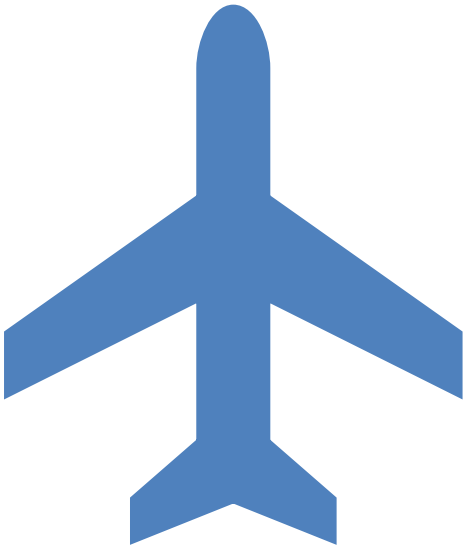


Aircraft Risk Analysis and Recommendations

Data Science : Phase 1 Project

Morgan Abukuse

Overview

Our focus is on analyzing aviation accident data from 1962 to 2023, sourced from the National Transportation Safety Board (NTSB).

The goal is to;

a) **Identify low-risk aircraft** and provide actionable insights to improve aviation safety and operational decision-making for a business venturing into the aviation industry.

b) **Key Deliverables**: Analysis, insights, and actionable recommendations.

Business Understanding

- Stakeholders:
  - ✓ Aviation Division Head: Strategic decisions for aviation operations.
  - ✓ Business Executives: Insights for aircraft acquisition and risk mitigation.
  - ✓ Operational Teams: Guidance to enhance safety protocols.

- Key Business Questions:
  1. Which aircraft types are associated with the lowest risks?
  2. What operational factors impact accident severity?
  3. Which regions and manufacturers require targeted safety interventions?

Data Understanding

Aviation accident data from 1962 to 2023 (National Transportation Safety Board).

- **Key Features:**
  - Accident details: Date, location, severity.
  - Aircraft specifications: Manufacturer, model, type.
  - Operational context: Flight purpose, weather conditions, flight phases.
  - Injury data: Counts of fatal, serious, and minor injuries.
- **Challenges:**
  - Missing values and inconsistencies handled during cleaning.
  - Standardized key features for consistent analysis.

Business Problem

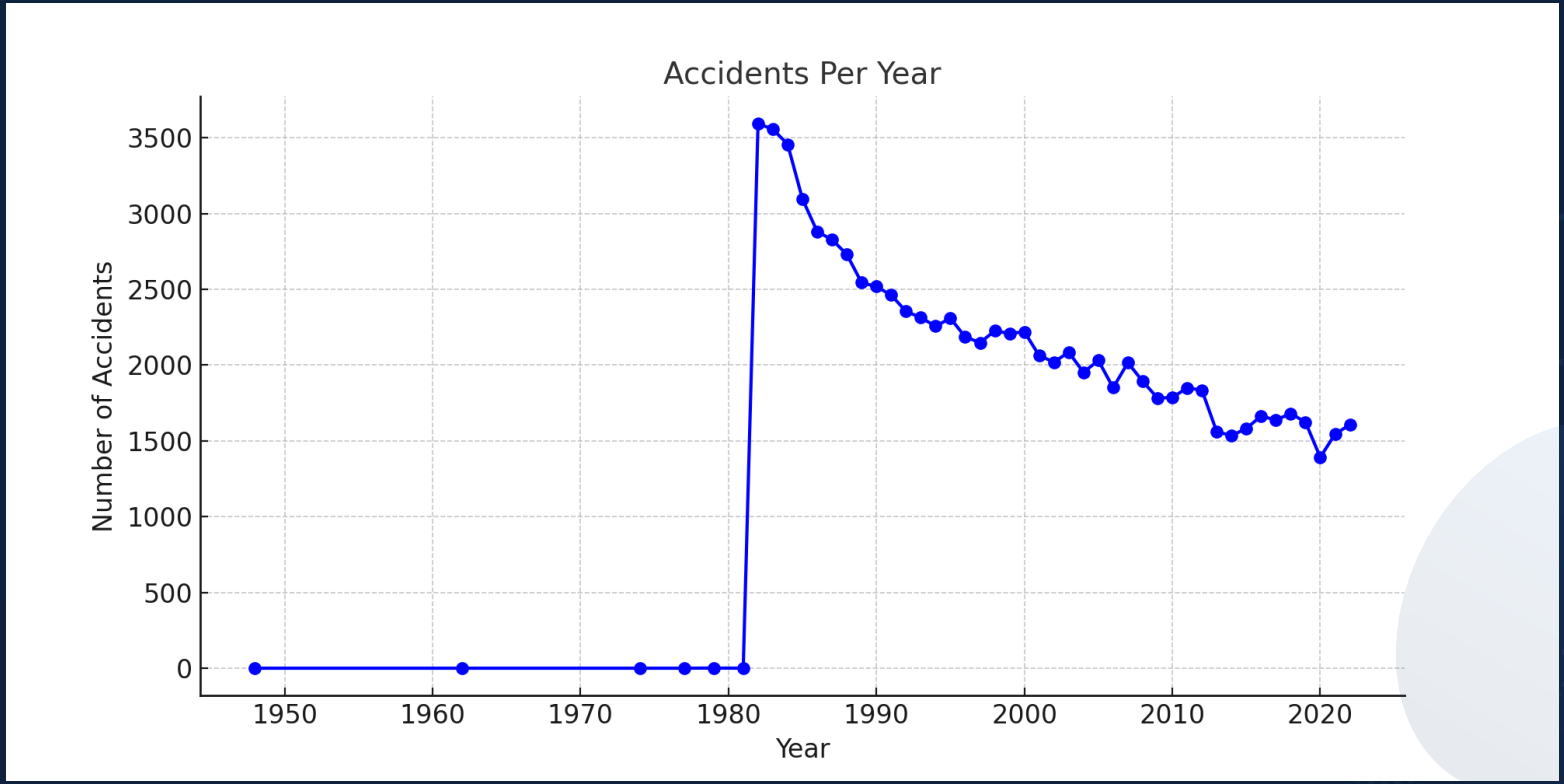
The company is expanding into the aviation industry but lacks insights into accident risks associated with different aircraft types and operational conditions. Identifying low-risk aircraft and strategies to mitigate operational risks is critical for this venture.

Objectives

1. Analyze aviation accident trends to identify risk factors and patterns.
2. Assess the impact of flight phases, weather conditions, and aircraft types on accident severity.
3. Develop actionable recommendations to reduce risks and improve aviation safety.
4. Provide insights for business decisions, including aircraft acquisition and operational safety improvements.

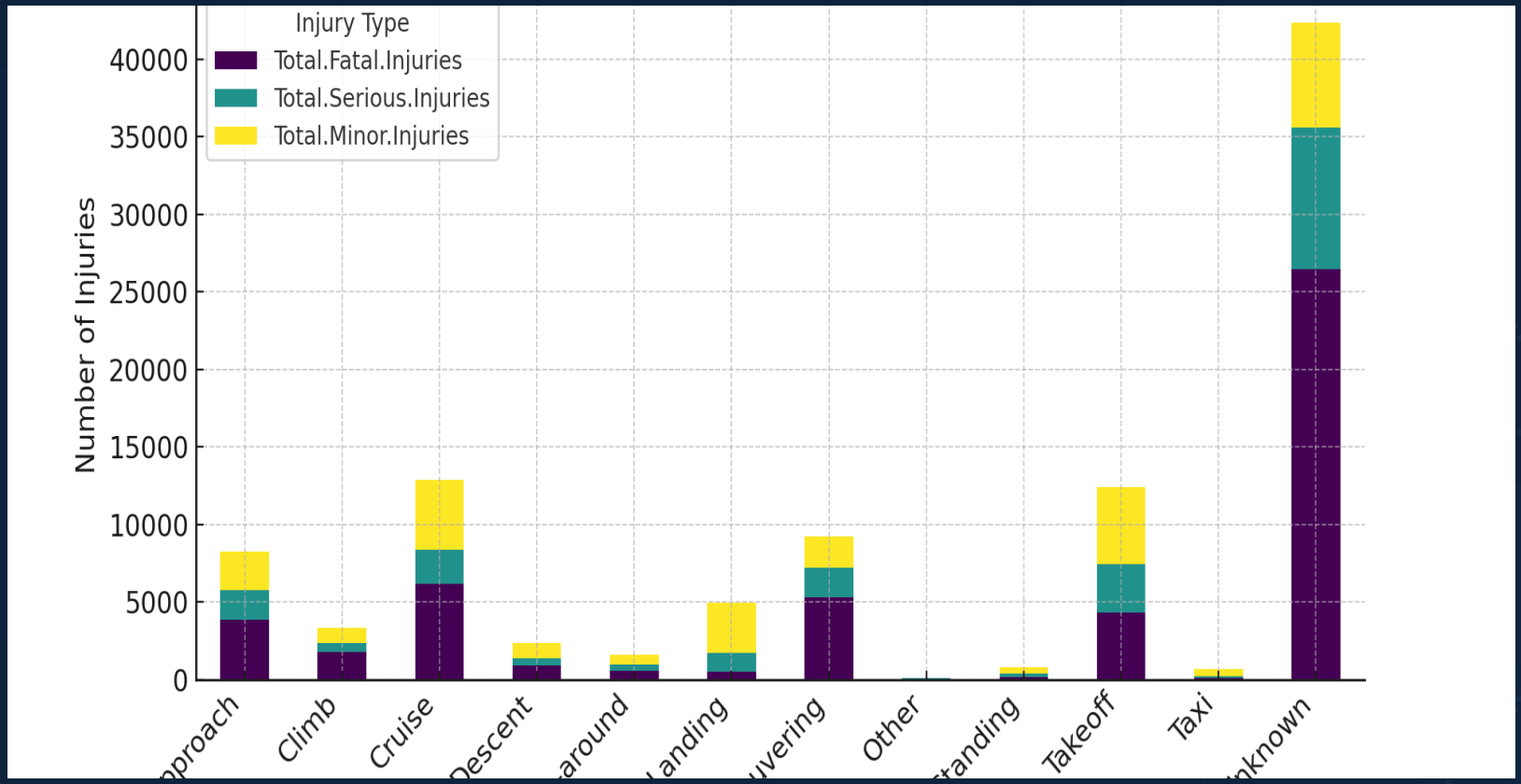
Data Analysis with Visualizations

Accident trends show a decline over the years, reflecting improved safety measures.



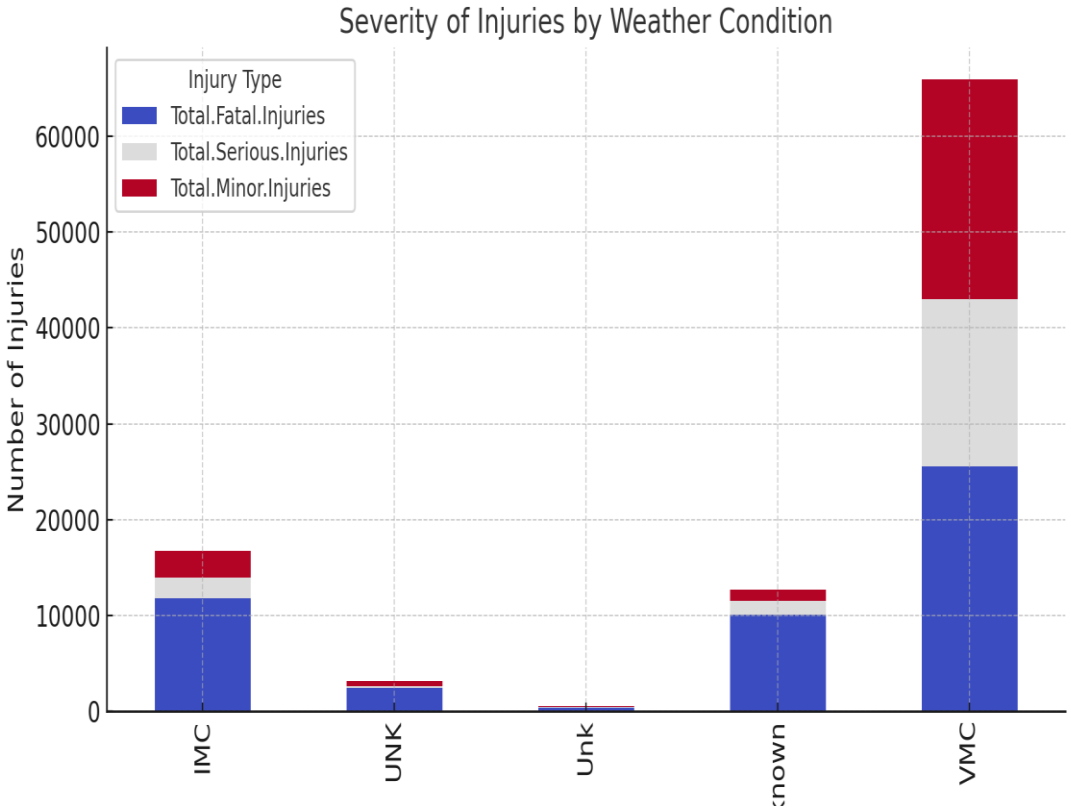
Data Analysis...

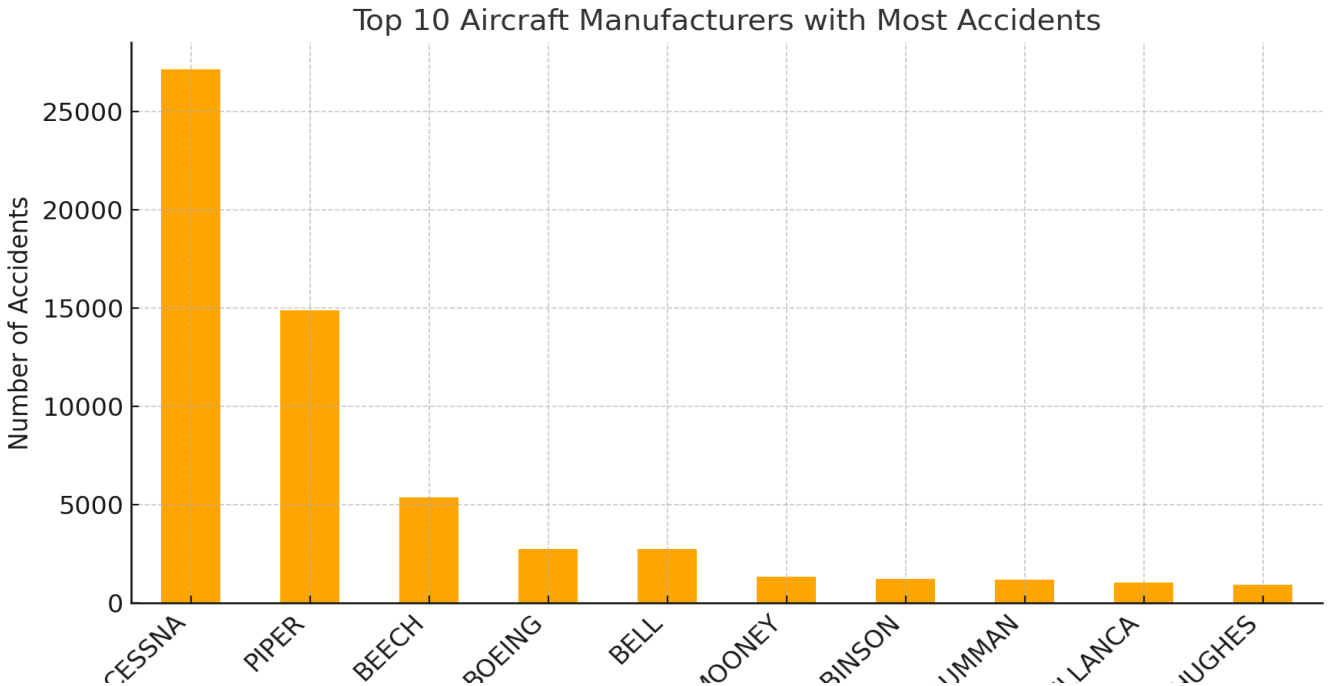
Cruise and takeoff phases are high-risk, with severe injuries recorded.



Data Analysis..

- IMC poses a higher risk per flight, as these conditions are more likely to lead to severe accidents when they occur.
- VMC accounts for more total injuries due to the higher overall number of flights conducted under these conditions.



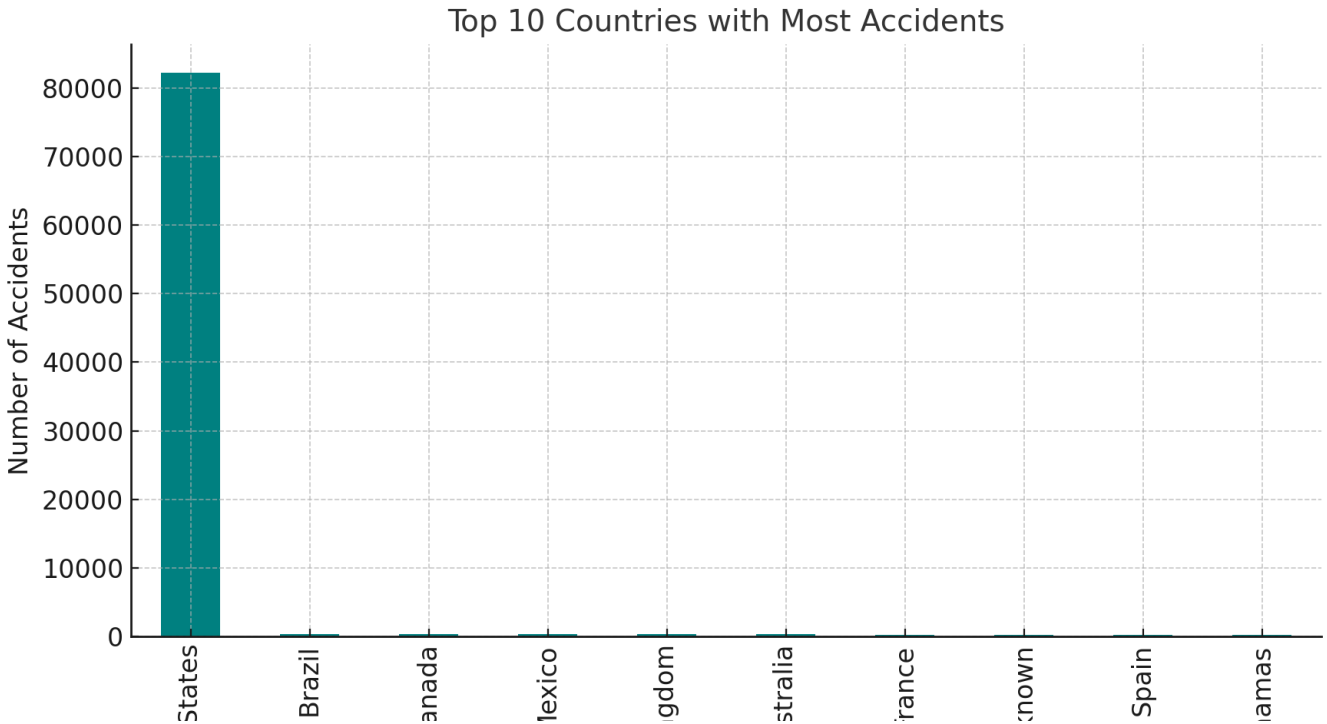


Cessna and Piper dominate accident records, suggesting high risks in personal aviation.

Data Analysis...

Data Analysis…

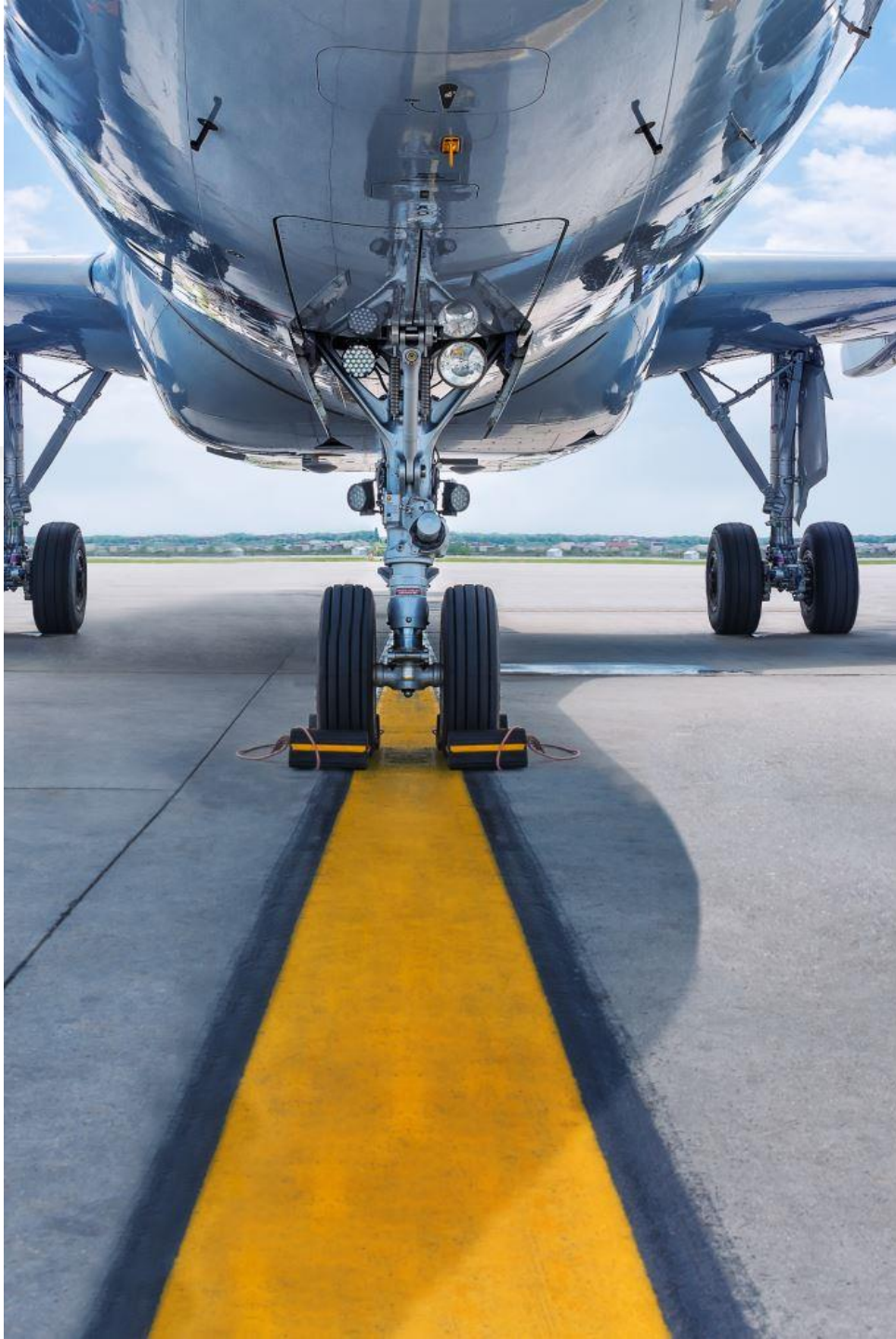
The U.S. leads in accidents due to its large aviation sector and comprehensive reporting.



Recommendations

1. Aircraft Selection:
   - Focus on modern commercial aircraft (e.g., Boeing, Airbus) with proven safety records.
   - Avoid older or recreational aircraft unless paired with enhanced safety measures.

2. Prioritize Critical Flight Phases:
   - Implement training and automated safety systems for cruise, takeoff, and maneuvering.
   - Invest in automated safety systems for error mitigation during these phases.



3. Enhance Weather-Related Safety:
    - Develop pilot training and equip aircraft with advanced weather navigation tools.
    - Prepare for adverse conditions (e.g., IMC) through rigorous safety protocols.
4. Target Personal Aviation Risks:
    - Improve training and maintenance for personal flights.
    - Educate recreational pilots on weather and operational safety.

5. Regional Safety Initiatives:
    - Focus safety improvement programs in high-accident regions like the U.S. and partner with aviation authorities to strengthen safety.

6. Invest in Technology-Driven Safety:
    - Adopt advanced safety technologies, including automated landing systems and collision avoidance tools

Next Steps

Integrate findings into operational decision-making.

Conduct further analysis on specific aircraft models and regions.

Develop training and safety programs for adverse conditions and critical phases.

Explore partnerships for acquiring modern aircraft equipped with advanced safety technologies.

Conclusion

Accident Trends:

- Accidents have generally declined over the years due to technological advancements and safety improvements.

High-Risk Factors:

- **Cruise** and **takeoff** phases are associated with severe injuries and fatalities.
- **IMC conditions** pose higher risks per flight, while **VMC conditions** account for more injuries due to flight volume.

Manufacturer Insights:

- **Cessna (27,149 accidents)** and **Piper (14,870 accidents)** dominate accident counts, emphasizing risks in personal aviation.
- Manufacturers like **Boeing** and **Airbus** exhibit lower accident rates, reflecting advanced safety features and operational standards.

Thank You

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