AIRCRAFT RISK ANALYSIS PROJECT

Business Expansion into Aviation

Overview

- This project was undertaken to support the company's expansion into the aviation industry by identifying the safest aircraft models for potential purchase. Using data-driven analysis of over 90,000 aircraft accident records from the National Transportation Safety Board (NTSB), covering the years 1962 to 2023, the project applied data cleaning, analysis, and visualization techniques to determine which aircraft types have the lowest risk of accidents and fatalities. The overall goal was to transform raw accident data into actionable business insights that can guide investment and operational decisions.

Business Understanding

- The company aims to diversify into the aviation sector by operating both commercial and private aircraft. However, management lacks detailed knowledge about the relative safety of various aircraft types. The business problem, therefore, is to identify aircraft models with the lowest accident and fatality risk. By conducting a comprehensive analysis of historical accident records, the project provides management with a risk-based decision framework to prioritize aircraft purchases that balance operational safety and business growth.

Data Understanding

- The dataset used for this analysis was sourced from the NTSB and contains civil aviation accident data from 1962 to 2023, including accident type, date, aircraft make and model, location, and severity of injuries. The dataset included over 90,000 rows and 31 columns. Data exploration revealed numerous missing values and inconsistencies, especially in geographic coordinates and injury counts. A thorough cleaning process was implemented to remove duplicates, handle missing data, standardize column names, and ensure accurate data types. Only records with valid aircraft make and model names were retained for meaningful analysis.

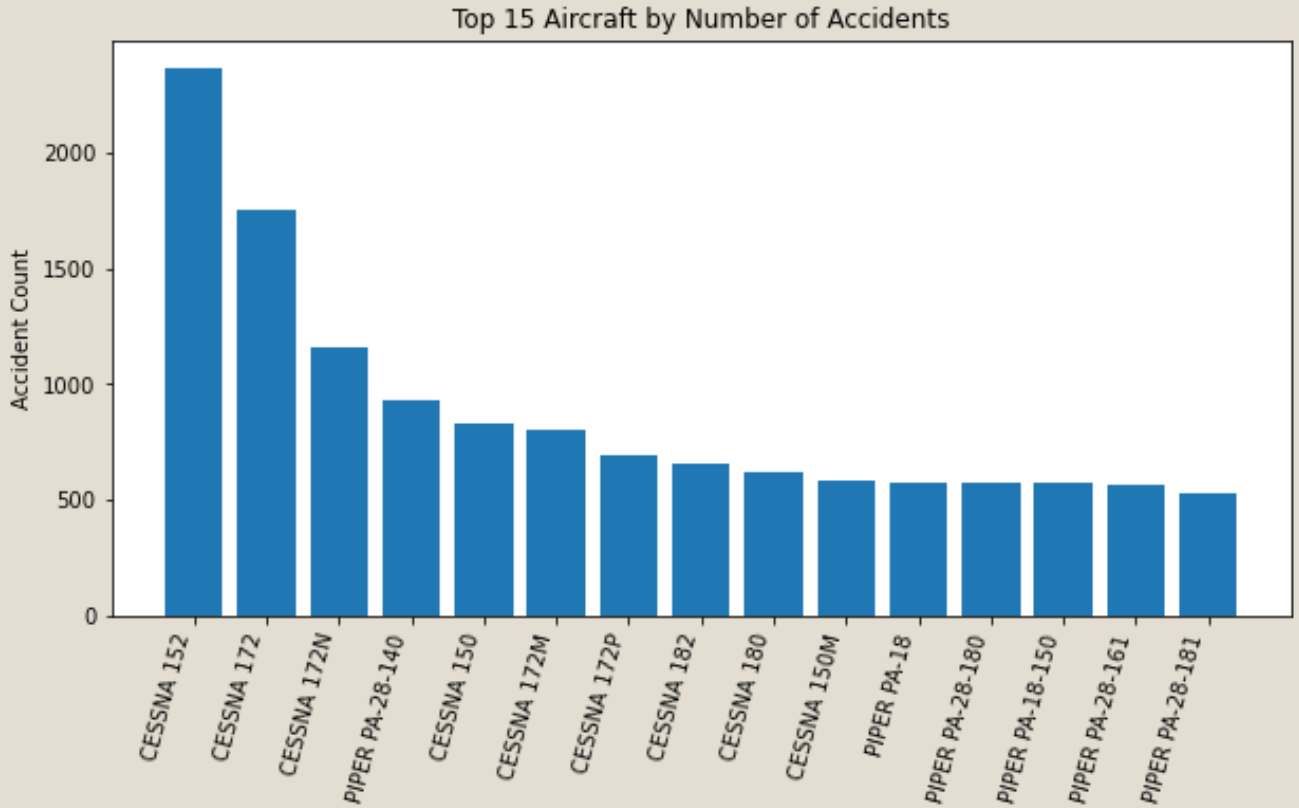
Data Analysis

- After cleaning, key variables such as total fatalities, serious injuries, and total accidents were aggregated by aircraft make and model. A "Risk Score" was developed to quantify accident severity, combining the frequency of accidents and the proportion of fatal outcomes. The analysis identified aircraft models with consistently low accident and fatality rates, making them the safest options for purchase. Additionally, aircraft with high total fatalities were flagged as high-risk models to avoid.

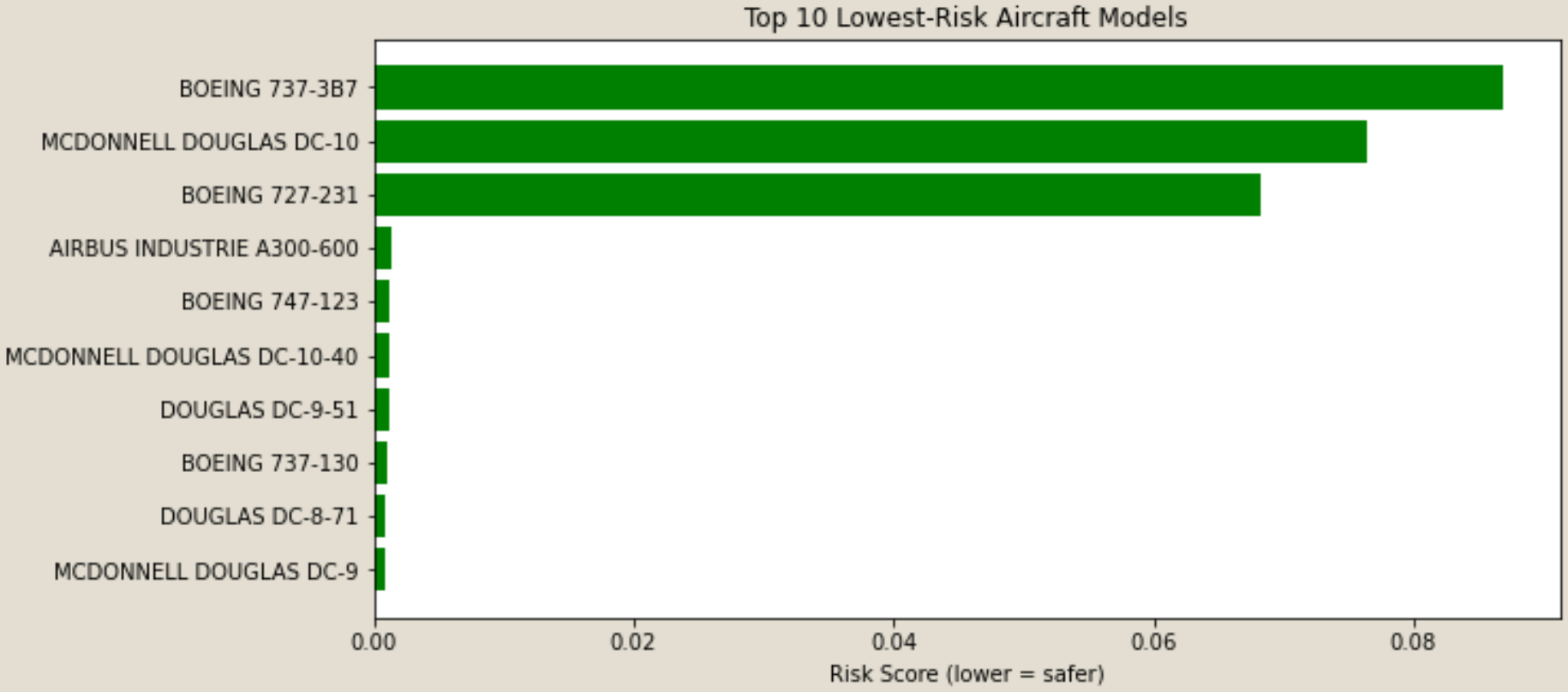
Visualization

- Several visualizations were developed to make the analysis clear to non-technical stakeholders. A **bar chart** was used to show the top 15 aircraft by number of accidents, providing insight into which models are most frequently involved in accidents. A **line graph** highlighted the ten aircraft with the lowest risk scores, showing clear differences in safety among them. These visuals make it easy for executives to interpret the data and support evidence-based decision-making.
- Below are some of the visualizations used:

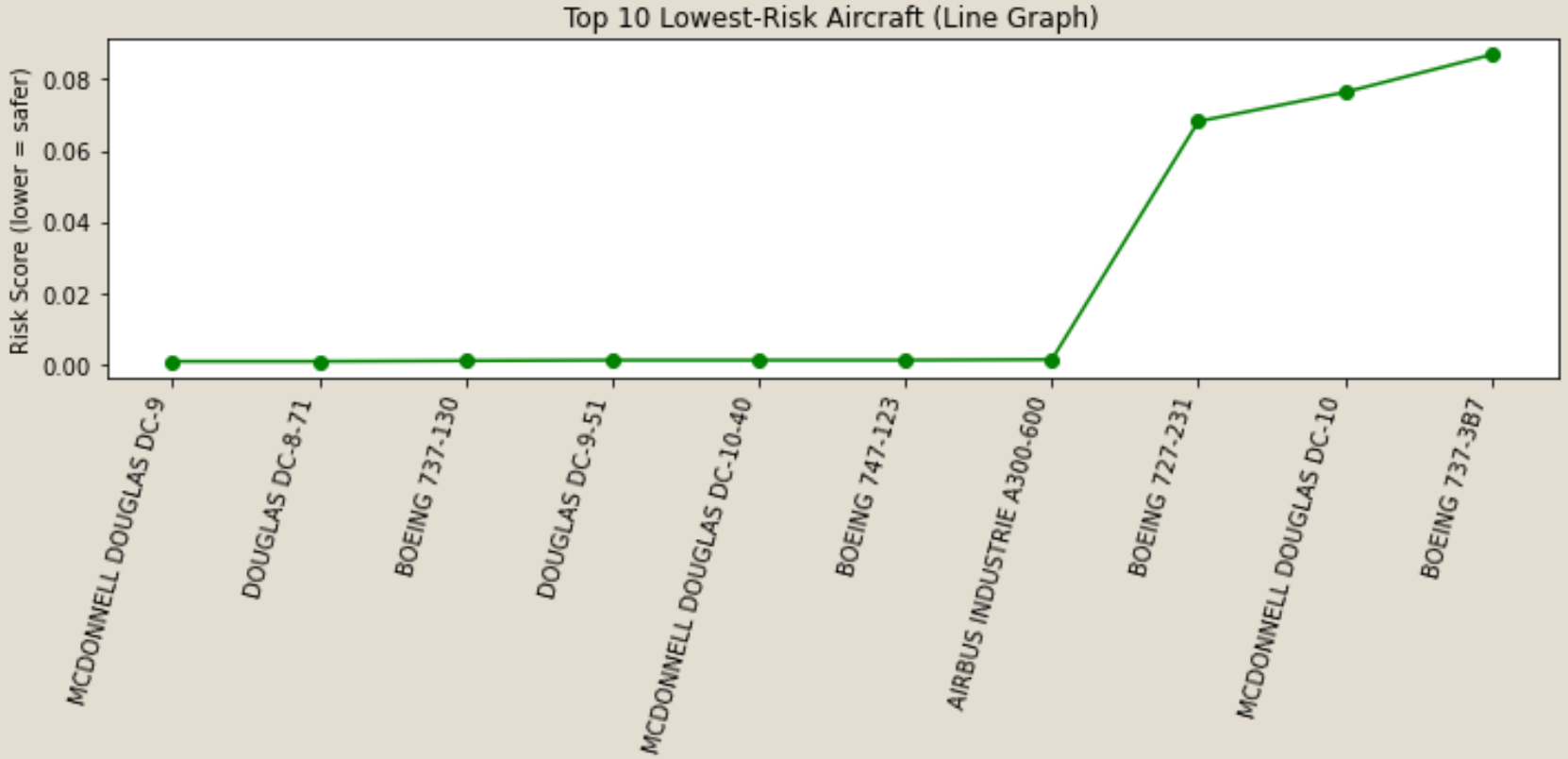
Top 15 Aircraft by Accident Count



Aircrafts with the lowest risk of Accidents



line Graph of Aircrafts with the lowest risk of Accidents



Recommendations

- Based on the findings, three key recommendations were made.
- The first is to prioritize aircraft with the lowest risk scores and a history of minimal fatalities, as these models represent the safest investment options.
- The second is to avoid aircraft models with disproportionately high fatalities, even if they have fewer recorded accidents, since such models pose a greater operational and reputational risk.
- The third recommendation is to consider safety data alongside operational factors such as maintenance costs, aircraft age, and intended use to ensure a balanced investment approach.

Next Steps

- Future work should involve integrating more detailed aircraft data such as maintenance history, operator type, and flight conditions to refine the risk analysis. Additionally, the dashboard and analytics process can be automated in Tableau or Power BI to provide real-time monitoring of aviation safety trends. Partnering with aviation regulators or safety organizations could also enhance data quality and credibility for long-term decision support.

Thank You

- Thank you for your time and attention. This concludes the presentation of the Aircraft Risk Analysis Project. For further inquiries or follow-up discussions, please contact **Laban Ltarasin Leploote** via https://www.linkedin.com/in/labanleploote/ .
- Questions are welcome.