Aviation Risk Analysis

New Business

Evaluating the Safety of Aircraft for Business Expansion

Summary

Explorative analysis was conducted on airplane accidents data to:

- Determine if aviation is a viable investment.
- Identify the safest and most reliable aircraft makes and models.
- Pinpoint the most profitable business opportunities within the aviation industry.

Outline

- Business Problem
- Data
- Methods
- Results
- Conclusion

Business Problem

Company expansion into the aviation industry, targeting both commercial and private sectors.

Objectives:

- To Minimize risk in Aviation
- Maximize return on investment (ROI)
- To determine the best Airplane Makes, Models to go with.

Data Understanding

Data Source:
Data is sourced from the National Transportation Safety Board (NTSB).

Description:

- Time Period: 1962 to 2023
- Includes incidents from both the United States and international waters.

- Includes information such as the aircraft make, model, category, engine type, and whether the aircraft was amateur-built, severity of injuries (fatal, serious, minor) and the extent of aircraft damage, flight schedules, and the number of engines and so on.

Data Methods

a). Data Preparation:

- **Import Data**: Loaded the NTSB aviation accident dataset into a DataFrame.(Table with Rows and Columns).
- **Handle Missing Values**:
  - Filled categorical columns with mode or 'Unknown'.
  - Filled numerical columns with appropriate statistics (mean, median) or zeros.
- **Data Type Conversion**: Ensured correct data types for each column (e.g., parsed dates correctly).
- **Remove Unnecessary Columns**: Dropped columns with excessive missing values or irrelevant information.
- **Create New Features**: Derived new features such as the total number of injuries by summing injury columns.
- **Parameter Creation**: Created parameters for dynamic filtering in Tableau.
- **Calculated Fields**: Developed calculated fields for filtering and analysis in Tableau.
- **Export Cleaned Data**: Saved the cleaned DataFrame to a CSV file for use in Tableau.
- This structured approach ensured the dataset was clean and ready for insightful analysis.

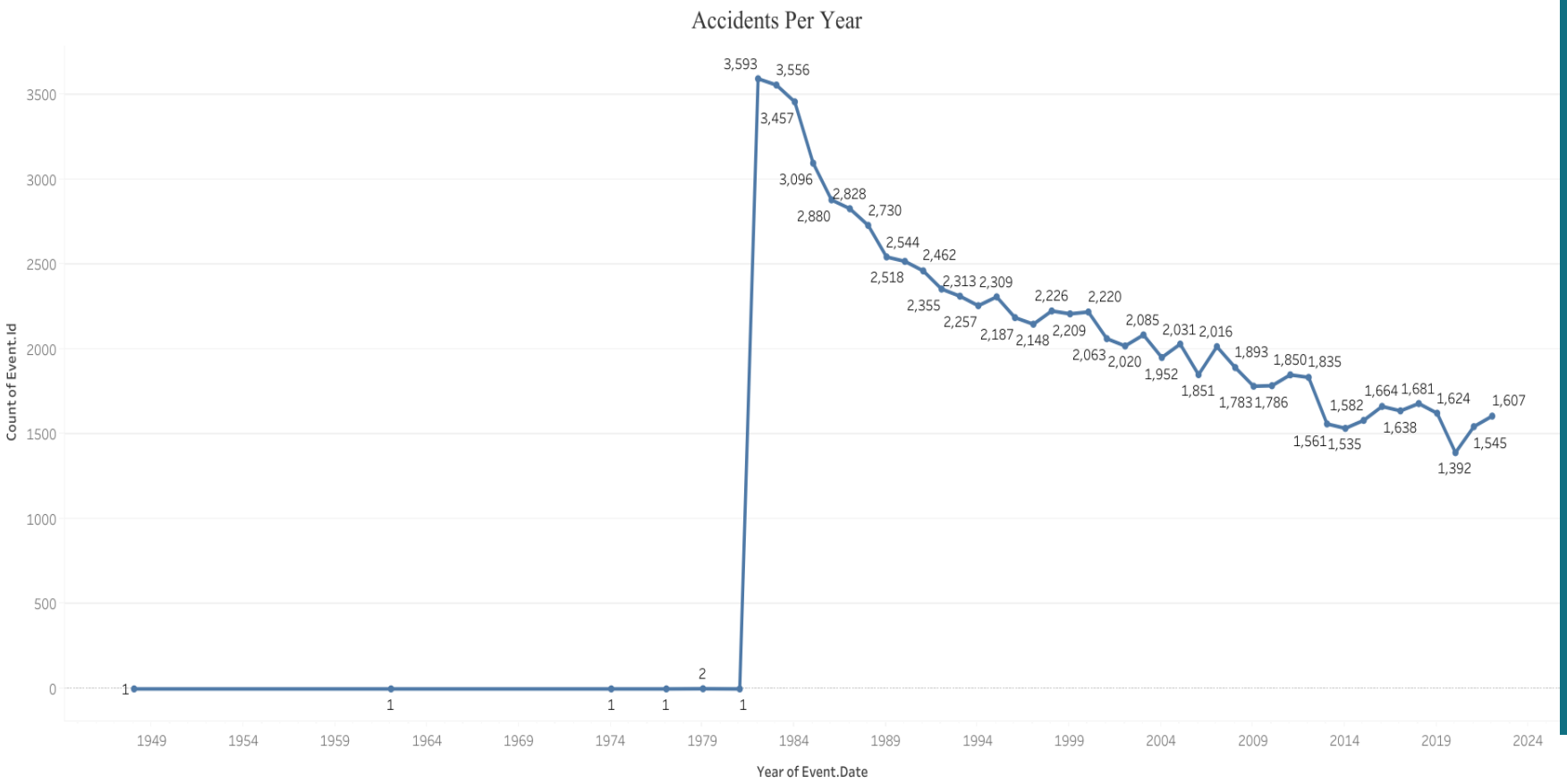
b). Data Analysis &Modelling

- **Exploratory Data Analysis (EDA)**:
  Visualized key metrics such as the number of accidents over time, geographical distribution, and injury severity.
  Analyzed trends and patterns in aircraft make and model incidents.
  Investigated the impact of weather conditions and phases of flight on accident rates.

- **Risk Assessment**:
  Calculated accident rates per aircraft make and model.
  Assessed injury severity distribution across different aircraft types.
  Identified high-risk conditions and phases of flight.

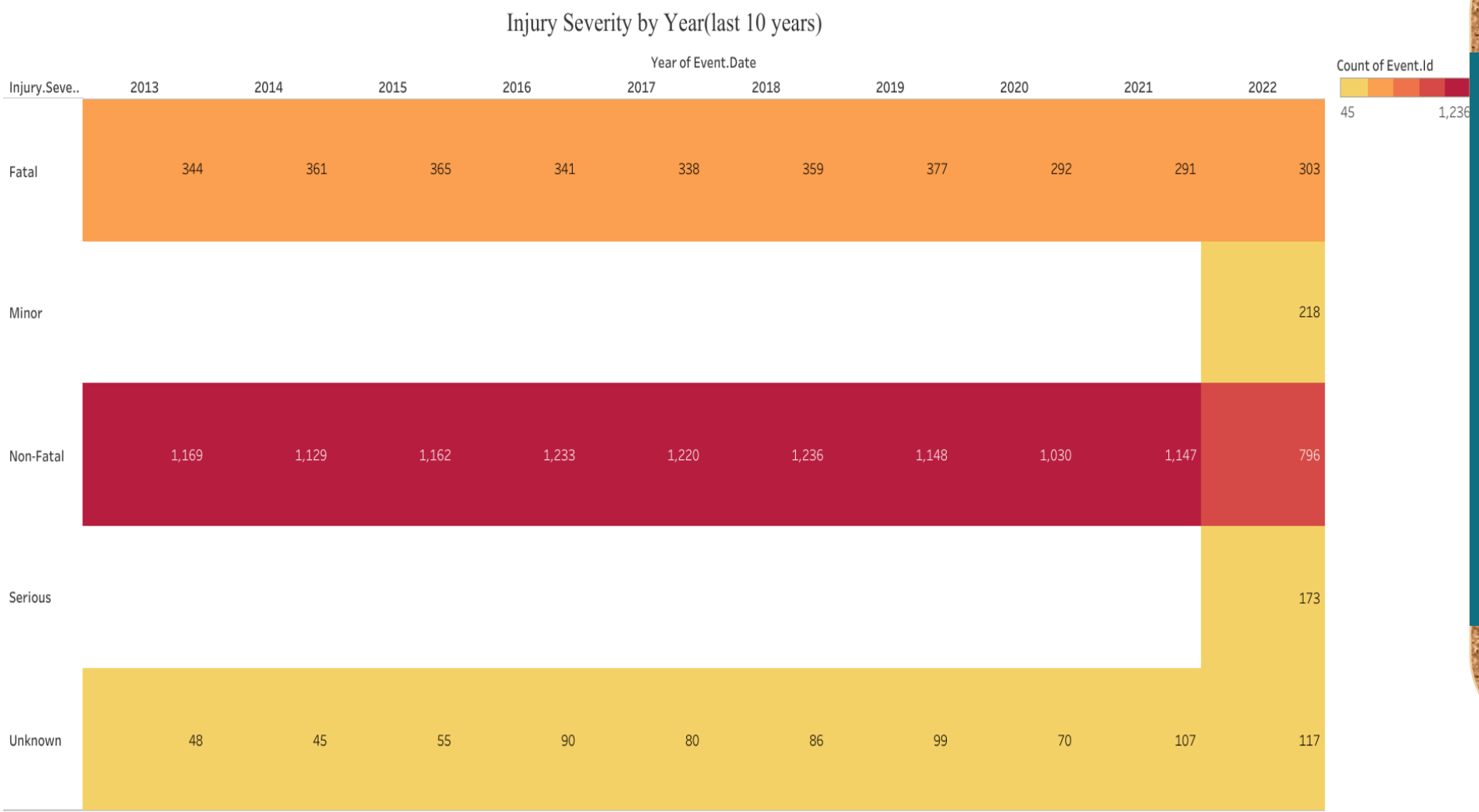
- **Dashboard Creation**:
  Developed an interactive Tableau dashboard for dynamic analysis and visualization.
  Included filters for Make, Model, and Location to enable detailed insights.
  Created visualizations to highlight key findings and support decision-making.

Results:



- There has been a decrease in accidents over the years since 1981 to 2022.

Results:

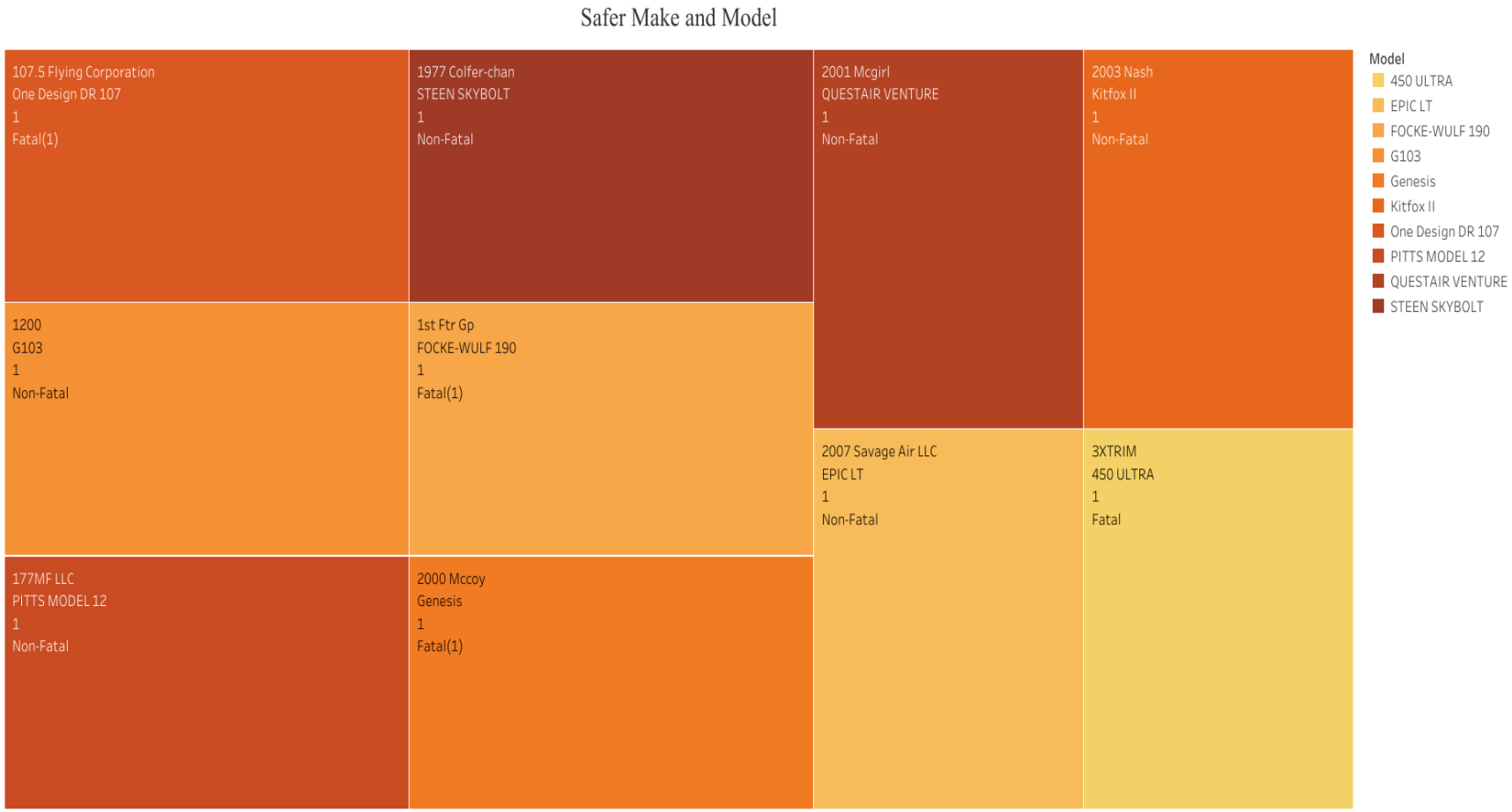


Over the last 10 years the accidents that took place, most of them have an Injury Severity of Non Fatal meaning the Aviation Industry is actually becoming safer.

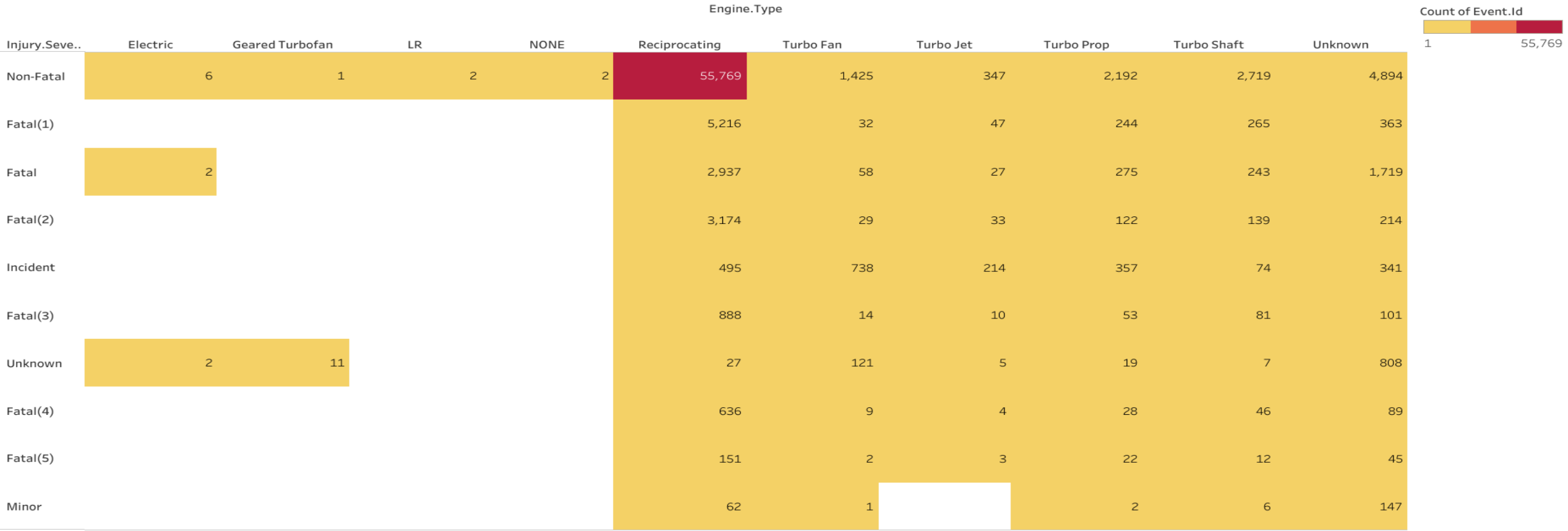
Results:

Based on the Analysis:
The safest Make and Models are:

1. 1977 Colfer-chan &Steen Skybolt
2. 1200 & G103
3. 2000 Mccoy
4. 177MF LLC & PITTS MODEL 12
5. 2001 Mcgirl& QUESTAIR VENTURE
6. 2007 Savage Air LLC & EPIC LT
7. 2003 Nash &Kitfox II



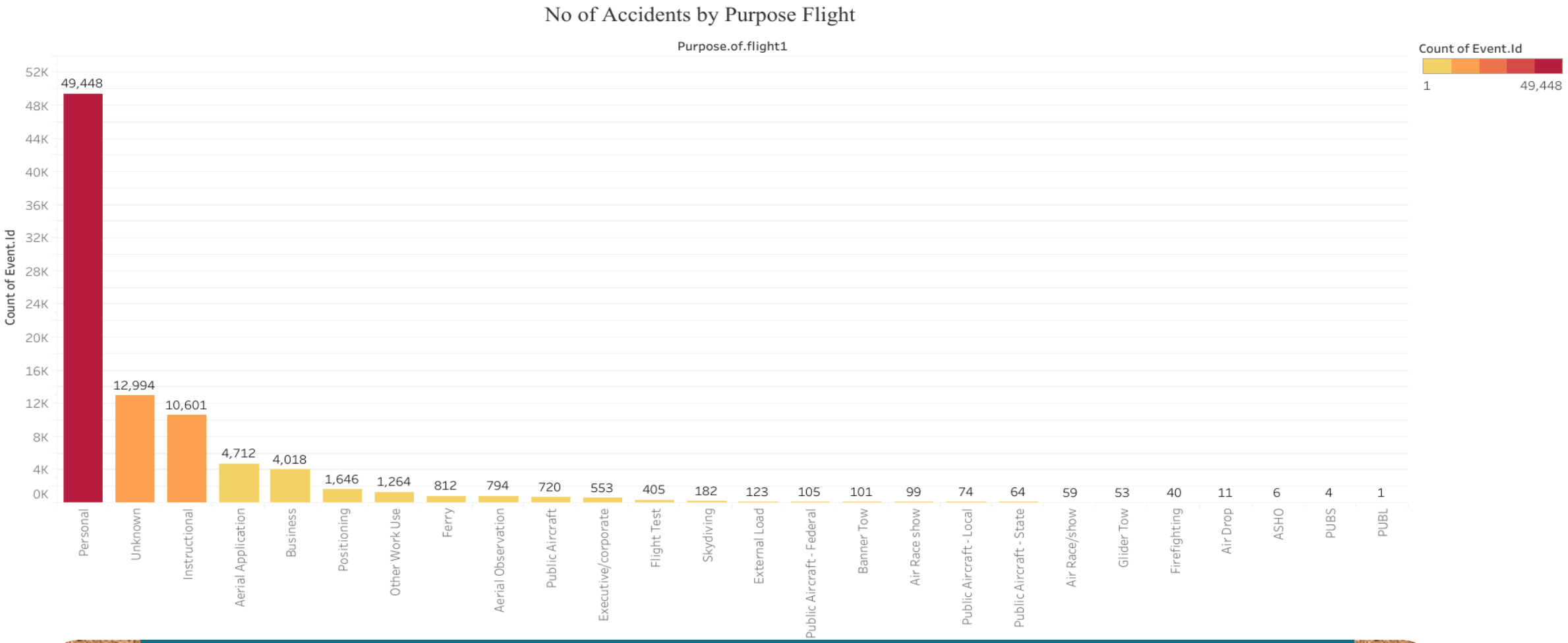
Lowest Injury Severity by Engine.Type



Injury.Seve..	Electric	Geared Turbofan	LR	NONE	Reciprocating	Turbo Fan	Turbo Jet	Turbo Prop	Turbo Shaft	Unknown
Non-Fatal	6	1	2	2	55,769	1,425	347	2,192	2,719	4,894
Fatal(1)					5,216	32	47	244	265	363
Fatal	2				2,937	58	27	275	243	1,719
Fatal(2)					3,174	29	33	122	139	214
Incident					495	738	214	357	74	341
Fatal(3)					888	14	10	53	81	101
Unknown	2	11			27	121	5	19	7	808
Fatal(4)					636	9	4	28	46	89
Fatal(5)					151	2	3	22	12	45
Minor					62	1		2	6	147

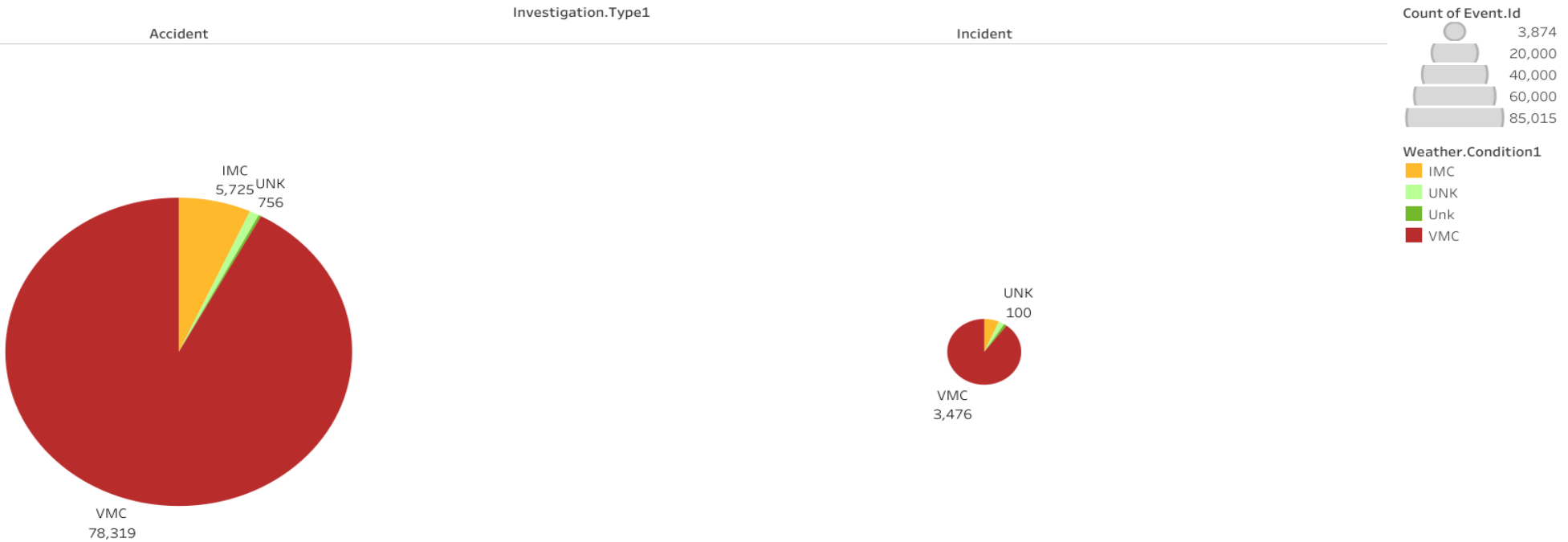
The above Engine Types have proved to have the lowest Injury Severity.
The most reliable being:

1. Electric Engine Type
2. Geared Turbofan
3. LR Engine Type



Of all the purposes needed for an Aircraft, the most common ones are;
Personal, Unknown, Instructional, Aerial Application, Business, Postioning.

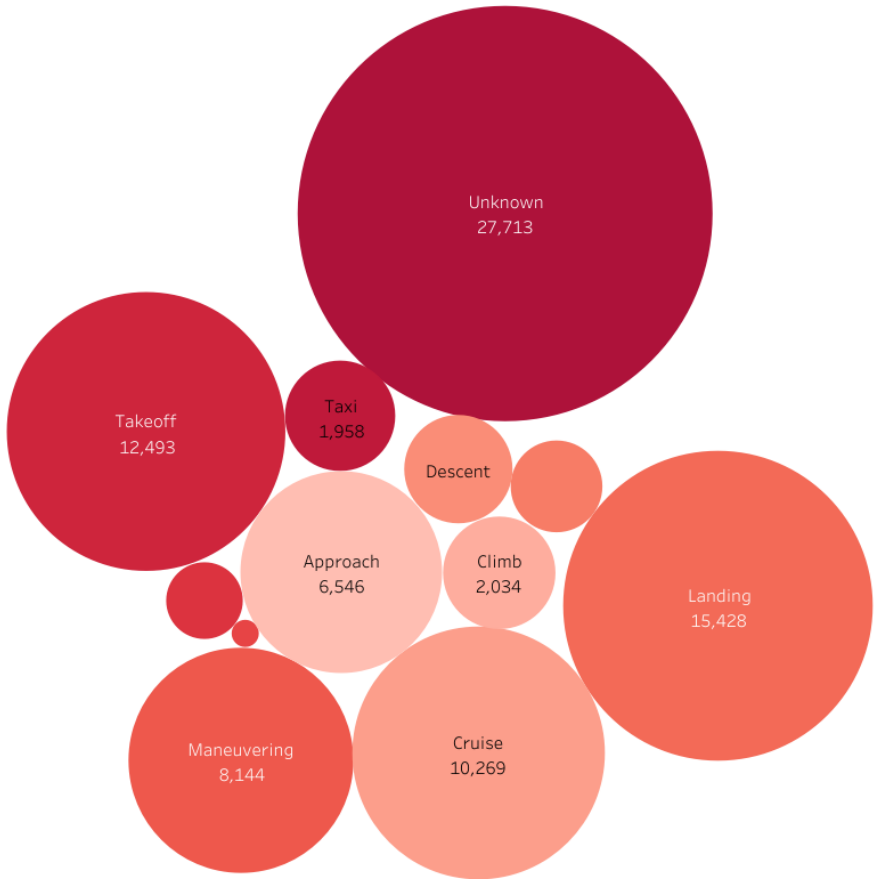
Accidents by Investigation and Weather

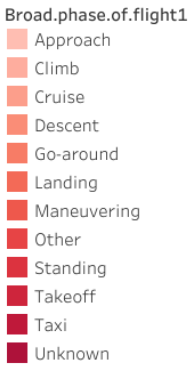


The weather conditions with highest no of accidents:

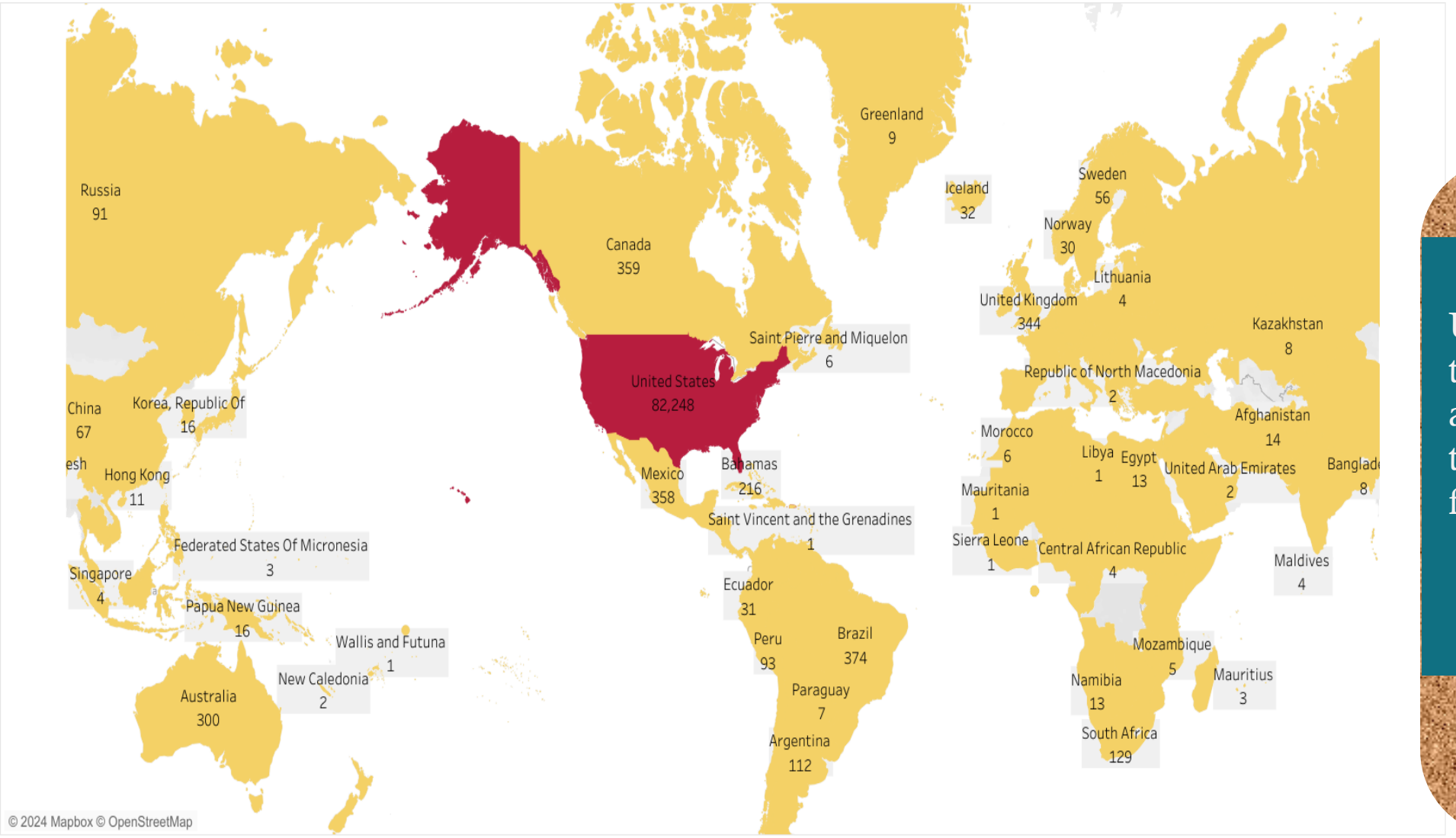
- VMC -meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specified minima.
- IMC- Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

No of Accidents by Phase of Flight



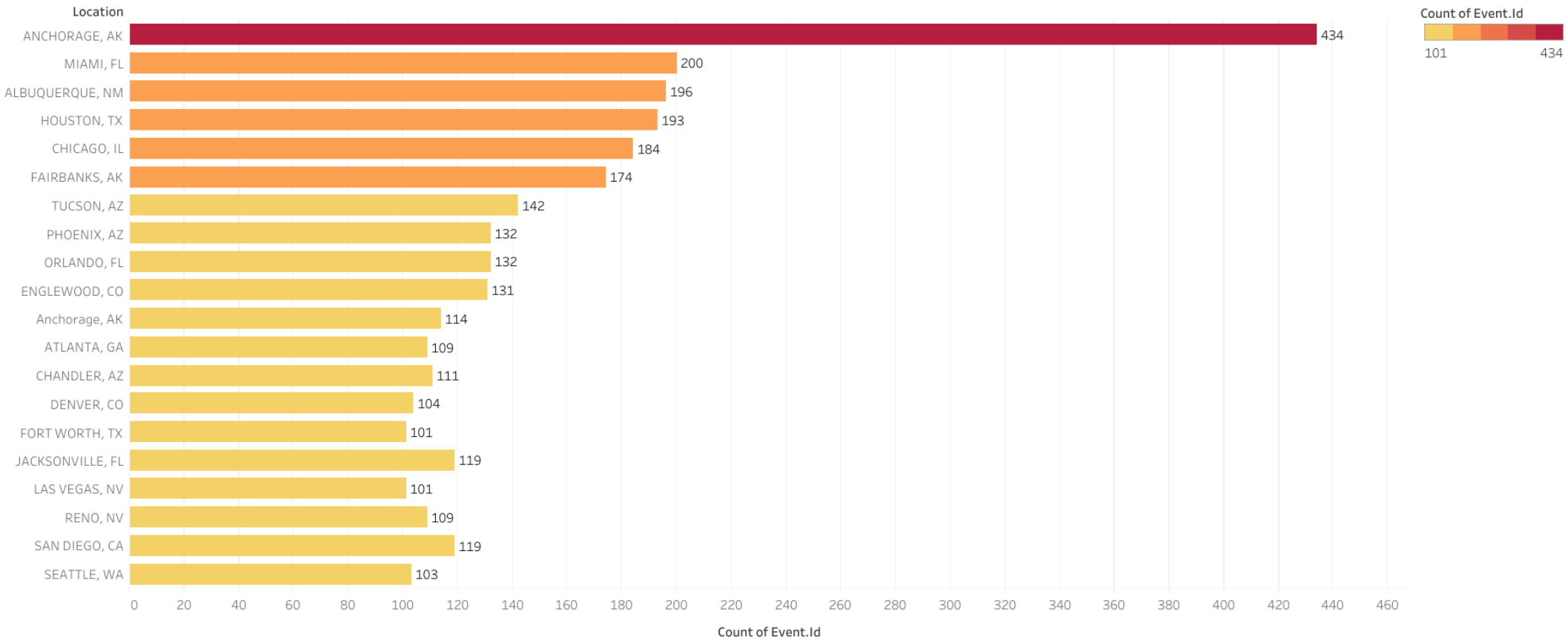


Landing Phase, Takeoff and Cruise phases have proved to be the most dangerous phases of flight with each having an accident count of 10k+



United States of America has the highest number of accidents totaling upto 85% of the accidents. It is a hot spot for aviation accidents.

Location with the Highest No of Accidents



Conclusion:

Investment Availability:

The overall trend shows a decrease in aviation accidents over the past few decades, indicating that the aviation industry is becoming progressively safer and could be a viable investment.

Low-Risk Aircraft:

Certain aircraft makes and models consistently exhibit lower accident rates and injury severities. These aircraft should be prioritized for purchase to minimize risk.

Profitability Insights:

The analysis highlighted significant revenue potential in both commercial and private aviation sectors, with private aviation showing slightly higher profitability due to larger market demand.

Key Risk Factors:

Adverse weather conditions and specific phases of flight (e.g., takeoff and landing) were identified as high-risk factors. Proper training and advanced technology should be employed to mitigate these risks.

Geographical Distribution:

The data revealed specific regions with higher accident frequencies. Understanding these high-risk areas will allow for better strategic planning and risk management.

THANK YOU!

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