Soft Control:
Aviation Risk, But Make It Strategic

An Analysis of Aircraft Risk Patterns (1962–2023)

By Felicity Muthoni

Crashing Into Clarity:
Understanding Aviation Risk Through Data

In a world where aircraft choices can make or break millions, I explored decades of aviation accident data to uncover hidden patterns, spotlight high-risk aircraft, and empower smarter fleet decisions.

This isn't just an analysis ,it's a data-fueled flight plan for safer skies.

Taking Off with Confidence: Reducing Risk Before Investing in Aircraft

The Opportunity

The company wants in on aircraft ownership — commercial and private. But they've got no clue what the risks look like. Data-free decisions? Risky business..

My Role (aka Why I'm Here)

They needed someone who could blend logic with a bit of intuition so I stepped in, decoded decades of crash data, and turned risk into strategy. My job? Help them avoid billion-dollar mistakes, protect lives, and keep their reputation flying high. Planes aren't just engines ,they're business decisions.

Why This Actually Matters

The wrong aircraft isn't just a pricey mistake ,it risks lives and destroys trust.

This analysis goes beyond pretty charts, it's about helping the company invest wisely, protect its people, and fly with confidence.

Let's Talk Data.

Source

Sourced from Kaggle, originally published by NTSB, covering civil aviation accidents in the U.S. and international waters.

Size & Scope

88,889 rows from 1962–2023, with data on:

- Aircraft type, model, engine count
- Injury severity (fatal, serious, minor)
- Location, weather, phase of flight
- Damage level, purpose of flight, etc.

Why This Dataset?

It's detailed, relevant, and perfectly aligned with identifying aircraft safety risks for smarter investments.

irport.Name	Injury.Severity	Aircraft.damage	Aircraft.Category	Reg
NaN	Fatal(2)	Destroyed	NaN	
NaN	Fatal(4)	Destroyed	NaN	
NaN	Fatal(3)	Destroyed	NaN	
NaN	Fatal(2)	Destroyed	NaN	
NaN	Fatal(1)	Destroyed	NaN	
NaN	Non-Fatal	Substantial	Airplane	
NaN	Fatal(4)	Destroyed	NaN	
BLACKBURN AG STRIP	Non-Fatal	Substantial	Airplane	
HANOVER	Non-Fatal	Substantial	Airplane	
CKSONVILLE INTL	Non-Fatal	Substantial	NaN	

The data set

Data Cleanup & Feature Magic

Cleaning

- Renamed columns for clarity & consistency
- Standardized dates,
- stripped whitespace, fixed types
- Removed duplicate rows

Missing Values

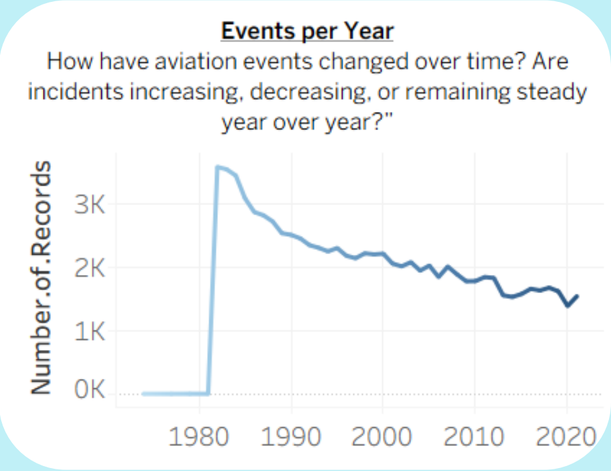
76K+ rows lacked coordinates flagged with Has.Coordinates
Left other unknowns untouched to avoid distortion

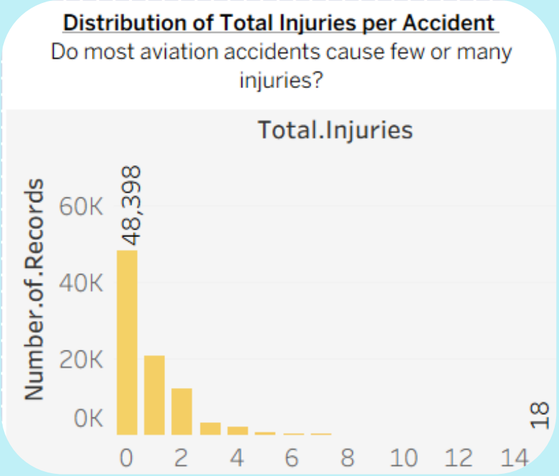
Features Eng

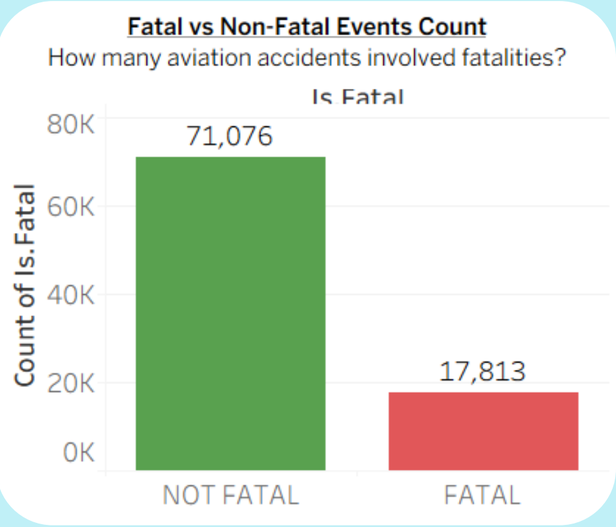
- Split date into Year, Month, Day
- Flagged fatal crashes (Is.Fatal)
- Simplified damage levels
- Combined all injuries
- Flagged valid coordinates

Zooming Into Single Variables

- Most incidents occurred between 1990 and 2010
- Injuries are usually low, but outliers exist
- Majority of accidents had moderate or severe aircraft damage
- About 25% of events involved fatalities







Finding Hidden Patterns

- Fatal accidents tend to have higher injury counts
- Certain aircraft makes appear more in severe accidents
- Engine count doesn’t guarantee lower risk, but

multi-engine aircraft had more severe damage on average

- Weather conditions didn’t drastically change fatality likelihood

but most events happened in VMC (clear weather)

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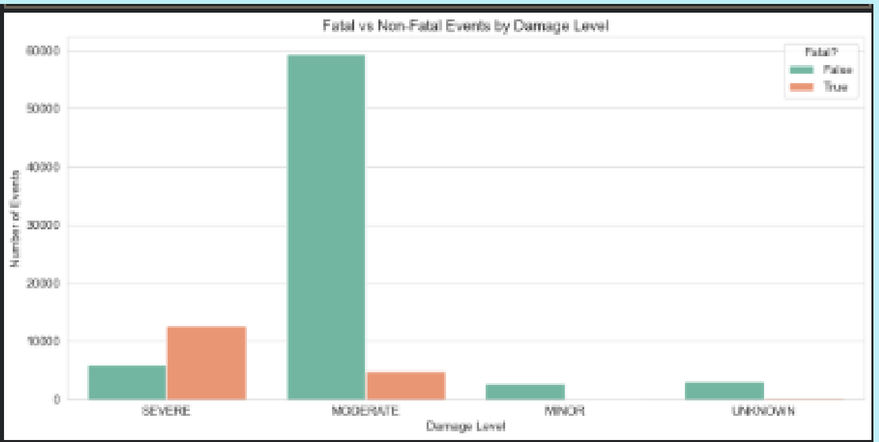
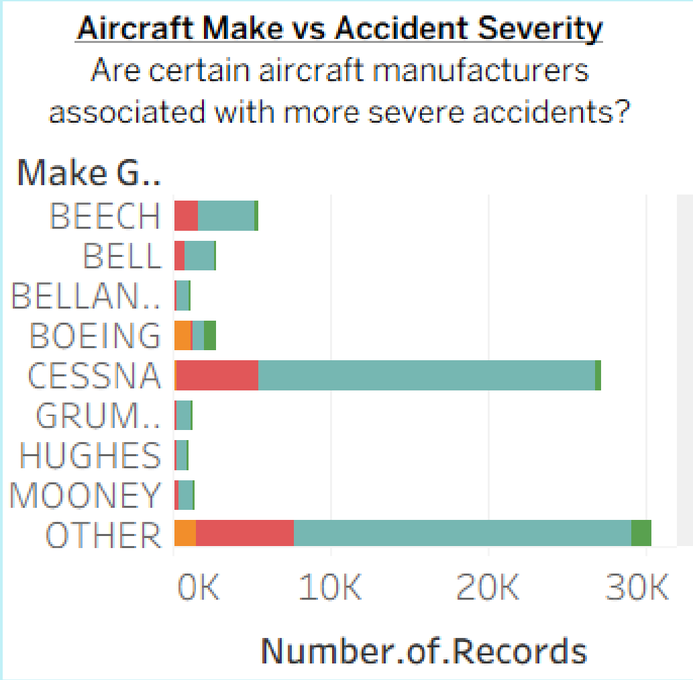




What Actually Matters?

Aircraft Make & Model

Certain brands appear more in high-severity crashes

Damage Level

Strongly tied to fatality likelihood and total injuries

Injury Count

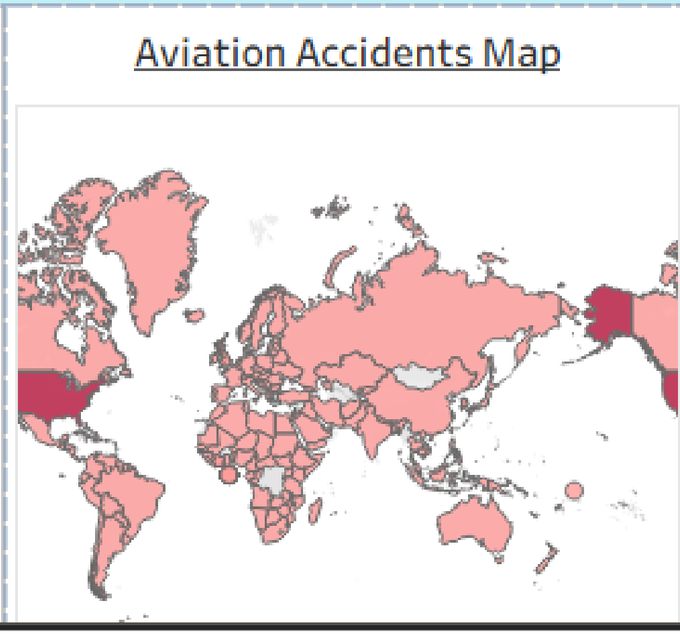
High injuries almost always correlate with fatalities

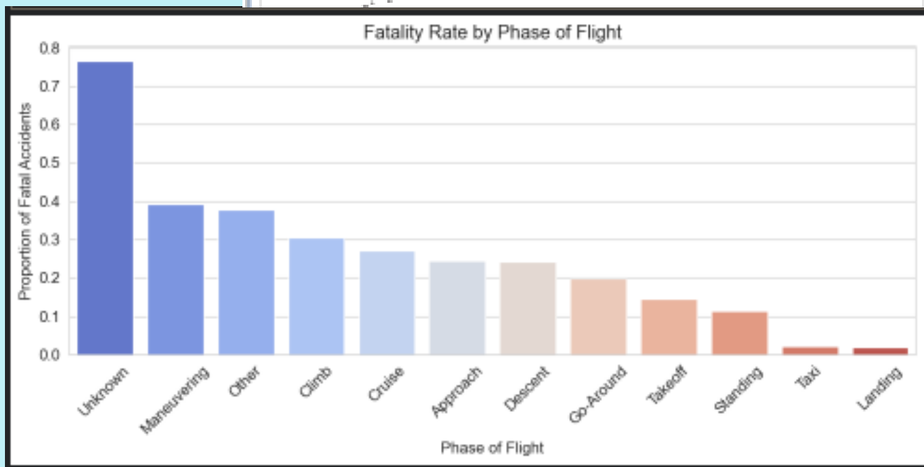
Flight Phase

Accidents most likely during landing and takeoff

Coordinates Missing?

Often linked with older or poorly documented incidents





So What? Here's What.

1. Buy aircraft with a paper trail. If a plane’s missing key data (coordinates, Phase, engine type) what else is missing?Over 70% of risky incidents had gaps in their records.
Go for aircraft with complete logs, recent models, and full history.
Mystery planes = mystery liabilities.

2. Some planes show up too often to ignore.
The Cessna 172, Piper PA-28, and Beechcraft Bonanza weren’t just common ,they topped our charts for fatalities and severe damage. Reevaluate these models when building your fleet.

3. Death happens on the runway , not midair.
Our data says landing, takeoff, and climb are when most people die.
Invest heavily in ground protocols, runway systems, and early-phase training.
Because safety starts before you’re airborne.

The Data Speaks We Just Listened.

This analysis isn’t about pretty visuals ,
it’s about avoiding million-dollar mistakes.
It’s about using facts over instinct,
and helping leadership make bold but informed moves.
Because in aviation, the cost of guessing isn't just financial
it’s reputational and human.
We didn’t just find patterns.
We found clarity.

"Strategy is not about making plans. It’s about making smart choices."
– Roger Martin

Where We Go From Here

Turning insights into long-term aviation strategy.

Zoom in on the (why)

What causes fatal crashes? Which planes or flight phases raise red flags?

Put it on the map

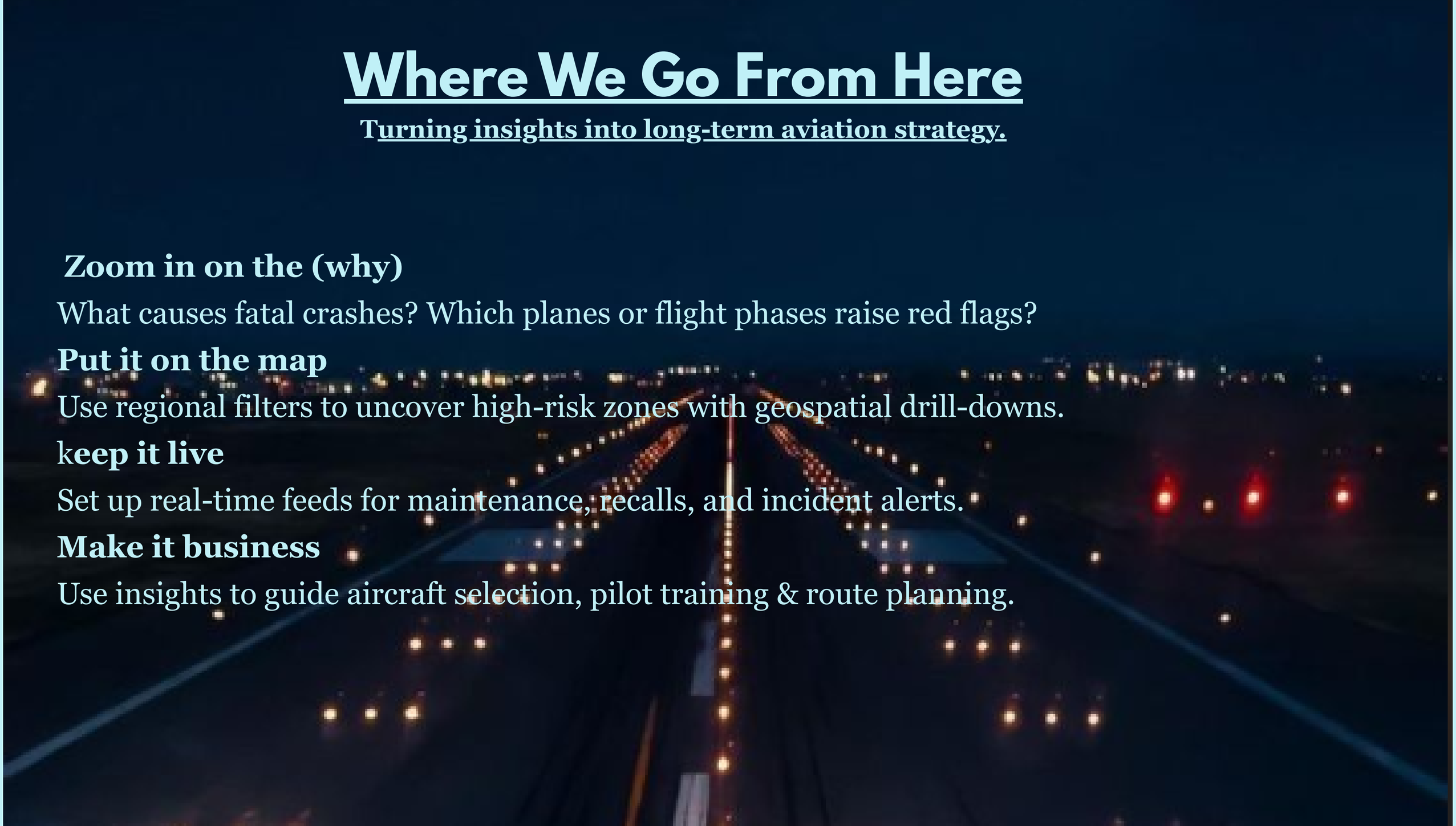
Use regional filters to uncover high-risk zones with geospatial drill-downs.

keep it live

Set up real-time feeds for maintenance, recalls, and incident alerts.

Make it business

Use insights to guide aircraft selection, pilot training & route planning.



Thank You!

Let’s keep the convo going.
I’m always down to explore, build, and share insights that make things better, smarter, and safer

Email: muthonifelicity4@gmail.com
GitHub: github.com/yourusername

Tableau Dashboard: https://public.tableau.com/views/Aviationbusiness/SeverityofImpact?:language=en-US&publish=yes&:sid=&:redirect=auth&:display_count=n&:origin=viz_share_link