

Business Problem

Airline companies operate a diverse fleet of airplanes from small jets to medium sized ones and have been offering good quality air travel services for a long time. Their primary goal is to make sure passengers have safe and comfortable, and convenient flights. But now they are facing challenges due to various factors like

1. New environmental rules are stricter
2. Taxes on flights have gone up
3. Increase Interest rates (so borrowing money is more expensive)
4. Fuel prices have increased
5. It's harder to find workers in a tight labour market as wages rising

As a result, it is harder for airlines to earn good revenue. To solve this, they want to look at their data and figure out how to fill more seats on each flight (increase the “occupancy rate”). If more seats are sold per flight, they can make more profits from each trip and improve their overall profits.



Main Challenges

1. **Stricter Environmental Regulations** : The airline industry is under growing pressure to reduce its carbon emission. As a result, stricter environmental regulations have been introduced, leading to higher compliance costs, operational restrictions and limited room for fleet expansion.
2. **Rising Flight Taxes** : To address climate concerns and boost government revenue, many countries are imposing heavier taxes on air travel. These increased taxes raise the overall cost of operations, which may reduce customer demand and hurt profitability.
3. **Tight Labor Market and Rising Labor Costs** : The aviation industry is facing a shortage of skilled professionals, such as pilots, engineers, and maintenance staff. This talent gap has driven up wages and turnover rates, making it harder to maintain consistent staffing levels while managing personnel expenses.

Objectives

1. **Increase Occupancy rate** : Fill more seats on each flight to boost average profits per seat and reduce the impact of rising costs.
2. **Optimize Pricing Strategy** : Create a smart pricing plan that reflects market trends and customer needs to attract and retain customers.
3. **Enhance Customer Experience** : we need to focus on the entire experience from booking to arrival as smooth and enjoyable as possible to stand out from competitors and build customer loyalty.

The ultimate goal of this task would be to identify opportunities to increase occupancy rate on low-performing flights, which can ultimately lead to increased profitability for the airline.

Basic Analysis

The initial data analysis offers key insights into our fleet and revenue trends. It highlights the number of aircraft with over 100 seats, tracks how ticket bookings and total revenue have changed over time, and reveals the average fare per aircraft under different fare conditions.

These insights are valuable for identifying opportunities to increase occupancy rates and optimize pricing strategies for each aircraft type.

Table 1 provides a breakdown of aircraft with more than 100 seats, along with their exact seat capacities.

Table 1

Aircraft Code	Number of Seats
319	116
320	140
321	170
733	130
763	222
773	402

To better understand trends in ticket bookings and the resulting revenue, we used a line chart visualization. The analysis revealed a steady increase in ticket bookings from June 22 to July 7, followed by a relatively stable period from July 8 through August. A clear peak is observed during this period(maybe due to a nearby festival), marking the highest number of tickets booked on a single day. Since revenue is closely linked to ticket sales, the revenue trend closely mirrors the booking trend over this time period. These findings indicate that analyzing the factors behind the booking peak could uncover valuable insights to help boost overall revenue and improve operational planning.

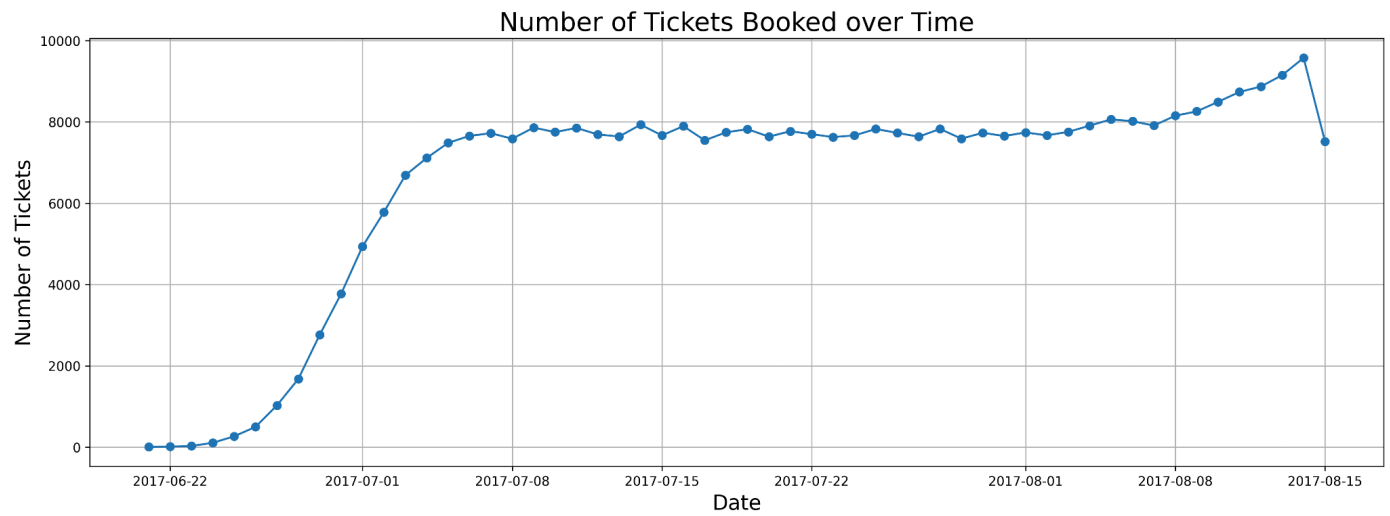


Figure 1

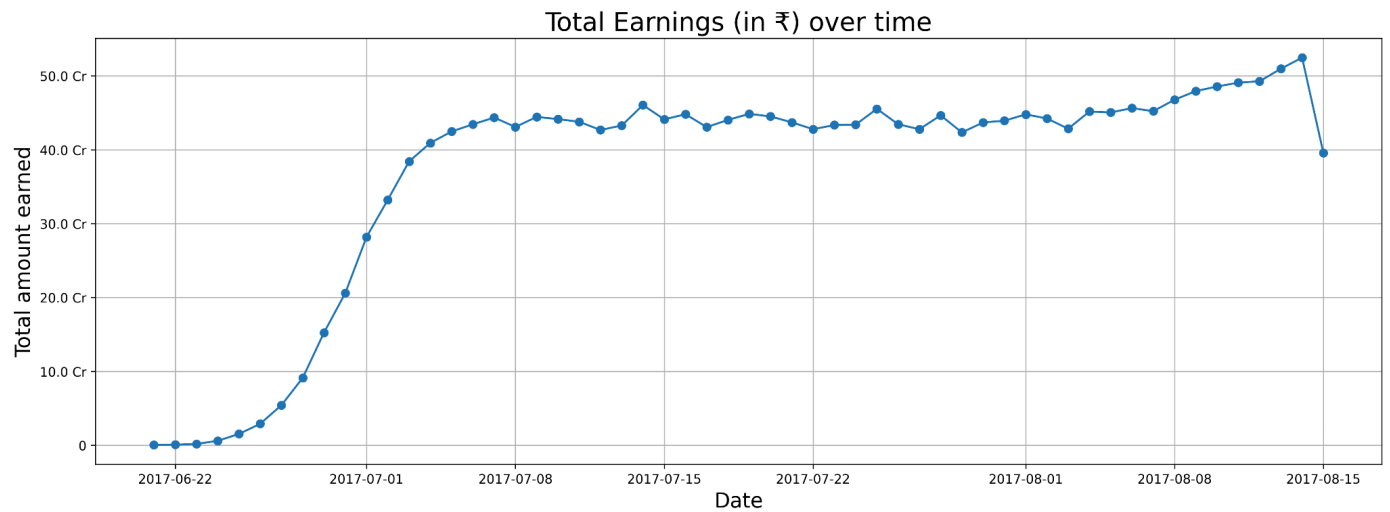


Figure 2

After calculating the average fare for each aircraft under different fare conditions, we created a bar chart to visually compare the results. Figure 3 illustrates the average fares for three classes: business, economy, and comfort. Notably, comfort class is only offered on the 773 aircraft, while CN1 and CR2 provide only economy class fares. Across all aircraft, business class consistently shows higher average fares than economy class, highlighting a clear pricing hierarchy regardless of the aircraft type. These insights can guide fare optimization by understanding which aircraft and fare combinations offer the greatest pricing leverage.

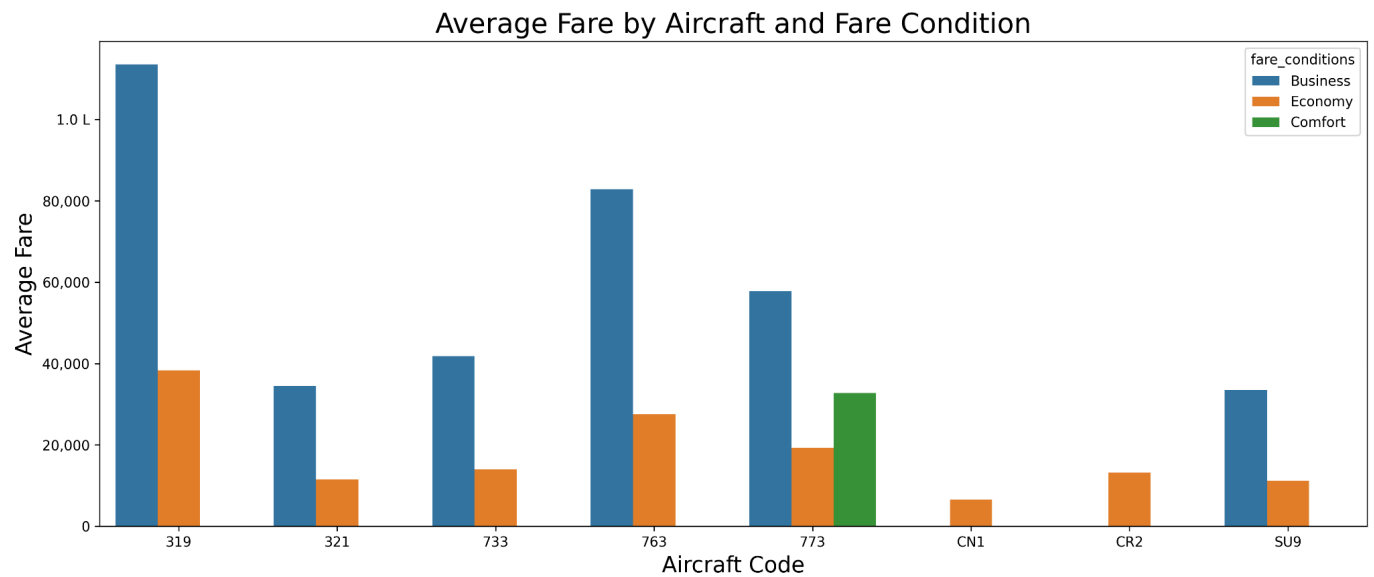


Figure 3

Revenue and Occupancy Analysis

To improve profitability, airlines need to closely examine their revenue streams. Two key metrics to consider are:

1. Total yearly revenue
2. Average revenue per ticket per aircraft

By analyzing these, airlines can identify which aircraft types and routes bring in the most income. This helps in making informed decisions about pricing, scheduling, and resource allocation.

Figure 4 shows total revenue, number of tickets sold, and average revenue per ticket for each aircraft.

The SU9 aircraft generated the highest revenue. From earlier analysis (Figure 3), we know that SU9 has the lowest prices for both business and economy class, which may have attracted more passengers. On the other hand, CN1 earned the least revenue, likely because it only offers low-cost economy class and may have limited features or comfort.

	aircraft_code	ticket_count	total_revenue	avg_revenue_per_ticket
0	319	52853	2706163100	51201
1	321	107129	1638164100	15291
2	733	86102	1426552100	16568
3	763	124774	4371277100	35033
4	773	144376	3431205500	23765
5	CN1	14672	96373800	6568
6	CR2	150122	1982760500	13207
7	SU9	365698	5114484700	13985

Figure 4

Occupancy Rate Insights :

Another crucial metric is the occupancy rate, which tells us how well the seats on an aircraft are being filled. It's calculated as:

$$\text{Occupancy Rate} = (\text{Booked Seats} / \text{Total Seats}) * 100$$

Higher occupancy means fewer empty seats, leading to better revenue and lower cost per seat.

Figure 5 shows the average occupancy for each aircraft. This metric helps airlines identify opportunities to boost load factors through better scheduling, pricing, or service improvements.

	aircraft_code	booked_seats	num_seats	occupancy_rate
0	319	53.58318098720292	116	46.19
1	321	88.80923076923077	170	52.24
2	733	80.25546218487395	130	61.73
3	763	113.93729372937294	222	51.32
4	773	264.9258064516129	402	65.9
5	CN1	6.004431314623338	12	50.04
6	CR2	21.48284690220174	50	42.97
7	SU9	56.81211267605634	97	58.57

Figure 5

Impact of Increasing Occupancy :

To explore the potential upside, we simulated a 10% increase in occupancy across all aircraft. The result, shown in the next figure, demonstrates a clear increase in total revenue.

This suggests that even a small improvement in occupancy can significantly boost profitability. Therefore, airlines should focus on optimizing pricing strategies and operations to drive higher seat utilization.

	aircraft_code	booked_seats	num_seats	occupancy_rate	Inc	occupancy_rate
0	319	53.58318098720292	116	46.19		50.809
1	321	88.80923076923077	170	52.24		57.464
2	733	80.25546218487395	130	61.73	67.90299999999999	
3	763	113.93729372937294	222	51.32		56.452
4	773	264.9258064516129	402	65.9	72.49000000000001	
5	CN1	6.004431314623338	12	50.04		55.044
6	CR2	21.48284690220174	50	42.97	47.266999999999996	
7	SU9	56.81211267605634	97	58.57		64.427

Figure 6

Conclusion

In summary, analyzing key revenue metrics such as total yearly revenue, average revenue per ticket, and average occupancy per aircraft is essential for improving airline profitability. These insights help identify areas for improvement and guide better pricing and route decisions.

One of the most effective ways to increase profit is by improving occupancy rates, as filling more seats boosts revenue and reduces losses from empty ones. However, pricing needs to be carefully adjusted, too high or too low fares can both reduce demand. Prices should reflect the condition and service level of each aircraft, offering a fair value to passengers.

Importantly, efforts to increase occupancy must not compromise customer satisfaction or safety. Airlines should aim for a balance between profitability and service quality. By using a data-driven approach to optimize pricing and operations, airlines can stay competitive and achieve sustainable growth in the long run.