



# For better or for worse, will my flight be delayed at an airport in the inland northwest?

By: Erik Thompson

When booking a flight, it is important to consider how much will the flight cost, is a window seat available, and what type of clothing to pack? Flight delays and cancellations are usually a surprise because they can be spontaneous. Who are the winners and losers, who is better, and who is worse? The Spokane International Airport (GEG), located in Spokane County, WA, wants to know where they stand.



The Seattle-Tacoma International Airport (SEA) located in Seattle, WA, is a much larger airport when compared to the Spokane International Airport, so the next best choice is Boise Airport (BOI) located in Boise, ID, with a comparable flight volume. Now that the contenders have been selected, it is time to gather the data and see how these airports measure up.

The data available at <https://www.openintro.org> will provide the necessary metrics to evaluate the performance of both the Spokane International Airport (GEG) and the Boise Airport (BOI) during the years 2019 and 2020. Delays and flight cancellations have many causes, but what is the most common reason for a flight to be tardy? Spokane **Fig. 1.1** vs. Boise **Fig. 1.2**.



Source: <https://spokaneairports.net>



Source: <https://www.iflyboise.com>

**Fig. 1.1 – Arrival Delays 2019 to 2020 (GEG)**

Spokane Carriers (GEG)	Delays in 2019	Delays in 2020	Total for 2019 and 2020
Alaska Airlines Inc.	52	11	63
American Airlines Inc.	15	20	35
Delta Air Lines Inc.	23	29	52
Envoy Air	1		1
Frontier Airlines Inc.	7	2	9
Republic Airline	1		1
SkyWest Airlines Inc.	40	47	87
Southwest Airlines Co.	84	25	109
United Air Lines Inc.	12	9	21
<b>Grand Total</b>	<b>235</b>	<b>143</b>	<b>378</b>

**Fig. 1.2 – Arrival Delays 2019 to 2020 (BOI)**

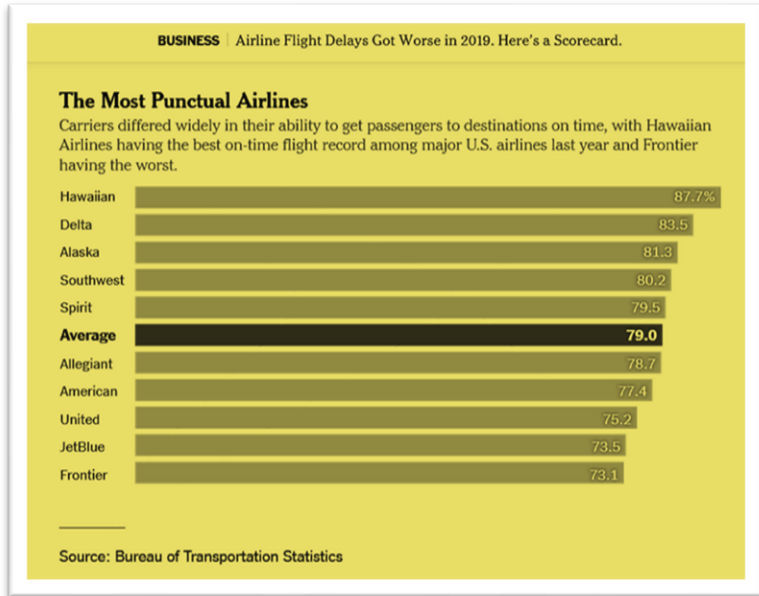
Boise Carriers (BOI)	Delays in 2019	Delays in 2020	Total for 2019 and 2020
Alaska Airlines Inc.	16	1	17
Allegiant Air	13	7	20
American Airlines Inc.	8	10	18
Delta Air Lines Inc.	18	14	32
Envoy Air	21	3	24
Mesa Airlines Inc.		15	15
SkyWest Airlines Inc.	171	67	238
Southwest Airlines Co.	99	34	133
United Air Lines Inc.	4	7	11
<b>Grand Total</b>	<b>350</b>	<b>158</b>	<b>508</b>

According to the New York Times **Fig 1.3**, some airline carriers struggled more than others for on-time flights among the major US airlines. Hawaiian Airlines is first place with, 87.7%, and Frontier bottoms out at 73.1%. The average on-time flights in 2019 is 79%.

The averages provided by The New York Times study will provide necessary context when evaluating the data. In **Fig 1.1 (GEG)** the major carriers account for 82%, 193/235, of all flight delays in 2019. In **Fig 1.2 (BOI)** the major carriers account for 45%, 158/350, of all flight delays in 2019. In **Fig 1.3**, major carriers like Delta, Alaska, and Southwest faired better than the average. Spokane International Airport is almost double Boise Airport in the category of flight delays caused by major airline carriers. Could a specific airline carrier be at fault or is there more to it?

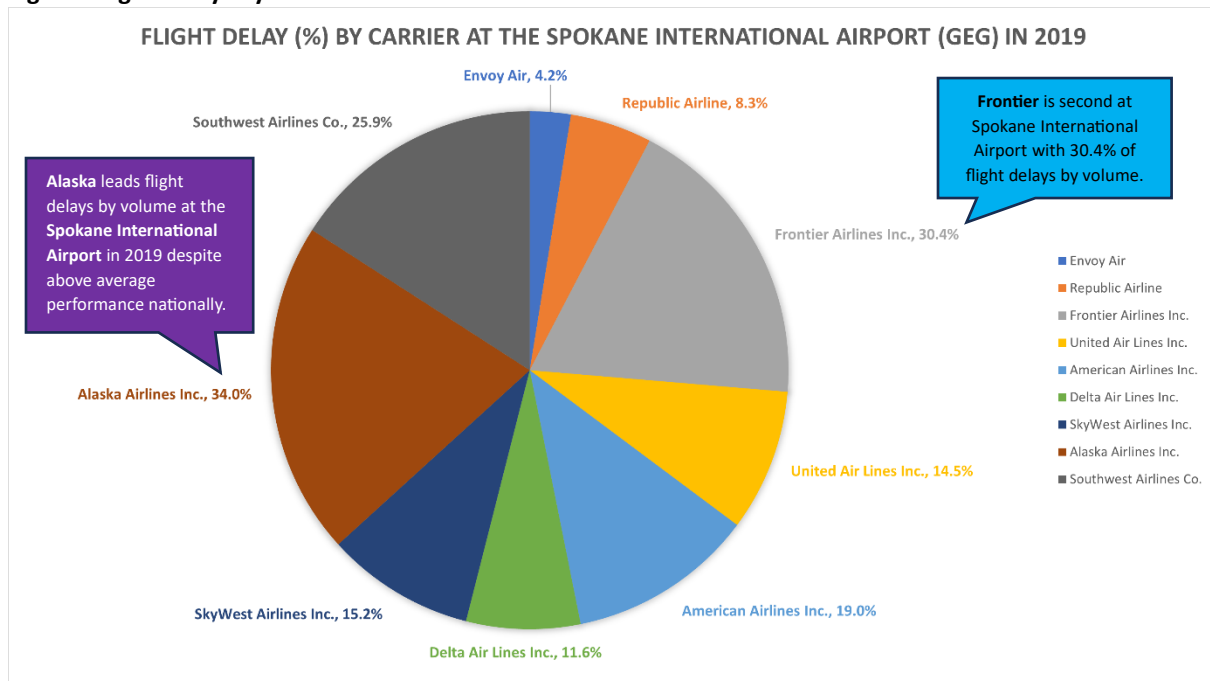
**The New York Times** Airline Flight Delays Got Worse in 2019

**Fig. 1.3**



Source: <https://www.nytimes.com>

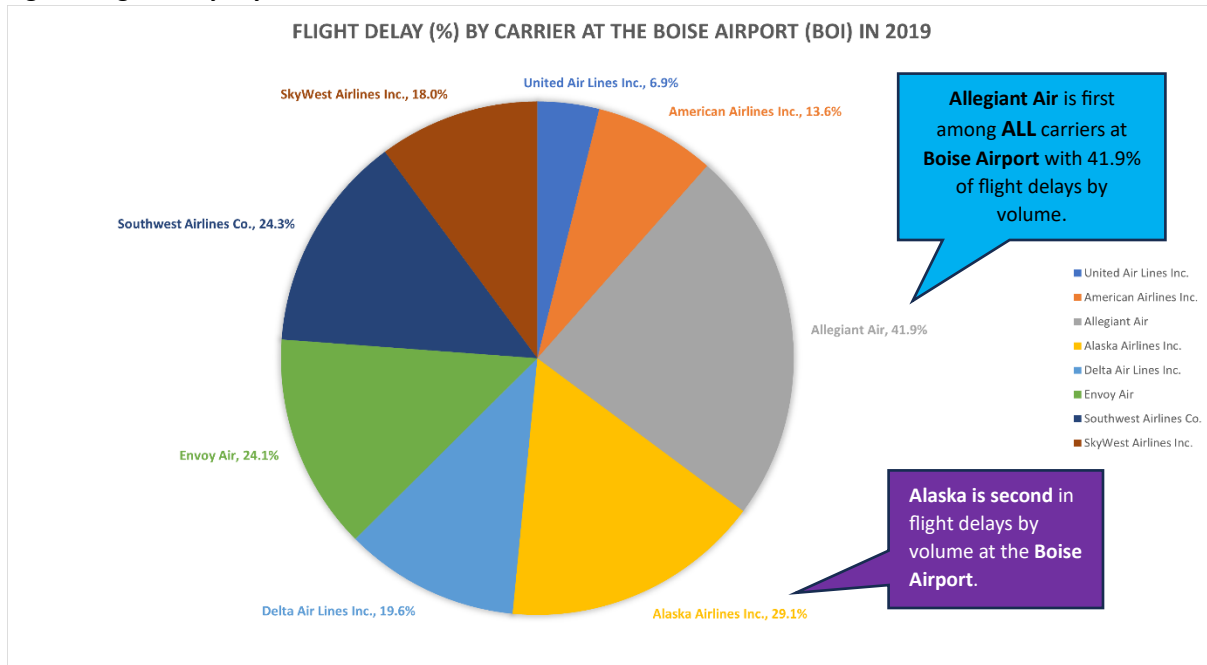
**Fig. 1.4 Flight Delays by Total Volume**



In **Fig 1.4**; Southwest Airlines Co., and Alaska Airlines Inc., account for almost half of the flight delays at the Spokane International Airport for the year 2019. Frontier Airlines Inc. is

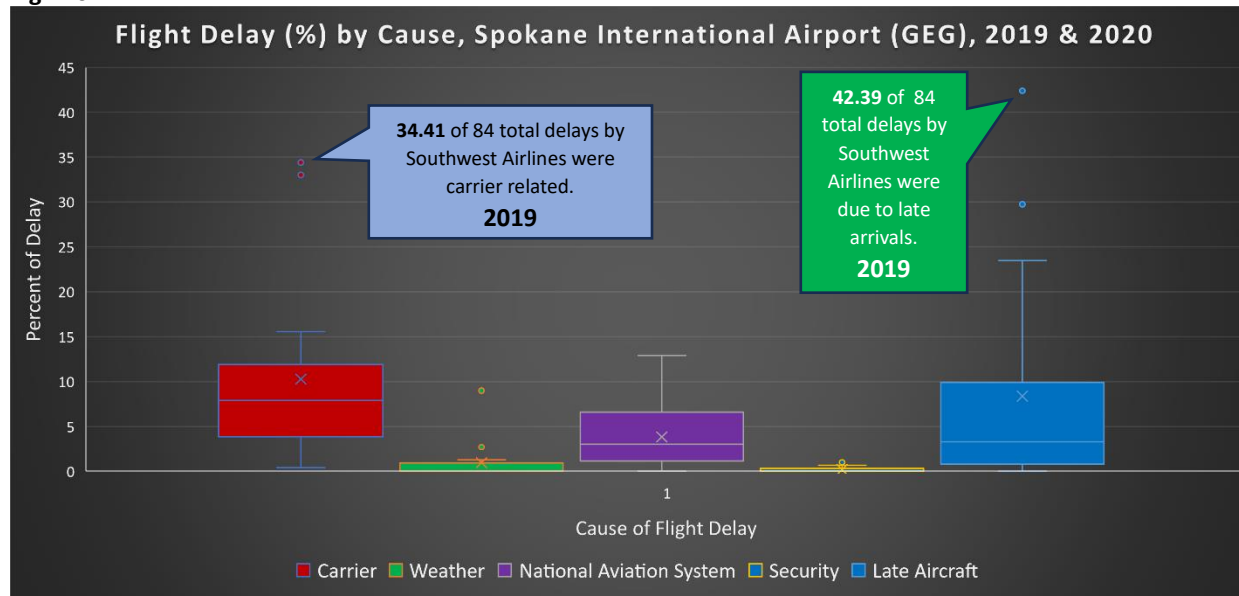
second in delays by volume at Spokane International Airport. Although Alaska Airlines is second at Boise Airport **Fig 1.5**, Allegiant accounts for almost half of the delays. A deeper dive into the data could provide answers for what was causing these delays. **Fig 1.2** shows SkyWest as having 171 delays, an amount nearly double that of Southwest Airlines' 99 delays. Did SkyWest struggle because they are a smaller carrier?

**Fig. 1.5 Flight Delays by Total Volume**



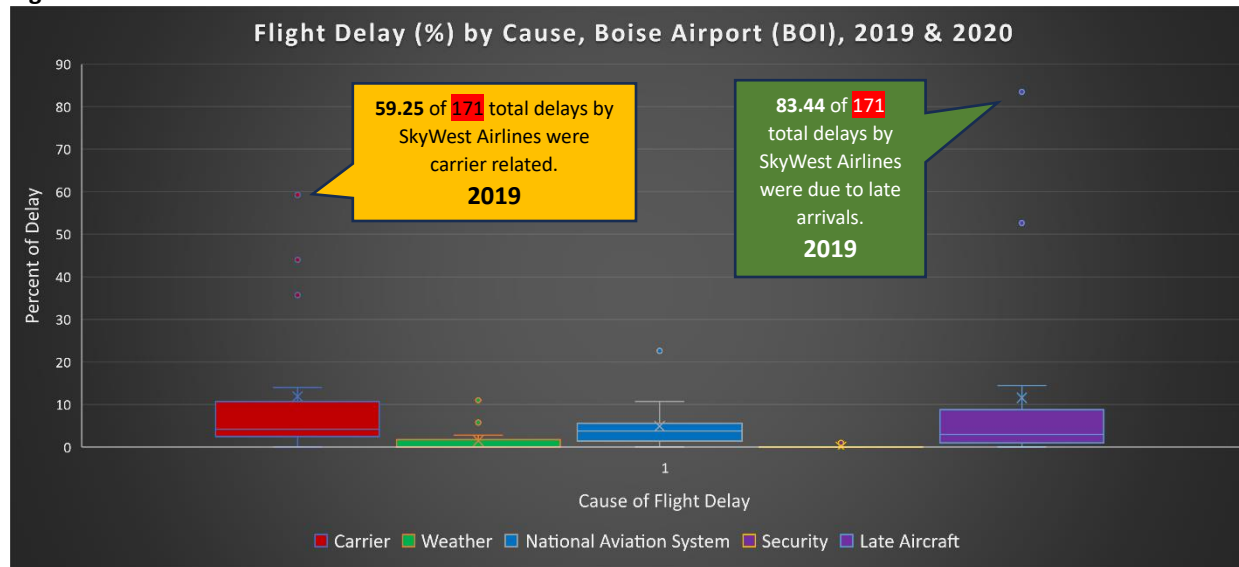
A Box plot of Spokane International Airport reveals late arrivals as the leading cause for delay in 2019 and 2020, with carrier related delays as a close second place. TSA is the lowest.

**Fig. 1.6**



Carrier related delays at Spokane International Airport were 17% in 2019 and 20% in 2020 for SkyWest airlines. Late arrivals accounted for 23.48% in 2019, but only 3% in 2020. Both airline carriers, Southwest and SkyWest struggled, but SkyWest bounced back with a 17% improvement in late arrivals in 2020. **Fig 1.6** shows that 34.41% of Southwest Airlines' delays were caused by carrier issues and another 42.39% by late arrivals in 2019. The New York Times in **Fig 1.3** shows that Southwest Airlines was above average for delays, but at Spokane International Airport they struggled. How did Spokane compare to Boise? Frontier has is responsible for 30.4% of Spokane International Airport's delays and is last place in the graph provided by New York Times.

**Fig. 1.7**



**Fig 1.7** shows SkyWest Airlines had more delays in 2019 at Boise Airport (171) when compared to Spokane International Airport (84). The data shows that SkyWest struggled at both airports but surpassed the major carriers at Boise Airport. Carrier and arrival delays were the primary cause for delays at both airports in 2019 and 2020. Weather and the TSA are even among the two airports and are the lowest cause for delays. The National Aviation System caused more delays at Spokane International Airport with 12.92 of 29 attributable to Delta Airlines in 2020.

A deeper dive into the statistics shows an average of 44.47 delays for all the carriers at Spokane International Airport over the period 2019 & 2020, **Fig 1.8**. Spokane International Airport has a leptokurtic feature for delays, but it is platykurtic for total flights. Spokane International Airport is also skewed right for delays and total flights but more skewed for delays. Total delays account for 17.4% of the total flights (2168) over the two-year period for Spokane International Airport. Carrier delays (164.35) were the top cause a flight was delayed, followed closely by late arrivals (134.02), and 3<sup>rd</sup> place goes to National Aviation System delays (61.3).

Delays were unimodal with a range of 377, a minimum of 1, maximum of 378, and a standard deviation of 88.69. Boise Airport had more delays over the two-year timespan with 508 versus Spokane International Airports 378 but had a lower percentage at 16% of 3150 flights. Even with the higher flight volume, Boise Airport had the lower delay value. Boise had 1,711 flights through SkyWest and 635 flights from Southwest Airlines compared to Spokane international Airport with 559 flights through SkyWest and 561 flights from Southwest Airlines.

Fig. 1.8

Descriptive Statistics for Spokane International Airport (GEG), 2019 & 2020

	<i>Airline Flights</i>	<i>Flight Delays +15m</i>	<i>Carrier Delays</i>	<i>Weather Delays</i>	<i>NAS Delays</i>	<i>Security Delays</i>	<i>Late Aircraft Delays</i>	<i>Flight Cancelled</i>	<i>Flight Diverted</i>
<b>Mean</b>	135.50	<b>44.47</b>	10.27	0.95	3.83	0.20	8.38	0.56	0.06
<b>Standard Error</b>	26.16	21.51	2.53	0.57	0.87	0.09	3.12	0.27	0.06
<b>Median</b>	112.50	20.00	7.88	0.00	3.03	0.00	3.30	0.00	0.00
<b>Mode</b>		<b>1.00</b>		0.00		0.00		0.00	0.00
<b>Standard Deviation</b>	104.63	88.69	10.13	2.27	3.46	0.37	12.48	1.09	0.25
<b>Sample Variance</b>	10947.73	7865.89	102.56	5.15	11.99	0.14	155.63	1.20	0.06
<b>Kurtosis</b>	-1.05	<b>14.59</b>	2.32	12.13	1.73	1.19	2.97	1.59	16.00
<b>Skewness</b>	0.44	<b>3.73</b>	1.66	3.38	1.23	1.63	1.93	1.74	4.00
<b>Range</b>	319.00	377.00	33.98	9.00	12.92	1.00	42.39	3.00	1.00
<b>Minimum</b>	5.00	1.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00
<b>Maximum</b>	324.00	378.00	34.41	9.00	12.92	1.00	42.39	3.00	1.00
<b>Sum</b>	2168.00	756.00	<b>164.35</b>	15.21	<b>61.30</b>	3.12	<b>134.02</b>	9.00	1.00
<b>Count</b>	16.00	17.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00

Boise Airport had more total traffic including 1711 flights from SkyWest resulting in **171** flight delays in 2019 alone. Boise Airport had a lower average for all carriers in **Fig 1.9** at 29.88.

Fig. 1.9

Descriptive Statistics for Boise Airport (BOI), 2019 & 2020

	<i>Airline Flights</i>	<i>Flight Delays +15m</i>	<i>Carrier Delays</i>	<i>Weather Delays</i>	<i>NAS Delays</i>	<i>Security Delays</i>	<i>Late Aircraft Delays</i>	<i>Flight Cancelled</i>	<i>Flight Diverted</i>
<b>Mean</b>	185.29	<b>29.88</b>	11.89	1.50	4.87	0.06	11.57	1.76	0.65
<b>Standard Error</b>	65.70	10.75	4.19	0.70	1.31	0.06	5.40	0.86	0.37
<b>Median</b>	59.00	14.00	4.20	0.00	3.77	0.00	2.98	0.00	0.00
<b>Mode</b>	58.00	7.00	1.47	0.00		0.00	0.00	0.00	0.00
<b>Standard Deviation</b>	270.90	44.30	17.26	2.88	5.39	0.24	22.28	3.56	1.54
<b>Sample Variance</b>	73387.85	1962.86	297.76	8.32	29.09	0.06	496.20	12.69	2.37
<b>Kurtosis</b>	4.10	<b>6.37</b>	3.02	7.57	7.26	17.00	7.30	4.22	9.83
<b>Skewness</b>	2.22	<b>2.50</b>	1.99	2.67	2.46	4.12	2.75	2.23	3.01
<b>Range</b>	921.00	170.00	59.25	11.00	22.58	1.00	83.44	12.00	6.00
<b>Minimum</b>	30.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Maximum</b>	951.00	171.00	59.25	11.00	22.58	1.00	83.44	12.00	6.00
<b>Sum</b>	3150.00	508.00	<b>202.11</b>	25.43	<b>82.74</b>	1.00	<b>196.73</b>	<b>30.00</b>	11.00
<b>Count</b>	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00

Airline carriers like frontier topped the percentage on the pie chart at 2<sup>nd</sup> place at the Spokane International Airport in 2019 with 30.4%, but the sample size of 5 flights is misleading. Meanwhile other airlines like Southwest that performed well nationally, and having high volume at the Spokane International Airport didn't do as well. **Fig 2.0** shows the changes over the two years by each carrier. Southwest Airline improved the most by volume in 2020 at Spokane International Airport.

**Fig. 2.0**



Looking at the frequency of delays by carrier in **Fig 2.1** again shows that the higher volume carrier, Southwest Airlines as an outlier. The 3 major carriers; Southwest, Alaska, and Delta had more delays because they had more flights recorded. What is missing from these graphs is the sample size. In 2019 Frontier Airlines had 5 flights, but then increased to 23 in 2020.

**Spokane International Airport (GEG), Stem & Leaf, Frequency of Flight Delays in 2019-2020**

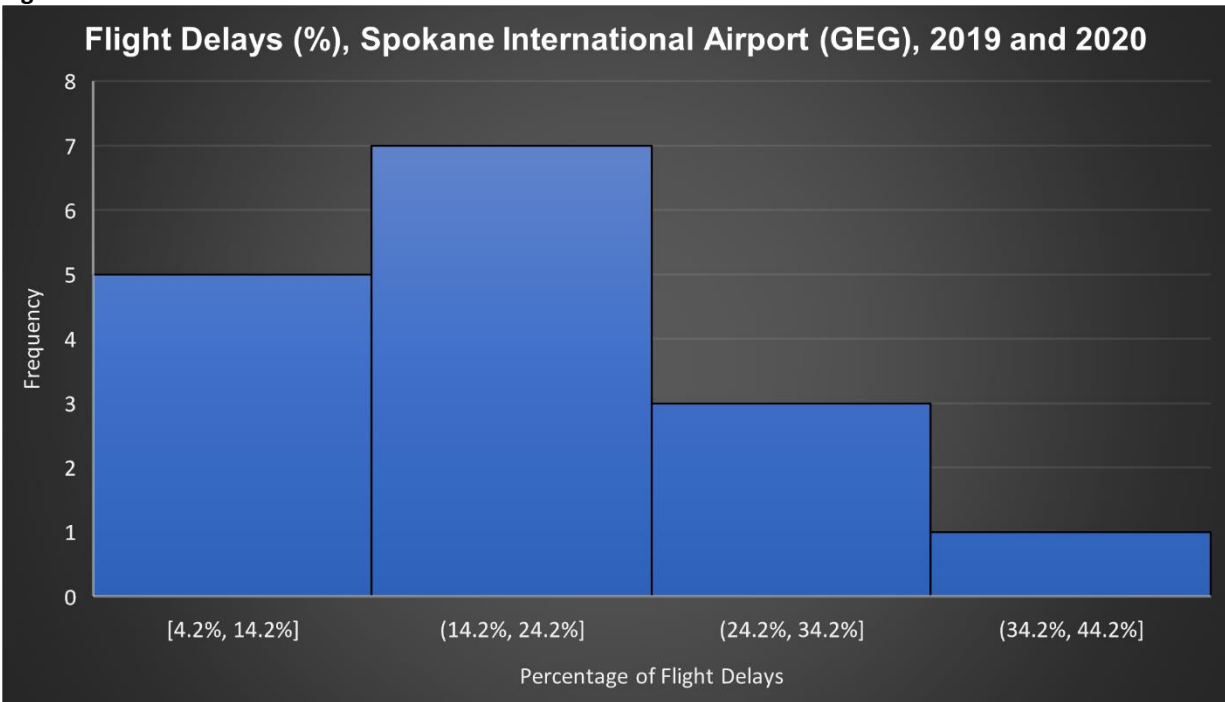
**Fig. 2.1**

STEM	LEAF
0	1 1 2 7 9
1	1 2 5
2	0 3 5 9
3	
4	0 7
5	2
6	
7	
8	4

According to **Fig 2.0** the number of delays decreased as the flights increased. American, Delta, and SkyWest had more flights delayed in 2020 than in 2019. There is a lot of variability in all the graphs, suggesting that there are more factors than what is being represented in these graphs. A closer look at sample size and research into individual carriers would be insightful.

Fig 2.0 also shows that major brands vary in performance year to year. Some improve like Southwest Airlines, while others go backwards, Delta Air.

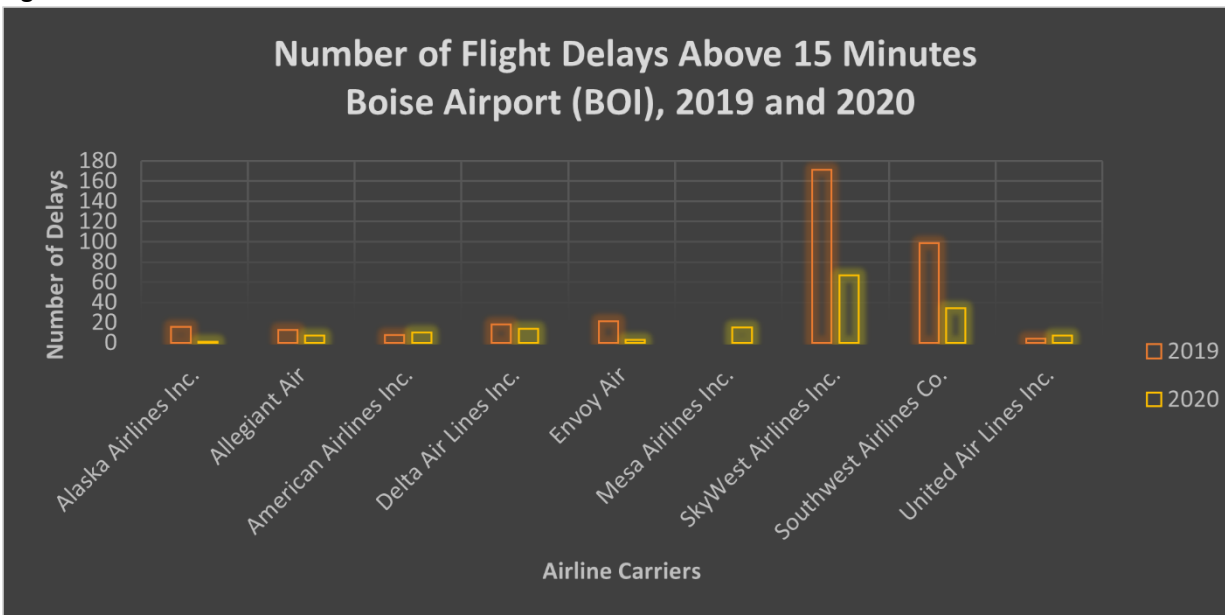
**Fig. 2.2**



Spokane International airport shows a unimodal feature in **Fig 2.2**. Most of the carriers fall into the 14.2% to 24.2% bar with a frequency of 7. There are no outliers in the data, but the frequency drops past 34% and shows a right skewed feature.

SkyWest is the clear loser in number of delays for 2019 and 2020, but bounced back in 2020 to have only 3% delays related to late arrivals. Mesa Airlines, **Fig 2.3**, didn't have any flights in 2019 so it's not possible to evaluate how they did, but in 2020 they had 58 flights with 25.9% delays by volume. United and American Air had more delays in 2020 than 2019.

**Fig. 2.3**



The stem and leaf show SkyWest as a clear outlier to the data that is skewed right. Boise Airport's delays are also skewed right as is Spokane International Airport. **Fig 2.6** and **Fig 2.7** show a combination of percentages that each carrier has compared to their volume as well as which carriers have the most delays. One interesting feature is that most of Spokane International Airport's delays come from a major carrier, Southwest.

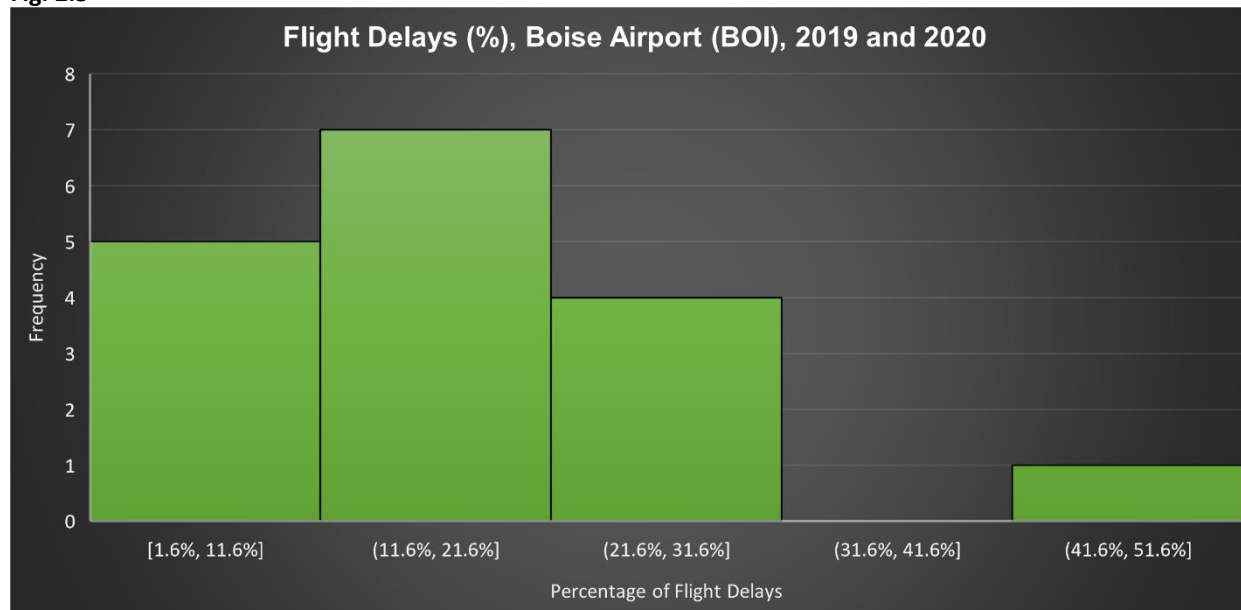
Boise Airport has higher overall volume, but most of its delays come from 2019 and from a non-major carrier, SkyWest. It is possible that SkyWest has a marketing strategy that is more competitive at Boise Airport. Airlines must pick and choose the best routes that make the most sense for the inventory of planes that they have.

Another study that could yield some interested results would be to evaluate each carrier more carefully from airport to airport. A study that is focused on why carriers select certain airports. One of the data points to investigate would be budget and inventory for each carrier.

Litigation is also left out of the analysis. Airline carriers are constantly bombarded with lawsuits by consumers. Maintenance or mechanical failure is another potential data point that should be evaluated in further study. How many delays are caused for good reasons, like noticing

a fault with the aircraft? These safety related reason should be looked into.

**Fig. 2.5**



**Fig 2.5** is unimodal with an outlier above 41%.

**Boise Airport (BOI), Stem & Leaf, Frequency of Flight Delays in 2019-2020**

**Fig. 2.4**

STEM	LEAF
0	1 3 4 7 7 8
1	0 3 4 5 6 8
2	1
3	4
4	
5	
6	7
7	
8	
9	9
10	
11	
12	
13	
14	
15	
16	
17	1

Fig. 2.6

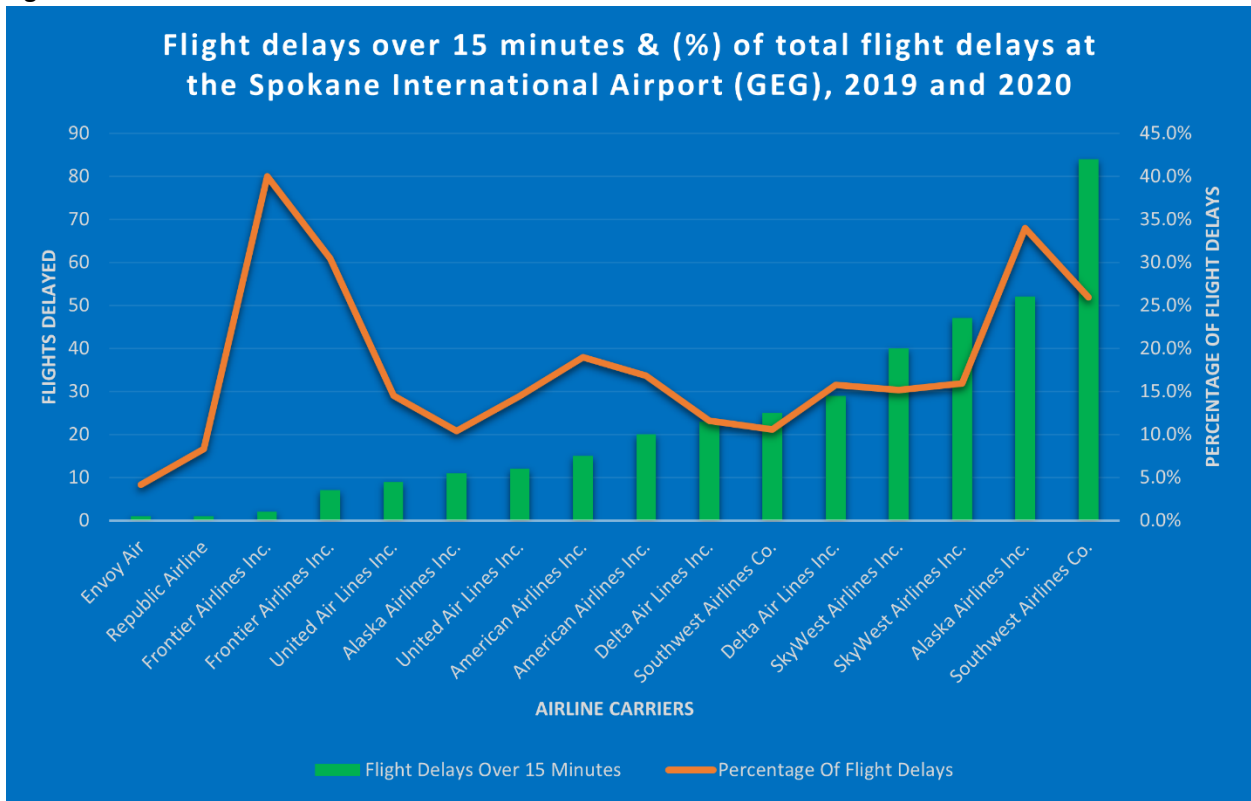
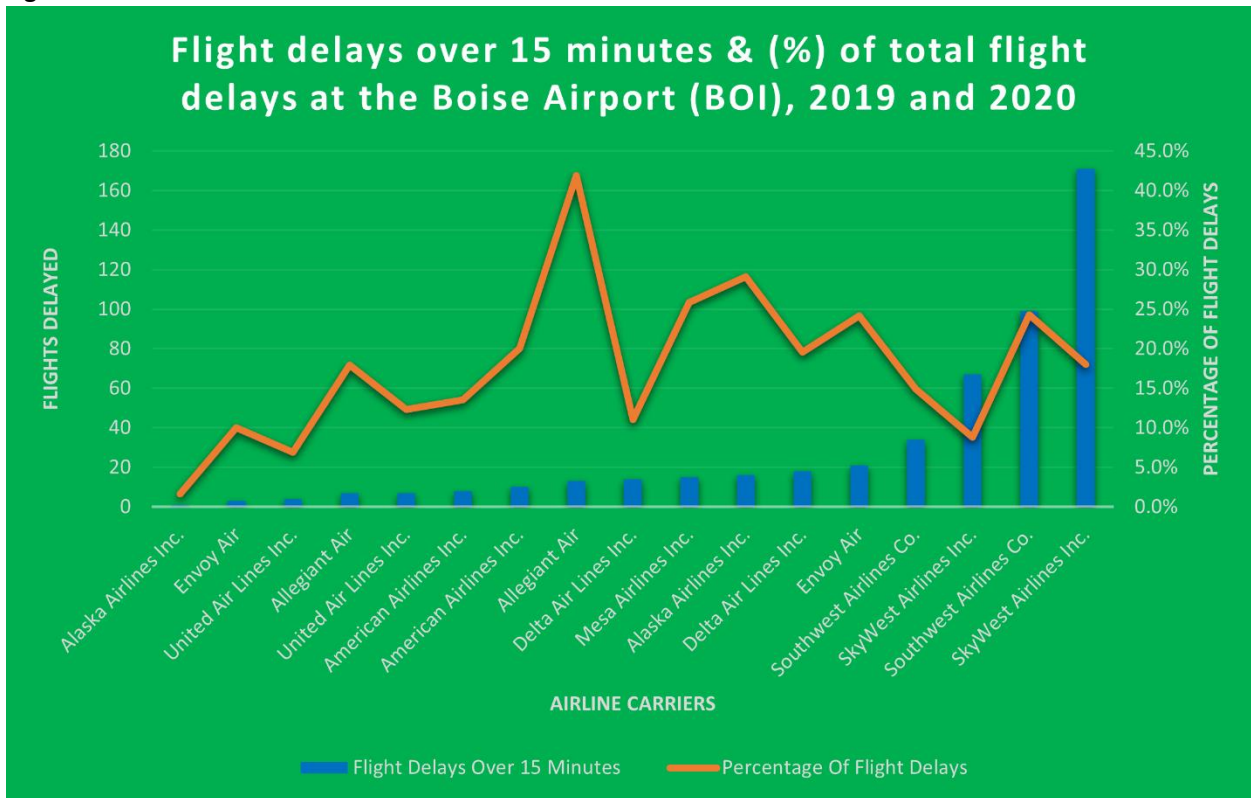


Fig. 2.7



**Fig 2.6** and **Fig 2.7** compare the total flights delayed by Spokane International Airport and Boise Airport. As shown in the pie charts **Fig 1.4** and **Fig 1.5**, Frontier shows up with the higher percentage of delays at the Spokane International Airport, and Allegiant shows up with the most delays at Boise Airport. Spokane International Airport broke records for passengers in 2019 <https://www.spokesman.com>. The data shows that Boise Airport has more volume, but that Spokane International Airport is always growing.

Who wins and who loses after carefully considering and analyzing the data? The airline carriers are the losers with weak arrival performances in 2019, some carriers including SkyWest made improvements in 2020. Passengers are the winners and flight delays will always be a part of the deal. Both airports had ups and downs, some of those downs are the result of late arrivals, and other carrier related issues. The truth is that Airports are mostly a partnership between a place to board an aircraft and a service provider, the carrier. For as long as carriers are deregulated and competitive, the passenger or consumer will be the winner. There are factors that will always cause delays, like weather, but competition will drive Airports to continue to improve.