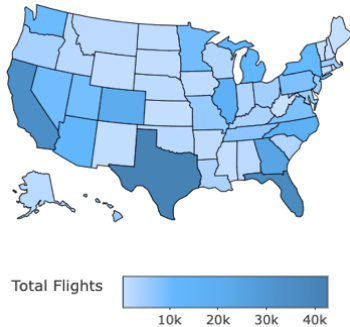# DSAN 6300 – MiniProject
Flight Delays and Cancellation Analysis – December 2020

Nandini Kodali
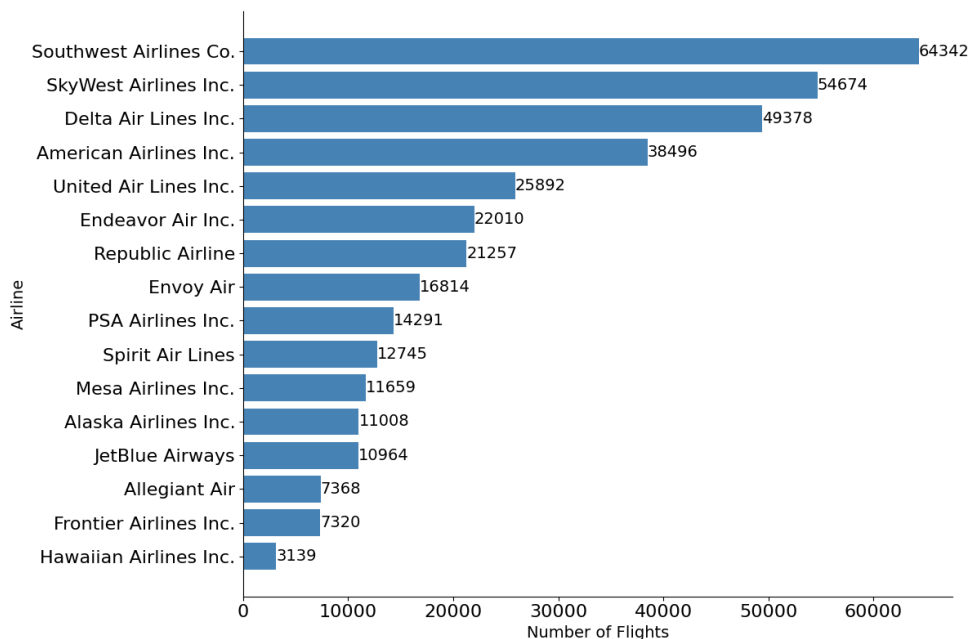
1. Flight Distribution and Trends

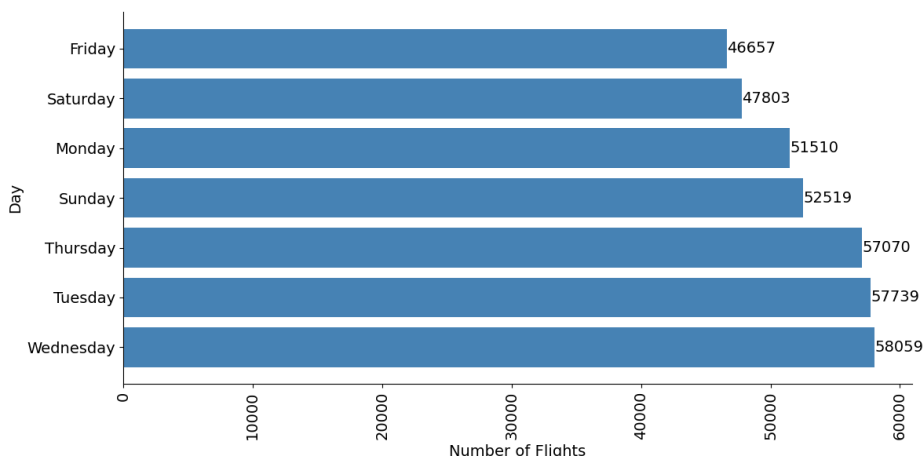### 1.1. Spread of Number of Flights for Each State

- Texas stands out with the highest number of flights.
- States such as California, Florida, and Colorado show a relatively high flight volume, highlighting their importance as major air traffic hubs.
- Airlines and Airports in these states should optimize schedules and infrastructure to accommodate growing demand efficiently.

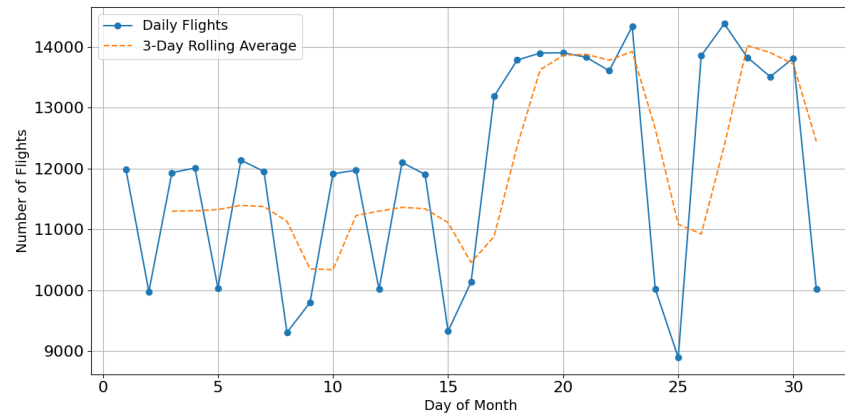### 1.2. Spread of Number of Flights by Airline

- Leading airlines in terms of flight volume are Southwest Airlines, SkyWest Airlines, and Delta Airlines.
- Hawaiian Airlines, Frontier Airlines, and Allegiant Air have a smaller footprint.
- Since the analysis is on data collected from December 2020, the pandemic could have influenced these numbers, specifically the smaller airlines.

1.3. Spread of Number of Flights by Day of Week

- Wednesday recorded the highest number of flights (~ 58,000), making it the busiest day of the week.
- Tuesday and Thursday follow closely. This suggests a consistent trend in higher flight activity during the middle of the week.
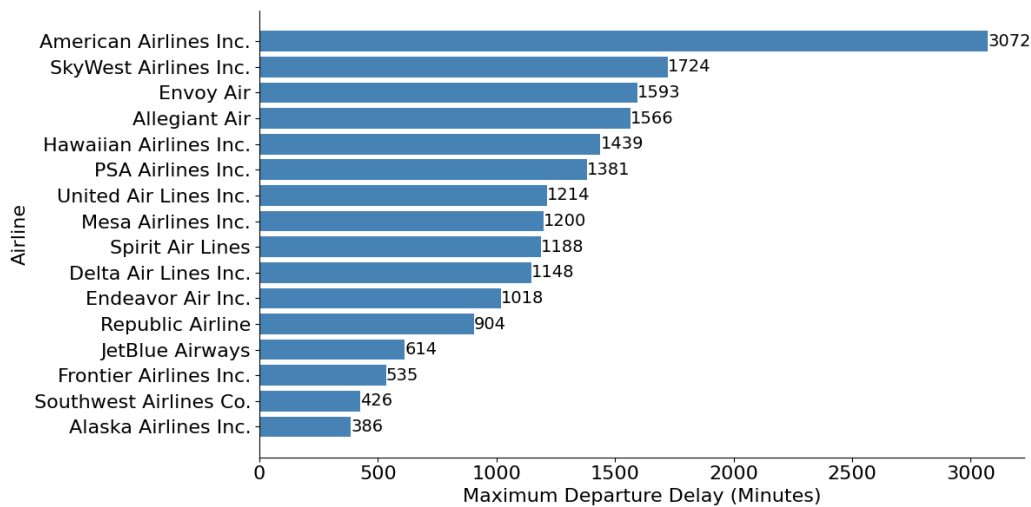
1.4. 3-day Rolling Average of Number of Flights

- There are notable peaks and troughs in flight activity throughout the month.
- Flight activity peaks around the 17th to 23rd and 27th. And significant drop is observed around the 25th and 31st, which coincides with reduced travel demand during holidays.
- We can also observe that when there is no holiday, the trend in number of flights in periodic.
- The rolling average smooths out daily variations, providing a clearer view of the overall trend aiding in long-term operational planning. Consistent trends emerge during the 3rd and 4th weeks of the month, these fluctuations closely align with travel patterns associated with the holiday season.
- Understanding these trends help airlines optimize their flight schedules and assist in pricing strategies.
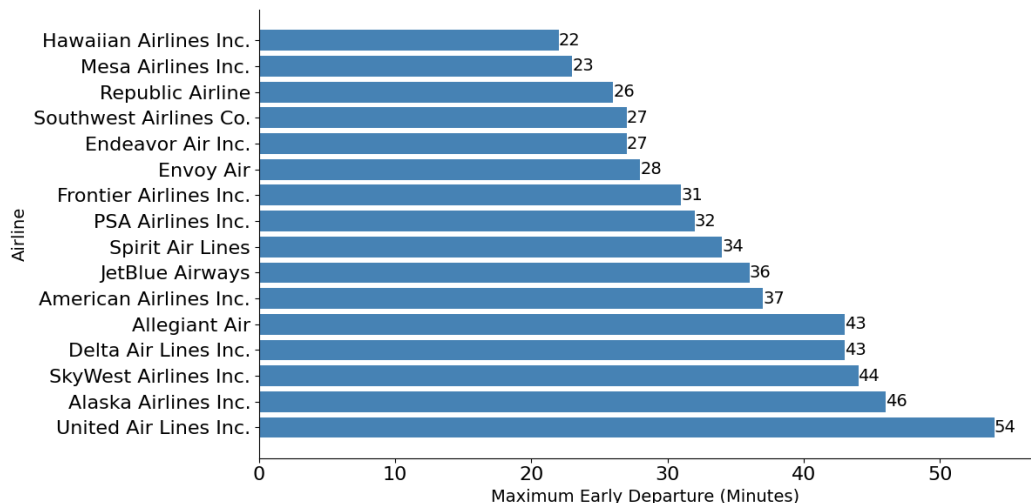
2. Flight Delays

2.1. Max Delay in Departure by Airline

- American Airlines has the maximum delay in departure, approximately 51 hours. On further analysis, we understand that this extreme delay is due to carrier delay.
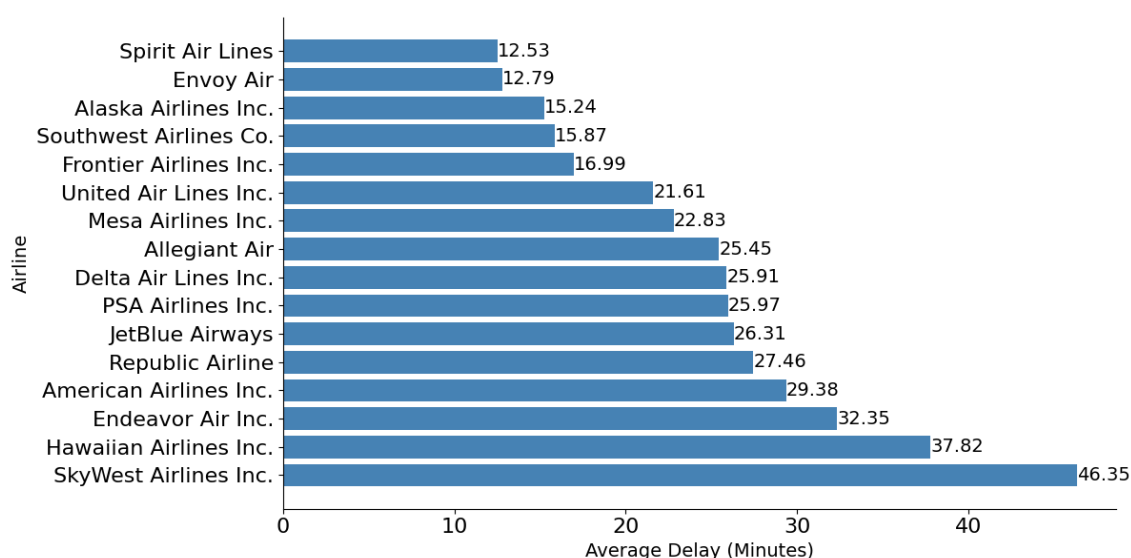
2.2. Max Early Departure by Airline

- United Air Lines Inc. has maximum early departure of 54 minutes.

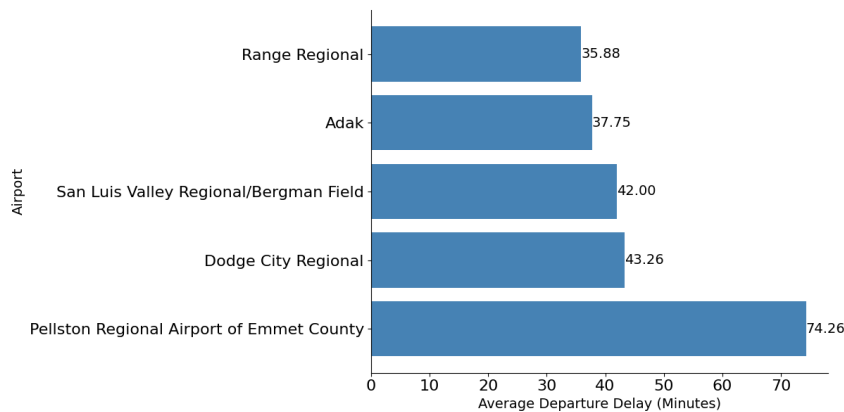## 2.3. Airport with Highest Average Departure Delay for each Airline

Airline	Airport	Average Delay (Minutes)
Endeavor Air Inc.	Sarasota/Bradenton International	79.57
American Airlines Inc.	Yampa Valley	54.19
Alaska Airlines Inc.	Adak	33.56
JetBlue Airways	Albuquerque International Sunport	36.09
Delta Air Lines Inc.	Myrtle Beach International	18.90
Frontier Airlines Inc.	Bismarck Municipal	39
Allegiant Air	Central Nebraska Regional	56.57
Hawaiian Airlines Inc.	John F. Kennedy International	218.86
Envoy Air	Phoenix Sky Harbor International	64.25
Spirit Air Lines	Minneapolis-St Paul International	30.35
PSA Airlines Inc.	Des Moines International	51.09
SkyWest Airlines Inc.	Pellston Regional Airport of Emmet County	74.26
United Air Lines Inc.	Glacier Park International	55.64
Southwest Airlines Co.	Memphis International	15.07
Mesa Airlines Inc.	Burlington International	51.67
Republic Airline	Fort Lauderdale-Hollywood International	35

2.4. Average Carrier Delay by Airline

- Carrier delay is an internal factor largely under the airline's control. High delays may indicate inefficiencies in airline operations, while low delays may reflect effective scheduling and quick turnaround times.
- Airlines with high delays should focus on streamlining turnaround times and improving scheduling practices to enhance performance.
- SkyWest Airlines has the highest average carrier delay of 46.35 minutes, significantly higher than all other airlines.
- Airlines such as Hawaiian Airlines and Endeavor Air Inc. also have relatively high average delays. These airlines might experience delays due to specific regional factors or operational limitations.
- Spirit Air Lines and Envoy Air has the lowest average carrier delays, indicating more efficient operations or effective delay management strategies.
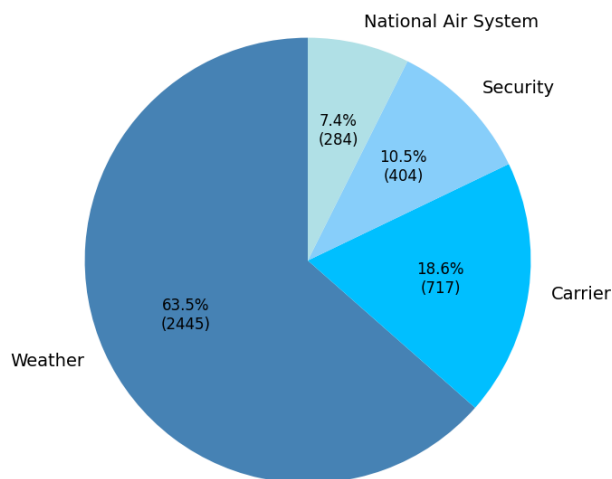
2.5. Top 5 Airports with the Highest Average Departure Delay

- Pellston Regional Airport of Emmet County has the highest average departure delay of 74.26 minutes, which is significantly higher than all other airports.
- The substantial delay may be influenced by adverse weather conditions, particularly during December, or operational inefficiencies.
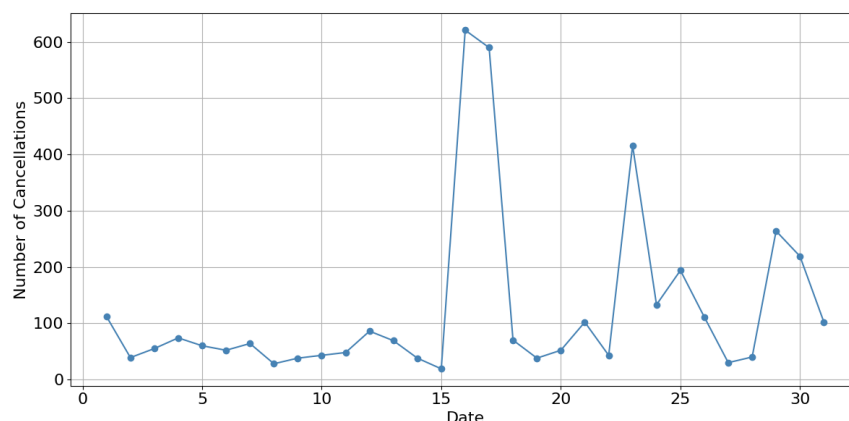
3. Cancellations

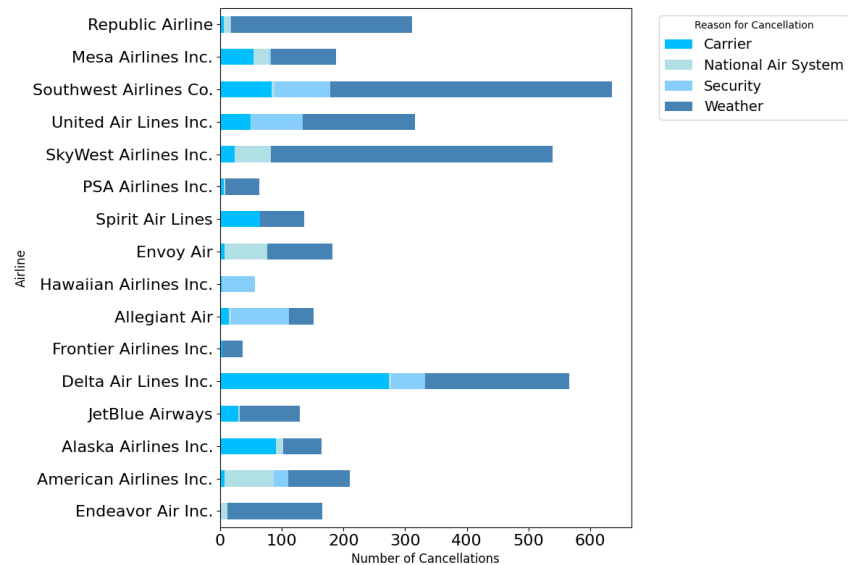### 3.1. Breakdown of Cancellation Reasons

- Weather is the primary cause of cancellation, accounting for 63.5%. This aligns with December's severe winter conditions, such as snowstorms and icy runways, which significantly disrupt flight operations.
- Carrier-related issues contribute to 18.7% of cancellations, likely due to operational inefficiencies, crew shortages, or technical problems. The COVID-19 pandemic may have further exacerbated these challenges, particularly regarding crew availability.

3.2. Trend in Number of Cancellations over Month

- There is no apparent correlation between the number of flights on a given day and the number of cancellations. This is consistent with the pervious pie chart, where most cancellations were attributed to weather conditions.
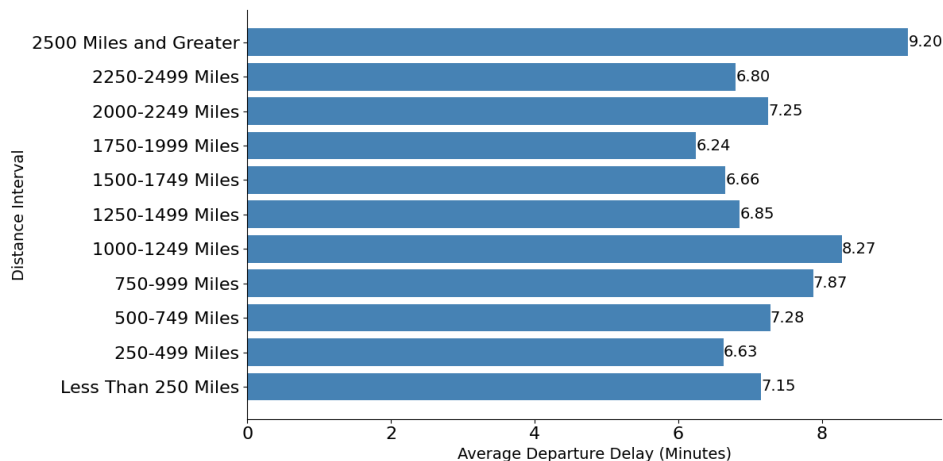
3.3. Number of cancellations and Compositions of Cancellation Reasons by Airline

- Delta Air Lines has the highest number of carrier-related cancellation at 274, significantly more than other airlines. This may indicate operational challenges or inefficiencies within Delta's operations.
- Alaska Airlines (90) and Southwest Airlines (84) also have exhibit notable levels of carrier-related cancellations, indicating room for operational improvements.

4. Distance Based Analysis
4.1. Average Delay in Departure by Distance

- Long-haul flights (2,500+ miles) experience the highest average departure delay (9.20 minutes).
- Flights in the 1,750-2,499 miles range show relatively lower delays (6.24 – 7.25 minutes).
- Short-distance flights may face higher delays due to congestions and quick turnaround pressures at busy regional hubs.