



Hazard Risk Assessment

Accidents

Airplane Crashes
Marine Accidents
Motor Vehicle Crashes
Train Derailments

Accidents

There are four types of accidents that will be discussed: air crashes, marine accidents, motor vehicle crashes and rail derailments. There are numerous accidents that happen in communities all the time – many of them tragic. But in this case we are examining accidents that would be considered a disaster for your community. In most small communities, the lack of ambulances or a nearby hospital able to accept seriously injured patients means that even a relatively small crash with multi-casualties can be considered a disaster. Resources are available to assist you in completing this assessment in the next section.

Airplane Crashes

Definition

An air crash is considered to be an accident involving one or more airplanes. While most airplane crashes occur on or near an airport, airplane crashes can occur anywhere.

Discussion

Aircraft accidents are caused by one or more stress factors. These can be summarized as the physical flying stressors (e.g. the noise, glare and pressure changes), the anxiety stress factors (e.g. level of training, night flying and unfamiliar airports), personal stress factors (e.g. hunger, fatigue and worry) and emergency stressors (e.g. control malfunction, metal fatigue and engine fire)¹.

Most air accidents occur on or near airports, but there are a large number of people in Canada who use small commercial and personal planes to fly from one location to another and these planes could go down virtually anywhere in Canada. From a mass casualty perspective it is accidents involving large passenger planes, or planes landing in residential, or urbanized areas which are of concern.

It Happened Here...

On September 2, 1998 Swissair flight 111 crashed into the waters of Peggy's Cove, Nova Scotia (population 46) killing all 229 passengers and crew onboard².



On May 28, 2010 the wreckage of a twin engine Piper Navajo was discovered near Cartwright, Newfoundland (population 629) shortly after taking off from Happy Valley-Goose Bay. The pilot and passenger both succumb to their injuries³.

On July 8, 1965, a CP Air DC6B exploded and crashed at Dog Creek (population 109), just west of 100-Mile House BC killing 52 persons on board⁴.

Note that even though your community does not meet any of the risk indicators, it is always possible for a plane to get off course and crash on, or near, your community.

Air Plane Crashes^{5 6} - Human-Caused

Hazard Rating	High Risk <input type="checkbox"/>	Low Risk <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
----------------------	------------------------------------	-----------------------------------	---	---

Yes	No	Need More Info	Not Applicable	FACTORS
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Communities located in flight paths are at greater risk. Is your community located in a flight path?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	**Most air accidents occur on or near airports during landing or take-off. Communities near airports are at greater risk. Is your community located near an airport?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The larger the aircraft the less likely it is to crash. This means places located near small aircraft routes are at greater risk. Is your community located on/near a small aircraft route?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Air crashes are more likely in mountainous terrain. Is your community located in a mountainous region?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Air crashes are more likely in areas that experience rapidly changing weather that led to poor visibility. Does your community often experience rapidly changing weather (Refer to the section on Atmospheric Hazards if required)?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pilots in training are more likely to crash than trained professionals. Communities located near aircraft training facilities are at risk. Is your community located near an aircraft training facility? The acrobatics of air shows increase crash risk. Do air shows occur in/near your community?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have there been previous air crashes in your community in the past?

Marine Accidents

Definition

Marine accidents are shipping events that threaten human life, property and natural resources. Ship collisions, ship fires and hazardous material spills are typical of marine accidents. Not as commonly considered, the possibility of nuclear submarine accidents also exists.

Discussion

Conditions such as high winds, rough seas and poor visibility coupled with local bathymetry (location of shoals, sandbars, reefs etc.) and geography produce hazardous conditions for marine traffic. Factors identified as risk indicators for marine navigation include winds, visibility, currents, water depths, passage widths, course changes and shipping density. In addition to risk indicators, the type of marine transportation (fishing vessel, passenger vessel, pleasure craft, military vessel, commercial/industrial cargo vessel) plays a role in the character and magnitude of potential hazards should a disaster, such as a ship collision, occur.

It Happened Here...

On March 22, 2006 around 12:25am the Queen of the North hit Gill Island 15km from Hartley Bay, British Columbia (population 200) and began to sink into Wright Sound⁷. It took the ship 1 hour and 15 minutes to fully submerge. Two passengers were never located, but 99 passengers and crew made it off the boat and to safety.

On November 1, 2006 just after 8 am the small fishing vessel Cape Fin-Tose capsized and began to sink off the coast of Kings Point, Newfoundland (population 775)⁸. All four people on board survived.

Marine Accidents^{9 10 11} - Human-Caused

If you don't have any lakes, rivers or oceans that boats or ships can navigate then you can safely state that this is "Not applicable."

Hazard Rating	High Risk <input type="checkbox"/>	Low Risk <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
----------------------	------------------------------------	-----------------------------------	---	---

Yes	No	Need More Info	Not Applicable	FACTORS
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bad visibility increases the risk of marine accidents. Does your community often experience bad visibility i.e., fog or storms (Refer to the section on Fog and Windstorms)?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	High winds and rough seas increase the risk of marine accidents. Does your community often experience bad visibility?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Collisions occur more frequently with larger vessels due to the loss in maneuverability. Does your community experience a lot of large vessels (i.e., tankers) traffic?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ports have increased accident rates. Is your community located near a port?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vessels that frequently call at port, such as passenger vessels, have the highest likelihood of having an accident. Is your community located on or near a passenger vessel port?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Accidents increase with the age of vessel. Are a large portion of the boats near your community considered old by the boating population?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Grounding is a major cause of accidents. Does your community have a marine route that is bordered by shallow waters, reefs and or/sandbars?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have marine accidents occurred in your community in the past?

Motor Vehicle Crashes

Definition

Motor vehicle crashes occur whenever a motor vehicle, be it a truck, passenger car, bus, farm vehicle or any other motor-powered vehicle collides with another motor vehicle, train or other obstruction; or lose control and incur damage. Numerous motor vehicle accidents occur every day in Canada. Of mention are those which involve large numbers of passengers, or have the potential to do so.

Discussion

Motor vehicle accidents, worthy of note from a disaster perspective, tend to be caused by several different factors. One cause of accidents with high mortality or injury rates is when the driver loses control of a motor vehicle and then crashes into buildings or groups of people. Another situation is where poor driving conditions lead to bus accidents or multiple vehicle collisions which lead to numerous fatalities and overwhelm local response agencies. There will also be situations of driver error which can cause multiple casualties.

It Happened Here...

On October 13, 1997 a bus descending a steep hill near Saint-Joseph-de-la-Rive, Quebec (population 222) suffered brake failure¹². As a result it missed a curve and plunged into a stony ravine. 43 people died and 5 were injured.

On February 2, 2004 the Alaska Highway was closed almost a week, severing northern B.C.'s main link to the rest of the province, after a southbound three-axle propane truck crossed the highway's centre line and collided with a northbound tractor trailer. The propane truck took almost a week to burn off its load of an estimated 17,000 gallons of liquid propane. The drivers of the trucks were able to escape without injury, but the fire quickly spread across the entire width of the highway and melted the road pavement.

Motor Vehicle Crashes^{13 14} - Human-Caused

Hazard Rating	High Risk <input type="checkbox"/>	Low Risk <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
----------------------	------------------------------------	-----------------------------------	---	---

Yes	No	Need More Info	Not Applicable	FACTORS
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	As road grade increases (the steepness of the road) so do accidents. This occurs uphill due to the increased passing of slower vehicles and downhill due to the increased speeds which decrease the time to react to situations. Do the roads in and around your community often go up and downhill?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Busier stretches of road tend to have higher accident rates. Does your community regularly experience what you would consider to be a high volume of vehicles on its roadways?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The more lanes on a roadway the higher the accident rate. Does your community have multiple lane highway/roadways either in your community or nearby?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Narrow shoulders decrease the space drivers have to correct errors and increase the rate of accidents. Does your community have roadways with narrow (1.5 metres or less) shoulders?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Highways and freeways tend to have multiple lanes, high speeds, and high traffic volumes, all factors that increase accident rates. Does your community have a highway/freeway through and/or near it?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adverse weather (snow storms, rain storms, fog) reduces visibility and increases the risk of accidents. Does your community experience adverse weather (Refer to the appropriate Atmospheric Hazards sections)?

Train Derailments

Definition

Rail accidents occur when a train derails or collides with another train, motor vehicle or obstruction on the rail tracks. A rail accident can also take place on a rapid transit system, such as the ALRT in the Lower Mainland of British Columbia or the GO trains in Metro Toronto.

Discussion

Many accidents are as the result of colliding with another train already on the tracks. Vandalism has also caused train wrecks, as has driver error. Weather conditions, often snow, account for a number of train accidents every year. Motor vehicles often are involved in collisions with trains.

It Happened Here...

Around 1:35am on December 4, 2002 42 cars of an 80 car Canadian Pacific Railway freight train left the tracks¹⁵. The molten sulphur on board ignited; causing a chemical fire. Nearby residents of night. Luckily, there were no injuries.

On September 26, Seven Persons, Alberta (population 239) were evacuated as fire crews battled the blaze all 2010 a semi-trailer and Canadian Pacific Railway train collided around 1 pm near Pense, Saskatchewan (population 507)¹⁶. There were no injuries but both the trailer on the truck and engine of the train were severely damaged.

Train Derailments ^{17 - Human-caused}

If your community does not have any rail lines running through, or close to, your community you can safely state that this is “Not Applicable.”

Hazard Rating	High Risk <input type="checkbox"/>	Low Risk <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
----------------------	------------------------------------	-----------------------------------	---	---

Yes	No	Need More Info	Not Applicable	FACTORS
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Does your community have rail lines running through and/or near it?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Traffic crossings increase the risk of rail accidents. Does traffic cross the rail line in and/or near your community?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Avalanche and steep mountainous areas increase the risk of rail accidents. Is your community located in and/or near steep mountainous and/or avalanche areas?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Rail lines that cross fault lines and/or soil at risk of liquefaction are at risk from earthquakes. Is your community located on and/or near a fault line and/or soil at risk to liquefaction (Refer to the section on Earthquakes)?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have there been train derailments in your community in the past?

Risk Assessment Resources

Historical Events for Accidents

Please Note: See your Provincial/Territorial Risk and Resilience Information Guides for additional resources, including information regarding your provincial or territorial Emergency Management Organization (EMO). EMO websites generally provide information specific to the hazards in your territory or province.

Accident	Resource
Air Crashes	http://www.tsb.gc.ca/eng/rapports-reports/aviation/index.asp The Transportation Safety Board of Canada lists all reported airplane crashes that have occurred.
Marine Accidents	http://www.tsb.gc.ca/eng/rapports-reports/marine/index.asp The Transportation Safety Board of Canada lists all reported boating or marine accidents that have occurred.
Rail Derailments	http://www.tsb.gc.ca/eng/rapports-reports/rail/index.asp The Transportation Safety Board of Canada lists all reported train derailments that have occurred.

Historical Events – General Information

Historical Events for Accidents

Please Note: See your Provincial/Territorial Risk and Resilience Information Guides for additional resources, including information regarding your provincial or territorial Emergency Management Organization (EMO). EMO websites generally provide information specific to the hazards in your territory or province.

Resource
<p>http://web.ncf.ca/jonesb/DisasterPaper/disasterpaper.html</p> <p>The “Canadian Disasters - An Historical Survey” website by Robert L. Jones provides a great list of past disasters which have occurred since the 1500s in Canada and have resulted in at least 20 deaths.</p>
<p>http://www.publicsafety.gc.ca/prg/em/cdd/srch-eng.aspx</p> <p>The Public Safety Canada “Canadian Disaster Database” contains a list of past disasters in Canada. Note that it has not been updated since 2005.</p>
<p>http://en.wikipedia.org/wiki/List_of_disasters_in_Canada</p> <p>Wikipedia has a list of disasters in Canada and links to various events; however, it does not have a lot of information about British Columbia.</p>
<p>http://www.collectionscanada.gc.ca/sos/index-e.html</p> <p>SOS! Canadian Disasters is supported by Library and Archives Canada, and provides some interesting stories on historical events and also has a great website on an education program (Grades 7 to 12) on understanding hazards and disasters in Canada.</p>
<p>http://archives.cbc.ca/search?q=disasters&RTy=0&RC=1&RP=1&RD=1&RA=0&th=1&x=10&y=14</p> <p>CBC Archives have a wide variety of news clips on historical and current disasters in Canada as well as educational information on hazards for teachers.</p>

Accidents References

- ¹ Jessen, Knud. 1985. "Aircraft Disaster Readiness". *Journal of World Association for Emergency and Disaster Medicine* (1985)
- ² Peggy's Cove. Retrieved March 3 2011 from http://en.wikipedia.org/wiki/Peggys_Cove,_Nova_Scotia and <http://www.nsexplore.ca/aircraft-crash-sites/>
- ³ Cartwright, Newfoundland and Labrador. Retrieved March 3 2011 from <http://ca.epodunk.com/profiles/newfoundland-and-labrador/cartwright/2000402.html>
- ⁴ Looker, Janet. 2000. *Disaster Canada*. Toronto, Canada: Lynx Images, Retrieved March 3 2011 from <http://www.amateurradio.ca/DL16%20Canadian%20Disasters.doc>
- ⁵ Li, G., Pressley, J. C., Qiang, Y., Grabowski, J. G., Baker, S. P., & Rebok, G. W. (2009). Geographic region, weather, pilot age, and air carrier crashes: A case-control study. *Aviation Space and Environmental Medicine*, 80(4), 386-390.
- ⁶ Transportation Safety Board – Canada. (2009). Annual Report. Retrieved on March 11 2011 from [.http://www.tsb.gc.ca/eng/stats/aviation/2009/ss09.asp#table_1](http://www.tsb.gc.ca/eng/stats/aviation/2009/ss09.asp#table_1).
- ⁷ Hartley Bay. Retrieved March 3 2011 from http://en.wikipedia.org/wiki/Hartley_Bay,_British_Columbia and <http://www.westcoastferries.ca/ferries/queenofthenorth.html>
- ⁸ King's Point. Retrieved March 3 2011 from http://en.wikipedia.org/wiki/King%27s_Point and <http://www.tsb.gc.ca/eng/rapports-reports/marine/2006/m06n0082/m06n0082.pdf>
- ⁹ Ligthart, V. H. M. (1980). Determination of probability of marine accidents with respect to gas carriers proceeding in dutch coastal and inland waters. *Journal of Hazardous Materials*, 3(3), 233-247.
- ¹⁰ Wang, J., Pillay, A., Kwon, Y. S., Wall, A. D., & Loughran, C. G. (2005). An analysis of fishing vessel accidents. *Accident Analysis & Prevention*, 37(6), 1019-1024.
- ¹¹ Yip, T. L. (2008). Port traffic risks - A study of accidents in hong kong waters. *Transportation Research Part E-Logistics and Transportation Review*, 44(5), 921-931.
- ¹² Disasters. Retrieved March 3 2011 from <http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0002313> and http://en.wikipedia.org/wiki/Les_%C3%89boulements,_Quebec
- ¹³ Milton, J., & Mannering, F. (1998). The relationship among highway geometrics, traffic-related elements and motor-vehicle accident frequencies. *Transportation*, 25(4), 395-413.
- ¹⁴ Martin, P., Audet, T., Corriveau, H., Hamel, M., D'Amours, M., & Smeesters, C. (2010). Comparison between younger and older drivers of the effect of obstacle direction on the minimum obstacle distance to brake and avoid a motor vehicle accident. *Accident Analysis and Prevention*, 42(4), 1144-1150.
- ¹⁵ Sulphuric Acid Plant Safety. Retrieved March 3 2011 from http://www.sulphuric-acid.com/techmanual/Plant_Safety/safety_accidents.htm
- ¹⁶ Pense, Saskatchewan. Retrieved March 3 2011 from http://en.wikipedia.org/wiki/Pense,_Saskatchewan and <http://www.cbc.ca/news/canada/saskatchewan/story/2010/09/27/sk-train-truck-crash-1009.html?ref=rss>
- ¹⁷ Farran, J. I. (2000). No turns allowed - controlling vehicles turning in front of light rail vehicles. *Transit: Rail Transit and Maintenance, Commuter Rail, Major Activity Center Circulation Systems, Light Rail Transit, and Ferry Service - Public Transit*, (1704), 85-89.