environment by transitioning incompatible uses into more compatible uses.

Work through the following hypothetical land use scenarios using the aviation compatibility information you have learned so far and the aircraft traffic pattern graphic and airport attributes. (Keep in mind the requirements of RCW 36.70.547 and 36.70A.510.)

Scenario 1

Area 1 is inside the urban growth boundary and is currently undeveloped. Preexisting, industrial uses are located to the east and undeveloped areas are located to the north, south, and west. The area has site constraints consisting of wetlands and some steep slopes. The land is currently zoned for commercial and light industrial use.

Aviation Considerations: The area falls within the downwind and baseleg portions of the traffic pattern. The airport's elevation is 500′ mean sea level (MSL). The traffic pattern altitude for the airport is 1000′ above ground level (AGL). The site has a significantly higher ground elevation than the airport. Aircraft would be generally traversing the area at altitudes ranging from 500′ to 700′ as they execute the downwind and baseleg portion of the traffic pattern. The area will be overflown by both single engine and multi engine aircraft.

- What use should the area be zoned for and why? (Single-family residential, high-density residential, commercial/light industrial, mixed-use.)
- What type of impacts will the property experience from aircraft and airport operations?
- Given the area, what tools could a jurisdiction employ to promote a more compatible environment?

Scenario 2

Area 2 consists of both undeveloped property and existing commercial uses. It is currently zoned for commercial development, but 50 percent has remained vacant since its annexation five years ago. No topographical features or wetlands exist on the site. Sporadic low-density residential development exists to the east and the property is zoned for commercial use to the west.

Aviation Considerations: The area falls within the approach/departure portion of the traffic pattern. Runway 36 currently has a visual approach, but has a planned non-precision approach in the future. The traffic pattern altitude for the airport is 1000′ above ground level (AGL). The site has the same ground elevation as the airport. Currently aircraft traversing the area are at altitudes ranging from 75′ to 250′ as they execute the approach and departure phases of flight. The area will be overflown by all aircraft types.

- Should the undeveloped property be zoned? (Single-family residential, high-density residential, commercial/light industrial, mixed-use.) Why/why not?
- What type of impacts will the property experience from aircraft and airport operations?
- Given the area, what tools could a jurisdiction employ to promote a more compatible environment?

Scenario 3

Area 3 falls inside the urban growth boundary and has a historic and extensive residential development pattern with small pockets of undeveloped and redevelop able property and is zoned residential low. Industrial and commercial properties are located to the south, vacant land to the west, and residential development to the north and east. The site has no topographical or wetland constraints.

Aviation Considerations: The area falls within the approach/departure portion of the traffic pattern. Runway 18 currently has a visual approach. The airport's elevation is 500′ mean sea level (MSL). The traffic pattern altitude for the airport is 1000′ above ground level (AGL). The site has the same ground elevation as the airport. Currently aircraft traversing the area at altitudes ranging from 100′ to 250′ as they approach and depart the airport. The area will be overflown by all aircraft types.

- Should the property be rezoned? (Single-family residential, high-density residential, commercial/light industrial, mixed-use.) Why/why not?
- What type of impacts will the property experience from aircraft and airport operations?
- Given the area, what tools could a jurisdiction employ to promote a more compatible environment?

Scenario 4

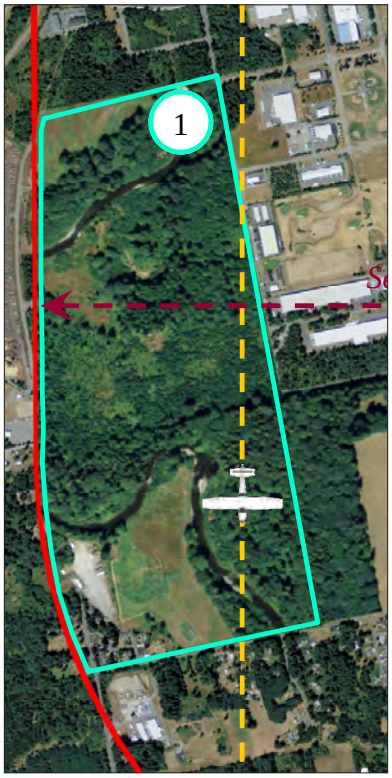
Area 4 falls outside the urban growth boundary and has yet to be developed. Residential development is located to the south and west of the site. Property to east and north are undeveloped. The site has wetlands constraints.

Aviation Considerations: The area falls within the baseleg portion of the traffic pattern for fixed wing single and multiengine aircraft. A portion of the property also falls within the established traffic pattern for helicopters. The site has a lower ground elevation than the airport. Aircraft would be generally traversing the area at altitudes ranging from 700′ to 900′ as they execute the traffic pattern. The area will be flown over by helicopters, single engine and multi engine aircraft. The land is currently zoned for low-density rural residential use, one dwelling unit per five acres.

- Should the undeveloped property be zoned from its current land use designation of rural residential?
- What type of impacts will the property experience from aircraft and airport operations?
- What tools could the jurisdiction use to encourage a more compatible environment?

Compatibility Scenarios Discussions

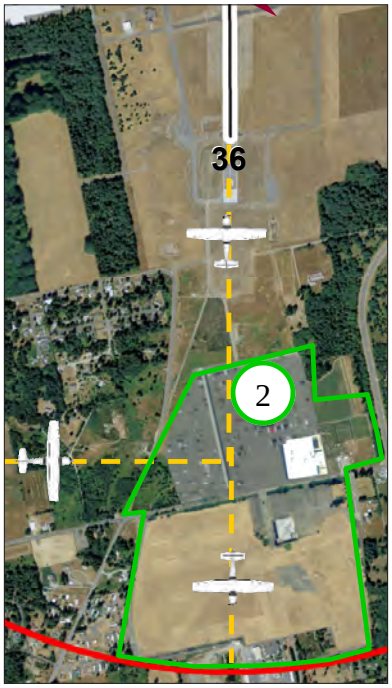
Scenario 1 Discussion



WSDOT's recommends designating the area for commercial/light industrial. Manufacturing, business office park, or mixed-use commercial/industrial would be ideal for the area. See the land use matrix in Appendix Section F for addition recommendations. The property is currently a clean slate with no established development pattern. The only adjacent use is an industrial area to the east. The property falls directly under the downwind and baseleg portions of the airport's traffic pattern. Due to the property's topographical features, higher terrain elevation, single engine and multi engine aircraft would be generally traversing the area at lower altitudes. This lower altitude will exacerbate the impacts of noise, light, vibration, fumes, and the negative perception of low-flying aircraft on adjacent uses. Single-family residential and high-density residential are incompatible with the current aviation environment. Mixed-use is a less desirable alternative and should only be used when all other alternatives have failed.

Tools: Cluster development, height hazards ordinance, discourage: high intensity uses, prohibit: reflective building materials, visual hazards, electronic interference, hazardous or flammable materials and wildlife attractants.

Scenario 2 Discussion



WSDOT recommends that all of the property within Area 2 retain its current commercial zoning designation. Out of the zoning choices presented, this is the most compatible option for the adjacent area and airport. The sporadic low density residential development to the east is not an established development pattern and may be transition to a more compatible use in the future. The adjacent property to the west has a zoning designation of commercial and has an established use. Aviation impacts and concerns include the property falls directly in the approach to runway 36. The aviation impacts of risk, noise, light, vibration, fumes, and the negative perception of low-flying aircraft will be significant. The property falls along the extended runway center line for runway 36. The majority of all aircraft accidents occur along this extended centerline. The approach to runway 36 will be changing from a visual to a non-precision. This approach change will translate into aircraft flying at even low altitudes above the property. Aviation impacts will increase over time as the number of operations grow. The airport is projected to have 85,000 operations in 20 years.

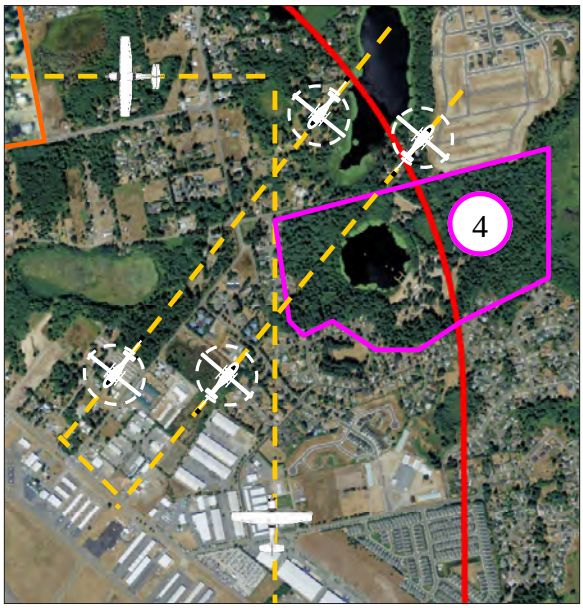
Tools: Height hazards ordinance, prohibit: high intensity uses, reflective building materials, visual hazards, electronic interference, hazardous materials, and wildlife attractants.

Scenario 3 Discussion

Given the area's well established and historic development pattern, WSDOT recommends that it retain its current zoning designation of residential. The property is directly in the approach to runway 18 and will be significantly impacted by low-flying aircraft, noise, light, vibration, and fumes. Since the area falls within the approach to runway, there is an elevated level of risk associated with it. The jurisdiction may wish to examine the area on a smaller scale and look for opportunities to promote a more compatible and harmonious environment. For example, the subject property is bordered by industrial and commercial uses to the south. Often older residential areas will evolve over time into another use. It is not uncommon to see commercial uses transitioning the periphery of these residential areas. Jurisdictions may wish to encourage this by promoting mixed-use zones. Larger parcels, away from the extended runway centerline, may be zoned for multifamily or mixed-use development. Opportunities for low impact commercial uses, along the extended runway centerline should be encouraged. Airport managers should work with planners on a recommended abatement procedure that lessen impacts on residential areas.

Tools: Redevelopment or adaptive reuse of residential areas, infill with mixed-use or multifamily, voluntary abatement procedure, height hazards ordinance, prohibit: high intensity uses, reflective building materials, visual hazards, electronic interference, hazardous or flammable materials, and wildlife attractants.

Scenario 4 Discussion



WSDOT's recommended strategy for Area 4 is to retain its current residential zoning designation. The designation promotes a compatible rural density of one dwelling unit per five acres. The property is located in the traffic pattern for fixed wing aircraft. It is also in the established traffic pattern for helicopters. The area will be impacted by low-flying aircraft, noise, light, vibration, and fumes. The ideal development for the area would be a cluster development that moves the residential development outside the airport influence area. The property, inside the influence and constrained by wetlands, could be used as open space and facilitate an increase of density in the buildable land to the east.

Tools: Cluster development, height hazards ordinance, discourage: high intensity uses, prohibit: reflective building materials, visual hazards, electronic interference, hazardous or flammable materials, and wildlife attractants.

Appendix A Formal Consultation: Airport and Compatible Land Use Program Guidebook

When is consultation required and who must be involved?

Towns, cities, and counties are required by RCW 36.70.547 and 36.70A.510 to formally consult with airport owners, managers, private airport operators, general aviation pilots, ports, and the Aviation Division of the Washington State Department of Transportation to address incompatible land uses prior to updating or amendment of comprehensive plans or development regulations that may affect properties adjacent to a publicly or privately owned public-use airport. This would include proposed or amended policies, land use maps, development regulations, or zoning maps that would propose to alter land uses, density, or intensity of uses or create height hazard/airspace obstructions or other similar impacts within the airport influence area of a public use airport. See the *Washington State Airports and Compatible Land Use Guidebook* for further information and guidance on addressing airport land use compatibility within your jurisdiction.

The Oxford dictionary defines the term "consultation" as "to seek information or advice, refer to a person for advice, to seek permission or approval for a proposed action." Consultation is a process by which a local jurisdiction seeks input on actions that may adversely affect or jeopardize public use airports as essential public facilities through the development of incompatible land uses. It usually involves notification (to publicize the matter to be consulted on), consultation (opportunities for a two-way flow of information and opinion exchange), as well as participation (involving interest groups in the drafting of policy or legislation). The level of consultation should be consistent with the level of potential impacts. Policies, standards, and/or regulations with potentially greater impacts may involve several meetings, while those with lesser impacts may be addressed through other forms of communication. See WAC 365-196-455 for additional guidance on consultation requirements related to airport compatibility.

Why is consultation needed?

The main goals of formal consultation are to avoid, minimize, and resolve potential land use conflicts with airports through the comprehensive plan and development regulations. Formal consultation is needed to:

- Gather technical information on the airport and aircraft operations from airport managers, airport operators and service providers, pilots, and the Aviation Division of the Washington State Department of Transportation.
- Local jurisdictions have the project and land use expertise and knowledge necessary to help identify reasonable and prudent alternatives or measures to avoid, minimize, or resolve incompatible land uses adjacent to public use airports.
- Provides a bridge between local decision makers and airport interests to make informed land use decisions based on how airports function and operate within communicates, and to safeguard airports as essential public facilities.
- Create intergovernmental cooperation and relationships between communities, airports, airport users, and aviation interests to promote coordinated transparent transportation partnerships and reduce conflicts between airports and land use activities.

- Promote early and continuous coordination and cooperation between airport interests and communities in order to avoid, minimize, or resolve potential land use conflicts and airports, through the comprehensive plan and development regulations.

What types of actions would require formal consultation

Consultation should be conducted when the local jurisdiction is proposing amendments to their comprehensive plans or development regulations that would alter existing land uses, density and the intensity of uses, or may create airspace, or height hazard obstructions within the airport influence area.

a. Towns, cities, and counties should request formal consultation when there are amendments on the following actions:
   - Comprehensive plans, subarea plans, or land use map.
   - Shoreline master plan.
   - Rezones.
   - Development regulations or zoning map.
   - Master plan communities, master planned resorts or other planned or special permits that would amend the comprehensive plan or development regulation.

b. Jurisdictions that have adopted comprehensive plan policies or development regulations pursuant to RCW 36.70.547 or 36.70A.510 may also request formal consultation to review a proposed project's consistency with their adopted comprehensive plan and/or development regulations.

What is technical assistance?

Airports, managers, private airport operators, general aviation pilots, ports, and the Washington State Department of Transportation (WSDOT) Aviation Division can provide information on the airport facilities, aircraft operations, flight patterns and characteristics, safety, airspace issues, and other airport operations data within the airport influence area. The *WSDOT Airport Land Use Compatibility Guidelines* can be used as the foundation for addressing land use compatibility adjacent to airports. Technical assistance helps:

- Determine if formal consultation is needed.
- Avoid minimize or resolve land use conflicts with airport facilities and operations.
- Ensure compliance with state law.

Formal Consultation Process Objectives

WSDOT Aviation's formal consultation process seeks to enhance communication and take a comprehensive approach to sharing airport technical information by providing opportunities for early and ongoing consultation between the airport, local jurisdiction, aircraft operators, and aviation service providers on airport operations. WSDOT also encourages all parties to work together throughout the comprehensive plan and development regulation process and to find comprehensive solutions of mutual benefit that fulfill the intent of the legislation to discourage incompatible development adjacent to public use airports consistent with local jurisdictions land use planning authority and obligations under law.

The following steps are generally part of the consultation process that would be initiated by cities or counties, but may vary depending on whether or not the application is a specific request by an applicant(s) such as a rezone application or initiated by the local jurisdiction through their normal comprehensive plan or development regulation process.

Step 1

Towns, cities, and counties should contact the airport and the Washington State Department of Transportation (WSDOT) Aviation Division when considering amendments to the comprehensive plan or development regulations. Request their assistance:

- Preliminary determination on whether the amendments would raise compatibility issues adjacent to the airport.
- Determine the process for consultation and prepare the meeting preparation.
- Contact list of airport operators, general aviation pilots, and other aviation interests.
- General airport facility and aircraft operations information.

Step 2

Review the *Airport and Land Use Compatibility Guidelines*. The guidelines provide information on airport operations, land use, and planning tools to assist in developing compatible land use solutions adjacent to public use airports. Worksheets are also provided and enable users to identify and document land uses and airport characteristics for areas adjacent to their airport. The worksheets will also assist in preparing for the formal consultation meeting identified in Step 3.

Step 3

Local jurisdiction would request formal consultation by contacting airport owners, managers, private airport operators, general aviation pilots, ports, and the WSDOT Aviation Division.

a. Encouraged to provide support information and advanced notification of the proposal and schedule the consultation meeting, ideally ten days in advance.
    - Establish a meeting date, time, and location for the consultation meeting.
    - Prepare summary description of the proposal and discuss proposed revisions to the comprehensive plan or development regulations. Information should include:
        - Maps, drawing, and/or description of affected properties and the proposed changes.
        - Description of proposed comprehensive plan text or map amendments.
        - Description of proposed development regulations or zoning map or amendments.
        - General description and map of existing land use patterns, circulation, and utilities currently allowed.
        - Other maps may also be useful such as an aerial photography, parcel map, topography maps, environmental constrain maps, and general land use or zoning maps.

b. The airport and aviation users are encouraged to provide written acknowledgment of the consultation request and should be prepared to discuss the airport facility, airport and aircraft operations data, flight characteristics, known constraints, and the long-term outlook for the airport. Other information should include:

   - Documentation on the airport master plan, airport layout plan, or other airport facility plans.
     - Number based aircraft and fleet mix.
     - Number of aircraft operations and type of operations.
     - Airspace drawing and topography or obstruction information or conflicts.
     - Airport traffic pattern.
     - Airport service information.
   - Upon request, the airport should provide the jurisdiction with other airport facility and operations data when available and provide technical support.

c. Following the consultation meeting, the jurisdiction, airport, or aviation users may request additional information to clarify the project, and exchange ideas on how to avoid, minimize, or resolve potential incompatible land use issues. Request additional information from the airport and users as needed.

Step 4

During the consultation meeting, all parties will identify issues and concerns regarding the proposal in an effort to reach a consensus on project objectives, project alternatives, modifications, or other specific measures that avoid, minimize, or resolve potential incompatible land uses adjacent to the airport.

- The local jurisdiction, airport, and state should document the consultation process and keep a record of the proceedings.

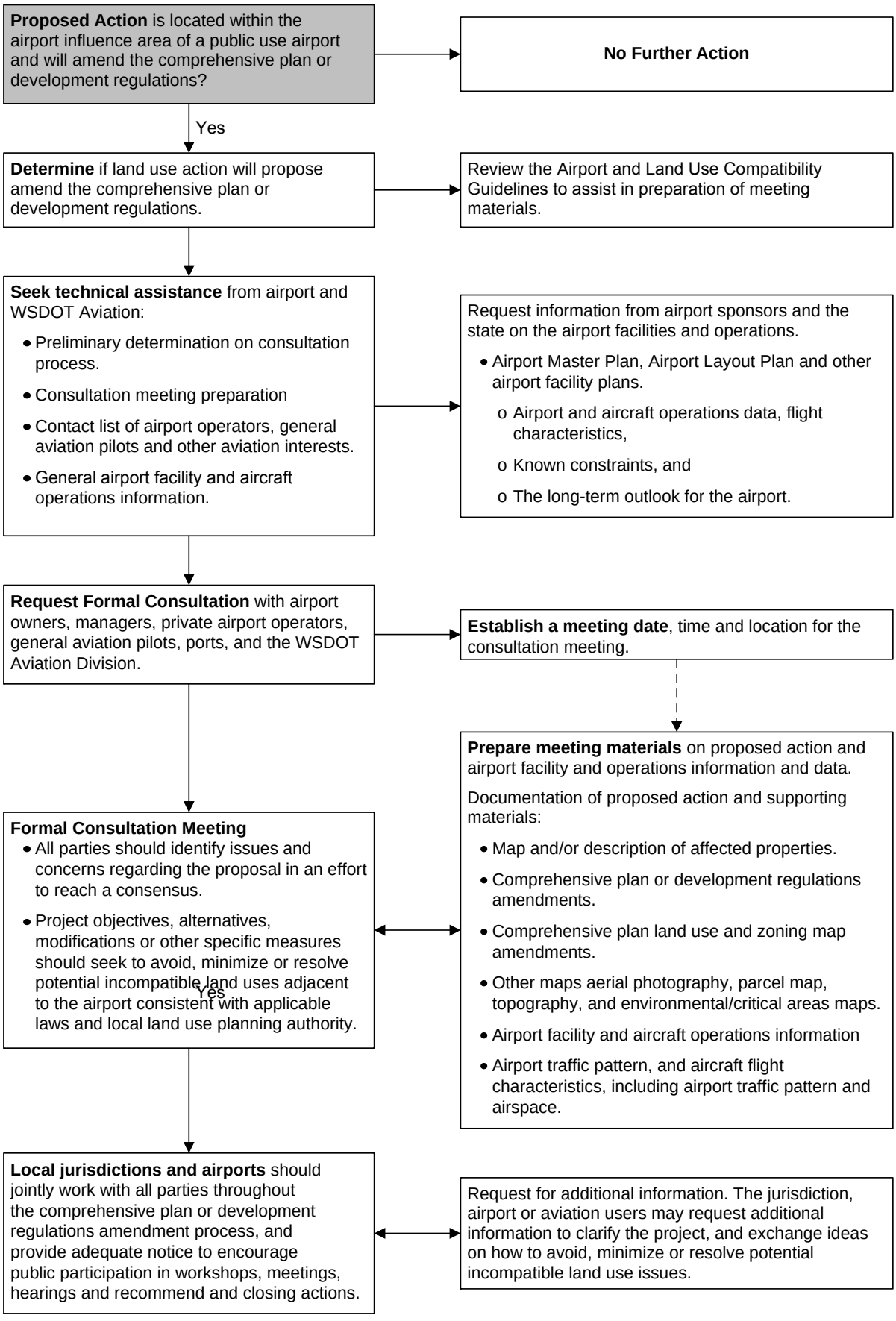
Step 5

Local jurisdictions and airports should jointly work with all parties throughout the comprehensive plan or development regulations amendment process, and provide adequate notice of public participation processes, workshops, hearings, and recommended or final actions.

Consultation Guiding Principles

- Recognize legal and policy parameters facing each others program's, but also take appropriate steps to remove impediments to working directly and effectively with each other's programs.
- Communication and consultation is a two-way street. Communication between airports, communities, and the state should be direct and involve two-way dialogue and feedback.
- Work to assure that each other's concerns and interests are considered whenever their actions or decisions may affect the others programs and statutory obligations.
- Build upon already established and ongoing relationships between communities, aviation interests, and the state.
- Issues that require consultation should be identified as soon as possible in order to involve all parties early on in the process. The need for consultation may be difficult to define in all cases and will vary among jurisdictions. Consultation is the primary responsibility of the local governments having land use authority, but can be initiated by the state in coordination with the local jurisdiction and airports.
- Airport owners and managers, public and private airport operators and businesses, pilots, ports, and WSDOT Aviation should make every effort to participate and provide requested information to the jurisdiction to prepare for consultation.
- Good faith efforts should be undertaken to involve affected governments that have related responsibilities and interests.
- Honesty and integrity must be maintained by all parties in the consultation process. Mutual respect and trust are fundamental elements in establishing a good consultative relationship.

Formal Consultation Process



Worksheet A Airport Land Use Compatibility Consultation

The consultation worksheet is intended to aid decision makers in the formal consultation process.

Organization: _____ Date: _____

Name: _____ Phone: _____

City: _____ State: _____ Zip Code: _____

Airport Name: _____

Proposed Meeting Date: _____ at ☐ a.m. ☐ p.m.

You Will Be Meeting With: _____

The items presented below are intended to help local jurisdictions prepare meeting materials for formal consultation to address proposed amendments to comprehensive plans or development regulations in accordance with RCW 36.70.547 and 36.70A.510. For additional information on formal consultation, refer to Appendix G. Also refer to Airports and Land Use Compatibility Guidelines for additional technical assistance.

Comprehensive Plan and Development Regulation Amendment

☐ Description of proposed amendment with supporting written documentation, maps, and drawings (8½″ × 11″ sheets).

- Description of proposed amendments.
- Site vicinity map.
- Supporting maps, drawings, and graphics with location of airport facility.
- Proposed schedule.
- Other actions or permits.

☐ Summary description of existing comprehensive plan and development regulations.

- Comprehensive plan policies and supporting text.
- Comprehensive plan land use map/designations.
- Development regulations.
- Zoning map.
- Identification of likely concerns with the proposed action.

☐ Supporting resource maps, graphics, and other visual aids of areas within the airport influence area.

- Existing land use map.
- Topography map.
- Parcel map.
- Environment sensitive or critical area maps.

Airport Facility and Support Information

☐ Airport Master Plan, Airport Layout Plan, Airport Facility Plan, and/or other related industrial/business plans.

☐ Summary description of airport facility, activities and services.

- Number of runways.
- Aircraft operations.
- Number of based aircraft.
- Aircraft fleet mix.
- Airport services.
- Proposed expansion plans.

☐ Airport Plan View Drawings (8½″ × 11″ sheets).

- Airport facility drawing, i.e., runways, taxiways, apron, hangar, terminal, and other activities.
- Airport traffic patterns.
- Airspace drawing.

Aviation System Plan

☐ Summary descriptions and role of the airport.

☐ Aviation economic impact profile.

The information above will be available from either the local jurisdiction, airport, or the Washington State Department of Transportation.

Formal Consultation

a. Towns, cities, and counties are required to discourage incompatible land uses adjacent to public use airports through the comprehensive plan and development regulations. Prior to updating or amending plan or regulations, local jurisdictions are also required by RCW 36.70.547 and 36.70A.510 to formally consult with airport owners, managers, private airport operators, general aviation pilots, ports, and the Aviation Division of the Washington State Department of Transportation.

b. Local jurisdictions should request formal consultation when the jurisdiction is considering proposed amendments on the following actions:

- Comprehensive plans, subarea plans, land use maps.
- Shoreline master plan.
- Rezones.
- Master plan communities, master planned resorts, or other planned or special permits that would amend the comprehensive plan or development regulation.
- Development regulations and zoning map.

c. The nature and extent of the proposed amendment to the comprehensive plan or development regulation may vary depending on the type and scale of the proposed action, existing land uses, and location of the proposed action within the airport influence area. The extent and complexity of assessment and consultation will vary in response.

d. Local jurisdictions that have adopted comprehensive plan policies or development regulations pursuant to RCW 36.70.547 or 36.70A.510 may also request consultation to review a proposed project's consistency with their adopted comprehensive plan and/or development regulations.

Guiding Principles for Formal Consultation Meetings/Workshops

- Recognize legal and policy parameters facing each other's programs, but also take appropriate steps to remove impediments to working directly and effectively with each other's programs where feasible.
- Communication and consultation is a two-way street. Communication between airports, communities and the state should be direct and involve two-way dialogue and feedback.
- Work to assure that each other's concerns and interests are considered whenever their actions or decisions may affect the others programs and statutory obligations.
- Build upon already established and on-going relationships between communities, aviation interests, and the state.
- Issues that require consultation should be identified as soon as possible in order to involve all parties early on in the process. The need for consultation may be difficult to define in all cases and will vary among jurisdictions. Consultation is the primary responsibility of the local governments having land use authority, but can be initiated by the state in coordination with the local jurisdiction and airports.
- Airport owners and managers, public and private airport operators and businesses, pilots, ports, and WSDOT Aviation should make every effort to participate and provide requested information to the jurisdiction to prepare for consultation.
- Good faith efforts should be undertaken to involve affected governments that have related responsibilities and interests.

Honesty and integrity must be maintained by all parties in the consultation process. Mutual respect and trust are fundamental elements in establishing a good consultative relationship.

Appendix B — Learning More About: Describing and Evaluating Airport Noise Impacts

Measuring Airport Noise

Measurement of Sound

Regardless of whether particular sounds are pleasant to hear or represent annoying or disruptive noise, their physical properties are measured in terms of three basic components: magnitude, frequency, and duration.

Sound is transmitted through the air when the movement of an object displaces the adjacent air particles which then bump into the next particles and so on. These actions form sets of pressure waves that strike our eardrums, causing them to vibrate and the sound to be heard.

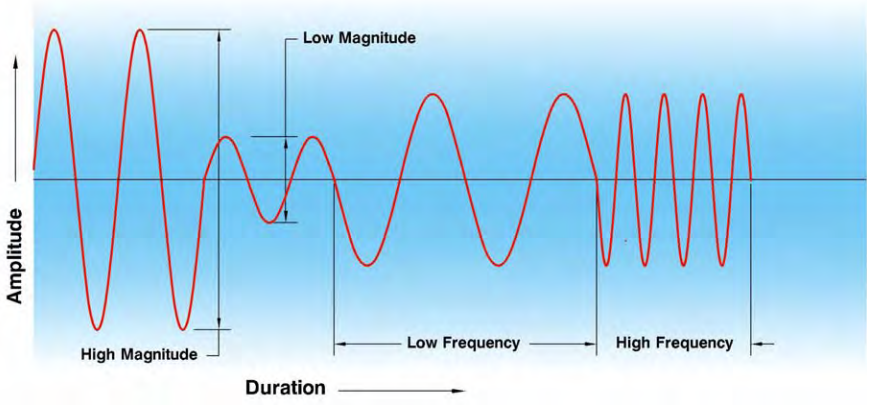
- **Magnitude** – Magnitude is a measure of the strength or amount of acoustic energy carried by a sound wave. Because the energy level of sounds we can hear varies in magnitude by a factor of 1 to 100 trillion—that is 10^{14} or 1 followed by 14 zeros—we measure magnitude using a logarithmic scale rather than a linear one. Each step in this scale from 0 to 14 is referred to as one bel in honor of Alexander Graham Bell. More commonly, each bel is divided into tenths, thus the term decibel which is abbreviated as dB.

  Magnitude is related to loudness, but isn't the same. Loudness describes how we perceive sounds. We perceive any sound level increase of 10 dB (1 bel) as representing a doubling of loudness regardless of whether the increase is from 40 to 50 dB or from 80 to 90 dB. In each case, though, the acoustic energy or magnitude of the sound is actually increasing by a factor of 10.

- **Frequency** – Frequency describes the spacing between sound pressure waves. We hear differences in frequency as tone—a low-pitched tone has a long spacing or wavelength and a high-pitched done has a short wavelength. Measured relative to the number of cycles per second, the scale used is called hertz , abbreviated Hz. Most sounds do not consist of a single frequency—a pure tone—but are instead comprised of a mixture of different frequencies, each usually having its own magnitude.

We don't hear all sound frequencies equally well. To balance what we perceive to be equally loud sounds of different frequencies, the measurement of sound magnitude is usually adjusted or weighted using A weighted decibels expressed as dBA.

Noise Waves



- **Duration** – The final component is the time period over which a sound occurs. Measuring the duration of a sound is not always as simple as it would seem. Many sounds, such as those from an aircraft overflight begin softly, increase to a maximum magnitude, then drop away. Where we begin and end the measurement depends on what we can hear. Moreover, what we can hear often depends on the background or ambient sound level. Thus, a sound that barely reaches above the background level may seem to have a short duration, but in a quieter environment, we may find its duration to be much longer. In effect, a high background noise level masks much of the noise from individual aircraft overflights.

Noise Variations Among Aircraft Types

Different types of aircraft sound differently. The magnitude, frequency, and duration of the sounds they create all differ. Moreover, variations occur not just among different types of aircraft, but even among different overflights of the same type of aircraft. The way the pilot flies the aircraft makes a difference.

- **Jet Airplanes** – The noise from jet airplanes was once distinct from other aircraft both by being louder and because it had a high pitch that was particularly annoying. Technology has enabled today's jets to be much quieter than their predecessors and the frequency is lower. Pound for pound, modern jets are quieter than equivalent propeller airplanes. However, on average, jets are larger than propeller planes and thus are typically noisier. Research is continuing into making jets still quieter, but there are trade-offs between noise levels, fuel efficiency, and the amount of emissions produced.

Courtesy of Cessna

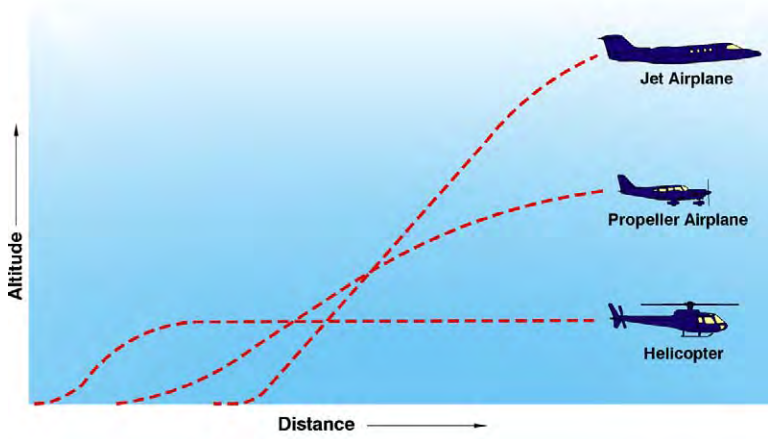
- **Propeller Airplanes** – The dominant noise from propeller airplanes, whether driven by piston or turbine engines, is from the propeller itself. Unlike jet aircraft, the noise levels produced by propeller airplanes has changed very little over the years. Moreover, the potential for future technology to enable significant noise reduction is limited. Also, private airplanes such as found at general aviation airports are not replaced by newer models at anywhere near the rate common to airline aircraft. In all, no major changes in propeller airplane noise can be anticipated.

Courtesy of Cessna

- **Helicopters** – Helicopter noise has unique characteristics. The relatively slow turning main rotor produces an impulsive sound that is particularly noticeable as the helicopter is approaching the listener. These pulsations are a key to understanding the greater annoyance that results from a helicopter flyby. Helicopter noise during the measurement process takes a highly variable source noise and averages it. In reality, people respond to the peaks which are audible at great distances as the onset and end point for the noise event. The result is a much longer total duration event. This contributes to a disproportionately adverse response. The noise is greatest during high-speed cruise and low-speed descents.

The amount of noise generated by different aircraft types is only one factor affecting how much noise is heard on the ground. Atmospheric conditions can make the sound bounce back to the ground and affect the noise levels that people hear. Another key factor is the altitude at which the aircraft are flying. In locations close to runways, the distinct performance capabilities of the different aircraft types greatly influences the noise impacts. As the illustration below shows, jets usually need more runway length to take off than propeller planes need, but then they climb much faster. At some point within a couple of miles of the runway end, jets will have reached a higher altitude than the more slow climbing propeller planes and their noise level on the ground will diminish more rapidly as they continue to climb more steeply. Helicopters don't need a runway to get airborne and they climb more steeply than airplanes (although they don't go straight up as is sometimes believed). Also, helicopters generally cruise at lower altitudes than airplanes and fly different routes. Thus several miles from an airport, helicopters may be the loudest aircraft around.

Typical Takeoff Profiles



In general, aircraft noise impacts are greater below the takeoff paths than at the arrival end of the runway. These differences, though, depend both on the aircraft type and on the distance from the runway. For example, as depicted by the preceding illustration, at some distance from the runway, jets will have climbed high enough that they may produce much less noise on the ground than the slower climbing propeller airplanes. When landing, all jets and propeller planes follow about the same approach slopes, thus noise differences depend mostly on the aircraft size and engine types. Also, because engines are set to low power levels on approach, the noise produced by the airframe from such features as wing flap and extended landing gear may be greater than the engine noise.

Noise Contours

For many airports, especially those with relatively little activity, noise and other impacts associated with aircraft overflight can be aggravating and viewed as more obtrusive due to their apparently random occurrence.

Noise contours are used to map or graphically depict areas of equal noise exposure around a noise source, such as an airport or highway. Just about any noise metric data can be illustrated in this manner. For land use compatibility planning purposes, though, noise contours are usually associated with cumulative noise level metrics such as DNL (day-night level or L_{dn}). DNL contours are commonly shown at 5 decibel increments so that they resemble topographic contours.

These days, noise contours for civil airports are produced using an FAA-approved computer program: the Integrated Noise Model, known commonly as INM. Most of the data about the performance capabilities and noise generated by various types of aircraft are stored in the program. The user must enter data regarding the number of operations by each aircraft operating at the airport, the time of day when the operations occurred (day versus night), the runways used, and the flight tracks followed. INM is capable of taking into account the actual ground elevations around an airport, thus increasing the calculated noise levels where the terrain is high and aircraft are consequently flying at a lower altitude than would be the case with flat terrain.

Preparation of noise contours showing current and projected airport noise impacts is generally done for larger airports as part of an airport master plan and is usually a required component of environmental documents for airport expansion projects. For busy airports where significant noise impacts may be generated beyond the airport boundary, noise contours, as measured by DNL may be generated as a planning tool to address compatibility. However, for most airports in Washington State, particularly those not eligible for Federal Aviation Administration funding, identifying noise contours is not necessary because aircraft noise levels do not generally exceed the 65 DNL threshold beyond the airport property. The 65 DNL threshold is used by the FAA to assist in determining eligibility for federally-funded noise mitigation programs. See Federal Aviation Regulations (FAR) Part 150 “Noise Compatibility Program” for more information.

Approaches to Addressing Airport Noise Impacts

Sitting Appropriate Uses

The FAA recommends that local jurisdictions address noise sensitive land uses through their development regulations by taking steps to understand airport operations and aircraft noise issues so that they can take steps to minimize noise impacts. Noise impacts are one of the factors that can be considered by local jurisdictions when developing strategies for addressing compatibility near airports. As indicated above, noise can be measured in terms of magnitude, how loud; frequency, how often; and duration, how long. Each of these factors, together with other compatibility criteria addressed in these guidelines can assist local jurisdictions in determining what strategies or criteria should be used in locating different types of land uses near airports. For example, some land uses such as a storage facility or restaurant may be located almost anywhere near an airport, however, locating a restaurant near the end of the runway may degrade the atmosphere for restaurant customers due to noise and increased accident risk levels. Whereas storage facilities have fewer customers with different expectations. The fundamental questions that local jurisdictions will need to address are:

1. What is the function of the proposed land use activity.
2. What connects the land use activity to the location.
3. What factors should be considered to ensure sustainability.
4. How will the land use activity be impacted by its environment.
5. What other factors are necessary to maintain a high quality environment.

WSDOT's guiding principal of "do no more harm" should always be exercised when considering what type of uses or activities should be promoted within the airports influence area without degrading the operational capabilities of the airport and the proposed activity.

State and local governments may protect their citizenry from aviation noise through land use controls and other police power not affecting airspace management or aircraft operations- FAA

Individuals and community responses to aircraft noise differ substantially and, for some individuals, a reduced level of noise may not eliminate the annoyance or irritation. The FAA address land use compatibility primary through grant assurances. In the assurances, the FAA requires that airports receiving federal grants, "take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations."

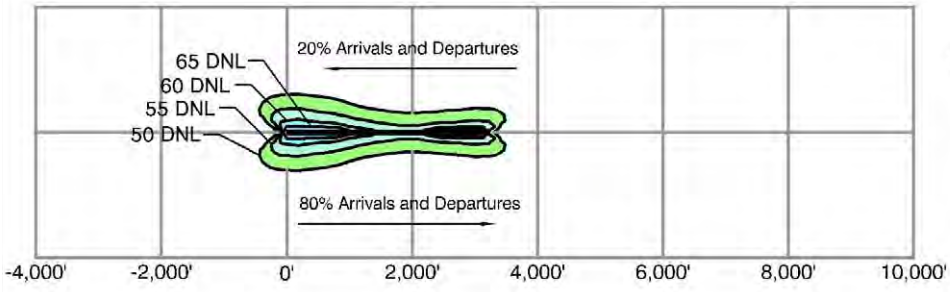
Several facts about current standards and noise contours are important to recognize:

- Even though the loudness of individual jet aircraft operations has been significantly reduced since the 1970s, people continue to be bothered by the noise. This may be due to an increase in the number of operations or simply because people's expectations regarding quiet are greater.
- Noise contours fail to fully explore the relationship and interaction between aircraft operations and the community. For example, many airports experience the majority of their operations during VFR conditions. Since outdoor activity is a significant aspect of single family residential development and often takes place during periods of good weather, the two activities often take place simultaneously.
- Compatibility does not mean that activities will not be disrupted by individual noise events. Even cumulative noise exposures of 60 or 55 dB DNL can include individual loud events that may be disruptive.
- Noise contours are a prediction, and it's only as good as the forecast and other input assumptions, e.g., flight tracks, fleet mix, etc.
- DNL is based on a year-long average and therefore may not reflect seasonal adjustments or increase aircraft operations or frequency during peak hour events

Generic Noise Contours for Typical Small Airports

General Assumptions

- Straight-in/straight-out flight tracks
- 3,200' Runway
- Airport elevation of 800'
- 85° F is average high temperature for hottest month
- 80% of single-engine piston operations are fixed pitch
- 20% of single-engine piston operations are variable pitch
- 80%-20% runway use distribution

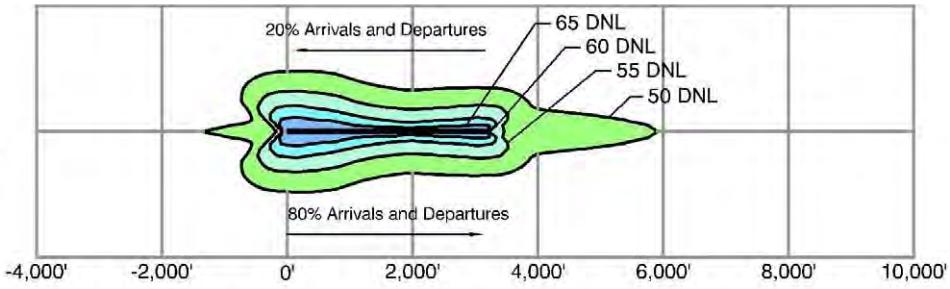


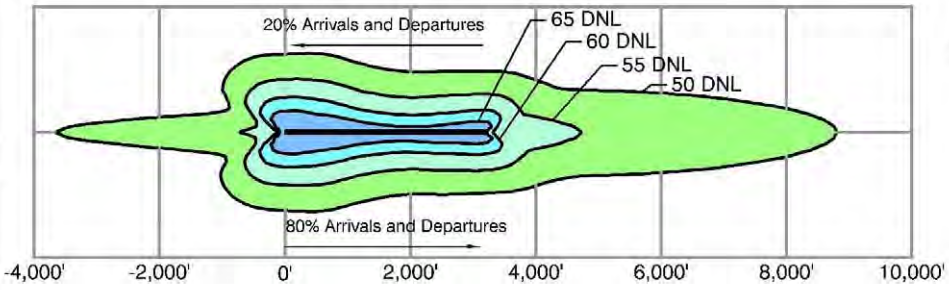
3,000 Annual Operations

- 100% Daytime
- 100% Single Engine Piston

10,000 Annual Operations

- 99% Daytime
- 1% Night Time
- 96% Single Engine Piston
- 3% Twin-Engine Piston
- 1% Light Turbo Prop





20,000 Annual Operations

- 98% Daytime
- 2% Night Time
- 93% Single Engine Piston
- 5% Twin-Engine Piston
- 2% Light Turbo Prop

Source: Mead and Hunt

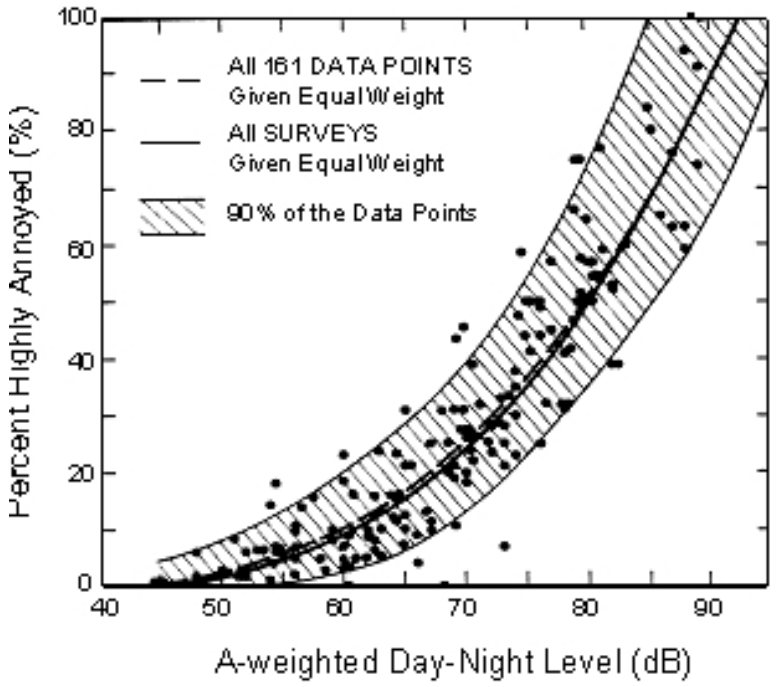
To reiterate, the FAA policy does not preclude local jurisdictions from setting a lower threshold of compatibility for new land use development. In fact, some states like Oregon have passed legislation that requires airports to analyze lower noise level thresholds. The FAA's Aviation Noise Abatement Policy 2000 states:

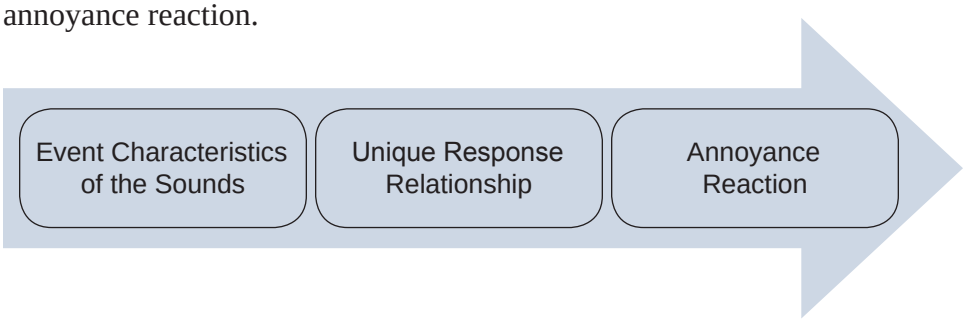
> "Based upon local factors, local jurisdictions may take a more comprehensive approach to aviation noise exposure below DNL 65. Some communities are more noise sensitive than others. Part 150 guidelines recognize local discretion to define noise sensitivity."

WSDOT encourages communities to seriously examine the significance of noise impacts, along with other compatibility factors such single-event noise levels, low flying aircraft, vibration, odors, annoyance, and other impacts of regular aircraft overflights—and to avoid new development that might be incompatible within the airport influence area. The affects of aircraft noise and other annoyance associated with normal airport opperations, as addressed in the appendix C, should be considered as well.

The Schultz Curve

The 65 DNL threshold addressed by the FAA through Federal Aviation Regulations (FAR) Part 150 in part relies on information derived from the Shultz Curve. The Shultz Curve was used to identify a level of compatible noise. Like many metrics, the Shultz Curve has its limitations. The curve is based on 30 year old sociological studies. Although cutting edge at the time, the studies failed to address a variety of variables. The Schultz curve is derived from aircraft, rail and transportation noise. The relationship between different modes and their noise impacts has been described as the exposure-response relationship[1]. Empirical evidence suggests that like rail noise, aircraft noise has a unique exposure-response relationship attached to it. This is due to event characteristics of the sound), which affects an individual's annoyance reaction.





[1] Hoeger, et al.

Aircraft noise has generally higher amplitude at the peak and is broadcast over wide areas from above. Simply put, one cannot simply go into the backyard and escape it. Aircraft noise has a sudden onset and may produce a fear response and an unusually loud aircraft noise implies that the airplane is close by accentuating the fear response.

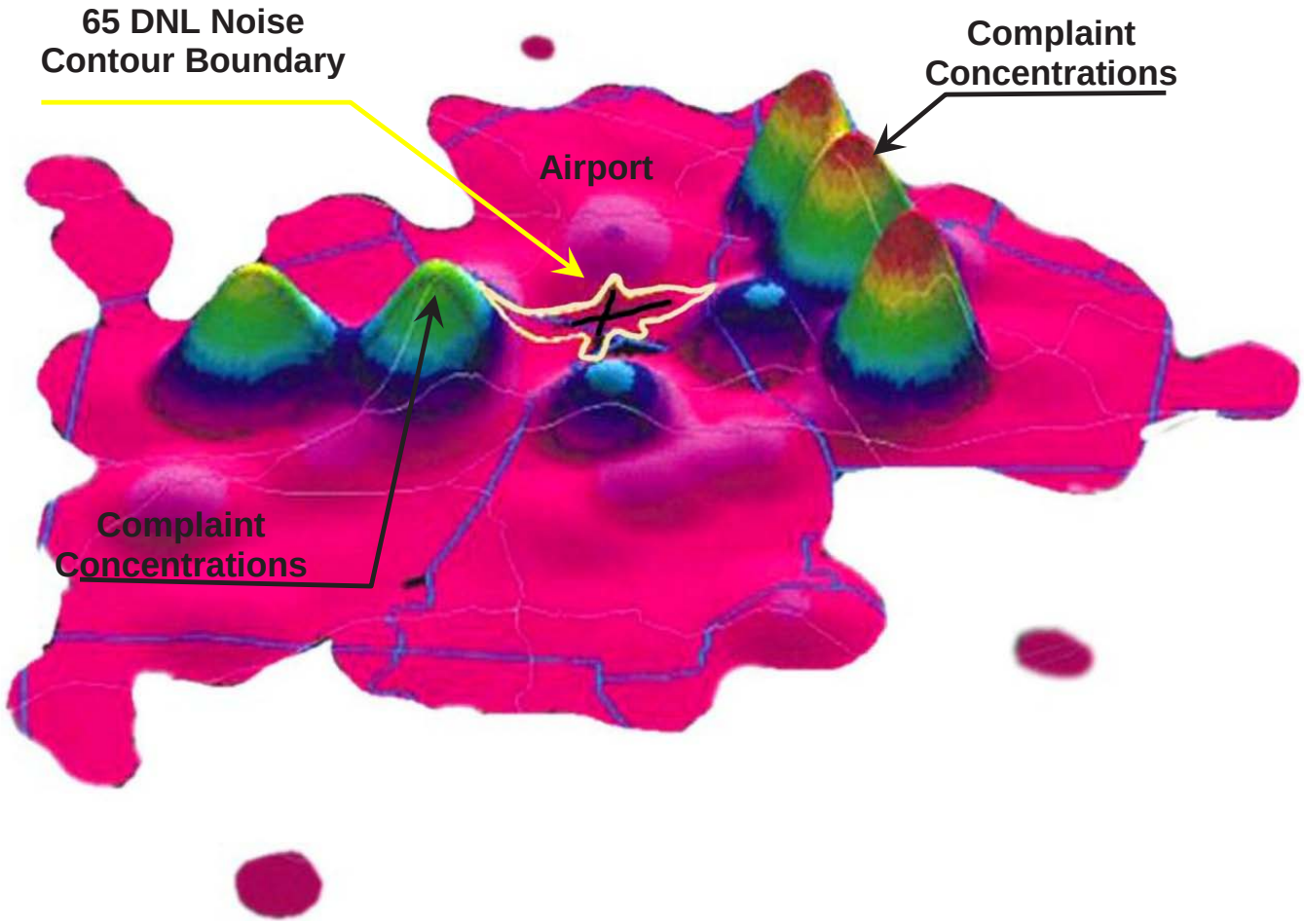
Single noise events, especially in areas where the background noise level is very low, contributing disproportionately to adverse responses.

Additionally, aircraft noise is mainly characterized by single events, while road traffic noise is perceived as more or less continuous[2]. Some people also view the sporadic nature of aircraft operations as more intrusive noise events when compared to other modes, especially when they disrupt intended activities[2]. Aircraft noise can be particularly intrusive during warmer weather when people are outside more or when residents leave their windows open. Research shows aircraft noise to be more annoying during the night or early morning hours, when ambient noise levels are lower and people are normally sleeping. These intrusive noise events can lead to negative evaluations of the airport, and the noise source can be seen as a highly unpleasant nuisance within the community[2]. Other considerations associated with the Schultz Curve include:

- The underlying sociological studies date back more than 30 years. Chief among these was one done by Schultz in 1978 which itself was a compilation of prior studies. One product of this study was the so-called "Schultz curve." This curve shows that 13% of the population living near an airport can be expected to be highly annoyed when the noise exposure is 65 dB DNL. Presumably, the percentage of people who are moderately annoyed would be even higher.
- The Schultz curve is derived from aircraft, rail and transportation noise. Adverse reactions are greatest for aircraft, then road vehicles and finally rail. Averaging these three sources together underestimates the level of impact from aircraft.
- The studies involved major air carrier airports in noisy urban environments. The degree to which people in quieter communities would be annoyed at lower noise exposures was not studied.
- But the time the noise surveys were conducted, truly noise sensitive individuals had relocated out of the sample population. This often referred to as a "survivor population". Thus the responses collected by the studies did not reflect the population as a whole.

[2] Night-time Noise Annoyance: State of the Art, Hoeger, et al.

Case Study: Hanscom Field GIS Noise Analysis



Source: The Schultz curve 25 years later: A research perspective

Complaints were geo-coded into street addresses and then spatially modeled in GIS. Complaints are represented by the graduated colors and vertical extrusion. The spatial analysis demonstrates that complaint concentrations are well beyond the airport's 65 DNL cumulative noise exposure contour.

Complaints are represented by the graduated colors and vertical extrusion (exaggeration).

65 DNL Noise Contour Line - yellow polygon

Airport runways -black intersecting lines

The argument that single event noise is a substantial compatibility factor is supported by research regarding the spatial distribution of noise complaints at Naples Municipal Airport , Hanscom Field and San Francisco International Airport. The research shows that most aircraft noise complaints are received from geographic areas outside traditional noise exposure contours. This fact demonstrates that noise complaints often have more to do with fleet mix, event times and operational characteristics than projected noise contours. Cumulative noise exposure is itself a far from perfect predictor of annoyance

Aircraft noise is very similar to noise generated from common power tools. It is loud enough to be intrusive, disruptive and cause conflict between neighbors. Single event noise characteristics and the high visibility of aircraft operations intensify the negative response many individuals experience.

String Trimmer

Aircraft Operations

Chainsaw

Noise Insulation

The mass of buildings' structural components greatly reduces the amount of aircraft noise heard indoors compared to outside. Modern, energy efficient, wood frame buildings typically reduce the exterior to interior noise levels by as much as 30 dB when windows are closed. Even with windows open, other parts of the structure can serve to substantially reduce the indoor sound levels caused by exterior noise.

Heavier structures, such as ones with concrete walls, or buildings designed with added noise insulation features can further enhance the noise level reduction. These qualities have often led to the view that aircraft noise impacts do not need to be a deciding factor in siting of noise-sensitive land uses near airports provided that adequate sound insulation is incorporated into the building design.

Noise insulation should not be thought about in this manner. The most appropriate application for structural noise insulation is for existing buildings. It is a method of improving existing incompatible conditions when changing the land use to something less noise sensitive is not practical. Even then, there are limitations. Noise insulation is not effective for land uses in which noise-sensitive activities take place outdoors. Unlike the case with ground-based noise sources, sound walls and other such devices do nothing to block noise from aircraft while they are in the air.

With regard to new development, noise insulation should be regarded as a measure of last resort. It is not a substitute for good land use compatibility planning and does not address a local jurisdictions responsibility to discourage incompatible development adjacent to the airport. Exterior noise levels should generally be the primary consideration in evaluation of proposed land uses, especially residential development and other land uses where noise-sensitive outdoor activities are normal and important features.

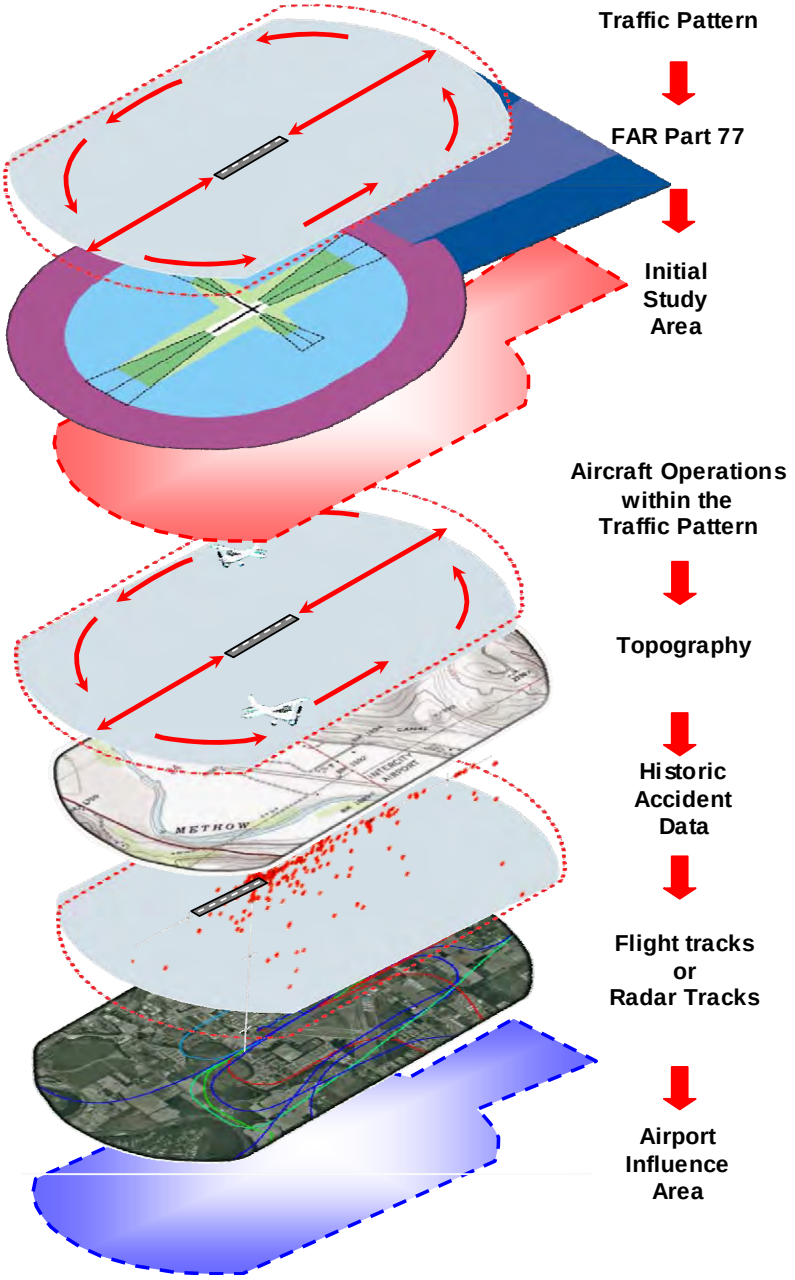
Appendix C — Learning More About: The Airport Influence Area and Evaluating Aircraft Operations

Introduction

This appendix has been developed to help planners understand the airport influence area and the airport operations that occur within it. It covers the fundamentals of: determining the area necessary for the initial study area to address airport land use compatibility planning, identifying the airport influence area, identifying airport and aircraft operational characteristics, and impacts associated with airport activity.

Study Area

The initial study area is inclusive of the airport ownership, airport traffic pattern, and Critical Airspace Surfaces identified in FAR Part 77. In most cases, these aeronautical factors will identify areas where normal aircraft operations occur and where conflict could potentially arise.



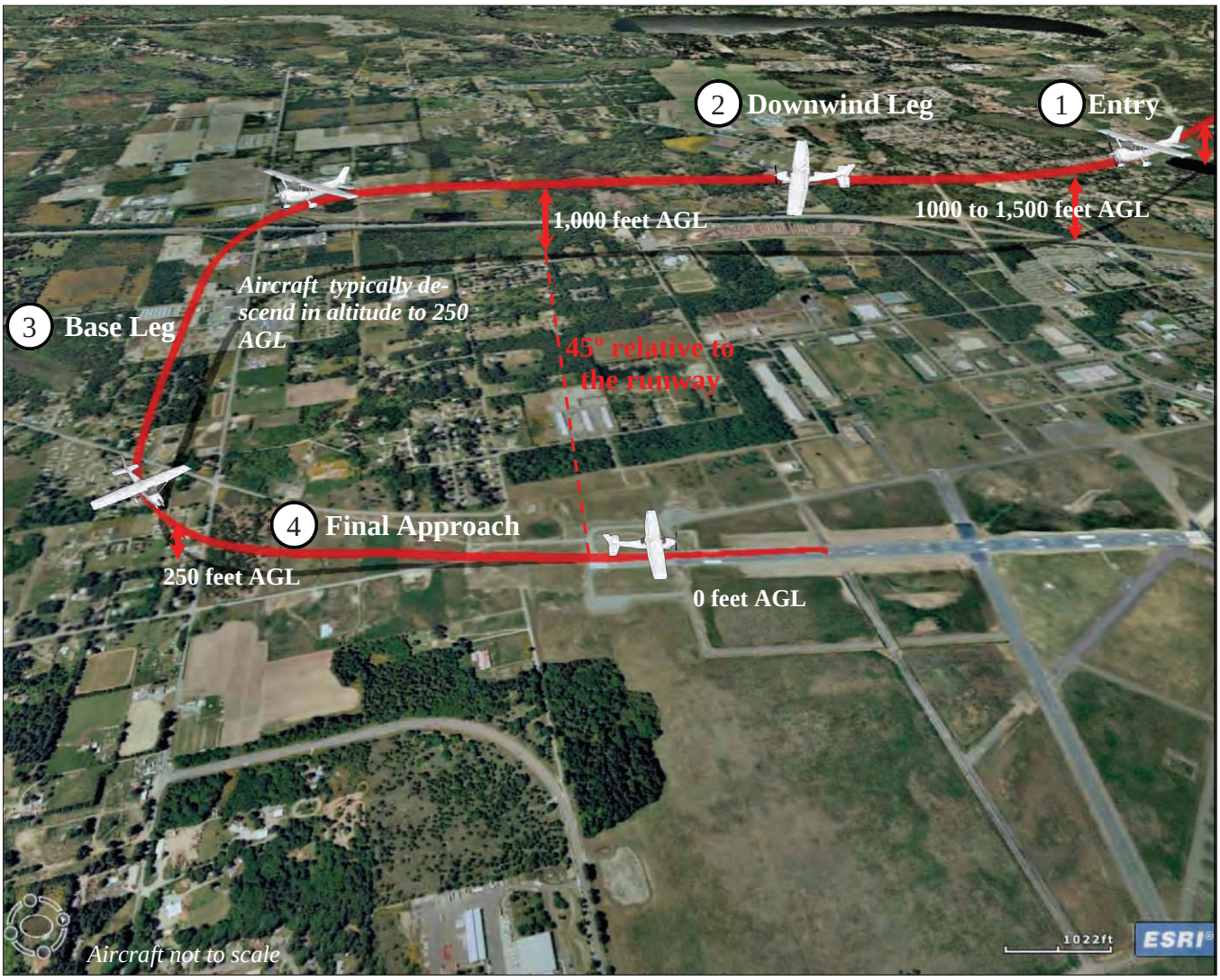
Airport Influence Area

The airport influence area is derived from the initial study area and may be larger, smaller, or the same size as the study area boundary depending on the airport and aircraft operations, flight characteristics, and land features. The jurisdiction should analyze the following elements:

- Airport and aircraft operations and characteristics.
- Airport traffic pattern.
- Topography.
- Historic accident data.
- Flight tacks or radar tracks (when available).
- Critical Airspace surfaces (FAR Part 77).

Airport and aircraft information is available from the airport sponsor and from WSDOT Aviation.

3D Phase of Flight Within a Standard Left Hand Traffic Pattern



1 **Entry** - Arriving aircraft should be at the appropriate traffic pattern altitude before entering the airport's traffic pattern. Entry to the downwind leg should be at a 45 degree angle. It is recommended that airplanes observe a l,000 feet above ground level (AGL) traffic pattern altitude. Large and turbine-powered airplanes should enter the traffic pattern at an altitude of 1,500 feet AGL or 500 feet above the established pattern For airport specific traffic pattern altitude, see the Federal Aviation Administration (FAA) Airport/Facility Directory.

2 **Down Wind Leg**– Aircraft parallel the runway at the recommended traffic pattern altitude, generally an altitude of 1,000 feet AGL.

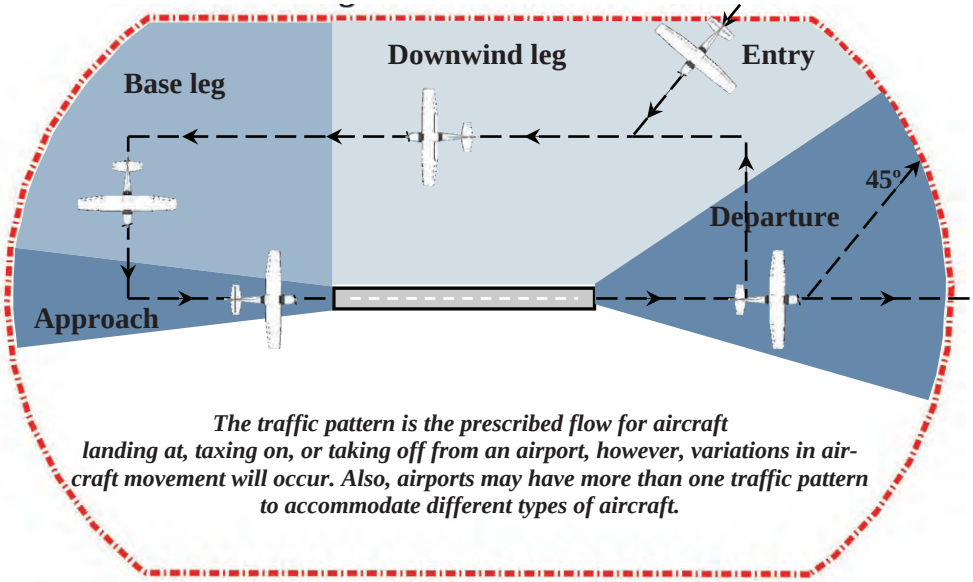
3 **Base Leg-** Aircraft begin their turn at a point 45 degrees relative to the runway's threshold. Aircraft typically descend in altitude from 1,000 feet AGL to 250 feet AGL.

4 **Approach** - Aircraft begin their approach at 250 feet AGL and descend to the runway.

Traffic Patterns

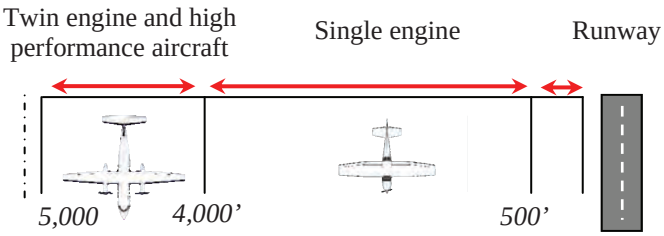
Phases of flight within the traffic pattern generally consist of the entry, downwind leg, base leg, approach, and departure. The width of typical general aviation airport's traffic pattern is generally 5,000 feet, but can vary between airports. Individual aircraft flight tracks within the traffic pattern will vary according to aircraft performance, wind, weather, piloting technique, topography, and aircraft weight. It is critical to understand that aircraft operate in a dynamic environment. They all do not fly along the same path.

Phase of Flight Within the Traffic Pattern



The traffic pattern is the prescribed flow for aircraft landing at, taxing on, or taking off from an airport, however, variations in aircraft movement will occur. Also, airports may have more than one traffic pattern to accommodate different types of aircraft.

Traffic Patterns Width and Aircraft Performance

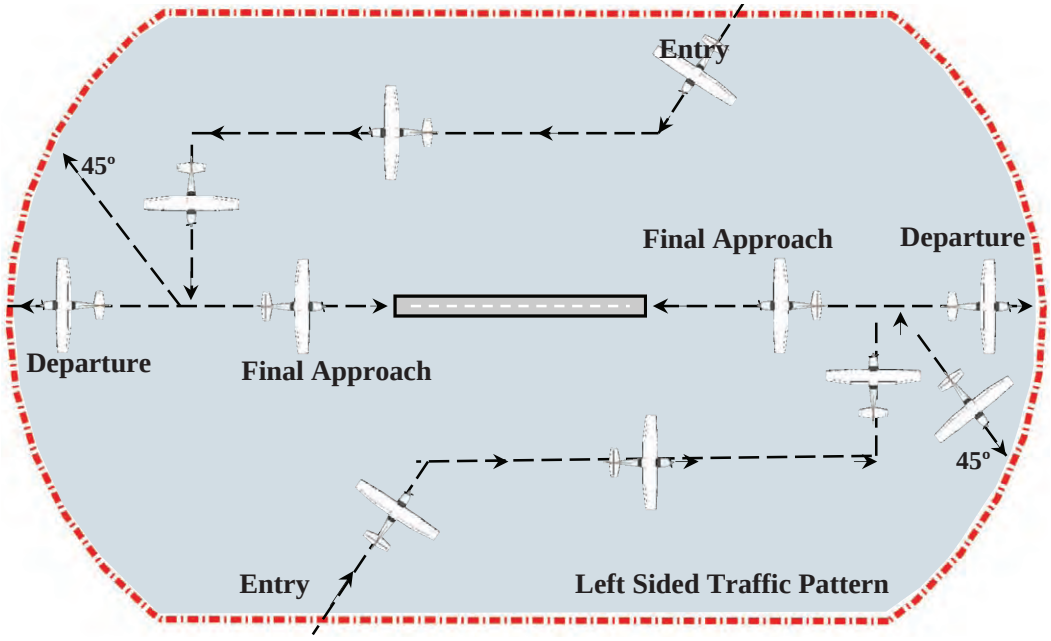


AC No. 90-66A states that "A pilot may vary the size of the traffic pattern depending on the aircraft's performance characteristics"

Higher performance aircraft, in many cases, will fly a higher wider pattern, while slower flying aircraft often fly a tighter pattern. The direction of the aircraft landing on the airport runway may also vary depending on wind conditions.

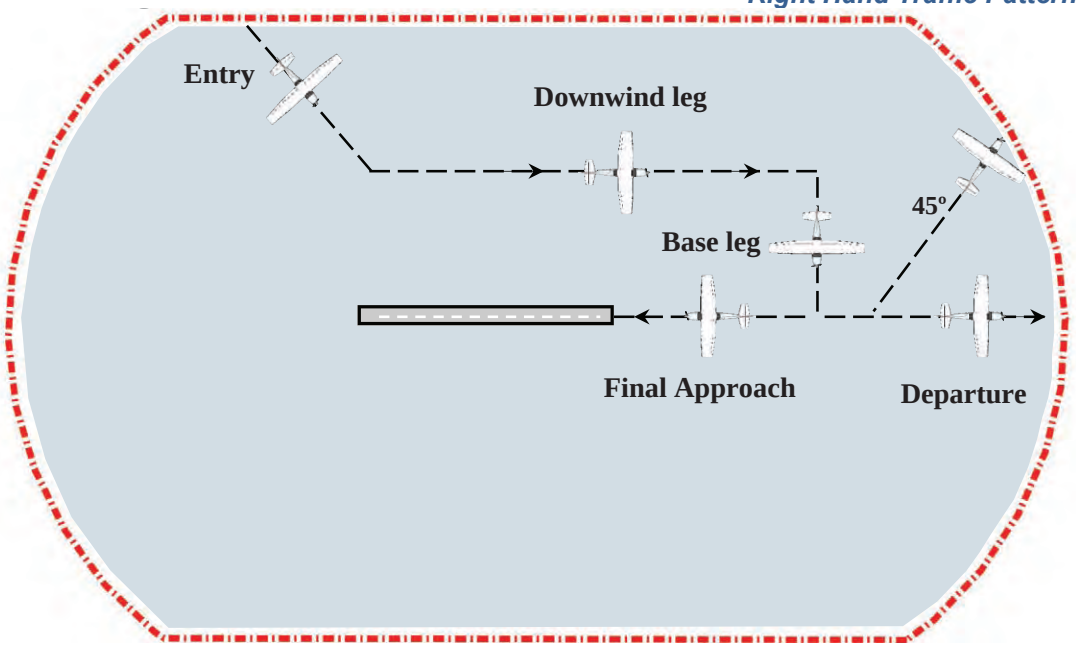
Most runways have a standard left-hand traffic pattern. However, this may vary depending on natural features near the airport, airport traffic pattern policies, and if the airport has more than one traffic pattern to address multiple types of aircraft. For example, variations may occur for helicopters, gliders, ultra lights, and jets.

Left Hand Traffic Pattern



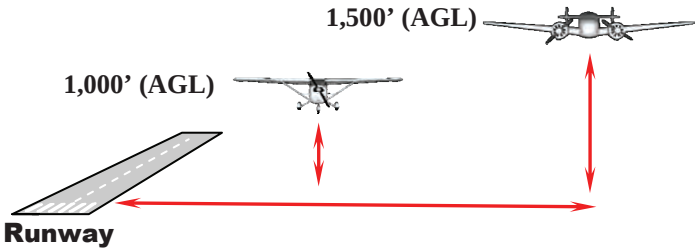
Some runways have a non-standard right-hand traffic pattern. This means that aircraft enter the pattern and parallel the runway on the right side, before turning on the baseleg and executing their final approach.

Right Hand Traffic Pattern



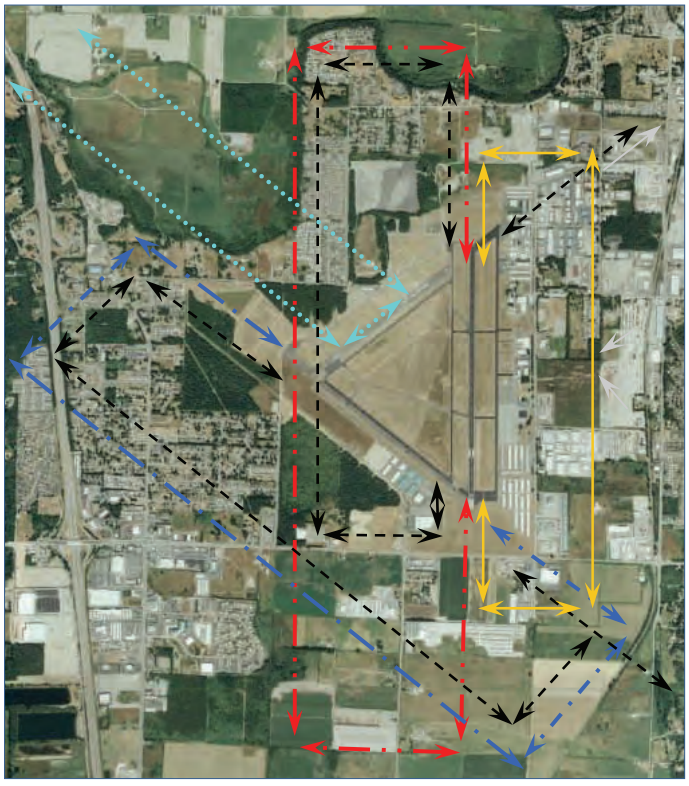
In many cases, higher performance aircraft will fly a higher traffic pattern. The FAA's AC No. 90-66A states that large aircraft should enter the traffic pattern at an altitude of 1,500 feet AGL or 500 feet above the standard traffic pattern. Some pilots, regardless of aircraft, prefer a higher pattern altitude since it gives them a higher probability of making a successful landing in an engine out scenario.

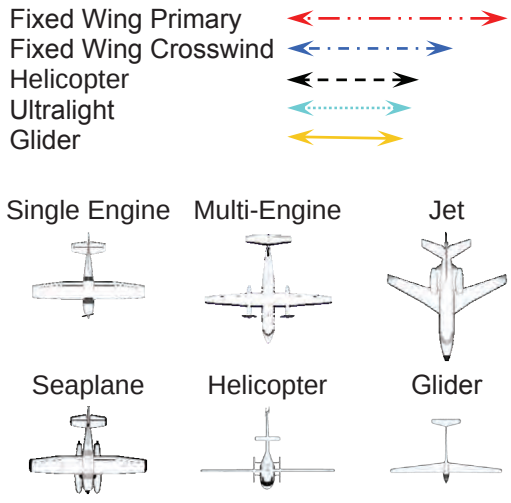
Traffic Patterns Altitude and Aircraft Performance



Some airports have established recommended traffic patterns for specific aircraft. Understanding the types of aircraft and where they fly gives you an idea of where the highest impacts occur. Be sure to consult with your airport manager and pilot community regarding the airport's and aircraft's unique operational characteristics.

Arlington Municipal Airport's Traffic Pattern

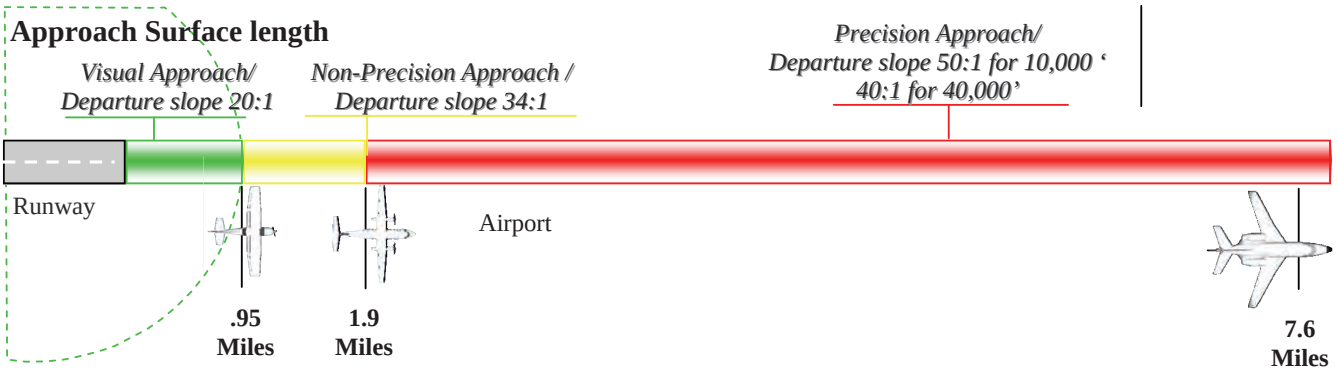




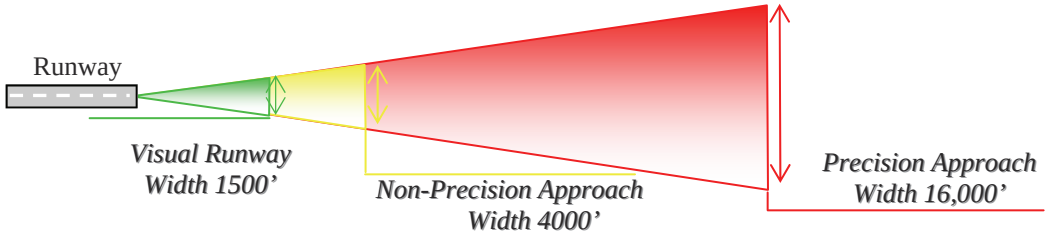
Understanding Airport Approaches

The following diagrams illustrate the three basic types of airport approaches and their fundamental characteristics. Understanding your airport's current and future approaches will help you identify areas that should be included in your initial study area and eventual airport influence area.
*All approach slope are based on the FAA's FAR Part 77 *Imaginary Airspace Surfaces*, and are the typical approach slopes found at all airports.

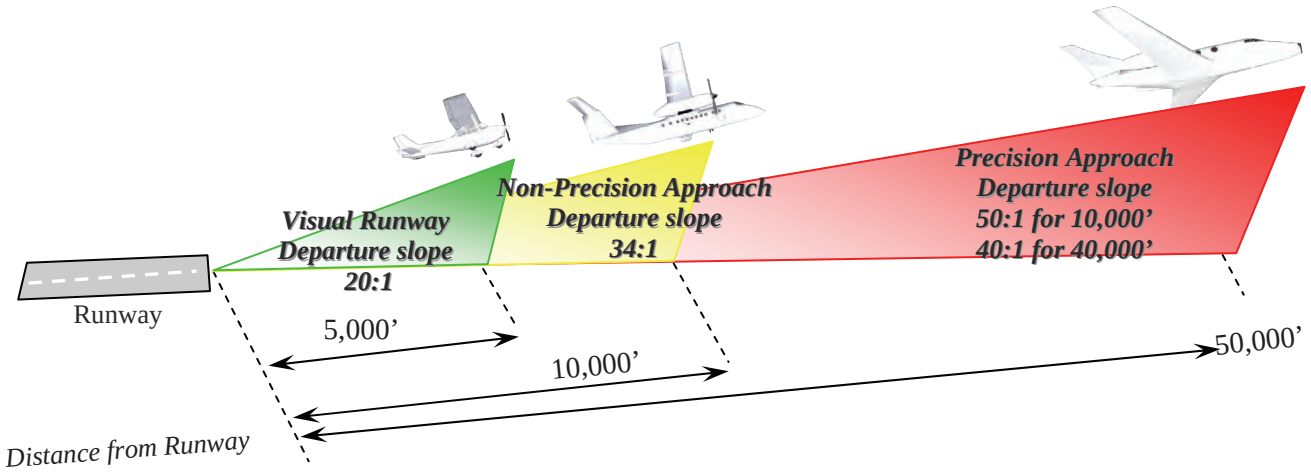
Approach Surface Length



Approach Surface Width



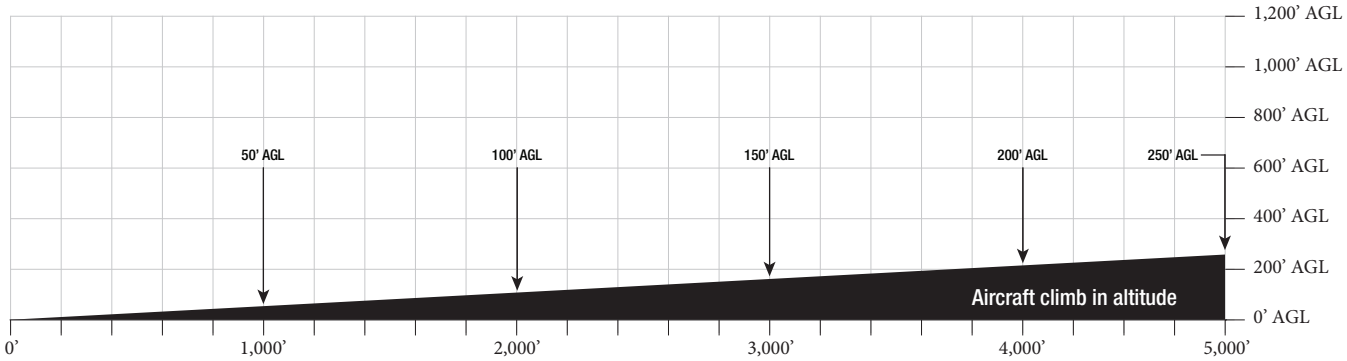
Approach/Departure Gradient



Airport Approach/Departure Gradient and Length

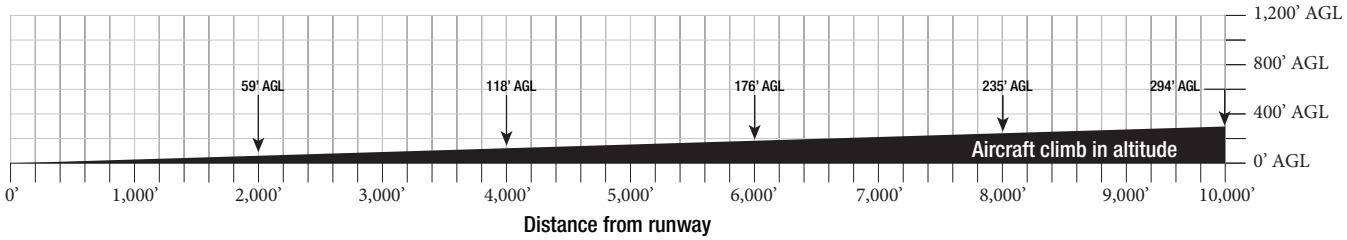
The following diagrams illustrate the three basic types of airport approaches and aircraft altitude in relation to their distance from the runway. Generally the lower the altitude the greater the impacts. The following approach/departures gradients are based upon the minimal airspace identified in the FAR Part 77 Imaginary airspace surfaces.

Visual Runway Approach/Departure Slope: 20:1



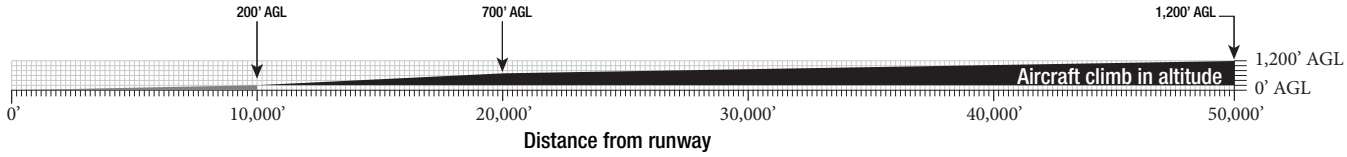
Use a run rise ratio of 20 to 1. So for every twenty feet the surface rise one foot.

Non-Precision Approach/Departure Slope: 34:1



If the airport has instrument approach procedures, a more extended area may be affected by aircraft flying at altitudes below that of the normal traffic pattern.

Precision Approach/Departure Slope: 50:1 for 10,000 feet, 40:1 for 40,000 feet



What are general aviation aircraft?

General aviation aircraft come in all sizes and types. They range from ultralights and single engine airplanes to business jets as large as a 747 or A380 commercial airliner. Helicopters, seaplanes, sailplanes, former military aircraft, and even hot air balloons are all general aviation aircraft. For basic planning purposes, aircraft can be further broken down into the follow categories: single engine, multi engine, jet, high performance, sea plane, helicopter, lighter than air, and gliders. Understanding your community airport's fleet mix will help determine potential impacts

Single Engine Aircraft make up the majority of Washington State's aircraft fleet. These aircraft generally fly the traffic pattern at un-towered airports. Sound characteristics vary greatly between modes.

Seaplane/Float Plane is an amphibious aircraft that can take off and land both on conventional runways and water. Piston driven sea planes are often slow and posses a larger noise signature. Their climb profile is often shallow.

Twin Engine Aircraft typically fly a wider and higher traffic pattern. These aircraft may use a straight in and out approach or the traffic pattern. Aircraft often climb to altitude quickly. Twins engine aircraft often require a longer runway than single engine aircraft. A loss of one engine may pull the aircraft to the left or right of their flight path

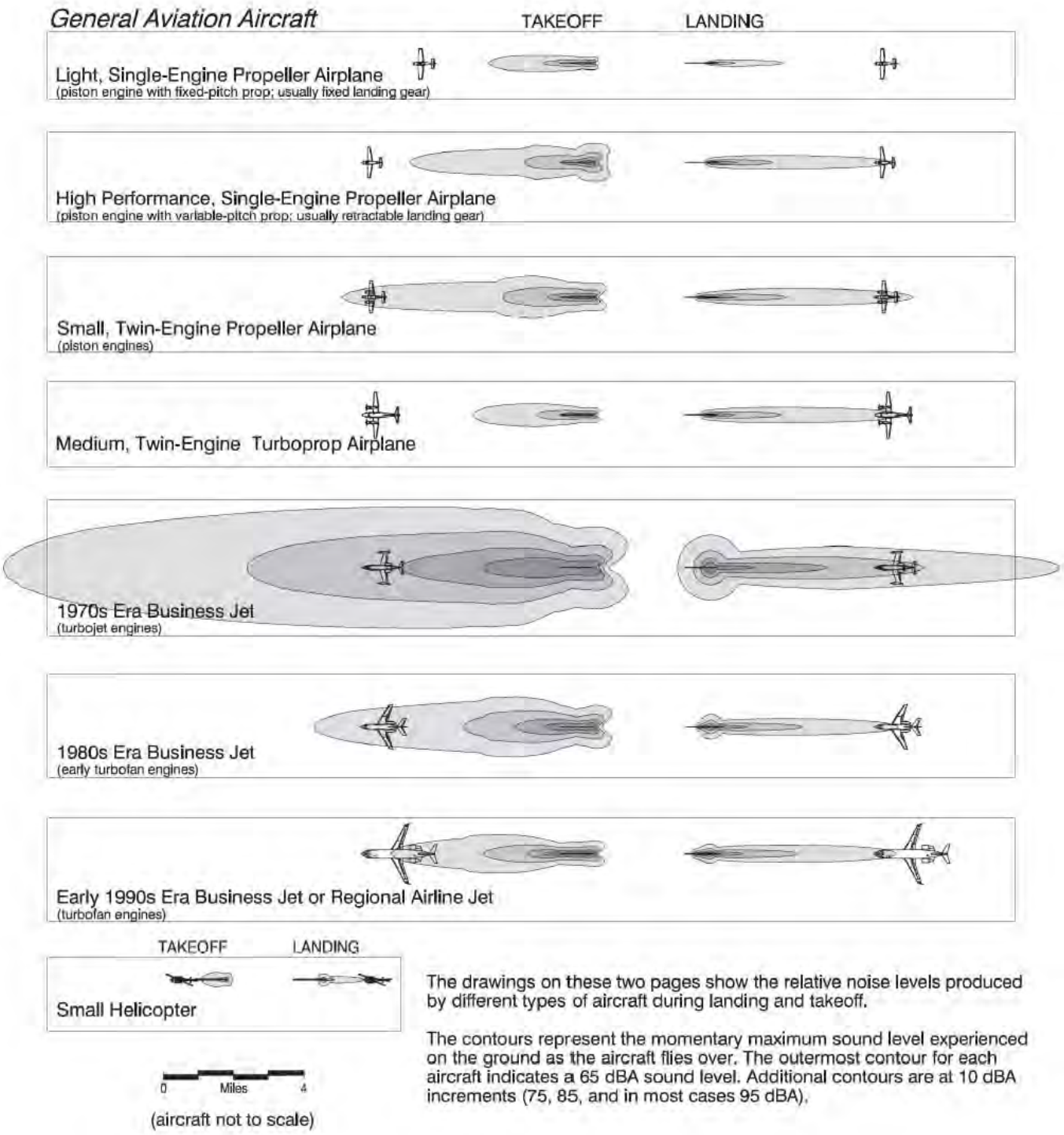
High Performance Aircraft have an engine of more than 200 horsepower (AC61.3). Some high performance aircraft include Cessna 182 and Cirrus SR 22. Aircraft may fly a straight in and out approach or a higher and wider traffic pattern.

Jets on average are larger than single engine aircraft. These aircraft typically fly a straight in and out approach and require a longer runway than their single engine counterparts.

Helicopters often fly a parallel traffic pattern, different than fixed wing aircraft. Helicopters fly lower and climb slowly than single engine or jets. The aircraft's main rotor produces a particularly noticeable noise signature.

Ultralight Aircraft are generally light-weight, slow moving, 1-or-2-person airplanes that may be equipped with an engine or have similar characteristics to gliders.

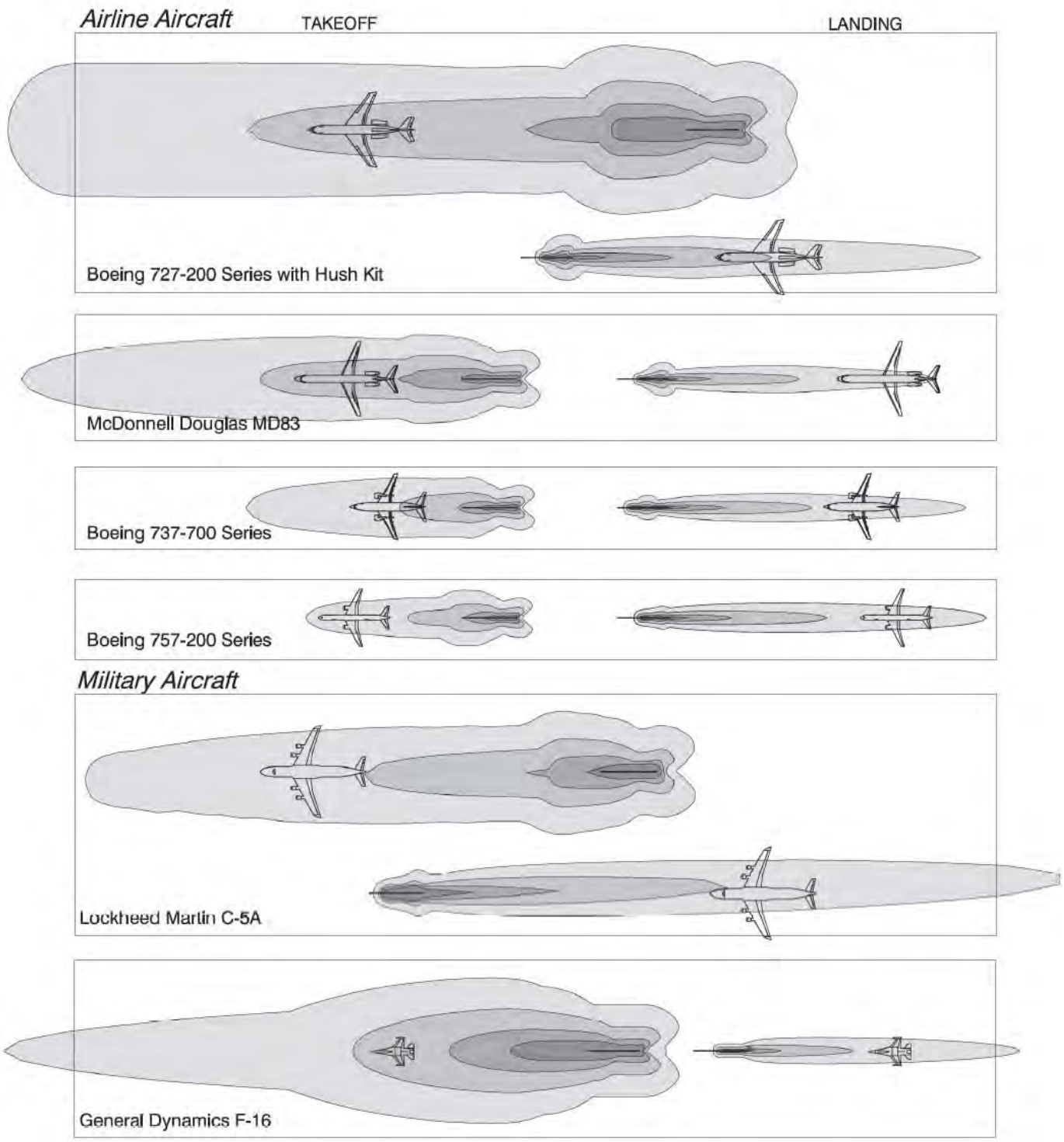
Gliders do not generate a noticeable amount of noise the tow planes used to bring the aircraft to altitude are a factor are generally single engine aircraft. Consult with you local pilot community for details on glider operations.



The drawings on these two pages show the relative noise levels produced by different types of aircraft during landing and takeoff.

The contours represent the momentary maximum sound level experienced on the ground as the aircraft flies over. The outermost contour for each aircraft indicates a 65 dBA sound level. Additional contours are at 10 dBA increments (75, 85, and in most cases 95 dBA).

Source: California Airport Land Use Planning Handbook, 2002



Source: California Airport Land Use Planning Handbook, 2002

Topography

When identifying your airport's influence area, be sure to consider how topography influences the airport and aircraft operations. Topography can impose physical constraints and unique operational challenges to aircraft movement as well as decrease the ability of the airport to attract business aircraft that rely on enhance navigational needs.

Disproportionate Impacts

Mountainous regions, ridgelines, and hills can be attractive places to construct residential dwellings, cell towers, and other facilities. However, these uses in the wrong place may impact the airport. The uses and activities may also be negatively impacted by noise, light, vibration, fumes, and low-flying aircraft.

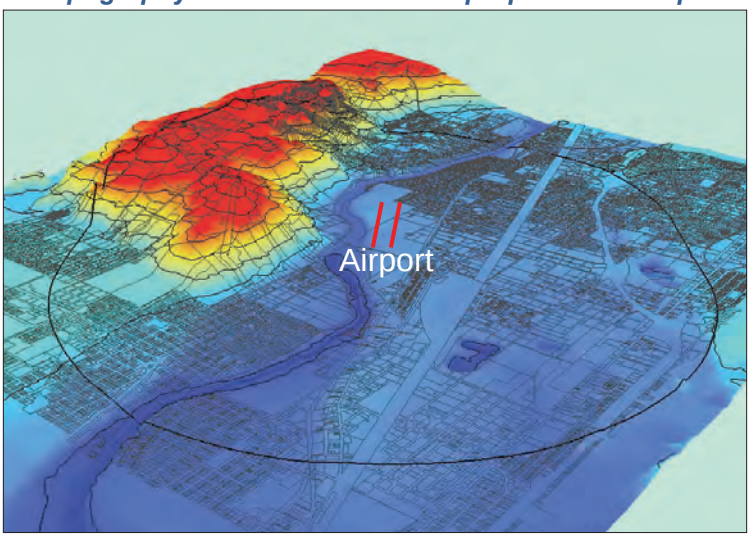
Analysis

Topographic information can be combined with other data to identify areas where noise and other negative impacts may pose a challenge to airport operation or reduce livability from increases in noise, low-flying aircraft, fumes, and vibration. In this example, the topography rises above the airport elevation and is within the airport influence area. Information on the airport, flight characteristics, and impacts from topographic features can be found within the Airport Master Plan and/or the airport manager, pilots, and aviation businesses.

Constraints

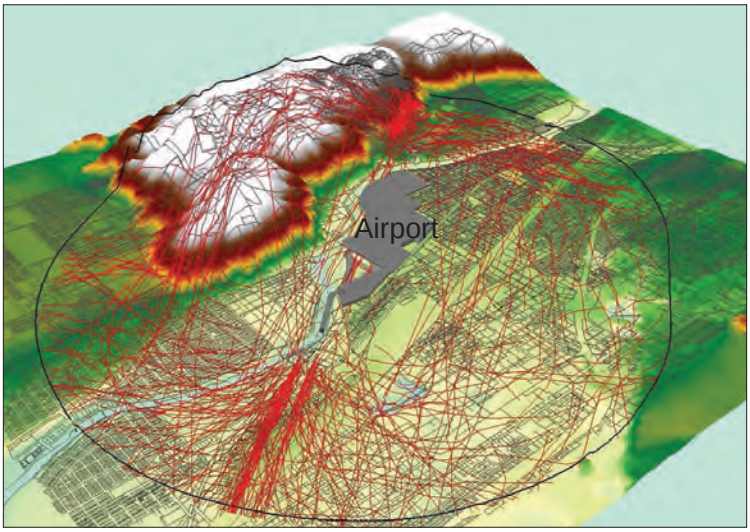
The topography within the airport influence area is an important factor to consider during your assessment. Terrain can significantly affect arrival and departure flight routes of an airport. In this example, an airport has a topographical feature that prohibits the execution of a left hand traffic pattern on one runway end. Aircraft traffic to the right of the runway will be reduced.

Topography With Potential for Disproportionate Impacts



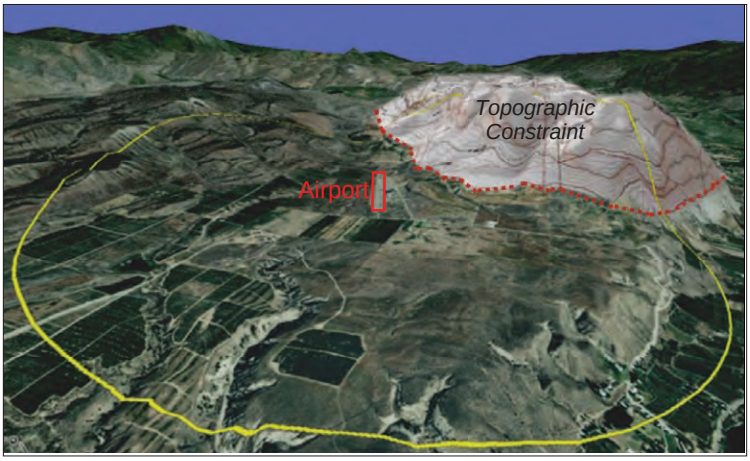
Felts Field, WA

Radar Track Data Clipped and Draped Over Topography



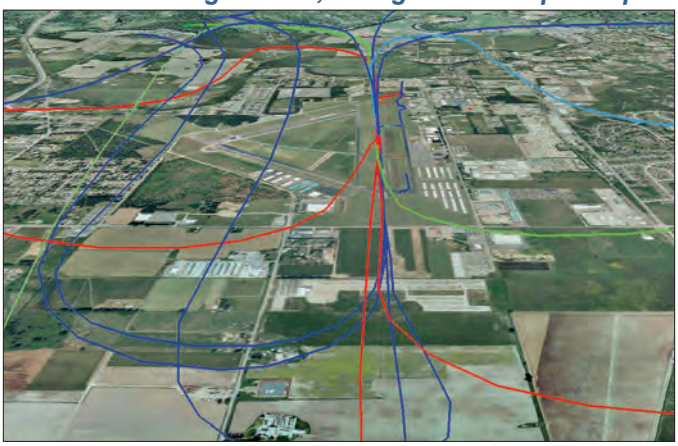
Felts Field, WA

Tonasket Municipal Airport



GPS Flight Tracks

GPS Flight track, Arlington Municipal Airport

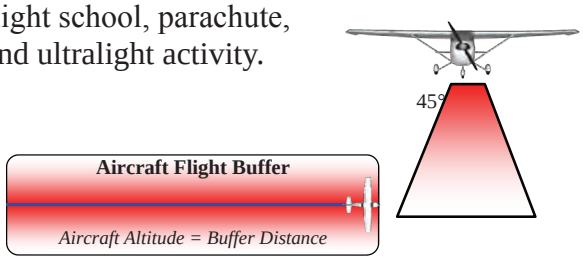


GPS Flight track data is not a necessary component of the airport land use compatibility planning process, but can be an effective tool in educating decision makers and the public.

Flight track data can be a useful tool to identify airspace used by aircraft and identify areas impacted by airport operations. It can be an extremely effective tool in communicating flight characteristics to decision makers.

If flight track data is not available for your airport it may be generated by using GPS equipped aircraft. GPS data may be gathered in coordination with aviation services or the airport sponsor. Also, check with WSDOT Aviation. While this type of data will not be as good as a sampling of radar track data from the FAA, it can provide useful information and assist in addressing land use within the airport influence area. Data collection should following the following principles:

- Include an adequate sampling of data.
- Record weather conditions during data collection.
- Represent the airport's current fleet mix.
- Represent the airports traffic pattern.
- Record actual operations.
- Identify all aviation activities such as flight school, parachute, and ultralight activity.

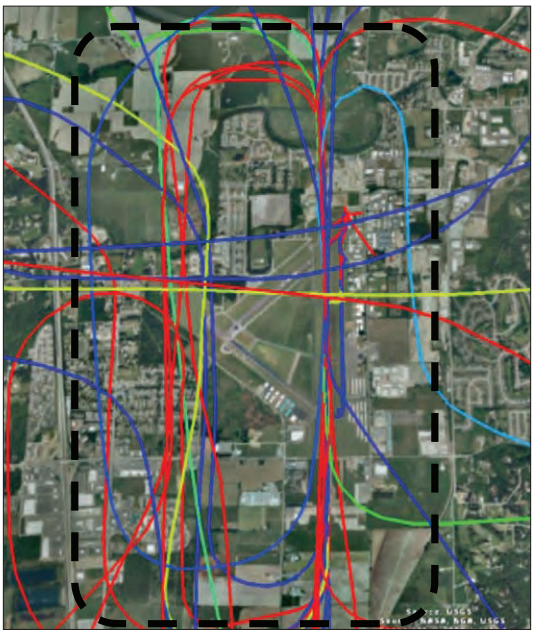


Why are GPS tracks good tools for planners?

- 3D visualization tool for decision makers.
- Precise spatial representation of aircraft: location, altitude.
- Makes visualizing complex concepts like the airport influence area easier.

Remember to include the airport traffic pattern and buffer.

Aircraft operations may vary depending on weather conditions, aircraft design, and pilot characteristics. Flight impacts, such as noise, are also not limited to just directly below the aircraft, and can extend outward affecting large areas. A good rule of thumb may be to encompass a corridor of land within which the aircraft can be heard and seen, within a 45° angle downward from the aircraft.



The Airport Influence Area includes 80 to 85 percent of Aircraft Operations

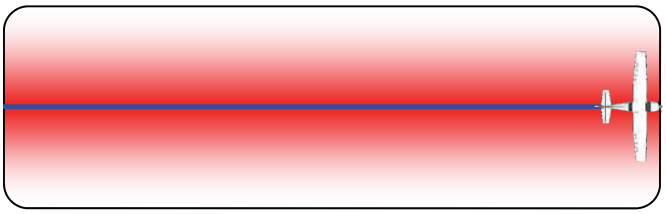
Aircraft Flight Track/GPS Analysis

When drawing the airport influence area boundary, do not attempt to encompass every flight track, aim for about 80 percent of the flight data. If you are defining the boundary based on information from pilots and others, you will not have 100 percent coverage in any case. However, even with GPS flight track data, you can omit the stray tracks that do not follow the typical routes.

Radar Tracks

When available, radar tracks can be a helpful tool in identifying areas overflown by aircraft. Radar track data is generally available at towered airports and may also be available if your airport is within a short distance of an airport with a radar tower. Airport managers will be your best point of contact when requesting this data.

Radar track data is not a requirement to effectively analyze airport land use compatibility. But like GPS tracks, they can be an effective tool in educating decision makers and the public on where aircraft fly. The adjacent diagram of Felts Field shows flight track data from an FAA Tower. The flight data tracts represent the location and vertical altitude of the aircraft.



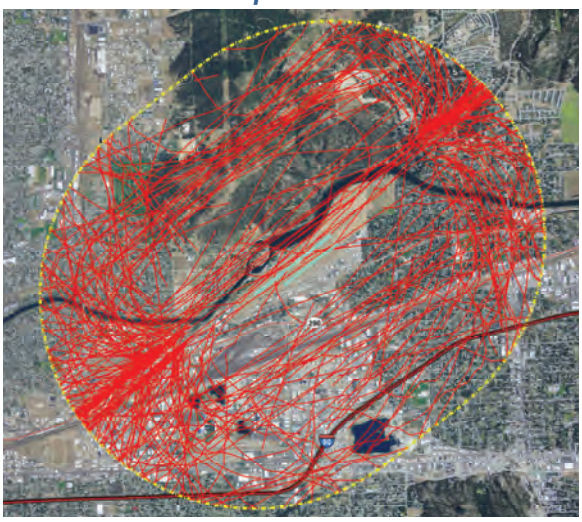
Remember to include a buffer beyond where the radar tracks are drawn.

Aircraft impacts, such as noise, are not limited to areas directly below the aircraft similar to GPS data. Aircraft operations may vary depending on weather conditions, aircraft design and pilot characteristics. Flight impacts. A good rule of thumb may be to encompass a corridor of land within which the aircraft can be heard and seen, within a 45° angle downward from the aircraft.

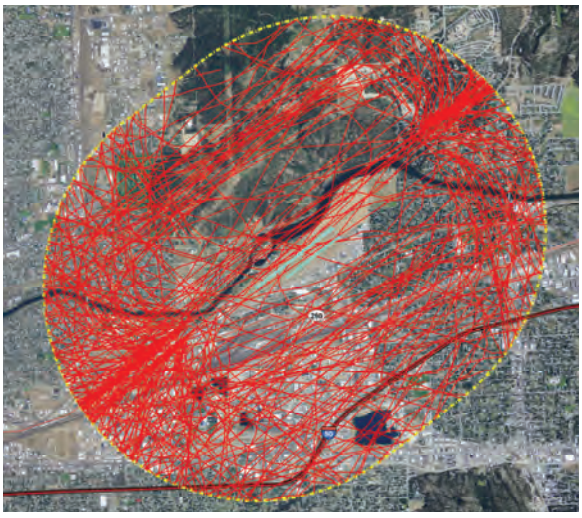
Radar Limitations

Depending upon the airport involved, a high percent of aircraft may not create a radar track because they are not equipped with transponders. Transponders are not required at airports located outside of Class C and Class B airspace, and radar coverage may be spotty or non-existent for some airports even within Class C and Class B airspace.

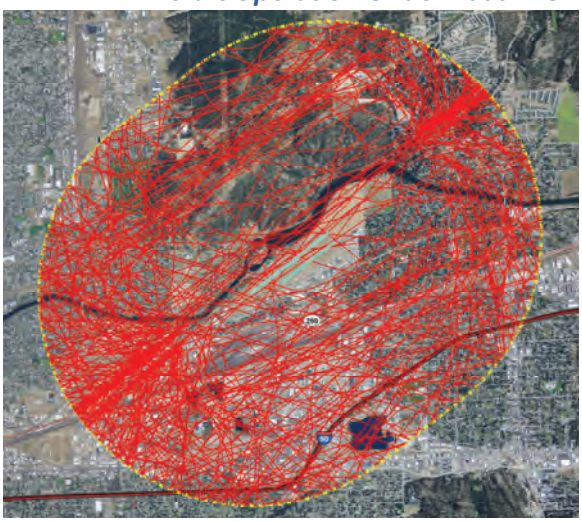
Aircraft Operation Under 1000' AGL



Aircraft Operation Under 1500' AGL



Aircraft Operation Under 2000' AGL



Felts Field Spokane, WA

Radar track data is representative of aircraft operations under 2,000 feet AGL for one week in October at Felts Field. Radar track data was sorted by altitude and clipped using a 10,000 foot buffer. In most cases, aircraft activity increases significantly during times of good weather

Aviation Impacts: Vibration, Light, Fumes and Low-flying Aircraft

Aviation impacts of vibration, light, fumes, and low flying aircraft can produce an adverse response in many people well beyond the airport boundary. These negative reactions are frequently expressed in the form of annoyance. Elsewhere, especially in locations beneath the traffic patterns of general aviation airports, a fear factor also contributes to some individuals' sensitivity to aircraft overflights.

Vibration

A vibration occurs when pressure waves or sound waves travel from one object to another, transferring energy. Sound waves are moving energy that travels through the air as a pattern of changing or oscillating pressure waves. Because air is a gas, it presents less friction to a pressure wave than a solid. Thus an unobstructed pressure wave can travel a longer distance before all of its energy is lost as heat. When a pressure wave strikes a wall of a home, part of the energy is transferred to the structure in the form of a vibration. This vibration in turn can create an annoyance for occupants of a structure.

Blade slap
Tieton State Airport

Helicopters produce the most notable source of vibration associated with general aviation activity. The rotating blade creates a phenomenon known as blade slap that varies in degree depending upon the speed and descent rate of the helicopter. Vibration mostly affects the airport approach and can also impact areas behind the start of takeoff roll for jet aircraft. Vibration can also be a problem with light, piston driven aircraft. For example, experience shows us a pre-1970 Cessna 185 on departure with a prop speed between 2,750 and 2,800 RPMs can produce a significant noise signature and related vibration.

Light

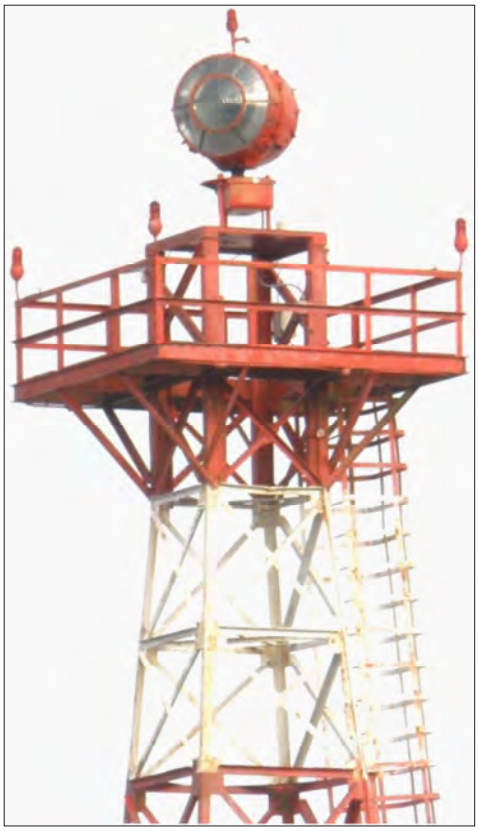
Although often overlooked as a compatibility factor, aviation related light can be a point of contention for airport neighbors. Light pollution, also known as photopollution or luminous pollution, is often defined as excessive or obtrusive artificial light. This aviation byproduct is most impactful in close proximity to the airport. Check with the airport manager to see if on airport light has been an issue in the past or could be an issue in the future.

Approach Lighting System

On Airport light

The primary sources of on airport light are: the Approach Light Systems (ALS), rotating light beacon, runway lights and general facility lighting.

Rotating Light Beacon



- The Approach Light Systems (ALS) provides the basic means to transition from instrument flight to visual flight for landing. Operational requirements dictate the sophistication and configuration of the approach light system for a particular runway.
- A rotating light beacon indicates the airport's location to pilots at night. It is often mounted on top of a tall structure or control tower above other buildings on the airport. It produces flashes of light very similar to a lighthouse.
- Runway lights come in a variety of intensities including High Intensity Runway Lights (HIRL), Medium Intensity Runway Lights (MIRL), and Low Intensity Runway Lights (LIRL). These types of lights are usually confined to airport properties in urban environments. Due to the nature of nighttime flight operations, aircraft landing lights are usually high intensity. Aircraft descending in altitude during the approach can impact adjacent property. In some cases, the landing lights of large aircraft can be seen for several miles.

Fumes

The impact that aviation fumes have on the airport neighbors' quality of life is often hard to quantify. Aircraft operations can produce small particles of carbon-based chemicals, which can be easily inhaled and, in some cases, cause respiratory inflammation. Exposure to these chemicals may be greater for people living near smaller airports. Larger airports with commercial service typically have buffer to reduce the residents' exposure to fumes and pollution. Small airports in heavily populated areas often don't have these buffers; therefore, residents may be more directly exposed to aircraft emissions[1].

Jet Fumes

Fumes and unpleasant smells (e.g. kerosene) are particularly noticeable from turbine-powered aircraft (jets, turbo-props, and some helicopters). On airport industrial activity can also be a source of offensive odors. Planners and decision makers should consult the airport manager about areas within the airport's environment exposed to the highest levels of fumes.

Low-Flying Aircraft

The sight and sound of low flying aircraft in the traffic pattern can be perceived by some as dangerous, and produce a negative emotional response. Fear and anxiety are two common emotional responses linked with perceived threats. Fear is often related to the specific event and may be related to future events, such as worsening of a situation, or continuation of a situation that is unacceptable. Anxiety is often a result of ongoing or multiple threats, which are perceived to be uncontrollable or unavoidable. These emotional responses often increase stress and fuel opposition to normal airport operations.

On the Ground Perspective

[1] *Aircraft Emission Impacts in a Neighborhood Adjacent to a General Aviation Airport in Southern California*, Environ Sci. Technol. 2009, 43, 8039-8045

Appendix D — Learning More About: Protecting and Evaluating Airspace for Airports

Introduction

Tall structures, smoke, and rising terrain are just a few conditions that can create hazardous conditions for aircraft. Therefore, protecting against them is essential to promoting effective land use compatibility adjacent to airports. Land uses that are hazards to flight may also impact an airport's continued viability and its ability to promote economic development through navigation and other improvements that are necessary in facilitating transportation access to communities. This appendix presents guidance to assist airports operators, planners, local jurisdictions, and land use developers on how to identify and protect critical airspace for aircraft landing and departing from airports.

Tall Structures

A graphic depiction of airspace obstructions (worst case scenario).

According to Chapter 14.12 RCW, an airspace hazard "endangers the lives and property of users of the airport and of occupants of land in its vicinity, and also, if of the obstruction type, in effect reduces the size of the area available for the landing, taking-off and maneuvering of aircraft thus tending to destroy or impair the utility of the airport and the public investment. Accordingly, it is hereby declared:

(1) That the creation or establishment of an airport hazard is a public nuisance and an injury to the community served by the airport in question;

(2) That it is therefore necessary in the interest of the public health, public safety, and general welfare that the creation or establishment of airport hazards be prevented; and

(3) That this should be accomplished, to the extent legally possible, by exercise of the police power, without compensation.

It is further declared that both the prevention of the creation or establishment of airport hazards and the elimination, removal, alteration, mitigation, or marking and lighting of existing airport hazards are public purposes for which political subdivisions may raise and expend public funds and acquire land or property interests therein."

There are three basic types of airspace hazards that must be considered when establishing land use compatibility policies to protect critical airspace:

- **Height Hazards** – The best recognized among airspace hazards is the potential for structures or tree or the use of land which would obstruct the flight paths of aircraft operating at the airport or would otherwise be hazardous to such landing and taking-off of aircraft at an airport.
- **Wildlife Hazards** – Bird strikes are the most common type of wildlife hazards to aircraft operations on and near airports, but animals such as deer and coyotes are also a significant factor at airports.
- **Other Physical, Visual, or Electronic Hazards** – Thermal plumes from power plants, smoke, glare, and light can also impact aircraft operations.

Local Role in Addressing Airspace Hazards

The standards for identifying obstructions to airspace are set forth in Federal Aviation Regulations (FAR) Part 77 *Imaginary Surfaces*. However, local jurisdictions play a critical role in protecting the airspace around airports from airspace hazards. This is particularly important because the FAA does not have enforcement authority to regulate local land uses. Cities and counties are also on the front lines of the land use permitting process and can provide early notification and assistance to affected development proposals early in the life of a project before large sums of resources are consumed.

Since the mid 1940s, the state has enacted several pieces of legislation to address airspace hazards and other land use activities that may be incompatible with airport operations. State legislation has authorized city and county jurisdictions to adopt comprehensive plans and establish development regulations under their police powers to prevent the creation or establishment of hazards and to discourage incompatible land uses. Under this authority, jurisdictions can adopt, administer, and enforce regulations in a manner that specifies the land uses permitted or restricted. To that end, many implementation tools are available to jurisdictions to control land uses that may impact public use airports. One of the most successful tools that a jurisdiction can adopt for regulating airspace is the development of an airspace hazard overlay. The airspace hazard overlay is a diagram with text that defines critical airspace surfaces around an airport, and provides regulatory criteria that can be used to avoid, minimize or mitigate obstruction. More information on overlay regulations is provided in Chapter 4.

Where an airport is owned or controlled by another jurisdiction, the jurisdiction owning or controlling the airport and the jurisdiction in which the airport is located may by ordinance or resolution create or authorize a joint agreement to adopt, administer, and enforce regulations to regulate land uses to address hazards. Procedures for adopting comprehensive plans and regulations should follow established state and local procedures.

Using the Airport Master Plan

If available, the Airspace Drawing which is prepared as part of the Airport Master Plan and Airport Layout Plan, is a useful tool in identifying critical airspace surfaces and obstruction issues. The airspace plan uses contour elevations to depict a three dimensional diagram of the Part 77 surfaces as they relate to a specific airport.

The Part 77 airspace diagram is overlayed onto a USGS map or other scaled topographic map to graphically portray the relationship between existing landforms and airspace surfaces. Some obstruction detail may already be identified on the airspace drawings. Before relying on the information in the Airspace Drawing, it is important to make certain that the background information which was used to size of Part 77 airspace surfaces addresses future airport improvements such as proposed extensions in the airport runway.

Limits on Federal Authority Under Part 77

The FAA's authority to promote the safe and efficient use of the navigable airspace, whether concerning existing or proposed structures, is predominantly derived from Title 49 USC Section 44718 (Section 44718). However, Section 44718 does not provide specific authority for the FAA to regulate or control land uses activity. The FAA strongly recommends that local governments having jurisdiction over land use activities establish airspace regulations to control obstructions to the FAR Part 77 Surfaces.

Federal action in response to new airspace obstructions is primarily limited to three possibilities:

- For airports with instrument approaches, an obstruction could necessitate modification to one or more of the approach procedures (particularly greater visibility and/or cloud ceiling minimums) or even require elimination of an approach procedure.
- Airfield changes such as displacement of a landing threshold could be required, which would shorten the available runway length for departing and arriving aircraft.
- The airport sponsor could be found in noncompliance with the conditions agreed to upon receipt of grant funds and could become ineligible for future grants (or, in extreme cases, be required to repay part of a previous grant).

Thinking in Multi-Dimensional Levels

The space around airports is conceptualized as conical surfaces and depicted as an inverted cone superimposed over the dimensions of the airport. For the purposes of this discussion, it is helpful to think of the space above and around an airport, in multi-dimensional terms:

- The vertical element encompasses the space above the airport containing the approach to the airport and other flight critical elements.
- The horizontal element encompasses the ground space Immediately underneath aircraft approach and transitional areas.

Height Hazards: Attributes and Issues

The loss of navigable airspace to non-aviation uses particularly within the flight critical airspace of an airport can creates a hazard to flight activity, aircraft passengers, and to people and property on the ground; additionally, these obstructions inhibit the safe and efficient operation of the airport, in general. Two things are necessary to fully understand the seriousness of airspace obstructions: one, the concept of imaginary surfaces and their relationship to the airport, and two, the nature of flight in the vicinity of an airport.

Runway Approaches

As previously mentioned, the size of a runway's imaginary surface is determined by the type of approach established for each runway end:

- **Visual** – Visual approach is the most basic approach; no special navigational aids are required, reasonable weather conditions are necessary, and the approach slope is 20:1.
- **Non-Precision** – A non-precision approach is an instrument approach and landing which utilizes lateral guidance but does not utilize vertical guidance. Non-precision approaches are often conducted with less use of automated systems than precision approaches. The approach slope is 34:1.
- **Precision** – Special navigational support; approach is always aligned with a specific runway and is related to a specific glide path; approach slope 50:1 for inner 10,000 feet, then 40:1 for outer 40,000 feet; weather conditions not as important as reliance for safe landing is upon instruments; often served by an Instrument Landing System, sometimes a Microwave Landing System, and soon a Global Positioning Satellite approach. Precision approaches are typically found at busier facilities.

Defining FAR Part 77 Obstruction Surfaces

Obstruction surfaces (often also referred to as imaginary surfaces) define the critical flight areas in airspace around an airport. FAR Part 77 *Objects Affecting Navigable Airspace* delineates these surfaces based upon the category of the airport runway and the category of runway approach.

The three-dimensional airspace above civil airport runways that requires protection from obstructions is bordered by five surfaces. These surfaces are defined in Part 77 Section 77.25 and are illustrated. The five surfaces are: Primary Surface, Transitional Surface, Horizontal Surface, Conical Surface, and Approach Surface.

- **Primary Surface** – The primary surface must be clear of all obstructions except those fixed by their function, such as runway edge lights, navigational aids, or airport signage. The majority of the primary surface is already controlled by runway safety area criteria contained in FAA AC 150/5300-13, *Airport Design Standards*, and therefore does not warrant inclusion as a land use zone.

  Even though the primary surface is not included as a land use zone, it functions as an important safety area since it is longitudinally centered on a runway and is intended to provide an obstruction-free area around the runway surface. When the runway has a prepared hard surface, the primary surface extends 200 feet beyond each end of that runway.

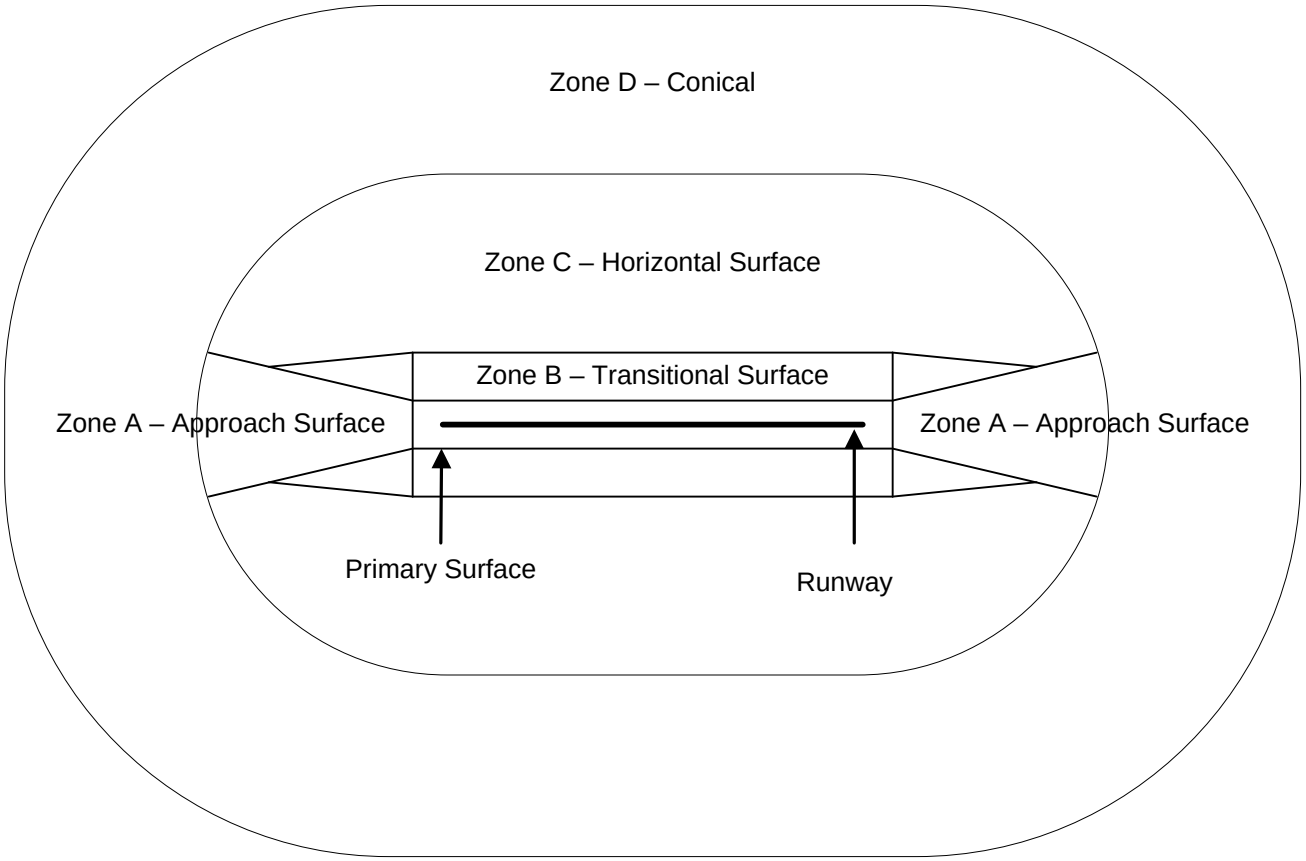
When the runway does not have a prepared hard surface, or planned hard surface, the primary surface terminates at each end of the runway. The width of a primary surface ranges from 250 to 1,000 feet depending on the existing or planned approach and runway type (visual, non-precision, or precision).

- **Transitional Surface** – The transitional surface extends outward and upward at right angles to the runway centerline and extends at a slope of 7 feet horizontally for each 1-foot vertically (7:1) from the sides of the primary and approach surfaces. The transitional surfaces extend to the point at which they intercept the horizontal surface at a height of 150 feet above the established airport elevation. For precision approach surfaces that project through and beyond the limits of the conical surface, the transitional surface also extends 5,000 feet horizontally from the edge of the approach surface and at right angles to the runway centerline.
- **Horizontal Surface** – The horizontal surface is a horizontal plane located 150 feet above the established airport elevation and encompasses an area from the transitional surface to the conical surface. The perimeter is constructed by generating arcs from the center of each end of the primary surface and connecting the adjacent arcs by lines tangent to those arcs. The radius of each arc for all runway ends (designated as utility or visual) is 5,000 feet and 10,000 feet for precision and non-precision runway ends.
- **Conical Surface** – The conical surface extends upward and outward from the periphery of the horizontal surface at a slope of 20 feet horizontally for every 1-foot vertically (20:1) for a horizontal distance of 4,000 feet. Height limitations for the surface range from 150 feet above the airport reference elevation at the inner edge to 350 feet above ground level (AGL) at the outer edge.
- **Approach Surface** – The approach surface is longitudinally centered on the extended runway centerline and extends outward and upward from the end of the primary surface. The approach slope of a runway is a ratio of 20:1, 34:1, or 50:1, depending on the approach type. The length of the approach surface varies from 5,000 to 50,000 feet and also depends upon the approach type. The inner edge of the approach surface is the same width as the primary surface and expands uniformly to a width ranging from 1,250 to 16,000 feet, depending on the type of runway and approach.

Figure D-1 and Table D-1 depict various dimensional requirements for the primary surface and other FAR Part 77 surfaces. A visual approach runway has relatively small surfaces with approach and horizontal surfaces extending 5,000 feet from the primary surface at an approach slope of 20 feet horizontally for each 1-foot vertically (20:1). For a non-precision approach runway, both the approach and horizontal surfaces extend either 5,000 or 10,000 feet from the primary surface, depending on the design category of the runway. The approach surfaces for precision approach runways are similar to those for non-precision approach runways except that the approach surface extends 50,000 feet from the primary surface, and the horizontal surface extends 10,000 feet from the primary surface.

New approach procedures that use Global Positioning Systems (GPS) such as Area Navigation (RNAV), and Lateral Precision with Vertical Guidance (LPV) approaches, which create a greater degree of flexibility in the definition of non-precision and precision instrument approaches. The FAA has not altered the text related to FAR Part 77 to reflect these changes to date.

Figure D-1
Part 77 Obstruction Surfaces
(One Utility Runway - Visual Approach)



Source: Federal Aviation Administration

Table D-1
FAR Part 77 Surface Dimensional Requirements

Dim.	Item	Dimensional Standard (feet)					
		Visual Runway		Non-Precision Instrument Runway			Precision Instrument Runway
		Utility	Larger Than Utility	Utility	Larger Than Utility X	Larger Than Utility Y	
A	Width of primary surface and approach surface width at inner end	250	500	500	500	1,000	1,000
B	Radius of horizontal surface	5,000	5,000	5,000	10,000	10,000	10,000
Dim.	**Item**	**Visual Approach**		**Non-Precision Instrument Approach**			**Precision Instrument Runway**
		Utility	**Larger Than Utility**	**Utility**	**Larger Than Utility X**	**Larger Than Utility Y**	
C	Approach surface width at end	1,250	1,500	2,000	3,500	4,000	16,000
D	Approach surface length	5,000	5,000	5,000	10,000	10,000	*
E	Approach slope	20:1	20:1	20:1	34:1	34:1	*

X Visibility minimums greater than ¾ mile.
Y Visibility minimums as low as ¾ mile.
* Precision instrument approach slope is 50:1 for inner 10,000 feet and 40:1 for an additional 40,000 feet.

How to Perform a FAR Part 77 Airspace Assessment

Getting Started – Data Collection Checklist

Before making an airspace assessment, be sure to gather basic information about the airport, structure, and geography. Do you have the following information?[1]

- Structure height _____
- Mean Sea Level (MSL) elevation of the terrain under the structure _____
- The distance, in a straight line, from the nearest point on runway to the structure _____
- Runway elevation (MSL) _____
- Approach type _____
- Runway length[2] _____
- Runway weight-bearing capacity _____
- Do you have a FAR Part 77 Airspace Diagram[3] _____

The Assessment – Step by Step

Step 1: Identify Type of Runway and Approach

Use the information from the data collection checklist to identify the runway approach type, runway length, and weight-bearing capacity. Then apply it to the table below to obtain the airspace dimensional standards for the runway.

There are two types of Visual Runway:

1. **Utility** – Accommodates aircraft less than 12,500 pounds.
2. **Larger Than Utility** – Accommodates aircraft more than 12,500 pounds.

There are three types of Non-Precision Instrument Runway:

1. **Utility** – Accommodates aircraft less than 12,500 pounds.
2. **Larger Than Utility** – Accommodates aircraft more than 12,500 pounds.
   - **Larger Than Utility X** – Accommodates aircraft more than 12,500 pounds with visible minimums greater than ¾ a mile.
   - **Larger Than Utility Y** – Accommodates aircraft over 12,500 pounds with visible minimums as low as ¾ a mile.

[1] Open-source software such as Google Earth™ and ArcGIS® Explorer can assist you in locating and obtaining basic distance and elevation data.

[2] Runway data for Washington State airports is available from the following sources: www.wsdot.wa.gov/aviation/allstateairports/default.htm and www.gcr1.com/5010web

[3] The FAA's FAR Part 77 Airspace Diagram is available at: www.wsdot.wa.gov/aviation/planning/civapimagsurf
Additional information about the FAA's FAR Part 77 and airspace obstructions is available at: www.wsdot.wa.gov/aviation/planning/default and www.faa.gov/airports_airtraffic/airports/regional_guidance/central/construction/part77

There is one type of precision instrument runway approach: precision instrument approach.

Slope Ratio (Run and Rise) – Now use and mapping resources to identify which airspace surface your structure falls under. This will give you the exact surface and slope ratio necessary for your airspace assessment.

Step 2: Determining the Structure Height

Use the following simple equation to determine the height of the proposed structure.

A = Elevation of terrain under structure _____

B = Height of Structure _____

A	+	B	=	Obstruction Height
_____	+	_____	=	_____

Step 3: Subtract the Airport Elevation to Find Total Obstruction Height

Airport Runway Elevation	-	Obstruction Height from Step 2	=	Total Height of possible obstruction or (X)
_____	-	_____	=	_____

Step 4: Determine the Distance From the Airport

C = Distance from airport to proposed site

_____

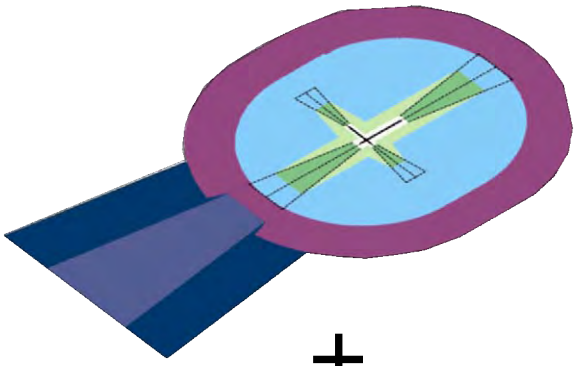
D = Slope Ratio _____ (See FAR Part 77 "Imaginary Surfaces" Diagram to determine necessary Ratio. Ratios include 7:1, 20:1, 34:1, 40:1 and 50:1)

F = Allowable Height at proposed location

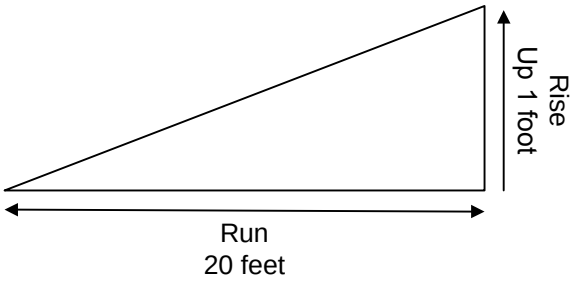
C	÷	D	=	F
_____	÷	_____	=	_____

Use Table D-1 to identify the applicable FAR Part 77 surfaces and dimensional standards in feet for your airport.

FAR Part 77 Airspace Diagram



Map Resource

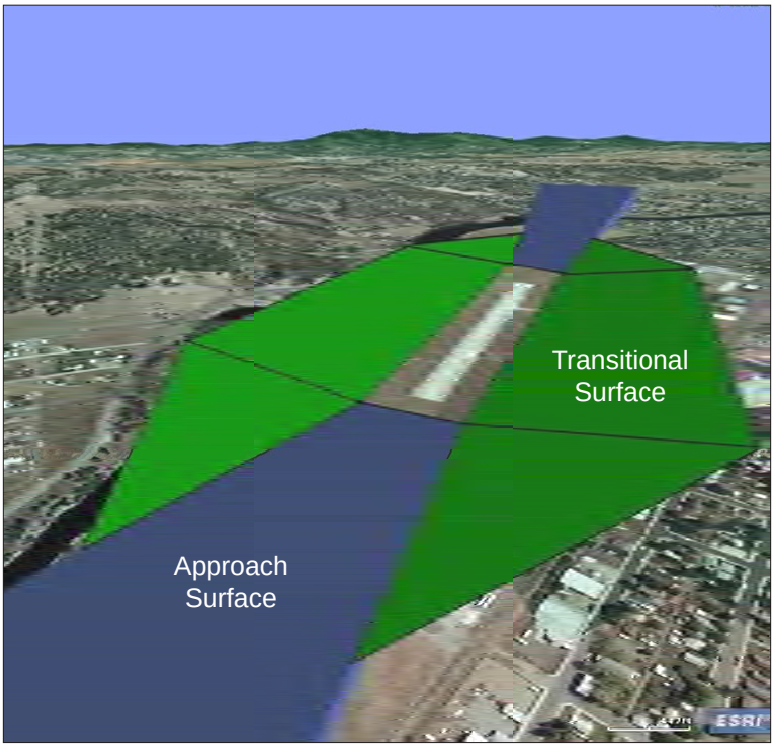


How the ratios work:
At a 20:1 ratio, for every 20 feet you go out, your elevation rises 1 foot.
At a 40:1 ratio, for every 40 feet you go out, your elevation rises 1 foot.

Step 5: Compare Obstruction Height to Allowable Height

Does the height of the Possible Obstruction (X) in Step 3 exceed the Allowable Height (F) in Step 4? If it does, then your structure penetrates the airspace surface. Air space assessments are just assessment: they provide a generalized idea of the structures relationship to the imaginary surface. Trained FAA professionals are the only individuals who should perform these highly specialized Aeronautical studies.

FAR Part 77 Transitional and Approach Imaginary Surfaces



The transitional surface can be one of the most difficult surfaces to understand, visualize, and measure. Note, the flared triangular portions are attached to the approach surface. This concept is critical to understanding the allowable height within these areas.

To calculate the allowable height within the flared triangular portions of the transitional surface, first determine the height of the closest point on the approach surface. Then measure from the approach surface point using a 7:1 run rise. This should give you a general idea of the allowable height in this area.

Remember, airspace assessments are used for general planning purposes only. Aeronautical studies are highly specialized and should only be performed by trained FAA professionals.

Role of the FAA in Regulating Airspace Hazards

As previously discussed above and in Chapter 4, the FAA has limited authority and scope to ensure that the imaginary surfaces described in FAR Part 77 are free of obstructions. To help ensure protection of the airspace essential to the safe operation of aircraft at and around airports, the FAA has established a process that requires project proponents to inform the agency about

No Objection – The subject construction did not exceed obstruction standards and marking/lighting is not required.

Conditional Determination – The proposed construction/alteration would be acceptable contingent upon implementing mitigating measures (marking and lighting, etc.)

Objectionable – The proposed construction/alteration is determined to be a hazard and is thus objectionable. The reasons for this determination are outlined to the proponent.

A Determination of No Hazard indicating that it has no objection to a proposed construction does not mean that the proposal is compatible with the airport.

The standards by which this airspace is defined are set forth by the federal government in Federal Aviation Regulations Part 77 (FAR Part 77) *Objects Affecting Navigable Airspace* (officially Title 14, Part 77 of the Code of Federal Regulations or 14 CFR Part77). Additionally, FAR Part 77 establishes requirements for notifying the FAA with regard to any proposed construction that could be deemed a hazard and it provides for aeronautical studies of these proposals to be conducted by the FAA.

Notification Requirements

Note that these notification sur-faces have a much shallower slope and extend farther from the runway than the obstruction surfaces typically shown in an airspace plan as described below.

Subpart B of the Part 77 regulations requires that the FAA be notified of any proposed construction or alteration within 20,000 feet of a runway and having a height that would exceed a 100:1 imaginary surface (1 foot upward per 100 feet horizontally) beginning at the nearest point of the runway. This requirement applies to runways more than 3,200 feet in length. For shorter runways, the notification surface has a 50:1 slope and extends 10,000 from the runway. Notification is required with regard to any public-use or military airport. Also requiring notification is any proposed object more than 200 feet in height regardless of proximity to an airport.

Exceptions to the notification requirement are allowed for "any object that would be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and would be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded would not adversely affect safety in air navigation."

When determining the height of structures, it is important to consider all of its components including elevator shafts, flag poles, and antennas that would extend above the roof level. Furthermore, proposed objects do not need to be permanent to require submittal of a notification. Notice also must be provided for temporary objects such as construction cranes. Such objects are critically important to airspace protection in that they often are taller than the ultimate height of the structure. Mobile objects on roads must be taken into account as well. To allow for vehicles, 17 feet must be added to the road elevation of Interstate highways, 15 feet added for other public roadways, and 10 feet to private roads. A 23-foot clearance over railroad lines is required.

The notification is to be provided using FAA Form 7460-1, Notice of Proposed Construction or Alteration. These days, the notice can be submitted on-line (https://oeaaa.faa.gov/oeaaa/external/portal.jsp) Receipt of the notice enables the FAA to evaluate the effect of the proposed object on air navigation and chart the object or take other appropriate action to ensure continued safety.

There is no cost for filing the Form 7460 notice. However, persons failing to comply with the provisions of FAR Part 77 are subject to Civil Penalty under Section 902 of the Federal Aviation Act of 1958, as amended and pursuant to 49 USC Section 46301(a).

By definition, any object that penetrates one of the imaginary surfaces is deemed an obstruction to air navigation. Not all obstructions are necessarily hazards, however. The determination of whether an object would be a hazard to air navigation is made as part of an aeronautical study conducted by the FAA as described below. However, the determination may not address cumulative impacts, or be consistent with the local jurisdictions own land use regulations, and may allow penetration of FAR Part 77 *Surfaces*.

In general, local governments should restrict the heights of objects near airports to below the FAR Part 77 Subpart C *Obstruction Surfaces*. Exceptions can be made for areas of high terrain, objects that are shielded by taller nearby objects, and objects that the FAA has determined to not be hazards. To assist in this regard, the state has several model zoning ordinances on file that are available to local governments. The model ordinance is built around the airspace plan drawing.

📖 www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.information/documentNumber/150_5190-4A

Aeronautical Studies

When the FAA receives a notice submitted by the project proponent in accordance with Subpart B requirements, Subpart D dictates that the FAA conduct an aeronautical study of the proposal.

The responsibility for preventing hazardous obstructions to airport airspace rests with state and local governments and the airport operator. The FAA merely provides technical expertise.

"In the aeronautical studies, present and future IFR and VFR aeronautical operations and procedures are reviewed and any possible changes in those operations and procedures and in the construction proposal that would eliminate or alleviate the conflicting demands are ascertained."

Several divisions of the FAA are involved in conducting aeronautical studies. Each division contributes to the review based on its particular area of expertise. The regulations do not specify a time limit for the FAA to complete an aeronautical study, but a typical turn-around time is 30 to 45 days.

After the FAA completes its aeronautical study of the proposed construction, it usually issues a form letter indicating its determination as to whether the specific proposal studied would be a hazard to air navigation. If the object is shielded by other taller objects or is located away from the normal traffic patterns and instrument approach routes, the outcome in most cases will be a "Determination of No Hazard" even if the object is technically an obstruction. As a condition for non-objection, the FAA may recommend that the object be marked and lighted in accordance with FAA standards.

If the aeronautical study finds that the object could adversely affect air navigation, the FAA will work with the proponent to seek modification to eliminate the problem. Adjustments to aviation requirements that would accommodate the proposed object are investigated as well. Ultimately, a "Determination of Hazard" could be issued.

Critical Concept!
Simply because the FAA has issued a Determination of No Hazard indicating that it has no objection to a proposed construction does not mean that the proposal is compatible with the airport.

Even under these circumstances, however, the determination is advisory and the FAA has no authority to prevent construction of the object. Federal action in response to new airspace obstructions is primarily limited to three possibilities:

- For airports with instrument approaches, an obstruction could necessitate modification to one or more of the approach procedures (particularly greater visibility and/or cloud ceiling minimums) or even require elimination of an approach procedure.
- Airfield changes such as displacement of a landing threshold could be required (especially at airports certificated for commercial air carrier service).
- The owner of an airport could be found in noncompliance with the conditions agreed to upon receipt of airport development or property acquisition grant funds and could become ineligible for future grants (or, in extreme cases, be required to repay part of a previous grant).

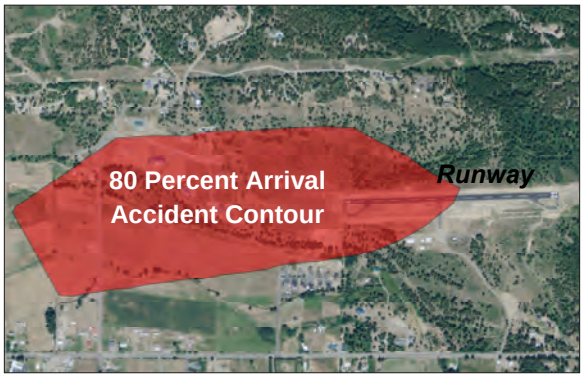
In the broader context of airport land use compatibility planning, the significance and limitations of FAA aeronautical study determinations are essential to recognize. These studies only address airspace issues. Simply because the FAA has issued a Determination of No Hazard indicating that it has no objection to a proposed construction does not mean that the proposal is compatible with the airport. Project proponents are known to wave the FAA determination in front of local decision makers and say that, because the federal government has no concerns, the local agency should approve the proposal. Compatibility with regard to noise, the density or intensity or the land use, and other factors also must be considered in the local decision. Height of the structure and its affect on airspace is only one part of the puzzle.

Appendix E — Learning More About: Describing and Evaluating Airport Safety Concerns

Aircraft Accident Data

Location Patterns

For airport land use compatibility planning purposes, the most essential information to have about aircraft accidents is data showing where accidents have historically occurred around airport runways. For general aviation aircraft accidents, the most comprehensive database currently available is the one compiled for the *California Airport Land Use Planning Handbook* published in 2002 by the California Division of Aeronautics. This database contains data on nearly 900 accidents that took place within 5 miles of an airport, but not on the runway itself. The data is from accidents nationwide and covers the 10 years from 1983 to 1992, though not all accidents during this period are included.



Historic accident distribution contours were georeferenced and overlayed on this community airport's runway end using GIS. Data Source California Airport Land Use Planning Handbook, 2002

Figures E-1 and E-2 depict the geographic distribution of arrival and departure accidents relative to the end of the runway that was used or intended to be used. These figures show all the accidents in the database. The California handbook also presents a variety of subset of this data—the distributions for runways of different lengths, for example.

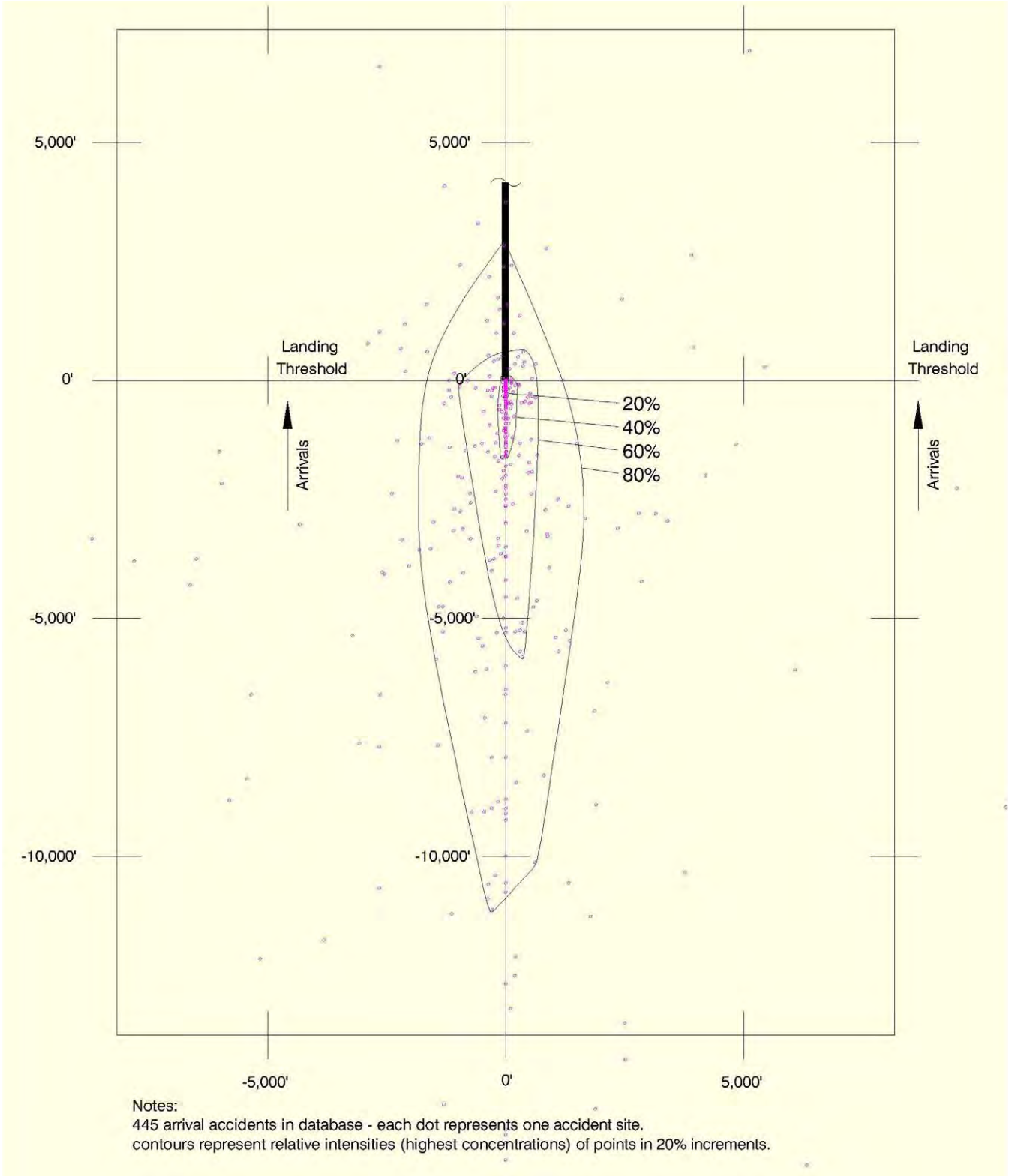
Critical Concept
Historic accident locations apply to both runway ends since accidents can occur at either.

Along with the accident location points, the two figures also show a set of risk contours. The purpose of these contours is to indicate the relative concentration of the accident points. The contours simply divide the data points into five equal groups. The innermost contour indicates the shape that encompasses 20 percent of the points in the least possible area. The remaining contour contain 40, 60, and 80 percent of the points, with the balance of the points lying beyond the 80 percent contour.

Among the key findings apparent from the data are these:

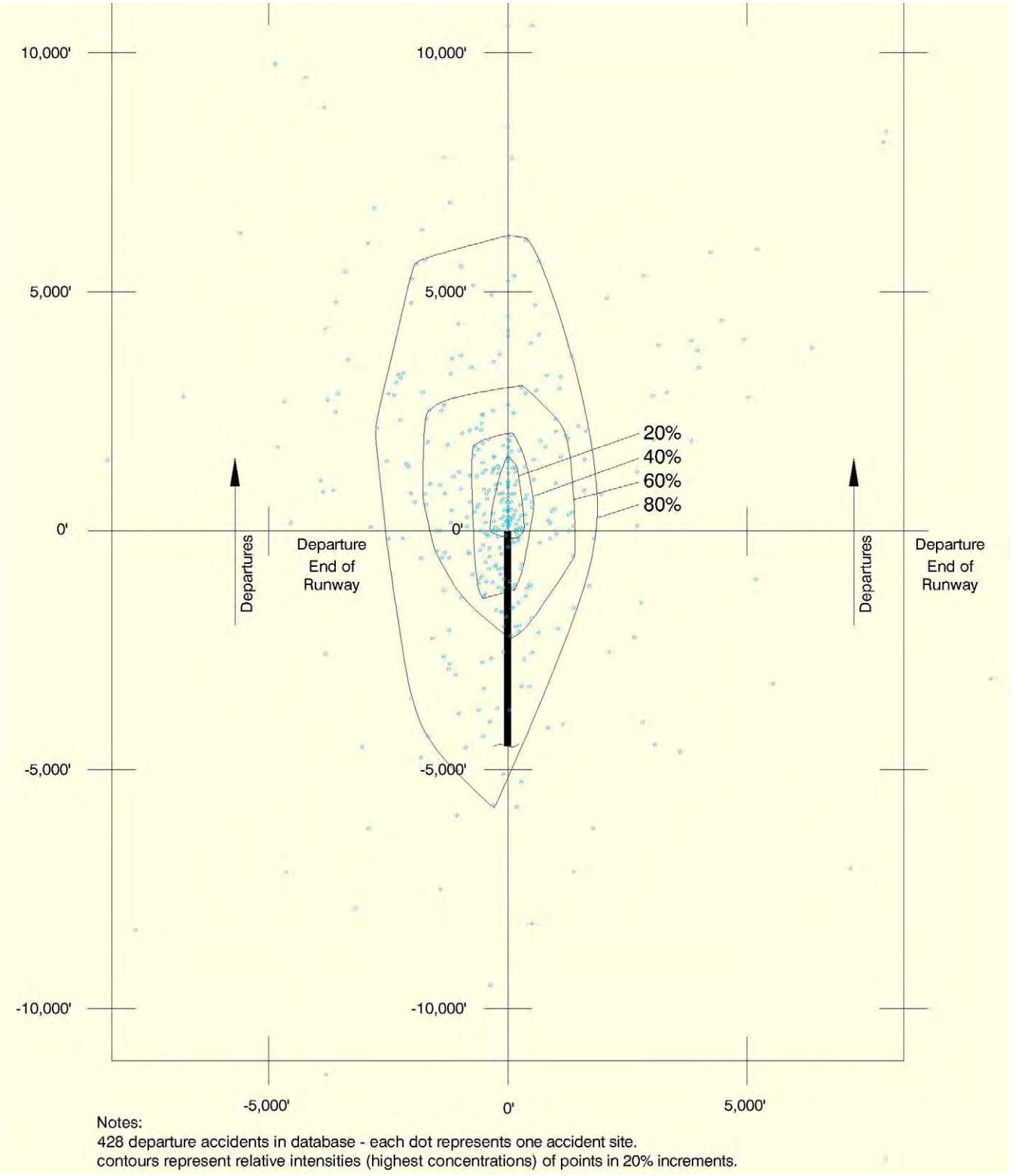
- About half of arrival accidents and a third of departure accidents take place within the FAA-defined runway protection zone for a runway with a low-visibility instrument approach procedure (a 2,500-foot-long trapezoid, varying from 1,000 feet wide at the inner edge to 1,750 feet in width at the outer end). This fact lends validity to the importance of the runway protection zones as an area within which land use activities should be minimal.
- Although the runway protection zones represent the locations within which risk levels are highest, a significant degree of risk exists well beyond the runway protection zone boundaries. Among all near-airport accidents, over 80 percent are concentrated within 1.5 to 2.0 miles of a runway end.
- Arrival accidents tend to be concentrated relatively close to the extended runway centerline. Some 80 percent occur within a strip extending 10,000 feet from the runway landing threshold and 2,000 feet to each side of the runway centerline.

Figure E-1
General Aviation Accident Distribution Contours
All Arrivals



Source: *California Airport Land Use Planning Handbook* (2002)

Figure E-2
General Aviation Accident Distribution Contours
All Departures



Source: *California Airport Land Use Planning Handbook* (2002)

- Departure accidents are comparatively more dispersed laterally from the runway centerline, but are concentrated closer to the runway end. Many departure accidents also occur lateral to the runway itself, particularly when the runway is long. Approximately 80 percent of the departure accident sites lie within an area 2,500 from the runway centerline and 6,000 feet beyond the runway end or adjacent to the runway.
- Runway length affects the distribution pattern of accidents. Arrival and departure accident locations tend to be clustered closer to the runway ends of short runways than is the case with longer runways.

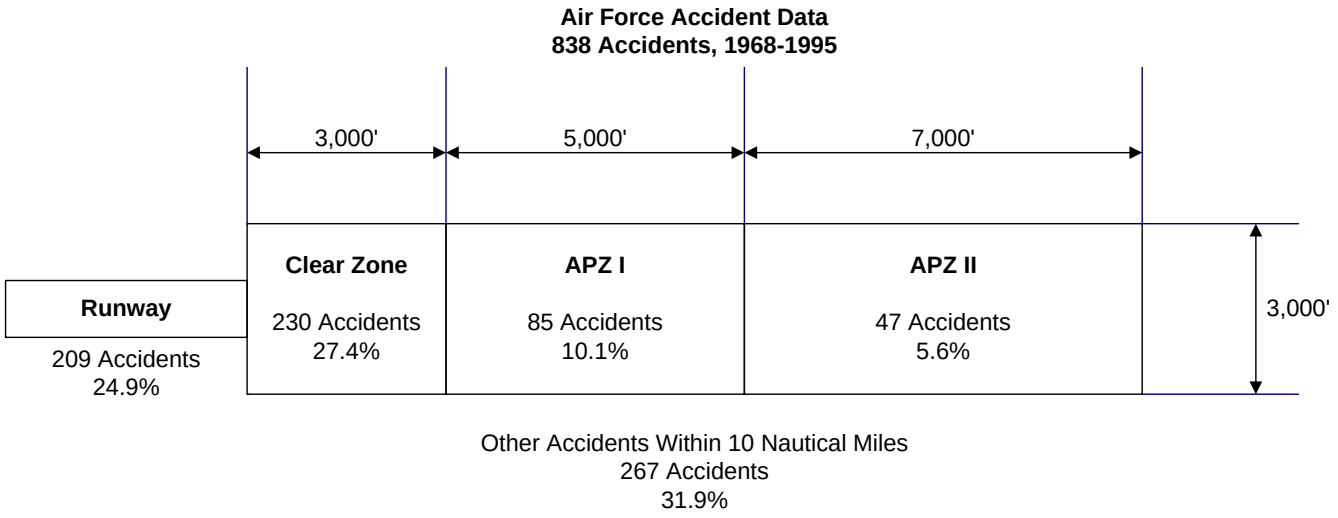
📖 For more detail, see Appendices E and F of the *California Airport Land Use Planning Handbook* (2002) available at: www.dot.ca.gov/hq/planning/aeronaut/documents/alup/ct%20aluph%20appendix%20e.pdf and www.dot.ca.gov/hq/planning/aeronaut/documents/alup/ct%20aluph%20appendix%20f.pdf

The FAA has summarized similar data for commercial aircraft operations. The database, though, is limited in size and has not been updated to include accidents that have taken place over the last 20 years. As Figure E-3 shows, all of the accidents represented are located within 2 miles of the runway end. The arrival accident sites are heavily concentrated along the extended runway centerline, while the departure accident sites are comparatively more scattered. The pattern is similar to that for general aviation accidents, particularly those associated with long (6,000 feet or more) runways.

The DOD data on military aircraft accident locations is presented in a more summarized format as illustrated in Figure E-3.

The database represents 838 Air Force aircraft accidents over a 28-year period ending in 1995. Equivalent data for Navy and Marine aircraft is not available. The diagram indicates the percentages of accidents on the runway and within distinct zones near the runway ends. As with general aviation and commercial aircraft accidents, the highest concentrations are close to a runway end. Excluding the accidents on the runway itself, a 3,000-foot by 3,000-foot area accounts for 36 percent of the accidents within 10 nautical miles of the runway. Approximately 57 percent of the off-runway accidents have historically occurred within a 3,000-foot-wide strip extending 15,000 feet from a runway. The remainder have taken place farther away including an unknown percentage that can be considered en route accidents beyond the 10-nautical-mile distance from a runway.

Figure E-3
Air Force Accident Data (1968–1995)



Source: AICUZ Program Manager's Guide. Air Force Handbook 32-7084 (March 1999)

Other Characteristics of Aircraft Accidents

A variety of other data regarding the characteristics of aircraft accidents is available in the California handbook and from Federal Aviation Administration and National Transportation Safety Board (NTSB) websites. A few pieces of information of value to airport land use compatibility planning are summarized below.

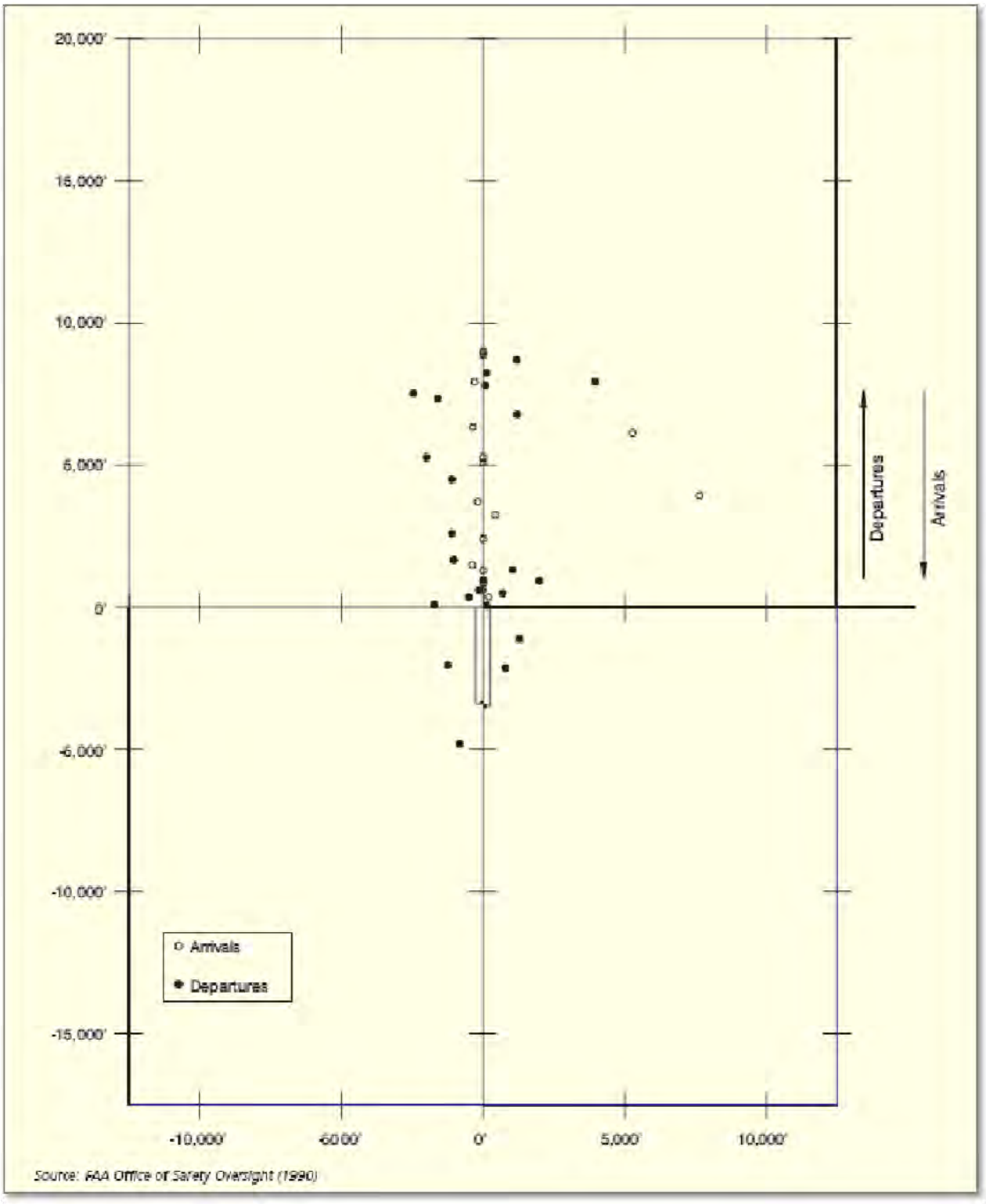
- **Aircraft Types** – The type of aircraft operated at an airport or on an individual runway at a multi-runway airport is an important compatibility planning consideration. Large, heavy aircraft, especially jets, have the potential to cause major destruction on the ground if an accident occurs. However, all of the aircraft operated by airlines, as well as most business jets operated by corporations, are flown by professional pilots and are maintained at high standards that significantly reduce the frequency of accidents compared to small, private airplanes. On the other hand, these small planes generally produce much less damage on the ground when accidents happen. From a land use compatibility perspective, these differences somewhat balance each other out and other factors—particularly where the accidents occur—become the dominant planning considerations.

- **Relative Frequency of Arrival Versus Departure Accidents** – On the whole, more aircraft accidents occur during the approach/landing phase of operation than during the takeoff/departure phase. However, many landing accidents take place on or immediately adjacent to the runway. Among off-runway, near airport accidents, arrival and departure accidents happen in about equal numbers. This is explicitly true for general aviation, but the more limited data for air carrier accidents suggests it is true for them as well.

- **Controlled versus Uncontrolled Accidents** – In planning for land use compatibility near airports, consideration must be given to the two different forms of aircraft accidents: those in which the aircraft is descending, but is flying and under directional control of the pilot; and those in which the aircraft is out of control as it falls. Available data indicates that a substantial percentage, if not the majority, of general aviation aircraft accidents fall into the former category. Moreover, these data do not include the incidents in which the pilot made a successful emergency landing.

- **Accident Swath** – Swath size is another useful piece of information, especially with respect to planning around general aviation airports. It indicates the area over which accident debris is spread. Swath size in turn depends upon the type of aircraft and the nature of the accident: was the aircraft in controlled flight (an engine failure for example), but then collided with something on the ground or did a catastrophic event (such as a mid-air collision or stall-spin) result in the aircraft making an uncontrolled descent? For small general aviation aircraft, the swath size data suggests that a controlled emergency landing in which the aircraft occupants have a strong chance of surviving is possible in an area about the size of a football field: 75 feet by 300 feet or about 0.5 acre. For larger aircraft, the minimum flight speed is so much higher that the consequences for people on board and anyone in the path on the ground are likely to be severe regardless of the land use or terrain characteristics.

Figure E-4
Commercial Aircraft Accident Location Pattern



Risk Concepts

Central to the task of addressing the safety aspects of airport land use compatibility is the concept of risk. Locations near airport runways are exposed to a greater risk of being involved in an aircraft accident than sites farther away. As development increase the number of structures and people on the ground exposed to risk increases. The question is: how much and what type of development is reasonable? To put is another way: what level of risk is acceptable?

There is no easy answer to these questions; no formula into which all the data can be inserted and a set of safety zones and criteria will result. While the probability of an aircraft accident occurring near an airport can be calculated—see the discussion in the following sections—the real issue is what the response to that risk should be. This aspect of risk is not quantifiable.

It is beyond the scope of this Guidebook to provide a comprehensive discussion of risk concepts. Nevertheless, several points are important to highlight.

📖 A more in-depth review of can be found in the *California Airport Land Use Planning Handbook* (2002) available at: www.dot.ca.gov/hq/planning/aeronaut/landuse.html

Judging Risk Acceptability

The risk of something negative resulting from an otherwise desirable activity can be measured in terms of two variables:

- The anticipated frequency of the negative event occurring.
- The potential consequences associated with the event's occurrence.

Frequency is calculated in terms of the number of events within a specific time period and location. Consequences can be physical or financial. Physical consequences can be measured in various ways depending on the nature of the event: injuries, fatalities, lost productivity, property damage, etc.

The combination of these two variables can then be used to judge whether the risk is:

- Negligible or acceptable risk (no action is necessary to reduce or protect against the risk).
- Significant, but tolerable risk (the cost of reducing or protecting against the risk must be weighed against the benefits to be gained).
- Intolerable risk (the risk cannot be justified except in extraordinary circumstances).

Intolerable risks are usually associated with events that have both high likelihood of occurrence and high consequences. Significant risks can result from events that have high frequency or high consequences or moderate levels of both, but not high levels of both. The table below illustrates the relationship between the two variables and the overall level of risk.

		Potential Consequences				
		Negligible	**Minor**	**Major**	**Severe**	**Disastrous**
Anticipated Frequency of Occurrence	Frequent					
	Occasional					
	Uncommon					
	Rare					
	Extraordinary					

Legend	Negligible/Acceptable Risk	Significant/Tolerable Risk	Intolerable Risk

In this chart, aircraft accidents can be considered to fall into the range of rare to extraordinary frequency. To hold the risks to an acceptable level therefore means that actions should be taken to avoid potential consequences that are disastrous or, where accidents are comparatively common, severe. The question to be answered thus becomes: what land use actions are appropriate in response to a significant risk?

Cost of Risk Response

One means of answering this question is to consider not just the risk itself, but the cost of the response. Risks that are deemed intolerable warrant a response almost irrespective of the cost. An acceptable risk on the other hand generally needs no specific action. It is in the middle range of risks—those that are merely tolerable—that costs become important. While avoidance of the risk may be desirable, society has limited resources for addressing risks and priorities often must be set. Risks that fall toward the intolerable end of the spectrum may warrant a response unless the cost is very high; whereas, if the risk is close to being acceptable, action may be appropriate only if the cost is relatively minimal.

When considering this issue in the context of aircraft accidents, two key variables are apparent.

- **Existing Versus Proposed Uses** – One clear distinction is that the cost of reducing or limiting risks is usually greater where development already exists than where land is undeveloped. The cost of removing an incompatible development is greater than the cost of avoiding its construction in the first place. An implication of this point is that allowing an existing incompatible use to remain may be considered tolerable, but permitting a similar new use may be unacceptable.

- **Urban Versus Rural Areas** – A second difference is between urban and rural environments. In urban locations, land values and other development costs typically are higher than in rural areas. The cost—represented by lost opportunity—of limiting development to what might, if not for airport compatibility concerns, otherwise be the land's highest and best use is thus typically greater in urban areas. Also a factor is that, in urban areas, there are often fewer options as to where land uses that are needed in the community can be placed. Less than ideal location choices consequently may be the best choices. Land uses that may not be entirely compatible with each other may nevertheless be considered as acceptable neighbors. People living in urban areas usually consider these risks as reasonable tradeoffs for the benefits that cities also provide. For these reasons, a particular use may be acceptable near an urban airport, but be inappropriate in an identical location near a rural airport.

Risk Perceptions

Another factor that greatly affects the response to risk is how the risk is perceived. This factor accounts for why two different risks that have very similar likelihood of occurrence and potential consequences may produce very different responses. Public response to a risk is usually driven more by the perception of the risk than by the actual risk based on historical experience or mathematical calculations.

A related factor is perspective—that is, who benefits from the activity and who bears the risk? Risks that may be acceptable to society as a whole, may not be acceptable to an individual or vice versa.

Some of the key variables that affect risk perception are listed in the tabulation below. Also noted is where aircraft accident risks fit with regard to these variables. When looked at in this manner, it is difficult to think of any other types of risks that are highly comparable to those posed to people and property on the ground by the threat of aircraft accidents. To be comparable to aircraft accident risks, not only must the likelihood of occurrence be similarly low, but the character of the risks must be qualitatively similar.

Risk Perceptions	
A risk is perceived to be higher if:	***Aircraft accidents are perceived as:***
The general public has limited understanding of how the technology or system operates	Involving a form of transportation that is not well understood by most people because they don't fly airplanes
After a failure in the technology or system, no one, including experts in the field, seems to know and understand the cause (as opposed to events for which the cause is clear)	Not well understood—and even if experts may eventually ascertain the cause of an accident, the public may not see or understand the conclusions
The possible consequences of the hazard evoke feelings of dread, especially concerns about death	Giving no advance warning (and people don't tend to look upward for potential danger)
The possible consequences seem unbounded (in magnitude or persistence over time) or are believed to be potentially catastrophic	Including consequences which are unpredictable and potentially catastrophic
The activity is not under one's own control (the risks are not affected by one's own skills)	Not controllable as a function of the individual's skills
The risk exposure is not on a voluntary basis (the exposure cannot readily be reduced by changes in one's lifestyle)	Not voluntary except to the extent that people choose to live near an airport
The hazard is unnatural (not an act of nature)	Not an act of nature
The potential personal or societal benefits to be gained from the activity involved appear to be minimal or nonexistent	Involving an activity (flying) that provides little or no benefit to the people and property owners on the ground who bear the risk
The distribution of risks and benefits among groups or geographically is inequitable	Placing the cost of mitigating the risk on owners of property near the airport
The groups at risk include children, elderly, the infirm, or others regarded as having comparatively little control over their own lives	Placing greater risk on these groups because they would have greater difficulty getting away from the site of an aircraft accident
Highly negative imagery about the technology or system is widespread in the media (especially pictures on television and in newspapers)	Often worthy of nationwide media coverage

Also evident is that for all of the variables listed, aircraft accidents fall at the end of the spectrum that causes the perception of the risk to be greater than the mathematical risk. Even though the frequency of aircraft accidents is low, people focus on the consequences as they have historically occurred and potentially could happen again. For these reasons, a stronger response can be justified for aircraft accident risks than might be warranted for other accident risks.

Establishing Safety Compatibility Policies

Safety Zones

The discussion in this appendix focuses on aircraft accidents and how this data should be used in addressing the safety compatibility of new development around airports. On this basis, we call the zones described here "safety zones." However, for Washington airports noise, airspace protection, vibration, odors, annoyance, and other impacts of regular aircraft overflights, can be folded into the safety zones to create composite "compatibility zones" and a composite set of compatibility criteria created to match.

Critical Concept
When considering the locations of aircraft accidents relative to the typical traffic patterns at the airport, it is important to recognize that where aircraft normally fly may not be where they fly under emergency conditions. Aircraft accidents often occur in locations that might not be expected merely from examination of flight tracks.

While the risk contours described above are helpful as means of portraying the geographic pattern of aircraft accident risks near an airport, they are difficult to directly use as the basis for defining safety compatibility policies. Their irregular shape is one drawback—although, in that respect, they are no different from noise contours. More important is the lack of precision that results from the modest size of the database. Also a consideration is that the irregular shapes do not specifically reflect the different phases of aircraft flight around and airport and the different risk characteristics associated with each phase.

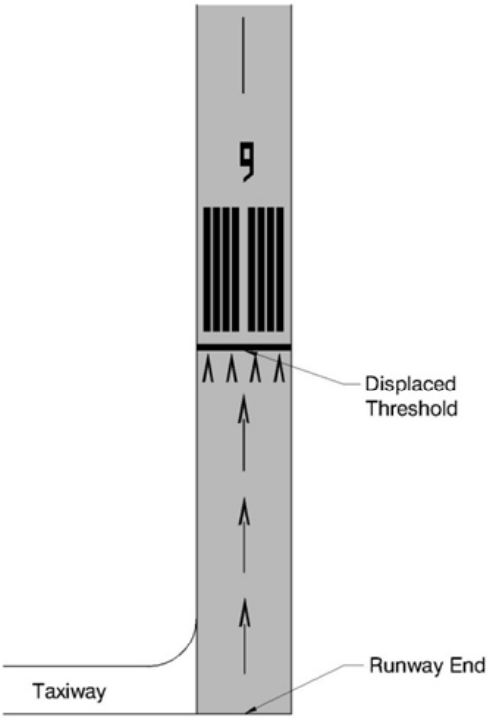
More useful for compatibility planning purposes is to define a set of safety zones based upon the accident location distribution data and risk contours, but having regular geometric shapes. Diagrammed below is a set of six zones originally recommended in the California handbook and utilized in Washington and other states. These zones were defined using the nationwide database of general aviation aircraft accidents described earlier (see Figure E-5).

The California handbook recommends variations on the zones to take into account different runway lengths, types of approach procedures, traffic pattern location, and other factors. As shown in the following diagrams, the suggested zones are larger for longer runways that accommodate larger, faster aircraft than for short runways used only by light aircraft. The same basic shapes and characteristics of the zones apply, however. The six zones can be characterized as follows:

- **Zone 1 – Runway Protection Zone** – This zone encompasses the runway protection zone (RPZ) at each end of the runway and should use the RPZ dimensions established in accordance with FAA standards (RPZ dimensions depend mostly on the visibility minimums for the approach to that runway end). Also included in the zone are the strips of land immediately adjacent to the runway where FAA standards preclude structures. Zone 1 is where the greatest concentration of accidents take place.

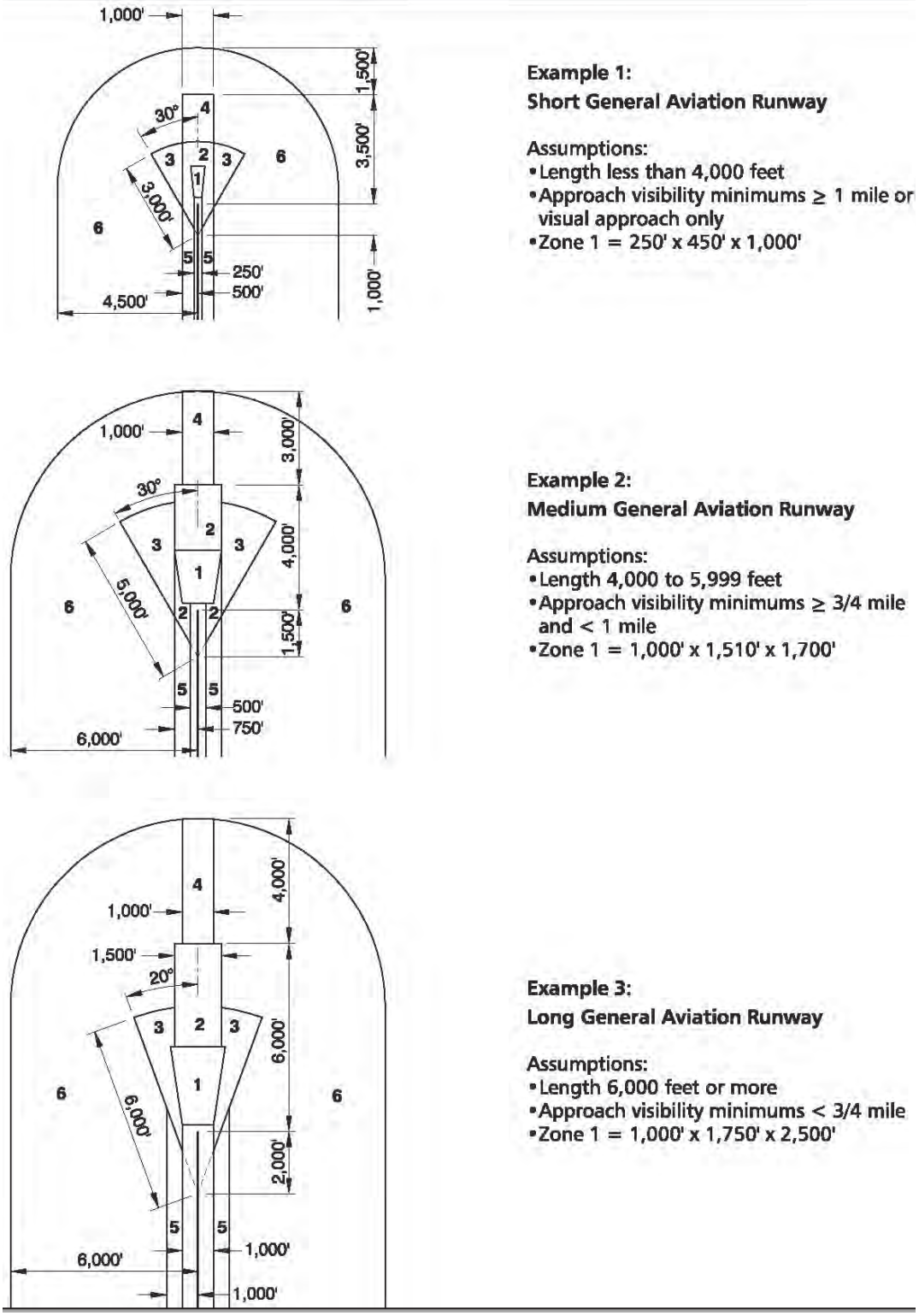
- **Zone 2 – Inner Approach/Departure Zone** – This zone wraps around and extends beyond Zone 1 along the runway centerline. Next to the RPZ, it represents the area where the risk of aircraft accidents is the greatest. On departure, aircraft are typically at full power in the initial phase of climb. On approach, they are at low altitude as they prepare for landing.
- **Zone 3 – Inner Turning Zone** – This zone is a wedge-shaped area lying along the sides of Zone 2. It is primarily significant at general aviation airports where most of the flights are visual. At airports where most aircraft approach and depart on instrument flight plans, then the close-in turns which are the concern with Zone 3 can be a narrow wedge. When operating visually, departing aircraft may begin turning over this area to fly toward their destination or to remain in the traffic pattern. Arriving aircraft often overfly this area as well, especially if they are flying a tight pattern. One type of accident known to occur in this area is a low-altitude stall-spin that can happen if a pilot attempts to make too tight of a turn.
- **Zone 4 – Outer Approach/Departure Zone** – This area lies beyond Zone 3 along the extended runway centerline. Aircraft flying straight out or in overfly this area at low-altitude. The zone is particularly significant on runways where much of the operations are on instrument procedures and at busy airports where elongated traffic patterns are common. The risks in this area are moderate, but less than in Zones 1 through 3.
- **Zone 5 – Sideline Zone** – Lying in narrow bands along each side of the runway, aircraft do not normally fly over the sideline zone. The principal risk is from aircraft that lose directional control while landing or just after takeoff. The risks are lower than in Zones 1 through 3 and similar to those of Zone 5.
- **Zone 6 – Traffic Pattern Zone** – The final zone contains the remainder of the airport environment where aircraft fly as they approach and depart the airport or are engaged in flight training. In area, Zone 6 is typically larger than the other zones combined. A substantial percentage of accidents take place here, but they are scattered over the large area.

Each airport is unique. Thus, it is essential to adjust safety zones to fit the airfield configuration, usage characteristics, and other factors associated with a specific airport. Adjusting for runway length is the first step. Additionally, adjustments for approach type, fleet mix, traffic pattern location, etc., may be appropriate for individual runways. For example, adjustments could be considered for runways having displaced landing thresholds, particularly if most landings are made at that end of the runway and few takeoffs come toward that end. Runways having traffic patterns only on one side may dictate some adjustment to Zone 3. Regular use of a runway by special-purpose airplanes such as agricultural, fire attack, and military or by helicopters also may warrant consideration.



Beyond these types of adjustments, reliance on nationwide rather than airport-specific accident data is essential. Because aircraft accidents are infrequent occurrences, the pattern of accidents at anyone airport cannot be used to predict where future accidents are most likely to happen around that particular airport.

Figure E-5
Safety Compatibility Zone Examples
General Aviation Runway



Source: *California Airport Land Use Planning Handbook* (2002)

Safety Criteria

The second half of the process of establishing safety policies is to decide upon the criteria that should apply within each of the zones you have delineated. Even more than for the mapping of the zones, there are no absolute rules here, only general guidance. Ultimately, the decision comes back to the issue of acceptable risk.

Several types of land use characteristics are particular concerns with regard to safety compatibility. Criteria should be written to address each of these.

While the criteria outlined here are all safety related, creation of a combined set of criteria that also considers noise, airspace protection, vibration, odors, and other impacts of regular aircraft overflights is highly encouraged.

- **High-Intensity Uses** – Given that the potential for injury or death to people on the ground is usually considered the greatest potential land-use-related consequence that could result from aircraft accidents, then limiting the number of people in harm's way is the foremost safety compatibility objective. Typically, the limit is defined in terms of a maximum acceptable number of people per acre of a project site and referred to as a "usage intensity" limit. Deciding upon a specific limit for each safety zone can be challenging, so you may want to instead emphasize land use types. See Chapter 3 for guidance on what land use types are compatible or incompatible with the airport.

- **Residential Uses** – Residential development is usually described in terms of density—the number of dwelling units per acre—rather than intensity or people per acre. Mathematically, a relationship can be drawn between the two by knowing the average number of persons per household. For safety compatibility purposes, however, residential density limitations should not be equated to the usage intensity limitations for nonresidential uses. Society tends to seek a higher degree of protection for people's homes than for most other types of land uses. On this basis, restricting residential development to a density lower than the equivalent nonresidential intensity limit is desirable. Better yet, because of noise and overflight impacts, the best choice is to not introduce new residential development in the approach safety zones (Zones 1 through 5) except perhaps if the densities are very low (less than 1 unit per 5 acres).

- **Uses Having Vulnerable Occupants** – These uses are those in which the majority of occupants are children, elderly, and/or disabled—people who have reduced effective mobility or may be unable to respond to emergency situations and get out of harm's way. Primary uses in this category include: children's schools (grades K–12); day care centers; hospitals and other health care facilities, especially where anesthesia is used during operations or patients remain overnight; and nursing homes.

- **Hazardous Materials Storage** – Aboveground storage of large quantities of hazardous materials (flammable, explosive, corrosive, or toxic) poses special concerns to the extent that an aircraft accident could cause release of the materials and thereby pose dangers to people and property in the vicinity. Avoidance of such uses or ensuring that the facilities are adequately protected against the consequences of an aircraft accident are recommended.

- **Critical Community Infrastructure** – This category pertains to facilities the damage or destruction of which would cause significant adverse effects to public health and welfare well beyond the immediate vicinity of the facility. Particular examples include: emergency services facilities such as police and fire stations, emergency communications facilities, and power plants and other utilities.

Table F-1

Maximum Residential Density						
Compatibility Zones	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**
Maximum Residential Density						
	Average Number of Dwelling Units Per Gross Acre					
Agricultural (farmland/forest)	0	Maintain current comprehensive plan designation and zoning designation				
Rural (outside an urban growth boundary)	0	1 d.u. per 10 acres	1 d.u. per 10 acres[A]	1 d.u. per 5 acres[A]	1 d.u. per 10 acres[A]	1 d.u. per 5 acres
Urban (within the urban growth boundary)	0	0	B	C	B	C
Maximum Intensities for Nonresidential Uses (Commercial, Industrial, Offices, and Activities)						
	Average Number of People Units Per Gross Acre					
Agricultural (farmland/forest)	1-5[E]	D, E	D, E	D, E	D, F	D
Rural (outside an urban growth boundary)	1-5[E]	10-25[E]	10-25[E]	40-60[E]	100-150[E]	100-150[G]
Urban (within the urban growth boundary)	1-5[E]	50-75[E]	80-120[E]	100-150[E]	100-150[E]	No Limit[G]

Notes:

A Cluster to preserve open space to maintain open approach corridor at and near runway ends.

B Infill development up to average of surrounding residential area is allowed, but is appropriate only if nonresidential uses are not feasible

C Promote high density and intensity mixed use development (15 or more d.u. per acre)

D Maintain current comprehensive plan designation and zoning designation.

E Special Function Land uses should be prohibited.

F 50-100 people per acre allowed if on airport and aviation-related.

G Special Function Land uses should be avoided.

Table F-2
Airport Land Use Matrix

	Compatibilty Zones					
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
A. Resource Operations						
1. Agricultural (Commercial)						
Agriculture, horticulture, general farming (crops only, not feedlots and stockyards)	P	P	P	P	P	P
Agricultural building	L	L	P	P	P	P
Agricultural chemical sales/storage	X	L	P	P	P	P
Agricultural Housing/Farm labor	X	X	L	P	L	P
Agricultural housing/farm labor	X	X	L	P	L	P
Agricultural market	X	X	P	P	X	P
Agricultural related industries	X	L	P	P	P	P
Animal husbandry	X	L	L	L	X	P
Agricultural feeding operation or stockyards	X	X	X	X	X	X
Agriculture or food processing facility	X	L	P	P	L	P
Livestock auction	X	X	X	L	X	P
Fairgrounds	X	X	X	X	X	P
Floriculture, aquaculture	X	L	P	P	P	P
Fruit bin sales/storage	X	L	P	P	P	P
2. Forest (Commercial)						
General forest silver culture	L	L	P	P	P	P
Forest product processing	X	L	P	P	P	P
3. Mining/Refining/Offsite Hazardous Waste Treatment						
Asphalt paving and roofing materials, rock crushing	X	X	L	L	L	P
Mining including sand and gravel pits	X	L	L	L	X	P
Stockpiling of earthen materials	X	L	L	L	X	P
B. Rural Development						
1. Rural Residential						
Single-family dwelling (large lot, 5 acres or greater*)	X	L	L	P	X	P
Single-family dwelling, rural centers	X	X	L	L	X	L
Residential Cluster Development, 40% open	X	X	LSC	X	X	P
Multi-family dwelling	X	X	X	X	X	P
Temporary farm housing	X	X	P	P	L	P

Chart Symbols

- **"L" Limited** – Uses or activities that may be compatible with airport operations depending on their location, size, bulk, height, density and intensity of use.
- **"LSC" Limited Special Conditions** – Development should be moved away from the extended runway centerline. Open space should be devoted to areas that experience elevated risk.
- **"P" permitted** – Uses or activities that should be permitted, however, these activities should be reviewed to ensure that they will not create height hazard obstructions, smoke, glare, electronic, wildlife attractants, or other airspace hazards.
- **"X" Prohibited** – uses or activities that should not be constructed near the airport.

All uses or activities identified herein are subject to intensity and density limitations set forth in Table F-1. Particular attention should be given to developments that when located in combination with other permitted or limited activities may create cumulative impacts on airport operations. All uses should be reviewed to ensure that they will not create airspace hazards.

	Compatibilty Zones					
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**
2. Rural Centers						
Single-family dwelling; up to 12 dwelling units/acre	X	X	L	L	X	L
Two - Four family dwelling (duplex) (*)	X	X	X	X	X	L
Multi-family dwelling; 12-20 units/acre	X	X	L	X	X	P
21+ units/acre	X	X	P	P	X	P
Agriculture/forest/mineral resources or industry (see item A)						
Community services (see item D2)						
Retail and commercial service (see items D4 & D5)						
Industrial/manufacturing (see item D4s & D5)						
C. Education Facilities						
1. Education Facilities						
Junior or community college	X	X	L	L	L	P
Schools, K-12 elementary, middle, senior high	X	X	X	X	X	X
Business school	X	L	L	L	L	P
Vocational schools	X	L	L	L	L	P
D. Urban Development						
1. Residential						
Single-family dwelling; up to 12 dwelling units/acre	X	X	X	X	X	L
Two - four-family dwelling (duplex)(*)	X	X	X	X	X	L
Multi-family dwelling(*): 15 or more	X	X	LSC	X	X	P
Mixed-use office/commercial/residential use	X	X	P	P	X	P
Residential development cluster 40% > open space	X	X	L	L	X	L
Residential infill	X	X	L	L	L	P
Mobile home parks	X	X	L	L	X	L
Boarding house	X	X	L	L	L	L
Retirement homes	X	X	X	X	X	L

Chart Symbols

- **"L" Limited** – Uses or activities that may be compatible with airport operations depending on their location, size, bulk, height, density and intensity of use.
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	Compatibilty Zones					
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
2. Community Services						
Cemetery	P	P	P	P	L	P
Churches, synagogues, temples	X	X	L	L	X	L
Community center meeting halls, fraternal organizations	X	X	L	L	X	P
Convalescent, nursing home and group homes	X	X	X	X	X	L
Day care facilities, family in-home	X	X	L	L	X	L
Day care center	X	X	L	L	X	L
Funeral home	X	X	P	P	X	P
Police, fire stations, ambulance service	X	L	P	P	P	P
Hospital	X	X	X	X	X	X
Medical clinic	X	X	L	L	X	P
Correction facilities	X	L	L	L	L	L
Libraries	X	X	P	P	X	P
Museums and art galleries	X	X	L	P	P	P
Zoo	X	X	P	P	X	P
3. Amusement and Recreation						
Amusement park (permanent)	X	X	L	L	X	L
Bowling alleys	X	X	P	P	X	P
Campground	X	L	L	P	L	P
Recreational vehicle parks; short term	X	L	L	P	L	P
Drive-in theatres	X	X	L	L	X	P
Fairgrounds	X	X	P	L	L	P
Golf courses	X	L	P	P	X	P
Gymnasiums, exercise facilities	X	L	L	L	L	P
Horse racing tracks, speedways	X	X	X	X	X	X
Miniature golf courses	X	X	P	P	X	P
Movie theatres, auditoriums exhibition halls	X	X	L	L	X	P
Parks	L	L	P	P	L	P
Roller skating rink	X	X	L	L	X	P

Chart Symbols

- **"L" Limited** – Uses or activities that may be compatible with airport operations depending on their location, size, bulk, height, density and intensity of use.
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- **"P" permitted** – Uses or activities that should be permitted, however, these activities should be reviewed to ensure that they will not create height hazard obstructions, smoke, glare, electronic, wildlife attractants, or other airspace hazards.
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All uses or activities identified herein are subject to intensity and density limitations set forth in Table F-1. Particular attention should be given to developments that when located in combination with other permitted or limited activities may create cumulative impacts on airport operations. All uses should be reviewed to ensure that they will not create airspace hazards.

	Compatibilty Zones					
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**
4. Retail Trade and Service						
Addressing, mailing, and stenographic services	X	L	P	P	L	P
Advertising agencies	X	L	P	P	L	P
Airport uses and activities commercial/industrial	L	P	P	P	P	P
Animal clinic/hospital	L	P	P	P	P	P
Antique stores	X	L	P	P	X	P
Automobile, truck, manufactured home, and travel trailer sales	L	P	P	P	P	P
Automobile and recreational vehicle (RV) sales; weekend	L	P	P	P	L	P
Automotive: car wash	L	P	P	P	L	P
Sales lot/auto center	L	P	P	P	P	P
Parking lots and garages	L	P	P	P	P	P
Maintenance and repair shops	X	P	P	P	P	P
Paint and body repair shops	L	P	P	P	P	P
Parts and accessories (tires, batteries, etc.)	X	P	P	P	P	P
Specialized repair shops (radiator, etc.)	L	P	P	P	P	P
Towing services	L	P	P	P	P	P
Wrecking and dismantling yard	L	P	P	P	L	P
Bakery	X	P	P	P	L	P
Beauty and barber shops	X	L	P	P	X	P
Bed and breakfast inn	X	X	L	L	X	P
Boats and marine accessories	X Except storage L	P	P	P	P	P
Books, stationery, office supplies	Storage only	P	P	P	L	P
Building and trade (plumbing, heating, electrical, painting, etc.)	Storage only	P	P	P	L	P
Clothing and accessories	X	L	P	P	L	P
Communication towers	X	X	L	L	L	L
Computer and electronic stores	X	L	P	P	L	P
Department, discount, variety stores	X	X	P	P	X	P
Drug stores (optical goods, orthopedic supplies)	X	L	P	P	L	P
Employment agencies (private)	X	P	P	P	L	P

Chart Symbols

- **"L" Limited** – Uses or activities that may be compatible with airport operations depending on their location, size, bulk, height, density and intensity of use.
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- **"P" permitted** – Uses or activities that should be permitted, however, these activities should be reviewed to ensure that they will not create height hazard obstructions, smoke, glare, electronic, wildlife attractants, or other airspace hazards.
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	Compatibilty Zones					
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Farm and implements, tools and heavy construction equipment	X	L	P	P	P	P
Farm supplies	L	P	P	P	P	P
Financial institutions	X	P	P	P	L	P
Food store	X	P	P	P	L	P
Furniture, home furnishings, appliances	X	P	P	P	L	P
General hardware, garden equipment and supplies	X	P	P	P	L	P
Grocery and convenience stores	X	L	P	P	L	P
Heavy equipment storage, maintenance and repair	X	L	P	P	L	P
Insurance agents, brokers, and service agencies	X	P	P	P	L	P
Kennels	L	P	P	P	L	P
Laundries, laundromats, and dry cleaning plants	X	P	P	P	L	P
Liquor stores	X	P	P	P	L	P
Lumber yards	L	P	P	P	L	P
Medical and dental laboratory, offices and clinic	X	X	L	P	x	P
Mini Storage	L	P	P	P	P	P
Motels and Hotels	X	X	P	P	P	P
Motorcycles sales/repair (including maintenance)	X	P	P	P	L	P
Paint, glass, and wallpaper stores	X	P	P	P	L	P
Pet stores, pet supplies, and dog grooming	X	L	P	P	L	
Professional office buildings for architects, attorneys, government, etc.	X	L	P	P	P	P
Rental: auto, truck, trailer, fleet leasing services	L	P	P	P	L	P
Repairs: small appliances, tv, business machines, watches, etc.	L	P	P	P	L	P
Restaurant, cafe and drive-in eating facilities	X	L	P	P	P	P
Service station	X	L	P	P	L	P
Sporting goods, bicycle shops	X	P	P	P	P	P
Taverns, bars, dance establishments	X	L	P	P	L	P

Chart Symbols

- **"L" Limited** – Uses or activities that may be compatible with airport operations depending on their location, size, bulk, height, density and intensity of use.
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	Compatibilty Zones					
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**
5. Industry/Manufacturing						
Aircraft parts	Storage only	L	P	P	P	P
Aircraft industrial	Storage only	L	P	P	P	P
Apparel and accessories	X	L	P	P	X	P
Bakery products (wholesale)	Storage only	L	P	P	X	P
Beverage industry	Storage only	L	P	P	X	P
Canning, preserving, and packaging fruits, vegetables, and other foods	X	L	L	L	X	P
Cement and concrete plants	X	L	L	L	X	P
Chemicals (industrial, agricultural, wood, etc.)	X	X	L	L	X	L
Concrete, gypsum, and plaster products	Storage only	L	P	L	L	P
Confectionery and related products (wholesale)	Storage only	P	P	P	L	P
Mini storage	P	P	P	P	P	P
Product assembly	Storage only	L	P	P	L	P
Prefabricated structural wood products and containers	Storage only	P	P	P	L	P
Printing, publishing, and binding	Storage only	P	P	P	L	P
Rendering plants, slaughter houses	X	X	X	X	X	L
Rubber products	X	L	P	P	L	P
Sawmills and planing mills	Storage only	L	P	P	L	P
Sheet metal and welding shops	Storage only	P	P	P	L	P
Stone products (includes finishing of monuments for retail sale)	Storage only	P	P	P	L	P

Chart Symbols

- **"L" Limited** – Uses or activities that may be compatible with airport operations depending on their location, size, bulk, height, density and intensity of use.
- **"LSC" Limited Special Conditions** – Development should be moved away from the extended runway centerline. Open space should be devoted to areas that experience elevated risk.
- **"P" permitted** – Uses or activities that should be permitted, however, these activities should be reviewed to ensure that they will not create height hazard obstructions, smoke, glare, electronic, wildlife attractants, or other airspace hazards.
- **"X" Prohibited** – uses or activities that should not be constructed near the airport.

All uses or activities identified herein are subject to intensity and density limitations set forth in Table F-1. Particular attention should be given to developments that when located in combination with other permitted or limited activities may create cumulative impacts on airport operations. All uses should be reviewed to ensure that they will not create airspace hazards.

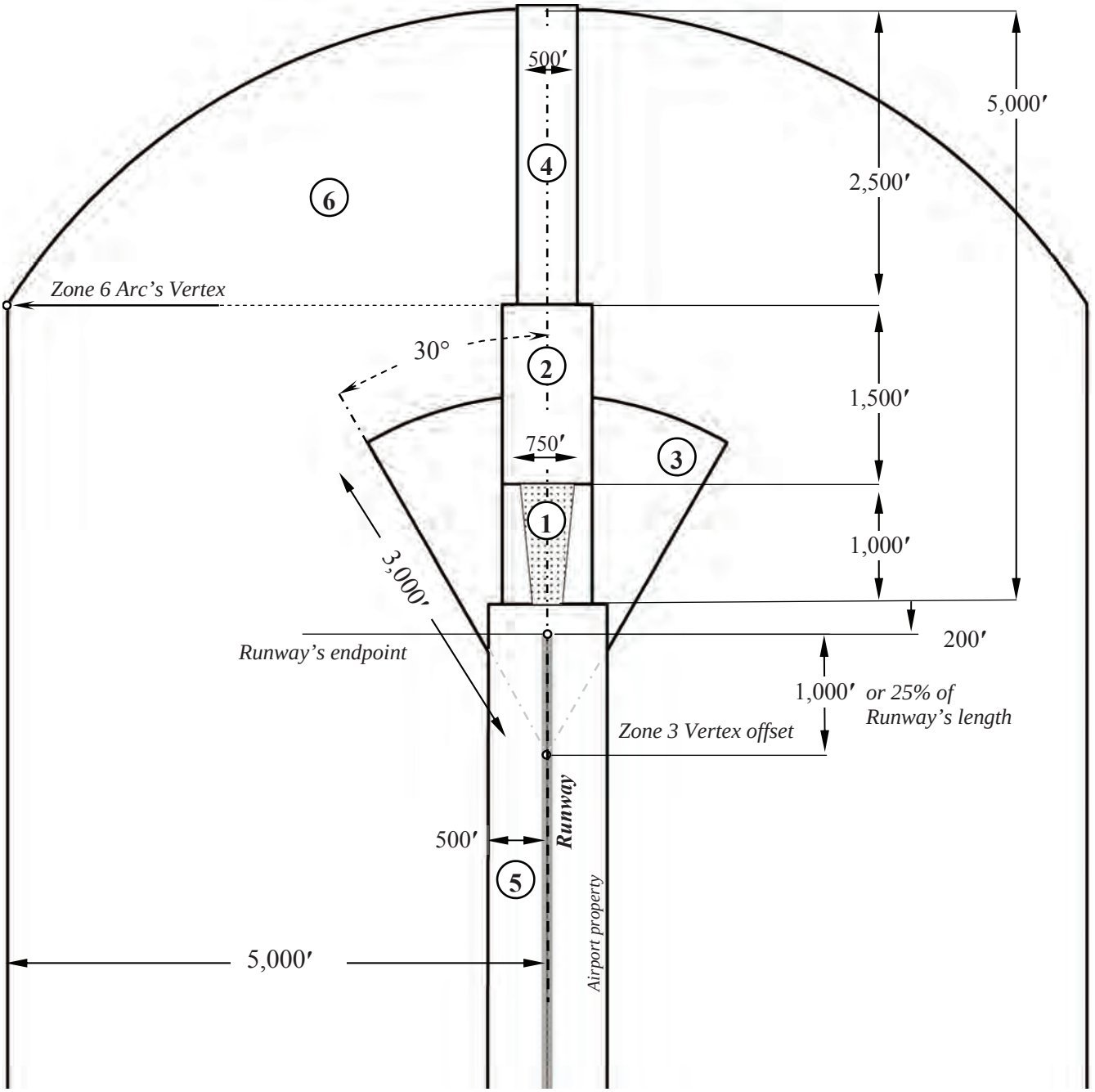
	Compatibilty Zones					
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**
6. Wholesale Trade-Storage						
Warehouses	Storage only	P	P	P	P	P
Wholesale trade	Storage only	P	P	P	P	P
Storage facilities; bulk	L	P	P	P	P	P
commercial	L	P	P	P	P	P
mini-storage	L	P	P	P	P	P
E. Transportation and Utilities						
1. Transportation						
Bus terminals	X	L	P	P	L	P
Transportation storage and maintenance facilities	Storage only	P	P	P	P	P
Transportation brokerage offices; without truck parking	X	P	P	P	P	P
with truck parking	L	P	P	P	P	P
Contract truck hauling, rental of trucks with drivers	L	P	P	P	P	P
Rail, truck terminals (for short-term storage, office)	L	P	P	P	P	P
Air storage and office use	Storage only	P	P	P	P	P
Railroad switch yards, maintenance, and repair facilities, etc.	X	P	P	P	P	P
Taxicab terminals, maintenance, and dispatching centers, etc.	X	P	P	P	P	P
2. Utilities						
Power generating facilities	L	L	L	L	L	L
Utility services (substations, etc.)	L	L	L	L	L	P
Wholesale trade	L	P	P	P	L	P
Storage facilities; bulk	L	P	P	P	P	P
Commercial	L	P	P	P	P	P

Chart Symbols

- **"L" Limited** – Uses or activities that may be compatible with airport operations depending on their location, size, bulk, height, density and intensity of use.
- **"LSC" Limited Special Conditions** – Development should be moved away from the extended runway centerline. Open space should be devoted to areas that experience elevated risk.
- **"P" permitted** – Uses or activities that should be permitted, however, these activities should be reviewed to ensure that they will not create height hazard obstructions, smoke, glare, electronic, wildlife attractants, or other airspace hazards.
- **"X" Prohibited** – uses or activities that should not be constructed near the airport.

All uses or activities identified herein are subject to intensity and density limitations set forth in Table F-1. Particular attention should be given to developments that when located in combination with other permitted or limited activities may create cumulative impacts on airport operations. All uses should be reviewed to ensure that they will not create airspace hazards.

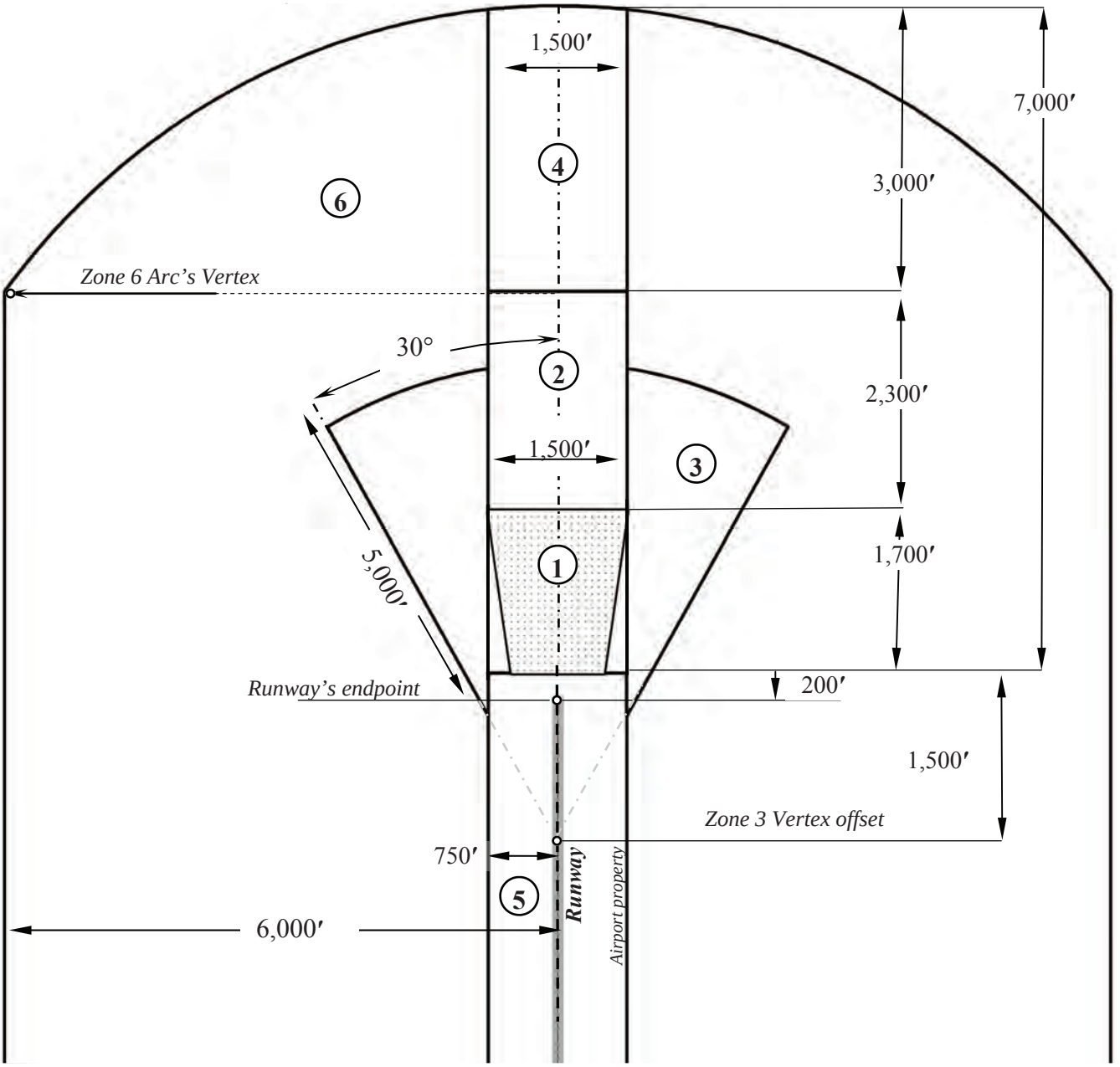
Airport Runways Under 3000 Feet



Airport Compatibility Zones			
Dimensions	**Length**	**Width**	**Notes**
Zone 1	1,000′	750′	Zone 1 includes the runway's RPZ. The RPZ is depicted with ordered stipple within Zone 1
Zone 2	1,500′	750′	NA
Zone 3	3,000′	*	*Plot Zone 3's vertex 1,000′ from the runway's endpoint or 25% of runway's length
Zone 4	2,500′	500′	NA
Zone 5	*	500′	Zone 5 ends 200′ past the runway's endpoint
Zone 6	5,000′	5,000’	Set the vertex for Zone 6's arc parallel to the end of Zone 2

RPZ – Runway Protection Zone

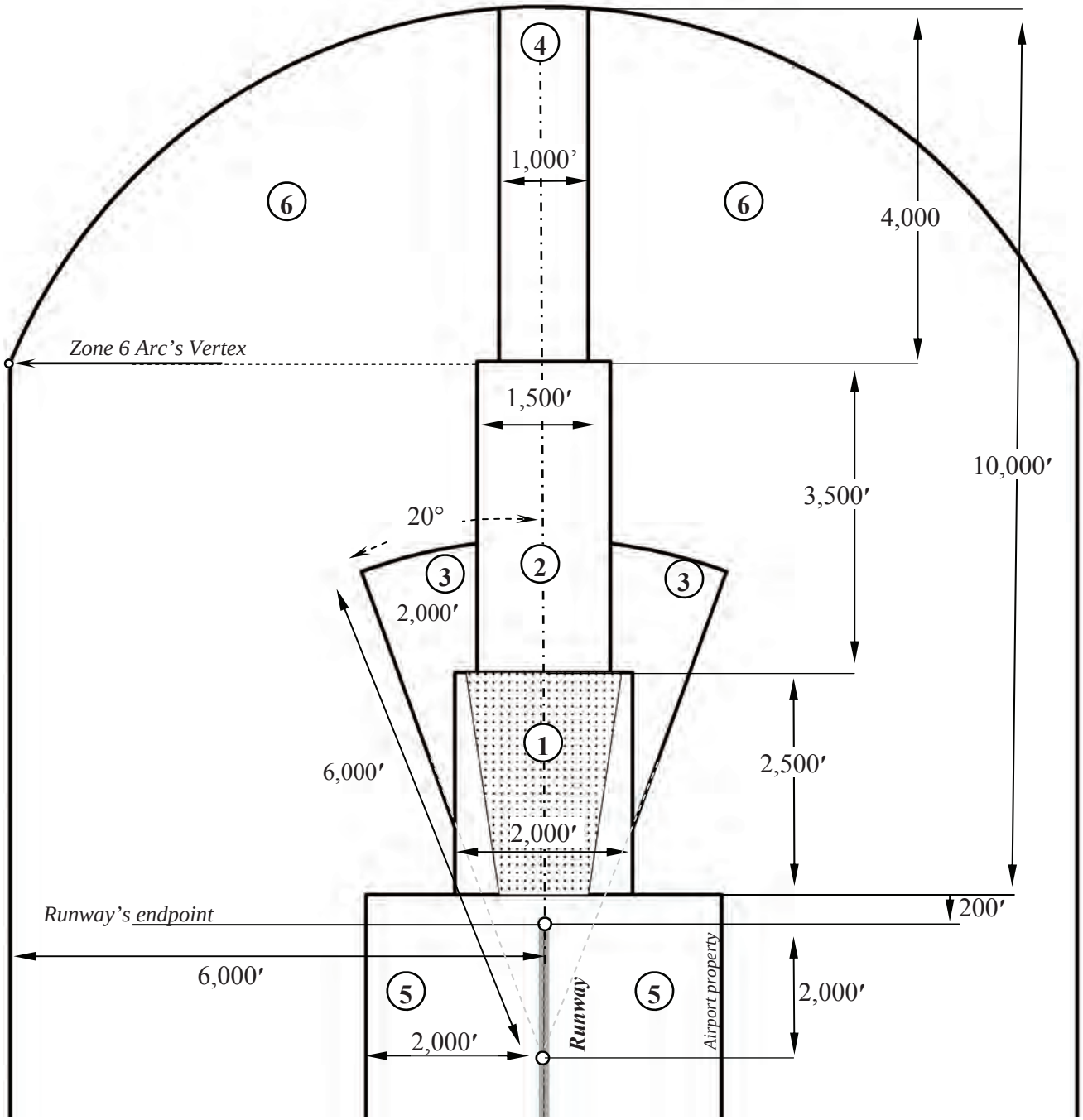
Airport Runways 3,000 to 5,000 Feet



Airport Compatibility Zones			
Dimensions	**Length**	**Width**	**Notes**
Zone 1	1,000′	750′*	Zone 1 includes the runway's RPZ. The RPZ is depicted by ordered stipple within Zone 1 ⬚ *RPZ dimensional standards are dictated by runway approach type.
Zone 2	1,500′	750′	NA
Zone 3	3,000′	*	*Plot Zone 3's vertex 1,500′ from the runway's endpoint
Zone 4	2,500′	500′	NA
Zone 5	*	500′	Zone 5 ends 200′ past the runway's endpoint
Zone 6	5,000′	5,000’	Set the vertex for Zone 6's arc parallel to the end of Zone 2

RPZ – Runway Protection Zone

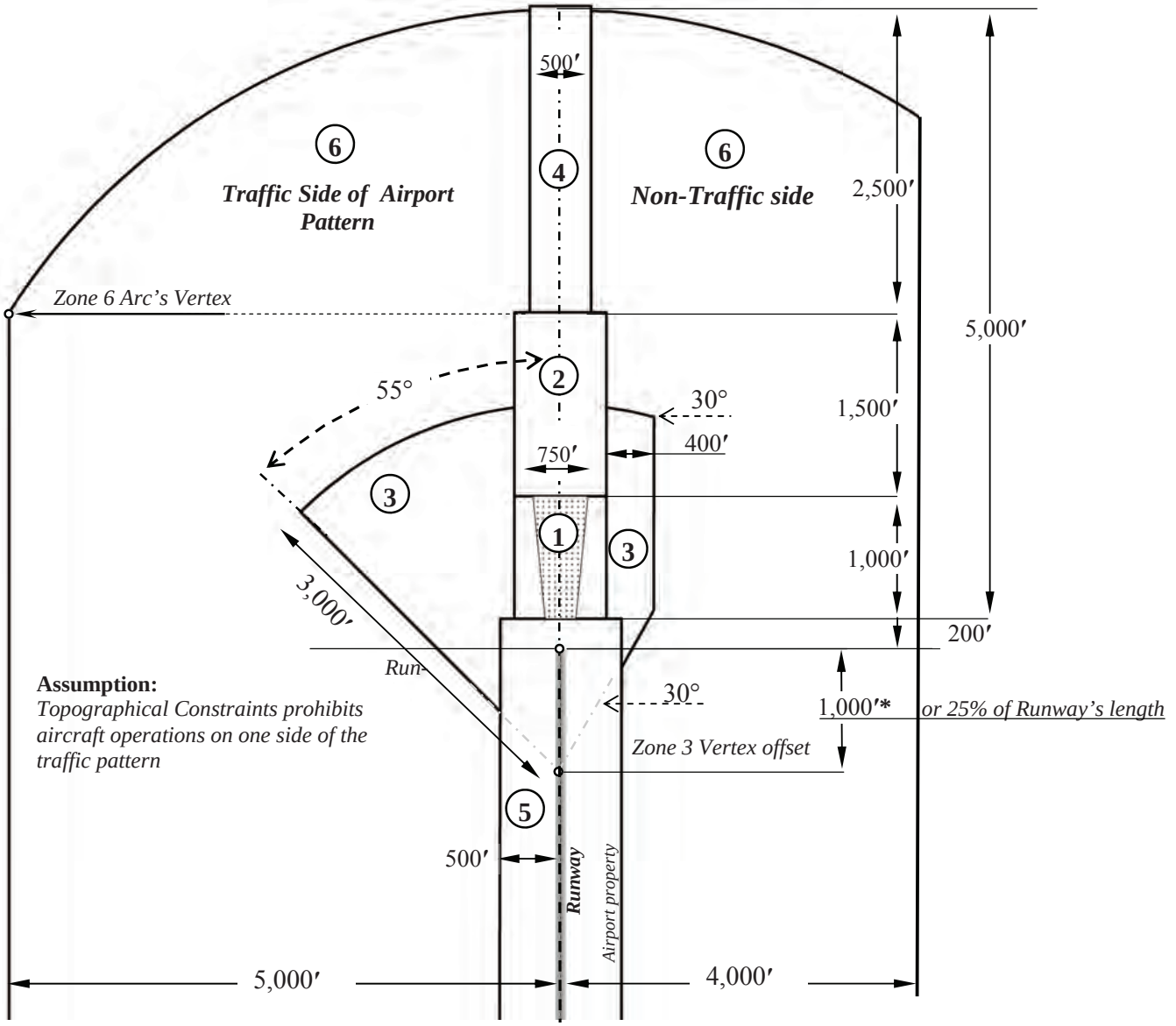
Airport Runways Greater Than 5000 Feet



Airport Compatibility Zones			
Dimensions	**Length**	**Width**	**Notes**
Zone 1	2,500′	2,000′	Zone 1 includes the runway's RPZ. The RPZ is depicted with ordered stipple within Zone 1 ⁝⁝ *RPZ dimensional standards are dictated by runway approach type.
Zone 2	3,500′	1,500′	NA
Zone 3	6,000′	*	*Plot Zone 3's vertex 2,000′ from the runway's endpoint
Zone 4	4,000′		NA
Zone 5	*	2,000′	*Zone 5 ends 200′ past the runway's endpoint
Zone 6	10,000′	6,000′	Set the vertex for Zone 6's arc parallel to the end of Zone 2

RPZ – Runway Protection Zone

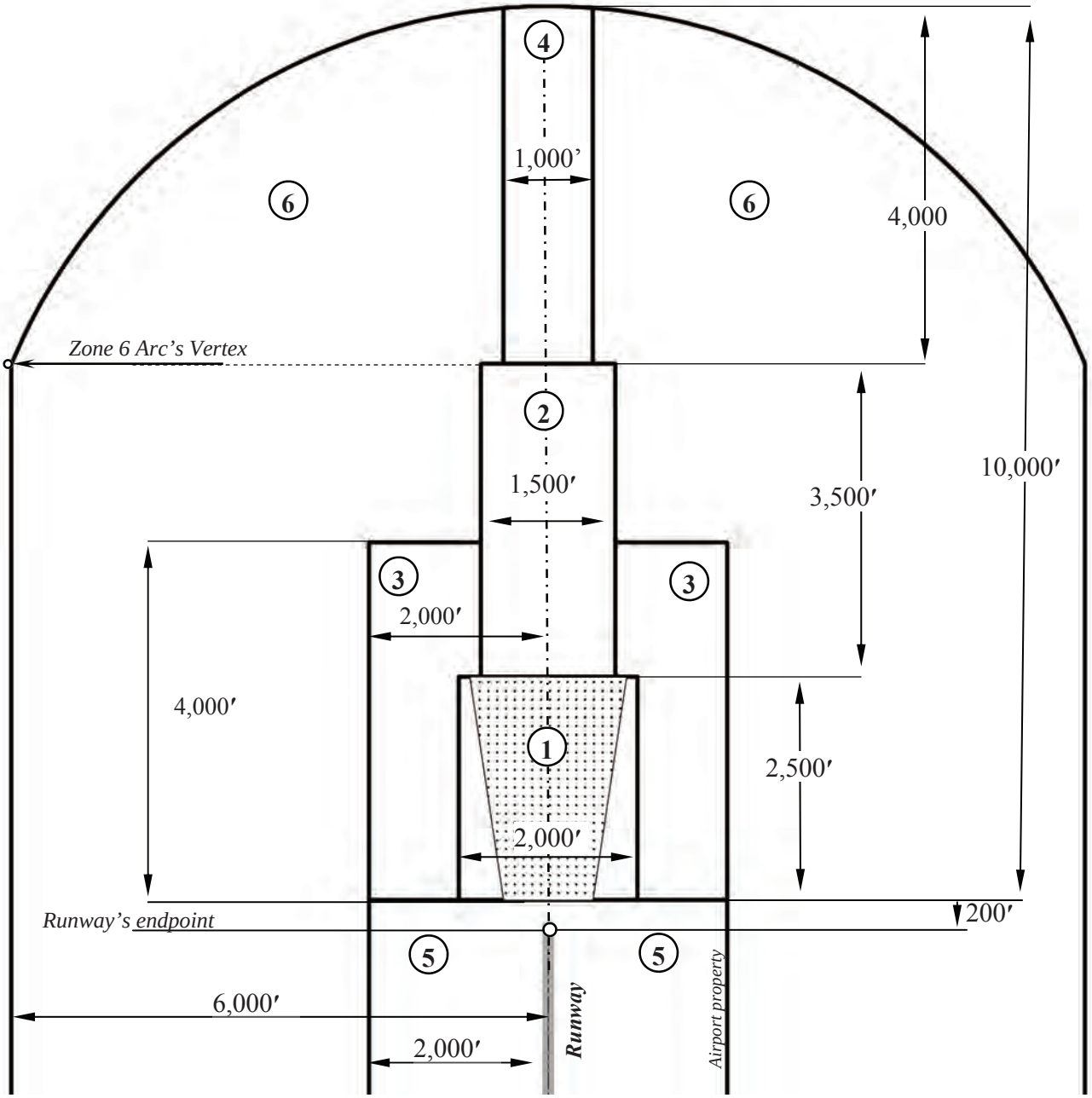
Airport Runway Under 3000 feet 'Single Sided Traffic Pattern Alternative



Airport Compatibility Zones			
Dimensions	**Length**	**Width**	**Notes**
Zone 1	2,500′	2,000	Zone 1 includes the runway's RPZ. The RPZ is depicted with ordered stipple within Zone 1 ⁝⁝ *RPZ dimensional standards are dictated by runway approach type.
Zone 2	3,500′	1,500′	NA
Zone 3	3,000′	3,000′	NA
Zone 4	4,000′		NA
Zone 5	*	2,000′	*Zone 5 ends 200′ past the runway's endpoint
Zone 6	10,000′	6,000′	Set the vertex for Zone 6's arc parallel to the end of Zone 2

RPZ – Runway Protection Zone

Airport Runways Greater Than 5,000 Feet: Alternative A



Airport Compatibility Zones			
Dimensions	**Length**	**Width**	**Notes**
Zone 1	1,000′	750′	Zone 1 includes the runway's RPZ. The RPZ is depicted by ordered stipple within Zone 1 ⁝⁝⁝
Zone 2	1,500′	750′	NA
Zone 3	3,000′	*	*Plot Zone 3's vertex 1,000′ from the runway's endpoint or 25% of runway's length. 55° or greater traffic side. 30° with 400′ width non-traffic side
Zone 4	2,500′	500′	NA
Zone 5	*	500′	Zone 5 ends 200′ past the runway's endpoint
Zone 6	5,000′	5,000′	Set the vertex for Zone 6's arc parallel to the end of Zone 2. 5,000′ width traffic side. 4,000′ width non traffic side.

RPZ – Runway Protection Zone

Appendix G — Learning More About: The Legal Framework for Compatibility Planning

Introduction

The legal framework on which airport land use compatibility planning is conducted is provided by a variety of federal and state laws and regulation and legal decisions. Some of these laws and regulations must be followed by airports when they receive grant money from the Federal Aviation Administration (FAA). In Washington State, the responsibility for ensuring compatibility between an airport and surrounding land uses rests with local jurisdictions in coordination with the airport. Local jurisdictions include jurisdictions in which the airport is located, as well as other jurisdictions into which the airports influence area extends.

Summarized in this section are state and federal laws, regulations, and state Growth Management Hearings Board decisions that have an important bearing on airport land use compatibility and the issues discussed earlier in Chapter 1.

State Laws and Regulations

The Revised Code of Washington (RCW) is a compilation of all permanent state laws. The following list highlights some of the laws affecting airports and development around them.

Aeronautics Laws

Laws pertaining to aeronautics are mostly gathered under RCW Title 14.

- **RCW 14.07 and 14.08** ***Municipal airports act*** – Adopted in 1941 and amended in 1945, the act provides for the acquisition and sponsorship of airports by Washington cities, towns, counties, port districts, and airport districts.
- **RCW 14.12** ***Airport zoning act*** – This act establishes definitions and criteria and allows local jurisdictions to adopt zoning controls to protect critical airspace from buildings, structures, or other airspace obstructions. The law provides direction and guidance to cities and counties on how to manage airport hazards.

Planning Enabling Act

Washington's Planning Enabling Act (Chapter 36.70 RCW) is a set of state laws that describe planning authorities and responsibilities for towns, cities, and counties. Sections particularly applicable to airport land use compatibility planning include the following.

- **RCW 36.70.320** ***Comprehensive plan*** – Under this section, counties are required to prepare a "comprehensive plan for the orderly physical development of the county, or any portion thereof …." RCW 35A.63.060 establishes similar comprehensive planning requirements for cities and towns. The two required elements of comprehensive plans are a land use element and a circulation element (RCW 36.70.330). Other elements are optional (RCW 36.70.350).

- RCW 36.70.547 ***General aviation airports*** – This section mandates that:

  "Every county, city, and town in which there is located a general aviation airport that is operated for the benefit of the general public, whether publicly owned or privately owned public use, shall, through its comprehensive plan and development regulations, discourage the siting of incompatible uses adjacent to such general aviation airport."

Plans may only be adopted following formal consultation with aviation stakeholders, including WSDOT Aviation. WSDOT Aviation is tasked with providing technical assistance to local agencies preparing plans and regulations consistent with this section. All proposed and adopted plans and regulations shall be filed with the Aviation Division of the Department of Transportation within a reasonable time after release for public consideration and comment.

Growth Management Act (GMA)

Adopted in 1990, the GMA (RCW Chapter 36.70A) was enacted in response to rapid population growth and concerns with suburban sprawl, environmental protection, quality of life, and related issues. The act expands the Planning Enabling Act requirements for comprehensive planning in the state's most populous and rapidly growing counties. Twenty-nine counties are either required to fully plan under the GMA or have chosen to do so. These counties make up about 95 percent of the state's population. The remaining ten counties have limited planning requirements under the act.

Several sections are important to airports:

- **RCW 36.70A.070** ***Comprehensive plans – Mandatory elements*** – This section lists eight elements that must be included in comprehensive plans. Most of the elements potentially affect airports in that they guide the development that may occur in nearby areas. The land use element is particularly significant to land use compatibility matters and the rural element also may be consequential to some airports. The transportation element requires an inventory of facilities and services needs, including general aviation airports, "to define existing capital facilities and travel levels as a basis for future planning."

- **RCW 36.70A.110** ***Comprehensive plans – Urban growth areas*** – Each county that is required or chooses to plan under the GMA must designate an urban growth area or areas within which urban growth is to be encouraged and outside of which growth can occur only if it is not urban in nature. Urban growth area boundaries must be reviewed at least every ten years and adjusted as necessary to accommodate the urban growth projected to occur in the county for the succeeding 20-year period (RCW 36.70A.130).

  For airports located near the edge of urban areas, airport land use compatibility should be considered in determining the location of the urban growth boundary.

- **RCW 36.70A.140** ***Comprehensive plans – Ensure public participation*** – Each county and city that is required or chooses to plan under RCW 36.70A.040 shall establish and broadly disseminate to the public a public participation program identifying procedures providing for early and continuous public participation in the development and amendment of comprehensive land use plans and development regulations implementing such plans. The procedures shall provide for broad dissemination of proposals and alternatives, opportunity for written comments, public meetings after effective notice, provision for open discussion, communication programs, information services, and consideration of and response to public comments.

In enacting legislation in response to the board's decision pursuant to RCW 36.70A.300 declaring part or all of a comprehensive plan or development regulation invalid, the county or city shall provide for public participation that is appropriate and effective under the circumstances presented by the board's order. Errors in exact compliance with the established program and procedures shall not render the comprehensive land use plan or development regulations invalid if the spirit of the program and procedures is observed.

- **RCW 36.70A.200** ***Siting of essential public facilities – Limitation on liability*** – This section deals with essential public facilities that are typically difficult to site. Airports are explicitly identified as an example of this type of facility. Others include: state education facilities, state or regional transportation facilities, state and local correctional facilities, solid waste handling facilities, and in-patient facilities including substance abuse facilities, mental health facilities, group homes, and secure community transition facilities. Counties and cities planning under GMA must have a process for identifying and siting essential public facilities. No local comprehensive plan or development regulation may preclude the siting of essential public facilities.

- **RCW 36.70A.210** ***Countywide planning policies*** – Recognizing that counties are regional governments within their boundaries and that cities are primary providers of urban governmental services within urban growth areas, this section establishes requirements for adoption of countywide planning policies. Such policies are to serve as a countywide framework from which county and city comprehensive plans are developed and adopted and made consistent with each other. Specific topics to be covered by the policies are listed.

Although airport land use compatibility is not explicitly listed as a topic for countywide planning policies, the statutes allow topics other than those listed to be addressed.

Findings of the Washington State Growth Management Hearings Boards

The following four decisions are ones most directly relevant to airport land use compatibility matters. The implications are noted here along with a brief indication of the topic addressed by the decision.

- ***Stephen Pruitt and Steven Van Cleve v. Town of Eatonville*** **– Central Puget Sound Growth Management Hearings Board (CPSGMHB Case No. 06-3-0016, December 18, 2006)** – Legitimized WSDOT's role in defining the compatibility policies that need to be incorporated into a community's comprehensive plan. Guidelines developed by WSDOT could include minimum standards that would be given great weight by growth management hearing boards. However, these guidelines would be recommendations, and not regulatory in nature.

- ***State of Washington Department of Corrections and Department of Social and Health Services v. City of Tacoma*** **– Central Puget Sound Growth Management Hearings Board (CPSGMHB Case No. 00-3-0007, November 20, 2000)** – Expansion of essential public facilities must also be accommodated by local agencies. A community's comprehensive plan therefore must support planned expansion of any airport that lies within the area covered by the plan. Guidance for expansion of airport facilities, volume of traffic and changes in aircraft fleet mix can be taken from an airport's master plan. Where a current airport master plan does not exist, the required facility planning can be done as a component of development of the comprehensive plan.

- ***Port of Seattle v. City of Des Moines* – Central Puget Sound Growth Management Hearings Board (CPSGMHB Case No. 97-3-0014, August 13, 1997)** – The requirement to accommodate expansion of essential public services includes necessary supporting facilities and services. While this is likely to be most important at larger commercial service airports, it clearly establishes that comprehensive plans must facilitate all elements necessary for an airport to function. At commercial airports this could include such off-airport facilities as: rental car facilities, airport shuttle businesses, air freight consolidators, and airline catering companies.

- ***Hapsmith et al v. City of Auburn* – Central Puget Sound Growth Management Hearings Board (CPSGMHB Case No. 95-3-0075c, May 10. 1996)** – Although this decision specifically addresses mitigations for a new essential public facility, it suggests that the external impacts of these uses need to be addressed. Compatibility policies contained in comprehensive plans can be viewed as a form of mitigation in that they are intended to minimize the noise and safety effects of airports. This case does not provide any guidance on the substance of mitigation. However, it does legitimize including mitigation of impacts as one more reason to include compatibility policies in comprehensive plans.

Additional decisions of interest include these:

- Local jurisdiction required to consult with airport prior to adoption of comprehensive plan amendments having an effect on the airport.
  - Son Vida II v. Kittitas County (EWGMHB Case No. 01-1-0017; March 14, 2002)
  - NFRD v. City of Yakima (EWGMHB Case No. 02-1-0009; December 5, 2002)
  - McHugh v. Spokane County (EWGMHB Case No. 05-1-0004; December 16, 2005)
- High-density residential zones adjacent to airports are inappropriate/incompatible uses; jurisdictions must preclude uses non-compatible with an airport to comply with GMA.
  - CCARE v. Anacortes (WWGMHB Case No. 01-2-0019; December 12, 2001)
  - Klein v. San Juan County (WWGMHB Case No. 02-2-0008; October 18, 2002)
  - Futurewise v. Whatcom County (WWGMHB Case No. 05-2-0013 September 20, 2005)

Washington Administrative Code

The Washington Administrative Code (WAC) are regulations of executive branch agencies are issued by authority of statutes. Like legislation and the Constitution, regulations are a source of primary law in Washington State. The WAC codifies the regulations and arranges them by subject or agency.

WAC 365-196-455 *Land use compatibility adjacent to general aviation airports.*

Federal Laws and Regulations

Federal airport land use compatibility policies are concerned mostly with airspace and environmentally significant noise issues. These statutes are implemented through regulations and policies of individual federal agencies, in particular the FAA. Federal guidance with regard to airport land use safety compatibility is primarily limited to FAA regulations concerning airport design and the protection of airport airspace.

Statutes

Three statutes are of particular relevance to airport land use compatibility planning in that they both support and, at the same time, limit the actions that airports and communities can take to mitigate noise impacts. It is important to note, however, that these statutes only apply to airports in the federal system of airports (NPIAS).

FAR Part 150, *Airport Noise Compatibility Planning*, requirements does not apply to most airports within Washington State. First, an airport must be in the NPIAS to participate. Even among those airports that are eligible, FAR Part 150 studies are generally valuable only for airline and busy general aviation facilities.

- **Aviation Safety and Noise Abatement Act of 1979 (ASNA)** – Among the stated purposes of this act is "to provide assistance to airport operators to prepare and carry out noise compatibility programs." The law establishes funding for noise compatibility planning and sets the requirements by which airport operators can apply for funding. The law does not require any airport to develop a noise compatibility program; the decision to do so is the choice of each individual airport proprietor. Regulations implementing the act are set forth in Federal Aviation Regulations Part 150.
- **Airport and Airway Improvement Act of 1982 (AAIA)** – This act established the Airport Improvement Program (AIP) through which federal funds are made available for airport improvements and noise compatibility planning. The act has been amended several times, but remains in effect as of late 2009. Land use compatibility provisions of the act are implemented primarily by means of the assurances that airports must provide in order to receive federal airport improvement grants.
- **Airport Noise and Capacity Act of 1990 (ANCA)** – In adopting this legislation, Congress' stated intention was to try to balance local needs for airport noise abatement with national needs for an effective air transportation system. To accomplish this objective, the act did two things: (1) it directed the FAA to establish a national program to review noise and access restrictions on aircraft operations imposed by airport proprietors; and (2) it established requirements for the phase-out of most older model, comparatively louder, "Stage 2" airline aircraft from the nation's airline fleet by January 2000. These two requirements are implemented by Federal Aviation Regulations (FAR) Part 161 and 91, respectively.

Federal Aviation Administration Policies

The most significant FAA policies having a bearing on airport land use compatibility are found in Federal Aviation Regulations (FAR) and, secondarily, in certain Advisory Circulars.

- **FAR Part 36,** ***Noise Standards: Aircraft Type and Airworthiness Certification*** – This part of the Federal Aviation Regulations sets the noise limits that all newly produced aircraft must meet as part of their airworthiness certification.

- **FAR Part 91,** ***General Operating and Flight Rules*** – This part of the Federal Aviation Regulations sets many of the rules by which aircraft flights within the United States are to be conducted. Rules governing noise limits are set forth in Subpart I. This FAR implements the requirements set forth in the Airport Noise and Capacity Act of 1990.

- **FAR Part 77,** ***Objects Affecting Navigable Airspace*** – FAR Part 77 establishes standards for determining obstructions to navigable airspace and the effects of such obstructions on the safe and efficient use of that airspace. The regulations require that the FAA be notified of proposed construction or alteration of objects—whether permanent, temporary, or of natural growth—if those objects would be of a height that would exceed the FAR Part 77 criteria. The height limits are defined in terms of imaginary surfaces in the airspace extending about two to three miles around airport runways and approximately 9.5 miles from the ends of runways having a precision instrument approach.

  When notified of a proposed construction, the FAA conducts an aeronautical study to determine whether the object would constitute an air-space hazard. Simply because an object (or the ground) would exceed an airport's airspace surfaces established in accordance with FAR Part 77 criteria does not mean that the object would be considered a hazard. Various factors, including the extent to which an object is shielded by nearby taller objects, are taken into account. The FAA may recommend marking and lighting of obstructions.

- **FAR Part 150,** ***Airport Noise Compatibility Planning*** – As a means of implementing the Aviation Safety and Noise Abatement Act of 1979, the FAA adopted these regulations establishing a voluntary program that airports can utilize to conduct airport noise compatibility planning. Part 150 prescribes a system for measuring airport noise impacts and presents guidelines for identifying incompatible land uses. Airports that choose to undertake a Part 150 study are eligible for federal funding both for the study itself and for implementation of approved components of the local program. Completion of a Part 150 study is a prerequisite to FAA funding of many noise abatement implementation measures.

  📖 See Advisory Circular 150/5020-1, *Noise Control and Compatible Planning for Airports* at:
  www.faa.gov/airports_airtraffic/airports/environmental/airport noise

- **FAR Part 161,** ***Notice and Approval of Airport Noise and Access Restrictions*** – This part of the federal regulations implements the Airport Noise and Capacity Act of 1990. It codifies the analysis and notification requirements for airport proprietors proposing aircraft noise and access restrictions on Stage 2 or Stage 3 aircraft weighing 75,000 pounds or more. Among other things, an extensive cost-benefit analysis of proposed restrictions is required. The analysis requirements are closely tied to the process set forth in FAR Part 150 and are more stringent with respect to the quieter, Stage 3 aircraft than for Stage 2.

- **FAA Advisory Circular 150/5300-13, *Airport Design*** – The primary function of this Advisory Circular is to establish standards for dimensions and other features of airport runways, taxiways, and other aircraft operating areas. Also included are standards for runway protection zones (RPZs), trapezoidal-shaped areas located immediately beyond the runway ends. The FAA strongly encourages airports to own this property and its acquisition is eligible for FAA grants. When not airport-owned, the airport or community should still greatly restrict the land uses there.

Other Federal Agencies

- **U.S. Environmental Protection Agency (EPA)** – A report published in 1974 by the EPA Office of Noise Abatement and Control continues to be a source of useful background information. Entitled Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, this report is better known as the "Levels Document." The document does not constitute EPA regulations or standards. Rather, it is intended to "provide state and local governments as well as the federal government and the private sector with an informational point of departure for the purposes of decision-making."

- **Department of Housing and Urban Development (HUD)** – HUD guidelines for the acceptability of residential land use are set forth in the Code of Federal Regulations Title 24, Part 51, Environmental Criteria and Standards.

- **Department of Defense Air Installations Compatibility Use Zones (AICUZ) Program** – The AICUZ Program was established by the DOD in response to growing incompatible urban development around military airfields. DOD Instruction Number 4165.57 (November 8, 1977) provides the overall guidance for the program and mandates preparation of an AICUZ plan for each installation. Each of the military services has its own individual guidelines for implementing the basic instructions. AICUZ plans prepared for individual military airfields serve as recommendations to local land use jurisdictions, but have no regulatory function.

- **Department of Defense Joint Land Use Study (JLUS) Program** – In 1985, congress authorized the DOD to make available community planning assistance grants (Title 10 U.S.C. Section 2391) to state and local government to help better understand and incorporate the AICUZ technical data into local planning programs. The Office of Economic Adjustment (OEA) manages the JLUS program. A JLUS is a cooperative land use planning effort between the affected local government and the military installation. The JLUS presents a rationale, justification, and a policy framework to support the adoption and implementation of recommended compatible development criteria. These measures are designed to prevent urban encroachment; safeguard the military mission; and protect the public health, safety, and welfare.

📖 See also, AOPA's *Guide to Airport Noise and Land Use Compatibility* at: www.aopa.org/asn/land_use

Worksheet 1A State Laws Applicable to Airport Land Use Compatibility in Your Community

Worksheet 1A State Laws Applicable to Airport Land Use Compatibility in Your Community

How and why do these laws apply to my jurisdiction?

Which particular state laws affect your jurisdiction's planning responsibilities related to airports? Many of the laws apply to all jurisdictions, while others are relevant only to certain types. Use this worksheet to note your observations and questions as to how the state laws apply to your jurisdiction.

Aeronautics Laws (RCW Title 14)
Laws pertaining to aeronautics are mostly gathered under Title 14.

RCW 14.07 and 14.08 *Municipal airports act*

RCW 14.12 *Airport zoning act*

Growth Management Act (RCW Chapter 36.70A)

RCW 36.70.320 *Comprehensive pla*n

RCW 36.70.547 *General aviation airports*

Planning Enabling Act (RCW Chapter 36.70)

RCW 36.70A.070 *Comprehensive plans – Mandatory elements*

Land Use:

Housing:

Capital Facilities:

Transportation:

RCW 36.70A.140 Comprehensive plans

Ensure Public Participation:

RCW 36.70A.200 Siting of essential public facilities

Limitation on Liability RCW:

RCW 36.70A.210 Countywide planning policies

RCW 36.70A.110 Urban growth areas

Worksheet 1B Purpose and Objectives of Airport Land Use Compatibility Planning

Worksheet 1B Purpose and Objectives of Airport Land Use Compatibility Planning

What are the primary purposes and objectives to be achieved in compatibility planning for the airports in your jurisdiction?

Are there specific issues to be addressed that are arising either because of changes at the airport or development pressures nearby? List the top three objectives.

Objective 1:

Objective 2:

Objective 3:

Land Use Compatibility Challenges

1.

2.

3.

4.

Worksheet 1C Challenges to Airport Land Use Compatibility Planning

Worksheet 1C Challenges to Airport Land Use Compatibility Planning

What particular challenges do you expect to face during the compatibility planning effort?

Some typical obstacles to compatibility planning include:

- Airport Expansion
- Community Opposition

Identify your top three challenges to the completion of the project:

1.
2.
3.

How do you intend to accomplish the compatibility planning study?

Will the study be done as part of the comprehensive plan?

Is a separate effort needed?

Have you allowed enough time to complete your study before the your comprehensive plan?

Are there specific issues to be addressed that are arising either because of changes at the airport or development pressures nearby? List the top three objectives.

Objective 1:

Objective 2:

Objective 3:

Land Use Compatibility Challenges

1.
2.
3.

Worksheet 1D Airport Data Checklist: Context, Features, and Activity

Worksheet 1D Airport Data Checklist: Context, Features, and Activity

Use the following worksheet to collect essential data about the airport. This data falls into three general categories:

- Airport Context
- Airport Features
- Airport Activity

Airport Context

1. Who owns or sponsors the airport and who runs it?

2. What previous planning studies have been done for the airport?

3. What is the state classification of the airport/s?
   - ☐ Commercial Service Airports
   - ☐ Regional Service Airports
   - ☐ Community Service Airports
   - ☐ Local Service Airports
   - ☐ Rural Essential Airports
   - ☐ Seaplane Bases

4. Who uses the airport?

5. What is the airport's role in the community?

   How does the airport fit into the goals of the community and the region?

   Has your community adopted specific policies regarding the role of the airport?
   How is the airport perceived by the general public?

   Have compatibility problems or other issues become major controversies?

6. Does the airport connect with other transportation modes?

   Is the airport an integral part of a multi-modal transportation system within your community and region?

   Is it disassociated with the transportation network?

   What links does the airport have with public transportation and freight movement systems?

   What are the opportunities for better inter-modal connections?

7. What is the airport's economic contribution to the community?

   Has a specific economic study been done?

   How many public and private employees does the airport have?

   If possible, what is the gross payroll of those employed at the airport?

   Does the airport have support charter service? Does it provide access for a regional based business?

Airport Features

1. What is the length, width, and surface type for each runway at the airport?

   Does the airport have a displaced threshold?

   Which runway end and how long is the displaced?

   Does the runway have a nighttime lighting system?

   What is the runway's pavement strength (Paved runways only)?

   What are the official latitude and longitude coordinates of the runway ends and displaced thresholds?

2. What types of approach capabilities does each runway end have?

3. Which (ARC) design standards apply to the airport and does the airport meet these standards?

4. What is the plan for future development at the airport?

   Are changes planned for runways or instrument approaches?

Airport Activity

1. What is the composition of aircraft operations?

   Is the airport used strictly by general aviation aircraft or are there also scheduled airline flights or operations by military aircraft?

2. What types of aircraft use the airport and how often?

   What aircraft are based at the airport?

Type of Aircraft	Number of Operations
Single Engine	
Multi Engine	
Jet	
Helicopter	
Glider	
Military	
Ultralight	
Seaplane	

   What transient aircraft regularly visit the airport?

Type of Aircraft	Number of Visits
Single Engine	
Multi Engine	
Jet	
Helicopter	
Glider	
Military	
Ultralight	
Seaplane	
Law Enforcement	

   What is the airports critical aircraft?

   What types of aircraft are expected to use the airport in the future?

   Does the airport support flight school activity, medical services, or parachute activity?

3. How many passengers does the airport serve?

   How many passengers does the airport service?

   How many tons of cargo does the airport ship?

4. What deviations from the normal traffic pattern are typical at the airport?

Worksheet 3A Compatibility Status of Existing Land Uses

Worksheet 3A Compatibility Status of Existing Land Uses

Use the following worksheet to inventory the uses that exist within the airport influence area.
Are these uses clearly compatible or incompatible with the airport? Flag the uses that could potentially be incompatible or that you are uncertain about.

1. To what degree does this use exist today?
2. Is the use compatible or incompatible?
3. Why?

Agricultural

1.
2.
3.

Power Plants/Transmission Lines/Roads

1.
2.
3.

Parks/Recreation

1.
2.
3.

Stadiums

1.
2.
3.

Industrial

1.
2.
3.

Retail/Service Uses

1.
2.
3.

Dining/Entertainment

1.
2.
3.

Offices/Industrial Parks

1.
2.
3.

Places of Worship

1.
2.
3.

Residential – Low-Density

1.
2.
3.

Residential – Medium-Density

1.
2.
3.

Residential – High-Density

1.
2.
3.

Children's Schools/Daycare Centers

1.
2.
3.

Hospitals/Nursing Homes

1.
2.
3.

Wildlife Attractants

1.
2.
3.

Airspace Hazards (tall structures, dust, smoke, glare, electronic transmissions)

1.
2.
3.

Vacant or Undeveloped Land

1.
2.
3.

Miscellaneous

1.
2.
3.

Worksheet 3B Potential New Incompatible Uses

Worksheet 3B Potential New Incompatible Uses

Based on current policy, what new development might exist in the future? Is the use compatible or incompatible? Why?

	Future Development	Compatible or Incompatible	Why
Land Uses			
Agricultural			
Power Plants/Transmission Lines/Roads			
Parks/Recreation			
Stadiums			
Industrial			
Retail/Service Uses			
Dining/Entertainment			
Offices/Industrial Parks			
Places of Worship			
Residential – Low-Density			
Residential – Medium-Density			
Residential – High-Density			
Children's Schools/ Daycare Centers			
Hospitals/Nursing Homes			
Wildlife Attractants			
Airspace Hazards (tall structures, dust, smoke, glare, electronic transmissions)			
Airspace Hazards (tall structures, dust, smoke, glare, electronic transmissions)			
Theaters			

Worksheet 3C Compatibility Concerns Based on Current Policy

Worksheet 3C Compatibility Concerns Based on Current Policy

List the specific issues that must be addressed to ensure that development of incompatible land uses is avoided in the airport influence area.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Worksheet 4A Current Policy

Worksheet 4A Current Policy

List the existing policies, goals, and development regulations affecting the airport influence area. Also note any implicit policies that may affect future land use compatibility.

Policies

1.
2.
3.
4.
5.
6.
7.
8.

Goals

1.
2.
3.
4.
5.
6.
7.
8.

Development Regulations

1.
2.
3.
4.
5.
6.
7.
8.

Worksheet 4B Compatibility Policy Findings

Worksheet 4B Compatibility Policy Findings

Write statements of fact that document your findings. These statements provide evidence of your work on airport land use compatibility and may be used to support adoption of policies and regulations, and may also be referenced in any proceedings of the Growth Management Hearings Board. Use the following questions to access your jurisdictions current policies:

- Do current policies help prevent incompatible land use development in the airport influence area or do they tend to promote this development?
- To what extent have policies intended to prevent incompatible development been inadequate to the task? Why? Are their loopholes in the policies that allow compatibility goals to be circumvented?
- Are the policies clearly defined or are they open to a wide degree of interpretation?
- Do the current policies provide a good starting point for more detailed and thorough policies or do you need to start from nothing?

Policy Findings

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Worksheet 4C Alternatives Analysis

Worksheet 4C Alternatives Analysis

Compatibility Problem List compatibility issues identified in Step 3 that need to be addressed	Potential Planning Strategies List options for addressing the problem and describe the advantages and disadvantages of each	Preferred Strategy Write a finding that explains why the selected approaches is best for your community

Worksheet 4D Airport Influence Area Adjustments

Worksheet 4D Airport Influence Area Adjustments

Circumstances Warranting Possible Impact Area Adjustment	What are the conditions at your airport?	Do these conditions warrant adjusting the Airport Influence Area boundary? In what manner?
All • Have any planned runway configuration changes been accounted for? • Is the traffic pattern only on one side of the runway?		
Noise • Have future changes in airport role and aircraft usage been considered? • Does airport activity have a significant seasonal variation warranting consideration of peak season activity? • Do aircraft frequently follow a "nonstandard" approach or departure pattern? • Are there locations that should be encompassed in the flight impact area because the area has particularly noise-sensitive uses or is the source of complaints from many different people? • Is the area initially drawn so large that its significance is diluted?		
Overflight • Does experience low operations?		
Airspace Protection • Does the airport have instrument approach procedures that are not aligned with extended runway centerline? • Do any of the runways have a displaced threshold? • Are there existing obstructions such as high terrain that affect where aircraft fly?		
Safety • Do aircraft frequently follow a "nonstandard" approach or departure pattern? • Does the airport's historical accident pattern reveal conditions that create greater or lower than normal risks in certain locations?		

Worksheet 6A Implementation Check

Worksheet 6A Implementation Check

Use this worksheet to confirm that you have addressed all the compatibility criteria in your implementing regulations.

List Relevant Planning Policies	Describe How Regulations Support Implementation and Address Compatibility Criteria

Worksheet 7A Airport Land Use Compatibility Planning Checklist

Worksheet 7A Airport Land Use Compatibility Planning Checklist

Organization:

Date:

Name:

Phone:

City:

State:

Zip Code:

Airport Names:

Step 1: Getting Started and Gathering Data

Tasks

☐ Applicable state laws have been reviewed

☐ Airport transportation inventory has been completed

☐ The Airport Manager has been contacted

☐ WSDOT Aviation has been contacted

☐ A Consultation meeting has been conducted

- Airport manager (prepare materials prior to meeting)
- Pilots (prepare materials prior to meeting)
- Airport Business (FOB) (prepare materials prior to meeting)

☐ A communication and public participation strategy or plan has been drafted (RCW36.70A.035)

☐ The airport's role, features, and activity have been identified and documented

☐ You have inventoried existing land uses around the airport and what land use plans are in place

☐ The initial study area has been identified

Worksheets

☐ Worksheet1A -State Laws Applicable to Airport Land Use Compatibility in Your Community

☐ Worksheet1B - Purpose and Objectives of Airport Land Use Compatibility Planning

☐ Worksheet 1C - Challenges to Airport Land Use Compatibility Planning

☐ Worksheet 1D - Airport Data Checklist: Context, Features, and Activity

☐ Airport Context Worksheet

☐ Airport Activity Worksheet

☐ Airport Features Worksheet

Data and products

- ☐ Airport Master Plan
- ☐ Airport Layout Plan
- ☐ Regional Transportation Plans
- ☐ Washington Aviation System Plan (WASP)
- ☐ Parcel map
- ☐ Existing land use map
- ☐ Topography map
- ☐ Environmental sensitive areas map
- ☐ Comprehensive plan, plan policies and land use map
- ☐ Development regulations and zoning map
- ☐ Map of the initial study area

Step 2: Delineate the Airport Influence Area

Tasks:

- ☐ The impacts of noise, light, vibration, low flying aircraft, fumes, airspace protection, and safety in the airport environment have been defined
- ☐ The airport traffic pattern has been identified
- ☐ The existing land uses, topography, airport operations have been analyzed.
- ☐ The airport master plan/ALP, comprehensive plan, and other supporting plans have been analyzed
- ☐ The airport influence area has been delineated

Data and Products

- ☐ Airport map showing airport facility information i.e. airport runway, taxiway, apron, terminal
- ☐ Traffic pattern map or diagram
- ☐ Radar track map (if available)
- ☐ GPS Flight Track map (if available)
- ☐ Airport influence area boundary map
- ☐ Airport airspace map showing FAR Part 77 Imaginary Surfaces and Elevations
- ☐ Map of compatibility zones applicable to each runway end
- ☐ Communication and public participation strategy or plan

Step 3: Identify Compatibility Concerns

Tasks:

☐ The compatibility status of existing land uses in the airport influence area has been determined

☐ Potential compatibility conflicts have been identified

☐ Strategies have been identified to address compatibility concerns

Worksheets

☐ Worksheet 3A - Compatibility Status of Existing Land Uses

☐ Worksheet 3B - Potential New Incompatible Uses

☐ Worksheet 3C - Compatibility Concerns Based on Current Policy

Data and Products

☐ List of current comprehensive plan policies affecting air transportation and land use development in the airport influence area

☐ List of compatibility conflicts and land use status

☐ Identification of potential future compatibility conflicts

☐ List of specific compatibility issues and strategies to be addressed by new policies

Step 4: Prepare Comprehensive Plan

Tasks

☐ Advantages and disadvantages of planning strategies have been identified and weighed

☐ Planning strategies and criteria have been identified

☐ A range of comprehensive plan policies have been identified that address air transportation and land use compatibility within the airport influence area

☐ The final draft airport influence area, compatibility zones, airspace and supporting documentation has been identified

☐ The proposed draft comprehensive plan updates or amendments have been circulated to the airport for review

Worksheets

☐ Worksheet 4A - Current Policy

☐ Worksheet 4B - Compatibility Policy Findings

☐ Worksheet 4C - Alternatives Analysis

☐ Worksheet 4D - Airport Influence Area Adjustments

Data and Products

- ☐ Draft comprehensive plan and policies
- ☐ Draft comprehensive land use map
- ☐ Capital Improvement Plan (if applicable)
- ☐ Compatibility land use zones overlay map
- ☐ Airspace and height hazard overlay map
- ☐ Land use compatibility matrix

Step 5: Adopt the Comprehensive Plan Amendment

Tasks:

- ☐ The environmental documentation has been completed and circulated for comment
- ☐ The comprehensive plan has been completed and circulated to agencies and the public for comment
- ☐ Public communication and workshops and meetings have been held
- ☐ The public and aviation stakeholders have had an opportunity to review the proposal and provide comments.
- ☐ WSDOT Aviation has provided comments on the compatibility measures you propose to take in your comprehensive plan update.
- ☐ Decision-makers have adopted a comprehensive plan update or amendment that contains appropriate measures to protect the airport from encroachment by incompatible land uses.

Data and Products

- ☐ Final comprehensive plan
- ☐ Comprehensive plan policies
- ☐ Compatibility land use zones overlay map
- ☐ Comprehensive land use map Airspace and height hazard overlay map
- ☐ Capital Improvement Plan (if applicable)
- ☐ Land use compatibility matrix
- ☐ Supporting documentation
- ☐ Recommendations have been forwarded to the airport manager.
- ☐ Public notice, findings and support documentation have been developed for the record

Step 6: Implement the Airport Land Use Compatibility Policies

Tasks:

- ☐ Implementation strategies have been identified
- ☐ Implementation regulations, zoning map, airspace overlay map and compatibility map has been developed consistent with the adopted comprehensive plan.
- ☐ The environmental documentation has been completed and circulated for comment
- ☐ The development regulations and supporting documentation has been completed and circulated to agencies and the public for comment
- ☐ Public communication and workshops and meetings have been held
- ☐ The public and aviation stakeholders have had an opportunity to review the proposal and provide comments
- ☐ WSDOT Aviation has provided comments on the compatibility measures you propose to take in your comprehensive plan update
- ☐ Decision-makers have adopted a comprehensive plan or amendment that contains appropriate measures to protect the airport from encroachment by incompatible land uses
- ☐ You have proposed revised development regulations to implement the policies.
- ☐ You have begun to put the policies to use

Data and Products

- ☐ Final development regulations
- ☐ Zoning regulations and maps
- ☐ Subdivision regulations
- ☐ Critical area regulations
- ☐ Compatibility land use zones overlay map
- ☐ Airspace and height hazard overlay map
- ☐ Final Capital Improvement Plan (if applicable)
- ☐ Land use compatibility matrix
- ☐ Supporting documentation
- ☐ Recommendations have been forwarded to the airport manager.
- ☐ Public notice, findings, environmental and support documentation have been developed for the record.
- ☐ Identification of continuing actions and specific points for implementation have been developed

Questions?

WSDOT Aviation provides technical assistance and is available to assist you with aviation land use. For more information, visit our website at: www.wsdot.wa.gov/aviation/planning

Aviation Activity Notice

WHEREAS, (full name of property owner(s)), are the owners in fee of that certain parcel of land situated in the County of _____, State of _____, more particularly described as follows:

(Insert legal description of property)

NOW, THEREFORE, notice is given to all future property owners that: "The subject property is located adjacent to and within close proximity and flight paths of *(airport name)* and may impact the property from a variety of aviation activities. Such activities may include but are not limited to noise, vibration, chemical, odors, hours of operation, low overhead flights and other associated activities."

AND, current and future property owners are also notified that the Federal Aviation Administration (FAA) establishes standards and notification requirements for potential height hazards that may be caused by structures, building, trees and other objects affecting navigable air space through 14 CFR Federal Aviation Regulations (FAR) Part 77 Civil Aviation Imaginary Surfaces. Any questions on establishing on height hazards or obstructions should be directed to (*local jurisdiction name)(airport sponsor name*) or the FAA.

Signed _____ day of _____, 20___.

_____

Legal Property Owner(s)

ACKNOWLEDGMENT

STATE OF_____,)
) ss.

COUNTY OF _____)

BE IT REMEMBERED, that on this _____ day of _____, 200 ____, before me, the undersigned, a Notary Public in and for the County and State aforesaid, came _____, who are personally known to me to be the same persons who executed the within instrument of writing and such persons duly acknowledged the execution of the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal, the day and year last above written.

_____
Notary Public

My commission expires _____

Appendix J Comprehensive Plan Goals and Policies

The following example goals/policies are offered to assist local communities in the development or amendment of comprehensive plans. The sample language may be used in whole or in-part as needed to reach community objectives and promote aviation as a significant resource within Washington State. We recommend that local jurisdictions insert policy language into several sections of their comprehensive plan including sections for general land use, capital facilities, economic development, essential public facilities and the transportation element.

- Protect the viability of the airport as a significant economic resource to the community by encouraging compatible land uses, densities, and reducing hazards that may endanger the lives and property of the public and aviation users.
- Encourage the protection of the (Name) Airport from adjacent incompatible land uses and/or activities that could impact the present and/or future use of the airport as an Essential Public Facility (EPF), endanger the lives of people on the ground and/or promote inadvertent growth of incompatible land uses. Incompatible land uses may include residential, multi-family, height hazards, uses that attract large concentrations of people, wildlife hazards, and special uses such as schools, hospitals and nursing homes, and explosive/hazardous materials.
- Coordinate the protection of the (name) Airport with (adjacent county or city) by developing consistent development regulations that utilize WSDOT Aviation Airport and Land Use Compatibility guidelines and other best management practices for encouraging compatible land uses adjacent to (name) airport(s).
- Promote the safe operation (Name of aviation facilities) by encouraging compatible land uses and activities, and discouraging uses or activities that will impede safe flight operations or endanger the lives of people on the ground.
- Encourage open space/clear areas and utilize zoning criteria within key safety areas adjacent to the airport to facilitate protection of the airport as an essential public facility, and reduce safety risk exposure to people on the ground and in the air. Applicable criteria may include promoting cluster development to promote open space/clear areas, locating structures away from the extended centerline of the runway, discouraging public assembly, transfer of development rights and other applicable strategies. When possible promote contiguous open space parcels, especially in areas with smaller parcel size configurations.
- Within the Airport Influence area a notice to title/disclosure statement should be required for new or substantial redevelopment of lots, buildings, structures, and activities. The notice should indicate that the property is located adjacent to the (name) airport and may experience low overhead flights, odor, vibrations, noise and other similar aviation impacts.
- Discourage the siting of uses adjacent to airports that attract birds, create visual hazards, discharge any particulate matter in the air that could alter atmospheric conditions, emit transmissions that would interfere with aviation communications and/or instrument landing systems, or otherwise obstruct or conflict with aircraft patterns, or result in potential hazards to aviation.

- Encourage the adoption of development regulations that protect the airport from height hazards by developing a Height Overlay District that will prohibit buildings or structures from penetrating the Federal Aviation Regulations (FAR) Part 77 “Imaginary Surfaces”.
- Ensure that the (name) Airport is protected from incompatible uses consistent with WSDOT Aviation Airport and Land Use Compatibility guidelines and best management practices.
- Recognize (name of airport) as an essential public facility and discourage land uses that may promote incompatible development adjacent to the (name) airport.
- Develop criteria, standards and compatible land use designations that will protect the airport and aviation uses from incompatible development by adopting a combination of zoning techniques including compatible zoning districts, overlay districts, and development siting criteria for evaluating uses or activities in key areas adjacent to the airport.
- Identify, preserve, and enhance, through interjurisdictional planning, goals, policies and development regulations that promote significant regional transportation linkages and multimodal connections to and from aviation facilities and employment centers.
- Encourage economic development opportunities and aviation related uses adjacent to airports and promote the efficient mobility of goods and services region-wide consistent with the economic development element and the regional transportation strategy.
- Evaluate all proposed amendments to the comprehensive plan, capital facilities plan and/or urban growth area (UGA) that will increase incompatible land uses or potential of incompatible development adjacent to the airport through inappropriate land use or zoning designations and/or inadvertent land use policies.

Glossary

Above Ground Level (AGL) – An elevation datum given in feet above ground level.

Accident Potential Zones (APZs) – A set of safety-related zones defined by AICUZ studies for areas beyond the ends of military airport runways. Typically, three types of zones are established—a clear zone closest to the runway end, then APZ I, and APZ II. The potential for aircraft accidents and the corresponding need for land use restrictions is greatest with the clear zone and diminishes with increased distance from the runway.

Air Carriers – The commercial system of air transportation, consisting of the certificated air carriers, air taxis (including commuters), supplemental air carriers, commercial operators of large aircraft, and air travel clubs.

Air Installation Compatible Use Zones (AICUZ) – A land use compatible plan prepared by the U.S. Department of Defense for military airfields. AICUZ plans serve as recommendations to local governments bodies having jurisdiction over land uses surrounding these facilities.

Aircraft Accident – An occurrence incident to flight in which, as a result of the operation of an aircraft, a person (occupant or nonoccupant) receives fatal or serious injury, or an aircraft receives substantial damage.

- Except as provided below, substantial damage means damage or structural failure that adversely affects the structural strength, performance, or flight characteristics of the aircraft, and that would normally require major repair or replacement of the affected component.
- Engine failure, damage limited to an engine, bent fairings or cowling, dented skin, small puncture holes in the skin or fabric, ground damage to rotor or propeller blades, damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered substantial damage.

Aircraft Approach Category – A grouping of aircraft based on a speed of 1.3 times the stall speed in the landing configuration at maximum gross landing weight. The aircraft approach categories are:

Category A - Speed less than 91 knots;
Category B - Speed 91 knots or more but less than 121 knots;
Category C - Speed 121 knots or more but less than 141 knots;
Category D - Speed 141 knots or more but less than 166 knots; and,
Category E - Speed 166 knots or more.

Aircraft Incident – A mishap associated with the operation of an aircraft in which neither fatal nor serious injuries nor substantial damage to the aircraft occur.

Aircraft Mishap – The collective term for an aircraft accident or an incident.

Aircraft Operation – The airborne movement of aircraft operating in the airport traffic pattern or within sight of the airport. There are two types of operations: local and itinerant. An operation is counted for each landing and each departure, such that a touch-and-go flight is counted as two operations.

Airplane Design Group – A grouping of airplanes based on wingspan. The groups are:

Group I: Up to, but not including 49 feet
Group II: 49 feet up to, but not including 79 feet
Group III: 79 feet up to, but not including 118 feet
Group IV: 118 feet up to, but not including 171 feet
Group V: 171 feet up to, but not including 214 feet
Group VI: 214 feet up to, but not including 262 feet.

Airport – An area of land or water that is used or intended to be used for the landing and taking off of aircraft, and includes its buildings and facilities if any. (FAR 1) (RCW 14.12)

Airport Classification – Washington State

1. **Commercial Service:** Accommodates at least 2,500 annual scheduled passenger boardings for at least three years
2. **Regional Service:** Serves large or multiple communities, all NPIAS relievers; at least 40 based aircraft and 4,000-foot long runway, with exceptions
3. **Community Service:** Serves a community; at least 20 based aircraft; paved runway
4. **Local Service:** Serves a community; fewer than 20 based aircraft; paved runway
5. **Rural Essential:** Other land-based airports, including residential airparks and remote back country airports.
6. **Seaplane Base:** Identified by FAA as a seaplane base, unless it is a Community Service airport

Airport Elevation – The highest point of an airport's useable runways, measured in feet above mean sea level. (AIM)

Airport Land Use Compatibility Program (ALUCP) – A technical assistance program to help communities meet the requirements of (RCW 36.70A.510, RCW 36.70.547). The law requires cities and counties to discourage encroachment of incompatible development adjacent to public use airports through adoption of comprehensive plan policies and development regulations.

Airport Layout Plan (ALP) – A scale drawing of existing and proposed airport facilities, their location on an airport, and the pertinent clearance and dimensional information required to demonstrate conformance with applicable standards.

Airport Master Plan (AMP) – A long-range plan for development of an airport, including descriptions of the data and analyses on which the plan is based.

Airport Overlay – A zoning district that establishes development standards in areas of special concern over and above the standards applicable to basic underlying zoning districts.

Airport Reference Code (ARC) – A coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. It is a combination of the aircraft approach category and the airplane design group.

Ambient Noise Level – The level of noise that is all encompassing within a given environment for which a single source cannot be determined. It is usually a composite of sounds from many and varied sources near to and far from the receiver.

Approach Protection Easement – A form of easement that both conveys all of the rights of an avigation easement and sets specified limitations on the type of land uses allowed to be developed on the property.

Approach Speed – The recommended speed contained in aircraft manuals used by pilots when making an approach to landing. This speed will vary for different segments of an approach as well as for aircraft weight and configuration. (AIM)

Aviation-Related Use – Any facility or activity directly associated with the air transportation of persons or cargo or the operation, storage, or maintenance of aircraft at an airport or heliport. Such uses specifically include runways, taxiways, and their associated protected areas defined by the Federal Aviation Administration, together with aircraft aprons, hangars, fixed base operations, terminal buildings, etc.

Based Aircraft – Aircraft stationed at an airport on a long-term basis.

Ceiling – Height above the earth's surface to the lowest layer of clouds or obscuring phenomena. (AIM)

Circling Approach/Circle-to-Land Maneuver – A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or not desirable. (AIM)

Clear Zone – The military airport equivalent of runway protection zones at civilian airports.

Combining District – See Airport Overlay.

Commercial Activities – Airport-related activities that may offer a facility, service, or commodity for sale, hire, or profit. Examples of commodities for sale are food, lodging, entertainment, real estate, petroleum products, parts, and equipment. Examples of services are flight training, charter flights, maintenance, aircraft storage, and tiedown. (CCR)

Commercial Operator – A person who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property, other than as an air carrier. (FAR 1)

Compatibility Zone – A regulatory component of an airport overlay that address the issues of noise, light, vibration, fumes, safety and low flying aircraft through the establishment of additional standards to the underlying zoning district.

Comprehensive Plan – A comprehensive plan is a policy document that expresses a community's vision about itself and what it would like to become. The plan forms the policy framework from which all future community planning actions will be judged, and it is the starting point for any discussion regarding local land use. The time range for the comprehensive plan is generally 20 years. Periodic updates every five to seven years are usually required. Comprehensive plans generally cover the following topic areas or "elements": Capital Facilities, Economic Development, Housing, Land Use, Natural Resources, Parks and Recreation, Utilities, Rural (county comprehensive plans only), Transportation.

Conditional Use Permit – Is a permit used to allow a use or activity that may need additional scrutiny within a zoning district. These permits are use to ensure that the activity is compatible with neighboring land uses. The permited use may be tailored to meet the limitations of the site or mitigate impacts. Conditional uses are decided by the governing body, hearing examiner, board of adjustment, or similar body.

Controlled Airspace – Any of several types of airspace within which some or all aircraft may be subject to air traffic control. (FAR 1)

County-Wide Planning Policies (CPPs) – A written policy statement or statements adopted by a county in cooperation with its cities and used solely for establishing a county-wide framework from which county and city comprehensive plans are developed and adopted (see RCW 36.70A.210).

Critical Areas – Areas and ecosystems which include wetlands; areas with a critical recharging effect on aquifers used for potable water; fish and wildlife habitat conservation areas; frequently flooded areas; and geologically hazardous areas (see RCW 36.70A.030(5)).

Day-Night Average Sound Level (DNL) – The noise metric adopted by the U.S. Environmental Protection Agency for measurement of environmental noise. It represents the average daytime noise level during a 24-hour day, measured in decibels and adjusted to account for the lower tolerance of people to noise during nighttime periods. The mathematical symbol is L_{dn}.

Decibel (dB) – A unit measuring the magnitude of a sound, equal to the logarithm of the ratio of the intensity of the sound to the intensity of an arbitrarily chosen standard sound, specifically a sound just barely audible to an unimpaired human ear. For environmental noise from aircraft and other transportation sources, an A-weighted sound level (abbreviated dBA) is normally used. The A-weighting scale adjusts the values of different sound frequencies to approximate the auditory sensitivity of the human ear.

Deed Notice – A formal statement added to the legal description of a deed to a property or provided as a note of the face of a short subdivision or major subdivision plat map. As used in airport land use planning, a deed notice would state that the property is located adjacent to an airport and may be impacted by aircraft noise, odors, vibration, and low flying aircraft. Deed notices are used to provide disclosure and is as a form of buyer notification as a means of ensuring that those who are particularly sensitive to aircraft overflights can avoid moving to the affected areas.

Development Regulations – The controls placed on the development or use of land by a county or a city including, but not limited to, zoning ordinances, critical area ordinances, shoreline master programs, and subdivision ordinances. RCW 36.70A.030(7).

Displaced Threshold – A landing threshold that is located at a point on the runway other than the designated beginning of the runway (see Threshold). (AIM)

Easement – A less-than-fee-title transfer of real property rights from the property owner to the holder of the easement.

Encroachment – Is an action that affects the ability to take action in the future i.e. , actions that diminishes the utility or viability of an existing use.

Environmental Impact Statement (EIS) – A report prepared under NEPA fully analyzing the potential significant environmental impacts of a federally funded project.

Equivalent Sound Level (Leq) – The level of constant sound that, in the given situation and time period, has the same average sound energy as does a time-varying sound.

FAR Part 77 – The part of the Federal Aviation Regulations that deals with objects affecting navigable airspace.

FAR Part 77 Surfaces – Imaginary airspace surfaces established with relation to each runway of an airport. There are five types of surfaces: (1) primary; (2) approach; (3) transitional; (4) horizontal; and (5) conical.

Federal Aviation Administration (FAA) – The U.S. government agency that is responsible for ensuring the safe and efficient use of the nation's airports and airspace.

Federal Aviation Regulations (FAR) – Regulations formally issued by the FAA to regulate air commerce.

Fixed Base Operator (FBO) – A business that operates at an airport and provides aircraft services to the general public including, but not limited to, sale of fuel and oil; aircraft sales, rental, maintenance, and repair; parking and tiedown or storage of aircraft; flight training; air taxi/charter operations; and specialty services, such as instrument and avionics maintenance, painting, overhaul, aerial application, aerial photography, aerial hoists, or pipeline patrol.

General Aviation – All civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire. General aviation accounts for the majority of aviation activity and encompasses a wide range of private and commercial purposes. General aviation aircraft can be of almost any size or type, ranging from gliders to large jets.

Glide Slope – An electronic signal radiated by a component of an ILS to provide vertical guidance for aircraft during approach and landing.

Global Positioning System (GPS) – GPS uses a group of many satellites orbiting the earth to determine the position of users on or above the earth's surface.

Growth Management Act (GMA) – Adopted in 1990, the GMA (Chapter 36.70A RCW) was enacted in response to rapid population growth and concerns with suburban sprawl, environmental protection, quality of life, and related issues. The act expands the Planning Enabling Act requirements for comprehensive planning in the state's most populous and rapidly growing counties. Twenty-nine counties are either required to fully plan under the GMA or have chosen to do so. These counties make up about 95 percent of the state's population. The remaining ten counties have limited planning requirements under the act.

Growth Management Hearing Board – Is a quasi-judicial panel, formed by the Washington State Legislature in 1990, to resolve land use disputes. The Board hears and decides challenges to official actions taken (usually ordinances) by city or county governments adopting or amending comprehensive plans or their implementing development regulations. The Board has the authority to hear only cases over which it has Subject Matter Jurisdiction. These include challenges to matters arising from the:

- Adoption of and/or amendments to a Comprehensive Plan
- Designation of Resource Lands and Critical Areas
- Adoption of and/or amendment to regulations to conserve Resource Lands and Protect Critical Areas
- Adoption of and/or amendments to County-Wide Planning Policies (not subject to a citizen-filed appeal)
- Adoption of and/or amendments to Urban Growth Areas

- Adoption of and/or amendments to Development Regulations that implement the comprehensive plan (zoning, subdivision,etc)
- Growth Management Planning Population Projections prepared by the State of Washington, Office of Financial Management
- Adoption of and/or amendments to a Shoreline Master Plan, as it relates to the GMA
- SEPA documents that accompany a GMA action
- Failure of the local government to act to meet a GMA statutory deadline

The jurisdictional regions for the three Growth Management Hearing boards are: Eastern Washington, Western Washington and Central Puget Sound.

Helipad – A small, designated area, usually with a prepared surface, on a heliport, airport, landing/takeoff area, apron/ramp, or movement area used for takeoff, landing, or parking of helicopters. (AIM)

Heliport – A facility used for operating, basing, housing, and maintaining helicopters.

Incompatible Development 'Aviation' – Uses that that diminish the overall utility of an existing use. Incompatible development may have both direct and indirect impacts. Directly, it may reduce property available for aviation operations, safety areas and navigatible airspace. Indirectly, incompatible development can lead to demands for limitations on the airport activity.

Infill – Is the practice of developing or redeveloping vacant or underutilized land in the midst of a community, especially land that is surrounded by existing uses similar to the ones proposed. This may mean further subdivisions of existing parcels to accommodate additional growth, redevelopment of under-utilized property to increase its density or intensity, or simply creation of new development on vacant land.

Instrument Approach Procedure – A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority (refer to Nonprecision Approach Procedure and Precision Approach Procedure). (AIM)

Instrument Flight Rules (IFR) – Rules governing the procedures for conducting instrument flight. Generally, IFR applies when meteorological conditions with a ceiling below 1,000 feet and visibility less than 3 miles prevail. (AIM)

Instrument Landing System (ILS) – A precision instrument approach system that normally consists of the following electronic components and visual aids: (1) localizer; (2) glide slope; (3) outer marker; (4) middle marker; (5) approach lights. (AIM)

Instrument Operation – An aircraft operation in accordance with an IFR flight plan or an operation where IFR separation between aircraft is provided by a terminal control facility. (FAA ATA)

Instrument Runway – A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach procedure having straight-in landing minimums has been approved. (AIM)

Inverse Condemnation – An action brought by a property owner seeking just compensation for land taken for a public use against a government or private entity having the power of eminent domain. It is a remedy peculiar to the property owner and is exercisable by that party where it appears that the taker of the property does not intend to bring eminent domain proceedings.

Land Use Density – A measure of the concentration of land use development in an area. Mostly the term is used with respect to residential development and refers to the number of dwelling units per acre. Unless otherwise noted, policies in this compatibility plan refer to gross rather than net acreage.

Land Use Intensity – A measure of the concentration of nonresidential land use development in an area. For the purposes of airport land use planning, the term indicates the number of people per acre attracted by the land use. Unless otherwise noted, policies in this compatibility plan refer to gross rather than net acreage.

Large Airplane – An airplane of more than 12,500 pounds maximum certificated takeoff weight. (Airport Design AC)

Localizer (LOC) – The component of an ILS that provides course guidance to the runway. (AIM)

Mean Sea Level (MSL) – An elevation datum given in feet from mean sea level.

Minimum Descent Altitude (MDA) – The lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circle-to-land maneuvering in execution of a standard instrument approach procedure where no electronic glide slope is provided. (FAR 1)

Missed Approach – A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing. (AIM)

National Transportation Safety Board (NTSB) – The U.S. government agency responsible for investigating transportation accidents and incidents.

Navigational Aid (Navaid) – Any visual or electronic device airborne or on the surface that provides point-to-point guidance information or position data to aircraft in flight. (AIM)

Noise Contours – Continuous lines of equal noise level usually drawn around a noise source, such as an airport or highway. The lines are generally drawn in 5-decibel increments so that they resemble elevation contours in topographic maps.

Nonconforming Use – Any use, situation, lot, building or structure that legally existed prior to the adoption of a development regulation that would otherwise prohibit its use.

Nonprecision Approach Procedure – A standard instrument approach procedure in which no electronic glide slope is provided. (FAR 1)

Nonprecision Instrument Runway – A runway with an approved or planned straight-in instrument approach procedure that has no existing or planned precision instrument approach procedure. (Airport Design AC)

Obstruction – Any object of natural growth, terrain, or permanent or temporary construction or alteration, including equipment or materials used therein, the height of which exceeds the standards established in Subpart C of Federal Aviation Regulations Part 77, *Objects Affecting Navigable Airspace*.

Overflight – Any distinctly visible and/or audible passage of an aircraft in flight, not necessarily directly overhead.

Overlay Zone – See Airport Overlay

Precision Approach Procedure – A standard instrument approach procedure where an electronic glide slope is provided. (FAR 1)

Precision Instrument Runway – A runway with an existing or planned precision instrument approach procedure. (Airport Design AC)

Referral Area – The area around an airport defined by the planning area boundary adopted by an airport land use commission within which certain land use proposals are to be referred to the commission for review.

Resource Lands – land designated for natural resource use under the GMA (i.e. agricultural, mineral, or forestry).

Revised Code of Washington (RCW) – The Revised Code of Washington (RCW) is the compilation for all permanent laws now in force. It is a collection of Session Laws (enacted by the Legislature, and signed by the Governor, or enacted via the initiative process), arranged by topic, with amendments added and repealed laws removed. It does not include temporary laws such as appropriations acts.

Runway Protection Zone (RPZ) – An area (formerly called a clear zone) off the end of a runway used to enhance the protection of people and property on the ground. (Airport Design AC)

Approach Visibility Minimums	Length	Inner Width	Outer Width
Visual and not lower than 1 mile:			
A & B small aircraft exclusively	1000	250	450
A & B	1000	500	700
C & D	1700	500	1010
Not lower than ¾ mile - all aircraft	1700	1000	1510
Lower than ¾ mile - all aircraft	2500	1000	1750

Shoreline Management Act (SMA) – Chapter 90.58 RCW; a statute that provides for the management of the shorelines of the state by planning and fostering all reasonable and appropriate uses. The goals and policies of the SMA are incorporated as goal 14 of the GMA.

Shoreline Master Plan (SMP) – Prepared by a city or county and approved by the Washington State Department of Ecology, this document contains regulations applicable to the use of shorelines within that city or county.

Single-Event Noise – As used in herein, the noise from an individual aircraft operation or overflight.

Small Airplane – An airplane of 12,500 pounds or less maximum certificated takeoff weight. (Airport Design AC)

Sound Exposure Level (SEL) – A time-integrated metric (i.e., continuously summed over a time period) that quantifies the total energy in the A-weighted sound level measured during a transient noise event. The time period for this measurement is generally taken to be that between the moments when the A-weighted sound level is 10 dB below the maximum.

Special Function Uses – These generally include children, elderly, the infirmed, or others regarded as having comparatively little control over their own lives. Land uses may include K-12 schools, hospitals, nursing homes, convalescent center and other similar uses.

State Environmental Policy Act (SEPA) – A statute that requires state and local agencies to consider the likely environmental consequences of a proposal before approving or denying the proposal (see Chapter RCW 43.21C).

Straight-In Instrument Approach – An instrument approach wherein a final approach is begun without first having executed a procedure turn; it is not necessarily completed with a straight-in landing or made to straight-in landing weather minimums. (AIM)

Taking – Government appropriation of private land for which compensation must be paid as required by the Fifth Amendment of the U.S. Constitution. It is not essential that there be physical seizure or appropriation for a taking to occur, only that the government action directly interferes with or substantially disturbs the owner's right to use and enjoyment of the property.

Terminal Instrument Procedures (TERPS) – Procedures for instrument approach and departure of aircraft to and from civil and military airports. There are four types of terminal instrument procedures – precision approach, nonprecision approach, circling, and departure.

Threshold – The beginning of that portion of the runway usable for landing (also see Displaced Threshold). (AIM)

Touch-and-Go – An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. (AIM)

Traffic Pattern – The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg, and final approach. (AIM)

Urban Growth Area (UGA) – A regional boundary, required by the GMA to control urbanization by designating the area inside the boundary for higher density urban and the area outside the boundary for lower density rural development. An urban growth boundary circumscribes an entire urbanized area designated for urban growth and is used by local governments as a guide to zoning and land use decisions. (See RCW 36.70A.030(20); RCW 36.70A.110).

Visual Approach – An approach where the pilot must use visual reference to the runway for landing under VFR conditions.

Visual Flight Rules (VFR) – Rules that govern the procedures for conducting flight under visual conditions. VFR applies when meteorological conditions are equal to or greater than the specified minimum—generally a 1,000-foot ceiling and 3-mile visibility.

Visual Runway – A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved airport layout plan. (Airport Design AC)

Washington Advisory Code (WAC) – The Washington Administrative Code (WAC) are regulations of executive branch agencies are issued by authority of statutes. Like legislation and the Constitution, regulations are a source of primary law in Washington State. The WAC codifies the regulations and arranges them by subject or agency. The online version of the WAC is updated twice a month.

Zoning – A police power measure, enacted primarily by units of local government, in which the community is divided into districts or zones within which permitted and special uses are established, as are regulations governing lot size, building bulk, placement, and other development standards. Requirements vary from district to district, but they must be uniform within districts. A zoning ordinance consists of two parts—the text and a map.

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NTSB – National Transportation and Safety Board

Acronyms

AC	Advisory Circular
ADF	Automatic Direction Finder
ADIZ	Air Defense Identification Zones
ADPM	Average Day of the Peak Month
AFB	Air Force Base
AGL	Above Ground Level
AIP	Airport Improvement Program
ALP	Airport Layout Plan
ALS	Approach Lighting System
ALSF-1	Approach Light System with Sequence Flasher Lights
AOC	Airfield Operation Capacity
ARC	Airport Reference Code
ARFF	Airport Rescue and Fire Fighting
ARP	Airport Reference Point
ARTCC	Air Route Traffic Control Center
ASDA	Accelerate-Stop Distance Available
ASOS	Automated Surface Observation System
ASR	Airport Surveillance Radar
ASV	Annual Service Volume
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
AVGAS	Aviation Gasoline
AWOS	Automated Weather Observation System
BRL	Building Restriction Line
CIP	Capital Improvement Program
dBA	A-weighted Decibels
DH	Decision Height
DME	Distance Measuring Equipment
DNL	Day-Night Sound Levels
DOT	Department of Transportation
EA	Environmental Assessment
EAS	Essential Air Service
EIS	Environmental Impact Statement
EP	Enplaned Passenger
EPA	The United States Environmental Protection Agency
EPF	Essential Public Facility
ESSB	Engrossed Senate Substitute Bill

FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FBO	Fixed Based Operator
FIS	Federal Inspection Service
FRA	Federal Railroad Administration
FSS	Flight Service Station
GA	General Aviation
GMA	Growth Management Act
GPS	Global Positioning System
HAT	Height Above Threshold
HIRL	High Intensity Runway Lights
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INM	Integrated Noise Model
LATS	Long Term Air Transportation Study
LCC	Low-Cost Carrier
LDA	Landing Distance Available
LIRL	Low Intensity Runway Lights
MALS	Medium Intensity Approach Light System
MALSF	Medium Intensity Approach Light System with sequence flashing Lights
MALSR	Medium-Intensity Approach Lighting System with Runway Alignment Indicators
MGW	Maximum Gross Weight
MIRL	Medium Intensity Runway Lights
MLS	Microwave Landing System
MOA	Military Operations Area
MPO	Metropolitan Planning Organization
MSL	Mean Sea Level
NAS	Naval Air Station
NAVAID	Air Navigation Facility/Aid
NBAA	National Business Aircraft Association
NDB	Non-Directional Beacon
NPIAS	National Plan of Integrated Airport Systems
OAG	Official Airline Guide
ODO	Overall Development Objectives
OFA	Object Free Area
OFZ	Obstacle Free Zone
PAPI	Precision Approach Path Indicator
PCI	Pavement Condition Index
PFC	Passenger Facility Charge

PIR	Precision Instrument Runway
RAIL	Runway Alignment Indicator Lights
RCW	Revised Code of Washington
REIL	Runway End Identifier Lights
RPM	Revenue Passenger Mile
RTPO	Regional Transportation Planning Organizations
RSA	Runway Safety Area
RPZ	Runway Protection Zone
RVR	Runway Visual Range
SPB	Sea Plane Base
TAF	FAA Terminal Area Forecasts
TODA	Take-Off Distance Available
TORA	Take-Off Run Available
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
WAAS	Wide Area Augmentation System
WTP	Washington Transportation Plan
WSCASP	Washington State Continuous Airport System Plan
WSDOT	Washington State Department of Transportation
WSTC	Washington State Transportation Commission

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