Aircraft Accidents Risk Analysis

Aviation Risk Analysis for Business Expansion

Presented By:Teresia Njoki
Date:24./03/2025

Project Overview

This project aims to support strategic business expansion into the aviation industry by identifying the safest aircrafts models for investment.It uses historical aircraft accident data,the analysis explores accident patterns,injury counts and safety metrics to help the company make data driven decisions.

Business Objectives

1)Identifying the safest aircrafts for purchase

2)Analyzing accident data to determine risk factors

3)identifying the best route to travel commercially

4)Evaluating the impact of aircraft configuration,engine type and amateur built status.

Data Overview

Dataset used:

i)Source:Aviation-accident-database-synopses from kaggle

ii) Total Records 88,889

Key columns-Aircraft make,model,Total fatal injuries,longitude,latitude, Engine type ,number of engines etc

Data Cleaning/Reprocessing

Steps Taken

1)Displayed information of the Dataset to find out how many entries the dataset has and what each column represents.

2)Checked the data for duplicate,erroneous or missing values

3)Found some missing values in some columns dropped the ones with more than 50% of their data missing and are not critical for our analysis preservermed latitude & longitude.

4)Filled string columns with unknown and numerical columns with median value.

5)After cleaning saved it as a new csv file

Tools Used

Programming Language used-Python,Jupyter Notebook

Libraries:Pandas,Numpy,matplotlib,Seaborn and Tableau Dashboard.

Risk Analysis Methods Used

1)Risk analysis by aircraft model and manufacturer

2)Mechanical failure by Aircraft Type

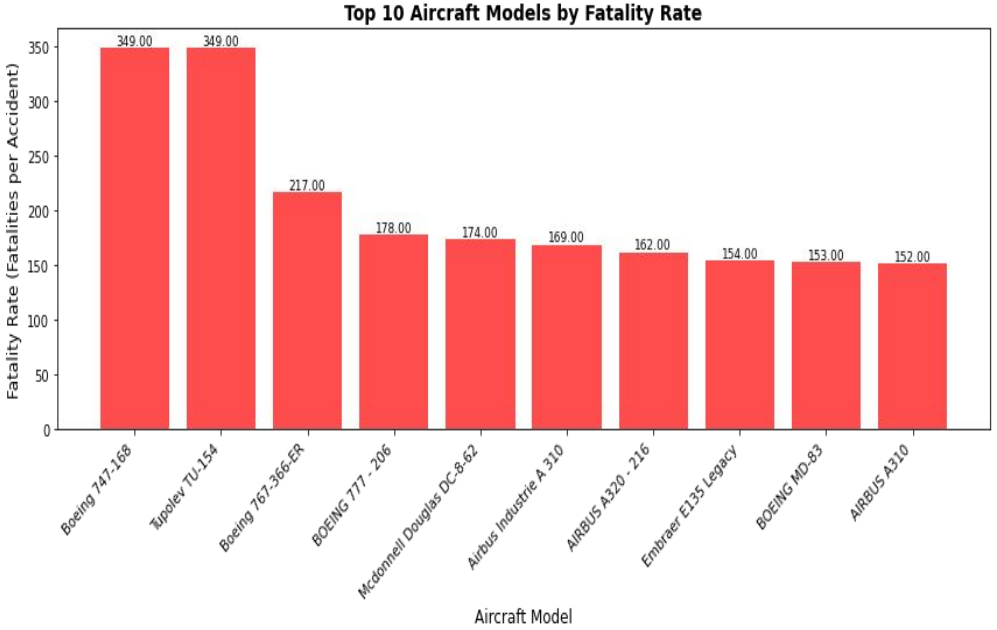
3)Accidents Hotspots by Location

4)Broad phase of aircraft

Risk Analysis by Model and Make

This presents top 10 fatalities by Make and Model

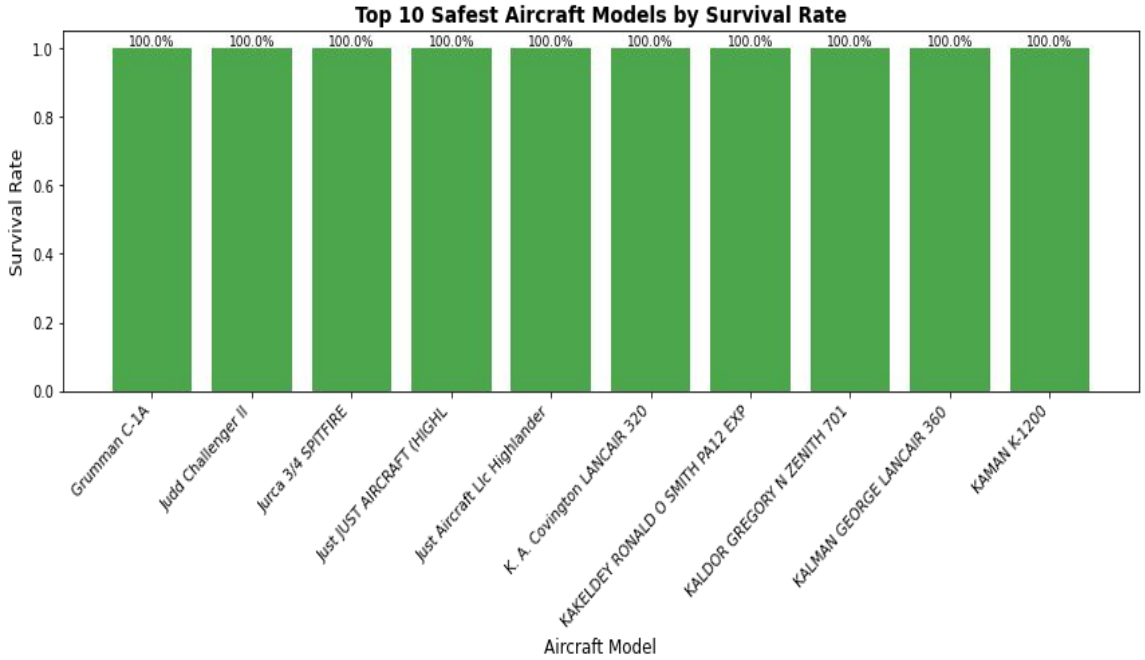
Boeing 747-168 leads the chat at 349, accidents, followed closely by Tupolev TU-154 and third place is Boeing 767-366ER at 217 deaths recorded.



Survival Rate by Aircraft Make and Model

This presents top 10 aircraft with the highest survival rates

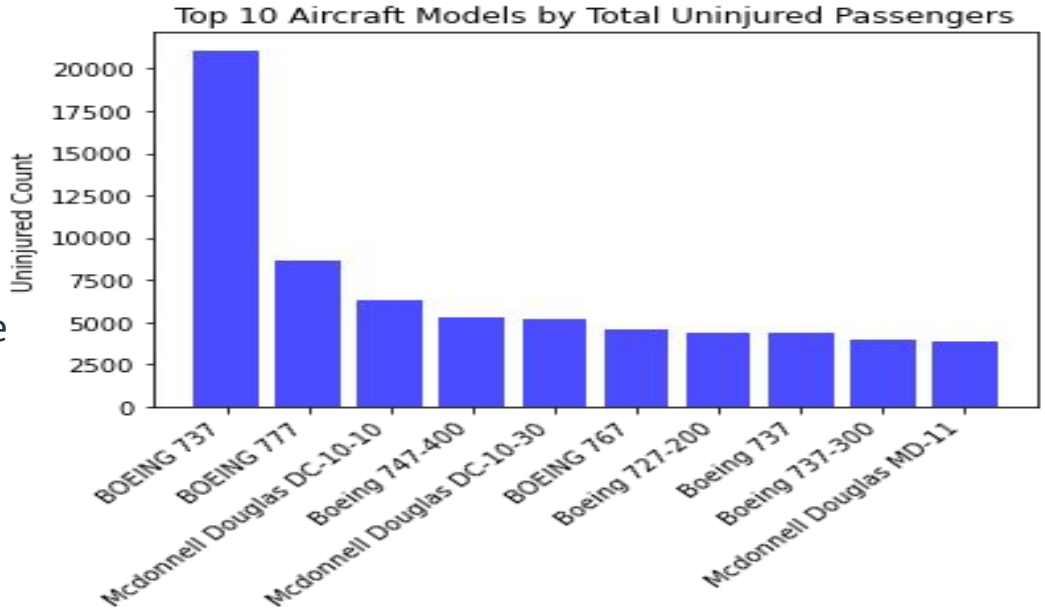
They are all at 100% meaning that the death rates are close to 0% and thus can be considered safe for travel



Top 10 Aircrafts by Total Uninjured

In this bar graph we display top 10 aircrafts by total number of uninjured passengers just so we can make a clear and conscience decision.

From our chart we can see that Boeing 737 is a more favourable choice



Average Fatalities by Make and Model

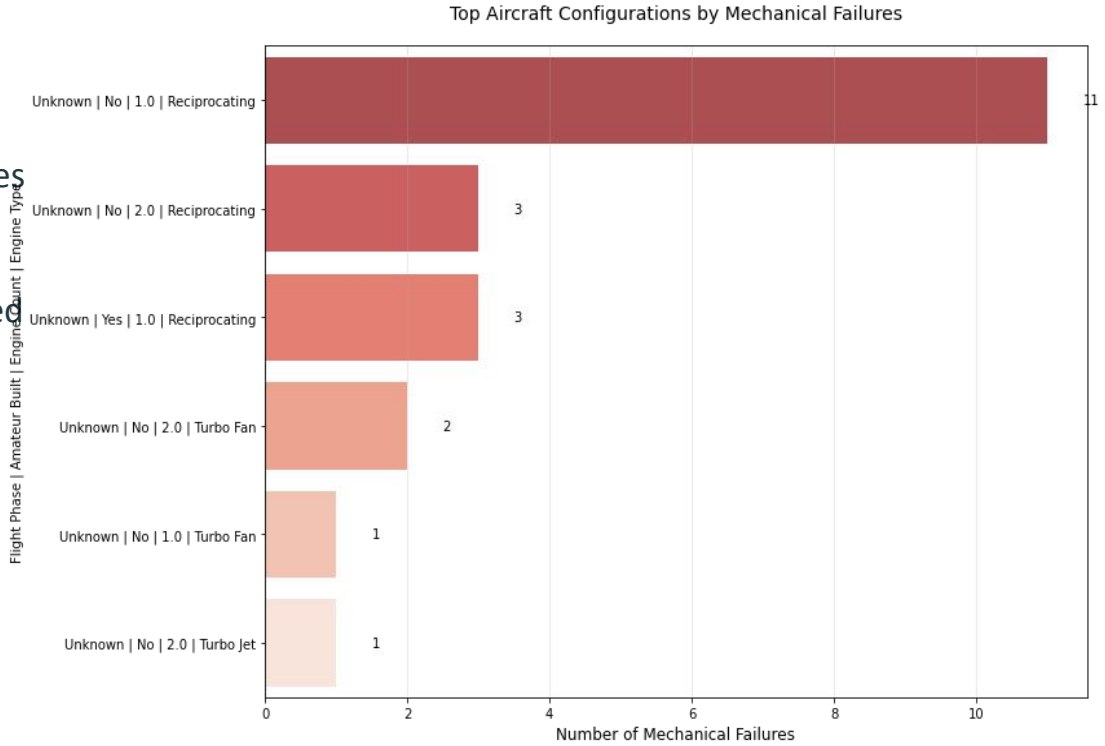
	Make	Model	Avg Fatalities
4077	Boeing	747-168	349
19048	Tupolev	TU-154	349
4179	Boeing	767-366-ER	217
2449	Boeing	777-206	178
13073	McDonnel Douglas	DC-8-62	174
1293	Airbus industrie	A310	169
325	Airbus	A320-216	162
8278	Embraer	E135 Legacy	154
2498	Boeing	MD-83	153
310	Airbus	A310	152

Survival Rate by Mechanical Failure

This presents top 10 aircraft fatalities based on mechanical failure

The mechanical failure is determined by broad phase of aircraft/engine type/no.of engines and amateur status of aircraft.

As observed single engine type of aircraft have recorded most deaths

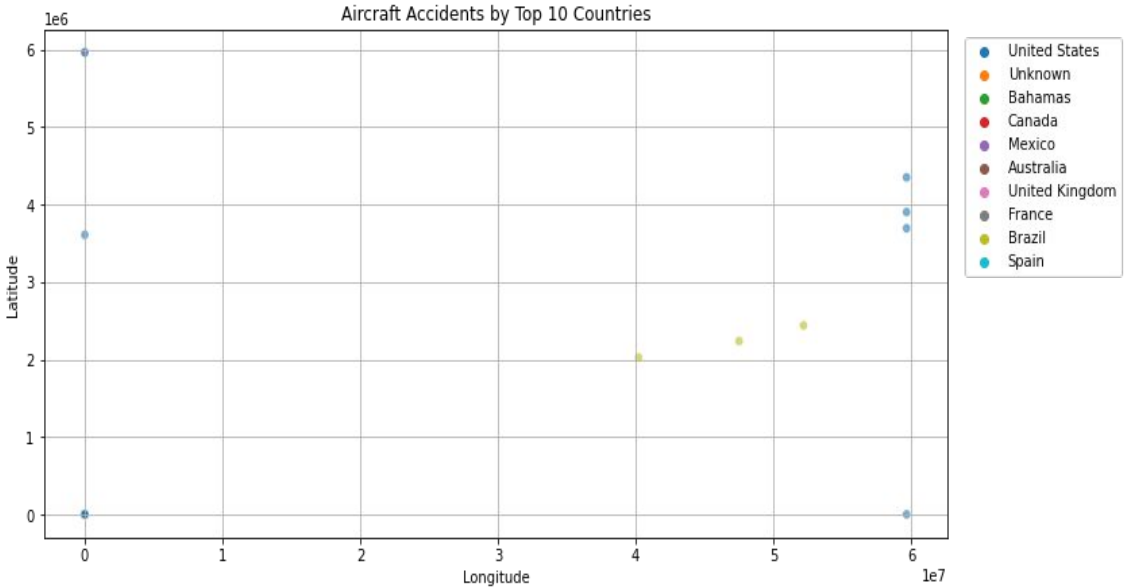


Accidents Hotspots By Location

Top 10 countries by aviation accident fatalities

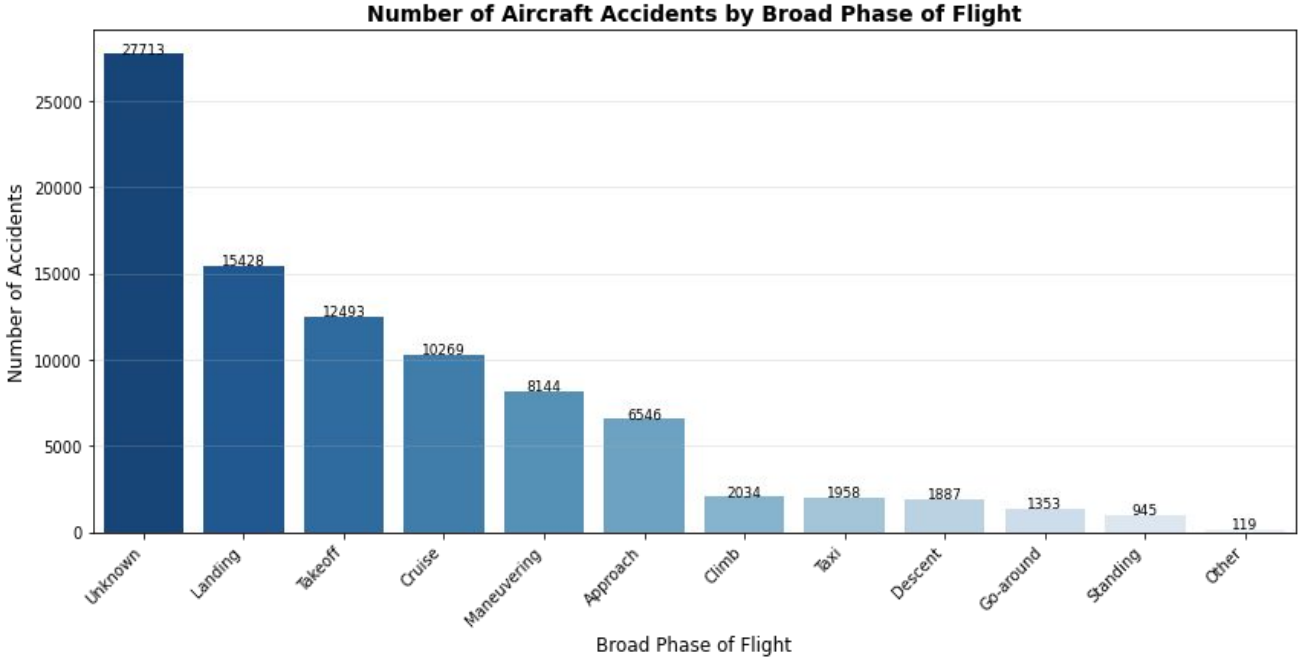
This gives as a breakdown of top 10 accident fatalities by using longitude/latitude and country.

From our observation Usa leads with total number of accidents recorded



Accidents by Broad Phase of Flight

From our observation we can observe that most accidents occur during landing with 15,428 records



Key Insights

1)Aircraft with certain manufactures have lower accident rates making them good candidates for purchase.

2)Single engine aircraft have high fatality rate compared to multi-engine aircrafts.

3)Amateur Built airplanes are generally safe to use.

4)United states has the highest number of accidents

Recommendations

1)Invest in multi-engine aircrafts

2)invest in aircrafts models historically with low accident rates

3)Conduct additional safety check ups during takeoff and landing

4)Develop a safety strategy for maintenance and operations

Conclusions

This analysis provides valuable insights into aviation risks.Future work can include more granular risk by aircraft age,maintenance records and weather conditions

Thank you.

Questions?