UDACITY PROJECT

Flight Delays and Cancellations

Storyboard #1: Flights during July and August (USA, 2015)

1. Link

https://public.tableau.com/views/UdacityProject-Insight1_17098525755180/Story1?:language=en-GB&:sid=&:display_count=n&:origin=viz_share_link

2. Summary

Dashboard 1: Seasonal Trends in Flights: July and August

In this dashboard it was investigated if there are any monthly and weekly trends. There is a modest increase in flight activity during July (520,897 flights) and August (510,718 flights), coinciding with the summer holidays.

On the other hand, February experiences a dip in flights, with 429,191 flights due to adverse weather conditions, which led to a relatively high number of flight cancellations (The Guardian, 2015; Martin, 2015, Mutzabaugh, 2015).

Moreover, weekdays emerged as the busiest periods, with a noticeable decline in flights on Saturdays, which might be connected to work-related trips.

Dashboard 2: Top 10 Busiest Airports and Cities: July and August

This dashboard examines the top 10 airports and cities frequented by travellers during July and August, as they represent the busiest periods in 2015.

The most visited destinations during July and August were:

- Hartsfield-Jackson Atlanta International Airport (ATL) in Atlanta, Georgia,
- Chicago O'Hare International Airport (ORD) in Chicago, Illinois,
- Dallas/Fort Worth International Airport (DFW) in Dallas-Fort Worth, Texas.

According to OAG Aviation Group (2022), those three airports are also the top 3 domestic megahubs "with the highest ratio of possible scheduled connections." This suggests that many individuals travelling to these airports were possibly on connecting flights to other destinations.

Dashboard 3: Destinations Connected to the Busiest Origin Airports: July and August

This dashboard examines the airports and cities that people travelled to in July and August, focusing on the top 3 origin airports: Chicago O'Hare International Airport, Dallas/Fort Worth International Airport, and Hartsfield-Jackson Atlanta Airport.

The results reveal that the highest number of flights from the three airports were to New York, Los Angeles, Denver, San Francisco, and Orlando. This differs from the results in the previous dashboard that listed Atlanta, Chicago, and Dallas/Fort Worth as the most popular destinations. This again suggests that Atlanta, Chicago, and Dallas/Fort Worth were primarily hubs for connecting flights rather than final destinations themselves.

Dashboard 4: Pathways between Top 3 Origin Airports and Top 5 Destination Airports: July and August

Lastly, a map was created to display the pathways between the top 3 origin airports, from which flights had departed from, connecting to the top 5 destination airports. This provides evidence of connectivity, supporting the hypothesis of connected flights.

3. Design

Dashboard 1

For both Graph 1 and Graph 2, a bar chart was chosen to find any trends. While line plots are commonly used to visualise quantitative data over time, the focus was on identifying which months of days of the week experienced the highest number of flights rather than tracking trends over time.

Dashboard 2

In Graph 3,4, and 5, a horizontal Pareto chart was used to highlight the top 10 busiest airports and cities. The Pareto chart arranged the data from the highest to lowest, providing a clear visualisation of the busiest destinations.

Dashboard 4

For Figure 1, a map was chosen to illustrate the pathways between the selected airports, connecting the origin and destination airports.

Across all dashboards, a colour scheme primarily consisting of blue and orange was chosen to ensure accessibility to ones with colour blindness. Moreover, backgrounds and grids were maintained in a minimalistic white tone, reducing chart junk, and enhancing the focus on the graphs' content.

4. Resources

- The Guardian (2015) Weather chaos in Texas and Oklahoma forces 1,600 flight cancellations, The Guardian. Available at: https://www.theguardian.com/us-news/2015/feb/28/texas-oklahoma-winter-weather-advisory (Accessed: 08 March 2024).
- Martin, H. (2015) Storms cancel 20,000 flights so far in 2015, Cost Airlines $65 million, Los Angeles Times. Available at: https://www.latimes.com/business/la-fi-storms-cancel-flights-20150211-story.html (Accessed: 08 March 2024).
- Mutzabaugh, B. (2015) Flight cancellations at 3,000 and counting from new storm, USA Today. Available at: https://eu.usatoday.com/story/todayinthesky/2015/02/16/flight-cancellations-at-600-and-counting-from-new-storm/23488003/ (Accessed: 08 March 2024).
- OAG Aviation Group (2022) Megahubs 2022: Most connected airports in the world. Available at:https://www.oag.com/megahub-airports-2022 (Accessed: 07 March 2024).

Storyboard #2: Flight Cancellations (USA, 2015)

1. Link

https://public.tableau.com/views/UdacityProject-Insight2_17098927960360/Story1?:language=en-GB&:sid=&:display_count=n&:origin=viz_share_link

2. Summary

Dashboard 1: Flights and Flight Cancellations by Month

There is a notable surge in flight activity during July and August, likely attributed to summer holidays. On the other hand, there is a significant decrease in flights in February, which correlated with the highest number of cancellations recorded in that month (20,517 cancelled flights).

Extreme weather emerges as the overall predominant cause of flight cancellations. Particularly in February, accounting for 75.29% of cancellations. This finding is supported by several articles reporting that in the United States during February 2015 there were a series of storms, forcing multiple airlines to cancel their flights (The Guardian, 2015; Martin, 2015; Mutzabaugh, 2015).

Dashboard 2: Flight Cancellations per Airline in February

American Eagle Airlines experienced the highest number of cancellations, totalling 3,887 (14.43% of all their flights). Following closely, Southwest Airlines recorded 3,454 cancellations, which however, only equalled to 3.83% of their flights. This can be attributed to the fact that Southwest airlines also operated the highest number of flights during February, with a total of 86,718 flights, explaining the relatively high number of cancellations. On the other hand, American Eagle Airlines only operated 23,053 flights during the same period. A spokesperson for American Eagle explained that due to their utilisation of smaller aircrafts, they tend to cancel or delay their flight before larger partnering airlines to inconvenience less passengers (USA Today, 2015).

Dashboard 3: Flight Cancellations per State in February due to Extreme Weather

Texas, Illinois, and New York emerge as the top three states with the highest number of flight cancellations due to extreme weather. Numerous articles reported that these states, along with their major airports Dallas/Fort Worth International Airport (DFW) and Chicago O'Hare International Airport (ORD), were significantly affected by freezing temperatures, heavy snowfall, and blizzards (The Guardian, 2015; Mutzabaugh, 2015; The Washington Times, 2015).

3. Design

Dashboard 1

Graph 1 features a combination of a bar chart and a line chart to illustrate the correlation between the total number of flights and the number of flight cancellations per month. This visualisation allows viewers to easily compare flight volumes and cancellation rates over time.

Additionally, a pie chart was included to depict the reasons for flight cancellations. Despite the potential challenge of interpreting areas in a pie chart, this format was chosen due to the low number of cancellation reasons. However, to enhance clarity, the percentage of total cancellations for each reason was added to the chart.

Dashboard 2

This dashboard focuses on comparing flight cancellations among different airlines. A Pareto chart was used to rank the airlines based on both their total number of flights and the number of cancellations.

This graph effectively highlights the airlines with the highest cancellation rates relative to their total number of flights.

Dashboard 3

To analyse flight cancellations by state, a map was created to visually represent cancellation rates, with darker shades indicating higher cancellation numbers. However, there might be a difficulty of quickly identifying states with the lowest/highest cancelled rates. Therefore, a corresponding table was included listing the states in descending order of cancellation rates and colour-coded to match the states on the map, facilitating easy comparison.

Furthermore, a bubble graph was employed to identify airports with the highest cancellation rates within each state, as it offers a quick visual comparison.

Across all dashboards, a colour scheme primarily consisting of blue and orange was chosen to ensure accessibility to ones with colour blindness. Moreover, backgrounds and grids were maintained in a minimalistic white tone, reducing chart junk, and enhancing the focus on the graphs' content.

4. Resources

- The Guardian (2015) Weather chaos in Texas and Oklahoma forces 1,600 flight cancellations, The Guardian. Available at: https://www.theguardian.com/us-news/2015/feb/28/texas-oklahoma-winter-weather-advisory (Accessed: 08 March 2024).
- Martin, H. (2015) Storms cancel 20,000 flights so far in 2015, Cost Airlines $65 million, Los Angeles Times. Available at: https://www.latimes.com/business/la-fi-storms-cancel-flights-20150211-story.html (Accessed: 08 March 2024).
- Mutzabaugh, B. (2015) Flight cancellations at 3,000 and counting from new storm, USA Today. Available at: https://eu.usatoday.com/story/todayinthesky/2015/02/16/flight-cancellations-at-600-and-counting-from-new-storm/23488003/ (Accessed: 08 March 2024).
- USA Today (2015) Long tarmac delays at U.S. airports spiked in February, USA Today. Available at: https://eu.usatoday.com/story/todayinthesky/2015/04/13/long-tarmac-delays-at-us-airports-spiked-in-february/25702235/ (Accessed: 08 March 2024).
- The Washington Times (2015) East Coast weather leads to Chicago flight cancellations, The Washington Times. Available at: https://www.washingtontimes.com/news/2015/feb/15/east-coast-weather-leads-to-chicago-flight-cancell/ (Accessed: 08 March 2024).

Storyboard 3: Flight Delays (USA, 2015)

1. Link

https://public.tableau.com/views/UdacityProject-Insight3_17100929344320/Story1?:language=en-GB&:sid=&:display_count=n&:origin=viz_share_link

2. Summary

Dashboard 1: Flight Delays by Month

Graph 1 illustrates that February and June experienced the highest percentages of flight delays in 2015. In both cases, February and June, 'Late Aircraft' was identified as the primary cause of delays.

Graph 3 reveals a notable trend where average arrival delays are lower compared to average departure delays. It appears that flights are attempting to adjust their speed to compensate for any departure's delays, thereby reducing arrival delays.

Dashboard 2: Departure Delays Analysis by Airport: February and June

February

Chicago O'Hare International Airport (ORD) and Hartsfield-Jackson Atlanta International Airport (ATL) observed the highest number of departure delays, with 12,100 and 11,078 delays respectively. February experienced extreme weather conditions, particularly affecting states in the Northeast and Midwest regions (NOAA, no date). Chicago, in particular, faced a major winter storm resulting in significant disruptions at ORD (ABC News, 2015; NWS, 2019), with 60% of total flights being delayed. On the other hand, ATL experienced less severe weather conditions and quickly resumed normal operations after the storm, with 42% of total flights being delayed (Chattanooga Times Free Press, 2015).

June

ATL and ORD again experienced the highest number of departure delays. However, June experienced even more delays, with 14,500 recorded for ATL and 14,298 for ORD. This increase could again be attributed to hot temperatures leading to storms and air traffic issues, given it is a peak travel time (Hope, 2016).
It is important to note that both ATL and ORD individually operated over 25,000 flights in June, which likely contributed to the high number of departure delays.

Dashboard 3: Arrival Delays Analysis by Airport: February and June

Arrival delays by airport during February and June were examined. The results mirror the results of the 'Departure Delays Analysis by Airport: February and June.'

Dashboard 4 Flight Delay Analysis by Airline: February and June

February

In February, Southwest Airlines experienced the highest number of delays, totalling 36,806 (Graph 8). However, this can be attributed to Southwest Airlines operating the highest number of flights overall, with 90,172 flights (Graph 9). Despite this, its on-time performance remained relatively high at 57%, indicating efficient operations and handling of delays. Moreover, its average delay time of 13 minutes is considered on-time by OAG Aviation standards (OAG Aviation, no date) (Graph 10).

Conversely, Frontier Airlines and American Eagle Airlines exhibited the lowest on-time performance percentages at 43% and 44%, respectively. Additionally, they had the highest average delay times of 40 and 53

minutes (Graph 10), while also operating fewer overall flights (Graph 9). This suggests that in comparison to Southwest Airlines, these two airlines experienced significant delays due to operational inefficiencies.

June

Once again, Southwest Airlines leads in the number of delays, with 54,083 (Graph 8). However, this time, its on-time performance appears to be lower, with a higher average delay time of 27 minutes (Graph 10), indicating greater difficulty in managing summer-related delays.

3. Design

Dashboard 1

Graph 1 features a bar chart to highlight monthly trends. Although a line plot is suitable for depicting quantitative data over time, the bar chart effectively identifies months with the highest number of cancelled flights, which was the dashboard's objective.

Graph 3 features a line chart to compare average delay time with average departure time. This visualisation allows for a comparative analysis and to uncover any connection between the two metrics.

Dashboard 2 + Dashboard 3

In both dashboards, the goal was to identify airports with the highest number of cancellations. A Pareto chart was a suitable choice as it ranks airports from highest to lowest. Additionally, a map was included, for the audience to locate airports as their location was referenced in the analysis.

Dashboard 4

Similarly to the previous dashboard, A Pareto chart was used to rank airlines based on number of cancellations and average delay time.

Across all dashboards, a colour scheme primarily consisting of blue and orange was chosen to ensure accessibility to ones with colour blindness. Moreover, backgrounds and grids were maintained in a minimalistic white tone, reducing chart junk, and enhancing the focus on the graphs' content.

4. Resources

- Chattanooga Times Free Press (2015) Atlanta Airport returns to normal operations after storm: Chattanooga Times Free Press, Times Free Press. Available at: https://www.timesfreepress.com/news/2015/feb/26/atlantairport-returns-normal-operations- after/ (Accessed: 11 March 2024).
- Hope, A. (2016) What you need to know about summer storms affecting air travel, Condé Nast Traveler. Available at: https://www.cntraveler.com/stories/2016-06-24/how-summer-storms-affect-air-travel (Accessed: 10 March 2024).
- NOAA (no date) February 2015 National Climate Report, February 2015 National Climate Report | National Centers for Environmental Information (NCEI). Available at: https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/201502#:~:text=February%206%2D8%3A%20Storms%20impact,the%20Sierra%20foothills%20and%20crest. (Accessed: 11 March 2024).
- OAG Aviation (no date) What is on time performance (OTP)?, OAG. Available at: https://www.oag.com/on-time-performance-airlines-airports (Accessed: 10 March 2024).