



Aircraft Safety Risk Analysis

Using historical aircraft accident data to make better purchasing decisions.



INTRODUCTION



The company plans to expand into new industries to diversify its portfolio by purchasing and operating airplanes for commercial and private enterprises but do not know anything about the potential risks of aircraft. Selecting improper aircrafts may lead to accidents frequently happening. The purpose of this project is to identify the types of aircraft that have the least operational risk based on the dataset obtained from past aviation accidents.

The Head of the Aviation Division is the main stakeholder and he will use the findings of this research to make informed decisions in purchasing aircrafts. Choosing the best aircrafts is the main goal of the research since there will be less risks and the company will be able to enter the market easily.



DATA UNDERSTANDING

The data used was obtained from Kaggle. The dataset contains records of aviation accidents that happened in the past. The data is stored in an excel file named flights.csv. The dataset has information about the accident date (acc.date), type of plane (type), aircraft registration (reg), operator, fatalities (fat), location and damage outcomes (dmg). The dataset is perfect for this analysis since it portrays real word safety performance of different aircrafts.

Unnamed: 0	acc.date	type	reg	operator	fat	location	dmg
0	0	3 Jan 2022	British Aerospace 4121 Jetstream 41	ZS-NRJ	SA Airlink	0	near Venetia Mine Airport sub
1	1	4 Jan 2022	British Aerospace 3101 Jetstream 31	HR-AYY	LANHSA - Línea Aérea Nacional de Honduras S.A	0	Roatán-Juan Manuel Gálvez International Airport sub
2	2	5 Jan 2022	Boeing 737-4H6	EP-CAP	Caspian Airlines	0	Isfahan-Shahid Beheshti Airport (IFN) sub
3	3	8 Jan 2022	Tupolev Tu-204- 100C	RA- 64032	Cainiao, opb Aviastar-TU	0	Hangzhou Xiaoshan International Airport (HGH) w/o
4	4	12 Jan 2022	Beechcraft 200 Super King Air	NaN	private	0	Machakilha, Toledo District, Graham Creek area w/o

The dataset has 2500 records of data. One limitation found was that the data didn't have any information about number of flights per the aircrafts which makes this research focused on the risk patterns instead of accident probabilities which would have been more useful.



DATA PREPARATION

The dataset was first cleaned by retaining only the relevant columns needed for the data analysis for better understanding. Initially there were eight columns then after dropping the irrelevant ones we remained with five columns. To enable the calculation of the data, the accident dates were translated from text to a regular date format and the fatalities column was translated from text to numbers.

The fatalities columns had missing values which were replaced with zero instead of dropping the columns because when it comes to reporting aviation accidents, the number of fatalities is normally recorded hence missing values are more likely to indicate no fatalities. By this we are able to maintain valid records and not underestimate frequency of accidents for better accuracy.

Rows in which there was a missing accident date or operator data were kept since those variables were not key in assessing aircraft risk and eliminating such rows would have lost valuable data.



DATA ANALYSIS

After data cleaning, data analysis was done. The analysis involved accident incidences, total deaths, and damage consequences among aircrafts and the following findings were made:

FINDINGS

- Certain types of aircrafts have a very lower number of accidents and deaths compared to others.
- Planes that record fewer accidents also face less serious impacts of accidents, which means they have less operational risk.

RECOMMENDATIONS

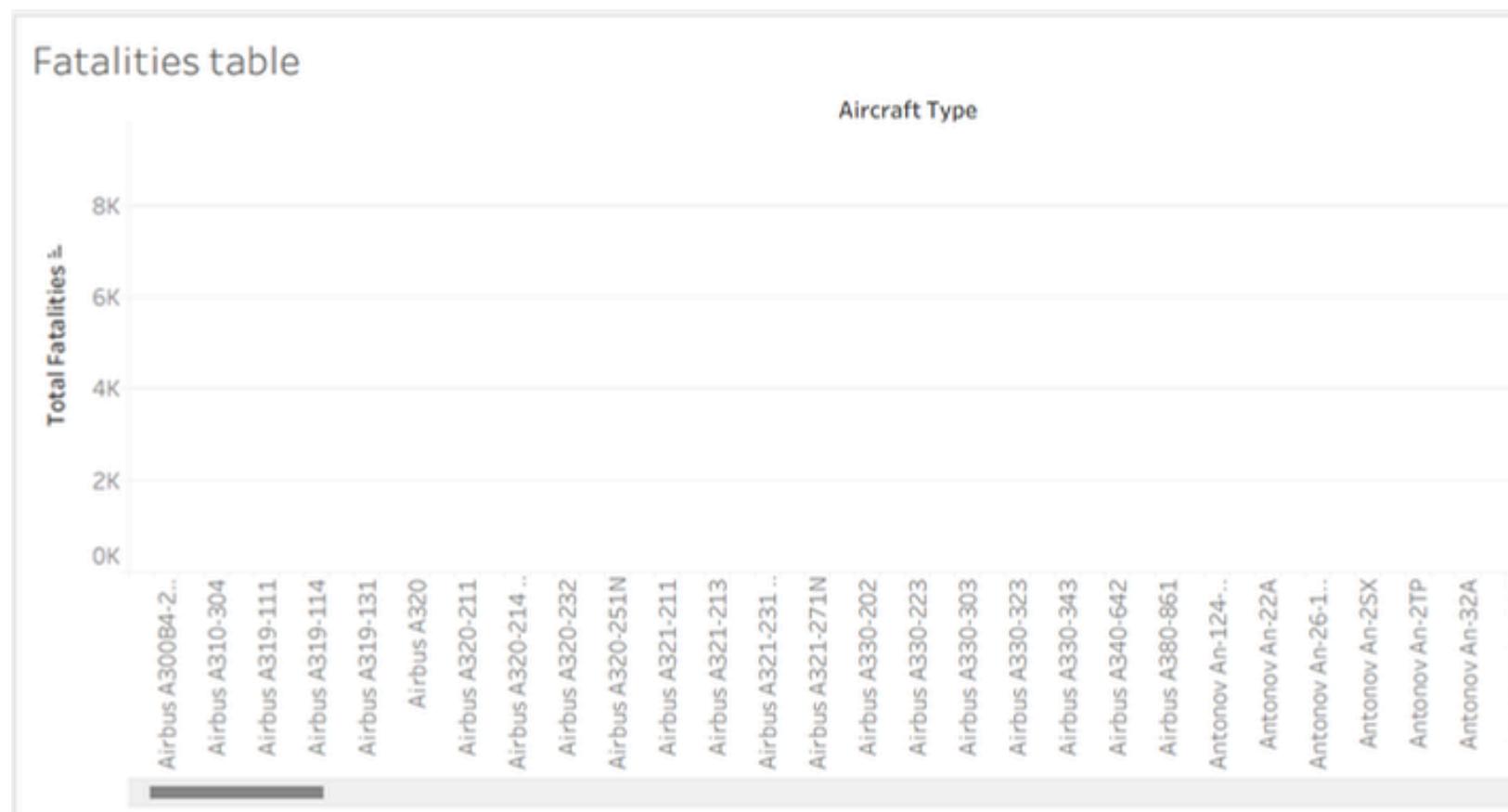
- The company must focus on buying types of aircrafts which have low frequency of accidents.
- Aircrafts with a record of high fatalities must not be flown or purchased, even in the case of fairly infrequent accidents.
- Aircrafts that receive less serious damage consequences should be purchased in order to minimize the costs of repairs as well as the time spent offline.

These recommendations will enable the company to minimize safety risks, lessen the financial exposure and most importantly developing a good aviation portfolio

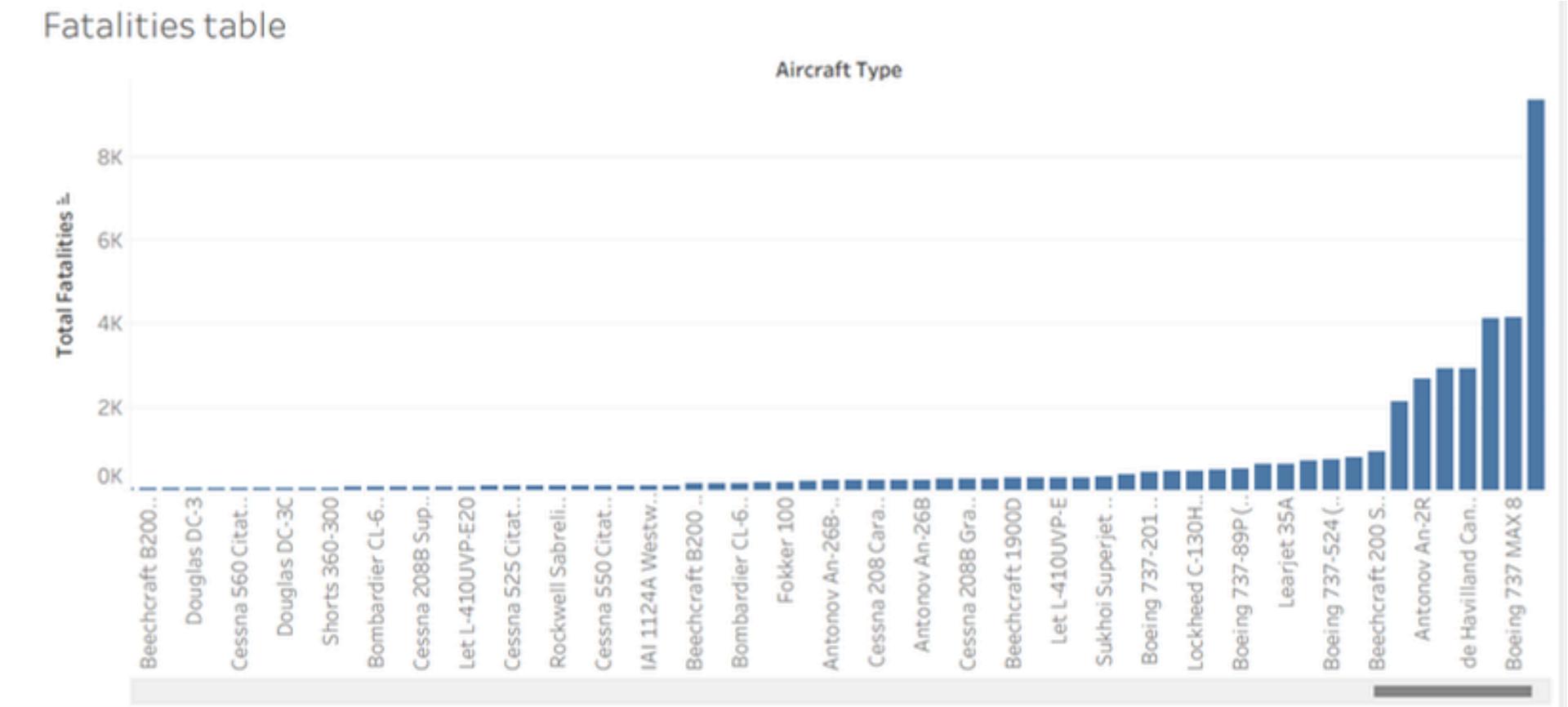


DATA VISUALIZATION

Aircrafts With Lowest Fatality Rate

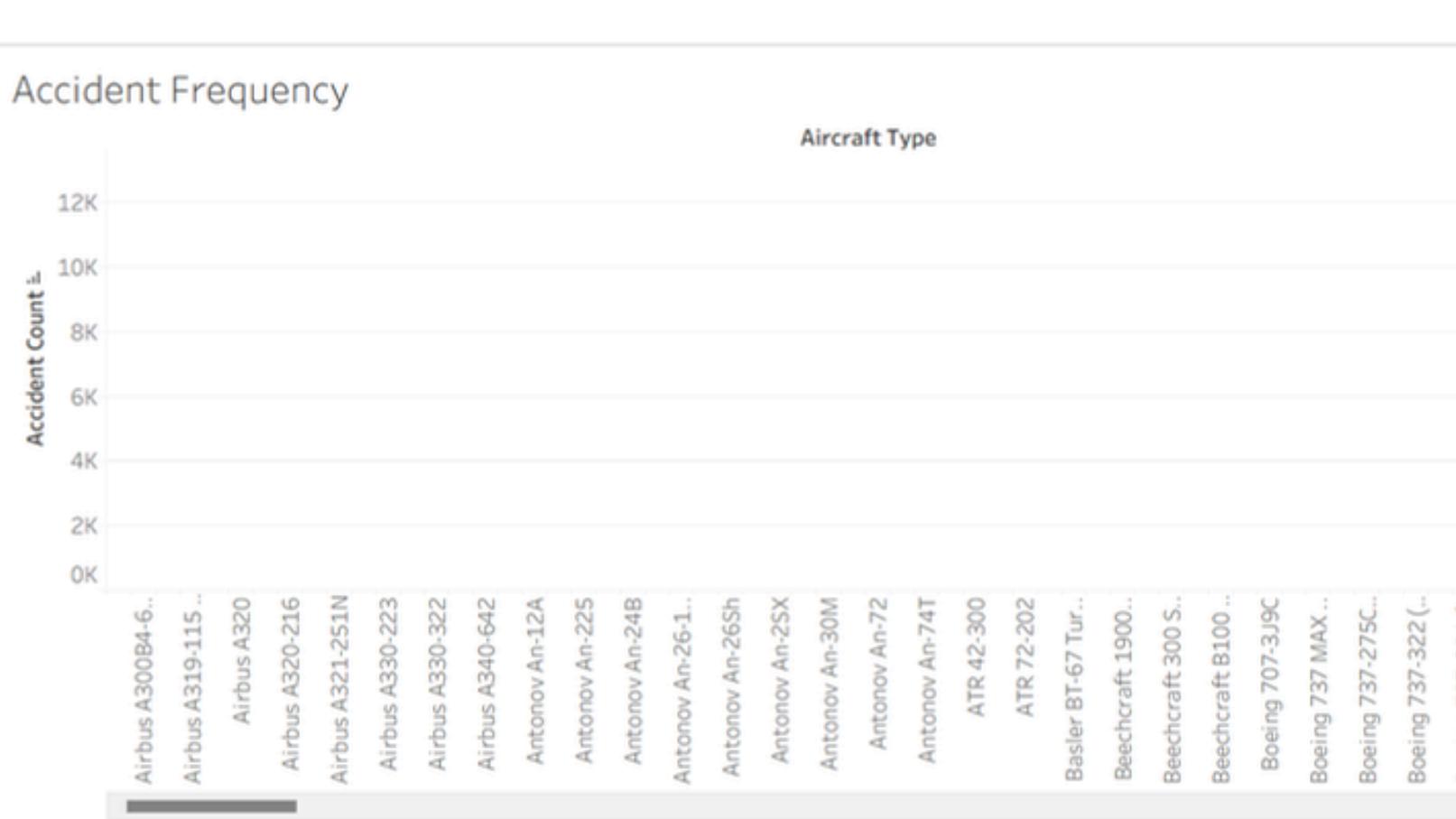


Aircrafts With Highest Fatality Rate

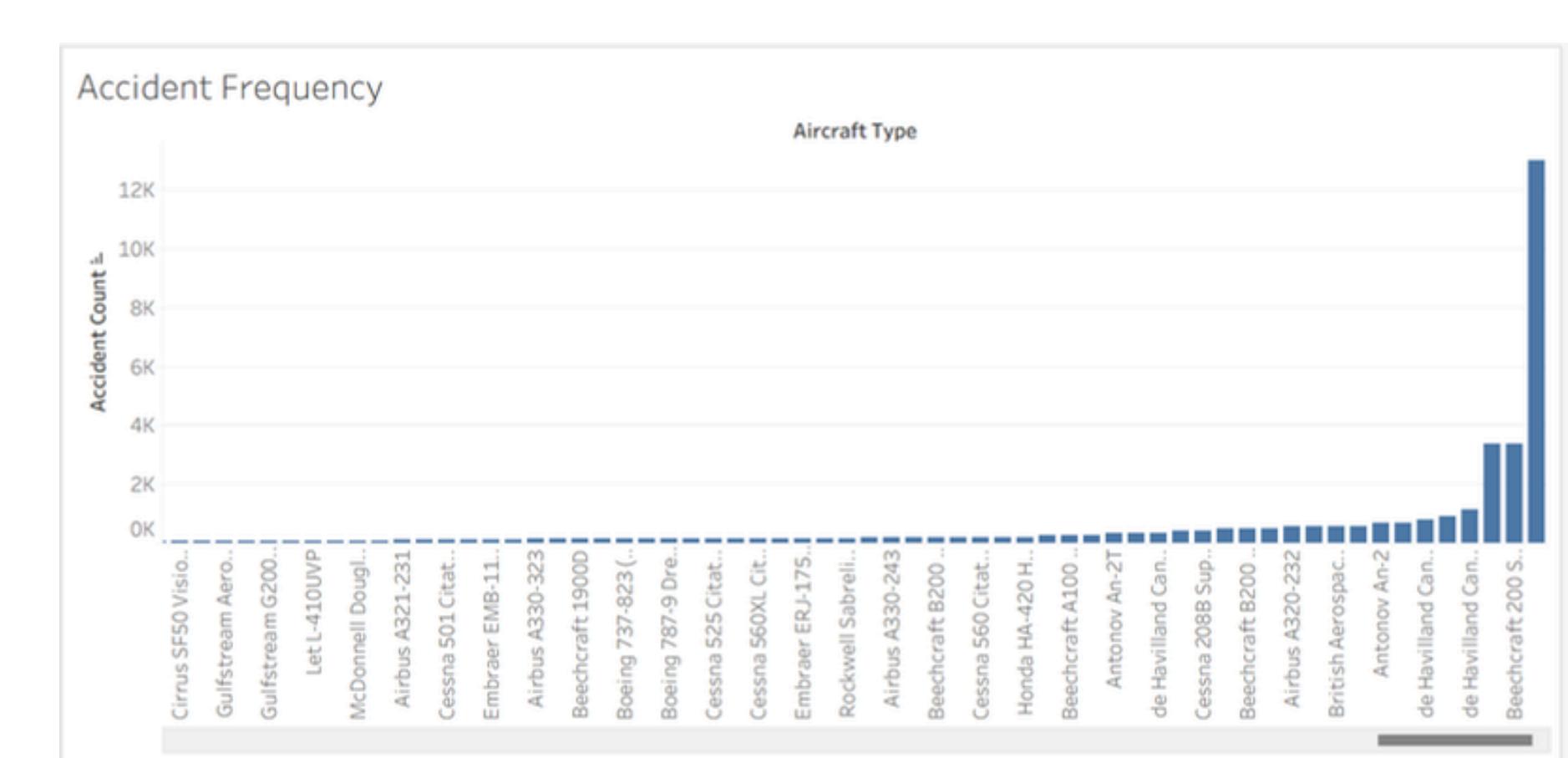


DATA VISUALIZATION CONTINUATION..

Aircrafts With Lowest Accident Frequency



Aircrafts With Highest Accident Frequency





CONCLUSION



In conclusion, aircrafts which demonstrate lower rate of accidents and few fatalities are safer options when venturing into the aviation industry. With a stronger focus on such planes, the company will be able to minimize risks in safety, manage costs and develop a stable aviation activity.

Recommended aircraft types to consider:

- Boeing 737 series
- Boeing 777 variants
- Airbus A320 family
- Airbus A340 family
- Embraer regional jets
- De Havilland Dash 8 models



Thank You