



An Analysis of Wildlife-Strike Data from the 30 Busiest Commercial Airports in Brazil (2020-2022)

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INTRODUCTION

- ✈️ Brazil → the largest country in Latin America - 8.514.876 Km²
- ✈️ The fifth largest airspace in the world
- ✈️ Booming aviation industry
 - ✈️ Approximately 1.4% of the Brazilian GDP
- ✈️ 100 million passengers in 2022
 - ✈️ Domestic Passengers → 200 million in 2030
 - ✈️ International Passengers → 55 million in 2030





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INTRODUCTION

✈ The number and rate of wildlife strikes have increased in Brazil... Why?

✈ Registered Aircraft – 28,616 in 2017 to 30,080 in 2022 (5%)

✈ Total domestic commercial aircraft movements increased almost 78% since [2020](#)

✈ Replacement of older and noisier aircraft fleets with more efficient and quieter, two-engine aircraft

✈ Human activities near some

Brazilian airports that potentially

attract hazardous wildlife to the airport environment





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METHODOLOGY

- ✈ The goal of this study is to supplement the CENIPA's annual reports with information derived from the analysis of wildlife strikes to aviation from the 30 busiest airports in Brazil (2020-2022)
- ✈ Specifically, the purpose of this study is to discover new information based upon the findings of relevant data analyzed that could be used for safety enhancement
- ✈ Two datasets were the primary sources of data (JAN 2020 through DEC-2022)
- ✈ The Brazilian national wildlife database (NWSD), managed by the Brazilian Aeronautical Accidents Investigation and Prevention Center (CENIPA)
- ✈ The Air Traffic Operations Annual Reports, published by the Brazilian Air Traffic Control Department (DECEA)
- ✈ Data analysis
 - ✈ Exploratory data analysis to provide an intuitive and overall trend of wildlife strikes at (and around) the 30 busiest airports hosting commercial operations in Brasil
























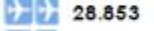
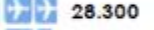
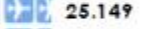
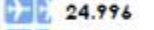
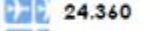
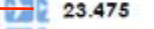
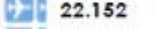
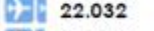




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FINDINGS & DISCUSSION

 Airports

1º	SBGR	Guarulhos		245.163
2º	SBSP	Congonhas		197.184
3º	SBBR	Brasília		135.626
4º	SBKP	Campinas		128.564
5º	SBRJ	Santos Dumont		111.873
6º	SBCF	Confins		91.218
7º	SBRF	Recife		83.088
8º	SBSV	Salvador		76.365
9º	SBJR	Jacarepaguá		69.659
10º	SBPA	Porto Alegre		66.440
11º	SBGO	Goiânia		61.180
12º	SBMT	Campo de Marte		57.610
13º	SBCT	Curitiba		56.058
14º	SBFZ	Fortaleza		54.327
15º	SBBE	Belém		51.483
16º	SBGL	Galeão		51.091
17º	SBCY	Cuiabá		44.795
18º	SBEG	Manaus		43.393
19º	SBFL	Florianópolis		43.127
20º	SBBH	Pampulha		42.209
21º	SBVT	Vitória		40.128
22º	SBYS	Pirassununga		38.761
23º	SBJD	Jundiaí		32.839
24º	SBBI	Bacacheri		28.853
25º	SBME	Macaé		28.300
26º	SBCG	Campo Grande		25.149
27º	SBNF	Navegantes		24.996
28º	SBPG	Ponta Grossa		24.360
29º	SBFS	Farol de São Tomé		23.475
30º	SBSL	São Luís		22.152
31º	SBRP	Ribeirão Preto		22.032
32º	SBNT	Natal		21.412

 SBYS & SBFS – No commercial Operations (2020-2022)



 Source: DECEA 2023



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FINDINGS & DISCUSSION

Year	Total Strikes	Damaging Strikes	Aircraft Operations	Wildlife-Strike Index	Damaging Wildlife-Strike Index
2020	1,518	200	1,259,840	120.49	15.87
2021	1,859	231	1,598,374	116.31	14.45
2022	2,388	574	1,979,745	120.61	28.99
Total	5,765	1,005	4,837,959	N/A	N/A

Note: Wildlife strike index = number of strikes / 100,000 aircraft operations



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FINDINGS & DISCUSSION

✈ *There were 5,765 wildlife strikes to all investigated airports (2020-2022)*

- ✈ 17.43% – caused some level of damage to aircraft
- ✈ Commercial operators - 88% of all strikes (known operator)
 - ✈ 82% of the total damaging strikes
- ✈ GA - 8% of all strikes (known operator)
 - ✈ 12% of the total damaging strikes
- ✈ Military operators - 4% of all strikes (known operator)
 - ✈ 6% of the total damaging strikes





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FINDINGS & DISCUSSION

Phase of Flight	Total Strikes	Damaging Strikes	Percentage of Total
Taxi	54	3	5.55
Takeoff Roll	1,455	201	13.81
Climb	165	44	26.67
Cruise	20	10	0.5
Descent	96	17	17.71
Approach	396	88	22.22
Landing	1,893	131	6.92
Runway Inspection	1,392	439	31.54
Turnaround Inspection	277	68	24.55
Parking	3	0	0
Low-Flight Training	14	4	28.57
Total	5,765	1,005	N/A



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FINDINGS & DISCUSSION

✈ Phase of Flight

✈ Departure Phases of Flight

- ✈ Commercial operators - 35% of all strikes & 40% of the damaging strikes
- ✈ GA - 36% of all strikes & 7% of the damaging strikes
- ✈ Military Aircraft - 27% of all strikes & 26% of the damaging strikes

✈ Arrival Phases of Flight

- ✈ Commercial operators - 51% of all strikes & 36% of the damaging strikes
- ✈ GA - 39% of all strikes & 32% of the damaging strikes
- ✈ Military Aircraft - 46% of all strikes & 44% of the damaging strikes





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FINDINGS & DISCUSSION

✈ Wildlife Group

- ✈ Birds – 2,802 strikes – 22% caused damage to aircraft
- ✈ Terrestrial mammals – 96 strikes - 11% caused damage to aircraft
- ✈ Bats – 164 strikes – 24% caused damage to aircraft
- ✈ Reptiles – 40 strikes – 32.5% caused damage to aircraft



✈ Size of animal

- ✈ Very small ($\leq 50\text{g}$) (n=386) – 16% caused damage to aircraft
- ✈ Small (51-250g) (n=575) – 20% caused damage to aircraft
- ✈ Medium (251-750g) (n=3,915) – 14% caused damage to aircraft
- ✈ Large (751-1,500g) (n=553) – 24% caused damage to aircraft
- ✈ Very large ($\geq 1,501\text{g}$) (n=333) – 35% caused damage to aircraft



Southern Lapwings



Source: istockphoto.com



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FINDINGS & DISCUSSION

✈️ *Height above ground level*

- ✈️ 0-500 feet AGL – 92% strikes & 88% of the damaging strikes
- ✈️ 0-1500 feet AGL – 94% strikes & 91% of the damaging strikes
- ✈️ 0-3500 feet AGL – 96% strikes & 95% of the damaging strikes

✈️ *Type of Operator - Height above ground level*

- ✈️ 0-500 feet AGL
 - ✈️ Commercial - 90% total strikes & 84% of the damaging strikes
 - ✈️ GA - 90% total strikes & 75% of the damaging strikes
 - ✈️ Military - 80% total strikes & 55% of the damaging strikes
- ✈️ 0-1500 feet AGL
 - ✈️ Commercial - 92% total strikes & 87% of the damaging strikes
 - ✈️ GA - 93% total strikes & 83% of the damaging strikes
 - ✈️ Military - 86% total strikes & 76% of the damaging strikes





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FINDINGS & DISCUSSION

✈ Time of day

	Strikes	Percentage of Total	Damaging Strikes	Percentage of Total
Dawn	540	9	89	9
Day	3056	53	623	62
Dusk	563	10	64	6
Night	1606	28	229	23
Total	5765	N/A	1005	N/A



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CONCLUSION

✈ Findings of Concern

- ✈ The number of aircraft operations increased 57% from 2020-2022
 - ✈ The number of damaging strikes almost doubled during the same period
- ✈ Approximately 17% of the strikes caused some level of damage to aircraft
- ✈ Almost 60% (n=3,402) of the strikes and 33% (n=332) of the damaging strikes occurred during the takeoff roll, and landing phases of flight
- ✈ Approximately 94% of the total strikes & 91% of the damaging strikes occurred at and around the airport environment (\leq 1,500 feet AGL)
- ✈ Approximately 28% of all strikes occurred at night
- ✈ There is a need to improve the quality of wildlife strike reporting in Brazil
 - ✈ Safety efforts to prevent wildlife strikes should be supported by robust data and empirical information





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FINDINGS & DISCUSSION

✈️ Limitations of the Study

✈️ Quality and quantity of strike reports

✈️ Several strike reports were incomplete (e.g., missing information about phase of flight; altitude of strikes; costs) and/or with conflicting information (e.g., strike during landing X altitude 3,000 feet AGL; 5,763 strikes in which the size of the animal was reported X 3,102 strikes in which the wildlife species [groups?] was identified)

✈️ There is a need for information regarding the costs of wildlife strikes

✈️ There is a need to improve the identification of the wildlife species involved in wildlife strikes and damaging wildlife strikes



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