Aviation Risk Analysis for Business Decision-Making

This presentation analyzes aviation accident data from the National Transportation Safety Board (NTSB) to assist a business stakeholder—specifically, the head of a new aviation division—in identifying low-risk aircraft types to guide strategic purchasing decisions. As the company looks to expand into the aviation industry, these data-driven insights will be essential for reducing operational risks and improving safety outcomes.

by Cris Mbici

Business Problem & Data Source

Business Problem

Our company is exploring new investment opportunities in the aviation sector. However, leadership lacks critical knowledge about the potential risks associated with different aircraft. This analysis is designed to fill that knowledge gap by identifying trends, evaluating accident patterns, and delivering actionable recommendations.

Data Source

The data comes from the National Transportation Safety Board (NTSB), containing decades of civil aviation accident reports within the United States and surrounding international waters from 1962-2023. We focused on the most recent 25 years (2000-2023) for relevance.

Data Preparation Approach

Data Cleaning

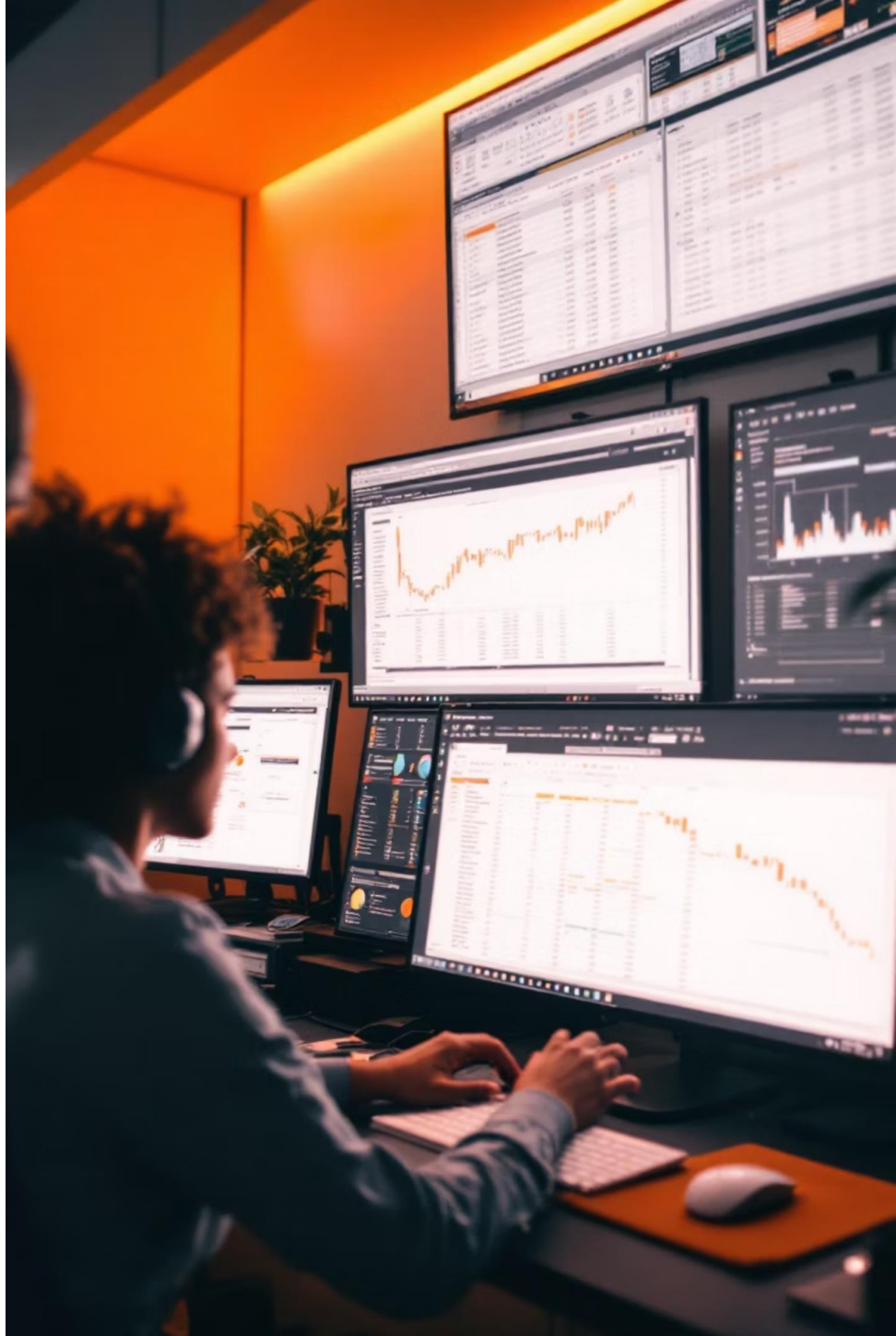
Handled missing values, renamed ambiguous columns, and filtered for relevant records. Standardized manufacturer names and corrected inconsistencies.

Data Filtering

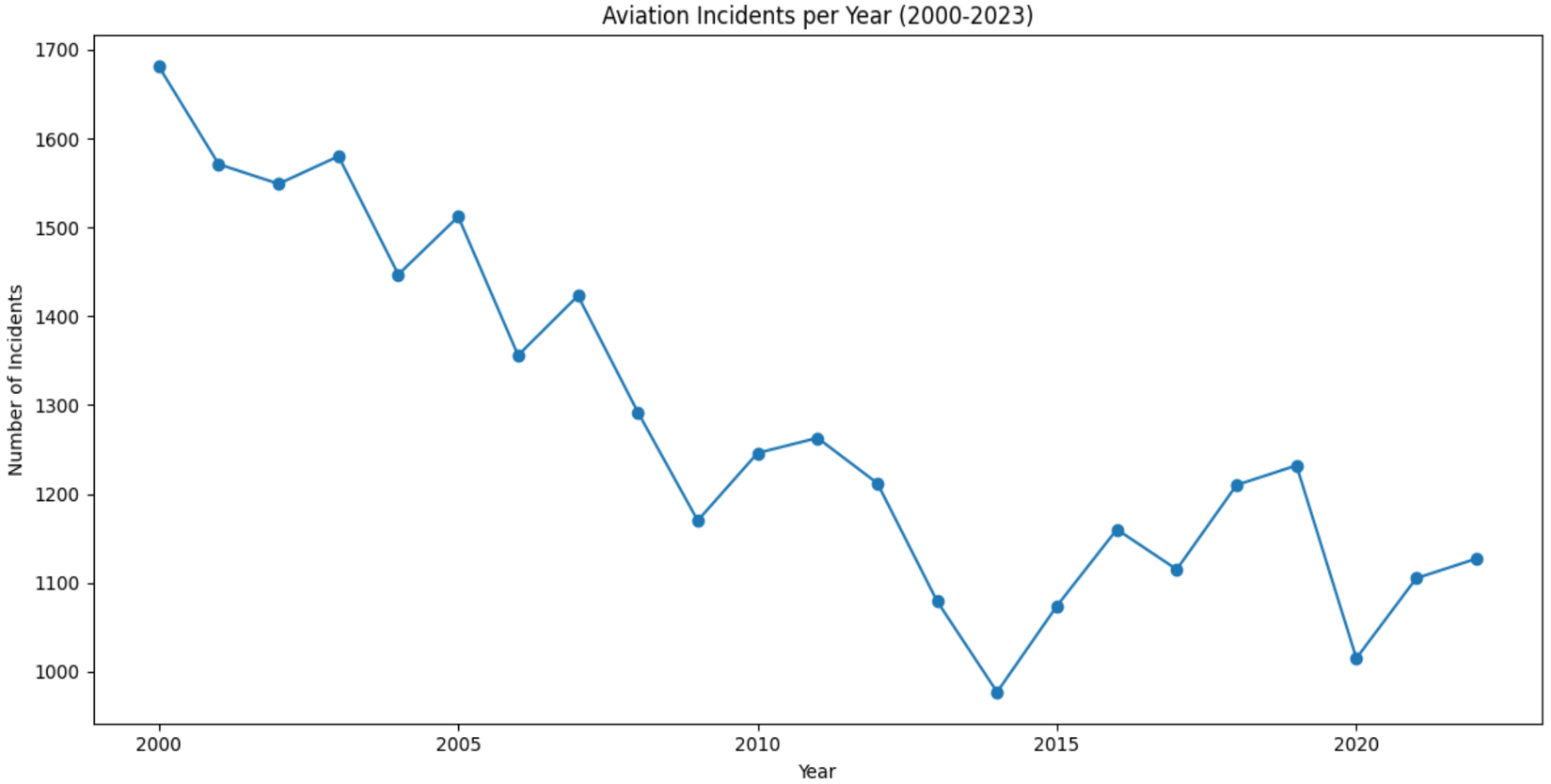
Focused on post-2000 accidents to ensure modern relevance. Kept only manufacturers with 100+ incidents for statistical reliability.

Categorization

Sorted flights into Private, Commercial, and Unknown categories to enable targeted analysis for different business operations.



Aviation Incidents Trend (2000-2023)

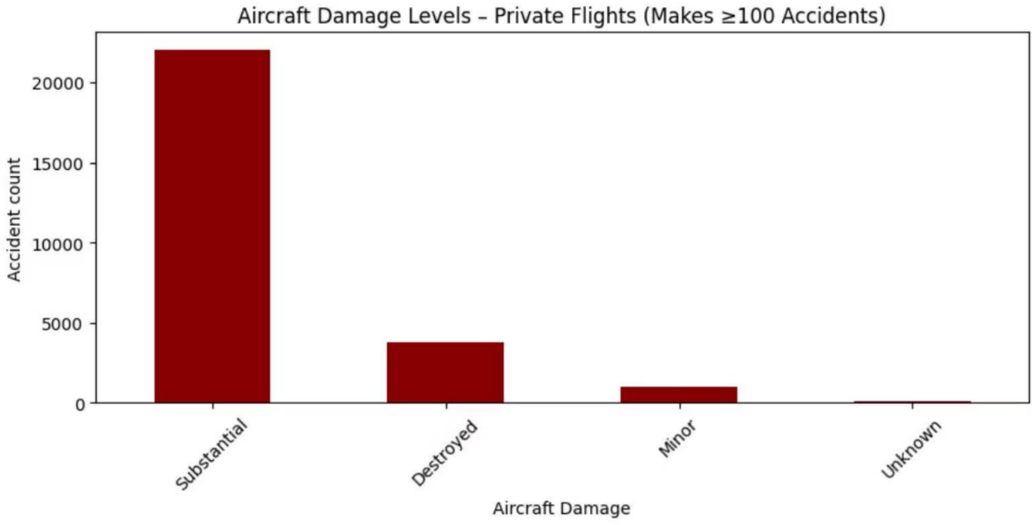


Aviation incidents have been trending downward since 2000, which is reassuring for industry entrants. The biggest drop happened in the early 2000s after 9/11, likely due to enhanced safety measures. Since then, incidents have fluctuated between 1,000-1,200 annually with notable dips in 2014 and during COVID in 2020.

Overall, flying has gotten noticeably safer over the past 20+ years even with increased air traffic, suggesting a positive industry safety trajectory.

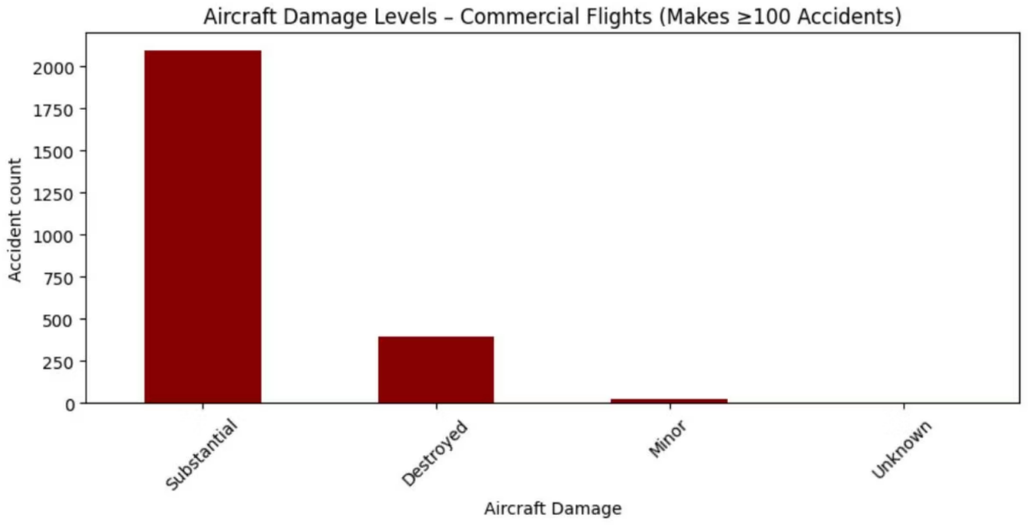
Aircraft Damage Analysis

Private Flights



Most private flight crashes result in substantial damage. It is very rare for an aircraft to sustain minor, repairable damage. Therefore, maintenance and solid insurance packages are key to avoid overwhelming losses

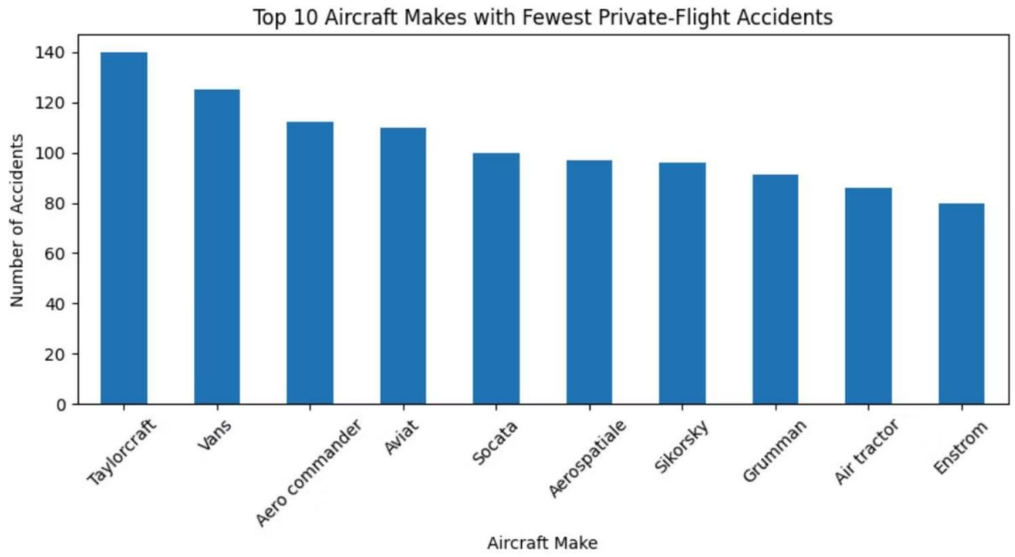
Commercial Flights



Commercial flights also frequently sustain substantial damage, are more rarely destroyed, and almost never sustain only minor damage. This indicates plane crashes typically cause significant loss rather than minor repairable damage. Maintenance and insurance are also key to avoid overwhelming loses.

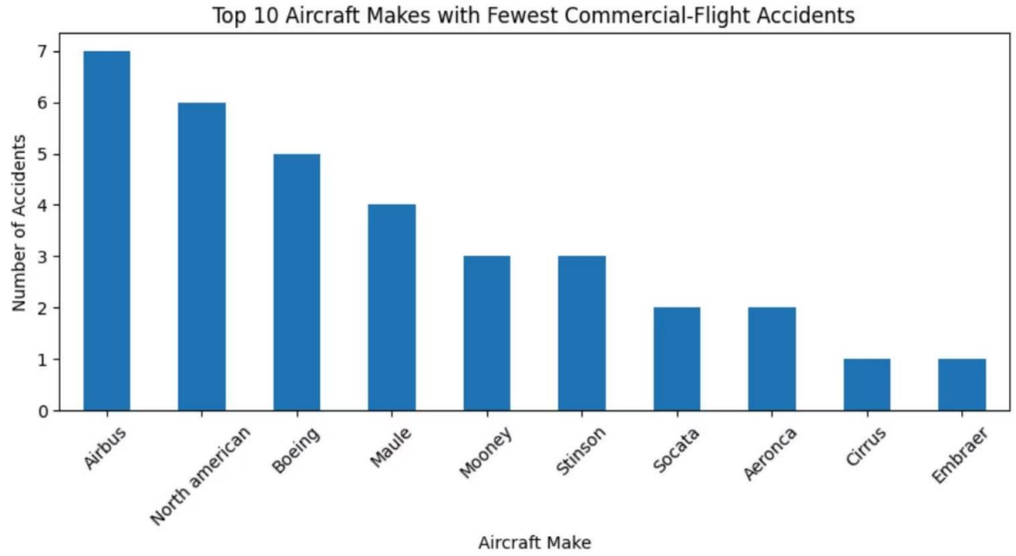
Safest Aircraft Makes by Flight Type

Private Flights



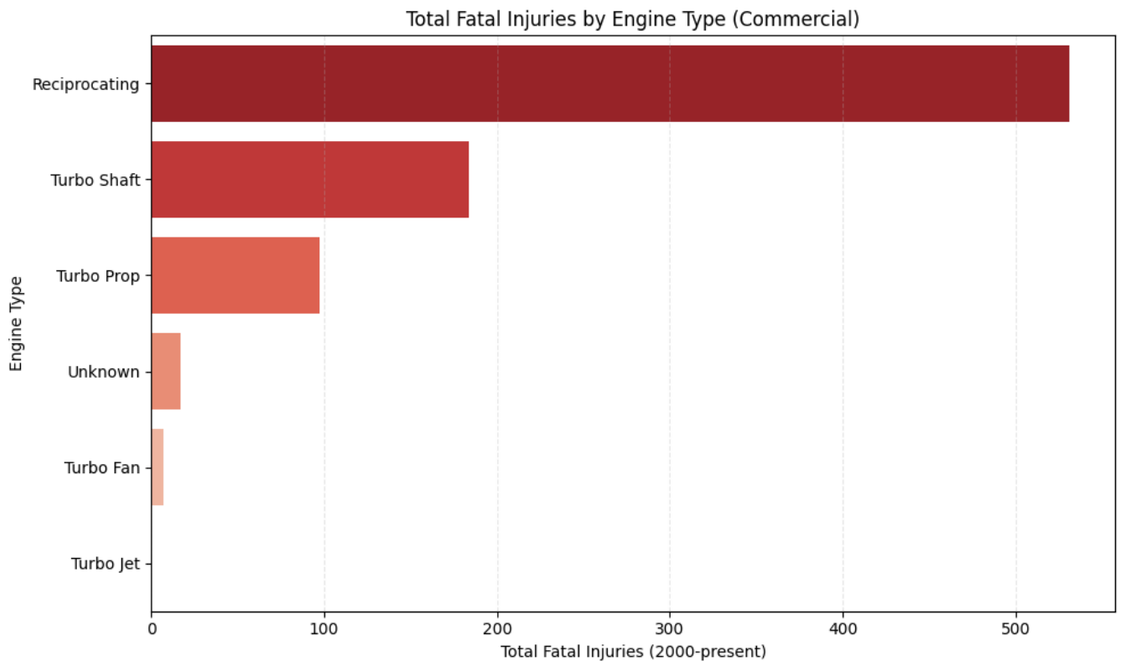
TaylorCraft, Vans, and Aero Commander consistently show the fewest accidents among manufacturers with 100+ incidents in our dataset.

Commercial Flights



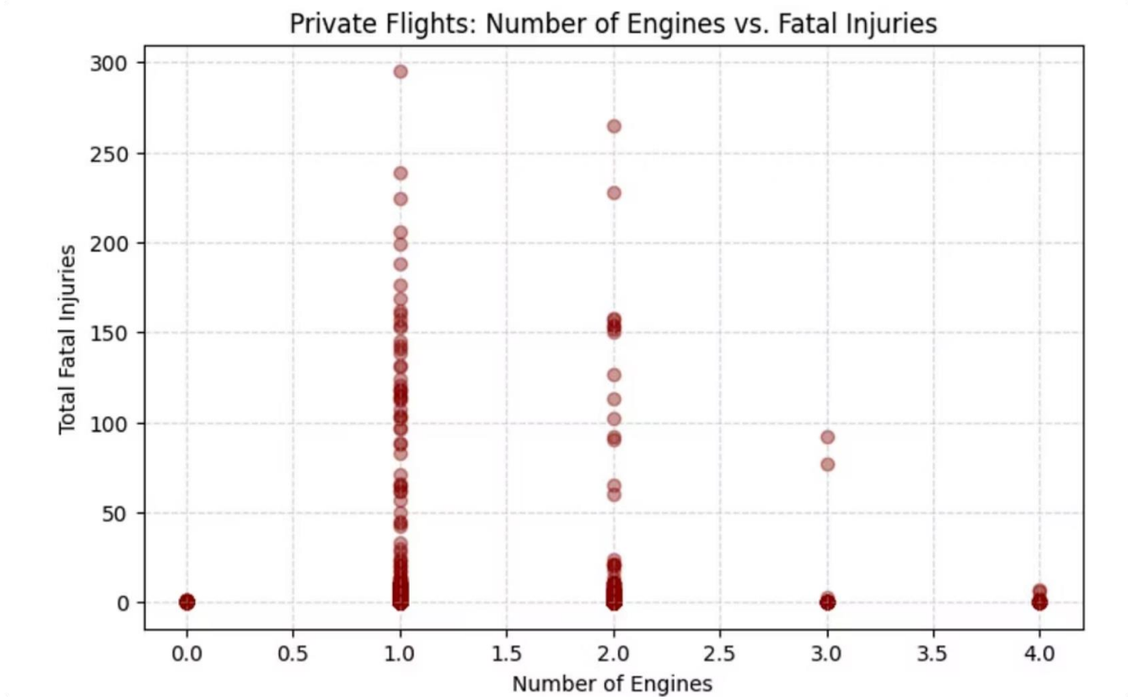
Airbus, North American, and Boeing lead the commercial safety rankings with the lowest accident counts among established manufacturers.

Engine Safety Analysis



Engine Type Risk

Reciprocating engines account for the overwhelming majority of fatal injuries (16,000+ cases in private flights), while turbine-based alternatives show dramatically lower fatality rates.



Engine Count Safety

Twin-engine aircraft show much lower fatality concentrations when accidents occur, while single-engine planes dominate the death statistics in private aviation.

Business Recommendations

1

Purchase TaylorCraft, Vans, or Aero Commander for private operations

These manufacturers consistently show the fewest accidents among those with significant market presence.

2

Choose Airbus, North American, or Boeing for commercial operations

These three manufacturers lead commercial safety rankings with the lowest accident counts.

3

Avoid reciprocating engines entirely

Specify turboprop as your minimum acceptable engine type, with turbofan/turbojet preferred to eliminate your biggest risk factor.

4

Start with commercial operations first

Commercial aviation shows dramatically lower accident rates across all metrics compared to private aviation, making it the safer business to enter initially.