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BRAZILIAN AVIAN HAZARD CONTROL PROGRAM – EDUCATIONAL INITIATIVES

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Abstract

Brazil has the second civilian aircraft fleet in the world and also the second largest catalogued bird species. Its vast territory and ecosystem variety have brought the Tourism Industry which has increased demand for new domestic routes and airports. Besides that, the air traffic growth in the big cities provokes a constant and high rate of airport facilities enlargement and modernization.
At the same time, due to human population growth and poor policies of garbage disposal in the past, nowadays we have open dumps near some big airports. That causes an ever-increasing population growth of a bird specie that survives eating carrion, the Black Vulture (Coragyps atratus, wt 2Kg, 4lb). Therefore, we have faced the rising risk of bird strikes in the vicinity of those airfields. The solution of the problem encompasses many institutions and requires, among other measures, the implementation of educational actions for the general public and local authorities.
The paper presents the educacional actions that have been undertaken by the SIPAER, the Brazilian Aviation Safety System, to keep the avian hazard under control in Brazil.

Key Words: Education / Attractants: Carrion, Garbage, Slaughterhouses.

1. Introduction

The bird population growth around the world, caused by the increased ecological consciousness and also by some urban disequilibrium, combined with the expansion of air transportation in most of the countries are resulting in a preoccupying increase of the bird strike statistics.

The problem affects a great majority of countries, assuming different characteristics for each peculiar geographic region. Brazil, with one the most diversified bird population region of the world, with more than 1,700 known species, barely have reports of bird strikes with migratory birds. However, due to some very specific problems to be discussed later, Brazil's statistics are somewhat alarming, and an well orchestrated Avian Hazard Control Program is needed.

This paper intends to present the peculiarities of Brazil's problems and the educational initiatives being developed to reduce the risk of aeronautical accidents due to bird strike.

2. The Brazilian Scene

The Federative Republic of Brazil has an area of 8,511,965 sq km (3,319,666 sq mi), holds a population of 158.7 million, being Portuguese the official language. Brasilia, its capital, designed by architect Oscar Niemeyer, urban planner Lucio Costa and landscape architect Burle Marx, was built in an incredible three year period (1957-60).

Brazil is made up of 26 States plus the Federal District. Thus, besides the Union Government, each state holds its own government structure. The states are divided into counties that also have their own administrative struture. The jurisdiction of each level of government is stablished by the Federal Constitution, laws and others legal acts. That requires a lot of agreements to solve a problem which root causes are spread into all three governments levels.

The richness and diversity of Brazil's fauna is astounding, and the country ranks first in the world for number of species of primates, amphibians and plants. Although major tributaries of the Amazon River are unexplored and many species of birds have not been classified yet, Brazil already ranks second for bird species after Colombia. Forest birds include toucans, parrots, macaws, hummingbirds and hawks. Unfortunately, some species are under threat because of the depletion of rainforests, desertification in the northeast, poaching in the Pantanal region and coastal pollution. For that reason, the Brazilian organization responsible for wild birds conservation, CEMAVE

(Centro de Pesquisas para a Conservação das Aves Silvestres), which is subordinated to the Ministry of the Environment, is a necessary presence in all matters related to birds.

Brazil has many landscapes. The long, narrow Atlantic seaboard has coastal ranges between the Rio Grande do Sul and Bahia states, but is flatter north of Bahia. The large highlands - called the Planalto Brasileiro or central plateau - which extend over most of Brazil's interior south of the Amazon Basin are punctuated by several small mountain ranges and sliced by several large rivers.

Figure 1. South America and Brazil

The Amazon Basin is a gigantic system of rivers and forests, covering half of Brazil and extending into neighboring countries. The stretch of river known as Rio Amazonas runs between the cities of Manaus and Belém, locations that are being rapidly settled and have had problems relating urban's growth and birds.

The Pantanal, a vast area of wetlands, about half the size of France, lies in the far west of Brazil and extends into the border regions of Bolivia and Paraguay. The Pantanal is a sanctuary for giant river otters, anacondas, iguanas, jaguars, cougars, crocodiles, deer and anteaters, but birds are the

most frequently seen wildlife. Cities like Campo Grande and Corumbá also have had problems concerning bird strike.

Although much of Brazil is scarcely populated, such as Amazon and Pantanal regions, there are also great metropolis, mainly next the coastal line, like São Paulo and Rio de Janeiro, and some smallers, Porto Alegre, Curitiba, Belo Horizonte, Salvador, Recife, Natal and Fortaleza, among others important cities with bird related problems.

3. The CENIPA Bird Strike Database

Brazil has a well established flight safety structure. Created in 1971, the Aeronautical Accident Prevention and Investigation System, known as SIPAER (Sistema de Investigação e Prevenção de Acidentes Aeronáuticos) has more than 4,000 flight safety specialists who were trained at the Aeronautical Accident Prevention and Investigation Center – CENIPA, the Brazilian' aviation safety center for military and civil aviation. Spread in large airlines, small aviation companies, aircraft manufacturers, technical centers, airport administrations, military units and commands, traffic control system and aviation schools, the huge systemic structure is connected directly to the CENIPA, in Brasilia.

The CENIPA's database, computerized since 1981 holds all accidents and incidents that have happened in Brazil since then. It controls not only all investigations and corrective action implementation, but also produces statistics information and trend analysis studies.

However, it was only in 1991 that the development of a Avian Hazard Control Program (formely Bird Strike Reduction Program) was initiated. The accidents and incidents related to bird collisions, even though already registered in the database, started to be inserted in a separated system, with specially designed fields like local, type of bird, collision altitude, aircraft speed, etc.

To feed the program, two information sheets were developed and disseminated throughout the SIPAER. The first one contains the collision information available immediately after the occurrence, and the second one contains information that becomes later, like aircraft repair costs. They are very simple forms of only one page that can be sent out by mail or fax.

In order to identify the bird species from its remains collected after collisions against aircraft, we have signed a cooperation contract with the CEMAVE. They are able to identify quickly and reliably most of the remains sent to them, including DNA identification, if needed.

4. Bird strike statistics

Since the very beginning of the CENIPA's database, 1,633 out of 1,858 reports had the phases of operation identified and are showed in the table below.

Table 1. Bird strikes per phase of flight (09/1980 up to 02/2000) Source:CENIPA

Phase of Flight	# of Strikes	% of the Total
Take-off	443	23.84
Approach	440	23.68
Landing roll	207	11.14
Low level flight	181	9.74
En route	133	7.16
Climb	102	5.49
Descent	54	2.91
Landing	51	2.75
Taxiing	13	0.70
Not reported	234	12.60

Considering the phases of flight that take place at or around the airport (taxiing, take-off, approach, landing and landing roll) and half of the other phases (except the en route phase), it is possible to notice that the collisions that occurred at the airports, their traffic area or its proximity represent more than 82% of all reported bird strikes.

From the CENIPA' s database, 1,658 out of 1,858 occurrences had the airport identified and are showed in table 2.

Table 2. Bird strikes per airport (from date on the right column up to 02/2000) Source: CENIPA

Airport	# Bird Strikes	City	First Report
1. SBGL	142	***Rio de Janeiro***	03/1984
2. SBGR	111	São Paulo	08/1989
3. SBPA	94	Porto Alegre	12/1987
4. SBSM	79	Santa Maria	04/1982
5. SBNT	65	Natal	08/1980
6. SBEG	54	Manaus	08/1989
7. SBYS	53	Pirassununga	04/1985
8. SBMN	50	Manaus	08/1982
9. SBRF	45	Recife	10/1981
10. SBSC	45	Rio de Janeiro	03/1988
11. SBCT	41	Curitiba	10/1988
12. SBSV	41	Salvador	03/1985
13. SBFZ	39	Fortaleza	05/1988
14. SBGO	37	Goiania	06/1991
15. SBBE	33	Belém	10/1985
16. SBFL	33	Florianópolis	05/1986
17. SBCO	32	Canoas	10/1986
18. SBPV	31	Porto Velho	07/1988
19. SBCG	28	Campo Grande	09/1984
20. SBVT	27	Vitoria	10/1984
21. SBRJ	23	Rio de Janeiro	08/1984
22. SBMO	22	Maceió	02/1984
23. SBSN	22	Santarém	09/1988
24. SBSP	19	São Paulo	10/1984
25. SBBR	18	Brasília	11/1989
26. SBAN	17	Anápolis	09/1981
27. SBBH	16	Belo Horizonte	03/1987
28. SBFI	15	Foz do Iguaçu	08/1990
29. SBCY	14	Cuiabá	11/1991
30. SBKP	14	Campinas	06/1984
31. SBSL	14	São Luís	01/1994
32. SBCX	12	Caxias do Sul	03/1994
33. SBSJ	12	São J. dos Campos	05/1988
34. SBST	12	Santos	08/1983
35. SBMQ	11	Macapá	09/1991
36. SBIL	10	Ilhéus	05/1994

A more accurate evaluation of the bird strike occurrence in big cities can be seen in the table below.

Table 3. Bird strikes per city (08/1980 up to 02/2000)
Source: CENIPA

City	Airports	Bird Strikes	Total up to 02/2000
Rio de Janeiro	SBGL	142	210
	SBSC	45	
	SBRJ	23	
São Paulo	SBGR	111	130
	SBSP	19	
Porto Alegre	SBPA	94	126
	SBCO	32	
Manaus	SBEG	54	104
	SBMN	50	
Natal	SBNT	65	65
Recife	SBRF	45	45
Curitiba	SBCT	41	42
	SBBI	1	
Salvador	SBSV	41	41

Figure 1 compares the total number of bird strikes reported to CENIPA since 1980 up to 02/2000 and the rate of the number of bird strikes reported to

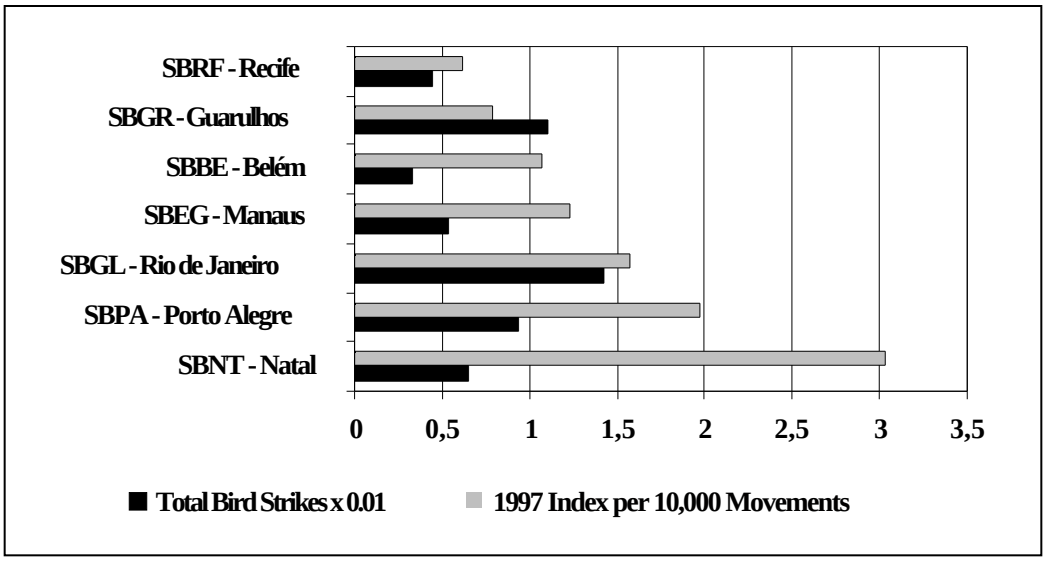

Figure 1. 1997 Index of bird strikes per 10,000 movements. Source: CENIPA

CENIPA in 1997 and the number of aircraft movement in the same year in acordance with Civil Aviation Institute data. It is possible to identify the airports having bigger rates of bird strike occurrences per aircraft movement in 1997.

4.1. The Species Involved in Bird Strikes

Almost all of the airports listed in the tables #2 and #3 and chart #1 are located within the cities, which means that the bird strike in Brazil is a problem predominantly related to urban areas.

Starting in 1995, members of CENIPA made helicopter flights with specialists from the CEMAVE over some cities with significant bird strike record. The most frequent bird species was located, identified and counted within a circular area of 20km radius from the airports. The bird population was estimated and the potential causes (natural or not) for their presence were identified. Flights were made in two subsequent days, being two per day (morning and afternoon), always at the same time. Departing from the major airport in the area, it was initiated a spiral flying over pre-specified points of interest, until reaching the 20km limit (approximately 1:45 hour flight).

Table 4. Bird species per city, Source: CENIPA

Airports	City	Coragyps atratus	Vanellus chilensis	Bulbucus ibis	Egretta thula
SBGL	Rio de Janeiro	1,352	13	1356	1315
SBEG/SBMN	Manaus	2,819	0	0	0
SBSV	Salvador	1,358	2	0	0
SBPA/SBCO	Porto Alegre	0	8	13	5
SBMO	Maceió	1,830	2	0	0
SBNT	Natal	1,790	7	6	5

It can be seen in the table #4, there is a kind of bird that is almost always in large numbers, be it in Manaus or Rio de Janeiro, cities almost 4,000 km far from each other: The ***Coragyps atratus*** (American Black Vulture or “Urubu**”**, in Portuguese).

CENIPA database shows that most of the bird strike events in Brazil were related with the Urubu. In 977 out of 1,858 reports the bird species involved in the strike was identified. Considering these 977 cases, that represents 52.55% of the total number of bird strikes on file, the participation of each species is showed in the table 5.

Table #5 –Birds involved in strikes in Brazil (08/1980 up to 02/2000)
Source: CENIPA

Bird Species	# of Strikes	% of Total
Black Vulture (Urubu)	545	55.78
Vanellus chilensis (Quero-quero)	143	14.63
Owl (Coruja)	60	6.14
Hawk (Gavião)	44	4.50
Podager nacunda (Bacurau)	36	3.68
Heron (Garça)	33	3.37
Others	116	11.90

5. The major cities and the Urubu

The Urubu is a black bird easily found in the Americas. It eats meat in deterioration, which makes it a very important part of the ecological balance. Because of that, it is very common in landfills and dumps, and usually not found in forests. Its wingspan averages 1.5 m (59 inches) and it weighs around 1.6kg (3.52 lbs).

The Urubu is the bird species more frequently hit by aircraft in almost all major cities. Analyzing the root causes for the bird presence, some basic contributing factors are identified.

Most of the areas close to airports, due to their location, usually are lower priced and inhabited by numerous lower income families, that live in shantytowns without adequate sanitary conditions for their garbage.

Frequently, waste landfills and airports share the same geographical space. Both need to be close enough to the city to make ground transportation cost-effective and require a good road structure.

Until 1989, according to IBGE, a brazilian official survey institution, about 86% of the brazilian counties had been disposing their solid waste in open dumps, offering a large amount of carrion, Urubu’s basic source of food.

There is no natural predator for the Urubu, hence the population growth allowed by the abundance of food remains unbalanced.

The Urubu flies in flocks on thermals and remains for long periods in the air, many times disturbing the airports’ traffic area, approach or departure paths.

Others Urubu's attractants activities, like slaughterhouses, tanning industries and fishing industries (when applicable) are found close to airports because of the same reasons listed for waste landfills.

Because of Urubu's characteristics, the most common control methods are not effective against it. Falconry does not work, since the Urubu (a top of line raptor) is bigger than falcons and flies in big flocks. Ground deterrents (like electronic devices, gas cannons, chemical products) do not work either, since the bird is not located on the airport surface area, but in flight.

Analysing each location individually, with few exceptions, all major cities, like São Paulo, Rio de Janeiro, Salvador, Recife, Natal, Belém, Manaus, among others, show a similar situation related to the Urubu.

5.1. São Paulo

São Paulo, the biggest city in South America with strong industrial development, has seventeen million people, many of them descendants of Italian and Japanese imigrants. Among other factors, the intense business live brings to the city about half of all Brazil's air traffic movement. At the same time, the fast growth of the metropolis' population leads to the installation of facilities like slaughterhouses and tanning industries, besides the apearence of urban areas with deficient or no garbage's collect system. That attracts the Urubu, for the traffic areas of big airports, like the Guarulhos International Airport (SBGR) and the Congonhas Airport (SBSP), the Brazilian's most crowded airport concerning domestic flights.

Table 6. Birds involved in strikes in São Paulo (10/1984 up to 02/2000) Source: CENIPA

	Urubu	Quero-quero	Others	Unidentified
# of Strikes	14	12	19	82
% of Total	11.03	9.44	14.96	64.57

5.2. Rio de Janeiro

Rio de Janeiro city, having its 7 million inhabitants jammed between ocean and escarpment, puts next to its natural beautiful about a third of the people living in slums that blanket many of the hillsides. This situation worsens the solid waste's collection, provoking the emersion of a lot of little open dumps and increasing the occurrence of the Urubu all over the city, including the airport's traffic areas of the Rio de Janeiro International Airport – Galeão - Antonio Carlos Jobim (SBGL) and the Santos-Dumont Airport (SBRJ), that holds the most important domestic route linking Rio de Janeiro and São Paulo cities.

Table 7. Birds involved in strikes in Rio de Janeiro (03/1984 up to 02/2000) Source: CENIPA

	Urubu	Heron	Others	Unidentified
# of Strikes	69	19	29	104
% of Total	31.23	8.59	13.13	47.05

5.3. Salvador

Salvador, capital of Bahia State, is a fascinating city loaded with historic buildings. Carnival in Salvador is justly famous and attracts hordes of tourists. The city principal airport, Luís Eduardo Magalhães International Airport (SBSV), faces the same problem of São Paulo's and Rio's airport, the massive presence of Urubus.

Table 8. Birds involved in strikes in Salvador (03/1985 up to 02/2000) Source: CENIPA

	Urubu	Others	Unidentified
# of Strikes	23	2	16
% of Total	56.10	4.88	39.02

5.4. Recife

Table 9. Birds involved in strikes in Recife (10/1981 up to 02/2000) Source: CENIPA

	Urubu	Owl	Others	Unidentified
# of Strikes	16	3	2	24
% of Total	35.56	6.67	4.44	53.33

5.5. Natal

Table #10 – Birds involved in strikes in Natal (08/1980 up to 02/2000) Source: CENIPA

	Urubu	Others	Unidentified
# of Strikes	49	1	15
% of Total	75.38	1.54	23.08

5.6. Manaus

Capital of the Amazon State, with a population of 1.2 million, Manaus city is located in the middle of the Amazon rain forest, isolated from the other cities by a dense forest that only permits communication through the river or the air. It has two major airports (one is located in an Air Force Base).

Manaus, besides the Urubu, has a second bird species with significant participation on bird strikes. The local statistics shows that the “Podager nacunda” (type of Night Jar known in Brazil as Bacurau), not present on the bird census done there (table #4), appears in very high strike numbers.

Table 11. Birds involved in strikes in Manaus (08/1982 up to 02/2000) Source: CENIPA

	Urubu	Bacurau	Others	Unidentified
# of Strikes	54	15	3	32
% of Total	51.93	14.42	2.89	30.76

The Bacurau is a migratory bird that stays in the area from May to October. It is a night bird (the reason of not being counted on the census) that is found in enormous quantities on the runways’ surface, where it can find warmth (the jungle is colder at night) and food (insects from the ramp lights and worms escaping from the wet soil).

During take-off and landings, the Bacurau turns blind with aircraft lights, staying still until it feels the air vibration and the noise of the aircraft getting closer and closer. Because of this delayed reaction, the usual outcome are multiple strikes against the coming aircraft.

5.7. The Southern States’ Capitals

The southern States’ capitals are some of few Brazilian’s cities where the Urubu is not the worst problem. Capital of the most southern state, Porto Alegre shows bird strikes due to the Vanellus chilensis (a type of a Lapwing known in Portuguese as Quero-quero), that has its natural habitat in the large swamp area surrounding both airports.

Table 12. Birds involved in strikes in Porto Alegre (06/1982 up to 02/2000) Source: CENIPA

	Quero-quero	Owl	Others	Unidentified
# of Strikes	31	9	24	62
% of Total	24.60	7.14	19.05	49.21

The Quero-quero is found in enormous quantities near the runways where it can find security. During take-off and landings, the birds start flying when they notice the aircraft proximity. Because of this behavior, the usual outcome are strikes against the coming aircraft.

Similar situation is found in Florianopolis, capital of Santa Catarina State, also situated in the southern region of Brazil. The statistics for Florianopolis is showed in the table below.

Table 13. Birds involved in strikes in Florianopolis (10/1988 up to 07/1999) Source: CENIPA

	Quero-quero	Urubu	Others	Unidentified
# of Strikes	8	3	6	16
% of Total	24.24	9.10	18.18	48.48

Curitiba, capital of Paraná, state situated at the North of Santa Catarina, has the same picture. The statistics for Curitiba is showed in the table below.

Table 14. Birds involved in strikes in Curitiba (10/1988 up to 07/1999) Source: CENIPA

	Quero-quero	Urubu	Others	Unidentified
# of Strikes	19	2	7	15
% of Total	44.18	4.66	16.28	34.88

To deal with the Quero-quero in Porto Alegre, Florianopolis and Curitiba falconry trainers have been contacted.

6. Educational initiatives

According to the Brazilian's laws, the Command of Aeronautics is responsible for the air navigation safety. However, the solutions for most of the major causing factors of bird attraction to airports' vicinities go beyond its constitutional scope. It involves numerous federal, state, municipal and even private sectors, from local governments to wildlife agencies, from waste management to residents associations.

For that reason, the best way to deal with the problem of bird strikes is to get all segments from society involved in its solutions, and that is done by educational initiatives that must reach government authorities, private institutions and the general public.

6.1. Educational Initiatives for Government Authorities

6.1.1. Airport Safety Area - ASA (1995)

In 1995 it was established the National Bird Strike Committee (Comitê do Perigo Aviário) with representatives of many segments from the community.

From that group came the first tool to effectively reduce bird strikes close to airports. The Ministry of Environment signed, in October of the same year (1995), a Resolution (same as law) creating the “Área de Segurança Aeroportuária” – “A.S.A.” (Airport Safety Area), where it became prohibited to establish any activity that could cause bird attraction. It includes landfills, slaughterhouses, tanning industries, some agriculture plantations, fish industries, etc. These areas have two different sizes. For IFR operating airports it has a radius of 20km, and for VFR airports, 13km.

6.1.2. The New Fauna Protection Law

Brazil has one of the most severe law in the world for animal protection. Killing a savage bird in Brazil is a crime with no parole , except if the act is done for feeding necessity. It protects even the Urubu, despite of the risk that it offers for human lives boarding aircraft.

In February, 1998, a new fauna protection law was approved. There is a paragraph that allows the Commander of Aeronautics to directly request the local agency of the Ministry of Environment to execute adequate bird control measures, when their presence affects aviation safety.

For the future, it is intend to change the fauna protection legislation in order to allow the administration of the airport to kill all birds inside its area that affect operation’ safety.

6.1.3. The Salvador Program

As a result of the actions taken in Salvador (BA) in accordance with the Avian Hazard Control Program, especially the seminar held there in 1996, the state government contracted a consultant to present a program proposal to control factors contributing to bird presence close to the city airport.

Amid the proposals were suggestions to relocate the city dump and provides guidance for construction and management of a new landfill. Nowadays the proposals have been turned into reality. The biggest city open dump was desativated and covered and a landfill was stablished for the metropolis area, that comprehends others municipals.

The funds for the project were partially received from BIRD, International Bank for Reconstruction and Development.

6.1.4. Bird Strike Seminars

Because of the difficulties in fixing the identified problems, due to the large variety of government institutions and civilian organizations involved, starting in 1995, a series of one-day seminars have been held in the cities with higher bird strike rates. For each seminar are invited each industry and local government department directly or indirectly related to the bird attraction problem, local aviation companies, airport administration, pilots, universities and the media. These seminars' goals are to discuss the local problems with all sectors involved, to present them specific information about bird strike hazardous potential, to call society's attention for the risk, pushing government's authorities to do something about the problem.

During the seminars, are presented the risk of aeronautical accidents caused by bird strikes (most of the audience do not know it until the seminar), the report of the evaluation flights done a few weeks before, the environmental impact of the deficiencies detected, and the legal aspects of an accident caused by bird strike (the source of attraction can be prosecuted). The seminars end with a open discussion with the audience, when solutions are presented and many of the desired actions are finally assumed by the legally responsible parties.

The seminars have been very effective, with a variety of initiatives being performed in most of the cities, but probably the best result has been the increased awareness of all segments of the local society for the risks involved and their responsibilities in reducing them.

6.2. Educational Initiatives for the Private Institutions

6.2.1. Lawsuits

When applicable, based in specific government attributions, administrative actions have been taken by the government in order to reduce the risk caused by birds at or near the airports. The private companies (slaughterhouses, tanning industries) are notificated about the problems caused by their activities and request to modificate the production process, in order to eliminate the bird attractants.

When those actions are not effective, some legal proceedings have been adopted based on the ASA Resolution and others legislations. Lawsuits against some solid waste management companies responsible for open dumps and slaghterhouses have been sued by officials institutions.

6.2.2. Check-list

In 1995, were developed and distributed two check-lists for pilots (civilian and military) and airport administration. The first contains preventive actions that a pilot can perform to avoid, reduce or minimize the effects of bird strikes in flight. The second contains environmental control procedures and other effective measures to reduce the presence of birds at airports.

6.2.3. Brazilian Air Force

Most of the Air Force bird strike events happen during low level flights, with the majority of flights occuring in training areas close to the aircraft's original Base. The exceptions have the same characteristics of the civil aviation, occuring on approaches and departures to the same airports mentioned before (some Brazilian Air Force Bases share the same runway with civilian airports).

With that in mind, was implemented a simple system where the areas known to have large bird flocks are marked on a large map of each training area. These maps are posted in mission planning rooms and Air Information Service facilities. Also, discussing bird strikes risks and collision avoidance procedures by pilots during mission briefings is now a standard procedure.

These measures are not sufficient to effectively control the problem, but they have already shown some positive results, proving to be very cost-effective.

6.3. Educational Initiatives for the General Public

6.3.1. Educational Campaigns

In Teresina, capital of the Piauí State, a strong educational campaign was developed to keep the airport's surrounding area free of bird attractants. The area was cleaned and many outdoors were set on the roads next to the places once used to dispose garbage. The outdoors' message, clear and well illustrated, told why and how to avoid disposing garbage on those places.

6.3.2. Comics Book

After a seminar held in Maceió in 1996, local organizations developed a small comic book for children about the bird strike risk. The magazine explains, with very simple language and drawings, the risk of accidents caused by bird collisions, the causes of bird attraction, the effects of such accident and the actions that everyone can take in order to reduce the problem.

The comic magazines were targeted at low-income children of the outskirts areas that are close to the airport. They were distributed in schools and residences of the region.

6.3.3. Children performance

Another fortunate product of the Maceió seminar was the creation of a group of children that developed and performed a theatrical presentation about the matter. Presented in the schools of the city, the performance showed exactly the same topics -- risk, causes, effects and corrections to the problem -- educating children about basic sanitary aspects and motivating them to contribute to quality of life improvement.

6.3.4. Video tape

In 1997, a video tape about bird strikes for the aviation community was produced by CENIPA. In 45min, It presents the problem and some general solutions, inclusively the pilot and airport check-lists. The tape is distributed at no cost to airlines, aviation schools, airport administration and other aviation related organizations.

7. Conclusion

Worldwide innumerable material resources have been invested by the air transport industry as a whole to deal with the bird strike problem. Reducing bird strike accidents is a goal pursued for untiring aviation safety specialists of all nationalities.

In Brazil, the aviation industry has had a tremendous growth during the recent years, achieving traffic volumes and airport movements that compare to some first world countries. At the same time, due to sanitary defficiencies usually associated with the solid waste destination, there is an ever-present population of birds on and near some important airports.

The solutions for the risk of accidents caused by bird strikes have encompassed many institutions and required, among other measures, the implementation of educacional actions for the general public, private institutions and government authorities.

In this paper some of those educational initiatives were commented. Because of them Brazil’s sky today is safer than yesterday, although still less safer than it will be tomorrow.

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