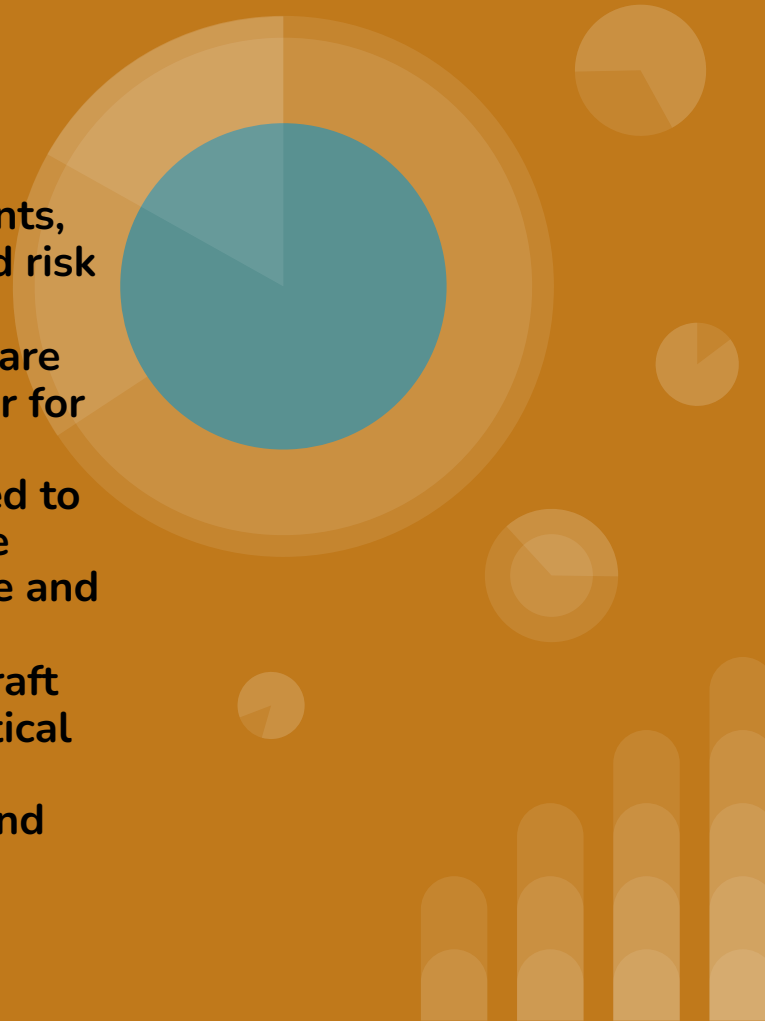
Aircraft Safety Analysis

Overview

This aviation safety analysis aims to guide a company's aircraft purchasing decisions by assessing the safety performance of various aircraft models, leveraging historical data from the National Transportation Safety Board (NTSB) aviation accident database. With a focus on minimizing risks and enhancing operational safety for both commercial and private aviation, the analysis will delve into key factors that influence aircraft safety.

Business Understanding

- Safety First: By choosing the safest aircraft models, we reduce the likelihood of such incidents, aligning with the company's focus on safety and risk management.
- Tailored Recommendations: Different aircraft are suited to different types of operations—whether for business, personal, or instructional flights. Our analysis will help identify the models best suited to our specific operational needs, ensuring that we choose aircraft that perform well in both private and commercial contexts.
- Environmental and Operational Factors: Aircraft must perform safely in varying weather and critical flight phases (e.g., takeoff, landing). We need models that can handle diverse environments and operational demands for consistent safety.



Data Understanding

Source of Data: The data comes from the National Transportation Safety Board (NTSB), which tracks aviation accidents and incidents for different aircraft models. It includes details about flight phases, weather conditions, and the purpose of the flight, providing important insights for assessing safety risks across various operations.

Description of Data:

- **Size**: The dataset contains 90,348 records and 31 columns.
- **Key Categories**:
  - Aircraft models (e.g., Cessna, Piper)
  - Flight phases (e.g., landing, takeoff)
  - Weather conditions (e.g., clear or stormy)
  - Purpose of flight (e.g., personal, business)
  - Accident severity (e.g., fatal, non-fatal)
  - Aircraft damage (e.g., minor, destroyed)
  - Number of engines and passenger injury data

Data Cleaning

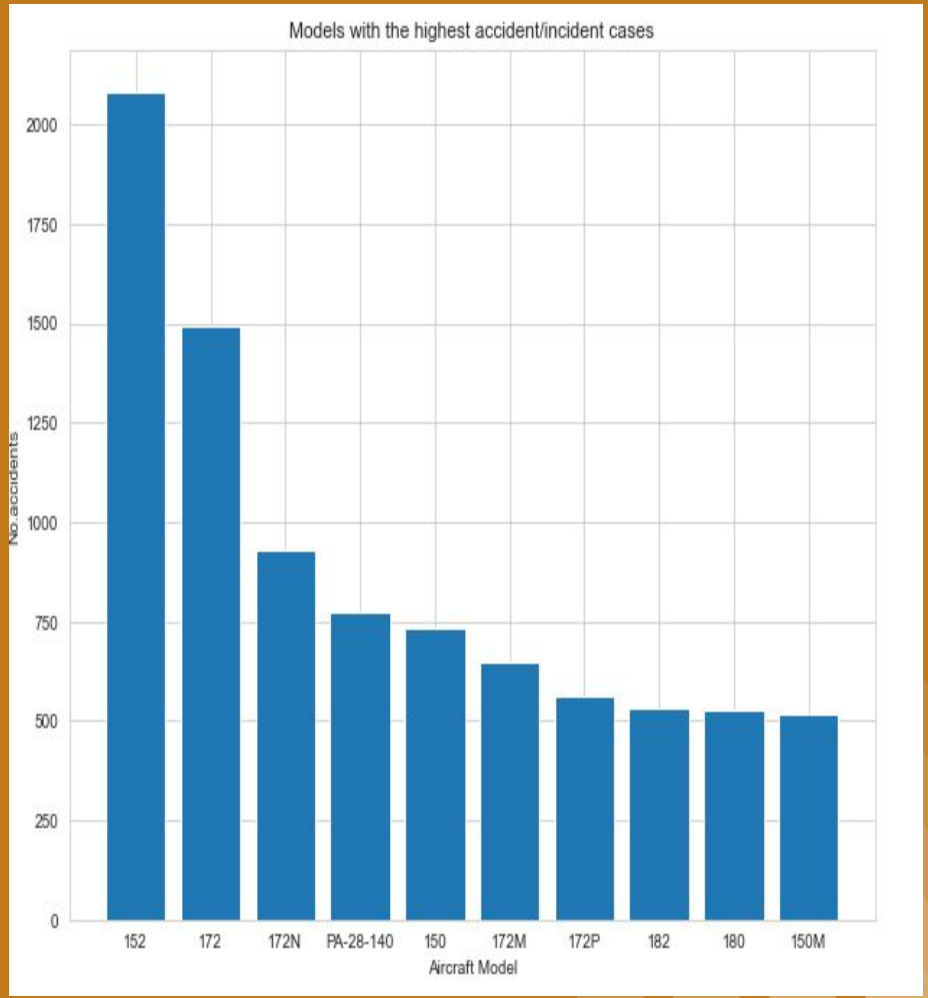
Data cleaning is a crucial step in the data analysis process that ensures the integrity and quality of the dataset. It involves identifying and correcting errors or inconsistencies in the data, which is essential for producing reliable and accurate results.

- Columns with more than 25% missing information were removed.
- Duplicate records were identified and deleted to ensure accuracy.

Data Analysis

- The data on investigation types reveals that the Cessna 152 model has the highest number of incidents, with 2,083 reported cases. It is followed by the Cessna 172 with 1,494 incidents and the Cessna 172N with 930. Other popular models like the Piper PA-28-140 (775 incidents) and the Piper 150 (731 incidents) also show significant numbers.

- These findings suggest that these aircraft, especially the Cessna 152 and 172, are commonly involved in incidents. This could be because they are widely used for training in flight schools and for personal flying, making them more likely to encounter situations that lead to investigations.

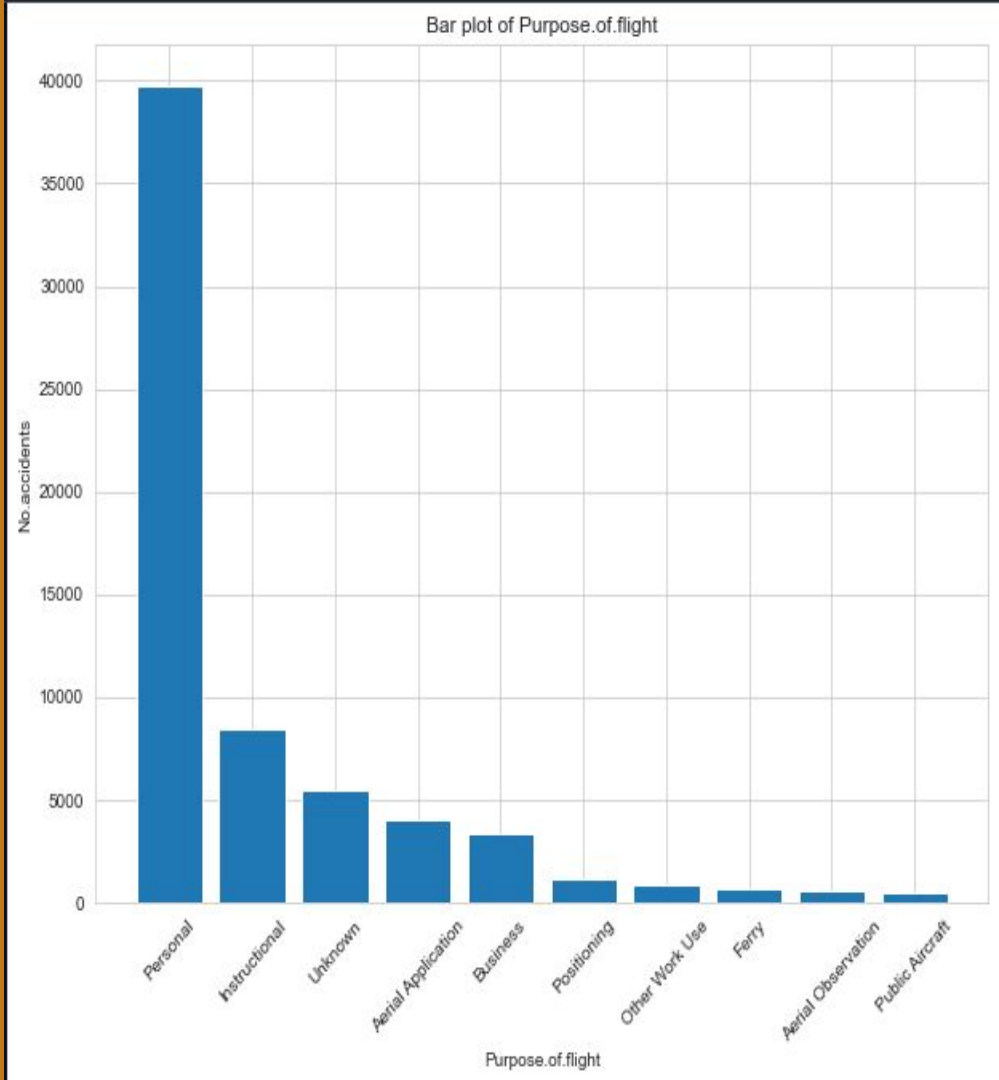


Data Analysis

The data indicates that personal flights have the highest number of incidents, totaling 39,762 accidents. This could be due to varying levels of pilot experience and less strict maintenance practices often seen in private flying.

Instructional flights also carry significant risks, with 8,486 incidents reported. This is likely because these flights involve students who are still learning and honing their flying skills.

Other flight purposes, such as aerial application (3,987 incidents) and business flights (3,337 incidents), also show moderate risks. These incidents may arise from the specific demands of each type of operation, like crop-dusting for aerial application or regular travel for business purposes.

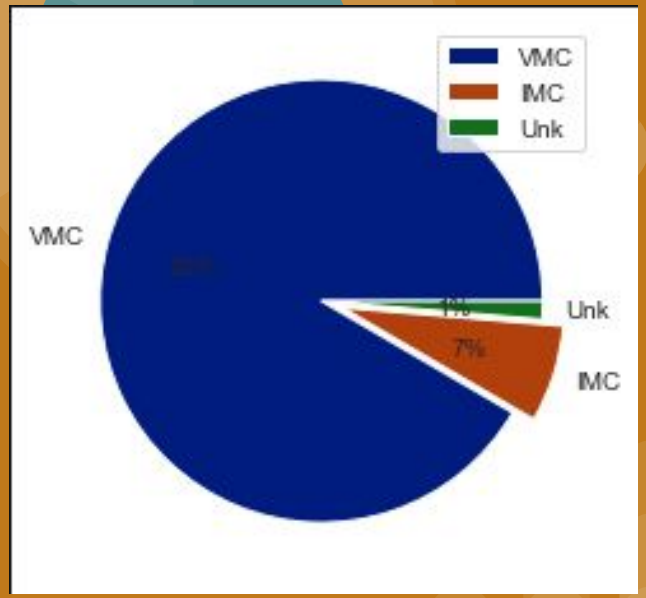


Data Analysis

Weather conditions play a significant role in aviation safety, so it's important to analyze how different aircraft models perform in various environments. In this analysis, we will focus on the Weather.Condition:column, which includes three categories:

- **VMC** (Visual Meteorological Conditions)
- **IMC** (Instrument Meteorological Conditions)
- **Unknown** (Undefined Weather Conditions)

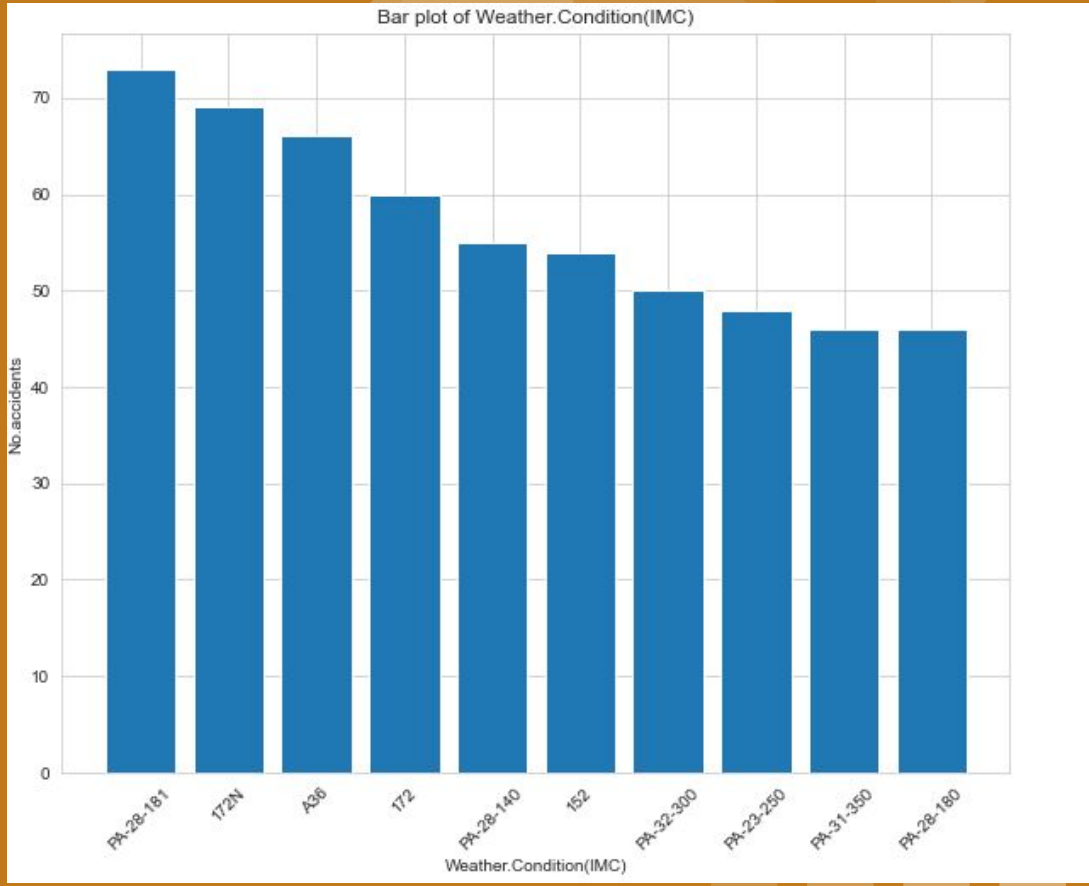
By comparing different aircraft models across these weather conditions, we can gain insights into which planes handle specific situations better. This will help us understand the safety performance of each model in varying weather scenarios, guiding our decisions on which aircraft are best suited for different operational contexts.



Data Analysis

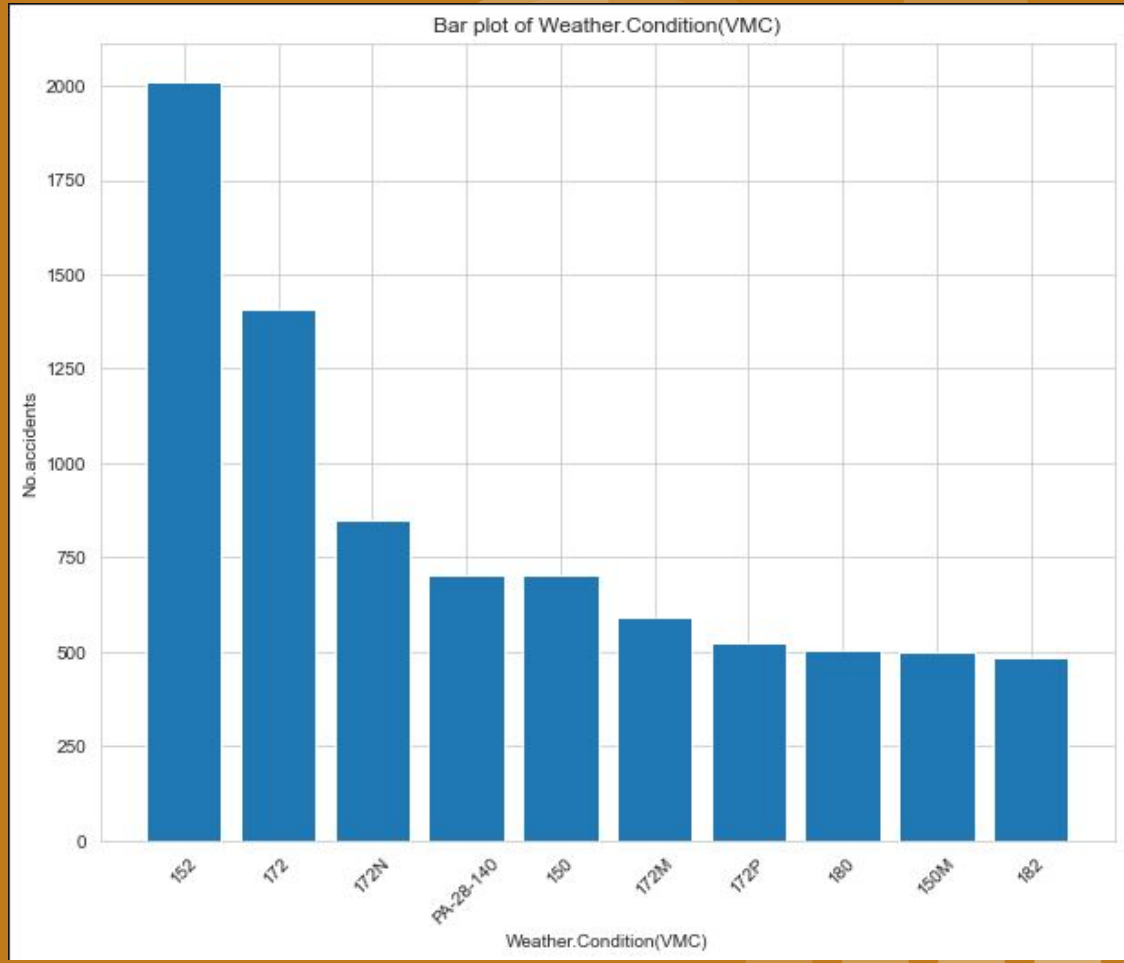
Aircraft such as the PA-28-181, Cessna 172N, and A36 show higher accident rates in IMC (Instrument Meteorological Conditions), with 73, 69, and 66 incidents reported, respectively. IMC refers to situations with poor visibility, which makes navigation more difficult.

For operations that often occur in low-visibility or challenging weather conditions, these models may require extra caution to ensure safety. It highlights the need for pilots and operators to be aware of these risks when flying these aircraft in adverse weather.



Data Analysis

In VMC (Visual Meteorological Conditions), aircraft like the Cessna 152, 172, and 172N experience a notable number of accidents, with 2,011, 1,410, and 848 incidents reported, respectively. Since VMC indicates good visibility, these accidents may suggest that human error or mechanical problems can occur even in relatively simple flying conditions. This emphasizes the importance of maintaining high safety standards and vigilance, regardless of favorable weather.



Recommendation

In conclusion, ensuring safety in aviation operations, especially for personal and instructional flights, requires a comprehensive approach. Key strategies include:

- **Scrutinizing Aircraft Models:** Focus on commonly used models to ensure they are well-maintained and equipped with advanced safety technologies.
- **Comprehensive Pilot Training:** Implement thorough training programs, particularly in instrument flight, for models like the PA-28-181, 172N, and A36. This will enhance pilots' situational awareness and reduce reliance on visual cues.
- **Selecting Safe Aircraft:** Choose aircraft with strong safety records and enforce stricter maintenance schedules to address risks associated with varying pilot experience levels and changing environmental conditions.

By adopting these measures, we can foster a safer aviation environment for both pilots and passengers.

Next Step

An in-depth analysis is essential for evaluating potential aircraft for acquisition. Gaining insights into fuel economy, lifespan, maintenance costs, and various other metrics will help inform the decision regarding which aircraft to purchase for our fleet.

Thank you

QUESTIONS

Feel free to reach out with any questions.

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