AirCraft Risk Assessment

Analysis For Risk Levels of Models/Makes in the Aviation Industry Using Aviation_Data from the National Transport Safety Board.

Introduction

This project seeks to guide the company as it ventures into operation of commercial and private airplanes. The main focus is on comparing the risk levels of different aircraft makes and come up with aircraft models that present the lowest risk and highest potential for successful operations.

Using Exploratory Data Analysis(EDA), the dataset from the National Transportation and Safety Board is used to profile the Aircraft models into either low risk or high risk depending on the number of accidents recorded.

Key Objectives of the Project

- Determine the lowest-risk aircraft options for the company's expansion into the aviation industry.
- Evaluate various Aircraft Models in terms of reliability and market reputation by looking into the number of accidents the model was involved in over time.
- Use Exploratory Data Analysis(EDA) to clean the dataset, aggregating and formulating visualization tools for a clear presentation.
- Create an interactive dashboard so that the users can explore the analysis.
- A summary of the key insights from the Analysis and recommendations for the company.

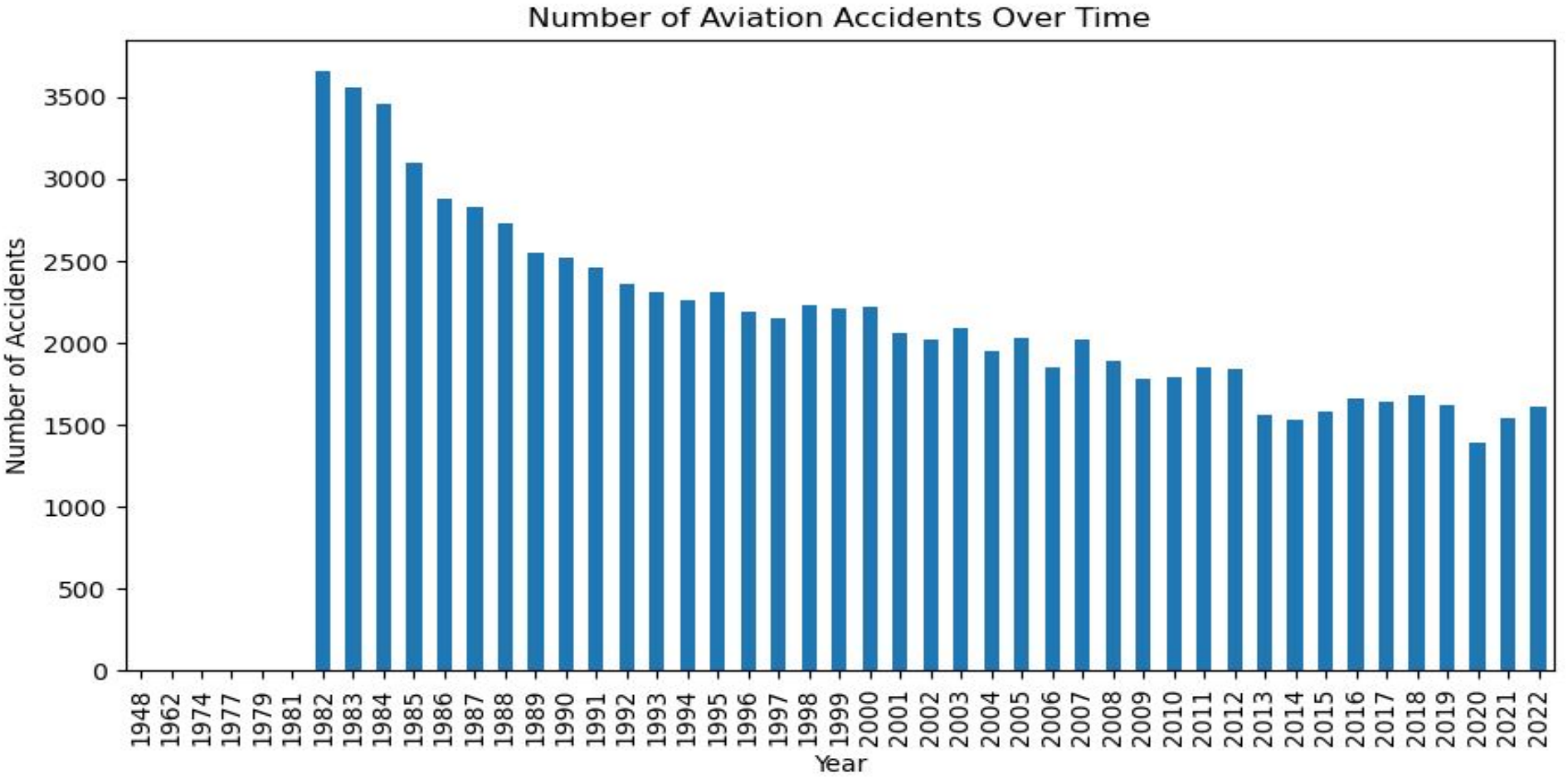
The Aviation_Data.CSV Dataset

From the csv file used in this project, there are a total of 90348 entries and 32 columns. Using EDA skills, the following steps were performed ;

- Getting rid of all columns with a threshold of more than 30% missing values.
- Treat the remaining Null values with mean for all numerical columns and mode for categorical columns.
- Look for duplicates and drop them from the dataset.
- Treat the outliers using the Interquartile Range (IQR).
- Save the cleaned data frame into a new CSV file and name it aviation_data.csv. This is the new data frame we will use in our analysis and presentation.

Let’s see the graphical presentations.

Number of accidents since 1948



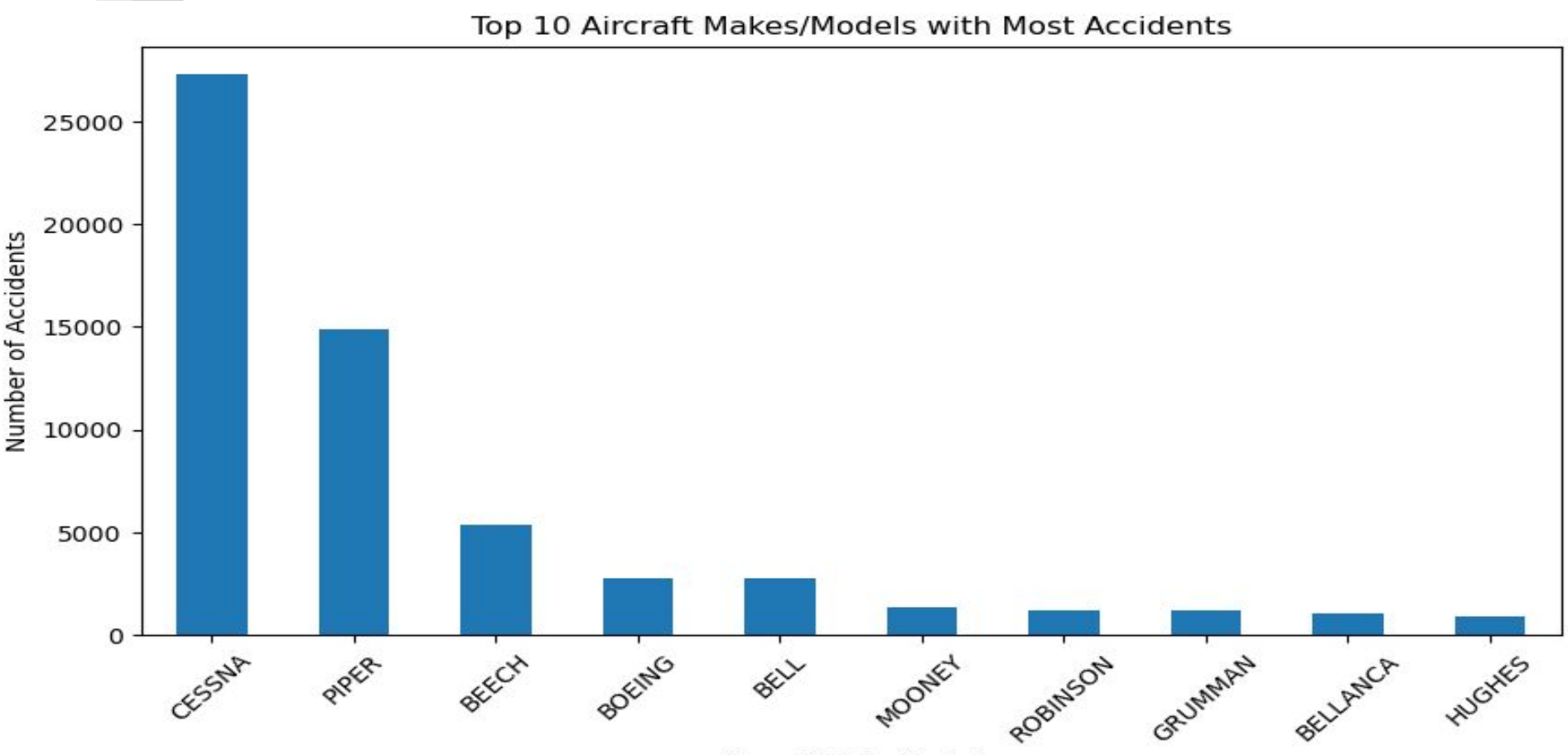
Number of Accidents trend over the Years

The graph above shows the number of accidents plotted against the years starting from 1948. This period is significant in aviation history.

After World War II, commercial aviation grew using mostly ex-military aircraft to transport people and cargo. But 1982 saw the spreading of the digital revolution both in flight avionics and in aircraft design and manufacturing techniques. The last quarter of the 20th century saw a change of emphasis. No longer was revolutionary progress made in flight speeds, distances and materials technology.

At the beginning of the 21st century, digital technology allowed subsonic military aviation to begin eliminating the pilot in favour of remotely operated or completely autonomous unmanned aerial vehicles (UAVs). The development of modern technologies in the aviation industry over the years explain the reduction of number of accidents since 1982.

Top 10 Aircraft Makes with Most Accident Occurrences

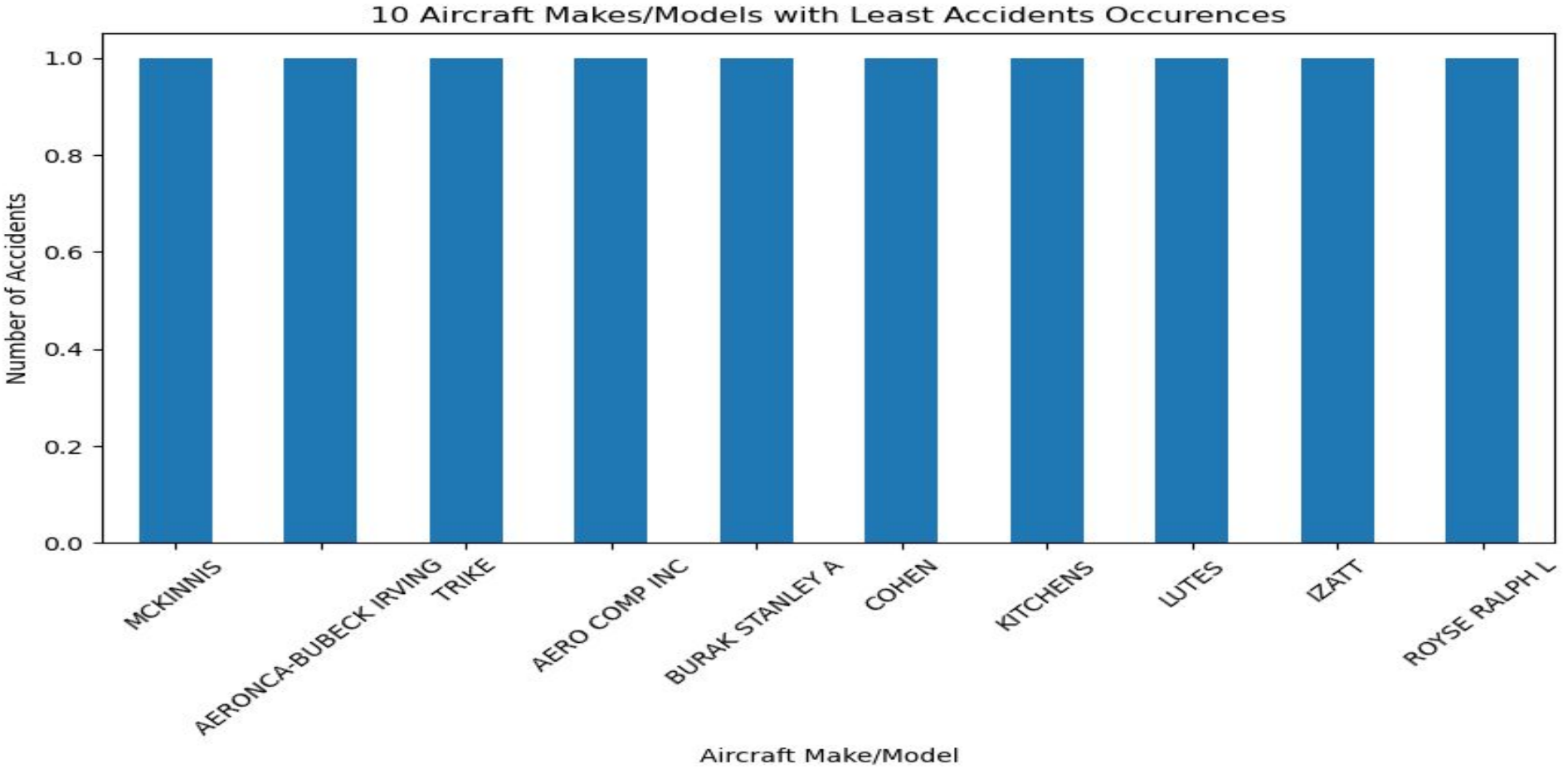


What does the graph show?

The above graph illustrates the top 10 Aircraft models/makes with the highest number of accidents. It is clear that;

- Cessna model has the highest number of accidents which is over 25000 and can be classified as high risk.
- The Piper Aircraft model follows with 15000 occurrences.
- Beech model records about 5000 occurrences.
- Other aircraft models such as Boeing, Bell, Mooney, Robinson, Grumman, Bellanca and Hughes follow with below 5000 number of accidents.

Top 10 Aircrafts with Least Accident Occurrences

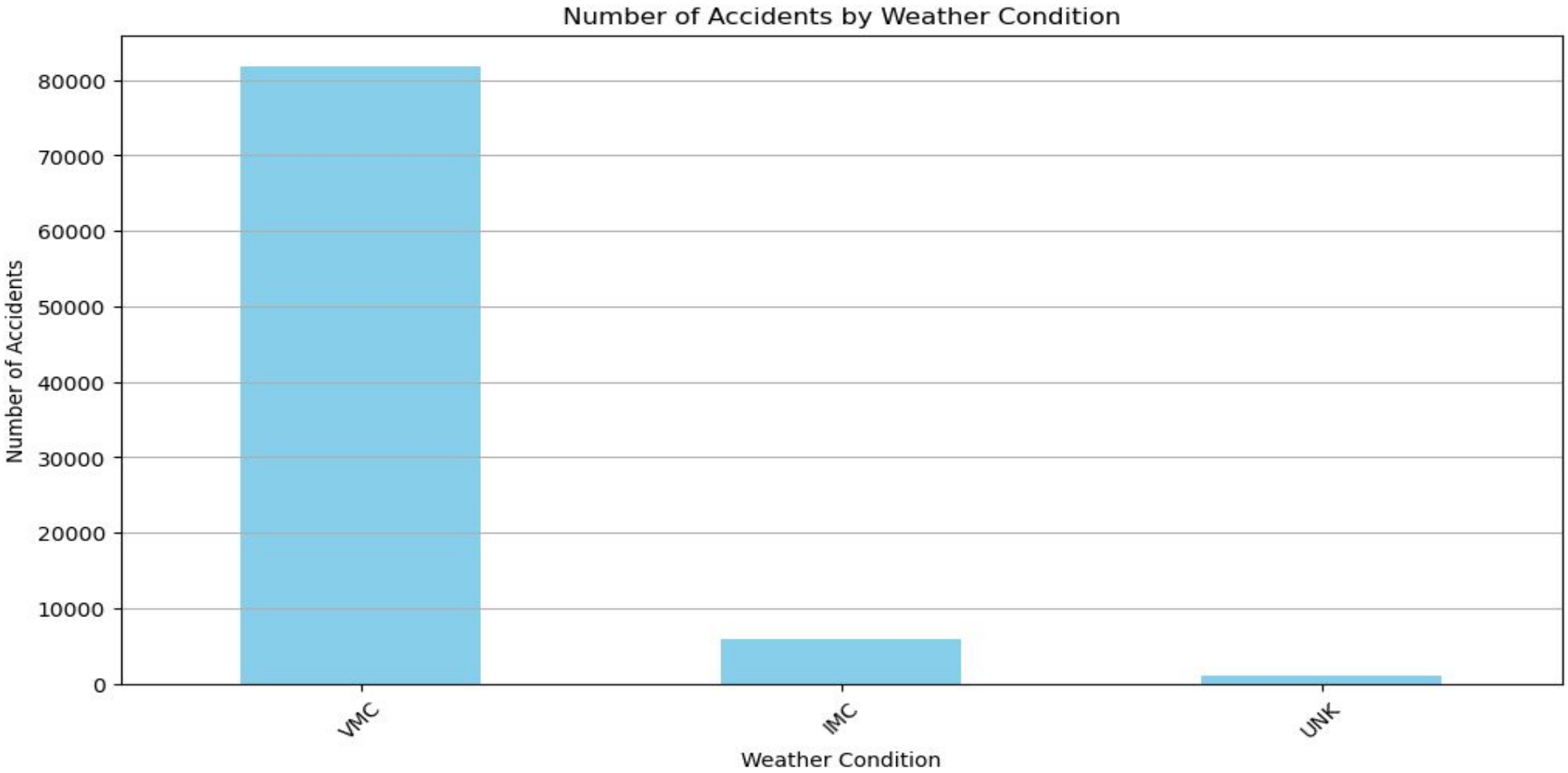


Aircraft with few number of accidents

From the above graph, the following observations can be made;

- The 10 aircraft models on the graph have only one accident occurrence.
- From the data analysis there is a total of 6133 number of Aircraft models that have less than 2 accident occurrences.
- These models can be classified as low risk from the low number of accidents they recorded.

Number of Accidents per Weather Condition



Weather Conditions

In aviation, Instrument Meteorological Conditions (IMC) are weather conditions that require pilots to fly primarily by reference to flight instruments, and therefore under instrument flight rules (IFR), as opposed to flying by outside visual references under visual flight rules (VFR). Visual meteorological conditions (VMC) is an aviation flight category in which visual flight rules (VFR) flight is permitted—that is, conditions in which pilots have sufficient visibility to fly the aircraft maintaining visual separation from terrain and other aircraft. From the above graph, the number of accidents occuring from VMC are high compared to IMC weather conditions.

Conclusions

From the analysis the following conclusions were made;

- The Cessna Aircraft Model has a bad reputation from the high number of accidents it is involved in.
- There are at least 6000 Aircraft models the company can choose from. Further Analysis would be required to determine the operation cost and customer preferences either in personal or commercial flights.
- The number of accidents were higher when there was clear visibility and therefore poor weather conditions did not contribute to high number of accidents. The high number of accidents would be due to other reasons.

Recommendations

From the analysis of the aviation dataset, the following are the recommendations.

1. The company need to watch out for the aircraft models with high number of accident occurrences since they reflect vulnerability. These include Cessna, Piper and Beech models which have recorded over 5000 number of accidents since 1948.
2. The aviation industry improves with time as seen from the reduction of number of accidents from 1982. Therefore it is good to keep on researching for new model production with high level of efficiency and reliability.
3. Operational cost was not covered by this analysis and therefore more analysis need to be undertaken to include the operation and maintenance costs of aircrafts for a better and informative decision to be made.

Acknowledgement

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