AIRCRAFT SAFETY AND RISK ANALYSIS

A data-driven recommendation for low-risk aircraft investment

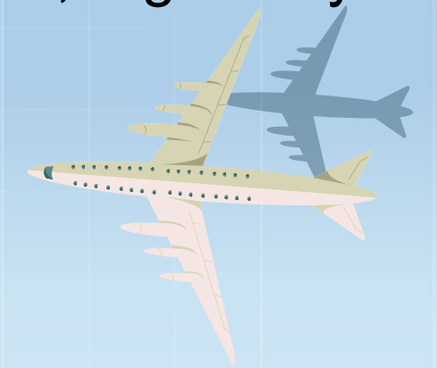
By Warren Patsi

OVERVIEW

- This project analyzes historical aircraft accident records to help identify low-risk aircraft types.
- We explore accident frequency, injury severity, and contributing causes like weather and flight phase.
- Tools used: Python (for data cleaning and analysis) and Tableau (for interactive visualizations).
- The goal is to make safe, data-backed investment decisions in the aviation sector.

BUSINESS UNDERSTANDING

- Our company is expanding into the aviation industry to diversify operations.
- The Aviation department needs guidance on selecting aircraft types with minimal operational and safety risk.
- Past accident data can help identify which models have better safety records.
- Understanding the risk profile of aircraft helps prevent financial loss, regulatory issues, and reputation damage



DATA UNDERSTANDING

- Data sourced from Kaggle: US and international aircraft accident reports (1960s–2020s).

- Each record represents an accident or incident, with details on aircraft type, weather, damage, and injuries.
- Key columns used: Event.Date, Make, Model, Weather.Condition, Aircraft.Damage, Injury Severity, Flight Phase.
- Data helped me to understand when, where, and how different aircraft models encounter risk.

DATA CLEANING

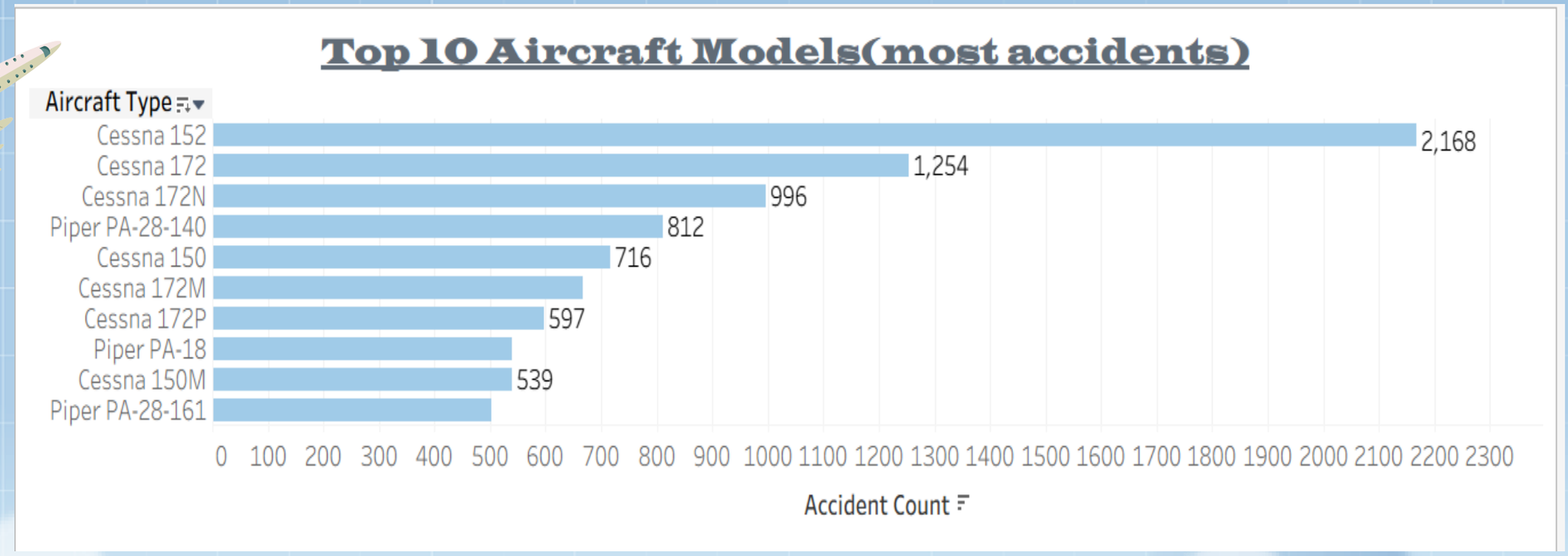
- We found that the raw data had some unclear or inconsistent entries.
- For example, 'Unknown', 'UNK', and 'Unk' were treated differently even though they mean the same.
- We combined similar entries and filled in important missing details where possible.
- This made the information more accurate and easier to analyze for decision-making.

DATA ANALYSIS APPROACH

- We used a tool called Python to help organize and explore the data quickly.
- Charts and summaries were created to find patterns in aircraft accidents.
- We focused on: how often accidents happen, how serious they are, and what usually causes them.
- To make things easier to understand, We built visual dashboards using a tool called Tableau.

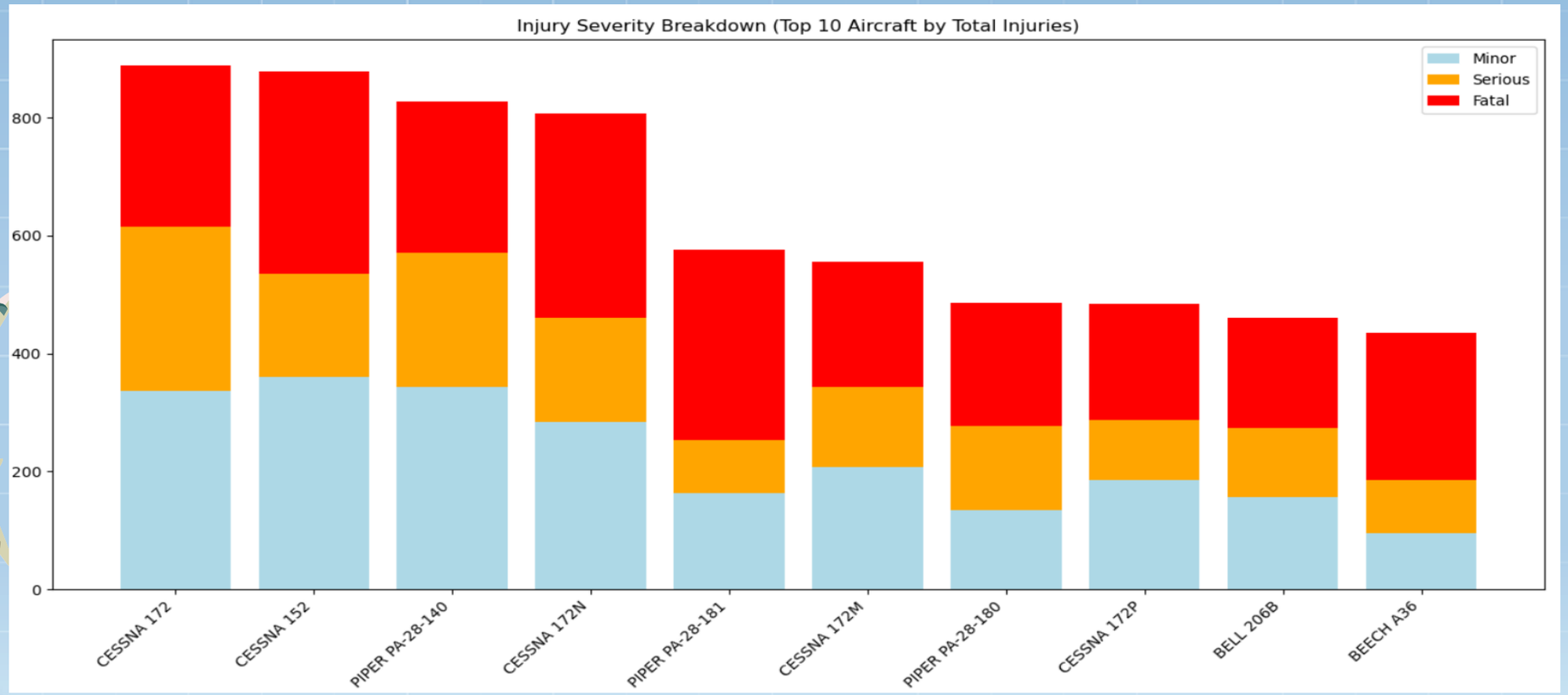
WHICH AIRCRAFT TYPES CRASHES MOST?

- Some aircraft types appear in accidents more frequently than others.These models may be more widely used, or operated in higher-risk conditions.
- By identifying high-frequency models, we can focus our attention on safer alternatives.
- Some aircraft may appear often because they are more common, not necessarily more dangerous, this highlights the need to consider severity next.



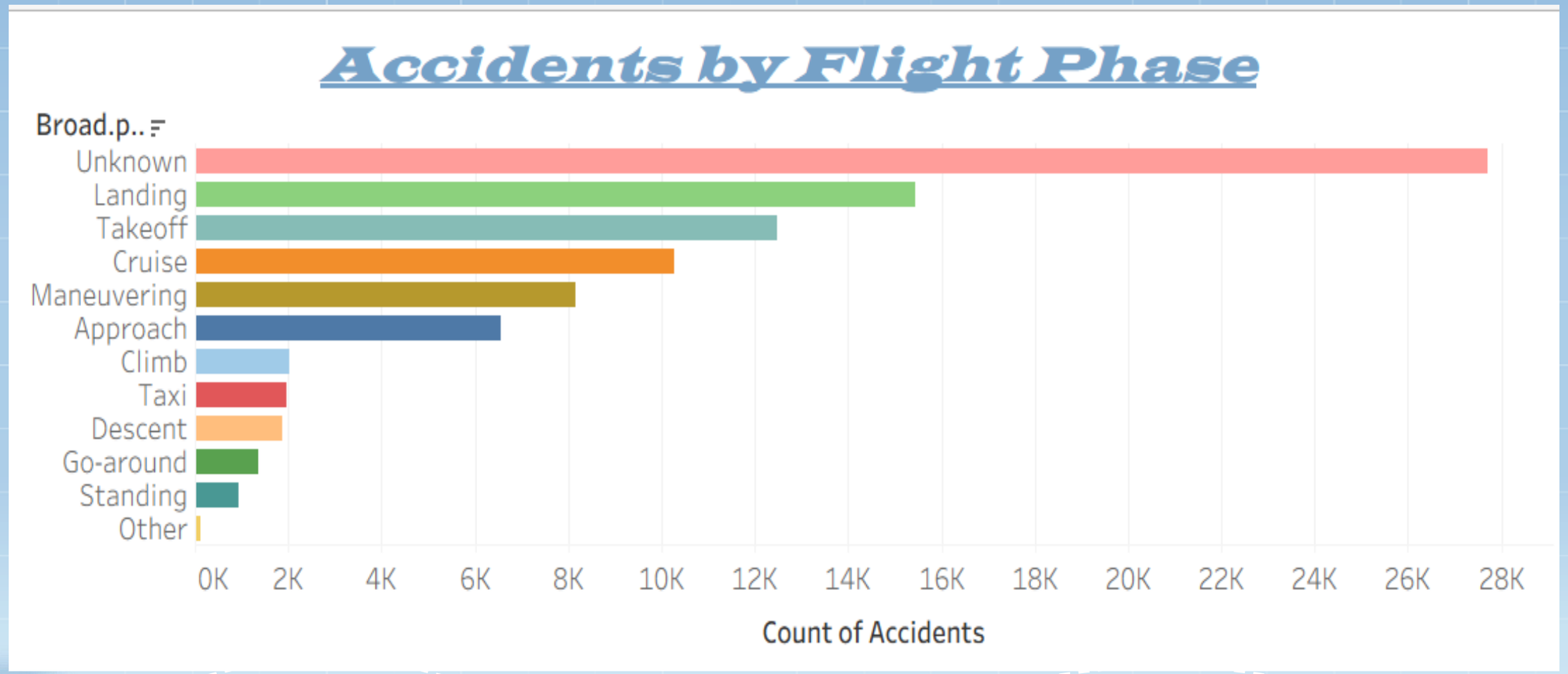
HOW SEVERE ARE AIRCRAFT ACCIDENTS

- Not all accidents are equally severe, some result in only minor injuries or none at all.
- Certain aircraft types have more survivable accident records than others.
- We prioritize aircraft where passengers are more likely to walk away unharmed.



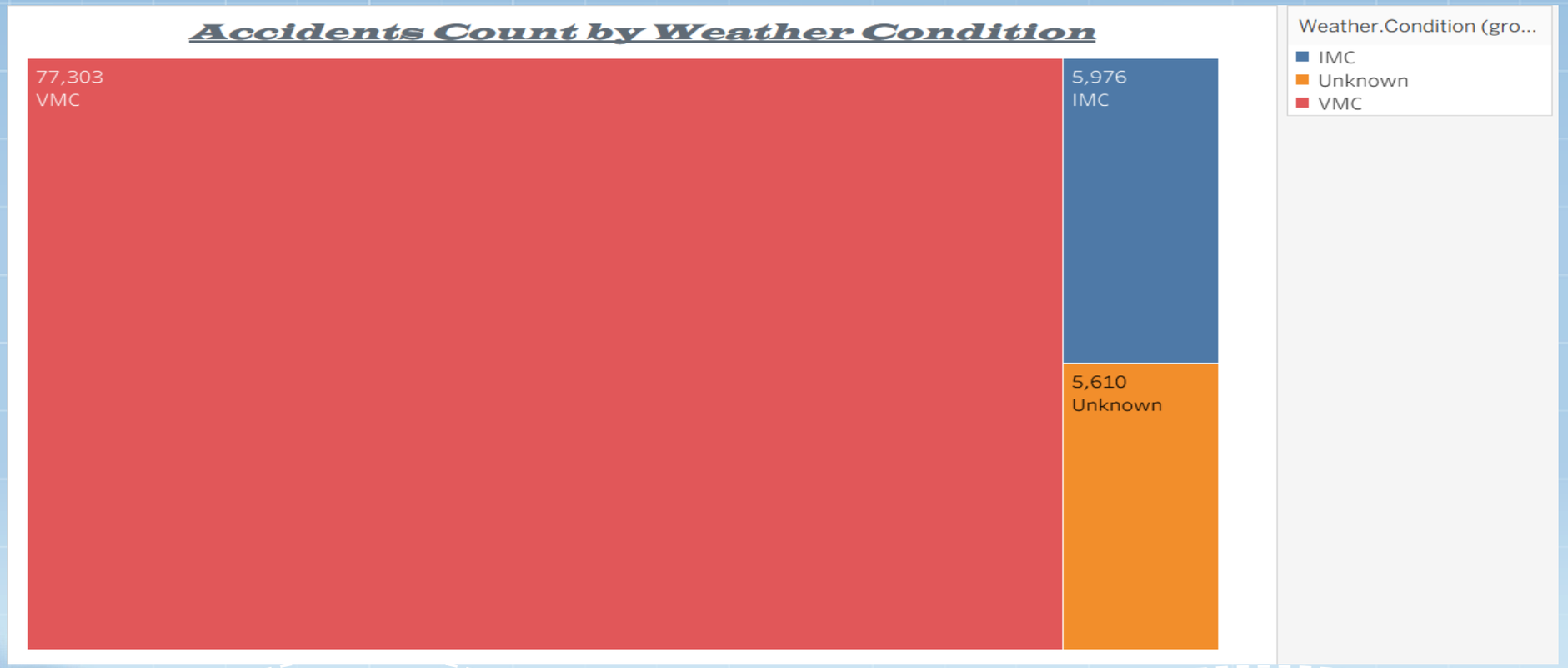
WHEN IN FLIGHTS DO ACCIDENTS HAPPEN?

- Most accidents happen during takeoff, landing, Cruise and approach.
- These phases are more complex and require precise handling.
- Training and equipment decisions should focus on reducing risk in these moments of flight.



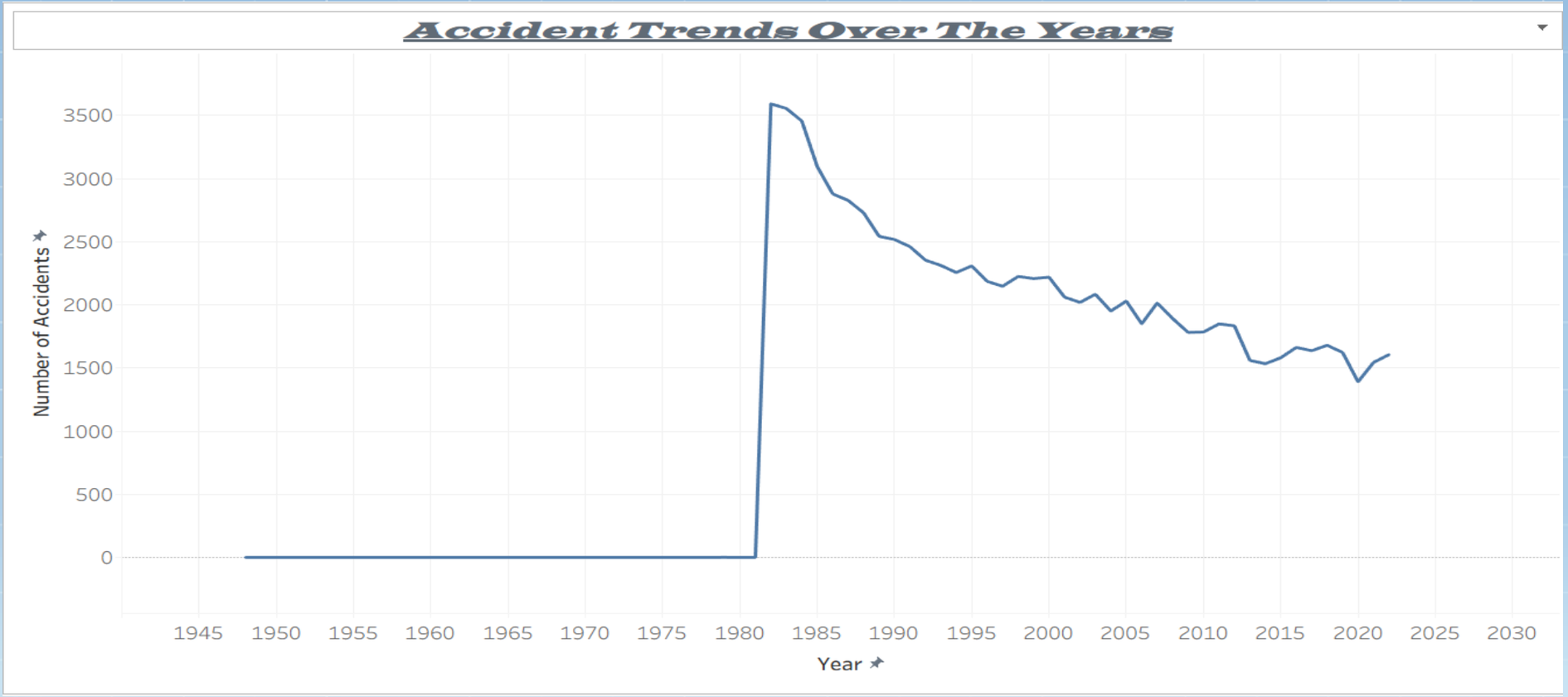
HOW WEATHER AFFECTS ACCIDENT RISK

- Most accidents happen in good weather, not during storms
- Good weather may give a false sense of safety, leading to human error
- Weather awareness and preparedness are key to safe operations, especially for private aircraft.



ARE AIRCRAFT ACCIDENTS DECREASING OVER TIME?

- The number of accidents peaked around 1990s and have declined ever since.
- Improvements in technology, regulation, and training are making flying safer.
- Investing in newer, modern aircraft models aligns with long-term safety trends.



BUSINESS RECOMMENDATIONS

- Invest in aircraft models with consistently low accident frequency and high survivability.
- Examples include the Cessna 180D, De Havilland DHC-8-102, and Howard DGA-15P, all of which showed no fatalities across multiple incidents.
- Avoid aircraft types with high fatality records or frequent crashes during critical flight phases.
- Focus operational training and risk management on landing and approach phases, which showed the most accident activity across all models.
- Select aircraft that perform reliably in both Visual (VMC) and Instrument (IMC) weather conditions, as weather risk is often underestimated.

NEXT STEPS

- Conduct a cost-benefit and maintenance feasibility study for shortlisted safe aircraft like the Cessna 180D and DHC-8-102.
- Engage aircraft manufacturers and regulatory authorities to validate safety records and assess parts availability and support reliability.
- Develop pilot training programs and safety protocols that specifically target high-risk phases like approach and landing.
- Invest in technology and operational procedures that enhance safety under poor weather conditions, especially for IMC scenarios.
- Monitor industry safety trends and update selection criteria annually as new accident data and aviation technologies emerge.

THANK YOU + QUESTIONS

- Thank you for your attention!

- Please feel free to ask any questions.

- Presenter: Warren Patsi
- Email: patsiwarren@gmail.com
- LinkedIn: Warren Patsi | LinkedIn


THE END