Aviation Safety Analysis and Feasibility Study

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Business Problem

- Your company is expanding in to new industries to diversify its portfolio.
- The company is interested in purchasing and operating airplanes for commercial and private enterprises.
- We are charged with determining which aircraft are the lowest risk for the company to start this new business endeavor then translating the findings into actionable insights that the head of the new aviation division can use to help decide which aircraft to purchase.

The Analysis

The Data

- The analysis utilizes two primary datasets merged to create a comprehensive view of aviation safety across the United States. The first dataset, AviationData.csv, contains detailed accident records including event dates, location information, aircraft specifications, injury statistics, and environmental conditions.
- The second dataset, USState_Codes.csv, provides state abbreviations that allow for geographic classification of incidents.
- The data preparation process involved several key steps to ensure data quality and usability.

- The merged dataset contains 33 columns, capturing multiple dimensions of aviation safety:

1. Temporal data: Event dates spanning decades of aviation history

2. Geographic information: Detailed location data including coordinates

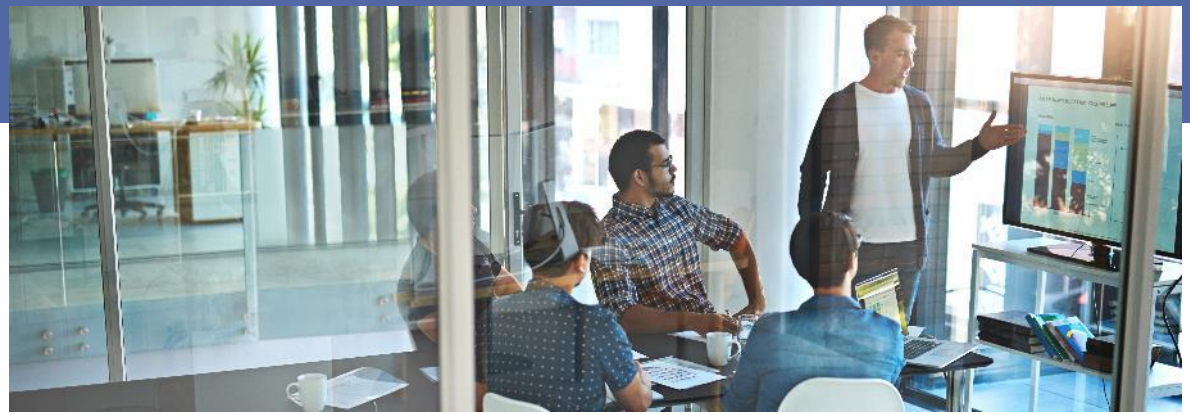
3. Aircraft specifications: Make, model, and configuration details

4. Safety outcomes: Fatality and injury statistics

5. Environmental factors: Weather conditions at time of incident

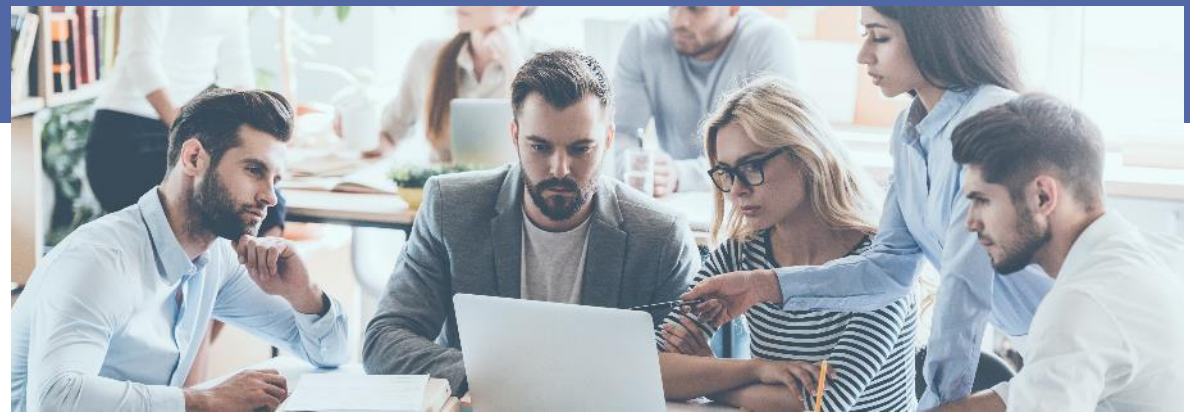
6. Operational context: Flight phase when incidents occurred

Findings



Safety Index

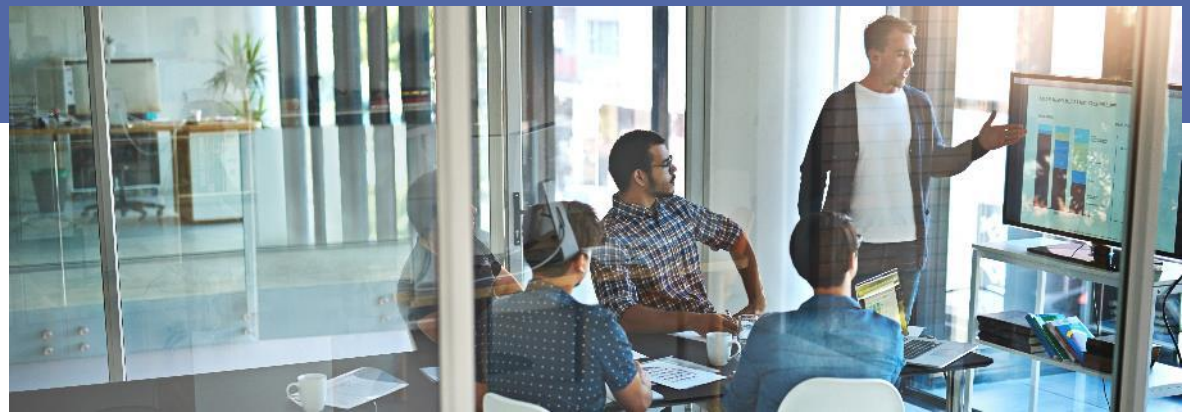
- A composite metric visible in the final dataset (value range approximately 1.3-2.0 in the visible samples) quantifies overall safety performance
- This index likely incorporates multiple factors including accident severity, aircraft type, and potentially temporal trends.
- The methodology for calculating this index represents a valuable contribution to aviation safety assessment, providing a standardized way to compare safety across different aircraft types, regions, or time periods.



Safety Index

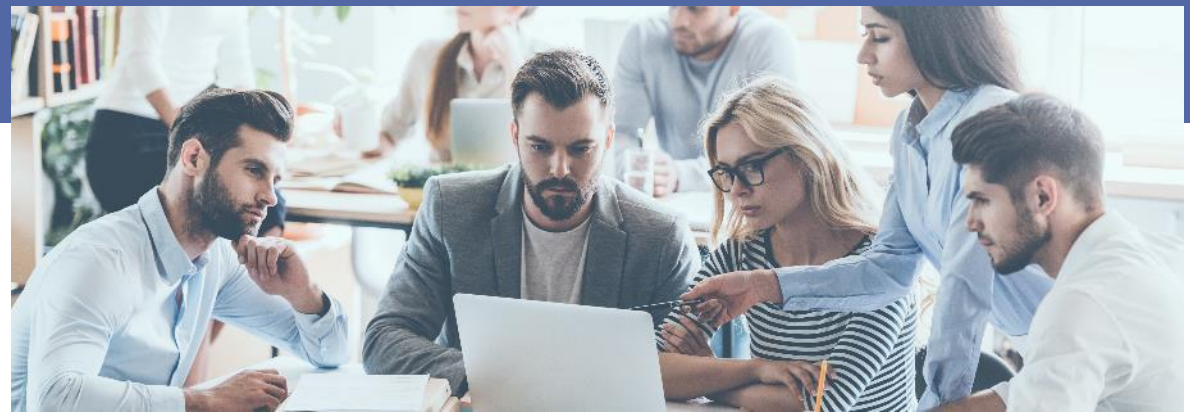
- Models like the Cessna 152, Piper PA-28-140, and Beech A36 rank highly, suggesting a lower overall risk profile.
- Deeper analysis involving filtering by Engine Type, Number of Engines could involve comparing safety indexes within specific aircraft categories for a more targeted recommendation.

Further Analysis Findings



Temporal Analysis and Safety Trends

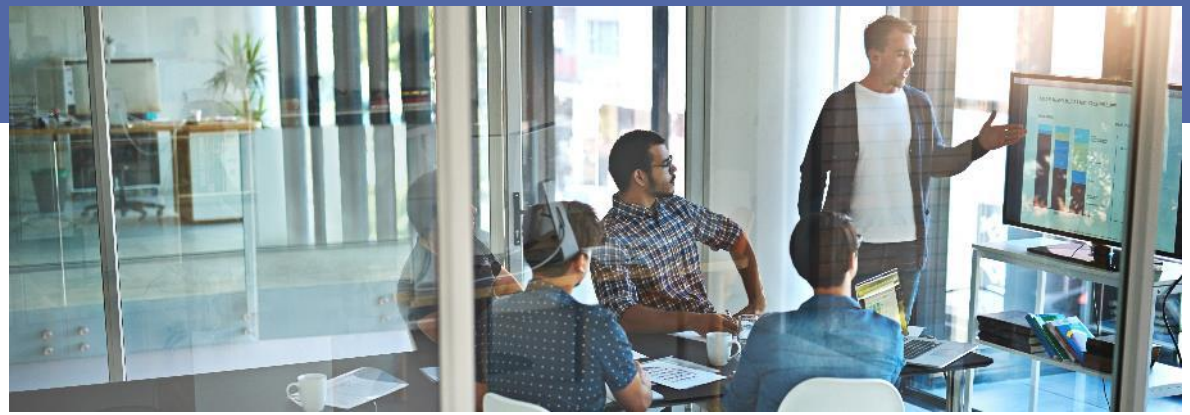
- The dataset spans multiple decades of aviation history, with records from 1948 through 2022.
- Notably event occurrences have reduced steadily over time.



Temporal Analysis and Safety Trends

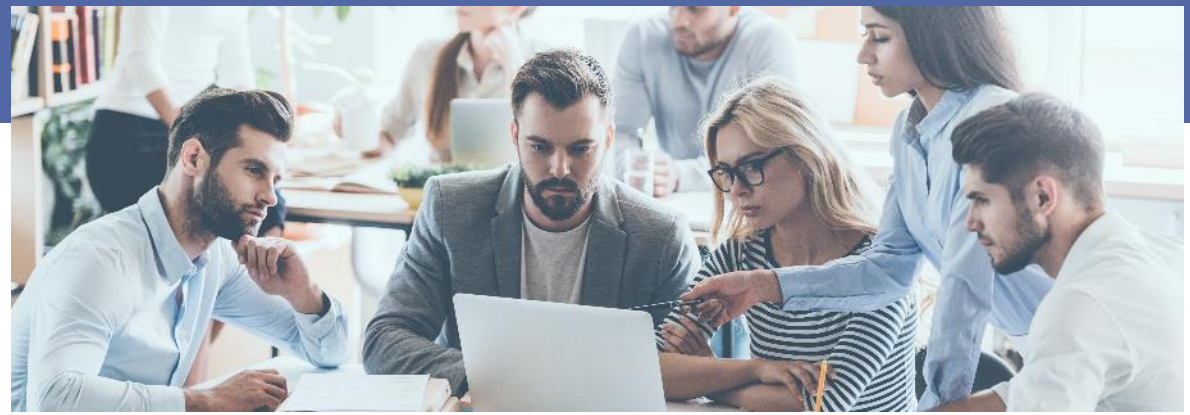
- This extensive temporal coverage enables analysis of safety evolution across different eras of aviation technology and regulation.

Further Analysis Findings



Weather Resilience

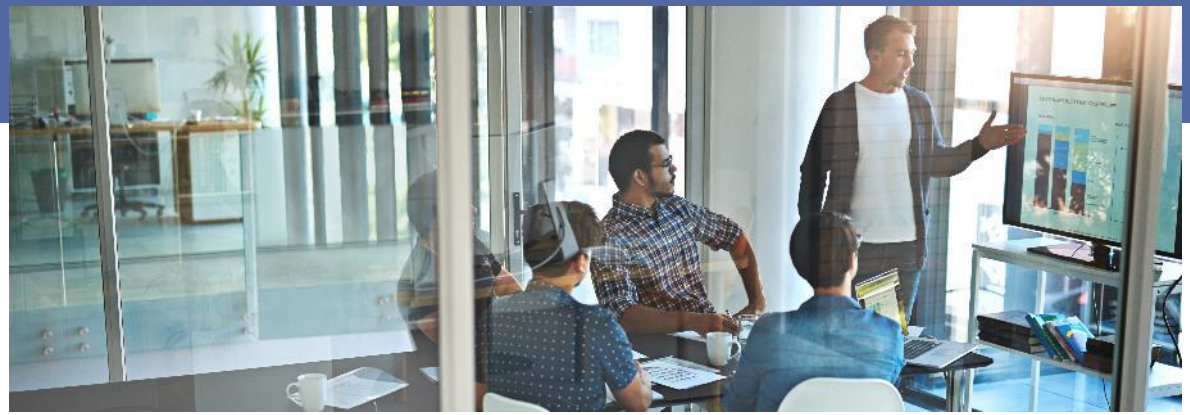
- A Weather_Resilience metric ranges from 0.0 to 1.0 in the visible data, which is a scale that quantifies how well aircraft perform under various weather conditions.
- This innovative metric could be particularly valuable for airlines operating in regions with challenging weather patterns, providing guidance on which aircraft types demonstrate better performance in adverse conditions.
- The analysis shows that VMC (Visual Meteorological Conditions) is the most common weather condition during accidents across all top states.



Weather Resilience

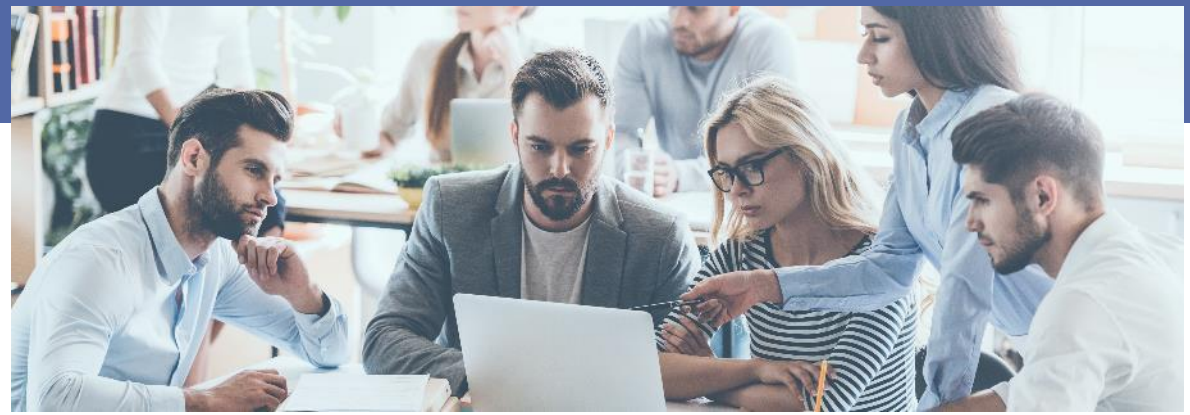
- California, Texas, and Florida show similar weather pattern distributions, while Alaska has a higher proportion of IMC (Instrument Meteorological Conditions) accidents compared to other states
- Alaska, despite being fourth in total accidents, has a higher proportion of IMC-related accidents, suggesting challenging weather conditions play a significant role in accidents there.
- The predominance of VMC(Visual Meteorological Conditions) conditions across all states indicates that most accidents occur in good visibility conditions, suggesting that factors other than weather (such as pilot error or mechanical issues) may be primary contributors.!

Analysis Recommendations



Airline Operators

- Fleet Composition Strategy: The analysis of Safety_Index by aircraft manufacturer provides guidance for fleet acquisition and retirement decisions. Operators should prioritize aircraft with consistently higher safety ratings when planning fleet expansions or replacements.
- Weather Operation Protocols: The Weather_Resilience metric offers a data-driven foundation for developing standard operating procedures specific to different weather conditions. Aircraft with lower resilience scores may require more conservative operational guidelines in challenging weather situations.
- Training Emphasis Based on Flight Phase Risk: The inclusion of "Broad.phase.of.flight" data allows for identification of higher-risk phases (such as approach, takeoff, or cruise) that should receive additional focus during pilot training and operational reviews.



Airline Operators

- Interactive Dashboard Development: Create a live dashboard that allows stakeholders to filter and explore safety metrics by region, aircraft type, time period, and weather conditions to support data-driven decision-making.
- Models like the Cessna 152, Piper PA-28-140, and Beech A36 rank highly, suggesting a lower overall risk profile.