US Flight Delay Analysis 2023

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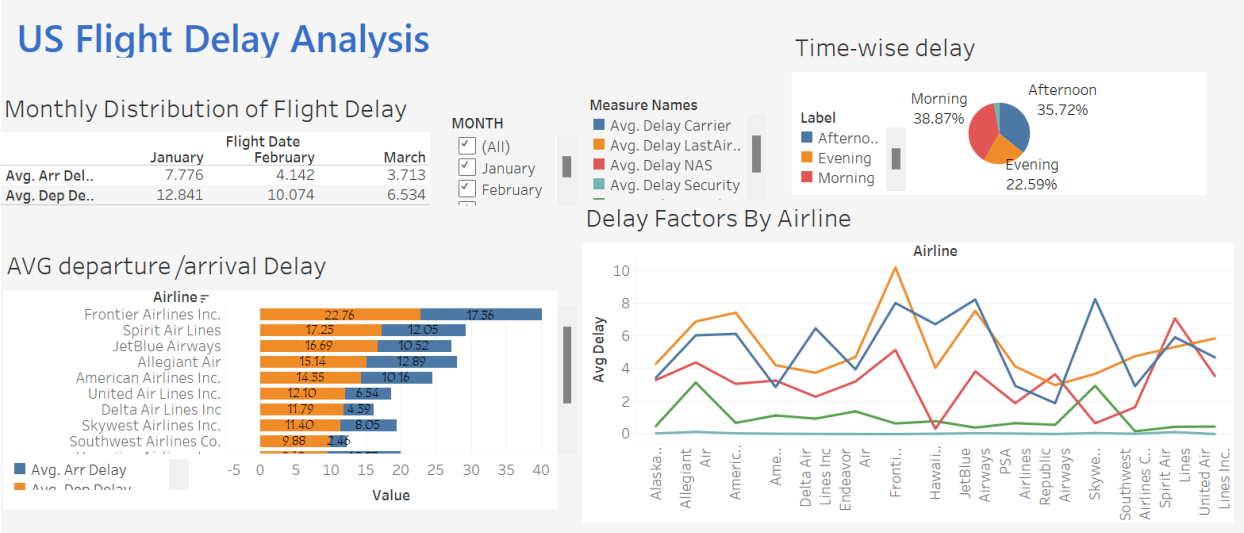
Introduction

Flight delays are a common occurrence in the aviation industry, impacting both passengers and airlines alike. Analyzing flight delay data is crucial for understanding the factors contributing to delays and devising strategies to minimize their impact. The dataset at hand offers a comprehensive view of flight information in the United States, excluding weather-related data. This exclusion is intentional to prevent biasing delay statistics and analysis

Dataset link:

https://www.kaggle.com/datasets/bordanova/2023-us-civil-flights-delay-meteo-and-aircraft

General Overview



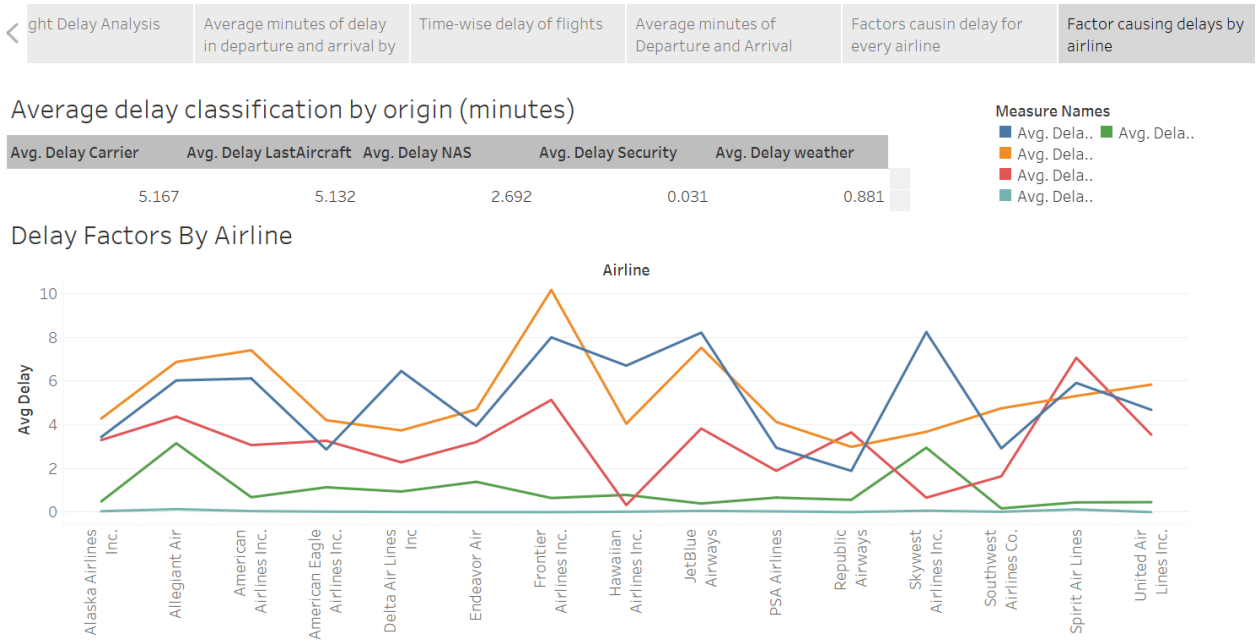
Our analysis delves into the first quarter of 2023, focusing on average arrival and departure delays. We observed that January had the most delayed flights, with an average arrival delay of 7.776 minutes and an average departure delay of 12.8 minutes.

Notably, Frontier Airlines emerged as the worst-performing airline in the US during this period, with significantly higher delays compared to the overall average. Their average arrival delay was 22.76 minutes, and the average departure delay was 17.56 minutes. These delays were notably higher than the industry average.

Further investigation revealed that most delays occurred during morning and evening hours. The dashboard also provided insights into the contributing factors for delays across airlines. Delay Carrier represents delays caused by the airline itself, while Delay by NAS refers to delays attributed to the National Airspace System (NAS). This system's high traffic volume in specific airspace sectors can lead to routing and altitude change delays for aircraft.

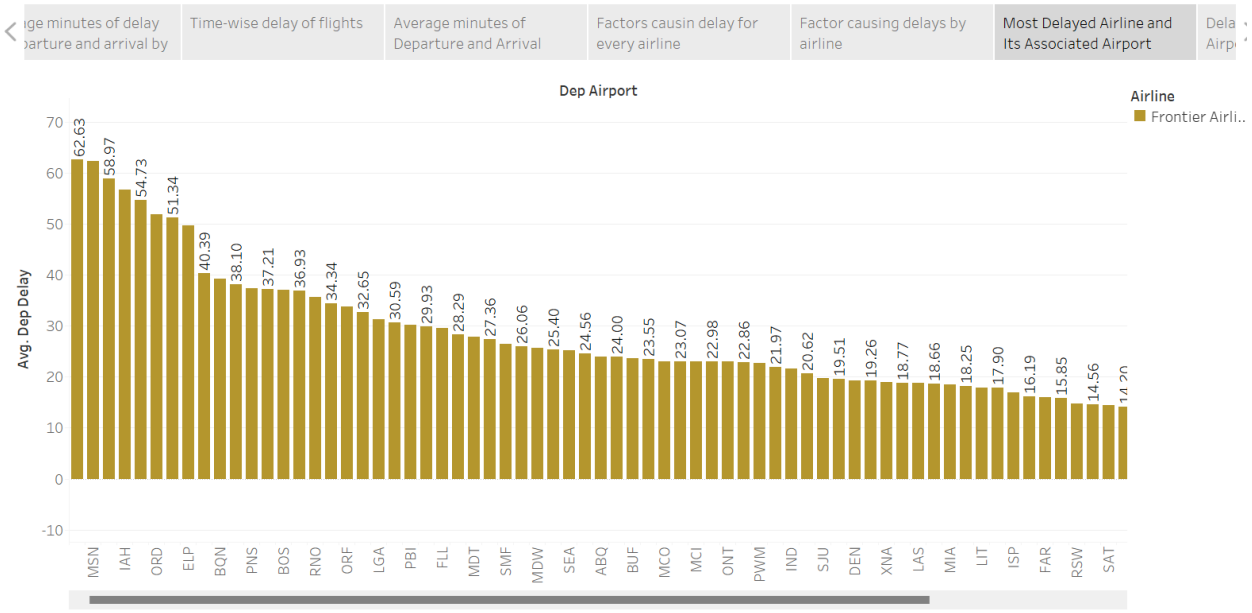
Overall, our analysis highlighted that the most significant factor contributing to delays across airlines was the delay caused by the arrival of the last aircraft.

Digging into Delaying Factors across all airlines



The KPIs reveal an interesting dynamic in delay causes. While the primary cause of delays across airlines is typically the arrival of the last flight, the duration of these delays is predominantly influenced by factors within the airline's control. This internal

aspect contributes significantly to the higher overall average delay times by carrier.One possible reason for this trend could be operational inefficiencies within the airlines, such as scheduling challenges, maintenance issues, or crew management problems. These internal factors directly impact departure and arrival times, leading to extended delays and affecting the overall travel experience for passengers.



In our analysis focusing on Frontier Airlines' performance, we delved deeper into the airports where Frontier Airlines experienced the most significant delays. The data revealed a striking finding: at MSN airport, Frontier Airlines encountered an average departure delay of a staggering 62 minutes. This substantial delay at MSN airport underscores a critical area where operational improvements could have a substantial impact on Frontier Airlines' overall performance and customer satisfaction.

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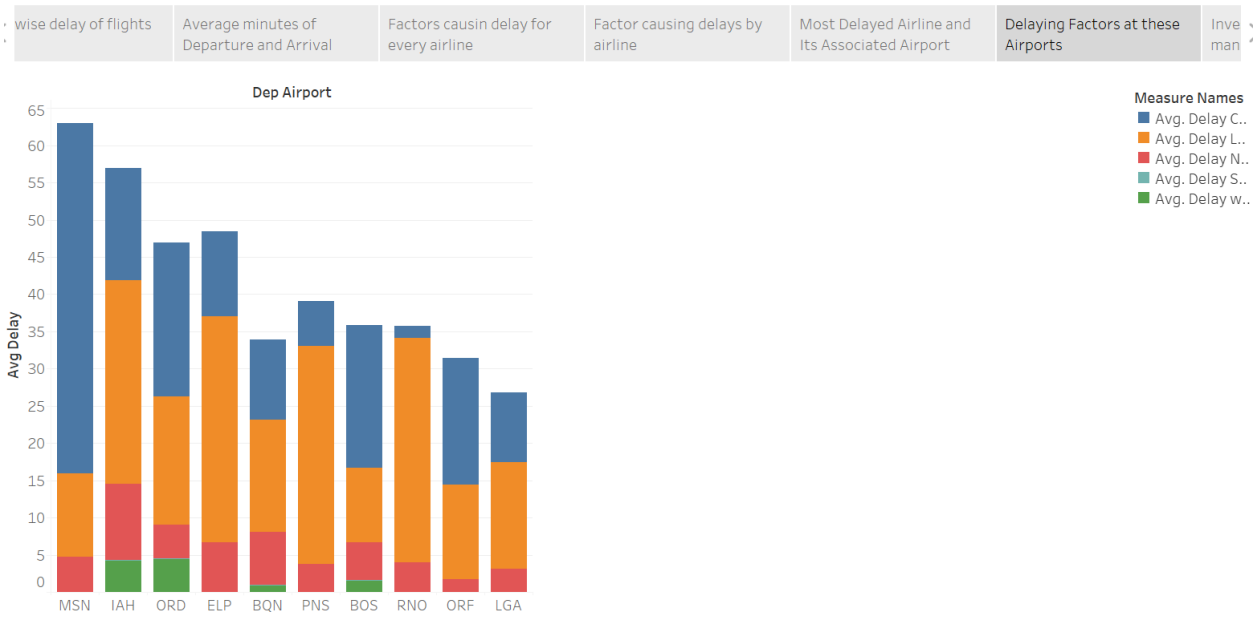
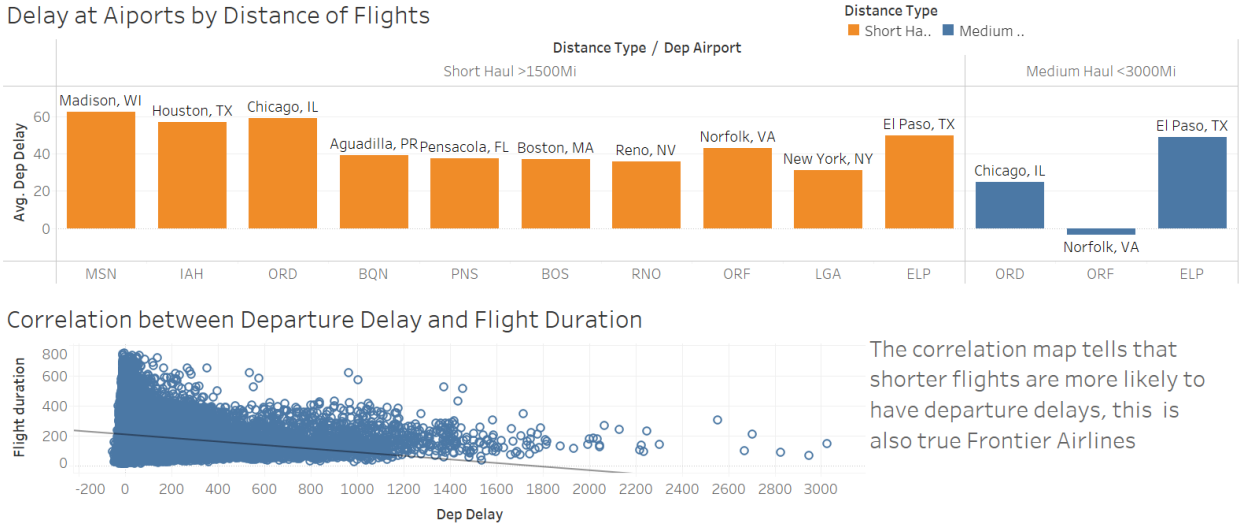


The chart provides valuable insights into the factors contributing to the most delays for Frontier Airlines across its top 10 worst-performing airports. Our analysis reveals that the primary contributor to delays is the airline itself, followed closely by delays caused by the arrival of the last aircraft. This pattern underscores the significance of internal operational challenges within Frontier Airlines, highlighting areas where targeted improvements can lead to more punctual and efficient services for passengers.

Manufacturer	Dep Airport	
AIRBUS	MSN	49
	IAH	196
	ORD	148
	ELP	42
	BQN	57
	PNS	25
	BOS	82
	RNO	20
	ORF	40
	LGA	172

We also explored whether delays could be attributed to the manufacturer. However, since Frontier Airlines exclusively operates Airbus aircraft, it's unlikely that delays are directly related to the manufacturer. Instead, our analysis suggests that operational and internal factors within Frontier Airlines itself play a more significant role in the observed delays. This insight further emphasizes the importance of addressing internal processes and operational efficiencies to mitigate delays effectively.



The correlation map tells that shorter flights are more likely to have departure delays, this is also true Frontier Airlines

Upon investigating the duration of flights, we segmented them into three categories: short, medium, and long haul. Interestingly, our analysis revealed that Frontier Airlines primarily operates short and medium haul flights, with no long haul flights in their operations.

Further exploration into Frontier Airlines' worst-performing airports unveiled a notable trend. In all 10 of these airports, Frontier Airlines operated short haul flights exclusively, experiencing the highest departure delay of 62 minutes on average. Comparatively, long haul flights were only present in three out of these 10 airports, with the highest delay averaging 49 minutes.

An intriguing observation from our analysis is the negative correlation between departure delay and flight duration, which holds true specifically for Frontier Airlines. This correlation suggests that shorter flights tend to experience more significant delays compared to longer flights within Frontier Airlines' operations. Understanding and addressing the underlying factors contributing to these shorter flight delays could lead to more efficient and punctual services for Frontier Airlines passengers.

Conclusion

In conclusion, our analysis focused on identifying the airports where Frontier Airlines experienced the most significant delays, leading us to the crucial insight that these delays primarily stem from internal factors within the airline itself. External elements like weather conditions or issues with the National Aviation System (NAS) for traffic control were not significant contributors to Frontier Airlines' delays during the analyzed period.

This finding underscores the critical importance for Frontier Airlines to concentrate efforts on enhancing internal operational efficiencies and processes. Areas such as scheduling optimization, crew management, and proactive contingency planning could greatly reduce delays and improve overall service reliability.

Furthermore, the negative correlation observed between flight duration and departure delays within Frontier Airlines' short haul flights highlights a specific area for targeted improvement. By focusing on strategies to minimize delays in short haul flights, Frontier Airlines can enhance customer satisfaction, maintain schedule adherence, and strengthen its competitive position in the aviation industry.

Recommendations stemming from this analysis include:

1. Implementing robust operational procedures and scheduling optimizations to reduce delays caused by internal factors.
2. Enhancing crew management strategies to ensure efficient turnaround times and minimize delays.
3. Investing in technology solutions for real-time monitoring and decision-making to address potential operational disruptions promptly.
4. Conducting regular performance evaluations and data-driven analysis to identify areas for continuous improvement and optimization.
5. Collaborating with relevant stakeholders, including airports and air traffic control authorities, to streamline processes and minimize external operational challenges.

By implementing these recommendations and addressing internal operational challenges, Frontier Airlines can significantly improve on-time performance, enhance passenger experience, and maintain a competitive edge in the dynamic aviation industry.