# Sky Analytics: Navigating the Complexities of Airline and Airport Operations

Objective:

The primary objective of this case study, titled "Sky Analytics: Navigating the Complexities of Airline and Airport Operations," is to deeply analyze and interpret the extensive datasets encompassing flights, airlines, and airports - namely "flights.csv", "airlines.csv", and "airports.csv". The analysis aims to uncover critical insights into flight operations, delay patterns, airline efficiency, and airport traffic dynamics. The ultimate goal is to provide strategic recommendations to enhance operational effectiveness, improve customer experiences in air travel, and contribute to the overall advancement of the aviation industry's standards and practices.
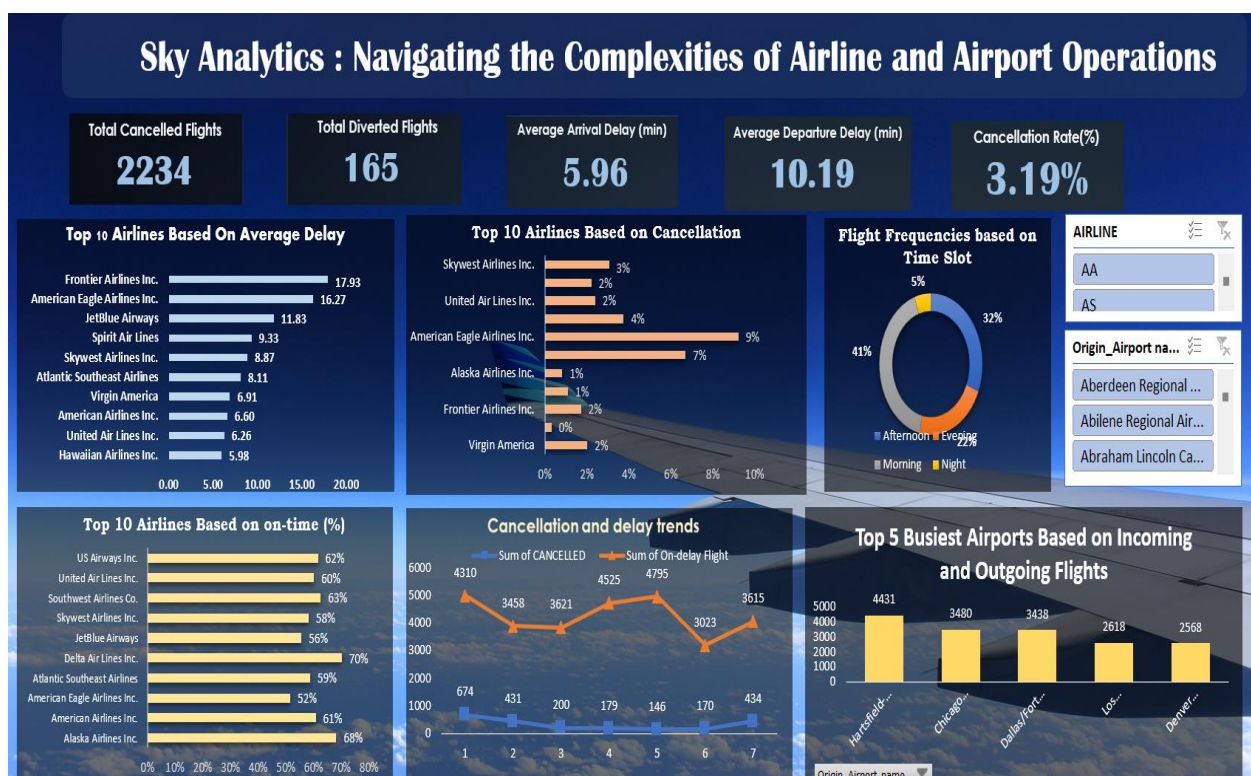
Check-out the Excel Data Analysis File here :-
https://docs.google.com/spreadsheets/d/1tmson77VHBYCVLh6vdBmsyoOQMs03D1w/edit?usp=drive_link&ouid=11729765408972074846 9&rtpof=true&sd=true

Data Sources

- [flights.csv]: Detailed flight information including timings, delays, and other flight-specific data.
- [airlines.csv]: Information about various airlines.
- [airports.csv]: Information about various airports.

Analysis Steps :

The analysis is divided into two parts:

Part 1: Excel Data Analysis

- **Missing Data Handling:** Identifying and addressing missing data in the flights dataset.
- **Flight Delays Analysis:** Determining the average flight delay per airline and identifying the top 3 airlines with the highest average delays.
- **Airport Traffic Volume:** Identifying the top 5 busiest airports based on the number of incoming and outgoing flights.
- **Flight Cancellation Insights:** Analyzing flight cancellations to determine the airline with the highest cancellation rate and the most common reasons for cancellations.
- **Seasonal Variations in Flight Operations:** Examining if there are seasonal patterns in flight operations, such as certain months being more prone to delays or cancellations.
- **Correlation between Distance and Delays:** Investigating if there's a correlation between the distance of the flight and the length of delays using scatter plots for visualization.
- **Efficiency of Airlines:** Calculating the on-time performance for each airline and ranking them based on this metric.
- **Impact of Day of Week on Flight Operations:** Assessing how flight operations (delays, cancellations) vary by the day of the week.
- **Analysis of Airport Connectivity:** Determining which airports serve as the most significant hubs in terms of connectivity.
- **Flight Duration Accuracy:** Comparing the scheduled flight duration versus the actual flight duration and identifying airlines with the most and least deviation.
- **Airline Fleet Utilization:** Analyzing which airline has the highest number of flights per aircraft, indicating fleet utilization.
- **Airport Geographical Analysis:** Using latitude and longitude data to analyze the geographical distribution of airports.
- **Delayed Flights and Delay Types Analysis:** Breaking down the delay types for each airline and analyzing their proportions.
- **Long-Haul vs Short-Haul Operations:** Comparing the operational metrics (delays, cancellations) between long-haul and short-haul flights for different airlines.
- **Pivot Analysis of Flights Data:** Summarizing key operational metrics by airline and airport using pivot tables.
- **Data Integration for Comprehensive Insights:** Merging data from the airlines dataset with the flights dataset to provide enhanced insights, such as correlating airline names with operational metrics.

Part 2: Building an Excel Dashboard

The Excel dashboard includes interactive visualizations for flight operations, airline performance, airport traffic, delay cause breakdown, time-based flight trends, and user interaction features.

Project Structure

- **Data:** Contains the raw data files (flights.csv, airlines.csv, airports.csv).
- **Analysis:** Contains the Excel files for data analysis and visualization.
- **Dashboard:** Contains the Excel dashboard files.

Metrics Details

- **Average Flight Delay:** Average delay in minutes across all flights or per airline.
- **Cancellation Rate:** Percentage of flights cancelled by each airline.
- **On-Time Performance:** Percentage of flights that depart and arrive on time.
- **Hub Connectivity:** Number of unique destinations served by each airport.
- **Flight Duration Deviation:** Deviation between scheduled and actual flight duration.
- **Delay Types Breakdown:** Proportion of delays attributed to different factors like airline, weather, or security.
- **Fleet Utilization:** Number of flights per aircraft, indicating how effectively airlines utilize their fleet.