

AIRCRAFT ACCIDENTS ANALYSIS

Analysis of Aircraft Safety Performance

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OVERVIEW

- We are entering the aviation industry by acquiring aircraft for commercial and private operations. This analysis focuses on identifying the safest aircraft to minimize operational risks.
- The primary challenge in selecting an aircraft is evaluating its historical safety performance to minimize the risk of accidents.

BUSINESS UNDERSTANDING

Objective

- Minimize the risk of accidents through data-driven aircraft selection, ensuring operational safety and compliance with industry standards.

Stakeholders:

- Decision-makers in the aviation industry.

DATA UNDERSTANDING

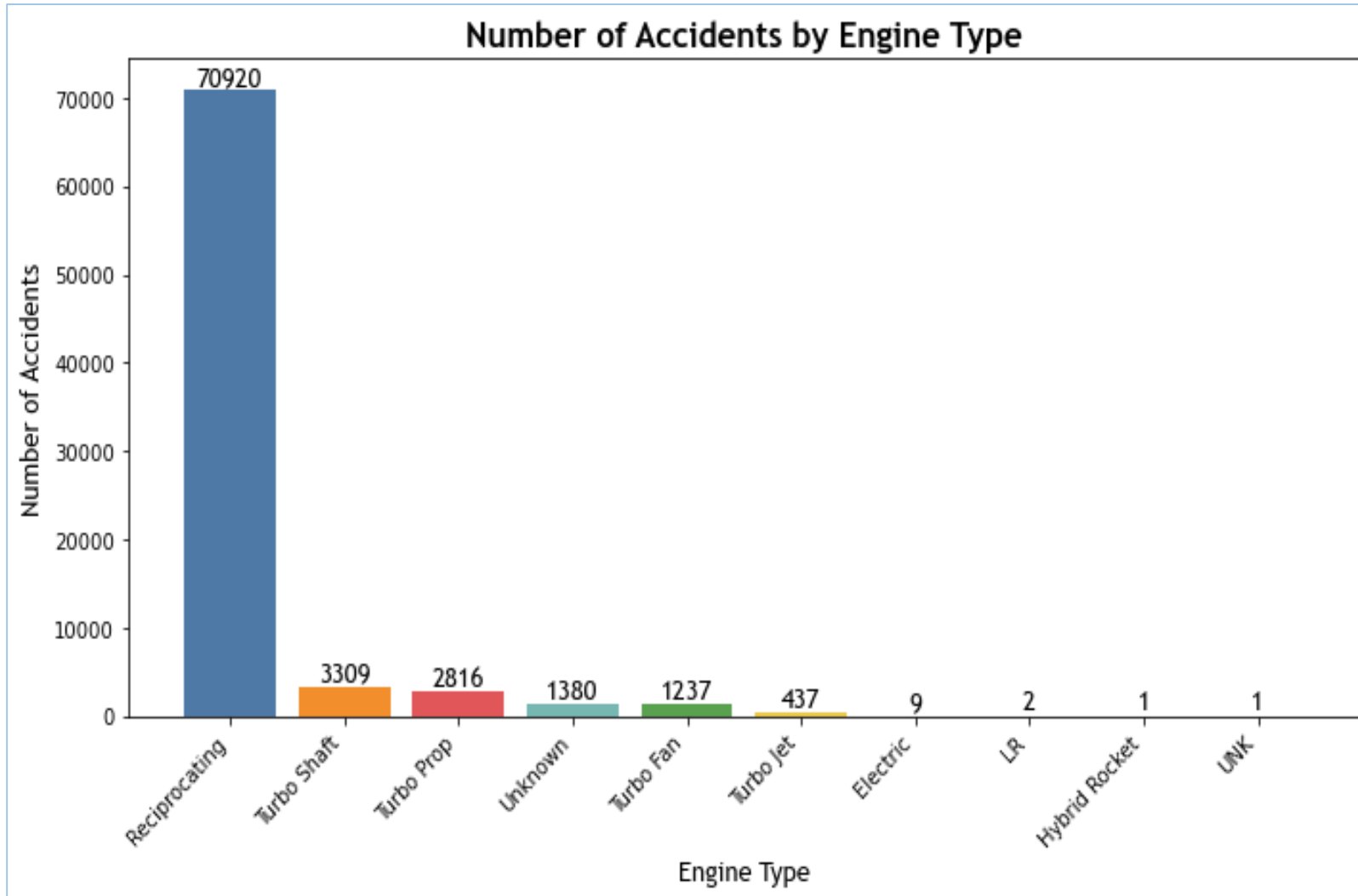
Description of dataset

- The dataset has:
- 82,474 rows (entries)
- 31 columns, including:
 - ❖ 6 float variables
 - ❖ 26 object data types
- Source of data:

<https://www.kaggle.com/datasets/khsamaha/aviation-accident-database-synopses>

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 88889 entries, 0 to 88888
Data columns (total 31 columns):
#   Column                                Non-Null Count  Dtype
---  ---                                -
0   Event.Id                             88889 non-null  object
1   Investigation.Type                   88889 non-null  object
2   Accident.Number                     88889 non-null  object
3   Event.Date                          88889 non-null  object
4   Location                            88837 non-null  object
5   Country                             88663 non-null  object
6   Latitude                            34382 non-null  object
7   Longitude                           34373 non-null  object
8   Airport.Code                        50249 non-null  object
9   Airport.Name                       52790 non-null  object
10  Injury.Severity                     87889 non-null  object
11  Aircraft.damage                     85695 non-null  object
12  Aircraft.Category                   32287 non-null  object
13  Registration.Number                 87572 non-null  object
14  Make                               88826 non-null  object
15  Model                              88797 non-null  object
16  Amateur.Built                      88787 non-null  object
17  Number.of.Engines                   82805 non-null  float64
18  Engine.Type                         81812 non-null  object
19  FAR.Description                     32023 non-null  object
...
29  Report.Status                       82508 non-null  object
30  Publication.Date                    75118 non-null  object
dtypes: float64(5), object(26)
```

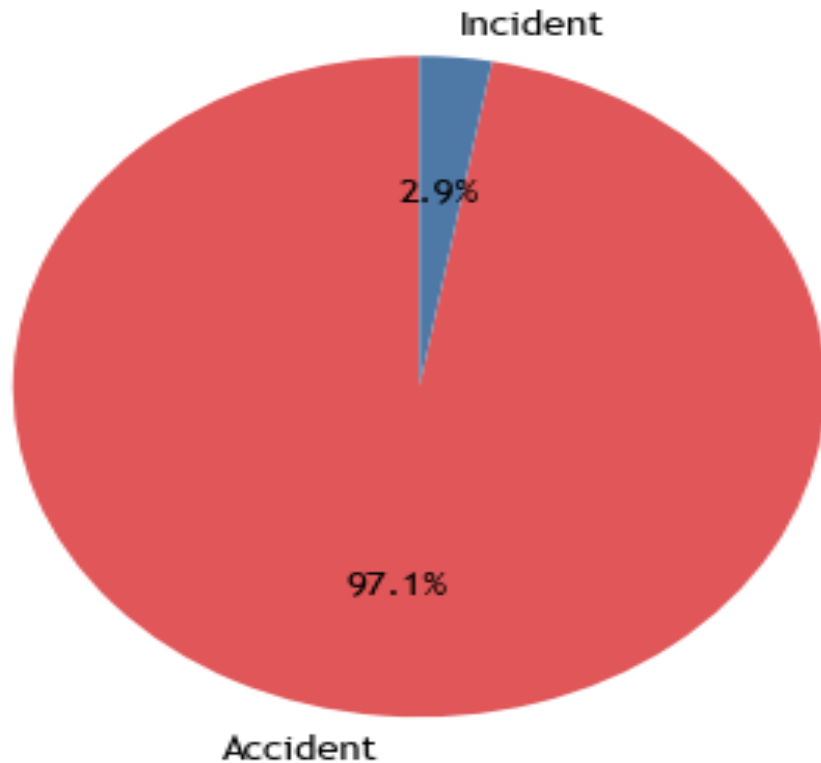
DATA ANALYSIS



- Reciprocating engines are involved in most accidents

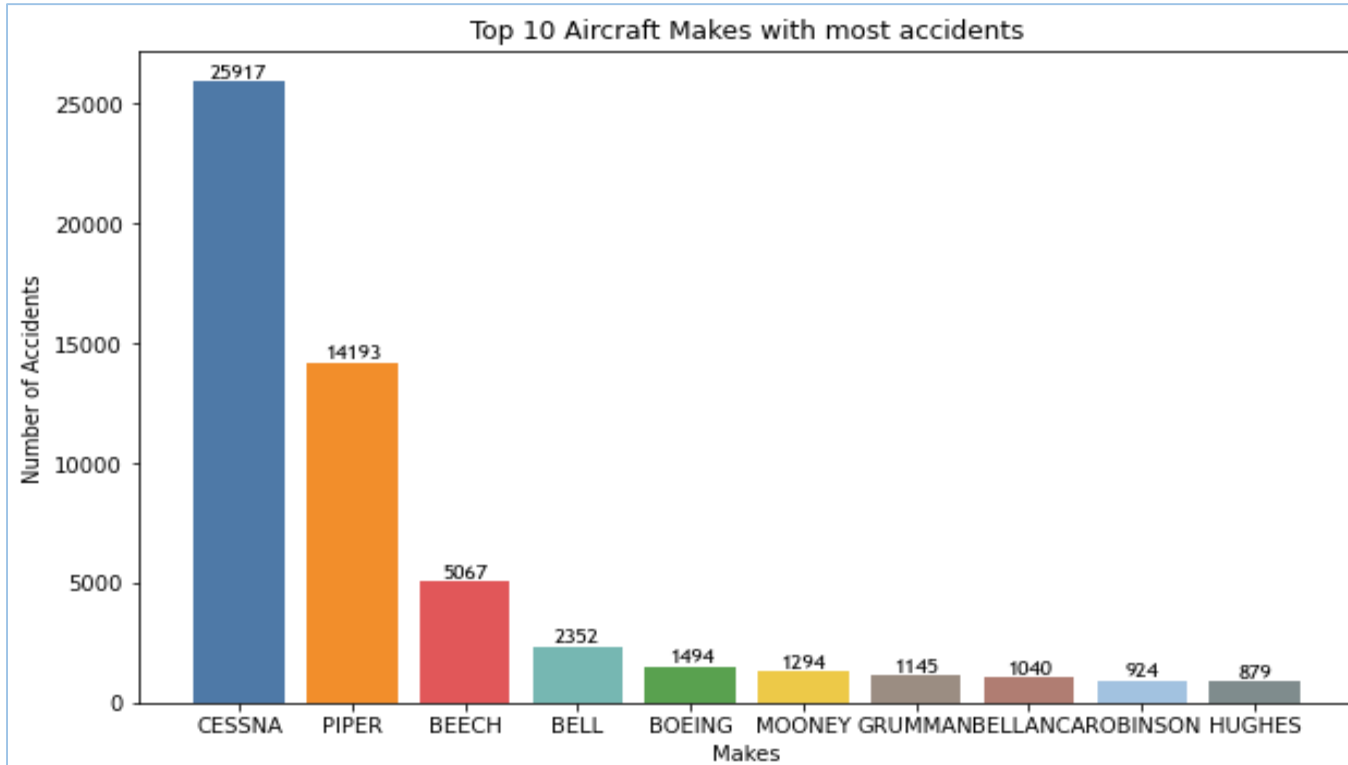
Investigation Types

Distribution of Investigation Types



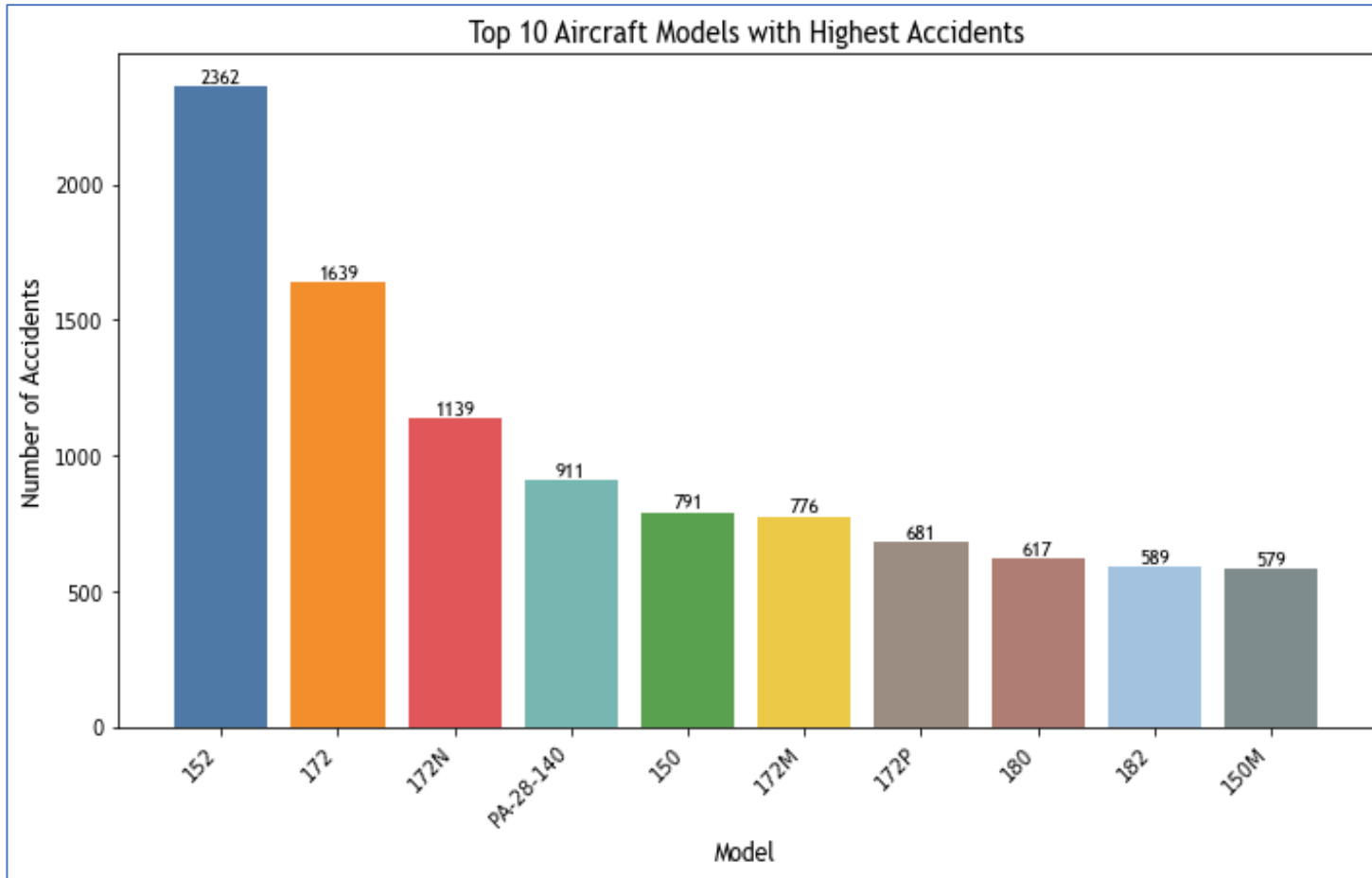
- Most Investigation types are classified as accidents, indicating a focus area.

Number of Accidents by Aircraft Make



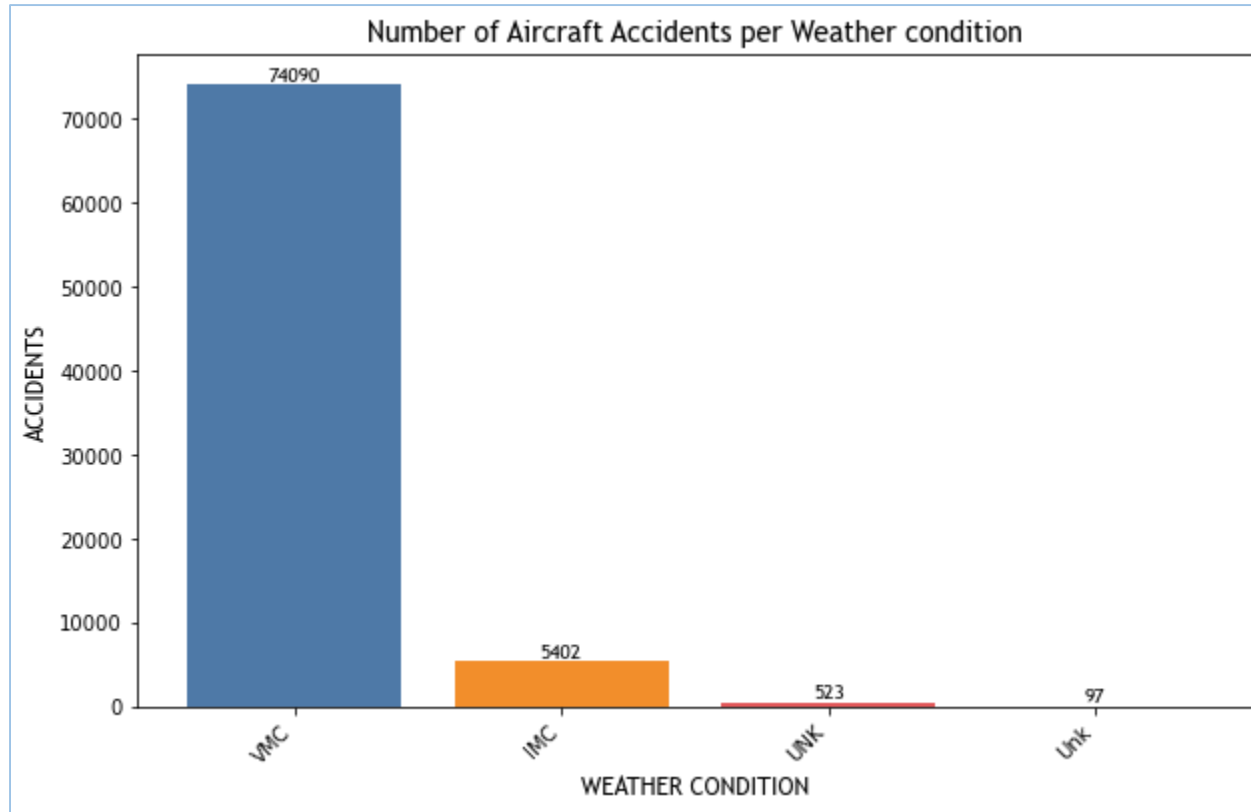
- CESSNA and PIPER are the most frequently involved in accidents.
- BOEING and BELL, while having fewer accidents compared to CESSNA and PIPER, still have significant numbers.

Number of Accidents by Aircraft Models



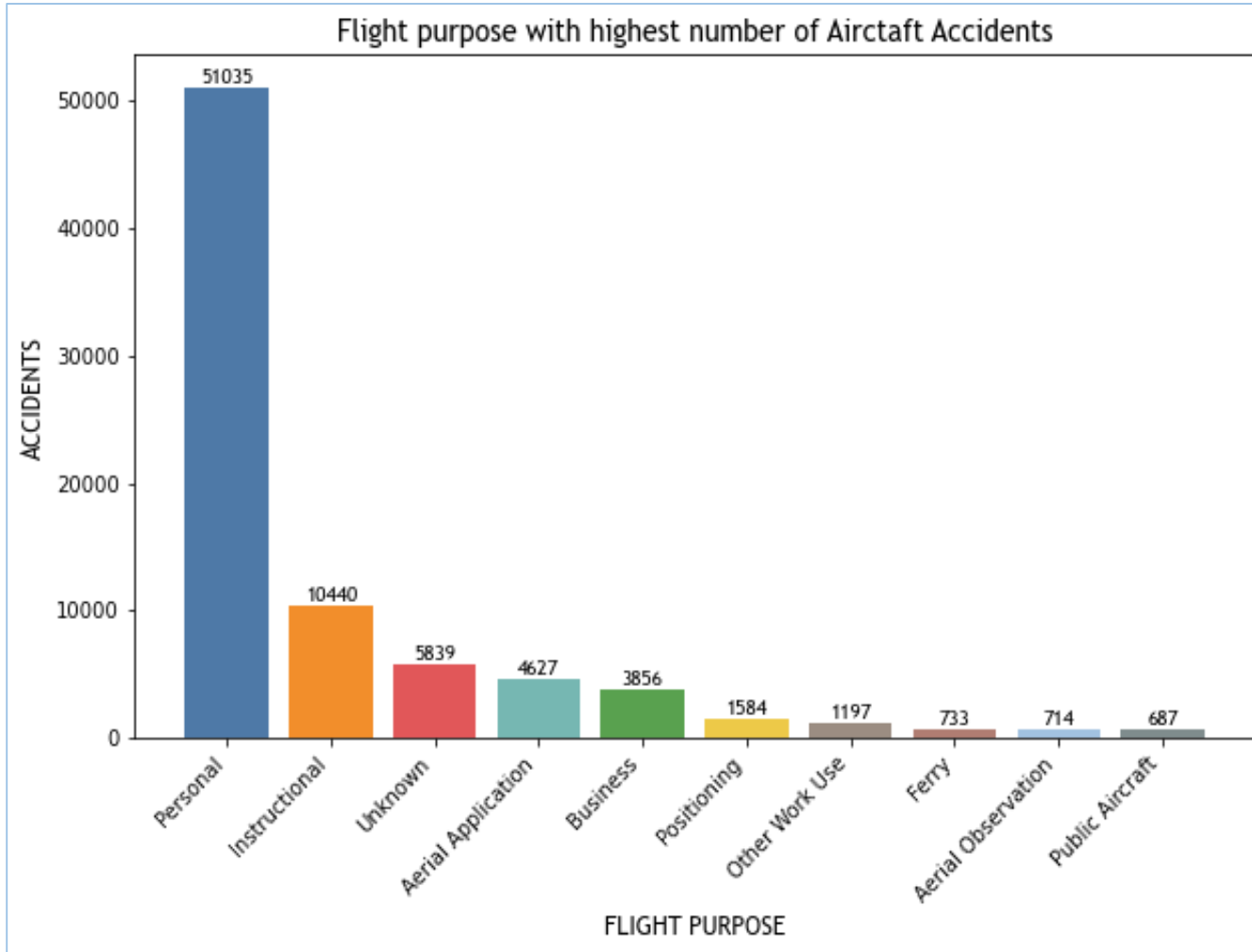
- 152 and 172 are the most frequently involved models in accidents, reflecting their high usage.
- PA-28-140 and 150 also show notable accident rates.

Number of Accidents by Weather conditions



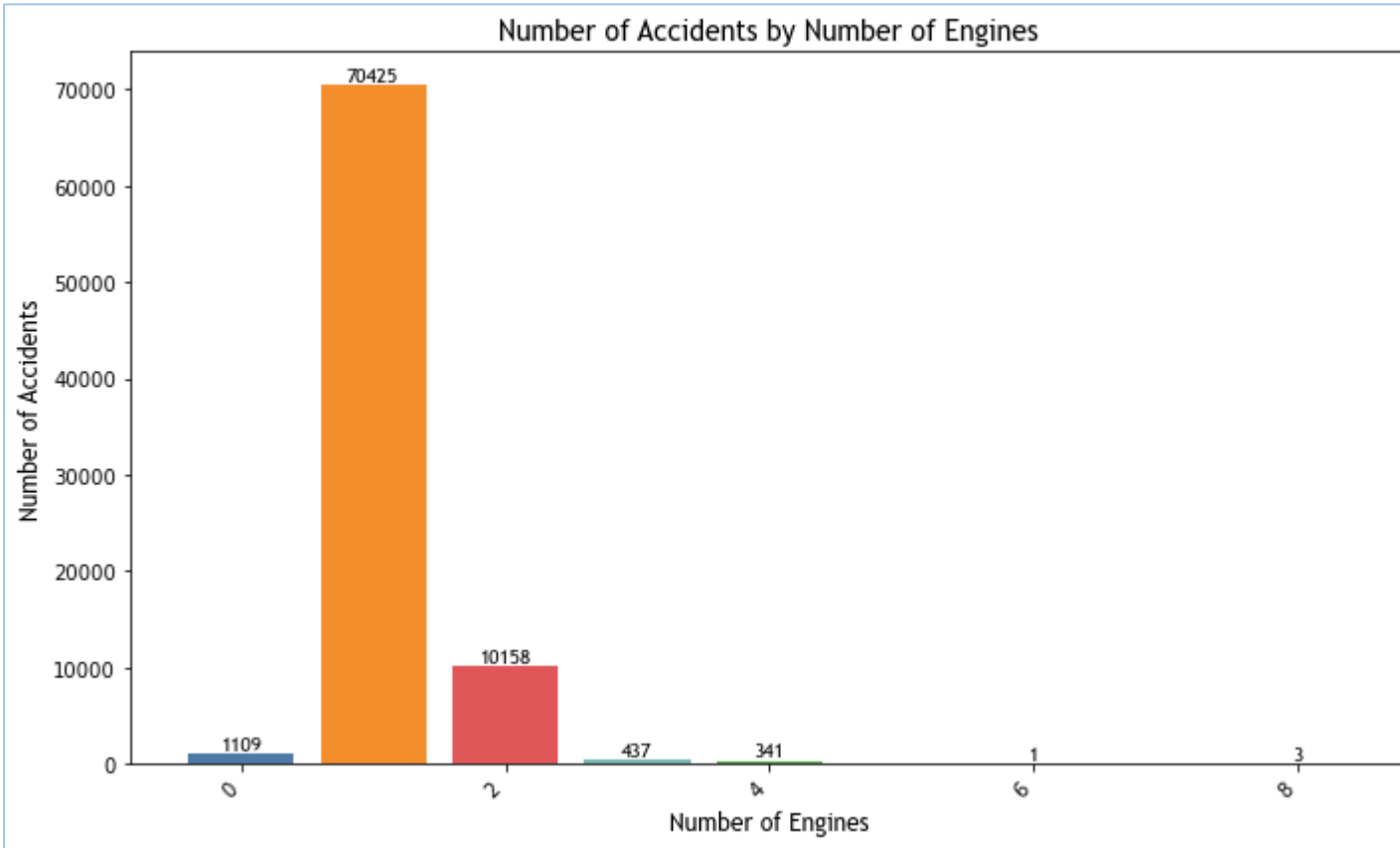
- VMC weather conditions exhibit huge accidents as compared to IMC and other weather condition categories

Accidents by purpose of flight



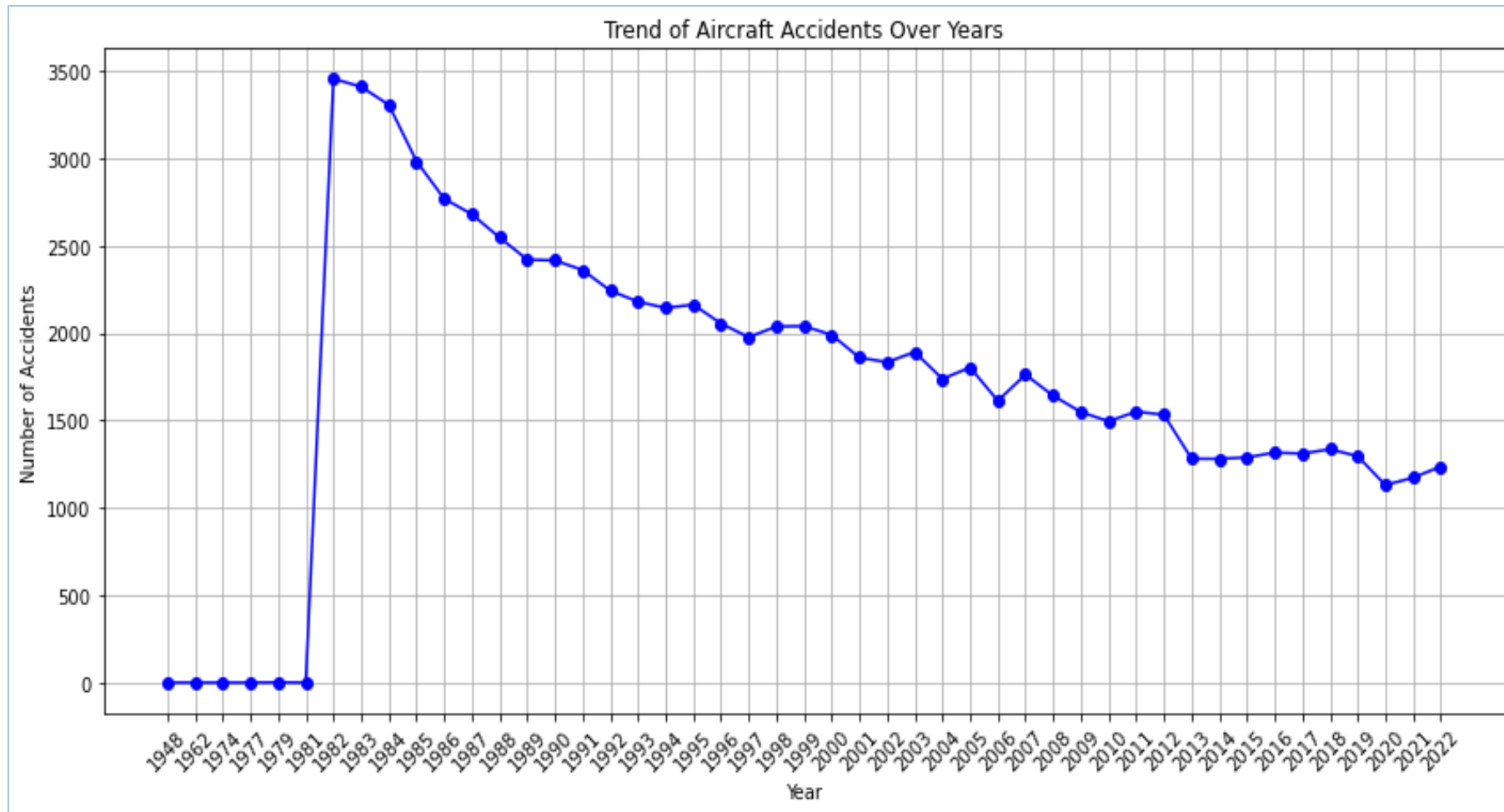
- Aircrafts used for Personal reasons experienced a huge number of accidents i.e. 51,035 as compared to those used for business purpose which experienced 3,856 accidents

Accidents by number of engines

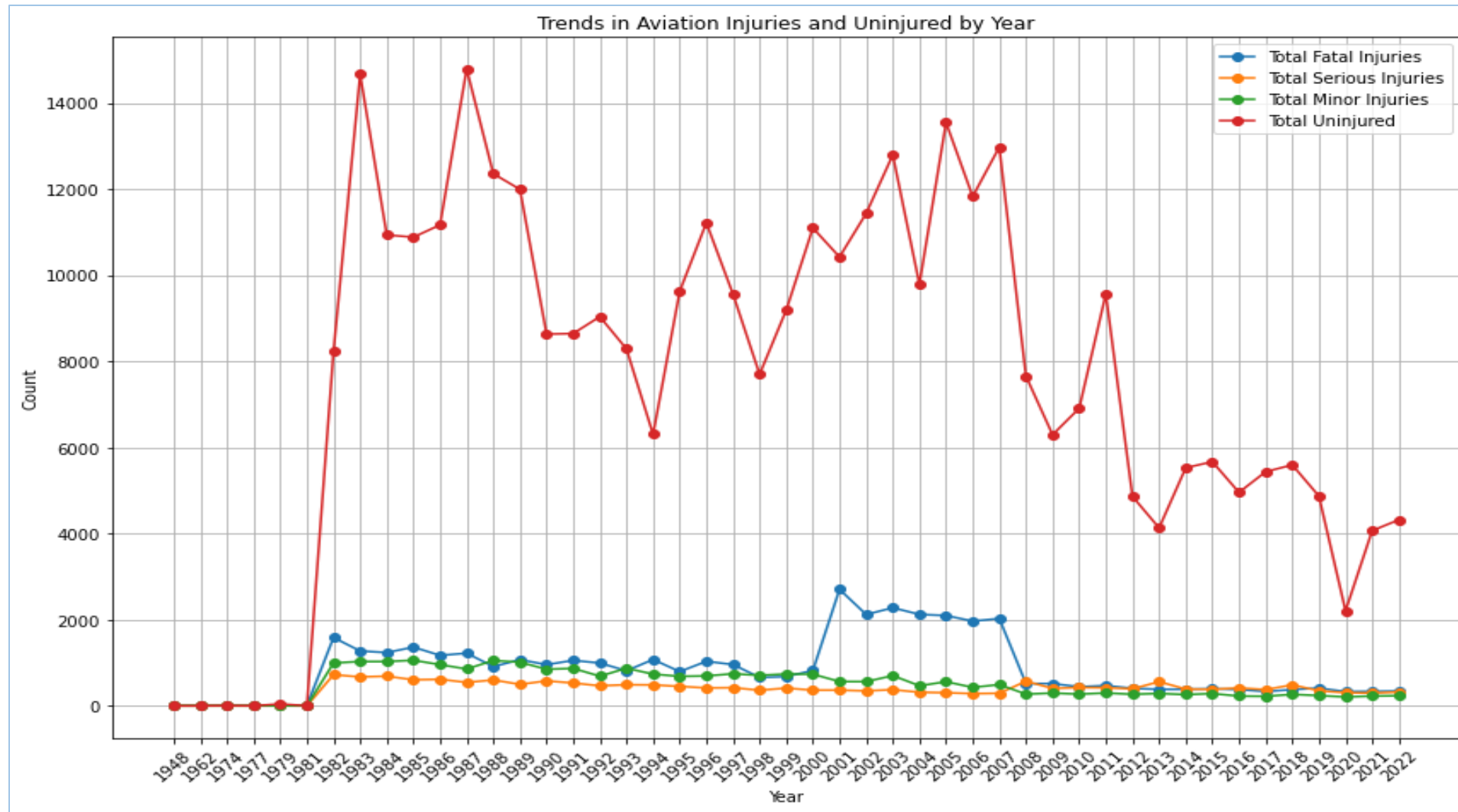


- Aircrafts with 1 engine experienced huge number of accidents i.e., 70,425 as compared with those with 2 engines or more.

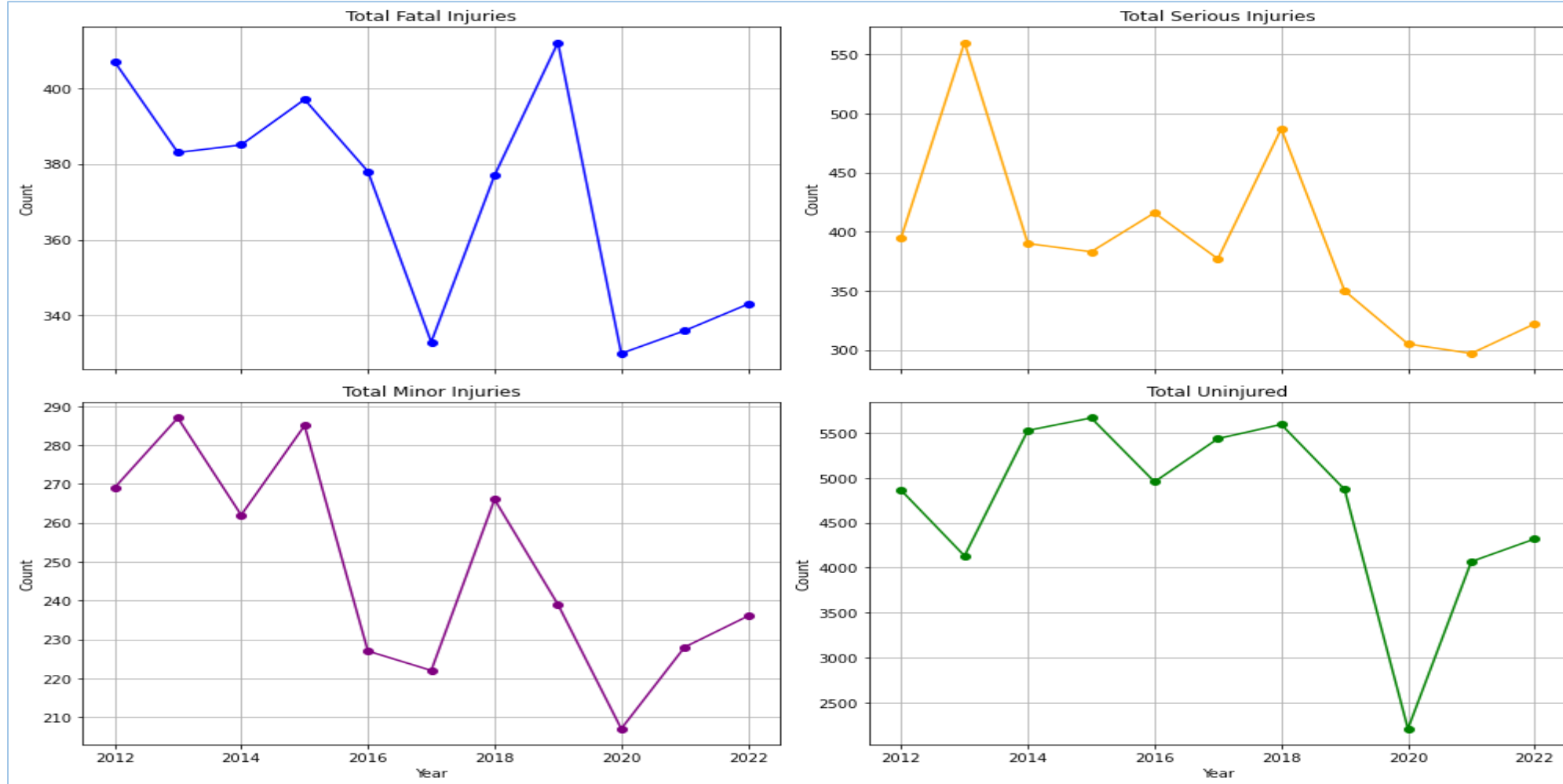
Trend of Aircraft Accidents over years



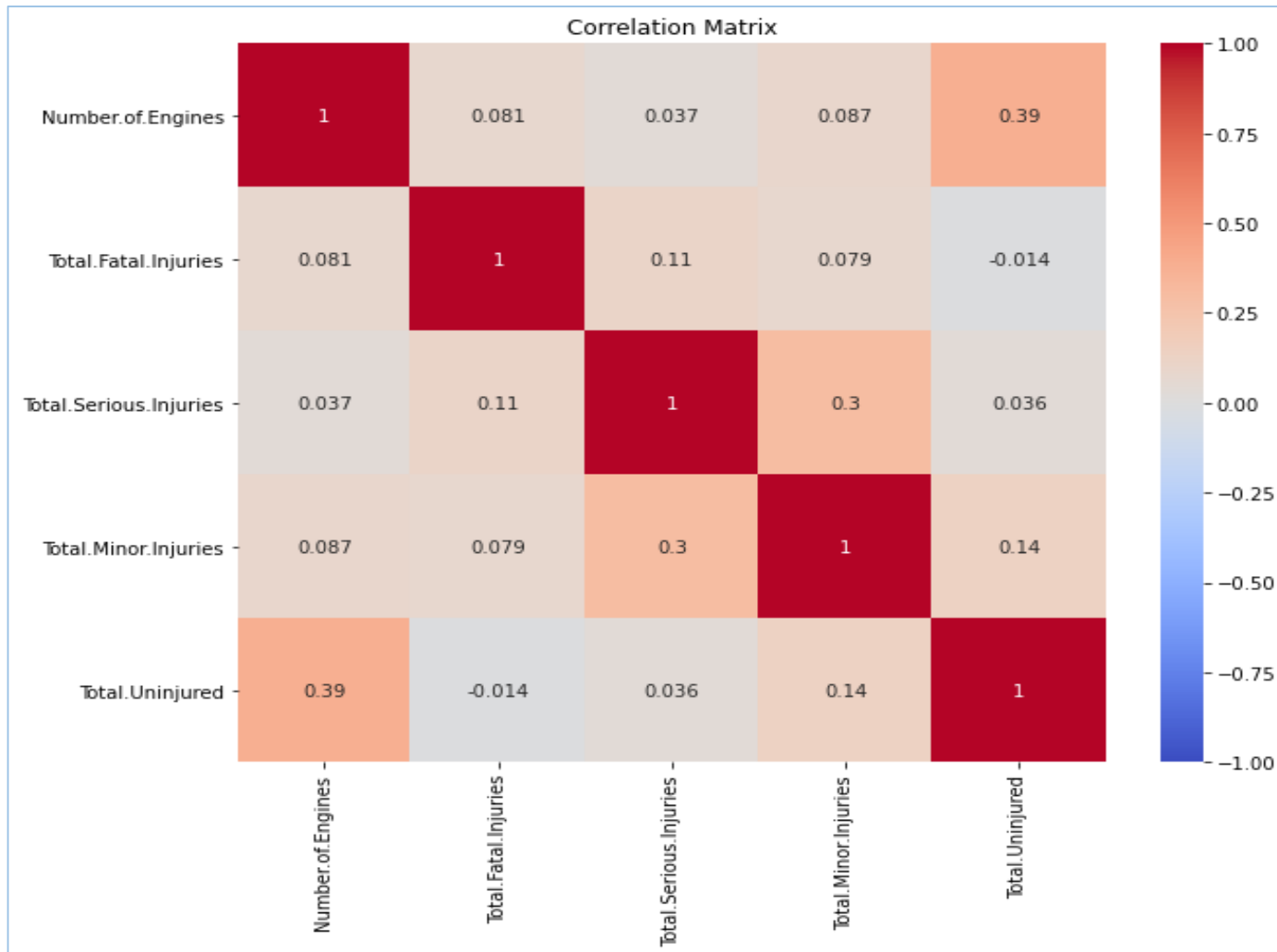
Trend Analysis of various injuries



Trend Analysis of injuries for the last 10 years



Heatmap



- Number of Engines and Total Uninjured (0.39)-ImPLY moderate +ve correlation i.e., Aircraft with more engines may provide better safety
- Total Serious Injuries and Total Minor Injuries (0.30)-accidents with a higher number of serious injuries tend to also involve more minor injuries
- Total Fatal Injuries with other injury categories, have weak positive correlations (close to 0) i.e. No relationship

Recommendations

- Opt for Dual-Engine Aircraft:** Choose aircraft with at least 2 engines, as they generally have lower accident rates due to engine redundancy.
- Ensure Weather Adaptability:** Select aircraft capable of operating in both VMC and IMC to enhance safety across diverse weather conditions.
- Evaluate Regional Risk:** Be cautious with aircraft operating in high-accident areas like Anchorage, Alaska. Consider alternative routes to mitigate risk.
- Prioritize Business Aircraft:** Favor aircraft used for business purposes over personal flights, as they typically adhere to stricter safety and operational standards.
- Avoid High-Accident Makes:** Consider aircraft from manufacturers with fewer accidents. For example, MOONEY and ROBINSON have lower accident rates compared to CESSNA and PIPER.
- Select Safer Models:** opt for aircraft models with fewer reported accidents. For instance, models like 150M have better safety records compared to the 152 and 172.
- Choose Newer Aircraft:** Prefer newer models or those with recent safety updates, as accident rates have generally decreased over time, reflecting improvements in aviation safety.

Next Steps

- **Action Items:** Review aircraft models, conduct further analysis.
- **Further Research:** Explore new technologies and safety improvements.

THANK YOU

***Questions ***

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