Flight Arrival Analysis

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1. Executive Summary

This report analyzes flight arrival data from 2019-2020, focusing on on-time performance, delays, cancellations, and operational impacts. Using **Excel for data cleaning**, **pivot tables for analysis**, and an **Excel dashboard for visualizations**, we evaluated airlines, airports, and root causes of delays.

Key insights include:

- On-time arrivals improved in 2020 (from 79.71% to 88.28%)
- Hawaiian Airlines and Alaska Airlines were the **most reliable**, while JetBlue had **the worst delay performance**
- Late aircraft and NAS were the **biggest contributors to delays**, with **weather delays lasting the longest**
- PSA Airlines lost the most arrival time to delays (42.67%), and ADK had a shocking 0% on-time rate

Our recommendations focus on reducing turnaround inefficiencies, improving scheduling, and mitigating major delay causes.

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2. Introduction

Problem Statement

Flight delays and cancellations affect passenger satisfaction, airline efficiency, and airport operations. This analysis aims to identify which airlines and airports perform best/worst, what causes delays, and how operations can be optimized.

Importance of Analysis

- Minimize delays and improve on-time performance
- Identify airports and airlines that require operational improvements
- Improve airline scheduling to reduce disruptions

Dataset Overview

- Data from 2019 & 2020, covering **997,120 flights**
- **Key variables**: Airport name, Airline name, delay causes (in total count and minutes), cancellations, and diversions
- Interactive dashboard includes airline, airport, and year filters.

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3. Data Preparation & Methodology

Data Cleaning & Preprocessing

- **Checked for duplicate records and cleaned delay categories**
    - 8 rows with missing data removed
- **Removed unnecessary columns** (Month, Carrier ID, Airport Name)
- **Manipulated dat**a
    - Columns carrier, weather, NAS, security, and late aircraft count rounded to nearest whole
- **Created pivot tables** to analyze trends across airlines, airports, and delay reasons
- **Designed interactive dashboard** for visual exploration

Tools & Techniques

- **Excel Pivot Tables**: Aggregated delay counts cancellation rates, and operational impacts
- **Excel Dashboard**: Visualized airline and airport performance

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4. Exploratory Data Analysis (EDA)

Overall Flight Performance

- Total flights decreased from **625,763 (2019) to 371,357(2020)**
    - Likely Covid related
- On-time performance improved from 79.71% to 88.28%
- Hawaiian Airlines, Alaska Airlines, and Endeavor Air had the best on-time rates
- JetBlue, Mesa Airlines, and Allegiant Air had the worst on-time rates

Delay Causes & Time Impact

- Late aircraft (57,414 cases) and NAS (54,078) were the **leading delay causes**
- Weather delays **lasted the longest** on average (123 minutes per delay)
- JetBlue Airways experienced the **most total delay minutes** (106 per flight)

Cancellations & Diversions

- ExpressJet Airlines had the **highest cancellation rate (2.08%)**
- MMH Airport had the **highest cancellation rate (19.3%)**

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5. Recommendations & Business Impact

- Reduce late aircraft delays with better turnaround strategies
- Focus on improving worst-performing airports (ADK, CDB, ASE)
- Weather-related mitigation for airports with long delays (de-icing, runway clearing)

- Improve communication strategies for high-delay airlines (JetBlue)

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8. Conclusion & Next Steps

This analysis highlights key delay trends, airline reliability rankings, and operational inefficiencies.

Future steps include:

- Investigate why ADK has a 0% on-time rate
- Examine seasonality effects on delays and cancellations
- Develop predictive models for delay forecasting