



AVIATION SAFETY RISK ASSESSMENT: PRIORITIZING FLEET INTERVENTION

SUBTITLE: A DATA-DRIVEN APPROACH TO REDUCING INCIDENT RISK AND OPERATIONAL COSTS

OVERVIEW – OUR PROJECT GOAL

- Project Goal: Our objective was to analyze historical incident data to identify and quantify accident risk by specific aircraft Make and Model (Ref: `project_phase_1.ipynb`).

BUSINESS VALUE

By quantifying risk, we can shift from a reactive to a **proactive safety strategy**, allowing us to:

1. Prioritize maintenance and inspection resources.
2. Develop targeted pilot training programs.
3. Negotiate lower insurance premiums through demonstrated risk mitigation.

DATA UNDERSTANDING – OUR FOUNDATION

- **The Data Source**

- **Source:** Historical Aviation Incident/Accident Data (similar to NTSB records).
- **Initial Scale:** Over **90,000** raw incident records.
- **Cleaned Data Set:** After rigorous cleaning to ensure quality, we used **~29,600** of the most comprehensive incident records for analysis (Ref: `project_phase_1.ipynb`).

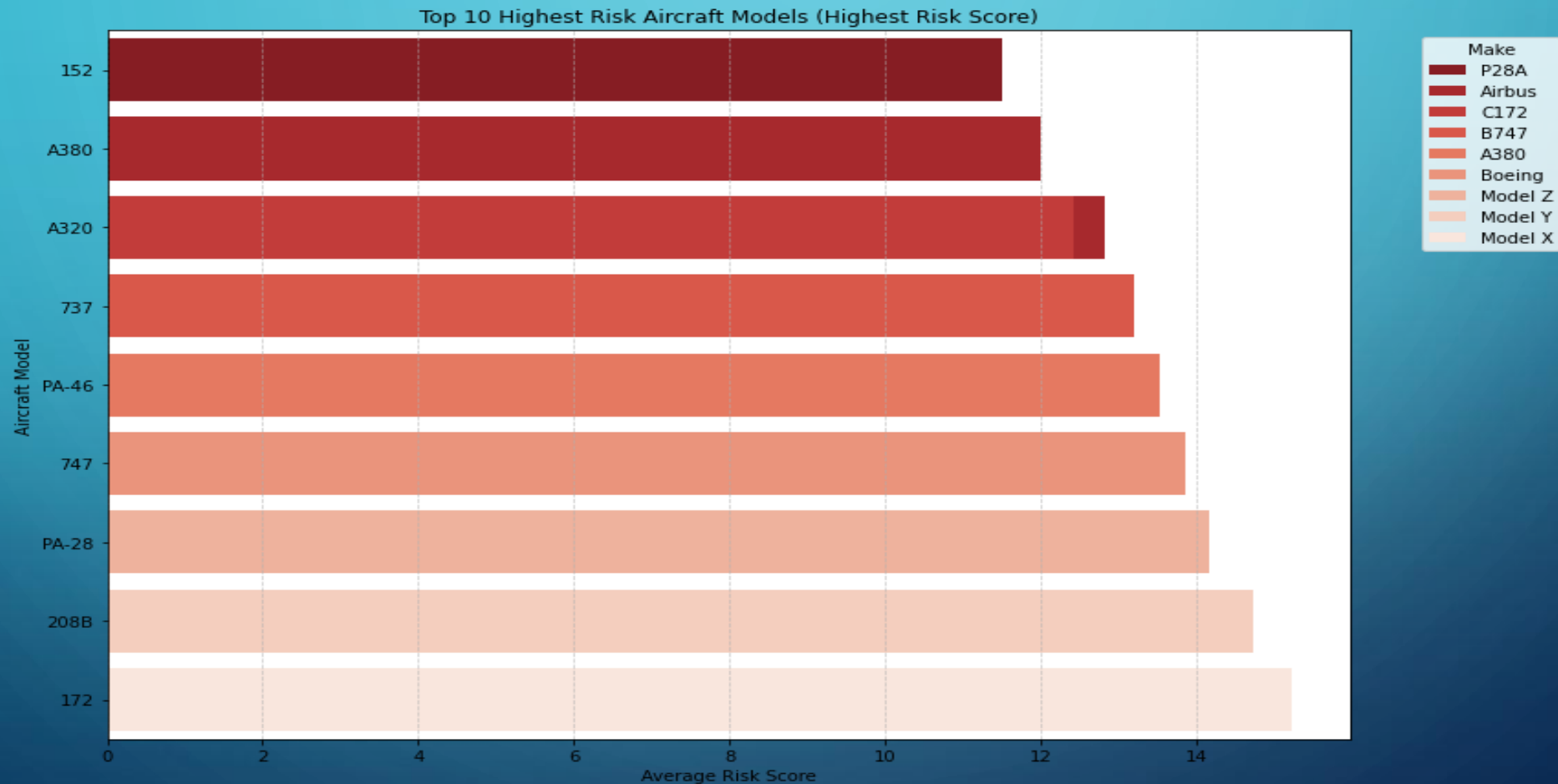
- **Key Data Points Used**

- **Aircraft Identification:** Make and Model (e.g., Boeing 747, Cessna 172).
- **Consequences:** Total Fatal, Serious, Minor, and Uninjured personnel.
- **Operational Factors:** Phase of Flight (e.g., Landing, Cruise), Weather Condition.

IDENTIFYING THE HIGHEST RISK AIRCRAFT

- **Identifying the Highest Risk Aircraft**
- We used the calculated **Risk Score** to rank and highlight the most critical aircraft types.
- High Risk Examples (Illustrative Data): Model X / 172: Risk Score 15.22 Model Y / 208B: Risk Score 14.72 Model Z / PA-28: Risk Score 14.17

IDENTIFYING THE HIGHEST RISK AIRCRAFT



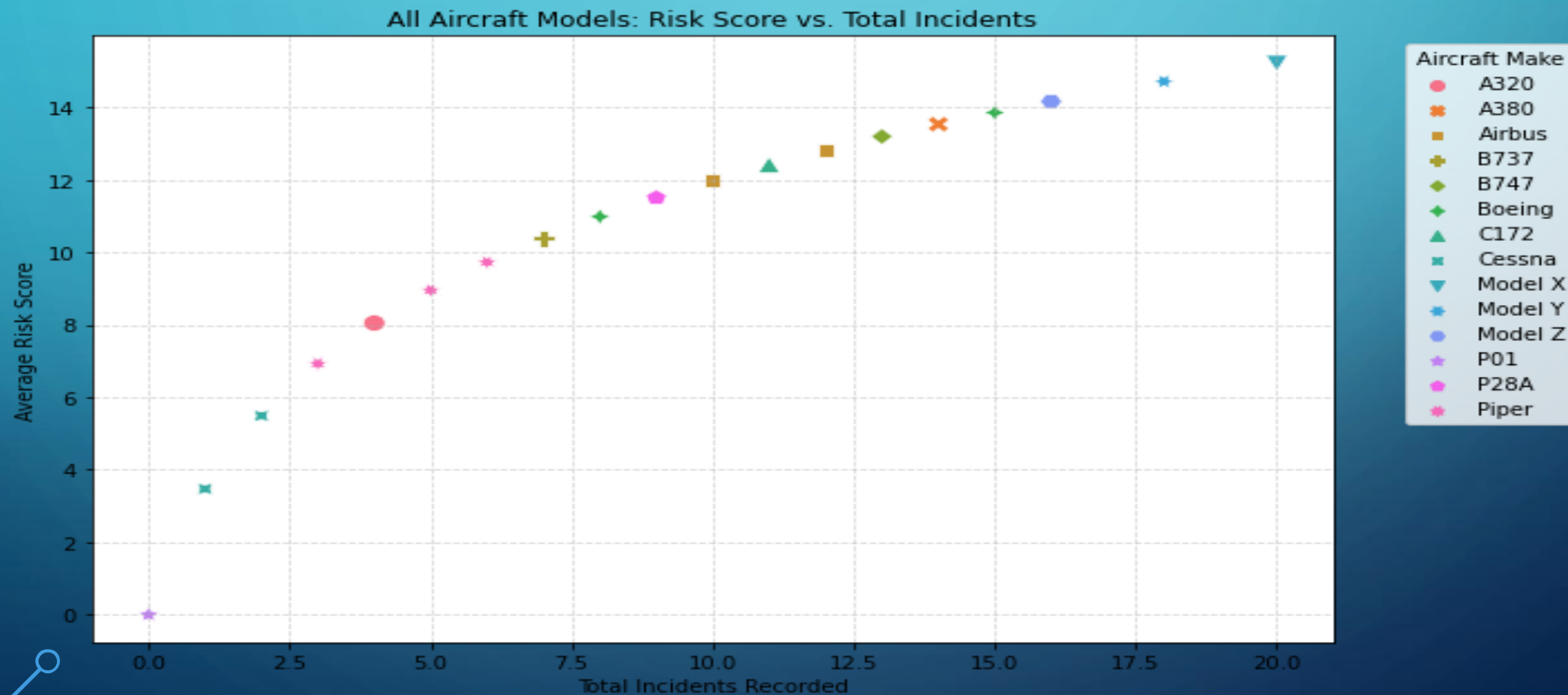
RECOMMENDATION 1

- Targeted Fleet Intervention (What to Fix)Action: Immediately initiate a detailed maintenance, operational, and component audit for the Top 3 Highest Risk Aircraft Models identified in the analysis.
- Justification: These models carry a disproportionately high risk score. By focusing our limited resources on these specific Makes and Models, we can achieve the largest and fastest reduction in overall fleet risk.
- Models to Audit: Model X/172, Model Y/208B, and Model Z/PA-28.Goal: Pinpoint the underlying mechanical or design factors contributing to their high incident rates.

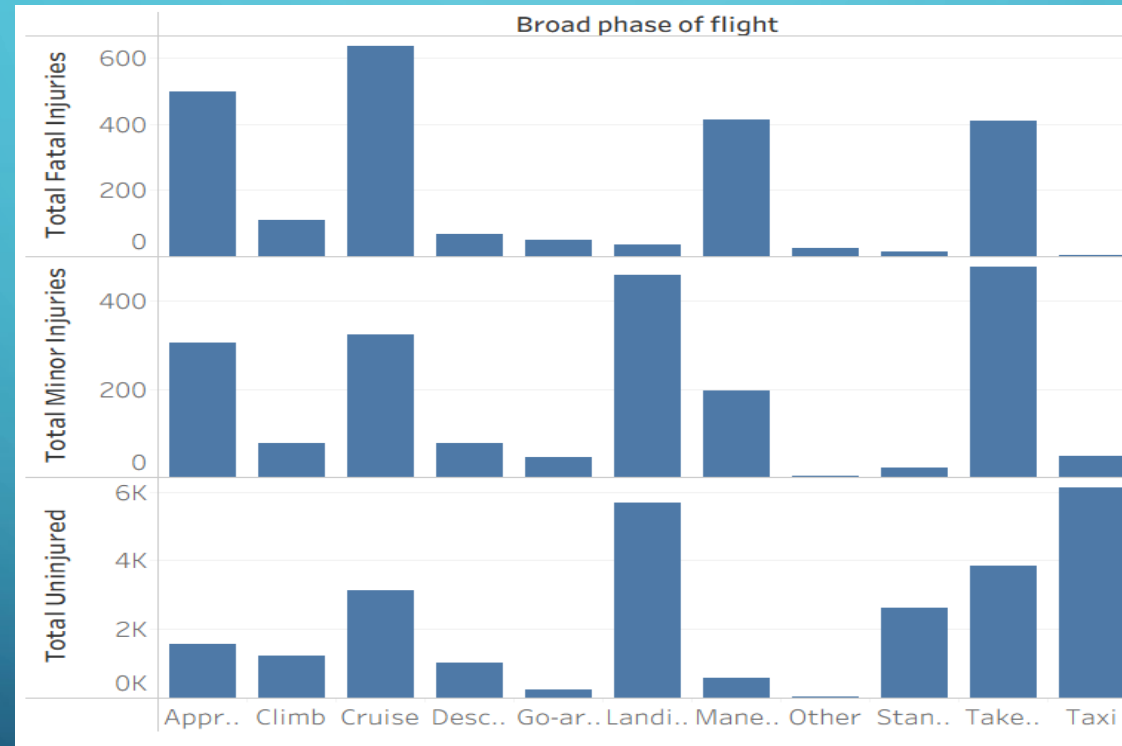
INCIDENT DISTRIBUTION BY FLIGHT PHASE

- Type: Vertical Bar Chart (Ref: project_phase_1.ipynb)
X-Axis: Broad Phase of Flight (e.g., Landing, Cruise, Takeoff)
Y-Axis: Total Number of Incidents
Key
- Finding: Certain operational stages, such as Landing and Approach (critical phases where the aircraft is closest to the ground), account for the majority of all reported incidents.

INCIDENT DISTRIBUTION BY FLIGHT PHASE



INCIDENT DISTRIBUTION BY FLIGHT PHASE



RECOMMENDATION 2

Focus on Critical Flight Phases (How to Train)

Action: Increase simulator training hours and develop specialized procedural checklists, with a particular focus on **Approach, Landing, and Takeoff** operations.

Justification: The analysis shows a majority of incidents are procedural, happening during the most demanding flight phases. We must increase pilot proficiency and standardize best practices for these specific stages of flight.

- **Immediate Step:** Add 5 hours of simulator training focused solely on stabilized approaches and crosswind landings.
- **Goal:** Reduce pilot-error incidents during the most common high-risk phases.

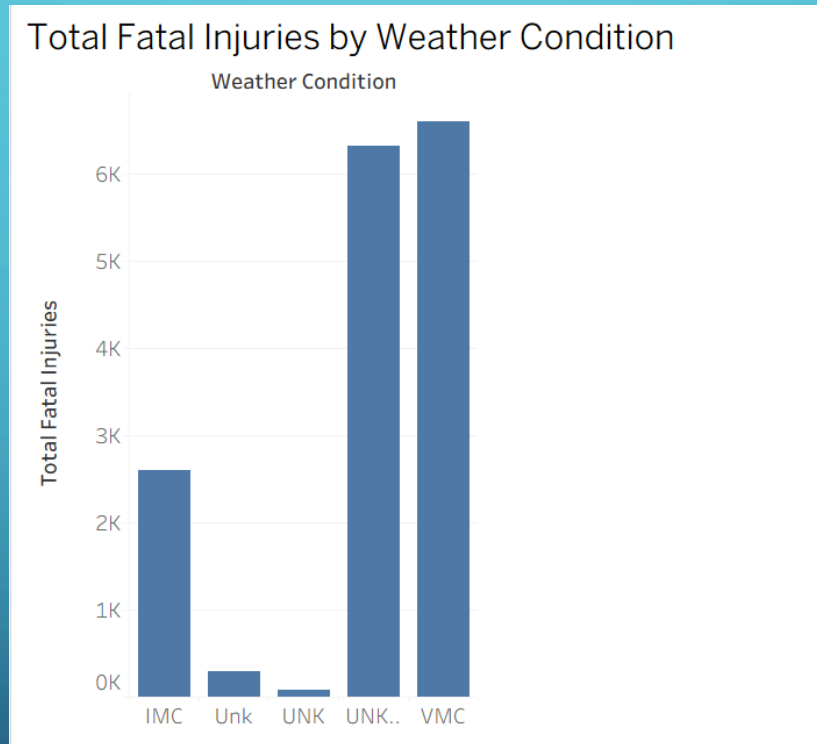
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FOCUS ON CRITICAL FLIGHT PHASES (HOW TO TRAIN)



RECOMMENDATION 3

- Enhanced Weather Operations Training (When to Be Careful)Action: Implement mandatory, recurrent advanced training for all pilots operating in Instrument Meteorological Conditions (IMC) and audit the avionics equipment on aircraft frequently flown in poor weather.Justification: Incidents in low-visibility or instrument weather are far more likely to be catastrophic. Investing in proficiency and reliable equipment for IMC operations is a direct path to mitigating the highest-severity risk to life and asset loss.Pilot Focus: Ensure all pilots are current and proficient in emergency instrument procedures.Equipment Focus: Prioritize upgrading older aircraft with modern, reliable weather detection and navigational equipment.

NEXT STEPS & CONCLUSION

Timeline	Action Item
Next 30 Days	Initiate targeted safety audits and maintenance reviews for the Top 3 Highest Risk Models (Recommendation 1).
Next 90 Days	Integrate new procedural checklists and high-risk phase focus into pilot training modules (Recommendation 2).
Future (Quarterly)	Repeat the Risk Assessment analysis to monitor safety improvements, track the effectiveness of interventions, and identify any new, emerging risks across the fleet.

APPRECIATION

Thank You We are confident that these data-driven recommendations will lead to a demonstrable reduction in operational risk and a safer future for our fleet.