

8.1 Transportation Incidents

- This section covers all major transportation modes: aviation, surface (road, rail, and pipeline) and marine. It covers incidents where a vehicle accident is the primary impact.
- Some of Seattle’s deadliest disasters were transportation accidents, but most occurred over 50 years ago when transportation systems were much less reliable. They are:
 - The sinking of the Dix off of Alki in 1906 that killed 42 people.
 - The 1943 crash of a B-29 bomber that killed 32 people.
 - Another bomber crash in 1951 that killed 11 people.
- While there have been huge gains in the safety and reliability of transportation systems, large, deadly accidents still happen today. In 2014, a “Ride the Ducks” vehicle collided with a charter bus full of international students on the Aurora Bridge. Five people died and many more were injured.
- Seattle’s transportation systems have become busier, more congested, more tightly interdependent, and lacking in substantial reserve capacity. Disruptions in one part of the system can produce large consequences far from the site of the disruption and can spread from one transport mode to another.
- **Aviation:** The direct hazard for Seattle is a large aircraft crashing into a crowded part of the city. The odds of such a crash are low. Between 2012 and 2016, there were only 59 fatal aircraft incidents worldwide involving a loss of control inflight or a crash into terrain. In the context of millions of annual flights, aircraft incidents are rare.⁴²⁵ Crashes are most likely to occur near flight corridors within two miles of an airport. Approaches and departures for SeaTac and Boeing Field, the country’s busiest general aviation airport, take aircraft over the city.
- **Marine:** Seattle has a large port and ferry system. While incidents in the waters surrounding Seattle could be severe, incidents that impact Seattle directly are the greatest hazard. There have been no deadly marine incidents in the past fifty years, but there have been a number of large ship fires and collisions.
- **Rail:** Seattle has an active rail system that has traditionally transported freight but passenger service has been growing in recent years. The main hazards are derailments, collisions, and tunnel incidents. Seattle has several miles of tracks that are exposed to landslides as well. Each week about 1,100 tank cars carrying highly flammable oil pass through the city. One of these trains derailed in 2014, but no oil was spilled.
- **Motor vehicles:** Motor vehicle collisions account for roughly 95% of all transportation related deaths and even more injuries. While this number represents mostly single or two-vehicle accidents, Seattle has had a few large -scale motor vehicle incidents.
- **Pipeline:** A spur of the Olympic/BP pipeline runs from Harbor Island to Renton, mostly along the City Light power transmission right-of-way. This pipeline carries mostly gasoline. Part of the same pipeline exploded in Bellingham killing three children.
- Transportation incidents can cause structural failure. Bridges are especially vulnerable. Barges and ships have collided with several Seattle bridges. The First Avenue South Bridge had to be rebuilt after a strike. Fires can also damage bridges. In 1975, the Alaskan Way Viaduct was damaged in a fuel tanker explosion.

8 1.1 Context

Transportation systems have been the source of some of the modern era’s biggest disasters. The September 11th attacks exploited the air transportation system to inflict catastrophic damage on New York and the Washington D.C. area. Air, marine, and surface systems have all produced high casualty count disasters.

Much of the vulnerability to transportation accidents is built into a community’s transportation infrastructure. For complete details on Seattle’s infrastructure network, see the Community Profile. Some transportation accidents could fall under multiple categories. For example, the explosion of a fuel tanker on a bridge could fall under this section, hazardous materials, fires, or infrastructure failure.

An accident doesn’t have to happen in Seattle for it to have a major impact on the community. Anytime a vessel originating here is involved in an accident, many Seattle residents are impacted. This was the case in 2000, when Alaska Airlines flight 261 crashed into the Pacific Ocean, killing all 88 passengers and crew. Forty-seven of them were from the Puget Sound area.⁴²⁶ Figure [Transportation Fatalities by Mode] shows national transportation fatalities by mode for 2016.

Air Transport

About 95% of all accidents involve general aviation (private aircraft) and only 5% involve commuter, charter, and scheduled airlines. Almost half (48%) of fatal commercial aircraft accidents occur during the final approach and landing phase of flight. The second most common phase is take off and initial climb (13% of fatal accidents).⁴²⁷ The FAA acknowledges this danger and requires airports to create special emergency plans that detail how they would respond to a crash within five miles from their boundaries. Nationally, despite the hundreds of thousands of planes that fly over urban areas, the number of crashes that have killed or injured non-passengers is very small.

Marine Transport

Maritime accidents include many different mishaps, such as grounding, capsizing, sinking, collision, fire, explosion and chemical spill. Worldwide, some of the worst maritime accidents have involved the sinking of passenger ferries. Many maritime accidents have a hazardous materials linkage. Great environmental damage has occurred as a result of oil spills.

Seattle is surrounded and bisected by water. Much of it is a working waterfront. Seattle is a major maritime center. The Port of Seattle is one of the largest in the U.S. It handles container, bulk cargo (grain), and cruise ship operations. Additionally, Seattle has three heavily used passenger ferry routes, the Ballard Locks that connect Lake Washington to Puget Sound, and a large commercial fishing fleet.

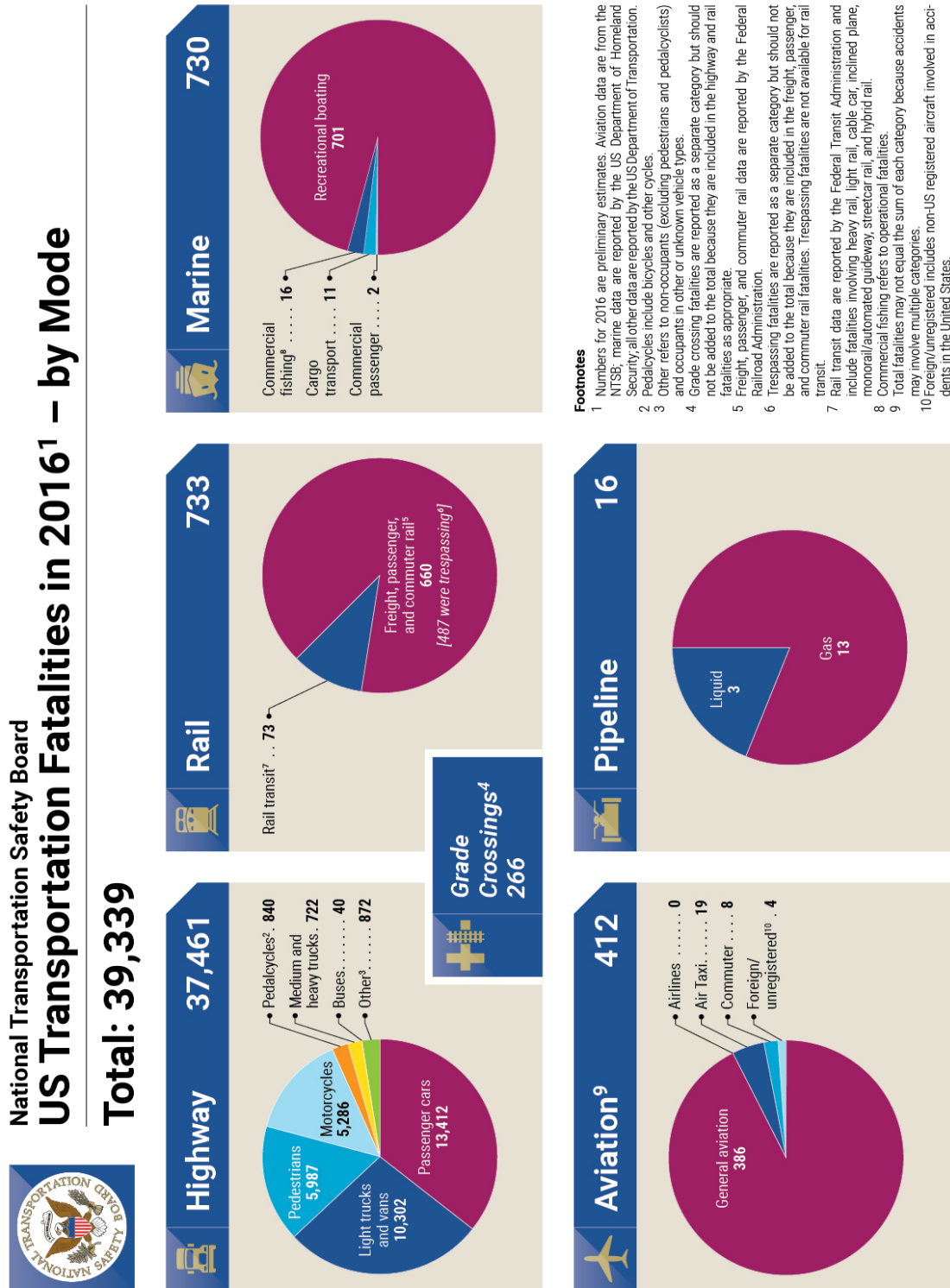
Surface Transport

Accidents on surface streets, highways, and railways can cause multiple fatalities, large hazardous materials releases, and damage to infrastructure. Nationally, large accidents have involved passenger buses, fuel tankers, and trail derailments. According to the Federal Highway Administration, the majority of weather-related car accidents happen on wet pavement or in rain.⁴²⁸

8 1.2 History

The time line of historic events focuses on accidents involving passenger vehicles. Seattle’s most deadly disasters, aside from the 1919 influenza pandemic, were transportation accidents. The first was the 1906 sinking of a passenger ship off Alki that killed 42 people and the second was the crash of a B-29 bomber during World War II that killed 32 people. While safety standards have vastly improved since both of these events, they illustrate the potential for high loss of life for transportation hazards.

Figure 8-1. Transportation Fatalities by Mode



Footnotes

- Numbers for 2016 are preliminary estimates. Aviation data are from the NTSB; marine data are reported by the US Department of Homeland Security; all other data are reported by the US Department of Transportation.
- Pedalcycles include bicycles and other cycles.
- Other refers to non-occupants (excluding pedestrians and pedalcyclists) and occupants in other or unknown vehicle types.
- Grade crossing fatalities are reported as a separate category but should not be added to the total because they are included in the highway and rail fatalities as appropriate.
- Freight, passenger, and commuter rail data are reported by the Federal Railroad Administration.
- Trespassing fatalities are reported as a separate category but should not be added to the total because they are included in the freight, passenger, and commuter rail fatalities. Trespassing fatalities are not available for rail transit.
- Rail transit data are reported by the Federal Transit Administration and include fatalities involving heavy rail, light rail, cable car, inclined plane, monorail/automated guideway, streetcar rail, and hybrid rail.
- Commercial fishing refers to operational fatalities.
- Total fatalities may not equal the sum of each category because accidents may involve multiple categories.
- Foreign/unregistered includes non-US registered aircraft involved in accidents in the United States.

Source: Data & Stats. National Transportation Safety Board. Retrieved August 16, 2018, from https://www.nts.gov/investigations/data/Pages/Data_Stats.aspx

Aviation Overview

Going back to 1984, the National Transportation Safety Board has recorded 26 incidents regarding commercial aircraft in Seattle, none of them fatal. There was a total of 20 minor injuries that resulted from the incidents.⁴²⁹ None of the accident reports indicated that aircraft were in danger of striking populated areas. While the Seattle area has not experienced a major crash in decades, there was a span of eight years mid-century when several deadly crashes occurred inside the city limits.

Maritime Overview

As indicated in the Community Profile, Seattle has an especially large maritime passenger sector. The Washington State Ferry system has never had a major accident. Despite this record, there have been 11 serious incidents since 1980. Five were minor collisions or near misses with other vessels. Four were dock ramming and two were groundings.

Seattle has become a major cruise ship terminal. There has never been a major accident involving them in Puget Sound. There have been some cases of Norwalk virus on Seattle based cruise ships.

Seattle is home to a major fishing fleet working on the Bering Sea. Fishing is a dangerous business and there have been a number of ships that have sunk, most recently the sinking of the F/V Destination in February 2017, taking with it all six of its crewmembers.⁴³⁰

Rail Overview

Seattle is a rail terminus for the BNSF and Union Pacific Railways. Historically, use of the rail network for passenger service has been limited, but has increased with the introduction of the Amtrak Cascades route between Eugene, Oregon and Vancouver, British Columbia, and the local Sounder commuter train. Amtrak Cascades has had roughly 800,000 annual passengers for the past 5 years and has a station in Seattle. While no major incident has happened within Seattle city limits, a new, faster Amtrak train traveling from Seattle to Portland derailed south of Tacoma on December 18, 2017 - its inaugural trip. Three passengers were killed and over 80 were injured.⁴³¹ Sounder Commuter rail, which runs between Everett and Tacoma, began in 2003. The Sounder has never had a major accident. As noted in the chapter on landslides, the tracks north of Seattle have been closed due to landslides. In 1997, a freight train was knocked into Puget Sound by a landslide.

Motor Vehicle Overview

Roadway accidents are a serious cumulative hazard in the Seattle area, but few individual incidents rise to the level of city-wide emergency, however tragic they are for the people involved. Nationally, several recent bus accidents have raised awareness that motor vehicle accidents can cause mass casualties. Several bus related incidents have occurred in Seattle. Accidents involving 10s or even 100s of vehicles have occurred in multiple locations, including Western Washington.

Major Accidents

Nov. 18, 1906. Maritime. The passenger ferry Dix sinks two miles off Alki. 42 fatalities.⁴³²

Feb. 18, 1943. Aviation. A B-29 Superfortress came down short of Boeing Field and struck the Frye slaughterhouse at 2101 Airport Way South. Eleven crew members, two firefighters and nineteen people on the ground were killed.⁴³³ The crash caused a large fire, cut major cross-town power lines and released enough ammonia from the slaughterhouse to kill one fireman.

Jul. 19, 1949. Aviation. A C-46 cargo plane crashed shortly after take-off, cutting power lines over wide areas and striking two buildings in Georgetown. After coming to rest, it caught fire and exploded, setting six houses on fire. Flying debris damaged three other houses. A total of eleven homes were damaged or destroyed. Five people on the ground and two passengers were killed. Thirty-three people were injured.

Aug. 13, 1951. Aviation. A B-50 bomber crashed into Sick’s Brewing and Malting at 3100 Airport Way and then bounced into the Lester Apartments, destroying one third of the building. The crash killed six people in the plane and five on the ground.⁴³⁴ The location was about one mile north of King County International Airport, just north of where the West Seattle Freeway and I-5 join. The site is now occupied by I-5.

August, 1996. Motor Vehicle. A 42-vehicle accident that caused one fatality and 23 injuries closed I-5 southbound for four hours⁴³⁵.

Nov. 27, 1998. Motor Vehicle. A passenger on a Metro bus shot and killed the driver as the bus was heading south on the Aurora Bridge. The bus crashed off the bridge, struck an apartment building and then the ground 50 feet below. The shooter, driver, and one passenger died, plus 32 passengers were injured.

Jan. 31, 2000. Aviation. Alaska Airlines Flight 261 crashes into the Pacific in route from Puerto Vallarta, Mexico to Seattle. All 83 passengers and five crewmembers died. Although the crash did not occur in Seattle, it had a big impact because Alaska Airlines is headquartered near Seattle and many of the passengers were from Seattle.

September 24, 2015. Motor Vehicle. A “Ride the Ducks” vehicle, from the popular Seattle tour company, veered into oncoming traffic on the Aurora Bridge, crashing into a charter bus full of international students. Five people died, and dozens were injured. The bridge was closed to traffic for roughly 12 hours.

Other notable incidents:

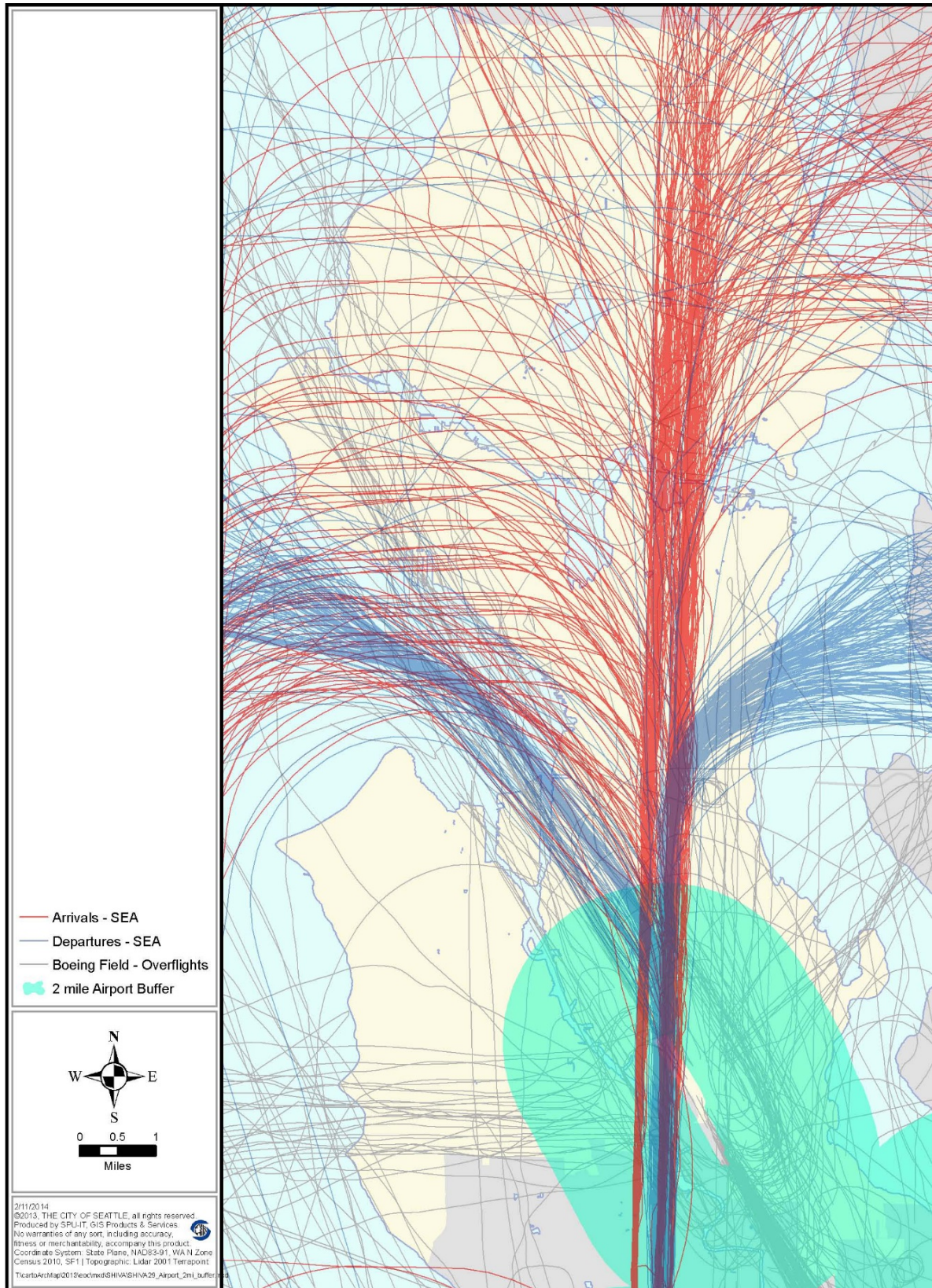
- October 18, 1984, Air Force Two and a private aircraft nearly collided eight miles from Boeing Field. The pilot of Air Force Two had to take evasive action to avoid a collision.
- December 19, 1984, only two months after the Air Force Two incident, a DeHavilland DHC-3 helicopter crash-landed on an athletic field and slid into a nearby street.
- October 10, 2001. A mechanical problem forced an emergency landing of Alaska Airlines flight 497. The accident occurred in California, but the plane was bound for Seattle.
- March 14, 2003. A commercial airliner landed on a SeaTac taxiway.
- May 8, 2003. A Seattle-based tour boat sinks in British Columbia. There were no casualties.
- Dec. 19, 2008. After a snowfall, a chartered bus slipped down an icy Capitol Hill street, plowed through a barrier, and teetered over I-5 near downtown Seattle. This was a near tragedy. No casualties resulted.

There have been several accidents in other parts of the county involving large commercial aircraft coming in populated areas, but such accidents are rare. Aviation safety systems have vastly improved since mid-century. In Seattle’s case, the changes probably have a lot to do with shifting major commercial operations from King County International Airport to SeaTac and aircraft production to other locations outside the city.

8.1.3 *Likelihood of Future Occurrence*

Trends in transportation safety have long been pulling in two directions. On one hand, the rate and severity of accidents has been decreasing dramatically. On the other hand, the use of all transportation modes has been increasing. So far, the pull of the safety improvements that decrease the accident rate

Figure 8-2. Flight Corridor and Areas Within Two Miles of Airports



has been dominant. At some point, the saturation of transportation networks or other factors may reverse this trend, but there is no clear indication that that Seattle is reaching this point. Seattle will probably experience another major accident, but this probability seems to be holding steady or decreasing.

8 1.4 Vulnerability

Transportation accidents present two sets of vulnerability. The first is to the vessels and vehicles themselves and the people in them. The second is to everything and everyone around them. People in transit are in an inherently vulnerable position. They are densely packed into vehicles or vessels and then moved at high speed across environments in which they could not often survive without help (e.g. the ocean). When things go wrong, many passengers can get hurt.

As large vehicles and vessels move about, often containing hazardous materials, they are liable to affect people and the built environment around them. Areas near aircraft flight paths, highways, and the shoreline are more likely to be affected by an accident than other areas. Urban areas like Seattle are inherently vulnerable due to high population density and the cost and complexity of the built environment through which transportation systems run. Seattle is continuing to invest in its transportation network to accommodate new residents. The Link Light Rail service will span from Tacoma to Everett by 2040.⁴³⁶ While safety will be a top priority in its construction, a denser transit network presents more opportunities for incidents.

Areas More Prone to Aviation Accidents

The areas that are most likely to be hit are the ones under or close to the flight paths, especially if they are within five-miles of an airport. Figure 8-2 -Flight Corridors and Areas Within Two Miles of Airports shows the area within five miles of both airports. Only Seattle’s most southern sections—White Center, South Park, Dunlop, and Rainier Beach—are within five miles of SeaTac, but many planes take flight paths over the southern half of the city. King County International Airport (Boeing Field) is in the city itself. Planes often approach for landing from the north, over the Duwamish Valley and Georgetown, flying quite low as they near the landing area. FAA regulations state that except when necessary for takeoff and landing, aircraft must fly at least 1,000 feet above the highest obstacle over urban areas.⁴³⁷

Seattle is also indirectly vulnerable to accidents that disrupt transportation networks. Most of these slowdowns or stoppages are temporary, but they can be an inconvenience to travelers and an economic burden.

8 1.5 Consequences

Transportation accidents are a classic case of a hazard with a vast number of low-impact events and a minute number of high-impact events. Every year roughly 35,000 – 45,000 people die in transportation accidents in the United States.⁴³⁸ The clear majority of these are the result of motor vehicle accidents. Most motor vehicle fatalities occur in passenger vehicles and small trucks, and on freeways and principal arterials.⁴³⁹ While individual accidents are not large incidents, they have a large cumulative impact. The long-term trend has been down. Many programs and regulations have been established to improve safety and the means to handle the most frequent incidents fall well within the scope of daily operations of local government.

Occasionally, larger incidents occur that have a bigger, more lasting impact on the community and challenge the response capabilities of local government. Outlined below are characteristics of what we can expect from the “most likely” large incident and what we can expect from the “maximum credible” scenario.

With so many smaller transportation incidents, the most likely scenario is one that just exceeds the normal response capabilities of local government. This is in contrast to incidents like earthquakes in which individual occurrences are more likely to be high impact. The 1998 Metro bus incident was a good example of an incident that nearly exceeded normal response capability. It drew large amounts of resources from the police and fire departments. Special lighting was needed to search for survivors after nightfall and social services, such as lodging, were needed for the families of the victims.

The most likely scenario would present a slightly higher level of impact. Despite the different transportation modes that might be involved, there are some similarities in impacts.

1. There is high likelihood of fatalities. This is in contrast to other hazards in which the “most likely” scenario involves a lot more property damage.
2. The geographic scope would be limited to the immediate scene of the incident with a strong possibility that transportation routes through the impacted area would be blocked. Infrastructure outages are also possible.
3. The duration of the incident would be limited. It would be likely that rescue and recovery operations could be completed in less than a few days. Transportation and infrastructure outages would also be restored in a similar amount of time.
4. Neighboring buildings and the people in them will probably be affected to some degree, but the majority of the casualties will be among those on the vehicle or vessel.
5. Maritime accidents tend to involve more property damage, especially when ships collide with bridges and other infrastructure.
6. There is a high likelihood of secondary hazards, especially fires and hazardous material spills. Transportation incidents can also be secondary hazards themselves.

Overall, the most likely major transportation incident will be short, but intense. Unless there is major infrastructure damage (i.e., to a bridge) the recovery will probably quick and complete.

8 1.6 Conclusions

Transportation safety has improved dramatically since the early days of motorized and air travel. Most of the major historical incidents date back to this earlier time. Still, transportation accidents hold the potential to produce very high casualty counts. As the amount of transportation increases, the total number of serious incidents may also increase despite safety improvements, especially as transportation networks become saturated and lose reserve capacity.

The possibility of terrorist attacking or using transport modes as weapons greatly increases the risks associated with the maximum credible events. The most likely events remain accidents that cause mass casualties among passengers and limited damage to surrounding infrastructure with the major caveat of damage to bridge or overpass structures.