Analysis of Carrier On-Time Performance

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American Airlines ranked the highest in January 2023, followed by Delta, Southwest and United airlines. Hawaiian, Frontier, JetBlue, and Spirit had similar flight numbers across the month. Older planes (100+ flights) had higher arrival delays than newer ones. Thursdays, Fridays, and Saturdays had fewer delays. Fridays had high flight numbers and Mondays had the most passengers traveling. Los Angeles, San Francisco, and Honolulu had the most delays due to strong winds, snowfall, fog, freezing rain, and low temperatures.

Airlines in US are ranked based on the number of flights. For January 2023, highest rank goes to American airlines. The top 5 airlines in US are American airlines (AA), Delta airlines (DL), Southwest Airlines (WN), United Airlines (UA) and Alaska Airlines (AS). Below is the table of ranking for reference.

Rank	marketing_airline_network
1	"AA"
2	"DL"
3	"WN"
4	"UA"
5	"AS"
6	"B6"
7	"NK"
8	"F9"
9	"G4"
10	"HA"

Table 1: Ranking of airline in US (January 2023).

Increased flights in January 2023 as people are returning from new year eve. Also, the previous year due to omicron variant surge, great number of people decided to travel in early 2023. American airlines, Delta, Southwest and United Airlines have a significantly higher number of flights due to their large fleet of flights and wide destination ranges and they have a strong presence in major airports across US, making it easier for travellers to connect to various destinations. They have a strong brand name and a good reputation in the aviation industry and offer frequent flyer and loyalty rewards. These airlines offer a variety of fare classes and options that help to cater to different budgets and travel needs. This allows passengers to find a price that fits their budget and preferences. The airlines have made significant investments in technology (like WiFi on board and good food), to enhance customer satisfaction.

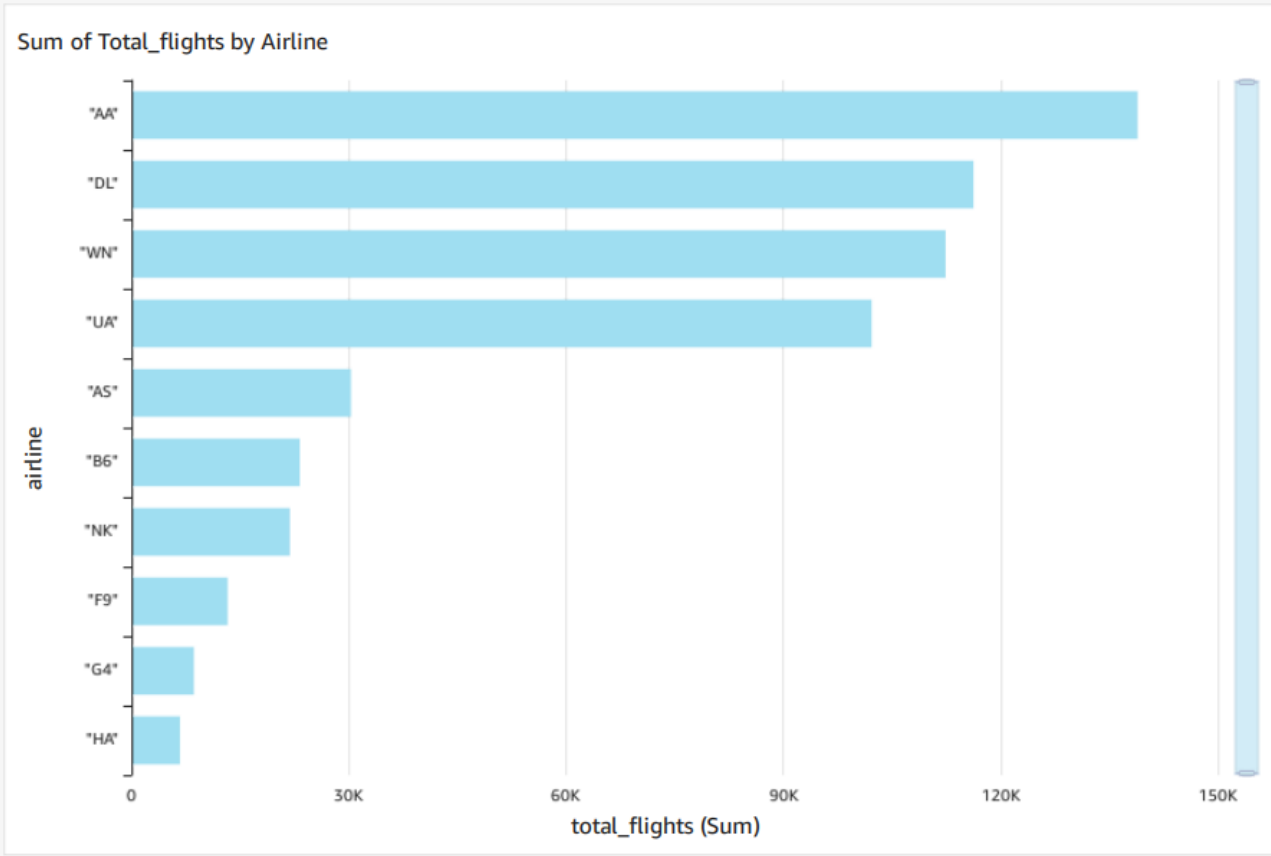

Fig 1: Total number of flights by Airline.

For January 2023, the flight patterns for various airlines in the US exhibit several interesting trends. All airlines experience low flight numbers on 1st, 7th, 14th, 21st, and 28th of January. Saturdays see a decrease in number of flights of all airlines. High number of flights on 02nd January indicate that individuals returning from holiday vacation. Hawaiian Airlines (HA), Frontier airlines (F9), JetBlue (B6) and Spirit airlines (NK) maintain a consistent number of flights the entire month. The top 4 airlines have similar trend in number of flights the entire month. Fridays - 13th, 20th and 27th – experience a high number of flights. United Airlines, one of the top airlines, demonstrates minimal fluctuation in number of flights the entire month. American airlines, Delta and Southwest airlines have same trend on number of flights the entire month. In the first week of the year and on the 15th, Southwest airlines has more flights than Delta, however over the entire month Delta surpasses Southwest Airlines in the number of flights.

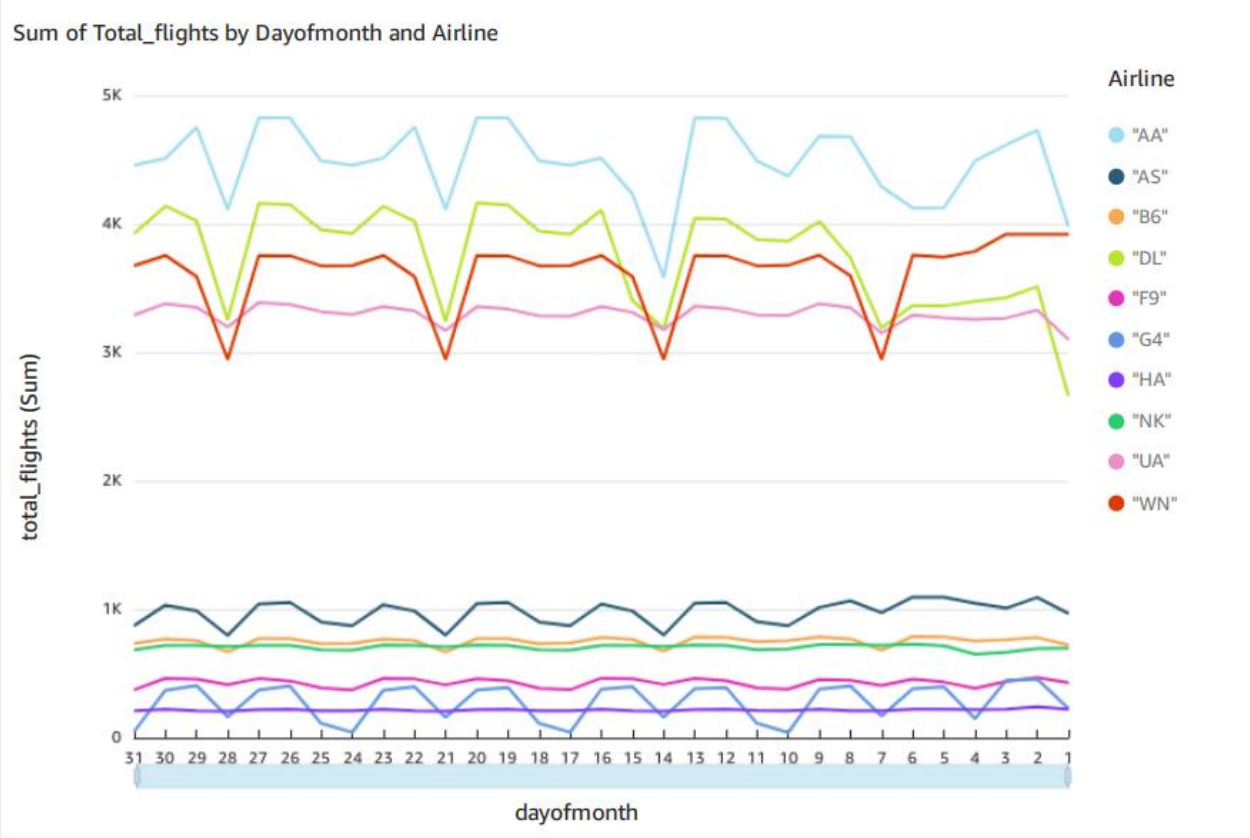

Fig 2: Total number of flights by airline and day of the month.

The investigation into flight delays, both in departure and arrival times, revealed instances where the departure was delayed by more than 30 minutes, yet the arrival was on time or earlier. The convention of designating Monday as Day 1 and Sunday as Day 7 is commonly used in the context of airline schedules and operations. This scenario, observed on Mondays and Sundays (day 1 and 7) suggest that these are favourable days as delayed departure do not affect arrival time. Airlines may respond to this by scheduling more experienced crews and prioritizing on-time arrivals for flights on these days. This potentially leads to improved decision-making and smoother operations during delays. This knowledge can also reduce disruptions for passengers, such as missed connections or tight deadlines.

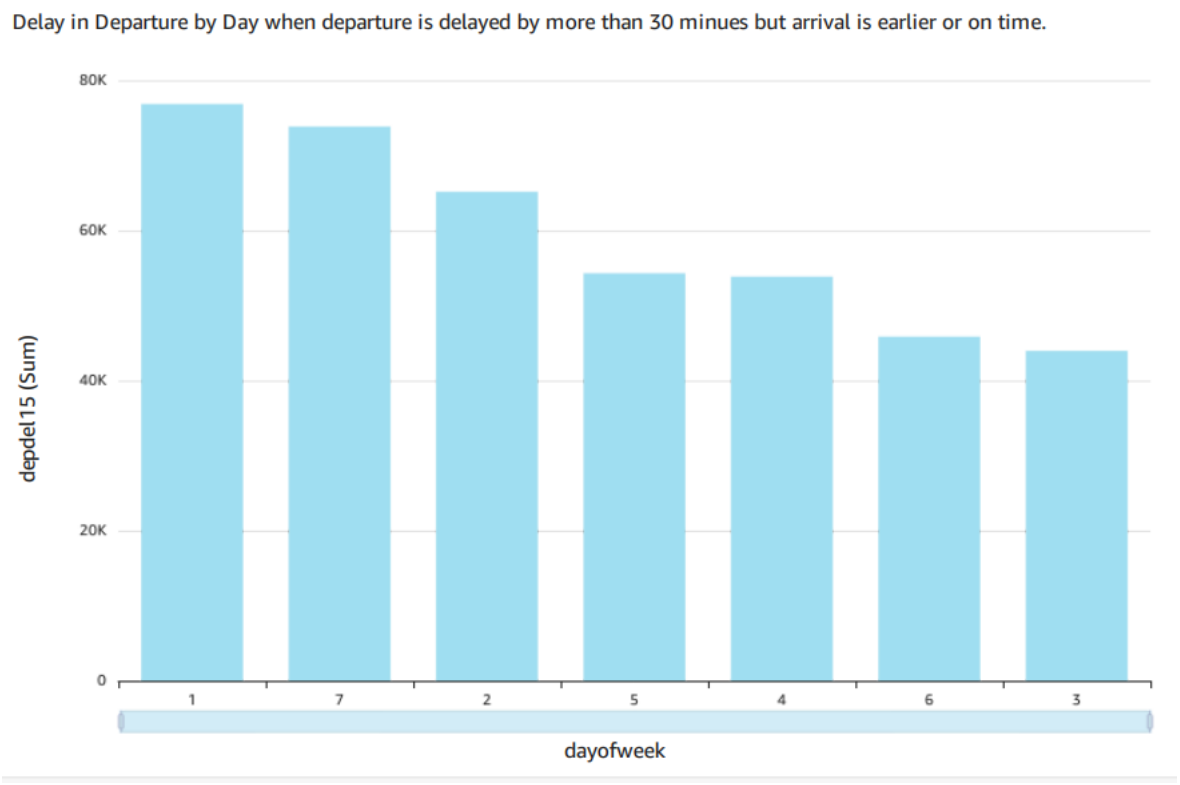

Fig 3: Delay in departure (more than 30 minutes) and arrival on time, by day of week.

There are days when both departure and arrival is delayed by more than 30 minutes. To minimise this, it is advisable to travel on Thursday, Friday, Saturday (day 4, 5, 6). These days exhibit lower instances of both departure and arrival delays, suggesting a potential strategy for reducing overall travel delays.

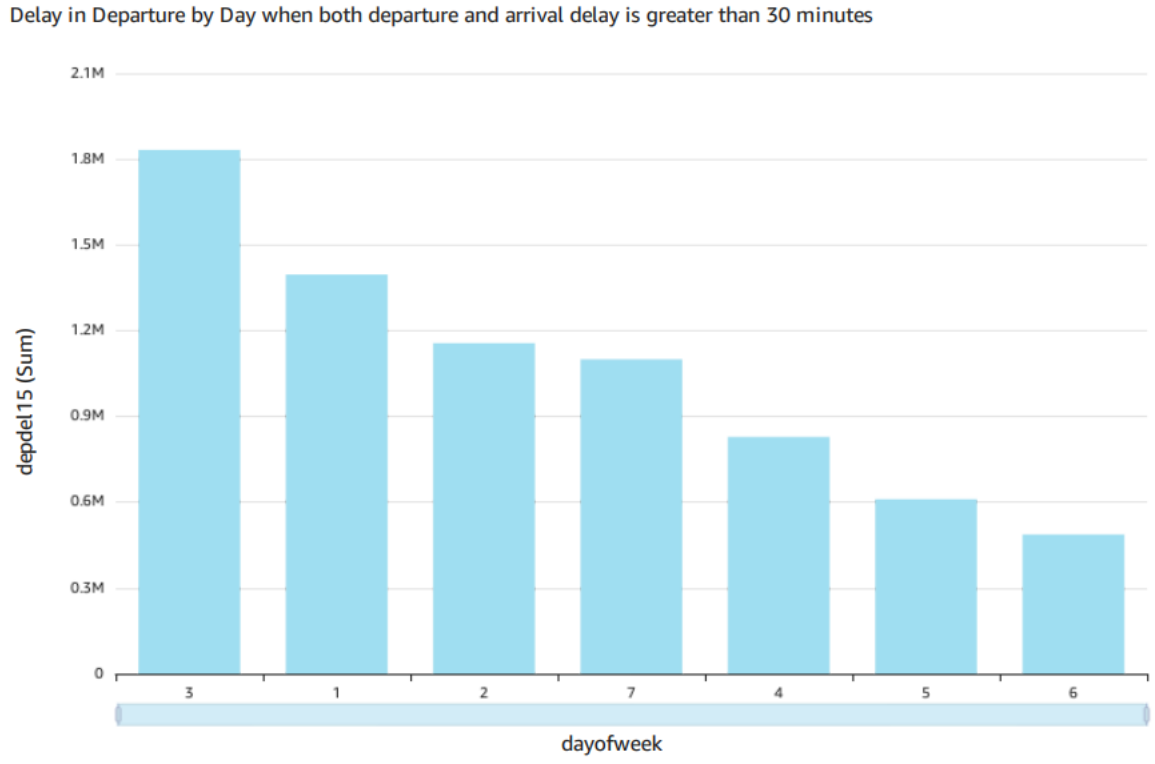

Fig 4: Delay in departure and arrival (more than 30 minutes), by day of week.

The analysis of the relationship between an aircraft's age and the number of flights has revealed that for aircraft with more than 100 flights, no clear trend is observed in the total arrival delay. However, it is noted that an aircraft with 172 flights exhibits less delay in arrival time compared to an aircraft with 103 flights. This suggests that the number of flights may have some influence on arrival delays, but the relationship is not consistent across all aircraft.

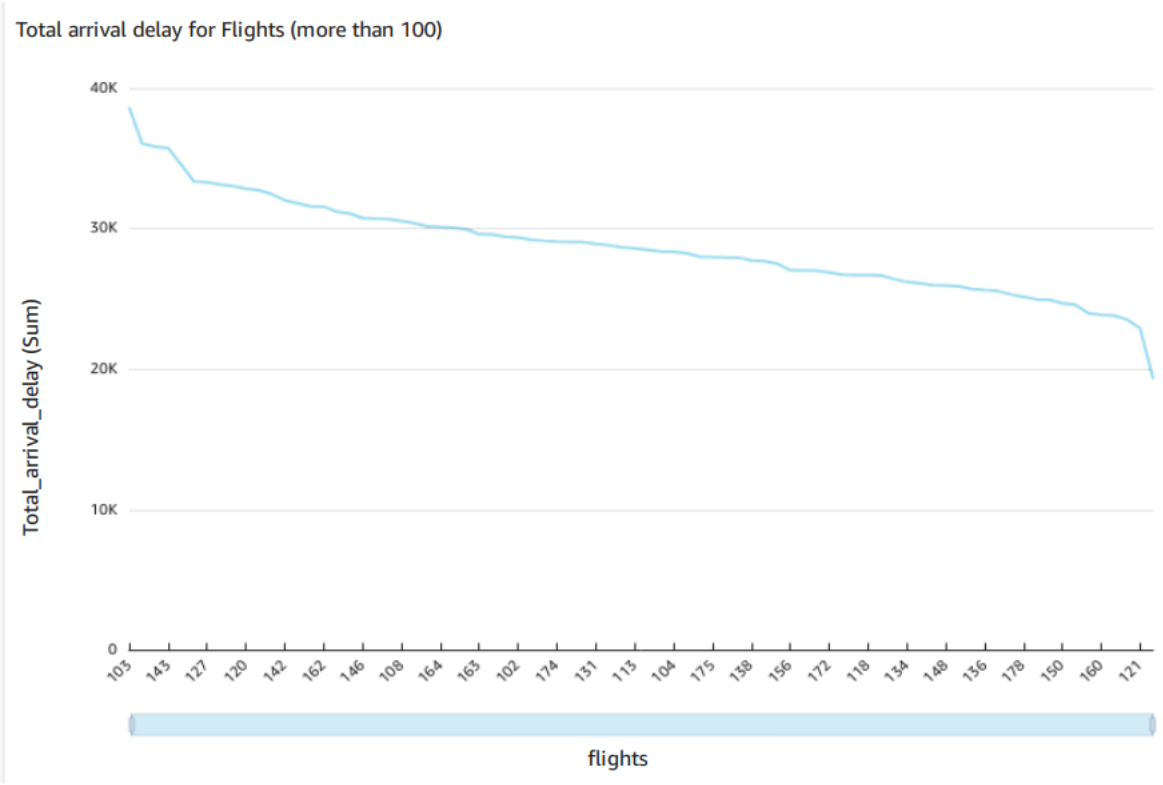

Fig 5: Total arrival delay by flights (with more than 100 number of flights).

Comparing with the number of flights lesser than 75, flight that has flown lesser number of times has lower total arrival delay. In fact, flights that have flown lesser than 55 times have not delayed at all.

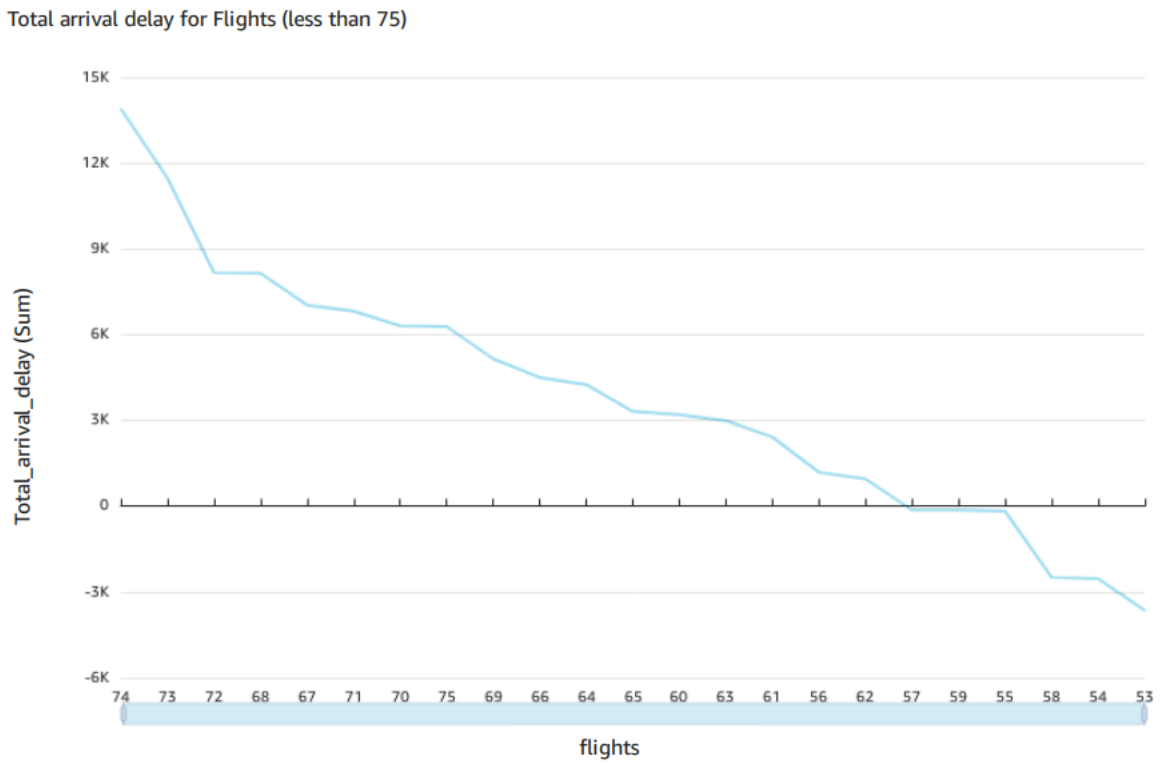

Fig 6: Total arrival delay by flights (with less than 75 number of flights).

The broader analysis indicates that the older flights (defined as those that have completed more than 100 trips) tend to experience more delays than newer flights. This finding suggests a correlation between the age of an aircraft and the likelihood of delays in the context of flight operations.

It has been observed that a higher volume of flights arrives and depart on Sunday and Monday compared to other days of the week. This trend is consistent with departing and arriving flights. There is a notable high number of passengers traveling to and from major airports such as Atlanta (ATL), Denver (DEN), Dallas/Fort Worth International (DFW), and Chicago O'Hare International (ORD). Furthermore, Mondays experience a particularly high number of travellers, while Thursday and Friday show intermediate numbers. In contrast, Wednesday and Saturday exhibit the lowest passenger traffic.

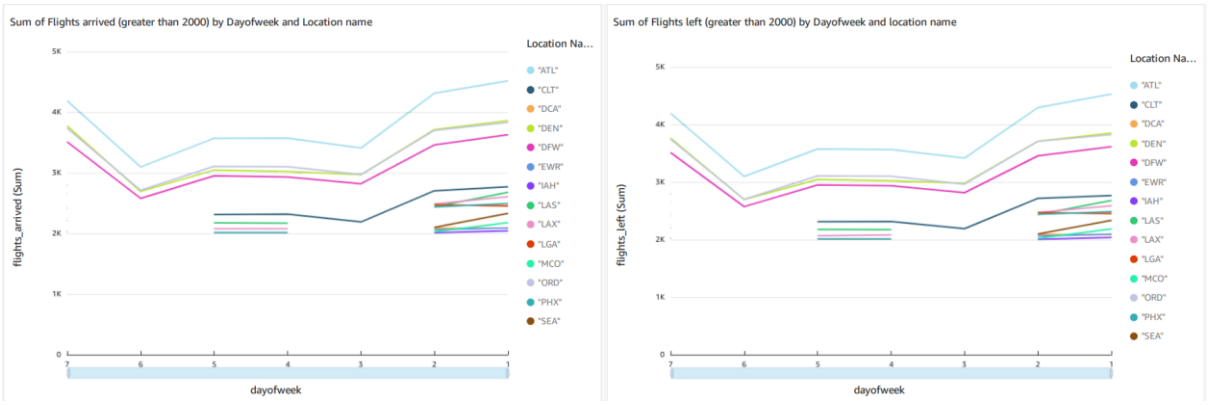

Fig 7: Sum of flights arrived and departed (more than 2000) by day of week and location.

LaGuardia Airport, New York City (LGA) airport has more than 500 flights on weekdays, with a decrease in passenger numbers observed on Saturdays due to a lower number of flights. The first week of the year generally exhibits fewer flights compared to the rest of the month, while the last two weeks experience a higher number of flights.

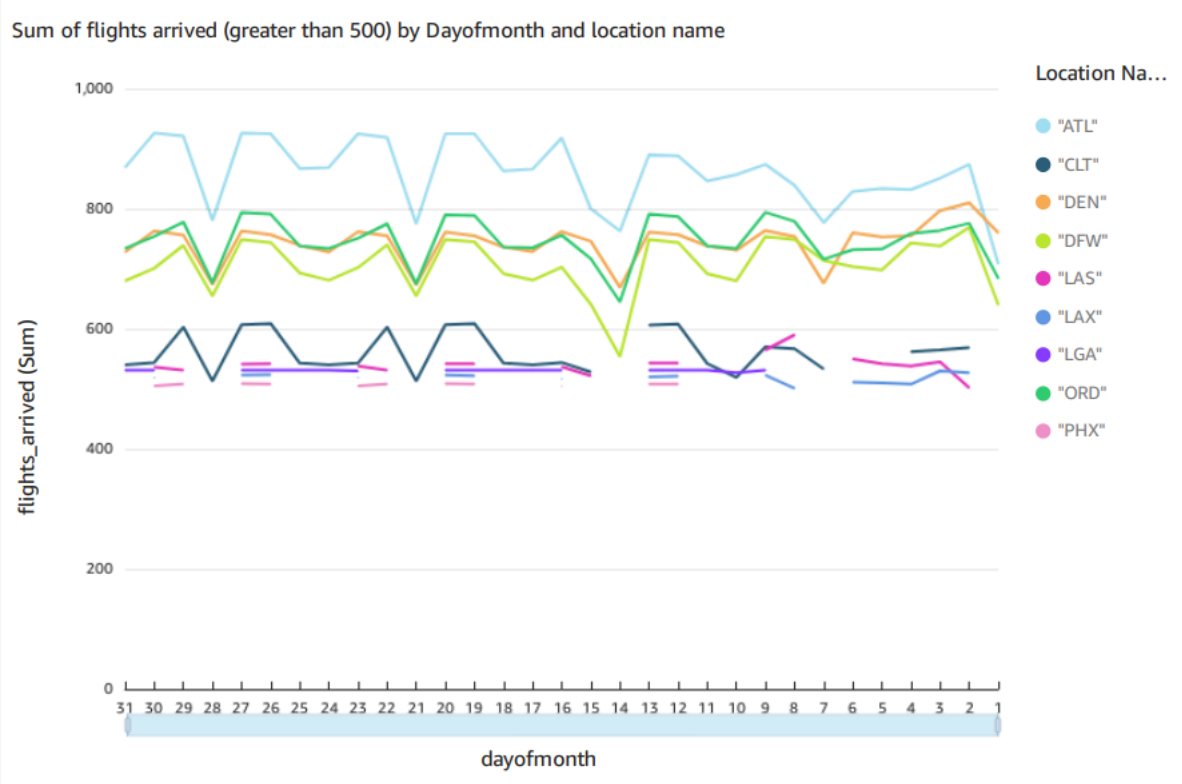

Fig 8: Sum of flights arrived (greater than 500) by day of month and location.

All flights have delayed due to weather ranging from 1 minute to 11 minutes. The investigation focused on instances where flight delays due to weather exceeded or equalled 10 minutes. It was found that 52 airports experienced weather-related delays ranging from 10 to 11 minutes. Here is a look into airports where flights delay 10-11 minutes sue to weather more than 20%.

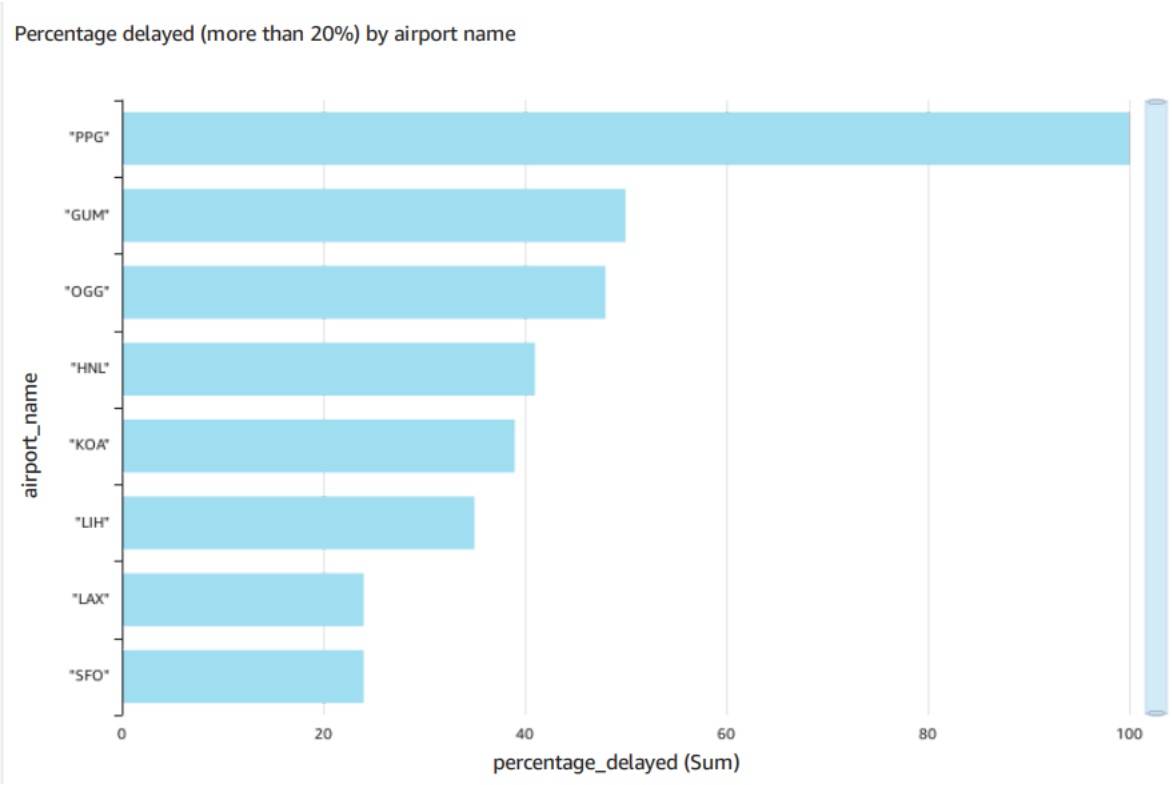

Fig 9: Percentage flights delayed (more than 20%) by airport.

Observing with numbers, highest number of flights delay in LAX (Los Angeles), SFO (San Francisco), HNL (Honolulu). Bigger airports like Seattle-Tacoma International Airport, Washington (SEA), Boston Logan International Airport, Boston (BOS), John F. Kennedy International Airport, NYC (JFK) have higher instances of delay. Other airports with more than 500 delayed flights due to weather are Newark Liberty International Airport (EWR), Kahului Airport (OGG), San Diego International Airport (SAN), Washington Dulles International Airport (IAD), Kona International Airport (KOA), Miami International Airport (MIA).

Fig 10: Number of flights delayed (more than 500) and total number of flights by airport.

Most of these airports (7 out of 12) airports are the major airports located in the western United States, particularly on the West Coast. Each airport serves a major metropolitan area on the west coast of US, acting as a crucial transportation hub for huge volume of passengers and cargo. Each airport serves as a major focus city for American Airlines, Delta Air Lines, United Airlines, Alaska Airlines, and Hawaiian Airlines. Located on the Pacific Coast, these airports offer convenient access to the Pacific Rim and facilitate trade and travel between the United States and Asia. Along with huge volume of traffic, strong winter winds, jet stream in LAX, SAN and SEA, snowfall, fog causing reduced visibility, freezing rain are possible reasons for flight delay due to weather in January 2023. On the East Coast (JFK, BOS, EWR, IAD) snowfall and low temperatures might affect aircraft performance, making it difficult to start engines and de-ice wings before take-off. In MIA, flights might be affected due to heavy rain and strong winds.

To minimize travel delays, passengers are advised to schedule their trips on Thursdays, Fridays, and Saturdays and opt for newer aircraft to enhance the overall travel experience. Airports such as Atlanta, Denver, Dallas/Fort Worth, and Chicago O'Hare experience high passenger traffic. Airlines can strategically allocate resources to these airports to optimize efficiency and meet the demand.

References:

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OST_R: BTS: Transtats. BTS. (n.d.). https://www.transtats.bts.gov/Fields.asp?gnoyr_VQ=FGJ