

# Aviation Accidents Risk Analysis Project

## Overview and Business Understanding

Our company is exploring entry into the aviation business by acquiring private and commercial operations aircrafts. To guide and inform this decision, we need a data-driven risk analysis to gauge the risk associated with this venture. We will analyze and understand the risks involved by focusing on aircraft types and manufacturers, flight phases, weather conditions, and injuries analysis.



by Erastus Njuguna





# Project Goals, Stakeholder Needs and Questions to answer



## Problem

The aviation division lacks data-driven insights on aviation risks for informed investment.



## Stakeholder

Head of Aviation Operations.



## Goal

Insights will help the stakeholder make safer investment decisions by avoiding high-risk aircraft and conditions.

- This project uses the NTSB aviation accident database to answer key questions that will guide stakeholders and real-world questions related to investments in this industry. These questions include:
  - a) Which aircraft manufacturers and models are linked to the most fatal accidents?
  - b) Are there specific phases of flight or weather conditions that present higher risks?
  - c) How have accident trends evolved over time?
  - d) How are injury types correlated?





# Data Understanding

## Data Source

The data source is from the [NTSB Aviation Accident Database \(1962-present\)](#) — Civil aviation accidents in the U.S, its territories, and international waters.

The data has 88,889 entries and 31 columns. The main features to help us in this Analysis are Aircraft Make, Model, Fatality, Phase of Flight, Weather Conditions, Accident Date and Location.

## Why this data?

This database contains comprehensive coverage of aviation accidents, Aircraft information, flight conditions, injury states and many more that will help in answering our questions above.

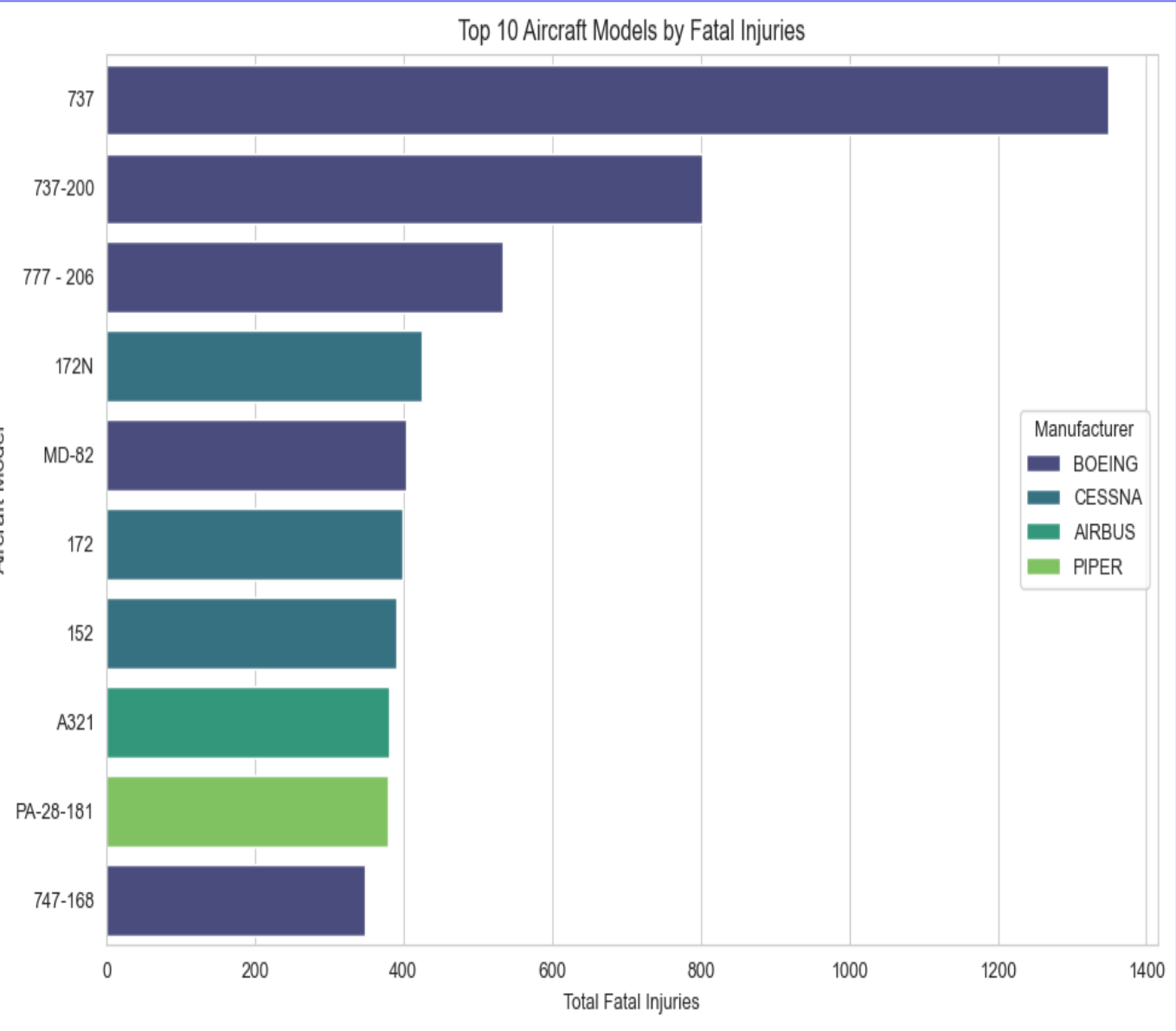
## Limitations

Missing values (e.g., Latitude, Longitude) and Data mostly concentrates on USA and may not fully represent the global risks.

# Data Analysis

We cleaned the missing values for our important columns and created new columns to assist us do our analysis on Aircraft Models and Makes, Accidents phases, effects of weather conditions, trend over the years and the injury types occurrences and correlation.

## 1.0 Fatal Accidents by Aircraft Model and Make



### Visual Overview

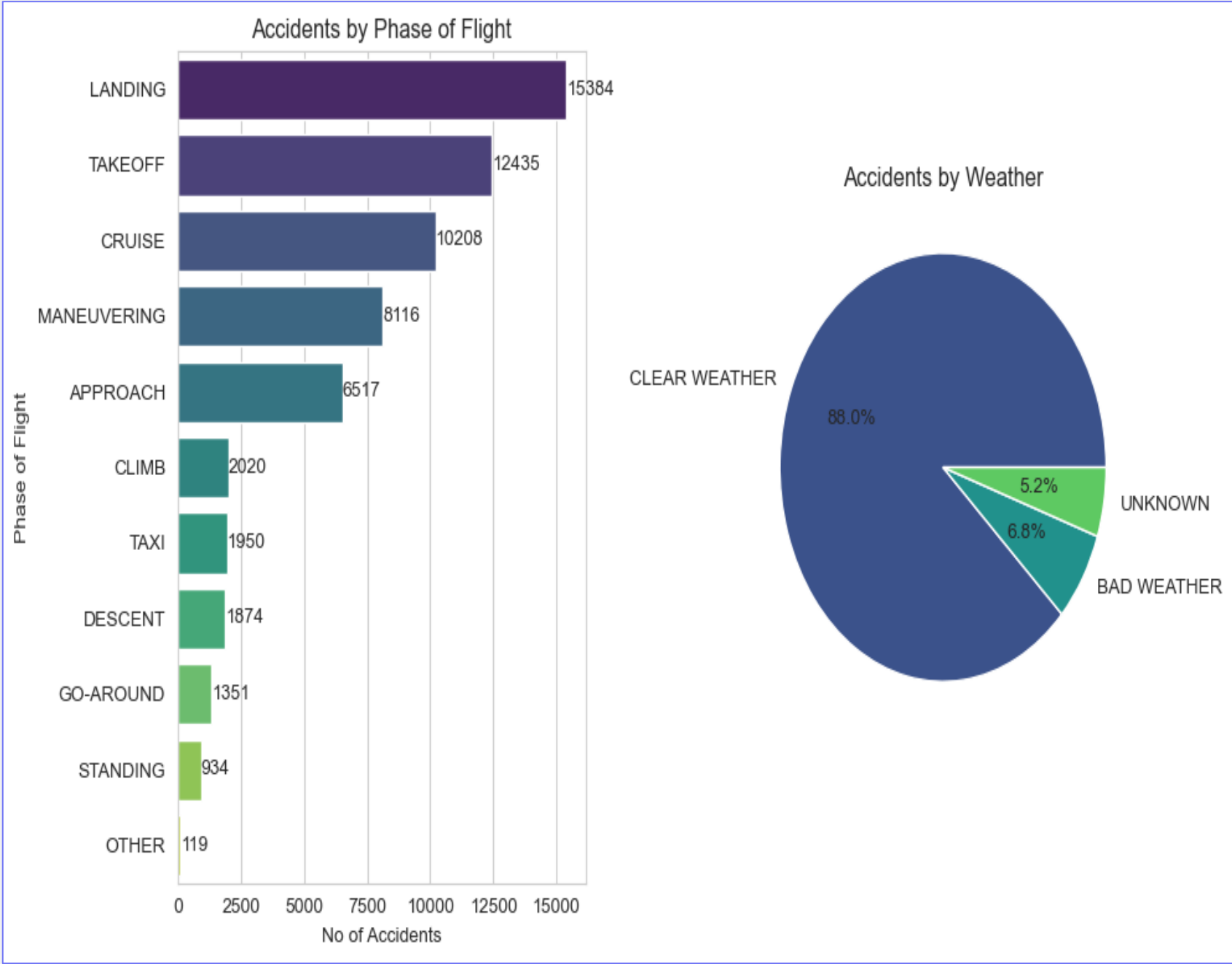
- Boeing aircrafts are dominant in the list ,this warrants a closer examination of its safety records.
- Cessna comes in forth, raising alarm noting is a smaller aircraft often used in training and non-commercial activities.
- Airbus A321 and Piper PA-28-181 appear in the list but with fewer fatal injuries but still significant to be in the top list.
- Commercial aircrafts are more in the fatal list due to their high flight numbers but smaller aircrafts like (Cessna, Piper) are also noted to have high fatal injuries.

### Business Insight and recommendation

Conduct detailed safety reviews before purchasing a Boeing or Cessna models.

# Data Analysis

## 2.0 Fatal Accidents by Phase and Weather Conditions



### Visual Overview

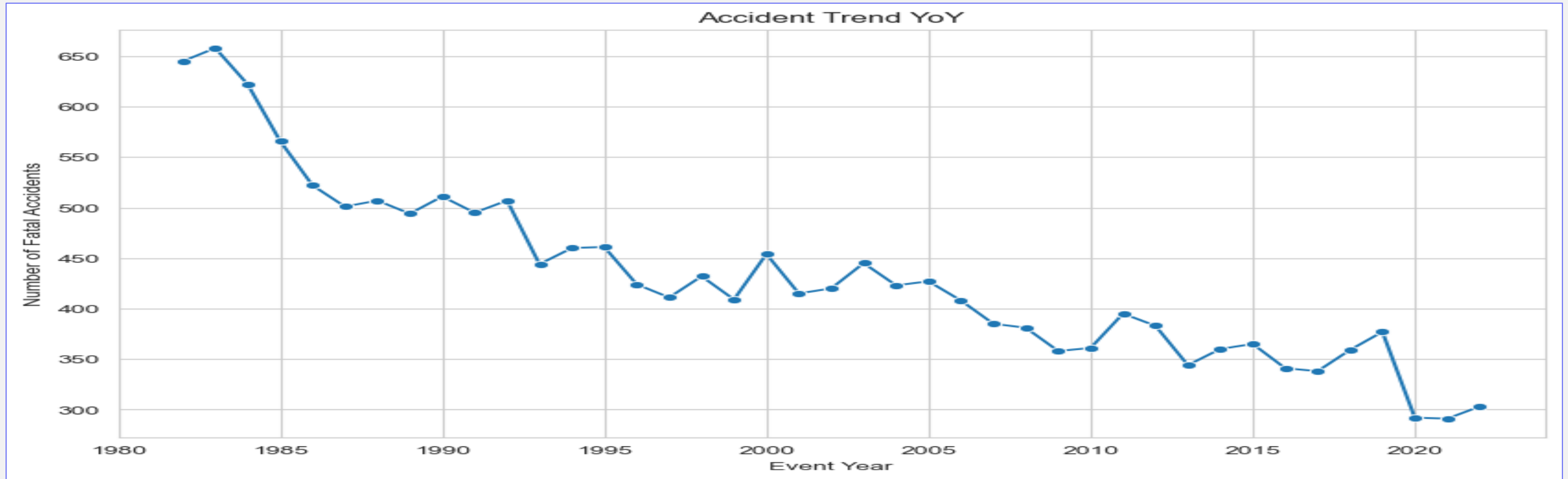
- Landing is critical as it has the highest number of fatal accidents. (15,384 cases), followed by Takeoff(12,435) and Cruise (10,208).
- Maneuvering and cruise also shows significant count Weather Condition
- It's noted that 88% of fatal accidents occur in clear weather and not in bad weather highlighting that other factors contribute to accidents.

### Business Insight and recommendation

- Landing, takeoff, and cruise phases should be targeted for more trainings.
- Weather conditions do not influence accidents, hence human factor trainings should be always emphasized.

# Data Analysis

## 3.0 Fatal Accidents Trend



### Visual Overview

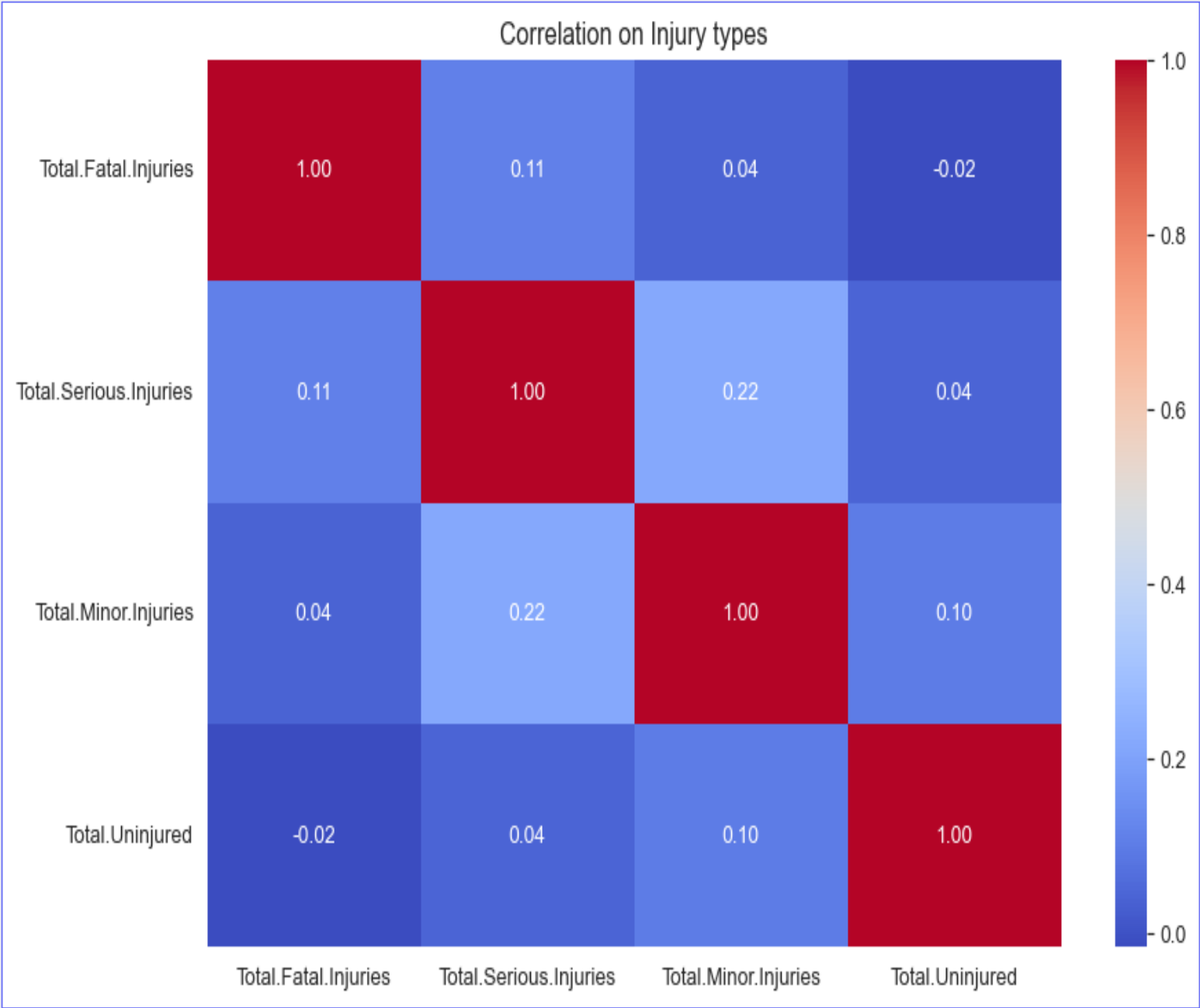
- Aviation accidents have generally declined over the years.
- noted small spikes in some years but overall, their accidents have declined over the years.

### Business Insight and recommendation

Focus investments on newer aircrafts for safety as they tend to come with new advanced safety technologies.

# Data Analysis

## 2.0 Fatal Accidents by Phase and Weather Conditions



### Visual Overview

- Correlations are minimal (none above 0.22), suggesting injury types behaves independently.

### Business Insight and recommendation

- Distinct safety strategies to be adopted. One-size-fits-all won't maximize results on injuries cause.



# Conclusion and Recommendations

Conclusion	Recommendations
<p><b>Aircraft Models and Fatalities</b></p> <ul style="list-style-type: none"><li>Boeing aircrafts are dominant in the list likely due to their widespread use but also warrants a closer examination of its safety records.</li><li>Though Cessna are mostly flown by private pilots for non-commercial activities and small in size, they are fatal and deeper analysis e.g. pilots experience and maintenance should be checked.</li></ul> <p><b>Flight Phase and Accident Risk</b></p> <ul style="list-style-type: none"><li>Landing(15,384 Cases), Takeoff (12,435) and Cruise (10,208) are the riskiest and more training investment should go towards that.</li><li>shockingly 88% of fatal accidents occur in clear weather highlighting that other factors contribute to accidents like human errors, technical faults, or operational risks play a larger role than adverse weather alone</li></ul> <p><b>Fatal trend over time</b></p> <ul style="list-style-type: none"><li>Aviation accidents have generally declined over the years with small spikes in some years that cannot affect the downward overall decline.</li><li>clearly shows technology has improved and purchasing new models is safer</li></ul> <p><b>Injuries preventions</b></p> <ul style="list-style-type: none"><li>The correlations are low and hence each behave independently and should be handled independently on precaution measures taken</li></ul>	<p><b>Aircraft Selection</b></p> <ul style="list-style-type: none"><li>Conduct detailed safety reviews before purchasing a Boeing or Cessna models.</li><li>invest in new models which will have improved technological advancements</li></ul> <p><b>Pilot Training and operations</b></p> <ul style="list-style-type: none"><li>Based on flight phase accidents; invest on proper trainings on Landing, Takeoff and Cruise.</li><li>Also noted is weather conditions do not influence accidents, hence human factor trainings should be emphasised at all times.</li></ul> <p><b>Maintenance and Inspections</b></p> <ul style="list-style-type: none"><li>Small and private aircrafts like Cessna and Piper should go under thorough maintenance and inspections noting the high risks</li></ul> <p><b>Tailored Safety Strategies</b></p> <ul style="list-style-type: none"><li>Develop distinct injury mitigation strategies noting they are independent and one-size-fit-all approach will not prevent the diverse causes of injuries.</li></ul>



# Next Step

- Improve on Training especially on High-risk phases and private aircrafts
- Prioritize audits and maintenance on high-risk aircrafts and older models that shows higher risk.
- Update policies in line with the findings of this analysis
- Conduct public and personnel awareness campaigns on flight precautions
- Launch deeper analysis using other data sources without limitations presented by data source used.
- Introduce continuous data monitoring. Set up dashboards for ease of information digestion

# Thank You!

We value your input! Please take a moment to provide feedback on the analysis using the following questions:

1. Did the analysis of the data resonate with the company's goal?
2. Any other insight on the data that you find useful?

"Thank you for your valuable feedback! Your input will help us refine the analysis.

## Contacts

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