Bird Strike Analysis 2000 - 2011

By
SONIYA CHANDRAN

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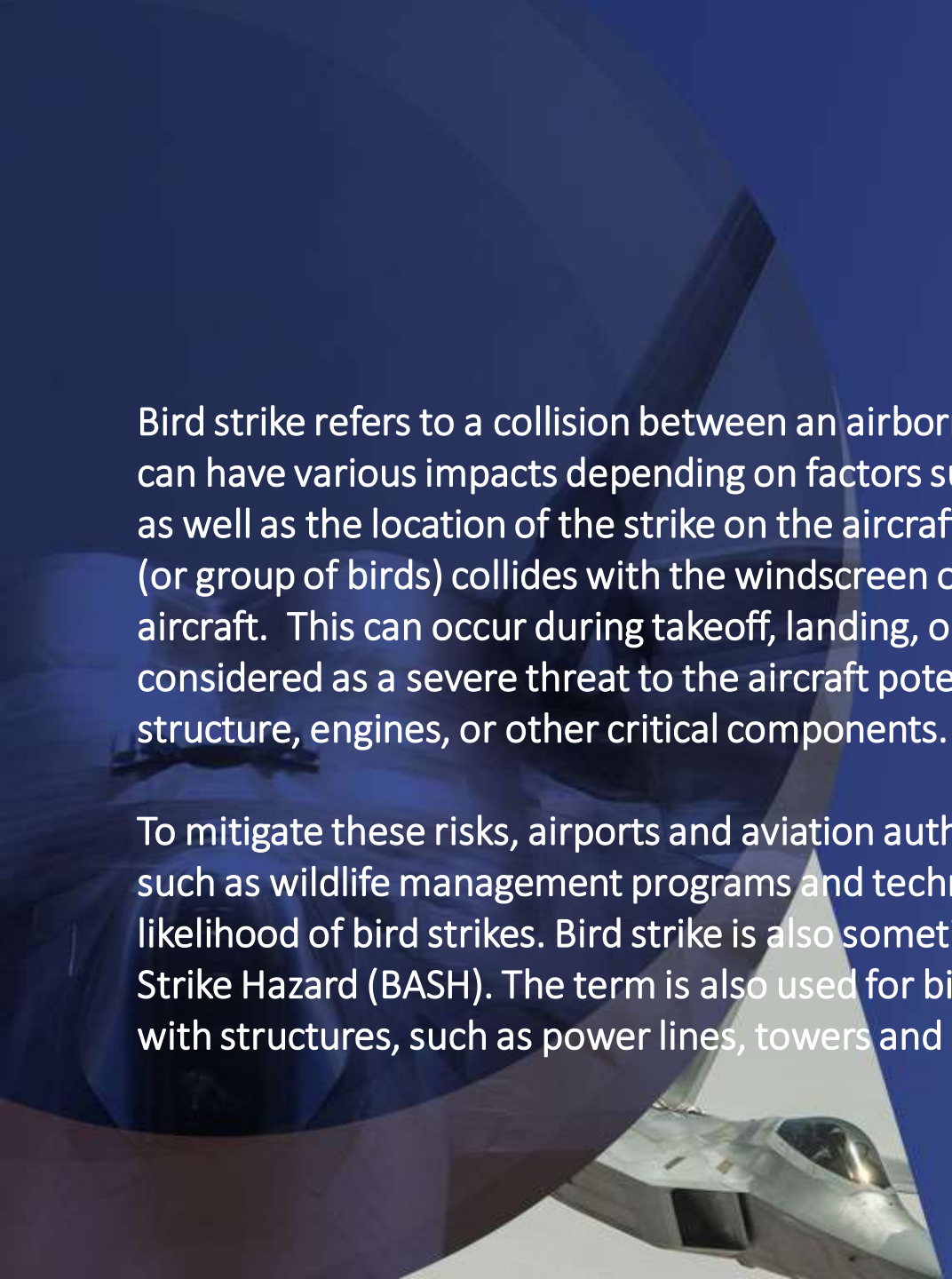

01

Introduction

Bird strike refers to a collision between an airborne animal and an aircraft. Bird strikes can have various impacts depending on factors such as the size and speed of the bird, as well as the location of the strike on the aircraft. Most accidents occur when a bird (or group of birds) collides with the windscreen or is sucked into the engine of jet aircraft. This can occur during takeoff, landing, or during flight. Bird strikes can be considered as a severe threat to the aircraft potentially causing damage to the aircraft's structure, engines, or other critical components.

To mitigate these risks, airports and aviation authorities employ various measures, such as wildlife management programs and technological solutions, to reduce the likelihood of bird strikes. Bird strike is also sometimes refers as bird hit or Bird Aircraft Strike Hazard (BASH). The term is also used for bird deaths resulting from collisions with structures, such as power lines, towers and wind turbines.

1.1

Impact of Bird strike

Structural Damage: Bird strikes can cause damage to the aircraft's structure, including the fuselage, wings, and control surfaces. This damage may require extensive repairs and can lead to costly downtime for the aircraft.

Engine Damage: One of the most significant concerns with bird strikes is damage to the aircraft's engines. Birds can be ingested into jet engines, causing engine failure or reduced performance. Even smaller birds can cause significant damage to engine components, necessitating inspection and potentially costly repairs.

Safety Risks: Bird strikes pose a safety risk to passengers and crew onboard the aircraft. In some cases, bird strikes have led to emergency landings or accidents resulting in injuries or fatalities.
Financial Costs: Bird strikes can result in significant financial costs for airlines, including repair expenses, operational disruptions, and potential legal liabilities.

Environmental Impact: Bird strikes can also have environmental consequences, particularly if the aircraft needs to jettison fuel or if there are concerns about the impact of debris resulting from the strike.

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Problem Statement

Transport and communication are in the crucial domain in the field of analytics. Environmental impacts and safety are, nowadays, two major concerns of the scientific community with respect to transport scenarios and to the ever-growing urban areas. These issues gain more importance due to the increasing amount of vehicles and people. Seeking new solutions is reaching a point where available technologies and artificial intelligence, especially MAS, are being recognized as ways to cope with and tackle these kinds of problems in a distributed and more appropriate way.

Bird Strike is common and can be a significant threat to aircraft safety. For smaller aircraft, significant damage may be caused to the aircraft structure and all aircraft, especially jet-engine ones, are vulnerable to the loss of thrust which can follow the ingestion of birds into engine air intakes. This has resulted in several fatal accidents.

Bird strikes may occur during any phase of flight, but are most likely during the take-off, initial climb, approach and landing phases due to the greater numbers of birds in flight at lower levels.

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About the Data

The analysis is conducted on the data collected on bird strikes by FAA between 2000 and 2011

- The data is collection over the time period of 2000-2011
- There are 25558 Records and 26 features
- **Null values are omitted during the visualisation**
- Out of these 26 ,some columns shows Null values, count of the same as follows;
  - ✓*129 Null values:* Aircraft: Type , Airport: Name ,Altitude bin, Wildlife: Number struck , Effect: Impact to flight , Effect: Impact to flight , Flight Date ,Aircraft: Airline/Operator, When: Phase of flight, Wildlife: Size ,Pilot warned of birds or wildlife? ,Feet above ground, Is Aircraft Large?
  - ✓*267 Null values:* Aircraft: Number of engines?
  - ✓ *449 Null values:* Origin state
  - ✓*4771 Null values:* Remarks

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List of Case Studies

- Visuals Depicting the Number of Bird Strikes
- Yearly Analysis & Bird Strikes in the US
- Top 10 US Airlines in terms of having encountered bird strikes
- Airports with most incidents of bird strikes – Top 50
- Yearly Cost Incurred due to Bird Strikes:
- When do most bird strikes occur?
- Altitude of aeroplanes at the time of strike
- Phase of flight at the time of the strike.
- Average Altitude of the aeroplanes in different phases at the time of strike
- Effect of Bird Strikes & Impact on Flight
- Effect of Strike at Different Altitude
- Were Pilots Informed? & Prior Warning and Effect of Strike Relation

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KPIs Extracted

25429
Total Bird Strikes

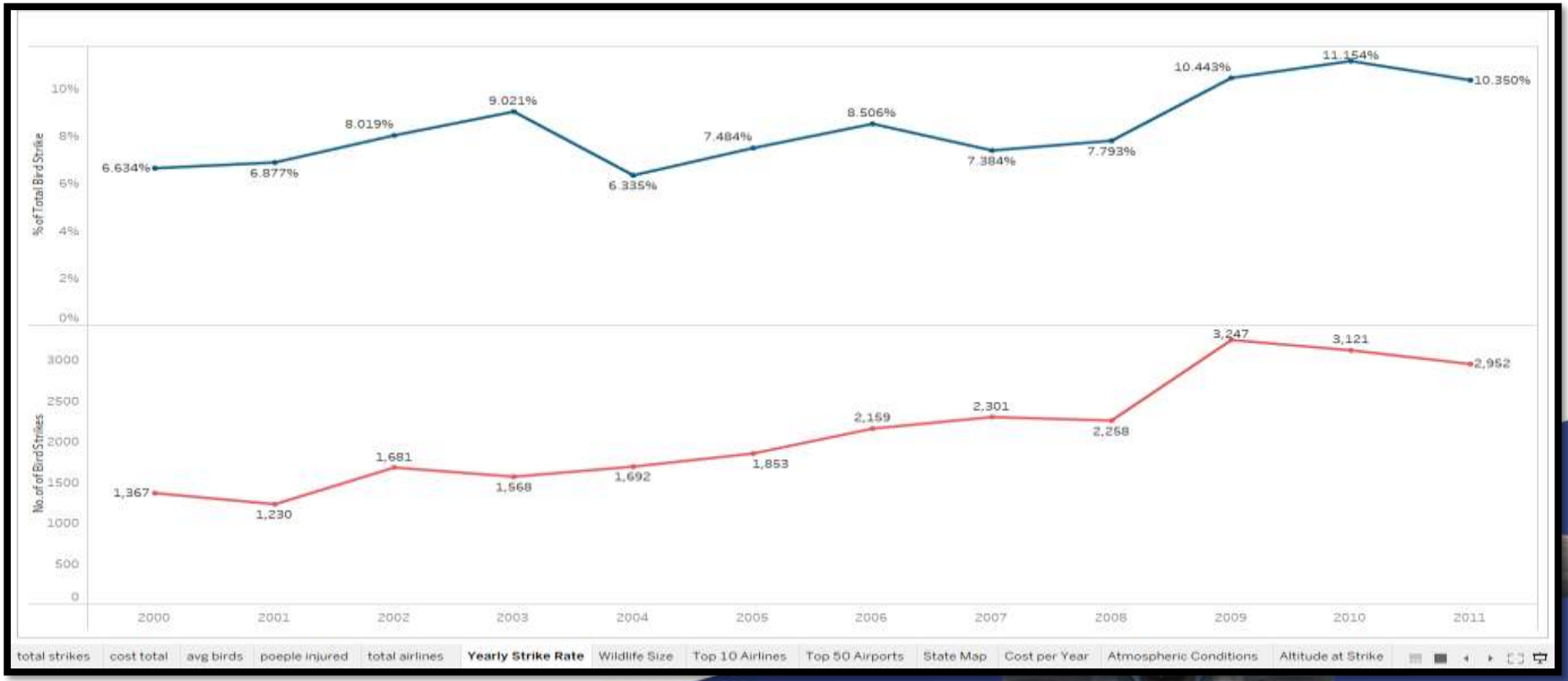
$14,22,90,445
Total Cost

21
Total Injuries

292
Number of Airports

Yearly Analysis & Strike Rate in the US

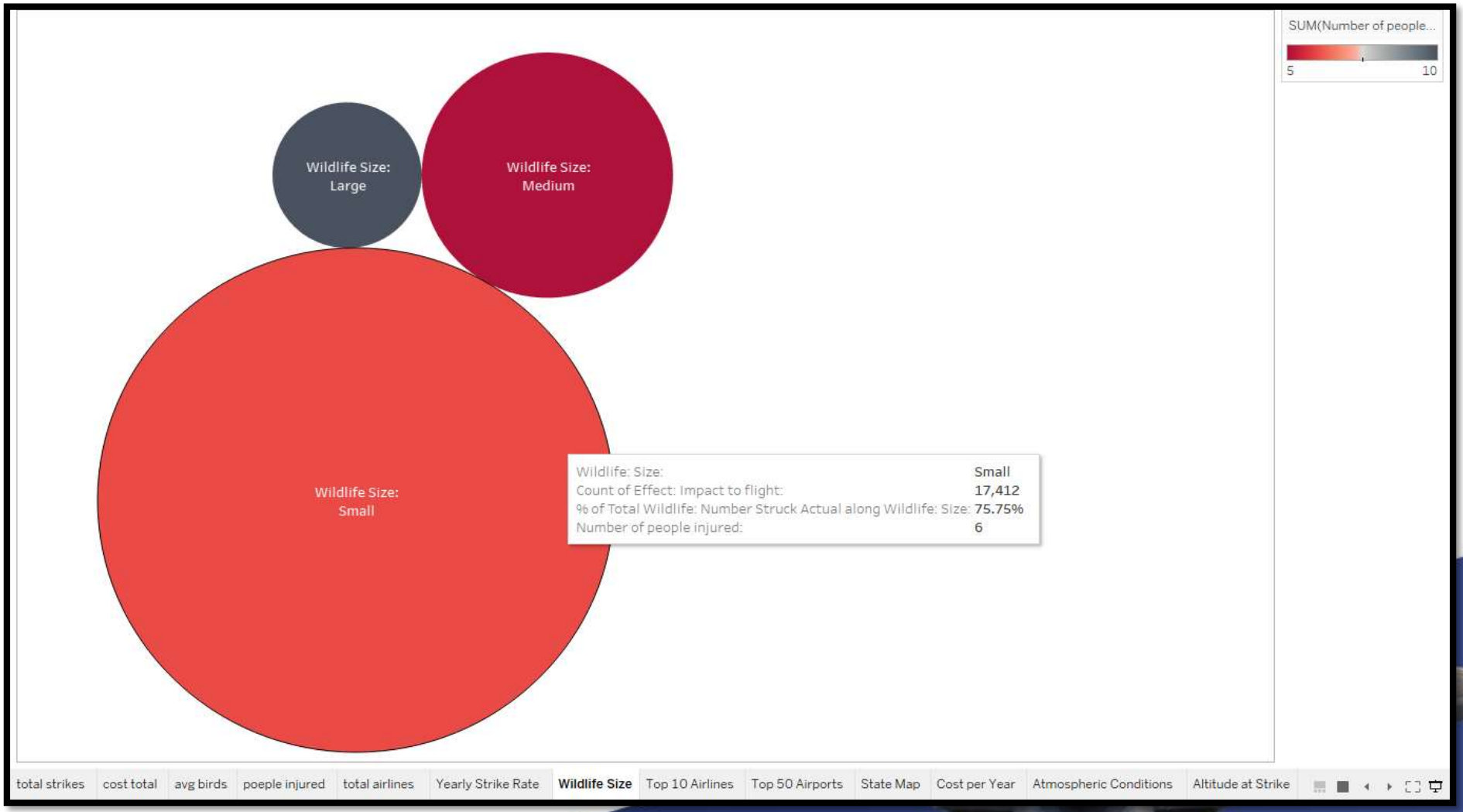
* The highest bird strike of 3247 recorded in 2009 with 1 casualty which accounted in 10.44% of total bird strike
* The 2nd highest is happened in 2010 with a number of 3121 bird strike with 0 casualty which accounted in 11.15% of total bird strike
* In 2001 the lowest accident happened with 1230 strikes.
* The year 2008 recorded a total of 8 injured people



Number of bird strikes and Injuries analyzed across Bird size

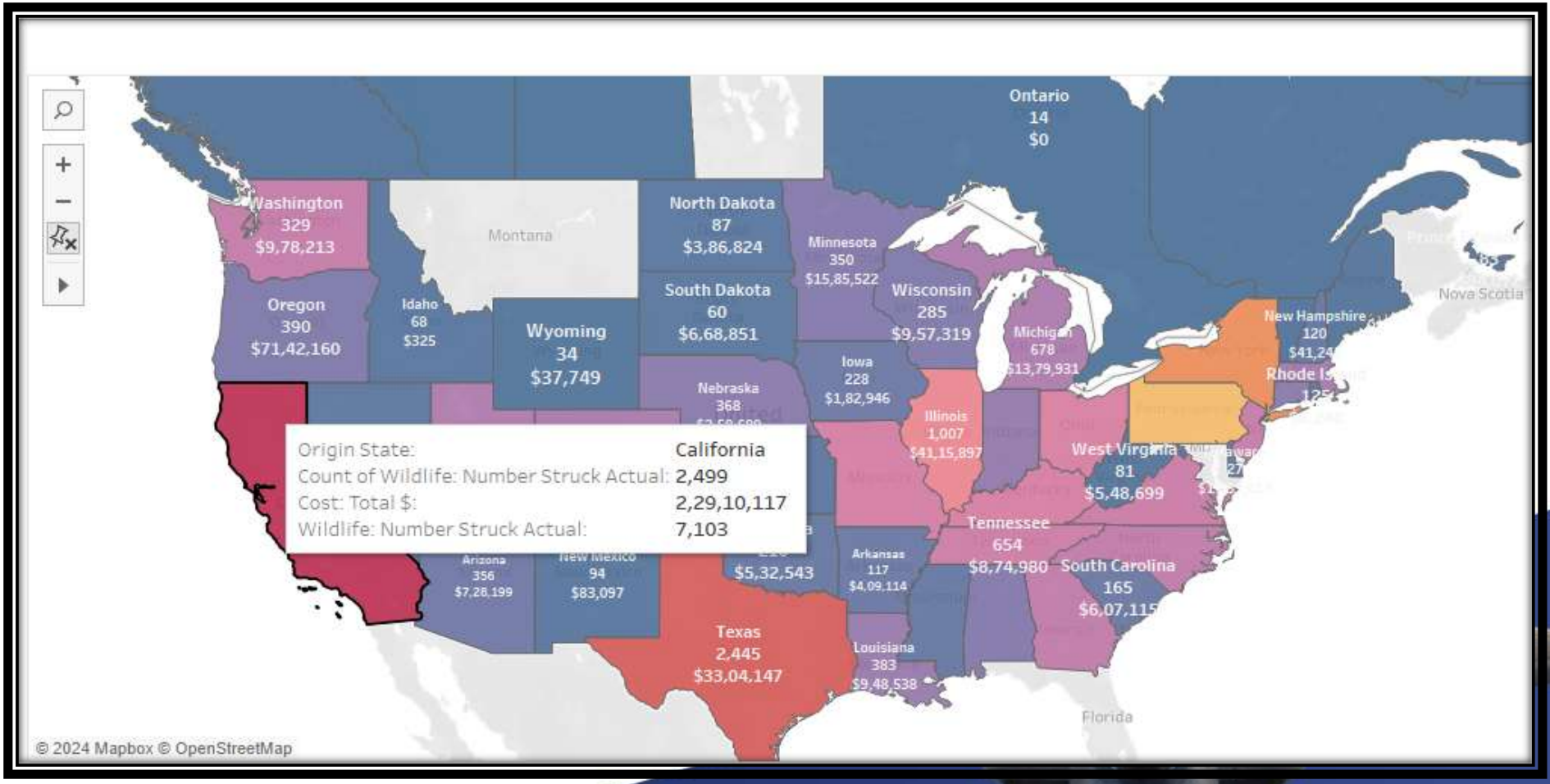
*75.75% of the total incidents happened due to small birds

* Highest number got people got injured with wildlife of Large size



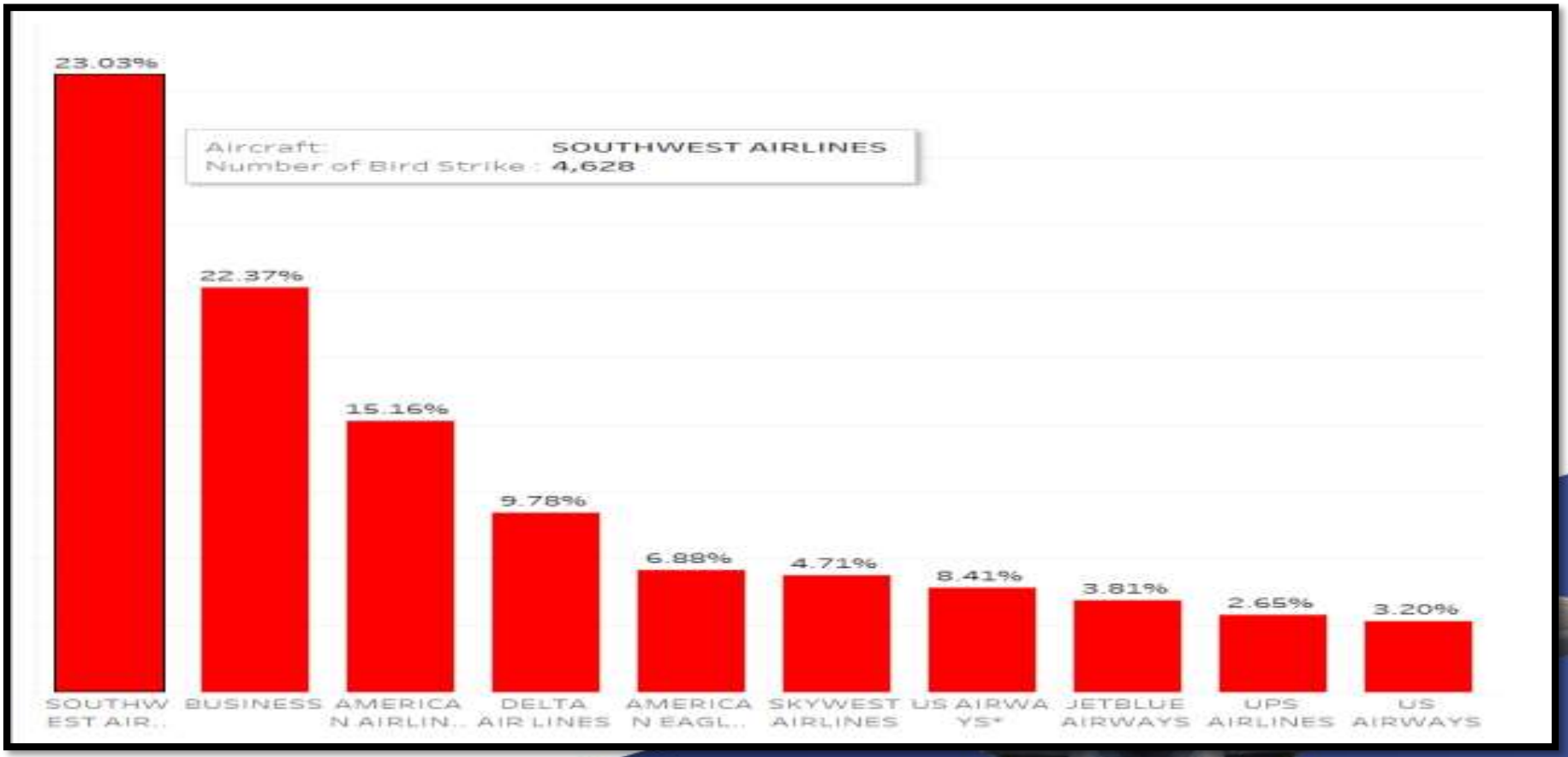
US states encountered Bird strikes

* California has the highest number of bird strikes with highest cost of $2,29,10,117. It has a total number of 2499 strikes with 7103 birds.
* In Texas it cost $ 33,04,147 due to 2445 times accidents happened



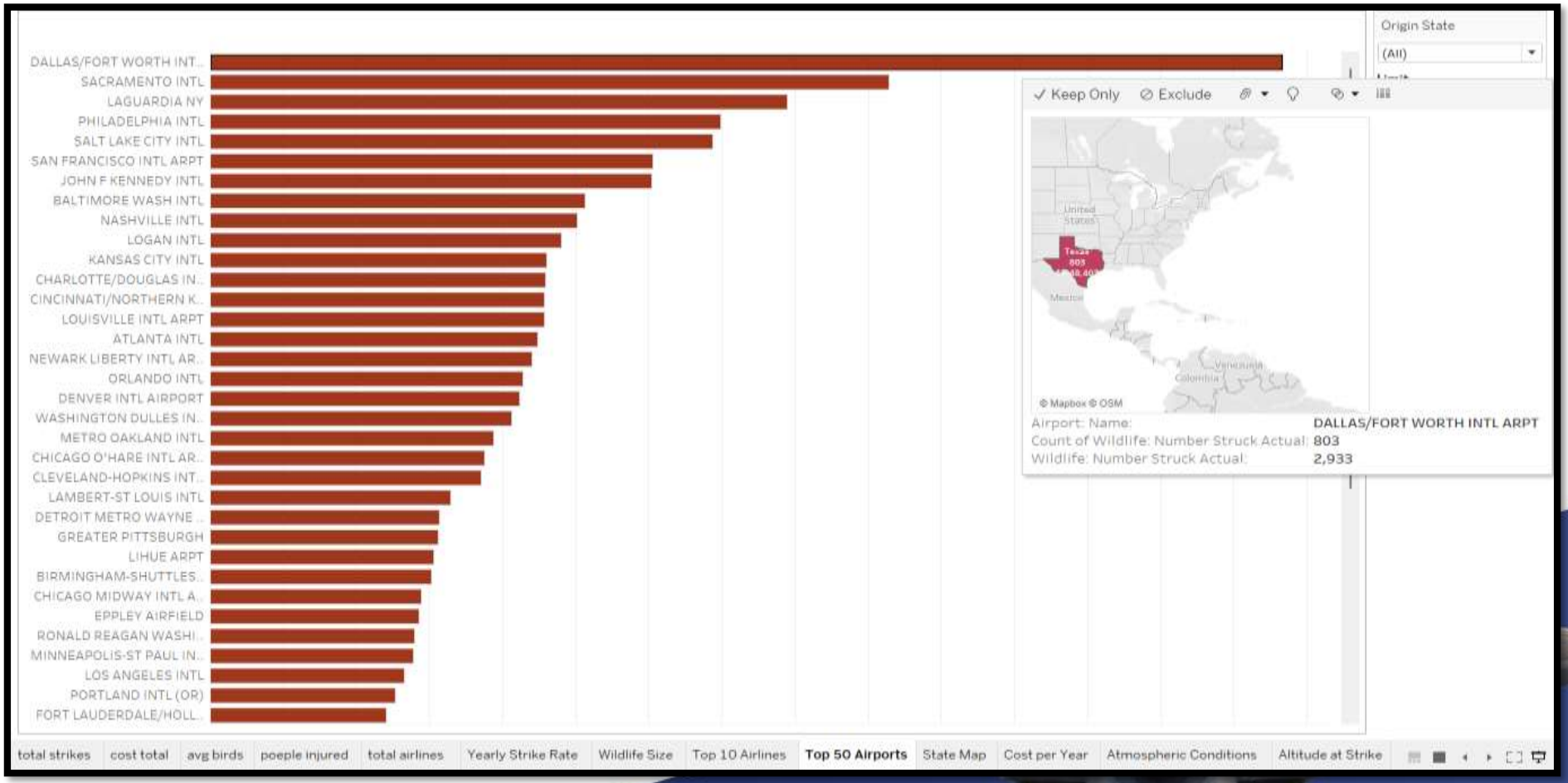
Top 10 Airlines affected by Strikes

* The southwest Airlines attacked with a highest number of 4628 times. They have the highest rate of 23.03% of total strikes.
* The lowest rate of bird strike happened with US Airlines with a number of 535 bird strikes



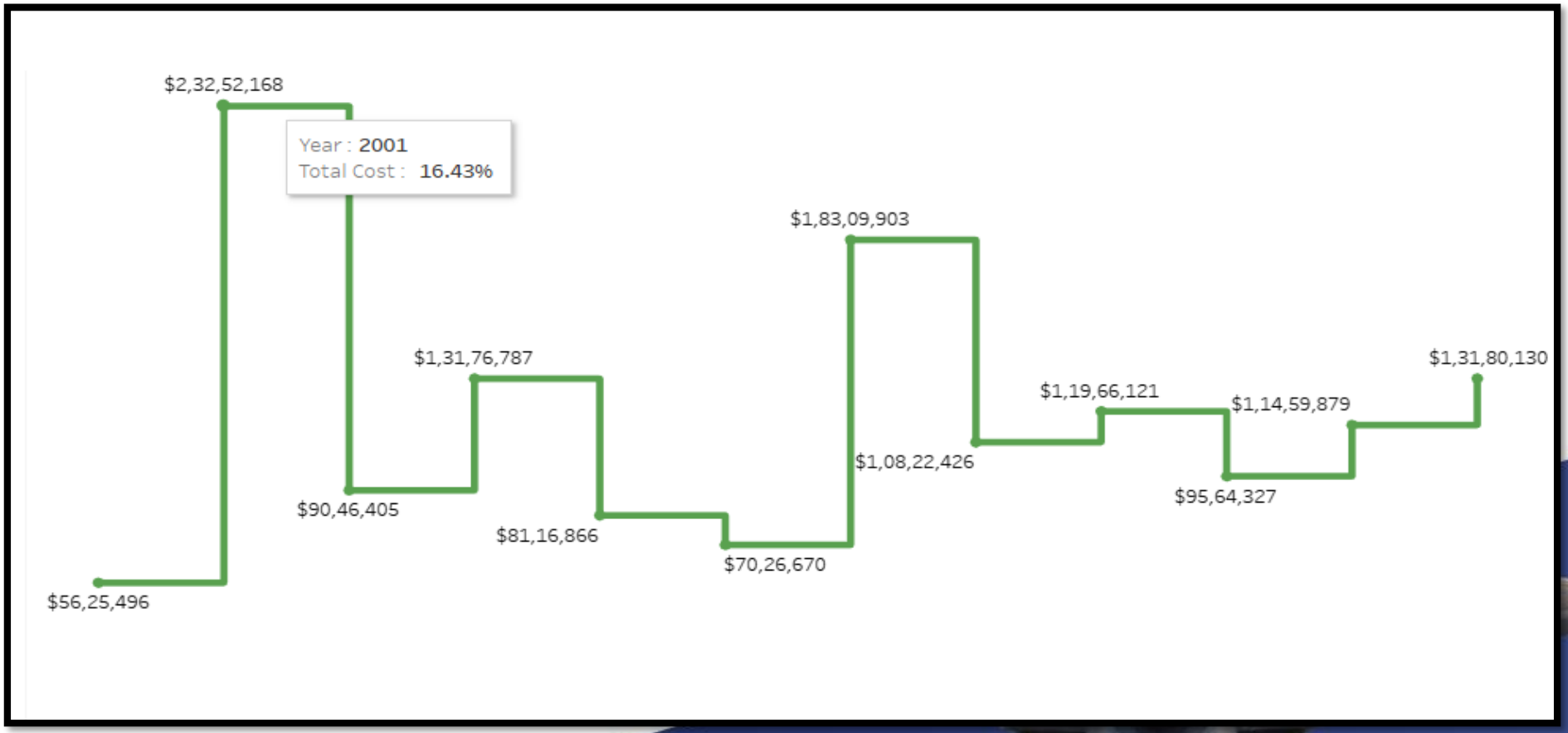
Top 50 Airports with corresponding strikes

* The chart is provided with Top 50 Airports with their corresponding strikes in highest to lowest
* Dallas/Fort worth INTL Airport was attacked 803 times. The total wildlife struck 2933. This airport is located in Texas.



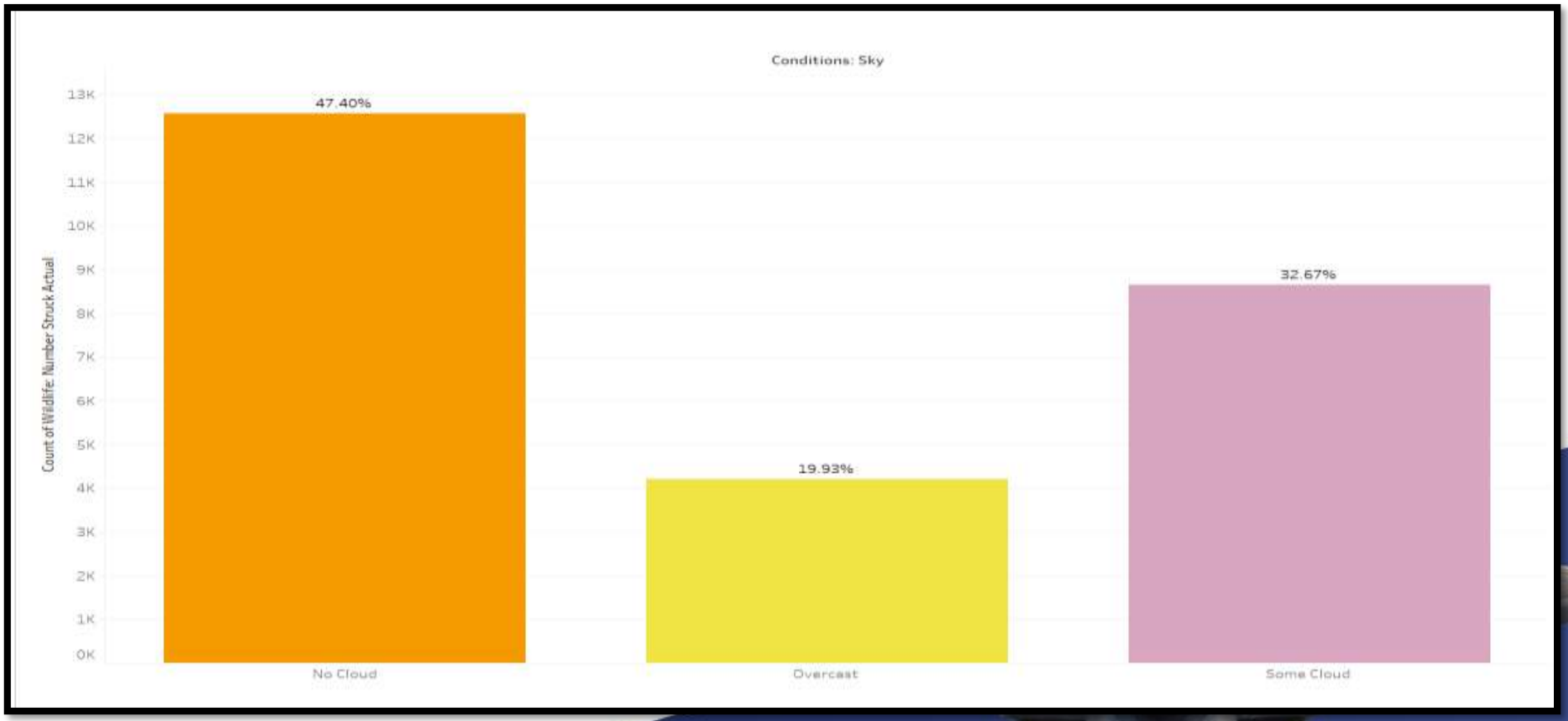
Cost Incurred per year

* An actual cost of $2,32,52,168 recorded in 2001 which is the highest cost of all years analysed.
* 16.43% of total cost were spend in the 2001
* The year of 2006 is in the 2nd position with $1,83,09,903
* Whereas the lowest is in 2000 with only 3.97%



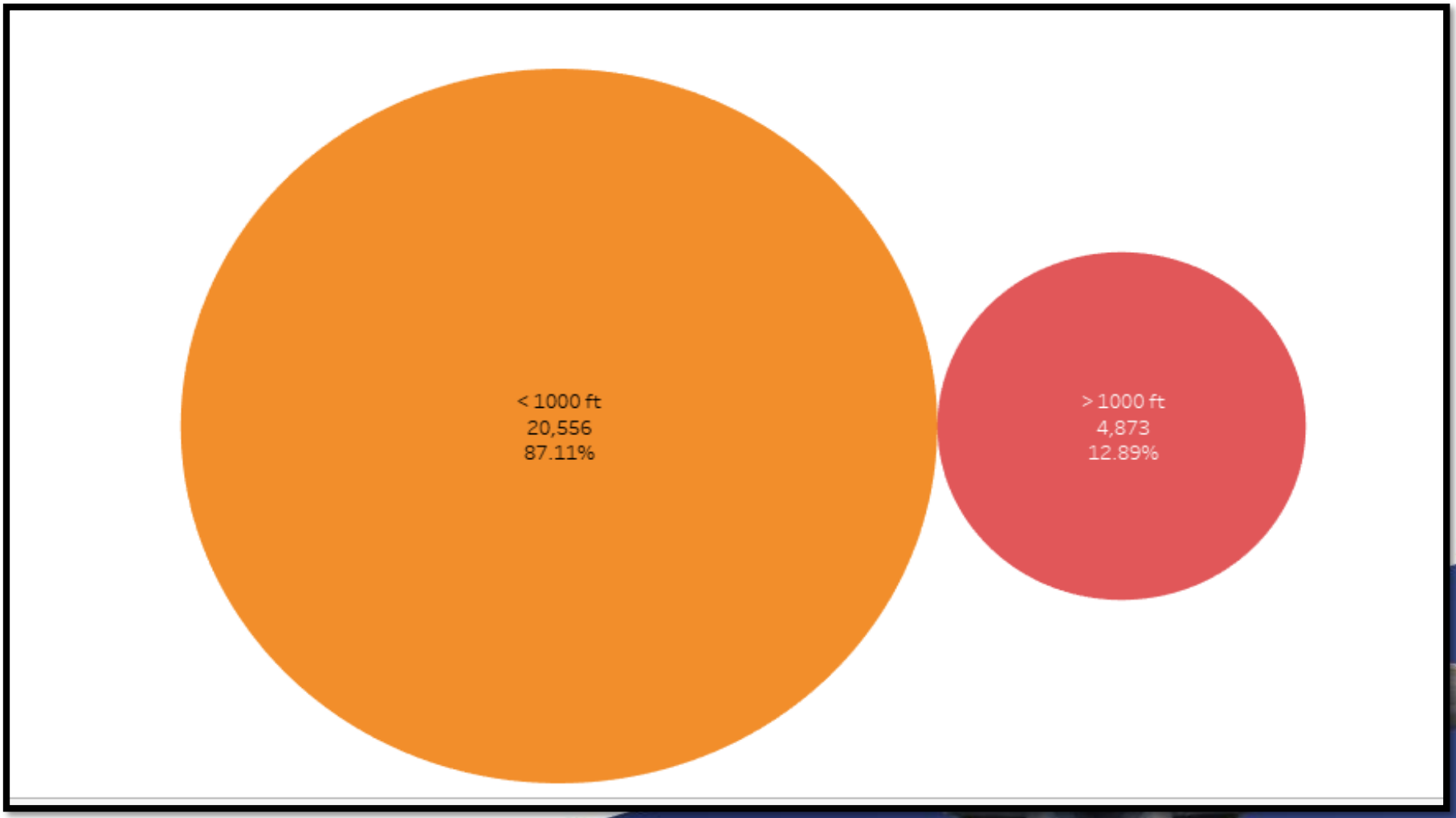
When do most bird strikes occur?

* 47.4% of total bird strikes happened when the atmosphere was clear with no clouds which counted a total of 12,575 times.
* Out of these 40% of times the pilot was warmed of the strikes
*32.67% with a total of 8659 strikes happened when the was some clouds while 19.93% of incidents happened when at atmosphere was telecasted as overcast



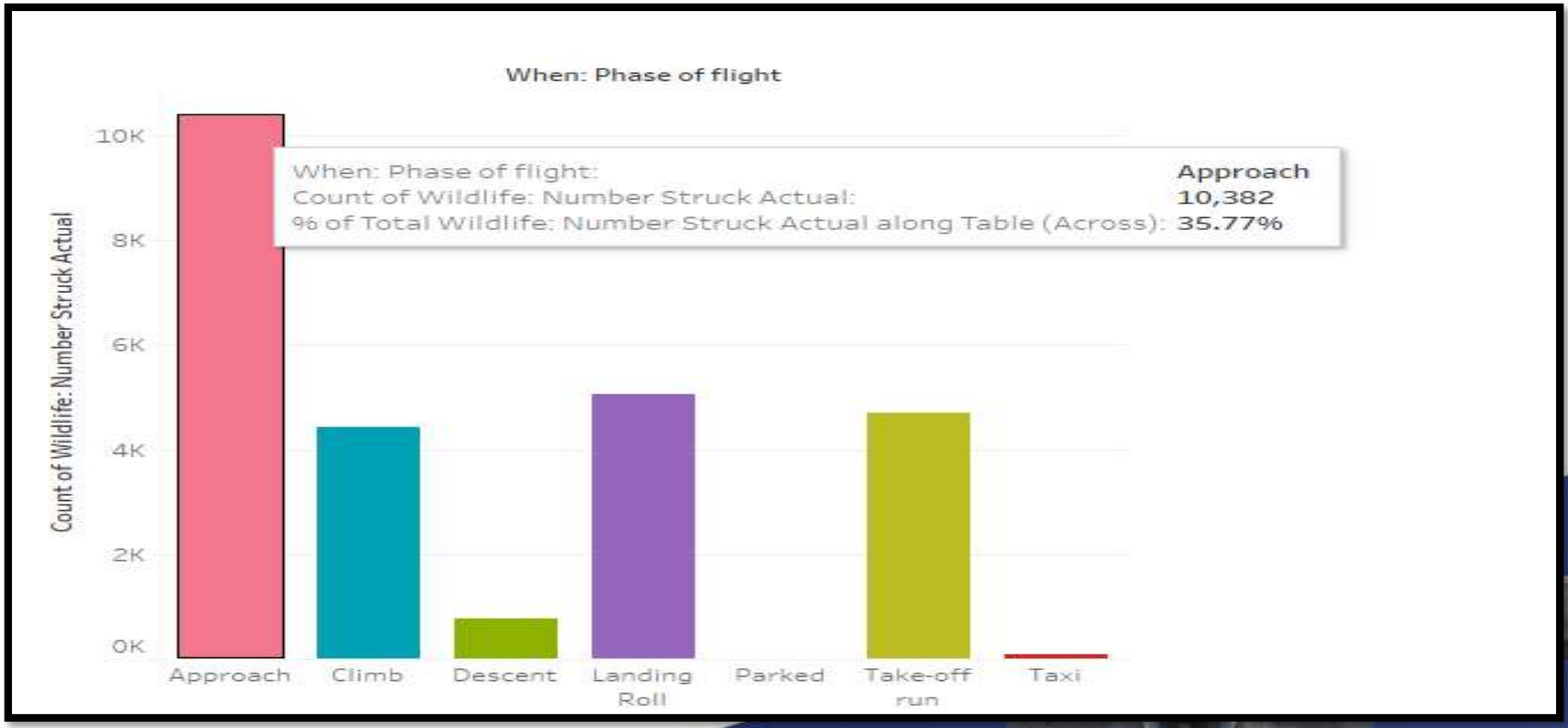
Altitude of Aeroplanes at the time of strike

* Most of the strikes happened when the flight was above 1000ft which is almost 87% of the total



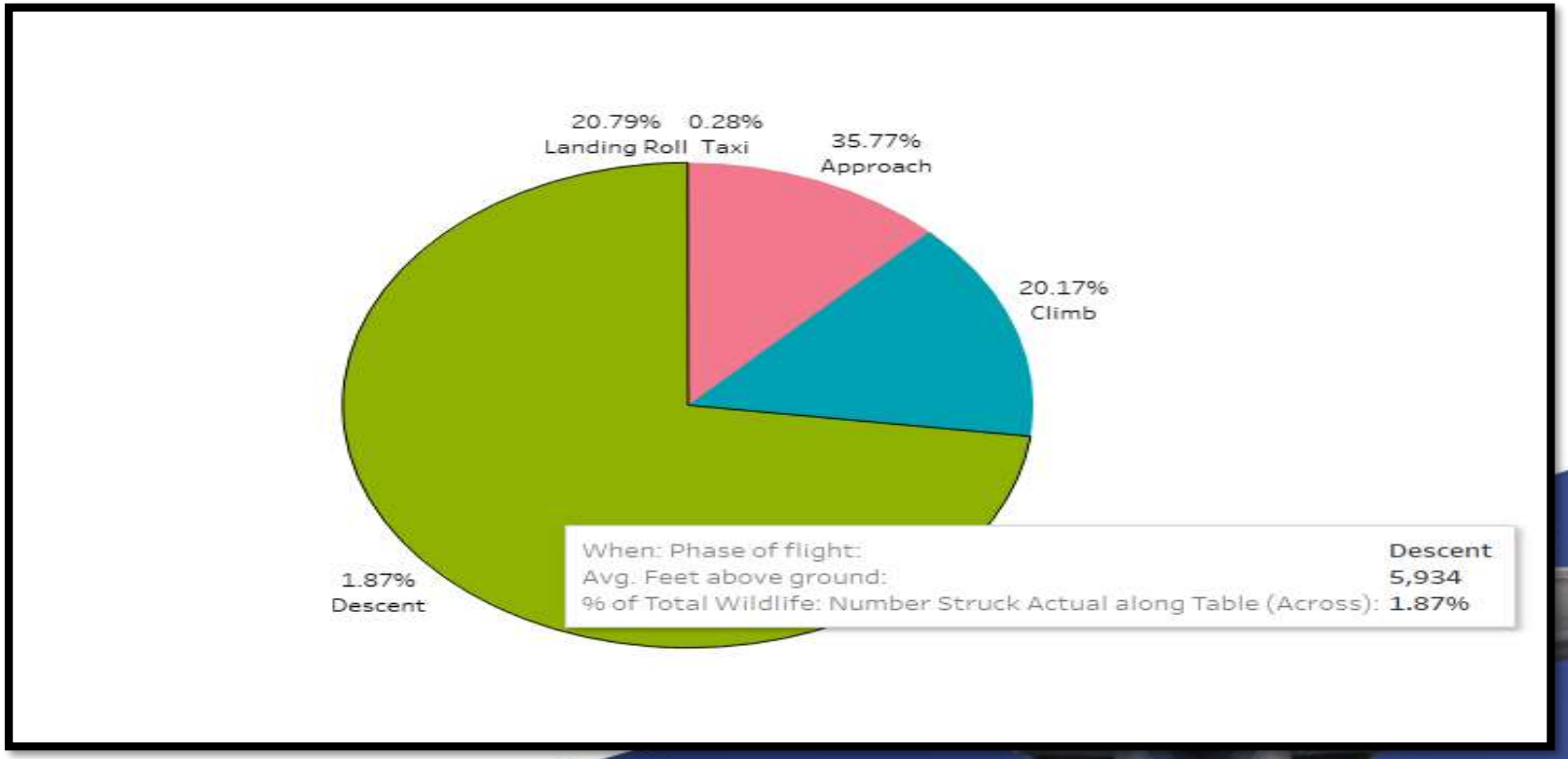
Phase of flight at the time of the strike.

* The highest bird strikes happened when the flight was approaching. It is 35.77% of total strikes
* The phase with 2nd highest numbers is Landing Roll which recorded20.79% With a number of 5047 strikes
* There wasn't much accidents happened when the flights were either on Taxi or Descent



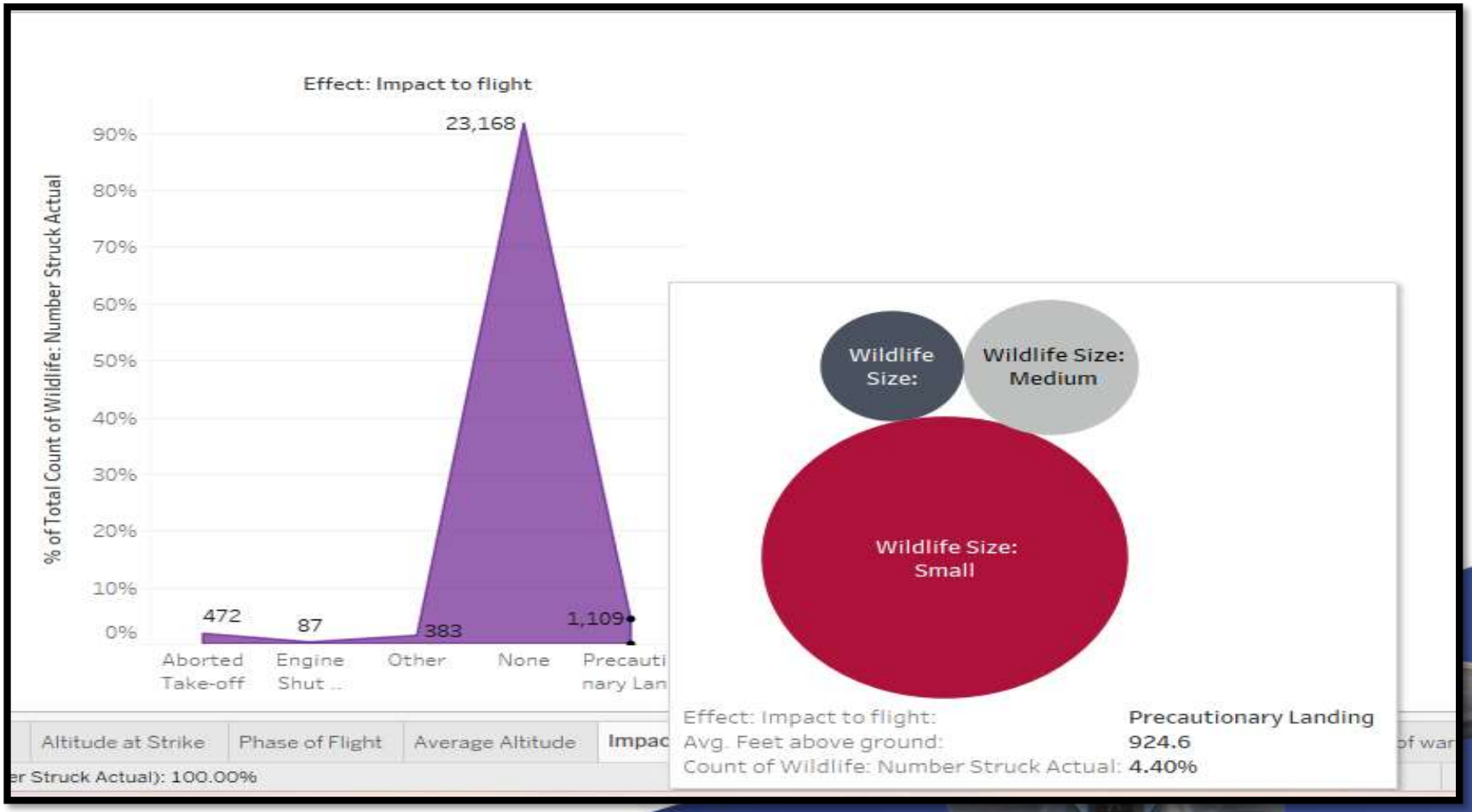
Average Altitude of the aeroplanes in different phases at the time of strike

* The three major phases are Descent, Approach and Climb
* In Descent phase the average feet was 5934 which is the highest of recorded
* In Approach an average of 1002 feet above the ground 35.77% of total wildlife struck rate recorded
* In Climb an average of 1200 feet above the ground recorded with 20.17% of total wildlife struck rate



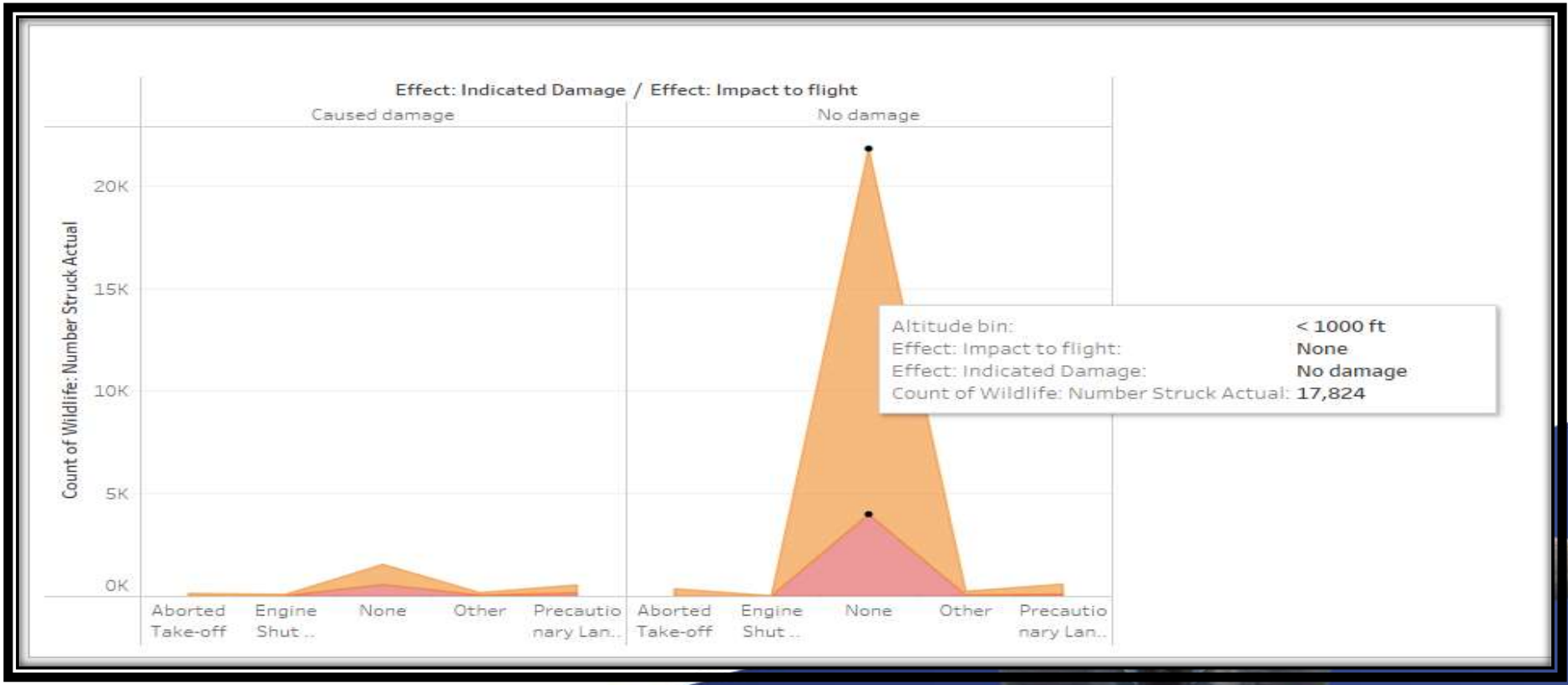
Effect of Bird Strikes & Impact on Flight

* 91% which numbered in 23168 time of total strikes there was no impact to the Flight. The average feet above the ground during these time were 813
* During 109 strikes the flights had take precautionary landing



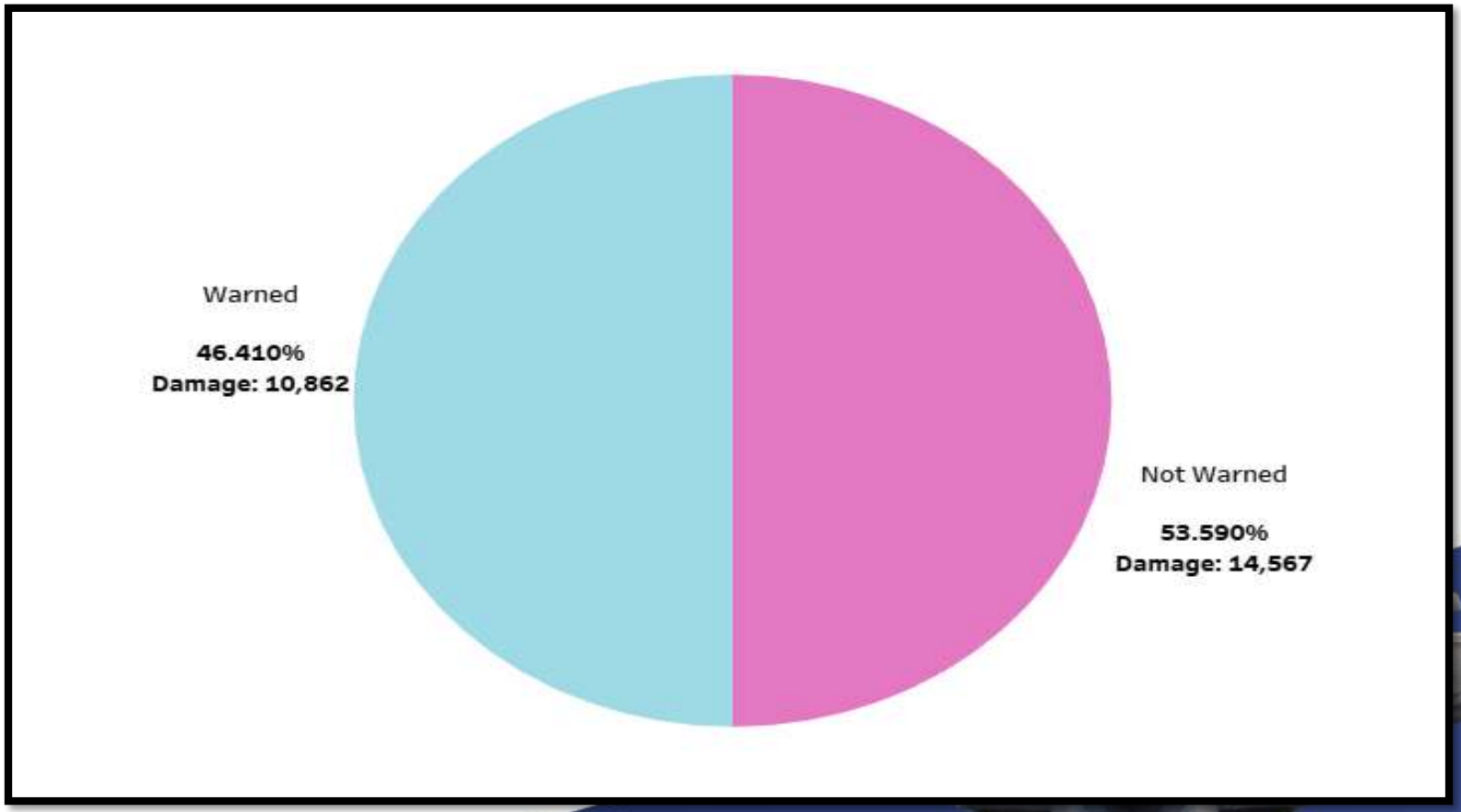
Effect of Bird Strikes & Impact on Flight

* When the altitude is more than 1000 ft, 17824 times there was no indicated damage or impact to the flight, 991 times there was indicated damage
* 488 times there was no damage but took precautionary landing
* When the altitude is less than 1000 ft 3948 times, times there was no indicated damage or impact to the flight, 552 times there was indicated damage
* 552 times there was damage with precautionary landing



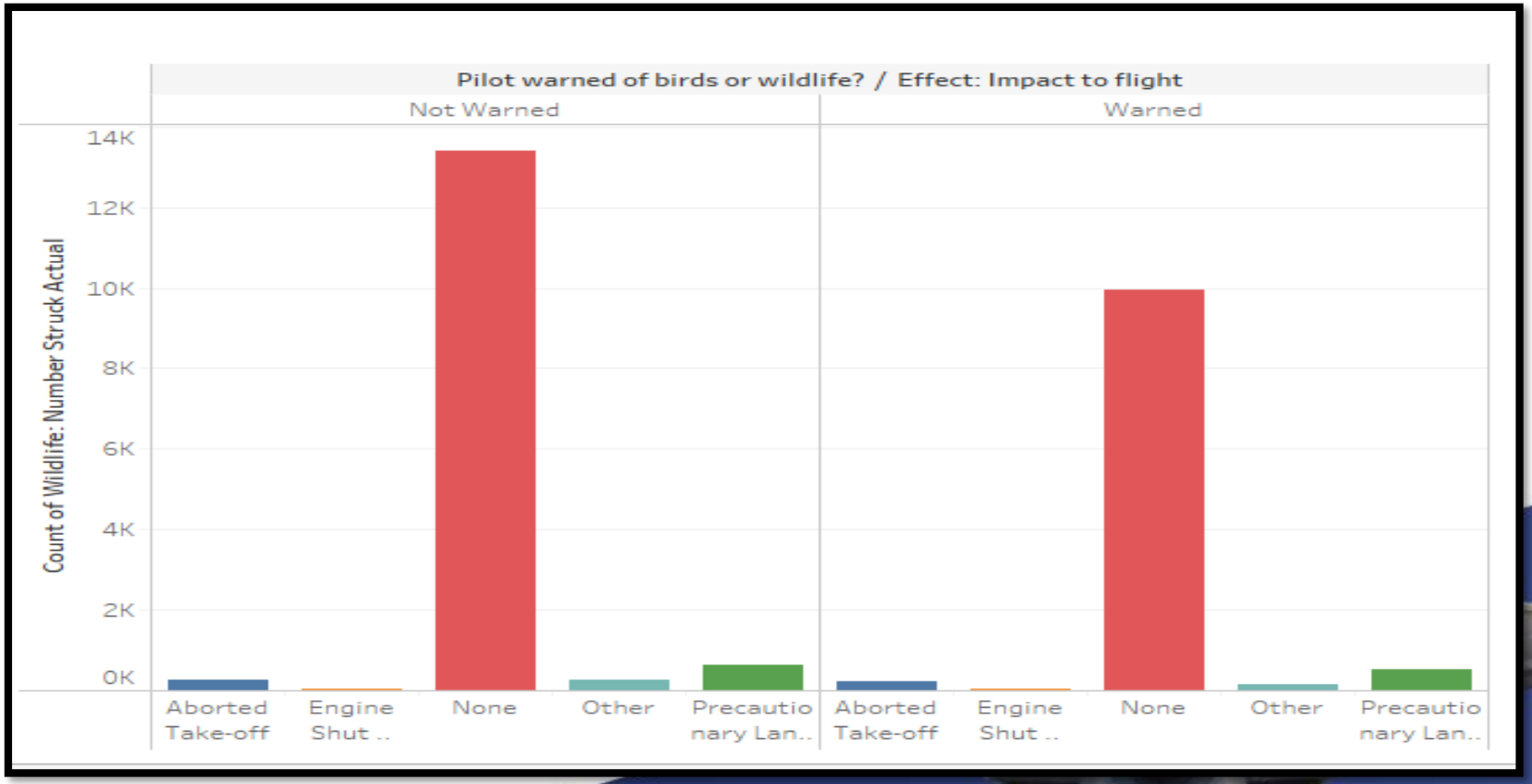
Were Pilots Informed: Prior Warning and Effect of Strike

* 53.6% of times the pilots were not warned which caused 14567 indicated damages
* 43.4% of times the pilots were warned but caused 10862 indicated damages
* There is not much difference in pilots getting warned with the rate of bird strikes



Were Pilots Informed: Prior Warning and Effect of Strike

* 502 times precautionary landing took place when the pilot is warned and 2 people were injured
* 9 people were injured when precautionary landing took place when the pilot is not warned.
* Only 2 people were injured when the pilot is warned while 19 people injured when pilot is not warned



Bird Strike Analysis -Dashboard 07

Origin State: (All)

Year: 2000 – 2011

Bird Strikes Analysis 2000 - 2011

$141.55M Total Cost Occured

291 Airlines Affected

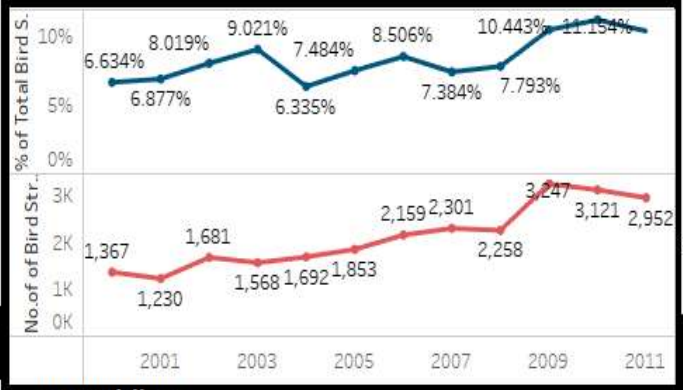
2.69 avg no.of Birds per strikes

21 Total People Injured

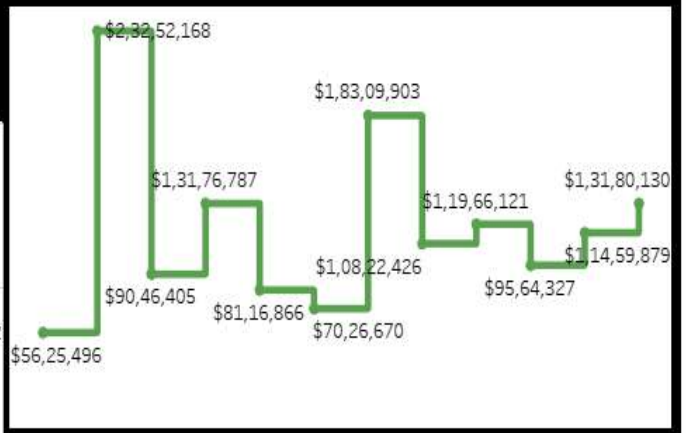
25,429 Total Incidents

Top 50 Airports

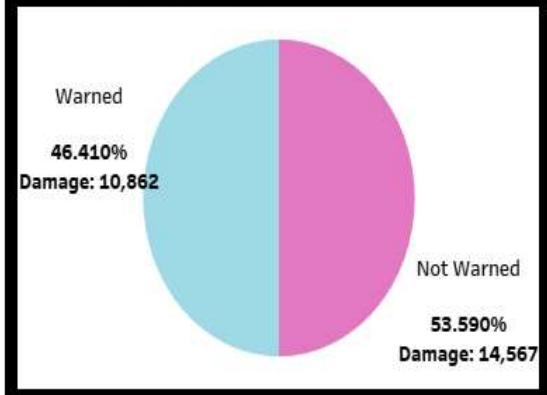
Yearly Strike Rate



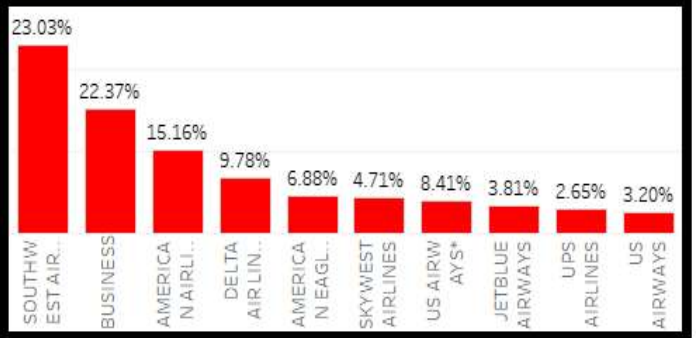
Cost per Year



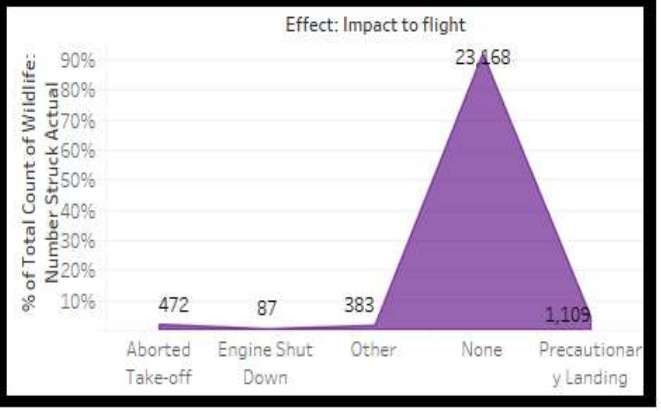
Were Pilots informed



Top 10 Airlines



Impact to flight



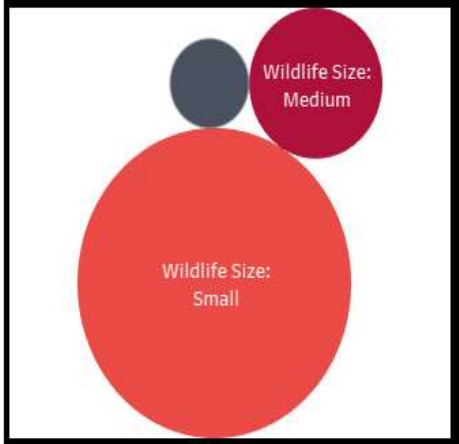
Bird Strike Analysis –Dashboard page 2

Bird Strike Analysis 2000 - 2011

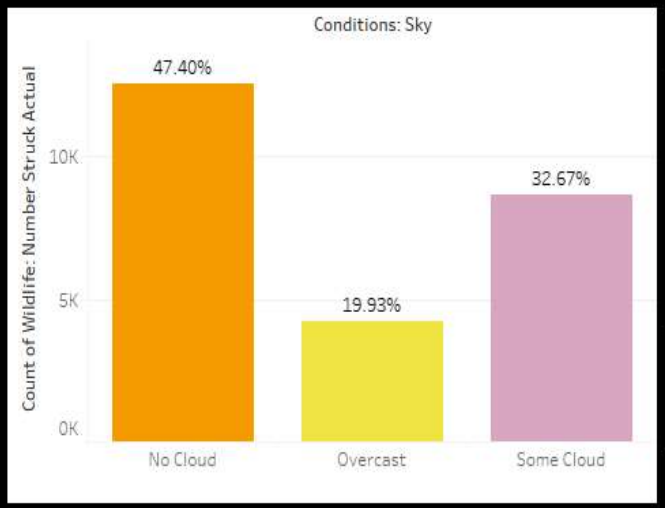
Conditions: Sky: (All)

Pilot warned ?: (All)

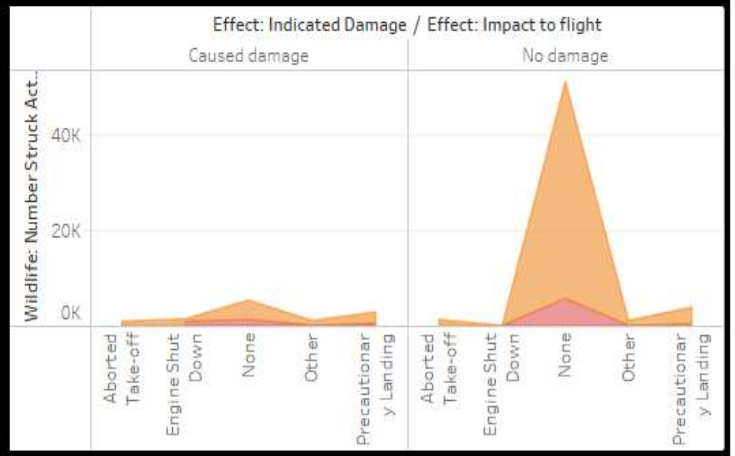
Wildlife Size



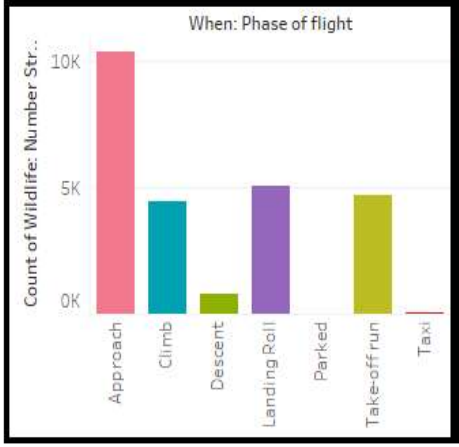
Atmospheric Conditions



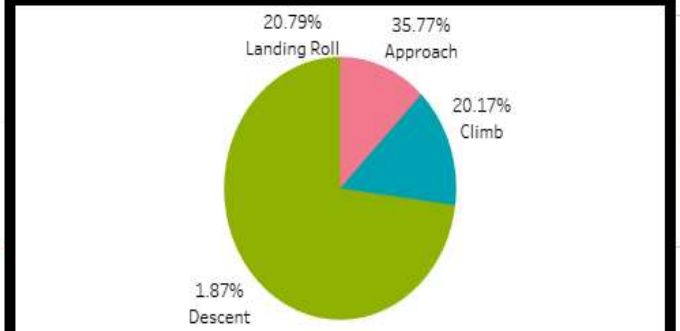
Effect at Different altitude



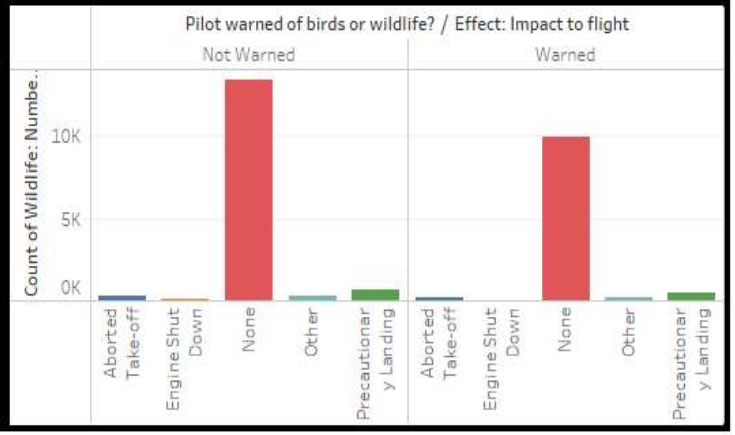
Phase of Flight



Average Altitude



Impact of warning



Itude at Strike | Phase of Flight | Average Altitude | Impact to flight | Effect at Different altitude | Were Pilots informed | Impact of warning | Bird strike Analysis 2000 - 2... | Bird Strike Analysis 2000 - ...

08

Impressions

- Bird strike rate shows an upward trend during the years. 2009 and 2010 are the years with highest strikes rates.
- Considering the Cost occurred due to damages, in 2001 highest damage happened Around $2,32,52,168 and lowest in 2000
- Out of the total, 75.75% of attacks were caused of Small Birds. Attacks caused by Large wildlife are comparatively lower.
- California ranks first in number of bird strikes cost incurred
- 86% of accidents happen in < 1000 ft and 35.7 % in the phase of Approach
- Considering the atmospheric conditions, the Bird strikes stands high even if there is n o cloud
- Only 4.4% of strikes results in a Precautionary landing and 91.8% has not affected the flight
- 53.6 % of time the pilots are not prior warned of the bird strikes resulting in injured passengers
- The difference in damage with regarding the warning is 3705


THANK YOU