



Comparative Analysis: Acorn Airlines vs Berry Airlines

Analysis of Summer 2019

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Table Of Contents

01

Overview

02

Flight Pattern

03

Cancellations

04

Departure/Arrival Delays

05

Aircraft Utilisation

06

Summary



Overview: Acorn Airlines

Between 1st July 2019 and 31st August 2019,



164,490
flights



106
cities

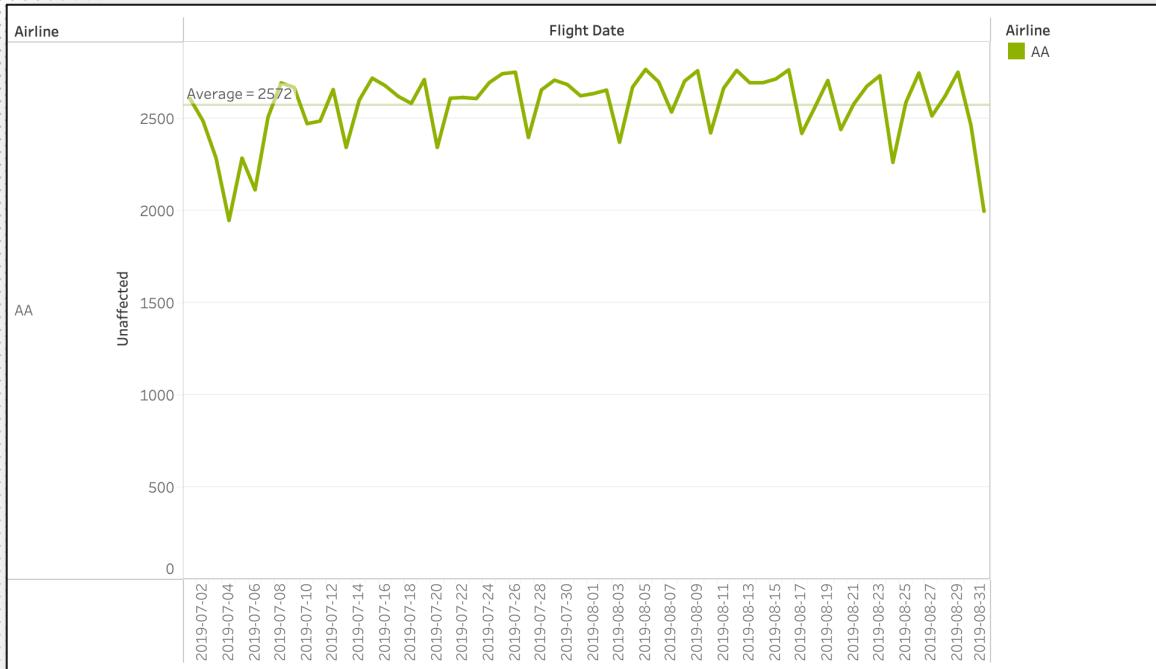


166.07 mil
miles travelled



Overview: Acorn Airlines

AA has a **weekly repeating pattern** in number of **unaffected flights**



2572

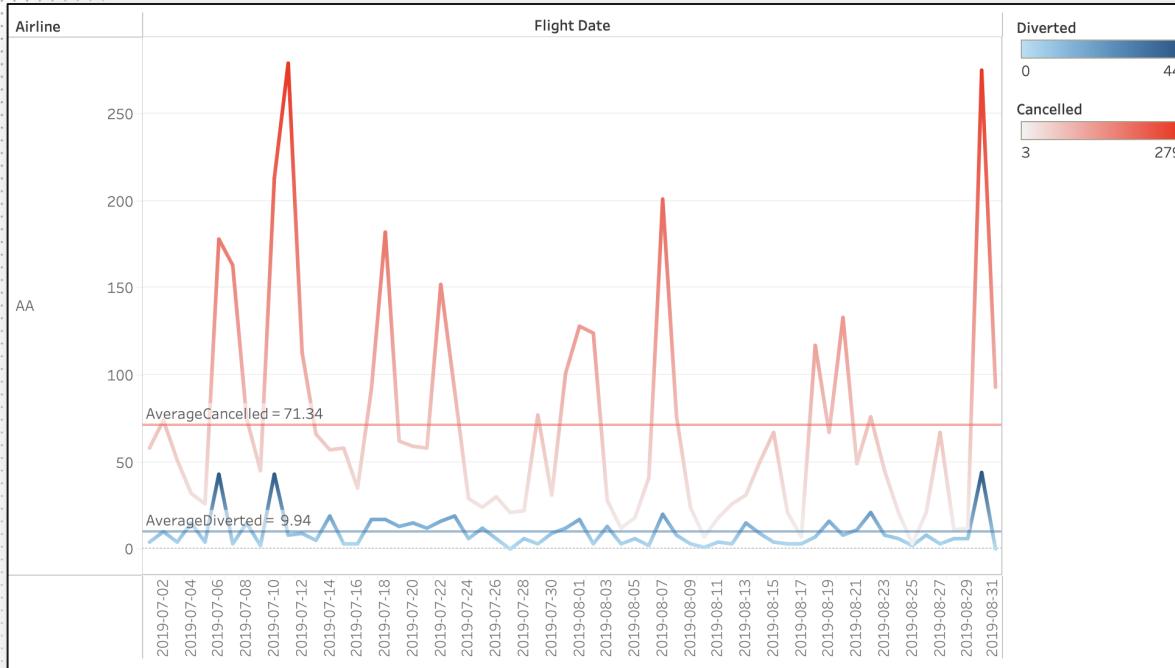
unaffected flights per day
on average

Unaffected Flights: Flights that
are neither cancelled nor diverted



Overview: Acorn Airlines

There is a general fluctuating trend for both **cancelled** and **diverted** flights.



71.34

cancelled flights each day
on average

9.94

diverted flights each day
on average



Overview: Berry Airlines

Between 1st July 2019 and 31st August 2019,



182,090
flights



146
cities

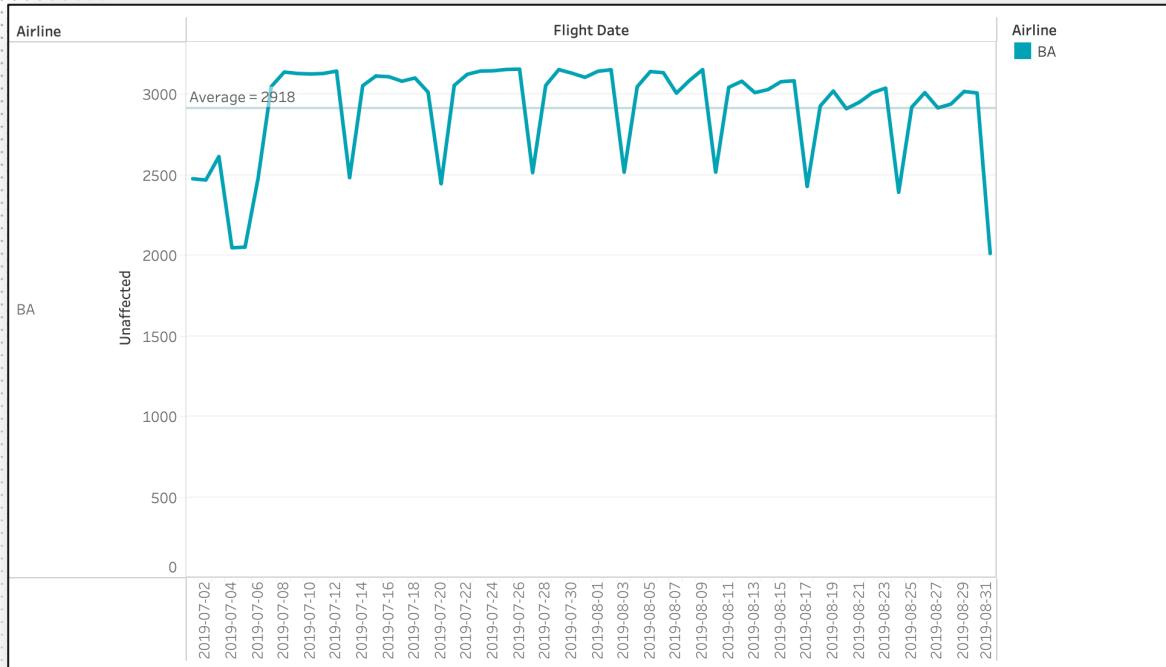


168.78 mil
miles travelled



Overview: Berry Airlines

BA has a **weekly repeating pattern** in number of **unaffected flights**



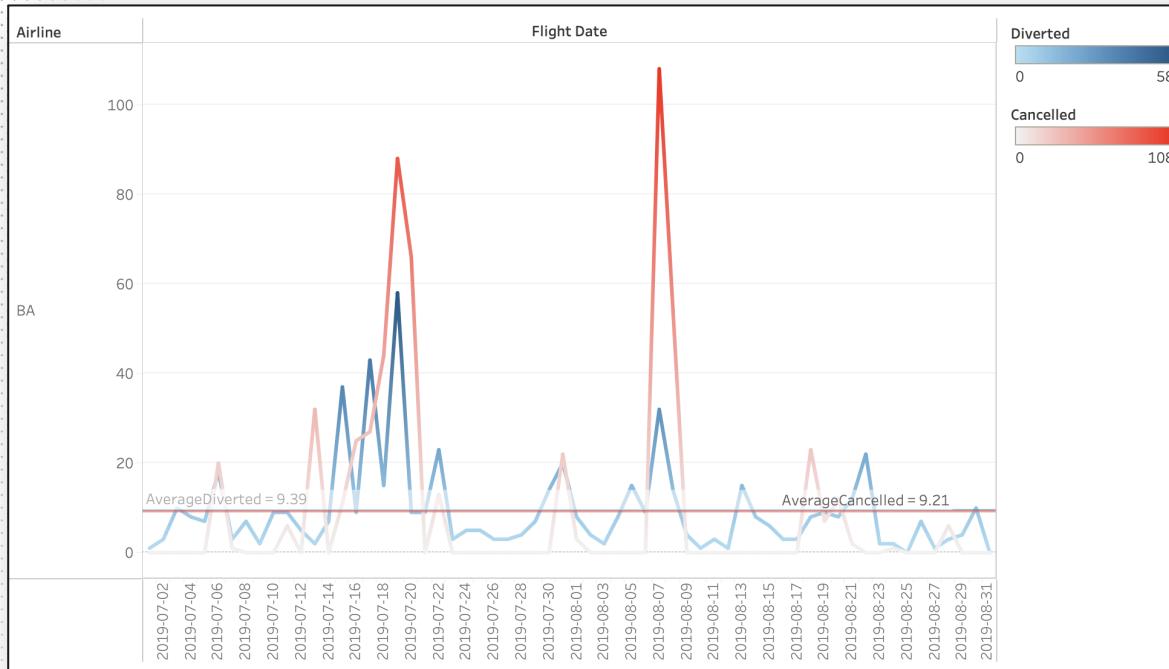
2918

unaffected flights per day
on average



Overview: Berry Airlines

There is a general fluctuating trend for both **cancelled** and **diverted** flights



9.21

cancelled flights each day
on average

9.39

diverted flights each day
on average

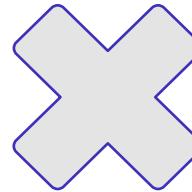
Comparative Analysis

To assess the performance of AA, relative to BA, we considered 4 key factors:

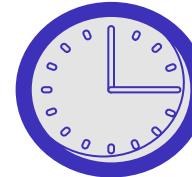
01 Flight Pattern



02 Cancellations



03 Delays



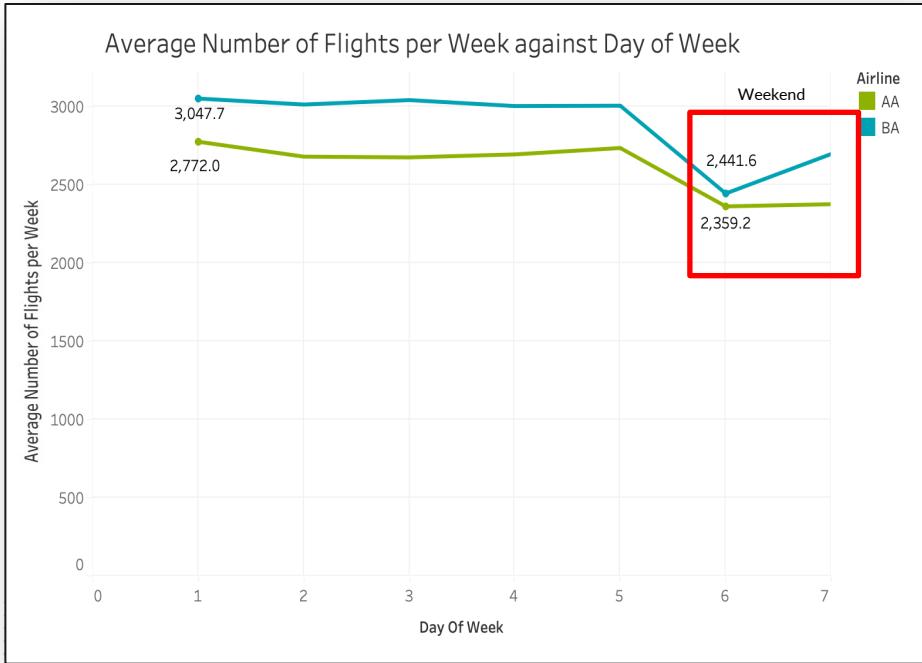
04 Aircraft Utilisation



Flight Pattern

Flight Pattern

Insight 1: There is **lower average number of flights on weekends** compared to weekdays



Observations

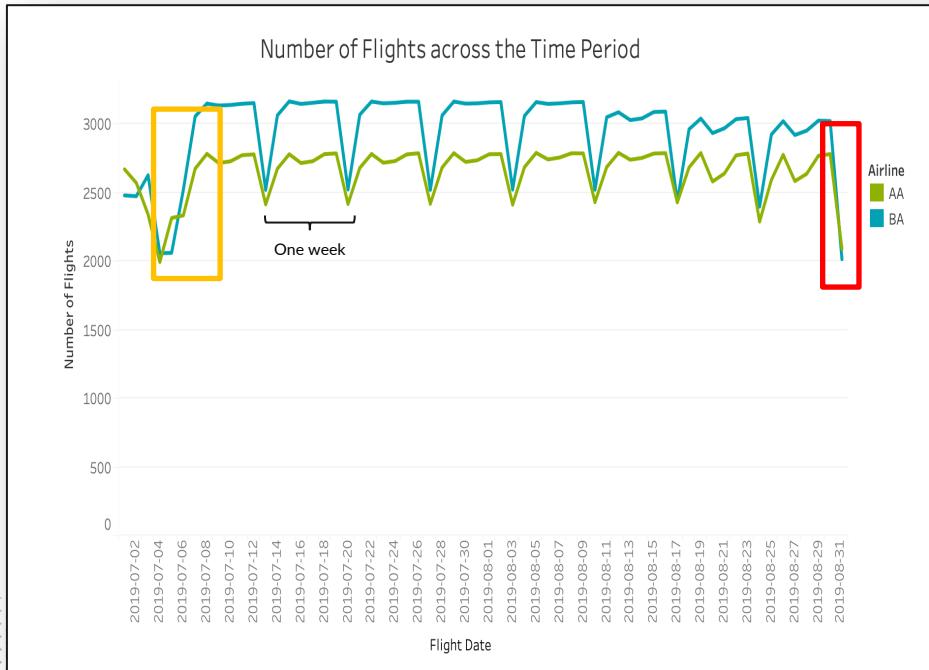
Both AA and BA shows a similar trend, with highest number of flights on Monday, and the lowest number of flights on Saturday.

Reasoning

Likely due to higher number of business travelers who take flights on weekdays for work purposes.

Flight Pattern

Insight 2: There is a **large increase** in the number of flights during the start and a **large decrease** at the end of holidays



Observations

There is a weekly pattern. Both airlines had a huge **increase** on 4th and 5th July and a huge **decrease** on 30th August.

Reasoning

- The **large increase** in demand for flights is likely due to Independence Day on 4th July.
- The **large decrease** in demand was likely due to the **end of summer break** for students in the US.



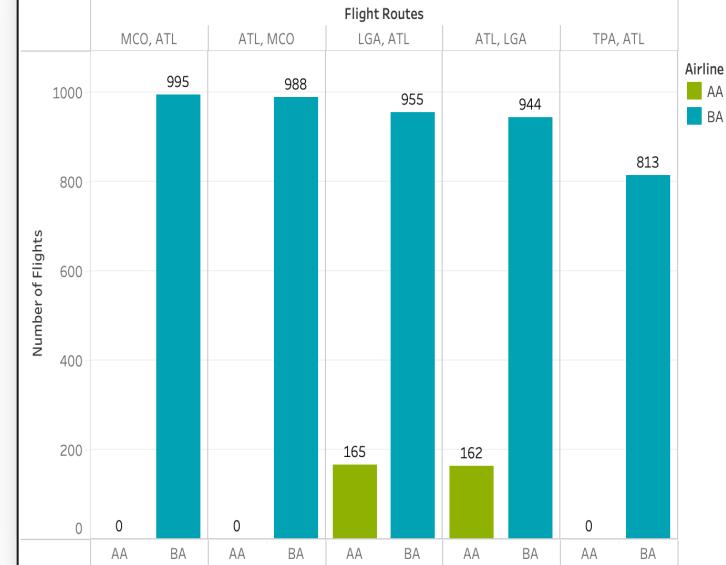
Flight Pattern

Insight 3: AA's top 5 flight routes are different from those of BA

Number of Unaffected Flights Against AA's Top 5 Flight Routes



Number of Unaffected Flights Against BA's Top 5 Flight Routes



AA and BA focus on different local routes and thus have different target markets



Flight Pattern

Insight 4: AA serves passengers for flights **nationwide** while BA serves passengers in the **east coast**



Observations

AA's top routes are **more spread out** across the US while BA's top routes are **concentrated in the east coast**



Flight Pattern

Recommendation 1: Increase **marketing efforts** to incentivize customers taking domestic flights during **weekends**



Recommendation

AA should promote **more weekend flights** by branding it as a “short weekend getaway.” Using **targeted marketing**, through social media or email direct marketing, to appeal to **leisure travellers** specifically.

Key Considerations

- AA should conduct **market research** to better understand the needs and preferences of its customer base.
- It should **also focus on its top routes** to capture a larger share of the market and improve customer loyalty.



Overview

Flight Pattern

Cancellations

Delays

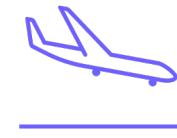
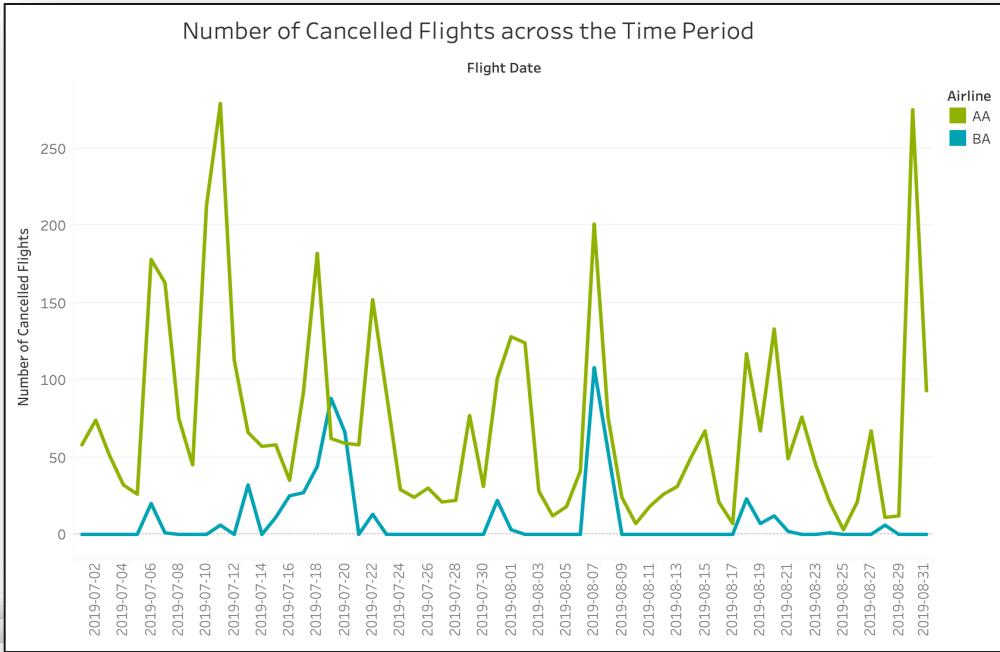
Aircraft Utilisation

Summary

Cancellations

Cancellations

Insight 5: AA had a **higher cancellation rate** than BA across the summer



For every **1000** flights

AA
27
cancelled

BA
3
cancelled

Cancellations

Insight 6: Airline complications contribute to a lower percentage of AA's cancelled flights compared to that of BA



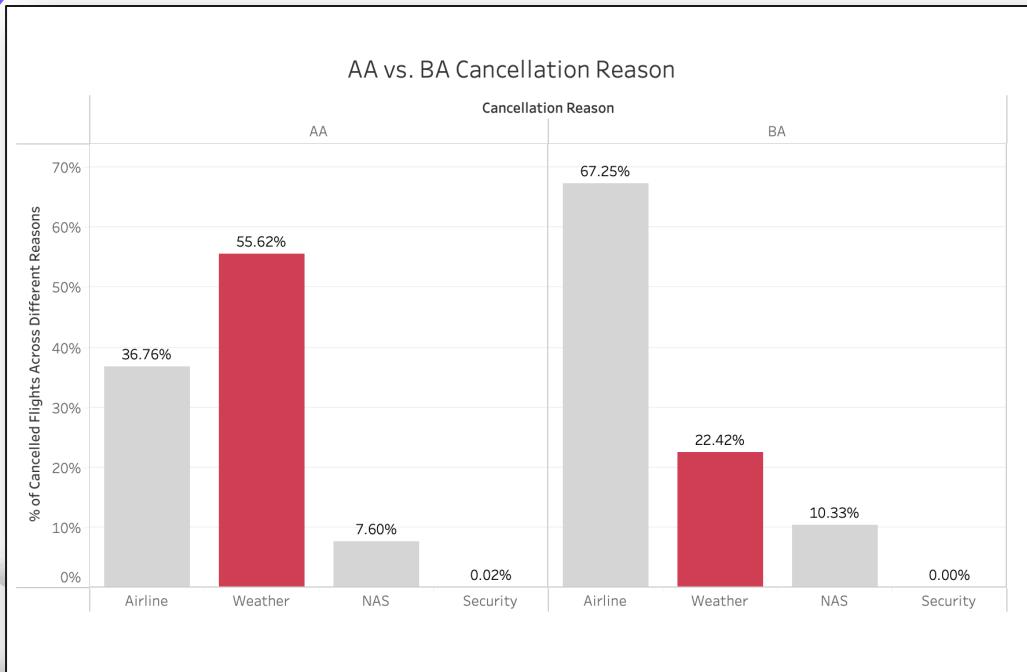
AA
36.76%
Airline

BA
67.25%
Airline



Cancellations

Insight 7: The percentage of cancelled flights due to weather for AA is significantly higher than BA



AA
55.62%
Weather

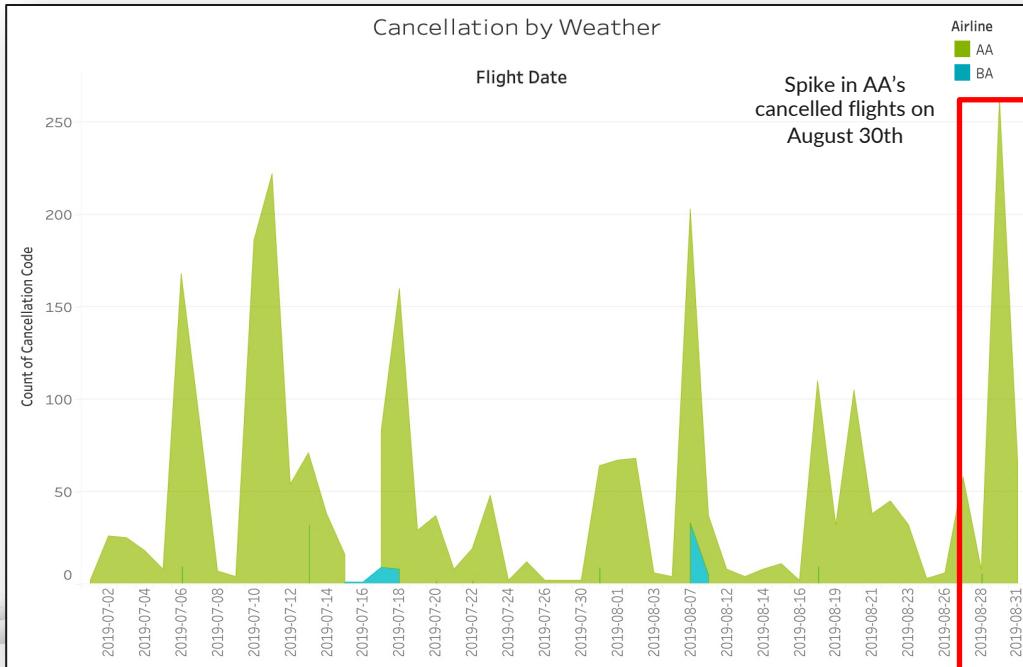


BA
22.42%
Weather



Cancellations

Insight 8: AA experienced the **highest number** of cancelled flights on **30th - 31st August**



Observations

- AA has more flight cancellations than BA.
- 30th August 2019 recorded the highest number of cancelled flights caused by weather due to *Hurricane Dorian*.
(24 Aug – 10 Sept 2019)

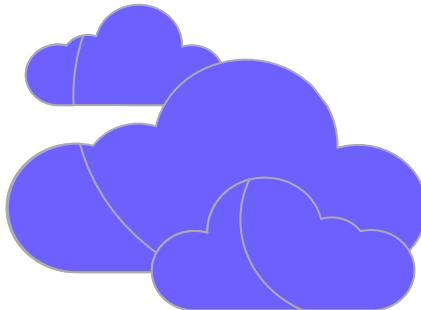
Source: NOAA's National Weather Service

Reasoning

BA is likely to have demonstrated **greater efficiency** in managing weather-related disruptions, resulting fewer cancelled flights compared to AA

Cancellations

Recommendation 2: AA can **offer rebooking** to affected passengers **at low or no cost**



Reasoning

Weather is unpredictable and it is difficult for AA to reduce cancellations by weather

- AA can better manage the effects of cancellation by weather by allowing passengers to **rebook their flights** at low or no cost, reducing the burden on passengers of a cancelled flight. This is likely to increase customer satisfaction.
- AA can also create or utilise existing platforms to **quickly disseminate** information to their passengers of incoming weather changes.

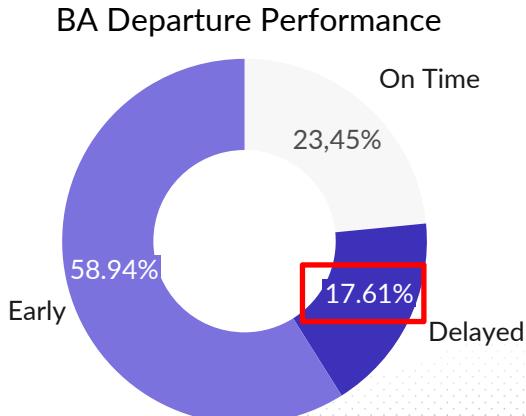
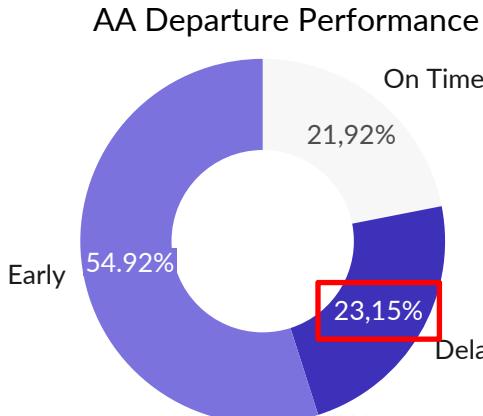
Source: Earthnetworks

Delays

Flights with departure delay or arrival delay ≥ 15 minutes

Departure Delays

Insight 9: AA has a **higher percentage of delayed departures** compared to BA

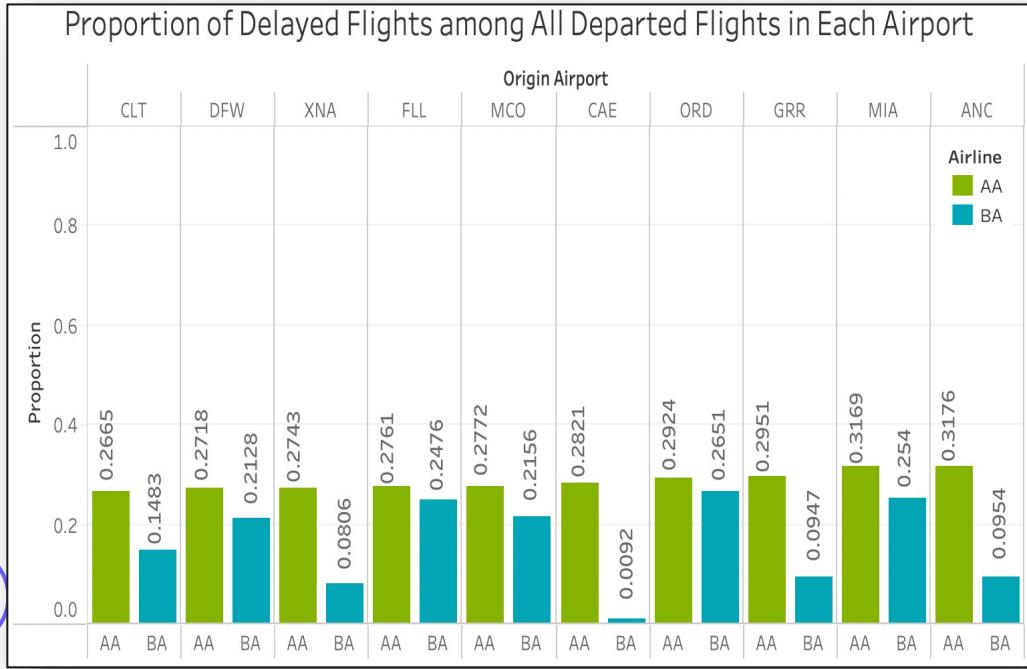


Observations

- Early flights make up the **greatest percentage** of AA's departure performance (54.92%).
- However, AA still has a **higher percentage of delayed departures** compared to BA.

Departure Delays

Insight 10: These are the **top 10 airports** where AA experiences the **highest proportion** of **delayed departures**



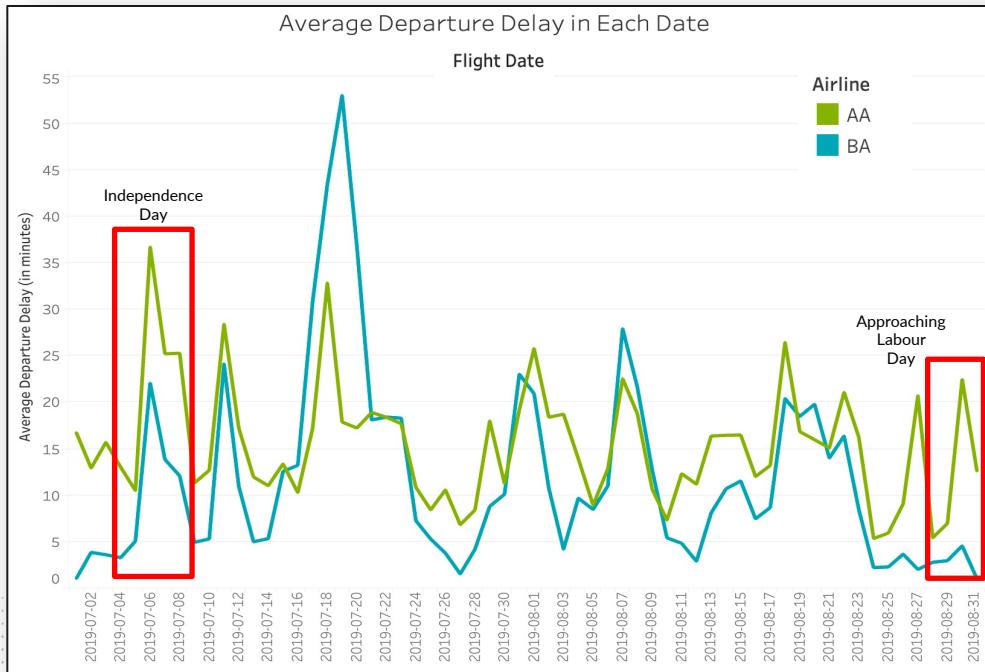
Observations

- In these 10 airports, **AA** has a **higher proportion** of **delayed departures** compared to **BA**
- Among these 10 airports, there are some of the **worst airports in the US** which are FLL and MCO as well as **most delayed airports in the US** which are CLT, DFW, and ORD

Source:
The Points Guy, Business Insider

Departure Delays

Insight 11: During **peak or holiday seasons**, AA experiences a higher average departure delay



Observations

- Approaching **peak seasons** around 4th July (US Independence Day) and 2nd September (US Labour Day 2019), AA experiences significantly higher average departure delay than BA.

Reasoning

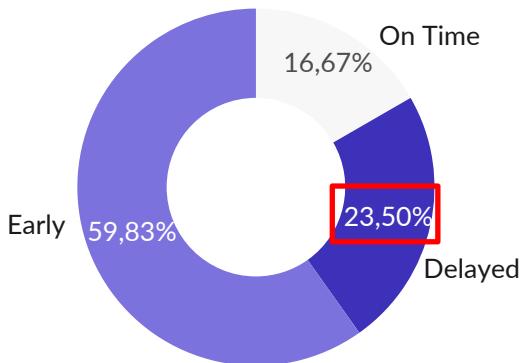
It is likely that AA experiences staffing shortages during holiday seasons.



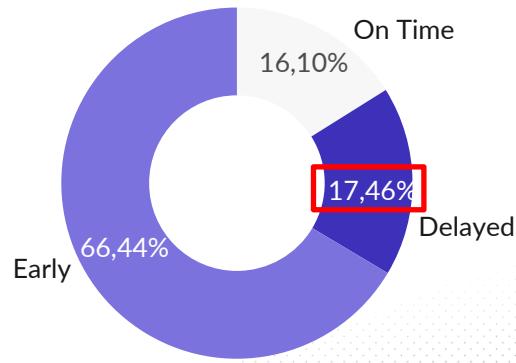
Arrival Delays

Insight 12: AA has **higher percentage of delayed arrivals** compared to BA

AA Arrival Performance



BA Arrival Performance

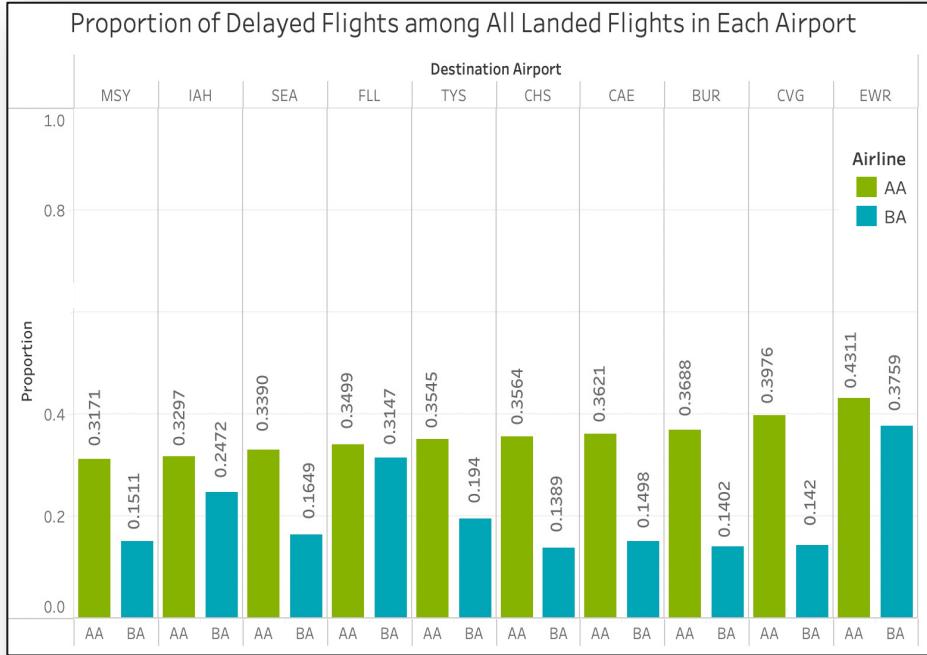


Observations

- Early flights make up the **greatest percentage** of AA's arrival performance (59.83%)
- However, AA still has a **higher percentage of delayed arrivals** compared to BA.

Arrival Delays

Insight 13: These are the **top 10 airports** where AA experiences the **highest proportion** of delayed arrivals



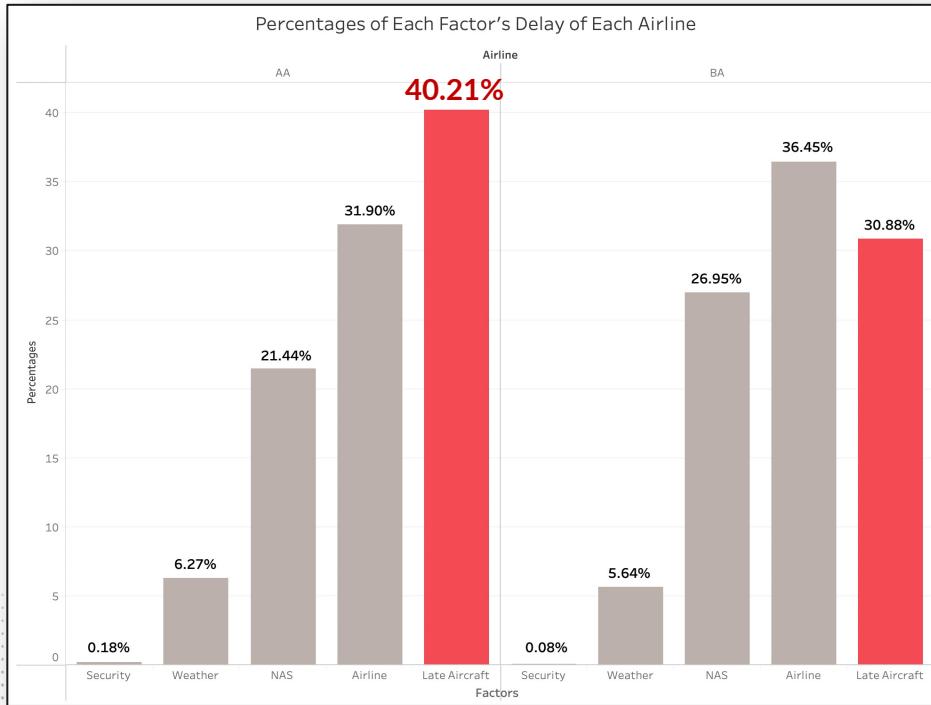
Observations

- In these 10 airports, AA has a **higher proportion** of delayed arrivals than BA
- AA experiences the **highest proportion** of delayed arrivals at EWR. According to our secondary research, it was also the **most delayed airport** in the US in Summer 2019

Source:
Business Insider

Arrival Delays

Insight 14: Late aircraft delay is the most significant factor that contributes to AA's arrival delay



Observations

AA's arrival delay caused by late aircraft delay is higher compared to that of BA

Reasoning

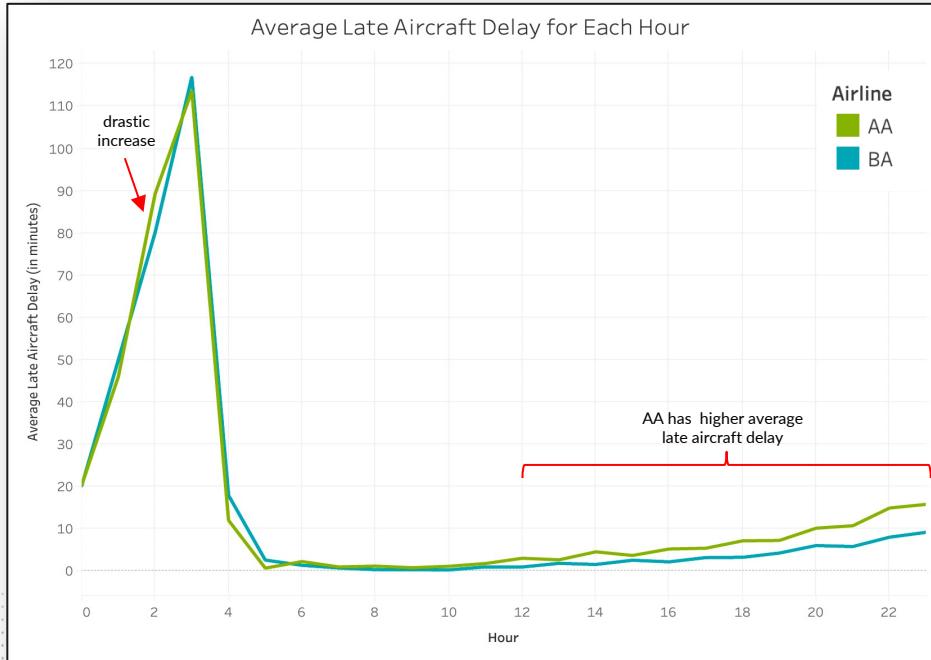
AA may be facing difficulties in efficiently managing consecutive flights that utilise the same aircrafts, resulting in delay propagation.

Source:
Federal Aviation Administration



Arrival Delays

Insight 15: There is a **large increase** in **late aircraft delay** for both AA and BA from 12am to 3am



Observations

- There is a **similar pattern** of average late aircraft delay in each hour for both AA and BA.
- From 12pm to 12am, the average late aircraft delay of AA is **greater** than BA. There is also a **large increase** in late aircraft delay from midnight to 3 am.

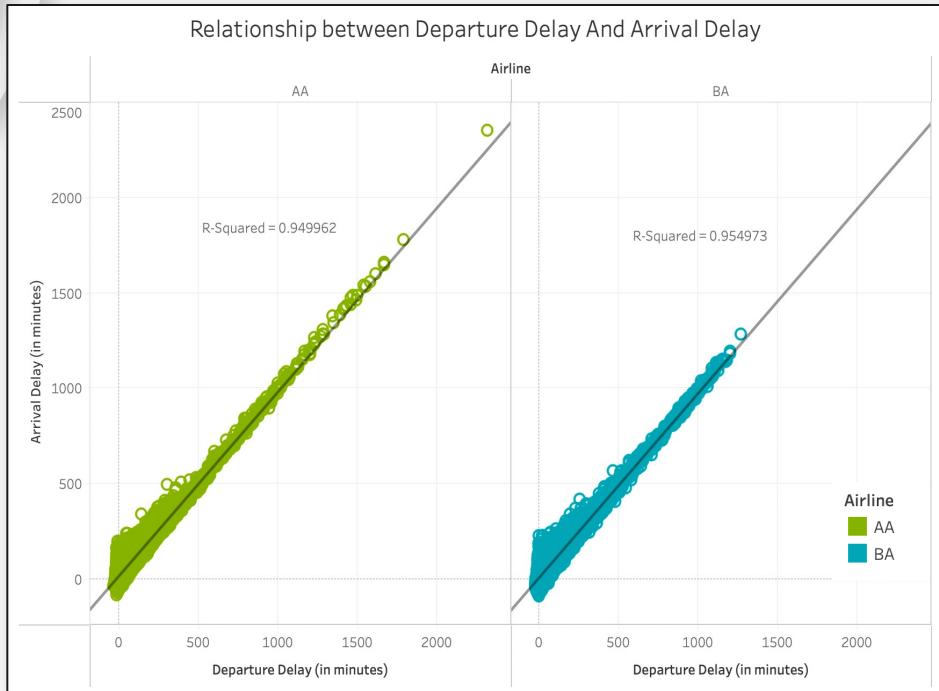
Reasoning

Due to night-time curfews, **airport operations are reduced**, increasing delays as night passes, creating a snowballed delay propagation.

Source: SimplyFlying

Arrival Delays

Insight 16: Departure delay is **directly proportional** and **highly correlated** with arrival delay

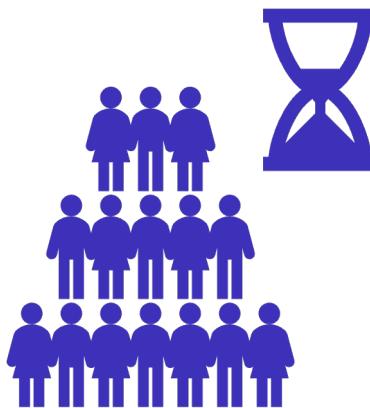


Observations

- There is a **strong positive linear relationship** between departure delays and arrival delays.
- The **high R-squared values** for both AA and BA indicates that a high proportion of variance in arrival delays can be explained by departure delays in the linear regression models.

Delays

Recommendation 3: AA can **improve scheduling** and **increase the number of ground staff** to ensure efficient execution



DELAY
AVOIDANCE

DELAY
RECOVERY

Recommendation

- **Improve scheduling and creating buffers:** Schedule flights with more time in between to provide flexibility and accommodate potential delays. It also reduces the impact of delays on subsequent flights.
- **Increase the number of ground staff:** Ensure efficient execution of necessary pre-takeoff procedures to minimise delay propagation.

Key Consideration

Buffers carry a **financial cost**. They should be used strategically to balance improved on-time performance against the costs of delivering it

Source: Northeastern Global News, BCG Global



Overview

Flight Pattern

Cancellations

Delays

Aircraft Utilisation

Summary

Aircraft Utilisation

Aircraft Utilisation

Insight 17: AA has a **lower average aircraft utilization** compared to BA

$$\text{Aircraft utilisation} = \frac{\text{Total airtime in hours}}{\text{Number of days aircraft is used}}$$

Computing the utilisation of a single aircraft:

- The total airtime was calculated by **summing up the airtime** of for every flight.
- The number of days was calculated by **counting the number of days** which contain at least one day where **airtime of the aircraft > 0**.
- The **higher** the aircraft utilisation value, the **more optimal** the aircraft utilisation is.

Source: MIT educational website

Boxplot of aircraft utilisation during 2019 summer

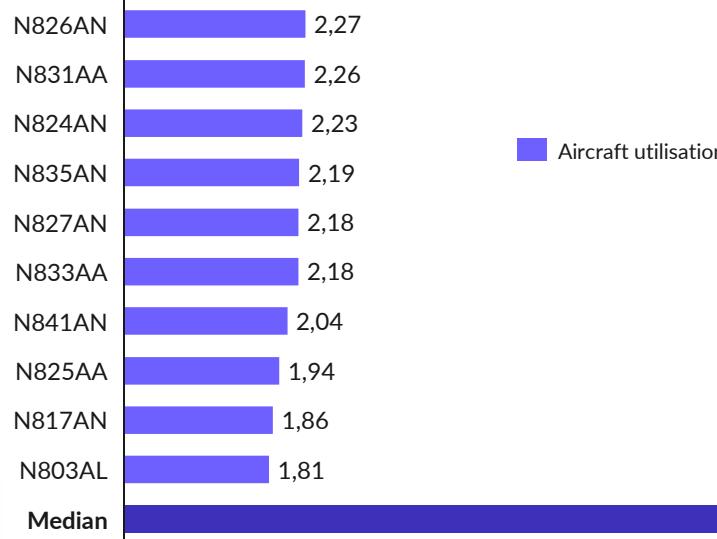


Airline	Mean	Median	Min	Max	Flights	25 th Percentile	75 th Percentile
Acorn	7.43	7.62	1.81	13.26	936	5.87	8.94
Berry	8.06	7.85	1.74	15.77	853	6.91	9.41

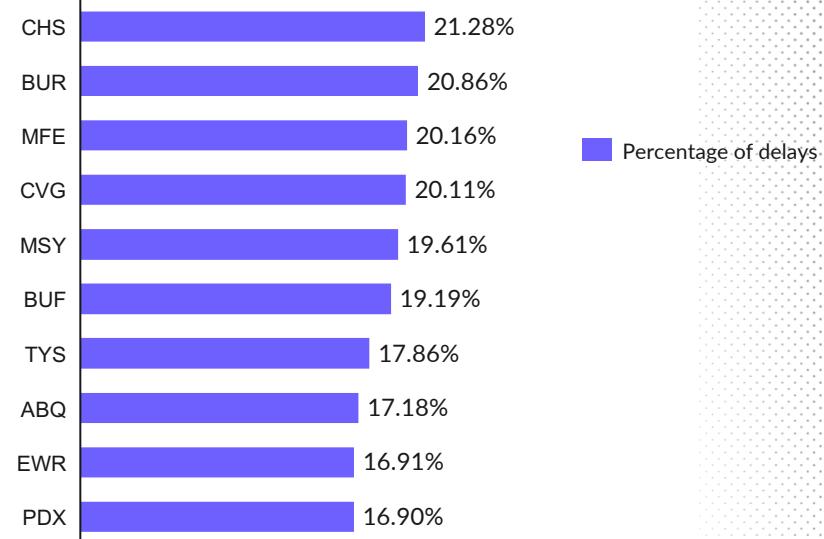
Aircraft Utilisation

Recommendation 4: AA should relocate aircrafts with low utilization to airports having more delays

Bottom 10 aircrafts with the lowest aircraft utilisation

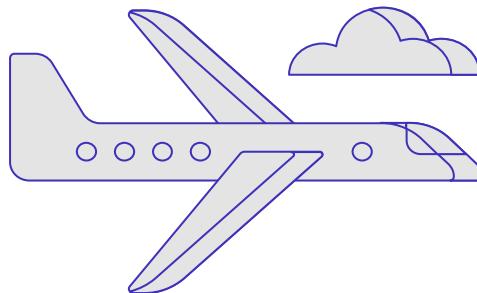


Top 10 airports with the highest percentage of late aircraft delays



Aircraft Utilisation

Recommendation 4: AA should **relocate aircrafts with low utilization** to airports **having more delays**



Recommendation

- Relocate the aircrafts to airports which has the **highest chance of being delayed** to fill the current gaps in the flight schedule.
- This increases **the number of spare aircrafts available** for that airport and therefore, reduce airport turnaround times, **decreasing the delay propagation**.



Aircraft Utilisation

Recommendation 4: AA should **relocate aircrafts with low utilization to airports having more delays**

Bottom 5 aircrafts with the lowest aircraft utilisation

Tail number	Top route	Aircraft age as of 2019
N826AN	ORD → LAX	2.2
N831AA	LAX → DFW	1.8
N824AN	LAX → DFW	2.6
N835AN	LAX → DFW	1.1
N827AN	DFW → LAX	2.2

Key Considerations

- AA should seek to understand how relocating the aircrafts **might affect** its previously assigned routes by **calculating the new delay time**.
- The aircraft selected generally should be **newer** to **minimise the maintenance works** required to keep the planes in flying condition.

Source: Airfleets

Summary

Summary: We have made recommendations in **four main areas** for AA to better its performance against BA

Flight Patterns

- AA should focus on **promoting** more weekend flights through **targeted marketing**
- Promote routes with **high traffic** but **low in competition**
- Reinforce its **position** in the market

Cancellations

- AA should prepare to **disseminate weather changes** as quickly as possible
- Offer option of **rebooking flights** at low/no cost
- Assures passengers assurance that **bookings are safe**

Delays

- Improve **flight scheduling** by creating buffers to accommodate potential delays
- Increase pre-boarding **aircraft preparation** service crew

Aircraft Utilisation

- **Relocate aircrafts with lower utilisation** to airports with highest percentage of delays
- Increase the **number of aircrafts available** at the airport
- **Reduces** delay propagation and airport turnaround time

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Appendix

Data Cleaning

Data Cleaning

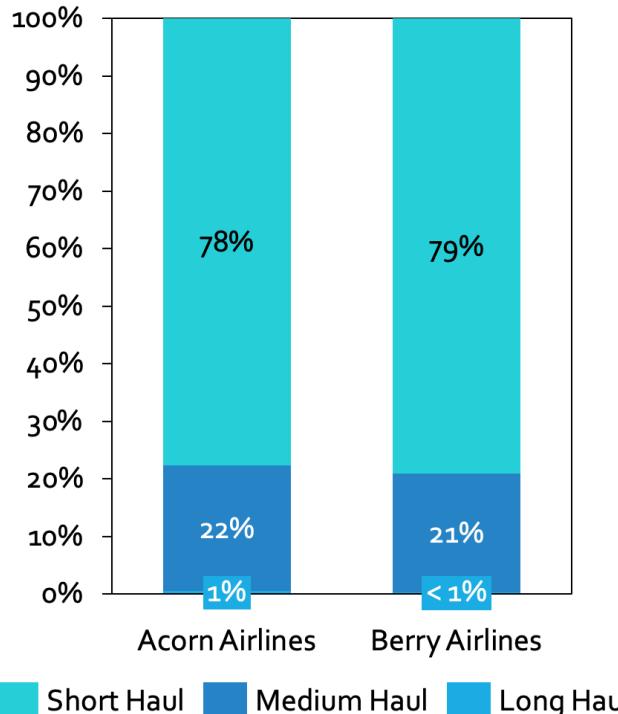
After the analysis of TwoAirlineFlights dataset, we included zeros into the integer fields which had empty strings. Given that there were numerous null values in the data set, we had initially delete the rows. However, after closer exploration of the data, we realized that some were containing data on flights which turned back, diverted flights and so on. Thus we concluded that the data was sufficiently clean.

Definitions

- Unaffected flights: flights that are neither cancelled nor diverted
- Delayed flights: flights with departure/arrival times that are ≥ 15 minutes longer than scheduled time

Flight Patterns

Breakdown of flight type by airline



Key Terms:

Short – haul : flight less than 3 hours

Medium – haul : flight between 3 and 6 hours

Long – haul : flight longer than 6 hours

- Short-haul planes are more expensive (Needs special planes)
- Long haul flights are better with 40% of revenue goes to mainline operating revenues and 90% goes to operating revenues

Source:

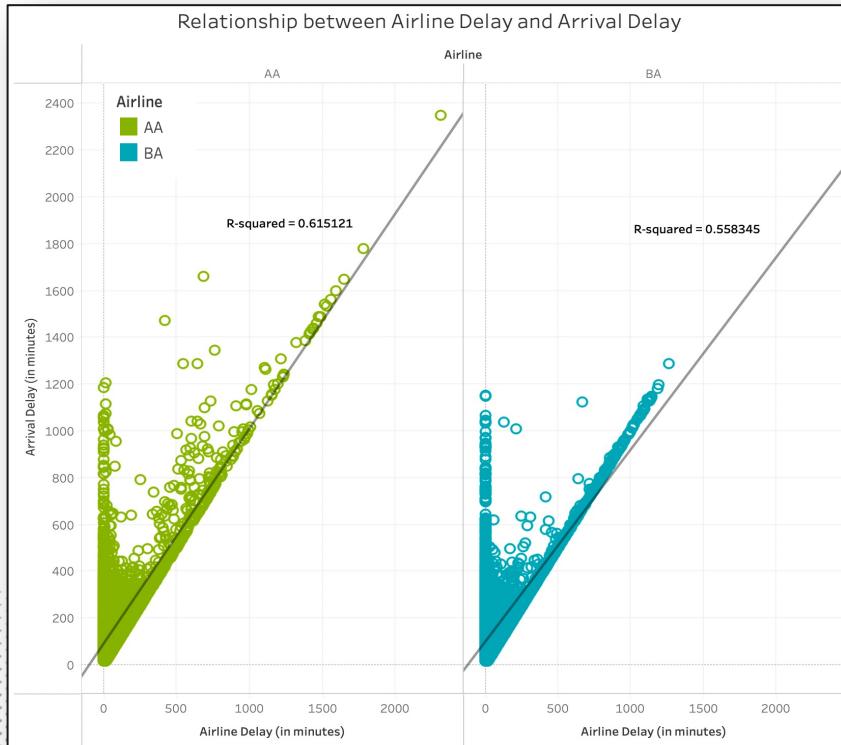
<https://www.cabincrewings.com/blog/long-haul-vs-short-haul-flying/>

<https://www.going.com/glossary/legroom-on-a-plane>

[A report by McKinsey](#)

Arrival Delays

Insight : Airline delay is **directly proportional** to arrival delay



Observations

There is a moderately strong positive linear relationship between airline delays and arrival delays.

The high R-squared values for both AA and BA indicates that a high proportion of variance in arrival delays can be explained by airline delays in the linear regression model.

Arrival Delays

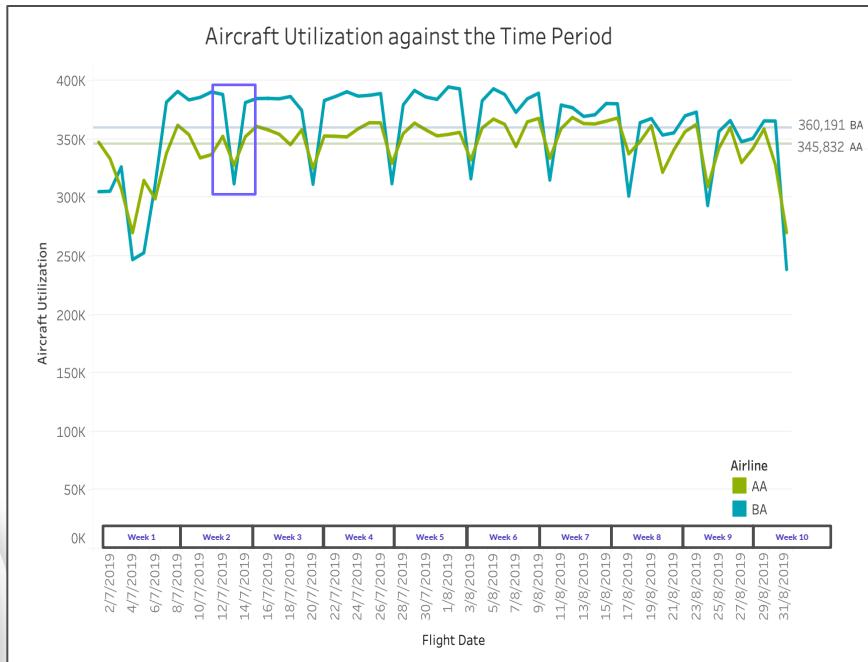
Average Airline Delay of Each Tail Number in Each Week

Week	Tail Number							
	N273AY	N293AY	N347AN	N725AN	N762AN	N787AL	N821AN	N830AN
1						0.0	10.7	0.0
2			9.0			244.3		19.5
3		424.3			8.7	18.2	215.3	145.0
4		0.0	46.8		407.0	3.7	64.0	0.0
5			10.7			16.7	6.0	54.0
6		0.0					9.8	8.0
7	214.5	0.0	354.0	0.0	13.0	369.7	28.5	
8	82.0		5.0	105.5		0.0	0.0	78.3
9			44.7		0.0		0.0	63.3

- During the first week, the average airline delay is the least because there are only a few flights possibly due to 4th of July (US Independence Day)
- 4 of the top 8 aircrafts that cause airline delay the most are old

Aircraft Utilisation

Insight: Acorn Airlines can **further optimise** its aircraft utilization when compared to Berry Airlines



Acorn Airlines experiences a less significant drop in aircraft utilisation closer to the weekend compared to Berry Airlines

There are two possible factors that could cause this:

- A higher volume of flights scheduled in the weekends
- A higher number of aircrafts are grounded on the weekends