Introduction
The following appendix has been developed to help planners understand the airport influence area and the operations that occur within it. The section covers the fundamentals of: determining the area necessary for initial land use compatibility planning, identifying the airport influence area, identifying airport and aircraft, and impacts associated with normal airport operations: nuisance noise, light, vibration, fumes and low flying aircraft.

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

Traffic Pattern
FAR Part 77
Initial Study Area

To determine 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.

Airport Influence Area
Delineate the airport influence area by assessing:

- Aircraft operations.
- Topography.
- Impacts of noise, light, vibration and low flying aircraft.
- Historic accident data.
- Flight tacks or radar tracks.

Planners should contact airport managers, staff, pilots and FBO to gather additional information on the operational characteristics of their community airport. The delineation of an airport influence area is driven by aeronautical factors, not by land uses.
Traffic Pattern 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. This tighter pattern is often advantageous in case of an engine out.

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

**Fixed Wing Primary**

**Fixed Wing Crosswind**

**Helicopter**

**Ulrlight**

**Glider**

**Single engine**

**Multi-engine**

**Jet**

**Seaplanes**

**Helicopter**

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.

**Traffic Pattern Altitude and Aircraft Performance**

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.
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 1,000 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 WSDOT's Washington State Airport Guide or the FAA’s Digital Airport Facility Directory.

Downwind leg - Aircraft parallel the runway at the recommended traffic pattern altitude, generally an altitude of 1,000 feet AGL.

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.

Approach - Aircraft begin their approach at 250 feet AGL and descend to the runway.
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 airport influence area.

**Approach Surface length**

<table>
<thead>
<tr>
<th>Runway</th>
<th>Visual Approach/Departure slope 20:1</th>
<th>Non-Precision Approach/Departure slope 34:1</th>
<th>Precision Approach/Departure slope 50:1 for 10,000’ 40:1 for 40,000’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.95 Miles</td>
<td>1.9 Miles</td>
<td>7.6 Miles</td>
</tr>
</tbody>
</table>

**Approach Surface Width**

| Runway | Visual Runway Width 1500’ | Non-Precision Approach Width 4000’ | Precision Approach Width 16,000’ |

**Approach / Departure Gradient**

<table>
<thead>
<tr>
<th>Runway</th>
<th>Visual Runway Departure slope 20:1</th>
<th>Non-Precision Approach Departure slope 34:1</th>
<th>Precision Approach Departure slope 50:1 for 10,000’ 40:1 for 40,000’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5,000’</td>
<td>10,000’</td>
<td>50,000’</td>
</tr>
</tbody>
</table>
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**

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

**Non-Precision Approach/ Departure Slope**

- 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**

- Departure slope 50:1 for 10,000' 40:1 for 40,000'

Visual Runway

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.
**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 commercial airliners. 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 following categories: single engine, multi engine, jet, high performance, seaplane, helicopter, lighter than air and gliders. Understanding your community airport’s fleet mix will help determine potential impacts.

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single engine Aircraft</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Twin engine Aircraft</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Sea plane/ Float plane</strong></td>
<td>is an amphibious aircraft that can take off and land both on conventional runways and water. Piston driven sea planes are often slow and posse a larger noise signature.</td>
</tr>
<tr>
<td><strong>High Performance Aircraft</strong></td>
<td>aircraft with an engine of more than 200 horsepower (AC61.3). Some high performance aircraft include: Cessna 182, Cirrus SR22. Aircraft may fly a straight in and out approach or a higher and wider traffic pattern.</td>
</tr>
<tr>
<td><strong>Jets</strong></td>
<td>on average, jets are larger than single engine aircraft and thus noisier. These aircraft typically fly a straight in and out approach and require a longer runway than their single engine counterparts.</td>
</tr>
<tr>
<td><strong>Helicopters</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Giders</strong></td>
<td>Although these aircraft don’t generate a noticeable amount of noise the tow planes used to bring the aircraft to altitude are a factor. Consult with you local pilot community for details on their operations.</td>
</tr>
<tr>
<td><strong>Lighter than Air</strong></td>
<td>Produce no discernable negative externalities.</td>
</tr>
</tbody>
</table>
**Topography**

Knowing the topography within your initial study area (traffic pattern and FAR Part 77 surfaces) will help you understand your airport’s unique operational characteristics and in some cases physical constraint. When identifying your airport's influence area, be sure to consider areas that may receive a disproportionate amount of impacts.

**Disproportionate Impacts**

Increases in terrain can be significant compatibility factors since they reduce the distance between aircraft and occupants. This diminished distance can increase the effects of noise, light, vibration, fumes and perception of low flying aircraft.

**Analysis**

Topographical information can be combined with other data to identify areas where nuisance noise and other negative externalities may pose a challenge. In this example GPS flight track data was overlaid a topological map. As a result planners and decision makers can identify areas regularly overflown by aircraft and areas that may experience increased impacts. Note flight track data or radar is not a necessary component for such an analysis. Airport managers, pilots and FBOs can be a wealth of information. Often these sources have information regarding the airport that won’t be demonstrated by a geographic spatial analysis. Many Airport managers have institutional knowledge, and can describe in detail how aircraft approach and depart the airport.

**Constraints**

The topography with 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.