

**AN AVIATION INSURER'S VIEW
OF THE SITUATION OF BIRD STRIKE PREVENTION IN GERMANY**

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Summary

Following an introduction regarding the background of the author, the paper contains brief details regarding German aviation law applicable to the bird strike problem and possible consequences arising from civil law. The next chapter deals with the Lufthansa reporting and statistical system to comply with legal requirements regarding bird strikes. Developments of the bird strike situation in Germany - also taking into account the cost of damages - are explained by extracts from statistics. Description of changes that were achieved by a major German airport by changing its bird strike prevention activities. Conclusions and recommendations based on our experience.

(This paper is the work of an individual author and may not reflect the full and final views of Delvag Luftfahrtversicherungs AG)

Key Words: Statistics, Regulations, Civil Aviation, Risk Assessment, Country, Liability, Insurance

**An Aviation Insurer's View
of the Situation of Bird Strike Prevention in Germany**

1. Background Information regarding Delvåg and Lufthansa

Delvåg is an insurance company owned by Lufthansa German Airlines. Due to this special situation we are not only acting as an insurer of the different airlines belonging to the Lufthansa Group - like Condor, Lufthansa Cargo, Lufthansa CityLine - but are, when necessary, also acting as the insurance department of Lufthansa.

Due to this role we not only focus on major damages - hull deductibles start at US \$ 500.000 for a Boeing 737-200 and go up to US \$ 1.000.000 for large aircraft like the Boeing 747.

We also must keep an eye on smaller incidents either as hull-deductible insurer or as the insurance department for those damages which are still too small to be covered by hull deductible insurance.

The role of the insurance department also implies the need to watch the development of costs that are not covered by any insurance (cost of rerouting or schedule change following occurrence of damage, cost for passenger accommodation, etc.)

The watchdog function is not limited to cost monitoring. It also includes surveillance of the conditions which lead to the noticed facts.

We therefore have installed a detailed reporting system and gather facts concerning changes occurring at and in the vicinity of airports. We are also keeping an eye on legal developments.

Since Lufthansa's home base is located in Germany and aircraft of Lufthansa and its subsidiaries perform more than fifty percent of the commercial aircraft movements in this country, this article focuses on the situation in Germany. We think that our knowledge regarding the legal system in Germany and developments which can be proven by our statistical system might be of interest to others.

2. Bird Strike Prevention and the Law

2.1. International Law

International law which results from the ICAO convention, a multilateral contract signed by nearly all countries, stipulates either to follow "the standards and recommended practices" or to announce any deviations resulting from national law.

Regarding our topic here, the relevant information is laid down in Annex 14, paragraph 9.5., in the "Airport Services Manual" (Doc 9137) Part 3, and in the "Manual on the ICAO Bird Strike Information System (IBIS)" (Doc 9332).

Although these documents contain important information and are also applicable to the situation in Germany, because Germany acceded to the convention, I do not intend to comment on these as I think most of us know these facts and it would only waste our time to recapitulate them again.

BIRD STRIKE

2.2. German

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2.2. German Law

2.2.1. The law regarding aviation

According to article 73 paragraph 6 of the German Basic Law - the so called Grundgesetz (GG) - aviation is governed by federal law.

The individual states have no legislative authority of their own in this respect unless they were empowered by federal act pursuant to article 71 GG.

Up to now this has not been done.

According to article 87 d of the Basic Law aviation administration is performed as federal administration. It is possible to transfer administrative tasks to the states by using the construction of federal-mandatory-administration.

The basis for German aviation law is the aviation act - Luftverkehrsgesetz (LuftVG). It contains the most important regulations and powers for the Federal Minister of Transport (Bundesminister für Verkehr) to issue orders, after having obtained the consent of the Bundsrat (the second chamber of parliament where delegates are representatives of the different German states).

Table 1 shows the structure of the different acts and regulations in this field

Table 1: Sketch regarding system of German Aviation Law



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BSCE 23
London, 13-17 May

2.2.2. German law concerning airports

Airports are one of the basic elements of a modern traffic infrastructure. Due to the importance the legal system in Germany has set up regulations regarding planning requirements, size and sites where an airport is permitted to be erected, as well as security aspects in view of location and operation of an airport. The basic regulations are laid down in §§ 6 to 19 of the Luftverkehrsgesetz (LuftVG).

For safety reasons § 25 LuftVG stipulates that any take-off or landing outside an approved airport - except in emergencies - is only allowed in case of consent of the authority of the ground and the appropriate aviation authority has granted permission. Any landings outside the designated areas of an airport or outside the regular operating times of the airport are only allowed upon consent of the airport operator and the authorities gave a permit. In fact these regulations force nearly everyone to make use of an appropriate airport.

On the other hand, the law (§ 29 LuftVG) defines a clear responsibility of the authorities for safety of aviation. Authorities are allowed to transfer these duties to third parties.

The Luftverkehrszulassungsordnung (LuftVZO) defines in §§ 40 to 44 the procedures and requirements that are necessary to obtain permission to operate an airport. Operation of an airport requires prior consent of the authority which has to carry out a licensing check process.

LuftVZO defines in §§ 45 and 46 the duties of the airport operator. The most important obligation is to keep the airport in safe condition and to report events that have considerable influence on airport operations without undue delay to the authorities. To make it clear to all responsible people in the German aviation industry, the German Minister of Transport issued a guideline regarding procedures in respect of the bird strike hazard.

This guideline - issued on 13 February 1974 - is binding for airport operators as well as for aviation authorities. The original wording and a translation are attached.

According § 47 LuftVZO, the authority has the right to check the conditions of the airport and - in case the requirements for an operation permit are not fulfilled, and not only temporarily - theoretically has the right to revoke the operation permit (§ 48 LuftVZO). More practicable are the contents of § 108, paragraph 7 a) of the LuftVZO. It makes clear that non-compliance with § 45 LuftVZO may be fined pursuant to § 58 LuftVG.

The most powerful tools to force people to comply with the rules are laid down in §§ 53 and 59 of the LuftVG, where different penalties are listed in respect of several offences.

2.2.3. The law concerning airlines and aircraft operators

The regulations applicable to aircraft operations cover a wide area as the legal system deals with nearly every possible situation and sets up respective rules.

As it seems impossible to cover all aspects in this article I would like to concentrate on the main aspects regarding bird strikes.

The LuftVO - the law containing „traffic rules of aviation“ - stipulates in § 2.1 that any aircraft must be operated by a pilot.
The pilot has to ensure compliance with any rule of the relevant orders, which is laid down in § 3.2 LuftVO.

Due to this the pilot is responsible for reporting any disturbance or abnormality that occurs during operation of the aircraft (§ 5.1 LuftVO). The reporting of a bird strike is based on this rule.

To enforce compliance of this reporting obligation, § 43, 10 LuftVO stipulates that non-compliance with this obligation shall be subject to sanctions pursuant to § 58 paragraph 1 no.10 of the LuftVG.

2.2.4. The law of torts

Any individual who suffers a loss or damages looks for third parties to either share the monetary damage or providing compensation for it.
The same reaction pattern applies to airlines or aviation insurers.

When a bird strike occurs and results in damage to an aircraft, we are talking about a case of hull damage. To avoid dealing with minor claims the insurance industry has set up a system of deductibles. Thus a lot of damages are not transferred to the insurers but are kept in the books of the aircraft owner.

The German Civil Code (Bürgerliches Gesetzbuch, BGB) contains in § 823 rules which cause a tort-feasor to indemnify a third party for damage suffered by the tort-feasor's negligent or wilful wrongdoing.

In general - pursuant to § 823.1 BGB - the claimant has to prove the cause of damage, the responsibility of the party he is claiming from, and that the damages he is claiming are related to or were solely caused by the alleged wrongdoing.

In respect of § 823.2 BGB the claimant has to prove the violation of a so called "obligation to protect" and that his damages were caused by circumstances which, had the protectionlaw been obeyed, would not have happened.
The proven violation of a protectionlaw changes - contrary to the general rules in German jurisdiction - the burden of proof to the advantage of the claimant (prima-facie evidence). To avoid being liable for claimed damages, the accused party has to prove that the violation of the protectionlaw had no influence on the occurrence of the damage.

The contents of §§ 29, 45 and 46 LuftVZO and the "Guideline Concerning Bird Strike Prevention" of the German Minister of Transport must be considered to be "protectionlaw" in the meaning of § 823.2 BGB.

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BSCE 23/ WP 6
London, 13-17 May 1996

3. Bird strike statistics

3.1. Reporting and statistical system in Germany

Due to the requirement of § 5 LuftVO, written reports regarding bird strike incidents have to be submitted to the Federal Aviation Office (Luftfahrtbundesamt - abbreviation = LBA).

Based on these reports and on traffic reports stemming from the airports, the LBA is able to prepare bird strike statistics. As the different airlines belonging to the Lufthansa Group represent the majority of reporting companies in Germany (in respect of incidents reported) Lufthansa and the LBA have agreed on some changes - as is permitted by § 5 paragraph 1, last sentence of the LuftVO - in the reporting system.

Instead of directly submitting the individual reports prepared by pilots to the LBA, Lufthansa set up an organisation which collects the data and submits the collected data by copy of a data file to the LBA.

LBA adds data concerning bird strikes received from other airlines or private aircraft operators to the data received from Lufthansa and by doing this receives the complete statistical information concerning bird strikes occurring in Germany.

Due to the fact that the bird strike statistics of the Lufthansa Group are based on more than fifty percent of the total aircraft movements at the major German airports, the findings regarding the rate of bird strikes and the rate of bird strike related damages seem to be realistic for the situation at these airports. To give feedback to the airport personnel in charge of bird strike prevention regarding the effective value of their activities, our statistics are not only kept a company secret or given to government authorities but are also distributed to the airports and the German Bird Strike Prevention Committee.

Reports to international database systems (like IBIS) concerning the bird strike situation in Germany are released by the LBA.

3.2. Lufthansa's reporting and statistical system

During the last years the Lufthansa statistical system has been subject to continuous improvement. The present situation is depicted in Table 2.

The old system was designed to comply with the law, so the reporting side done by flight crews was well developed but cost documentation took only those cases into account where the amount of hull damage exceeded the amount of DEM 5.000,00. Under the new system all damages are incorporated into the statistics as well.

Since in the past bird remains only occasionally were secured and forwarded for analysis, the German Committee for Bird Strike Prevention asked for improvement of the situation in order to obtain more detailed knowledge of the bird species causing the damages.

The technical staff of Lufthansa was informed about this problem and the importance of getting analysis results and as a consequence the number of secured bird remains is increasing. Details regarding this development are shown on Table 3.

Table 2:

Bird strike reporting system of Lufthansa

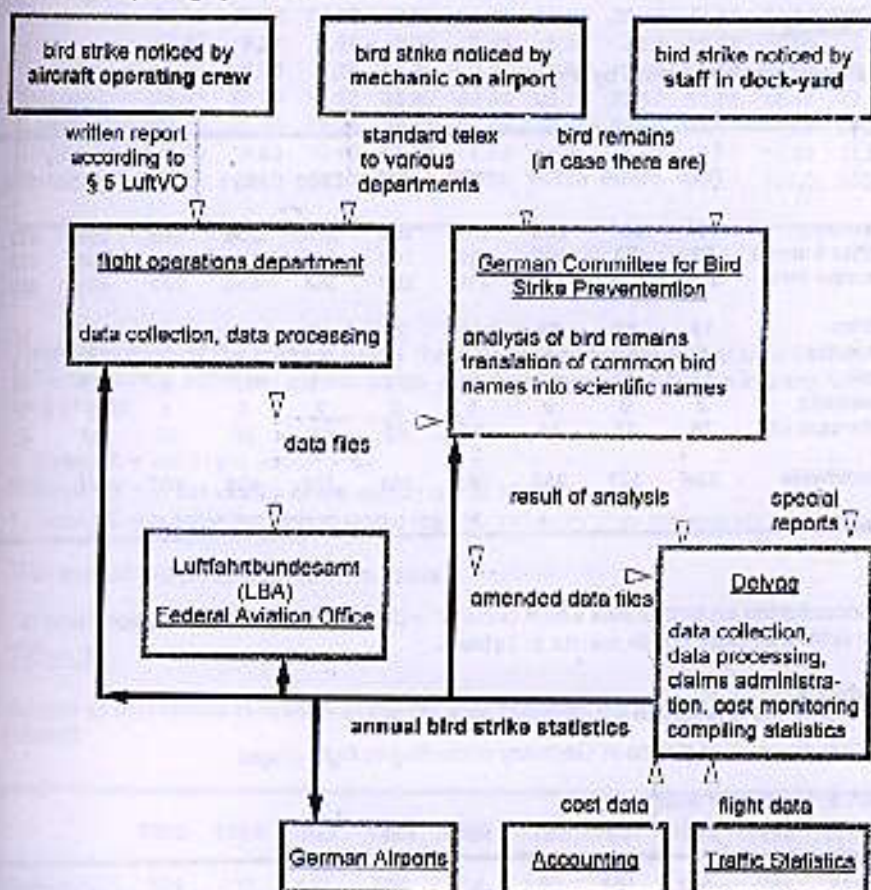


Table 3:

Number of analysis on bird remains found in or at aircraft of Lufthansa

year	1993 and years before	1994	1995
number of analysis on bird remains	10 to 20 per year	33	75

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London, 13-17 May

3.3. Extracts from our bird strike statistics

Our statistics are based on bird strikes which affected Lufthansa aircraft. The breakdown into regions where the incidents occurred is given in the following Table 4.

Table 4:

Distribution of bird strikes by region

	1985	1986	1987	1988	1989	1990	1991	1992	1993
Germany	185	205	239	207	190	274	306	253	356
Other Europe	81	73	100	112	108	110	124	124	136
Europe total	266	278	339	319	298	384	430	377	491
Africa	13	12	22	14	23	16	13	9	23
America	5	13	5	10	13	12	3	11	6
Asia	18	12	17	10	16	18	13	9	16
Australia	2	0	0	1	0	2	0	1	2
Intercont (tff)	38	37	44	35	52	46	29	30	47
Worldwide	324	323	385	368	361	432	459	407	540

Concentrating on bird strikes which occurred within Germany the sorting according to the criteria of flight phase results in Table 5.

Table 5:

Distribution of bird strikes in Germany according to flight phase

Part a: number of events

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Rolling	0	0	2	0	2	0	1	0	0	1
Start	63	56	83	43	60	76	81	106	98	102
Climb	14	19	16	13	17	24	24	46	0	13
En route	2	2	3	4	10	0	0	0	68	66
Descent	47	41	57	70	43	69	83	30	54	74
Landing	41	57	53	61	63	74	69	44	101	118
Unknown	18	30	26	16	8	31	48	27	45	49
Total	186	205	239	207	190	274	306	263	356	422

Part b: shares of flight phases in percent of total number of events

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Rolling	0,00	0,00	0,84	0,00	1,05	0,00	0,33	0,00	0,00	0,24
Start	34,05	27,32	34,73	20,77	31,58	27,74	26,47	41,80	27,53	24,17
Climb	7,57	9,27	6,09	6,28	8,95	8,76	7,84	18,18	0,00	3,08
En route	1,08	0,98	1,26	1,93	5,26	0,00	0,00	0,00	16,29	15,40
Descent	25,41	20,00	23,85	33,82	22,63	25,18	27,12	11,86	15,17	17,64
Landing	22,16	27,80	22,18	29,47	27,89	27,01	22,55	17,39	28,37	27,98
Unknown	9,73	14,83	10,46	7,73	2,53	11,31	15,69	10,87	12,04	11,61
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Taking into account the areas in which the different entities are responsible for bird strike prevention activities, we can divide the above mentioned figures into the following groups:

- Group A = within the airport area
- Group B = in the vicinity of the airport (up to 12 km)
- Group C = outside the airport (more than 12 km away from the airport) or unknown

The result of this sorting is shown in Table 6.

Table 6:

Number of bird strikes in relation to the distance between the airport and the place of incident

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Group A	104	113	138	104	115	150	161	150	199	221
Group B	61	60	73	83	60	93	107	76	54	87
Group C	20	32	28	20	15	31	48	27	103	114
Total	186	205	239	207	190	274	306	253	356	422

The following Chart 1 illustrates the change in the individual shares of the groups.

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3.3. Extracts from our bird strike statistics

Our statistics are based on bird strikes which affected Lufthansa aircraft. The breakdown into regions where the incidents occurred is given in the following Table 4.

Table 4:

Distribution of bird strikes by region

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Germany	185	205	239	207	190	274	306	253	356	422
Other Europe	81	73	100	112	108	110	124	124	135	178
Europe total	266	278	339	319	298	384	430	377	491	600
Africa	13	12	22	14	23	16	13	9	23	17
America	5	13	6	10	13	12	3	11	6	11
Asia	18	12	17	10	16	18	13	9	16	19
Australia	2	0	0	1	0	2	0	1	2	0
Intercont (tot)	38	37	44	35	52	48	29	30	47	47
Worldwide	324	323	385	368	351	432	459	407	540	655

Concentrating on bird strikes which occurred within Germany the sorting according to the criteria of flight phase results in Table 5.

Table 5:

Distribution of bird strikes in Germany according to flight phase

Part 3: number of events

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Rolling	0	0	2	0	2	0	1	0	0	1
Start	63	56	83	43	60	76	81	106	98	102
Climb	14	19	18	13	17	24	24	48	0	13
En route	2	2	3	4	10	0	0	0	58	65
Descent	47	41	57	70	43	69	83	30	54	74
Landing	41	57	53	61	53	74	89	44	101	118
Unknown	18	30	25	16	6	31	48	27	45	49
Total	185	205	239	207	190	274	306	253	356	422

Part b. shares of flight phases in percent of total number of events

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Rolling	0,00	0,00	0,84	0,00	1,05	0,00	0,33	0,00	0,00	0,24
Start	34,05	27,32	34,73	20,77	31,58	27,74	29,47	41,90	27,63	24,17
Climb	7,57	9,27	6,69	6,28	8,95	8,76	7,04	18,18	0,00	3,08
En route	1,00	0,98	1,26	1,93	5,26	0,00	0,00	0,00	16,29	15,40
Descent	25,41	20,00	23,86	33,62	22,63	25,18	27,12	11,86	15,17	17,54
Landing	22,16	27,80	22,18	29,47	27,89	27,01	22,65	17,39	28,37	27,98
Unknown	9,73	14,83	10,46	7,73	2,63	11,31	15,69	10,67	12,64	11,61
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Taking into account the areas in which the different entities are responsible for bird strike prevention activities, we can divide the above mentioned figures into the following groups:

- Group A = within the airport area
- Group B = in the vicinity of the airport (up to 12 km)
- Group C = outside the airport (more than 12 km away from the airport) or unknown

The result of this sorting is shown in Table 6.

Table 6:

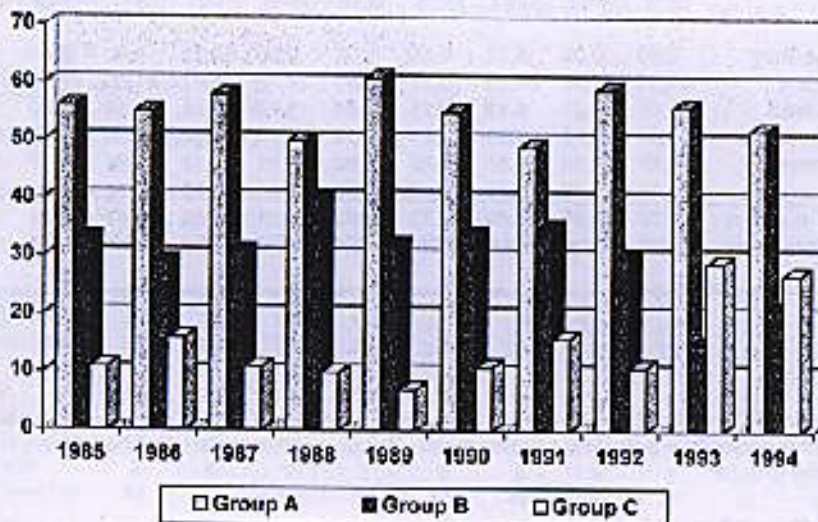
Number of bird strikes in relation to the distance between the airport and the place of incident

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Group A	104	113	138	104	115	150	161	150	199	221
Group B	61	60	73	83	60	93	107	76	54	87
Group C	20	32	28	20	15	31	48	27	103	114
Total	185	205	239	207	190	274	306	253	356	422

The following Chart 1 illustrates the change in the individual shares of the groups.

Chart 1:

Share of distance groups in total bird strike events in Germany



Correlating the observed number of bird strike events with the total number of flight movements performed we get the more significant bird strike rate. The same can be done with the number of events resulting in damages to get the bird strike damage rate. These rates are based on 10,000 movements.

Development of the bird strike rate and the bird strike damage rate are shown in the following Table 7.

Table 7:

Bird strike rates and bird strike damage rates 1985 to 1994

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Bird Strikes	185	205	239	207	190	274	306	253	356	422
Damages	25	39	55	62	65	49	74	113	183	162
Bird strike rate	6,12	6,61	6,08	4,65	4,11	6,08	4,60	4,32	5,40	7,11
Damage rate	0,73	1,07	1,40	1,17	1,19	1,09	1,11	1,93	2,76	2,73

As the Lufthansa statistics does not only provide details regarding development of bird strike events and the respective rates I would like to show some details regarding cost of bird strikes.

The following Table 8 contains information regarding costs of hull damages which resulted from bird strikes.

Table 8:

Hull damage cost of bird strikes in Germany

	Total of Cost	average cost per event	average cost per 10,000 movements
1990	867.908	17.712	19.259
1991	4.944.410	66.816	74.328
1992	2.481.074	21.956	42.365
1993	19.561.972	100.096	295.727
1994	2.525.561	15.590	42.552

amounts are given in DEM

As some events were very expensive and these might have an inadequate influence on the statistics we eliminated the most expensive events of the year 1991 and 1993 and received Table 9.

Table 9:

Hull damage cost of bird strikes in Germany (without extrema)

	Total of Cost	average cost per event	average cost per 10,000 movements
1990	867.908	17.712	19.259
1991	3.421.880	46.241	51.440
1992	2.481.074	21.956	42.365
1993	2.852.658	15.588	43.271
1994	2.525.561	15.590	42.552

amounts are given in DEM

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To get better knowledge in respect of the structure of the damages it seems to be helpful to assign the different events to groups using the individual amount of damage as the sorting criteria.

The result of this transaction can be seen in Tables 10 and 11 and Charts 2 and 3 on the following page.

Table 10:

Number of events grouping by amount of individual cost of damage

amounts are in DEM	1990	1991	1992	1993	1994
less than 10.000,00	41	49	50	155	130
10.000 to 49.999,99	4	12	13	8	12
50.000,00 to 499.999,99	4	11	9	19	10
500.000,00 to 999.999,99	0	0	1	0	1
1.000.000,00 or more	0	2	0	1	0

Chart 2:

Share of groups in number of events per year

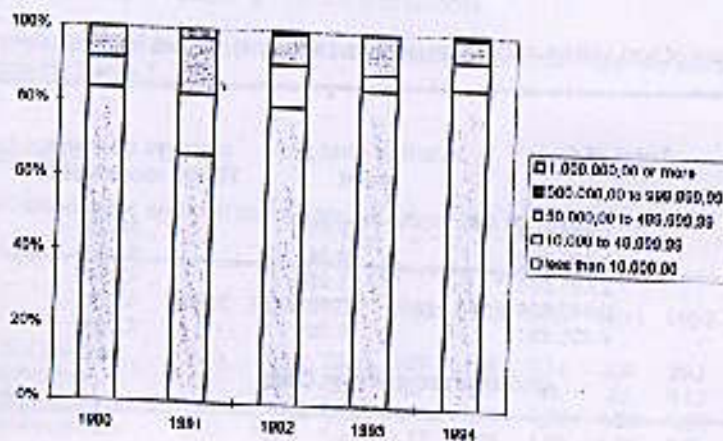


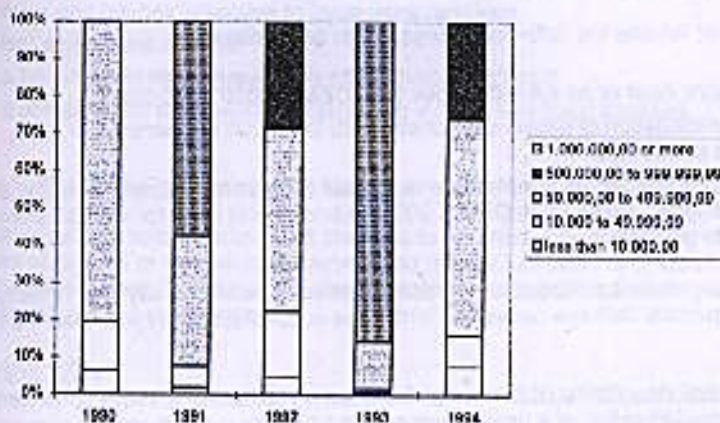
Table 11:

Total of costs of defined group of events

amounts are in DEM	1990	1991	1992	1993	1994
less than 10.000,00	56.000	97.407	123.862	168.650	195.570
10.000 to 49.999,99	114.600	288.600	435.870	193.975	214.000
50.000,00 to 499.999,99	697.348	1.734.638	1.216.812	2.489.633	1.466.250
500.000,00 to 999.999,99	0	0	704.510	0	650.441
1.000.000,00 or more	0	2.823.765	0	10.709.314	0

Chart 3:

Share of defined groups in damage costs per year



In addition to the costs of hull damages the costs of consequential damage have also an important influence on the cost situation of airlines. Although it is possible to buy insurance protection for these costs I do not know any airline having done so. The reason for this is that such contract is not a standard and therefore expensive.

As airlines have (in general) no coverage for such cost and are only in exceptional cases able to take recourse against third parties for damages suffered by bird strikes, no permanent data collection is done in respect of such costs.

Consequential damage depends on several factors:

- extent of damage to the aircraft
- distance between place of occurrence and home base / major base of the airline
- size of the fleet of the airline
- kind of business (cargo or passenger transportation)

In case the damage to the aircraft is only a minor one, any repair may be deferred to regular stop at the repair facilities of the airline.

Severe damage that requires immediate repair of the aircraft to enable safe operation will cause problems to organise repair and have severe influence on the network operation of the airline.

Such problems are for example: time and transportation capacity needed to get the repair team and spare parts to outside airports, to cover flights to be performed by the defective aircraft by use of other (suitable) aircraft, availability of other aircraft, crew and aircraft rotation schedules, passenger accommodation, protection of cargo.

Regarding cost volume the following figures are to be mentioned:

- cost per block-hour of an aircraft ranges from DEM 10,000 to 25,000
- hotel accommodation of passengers costs up to DEM 200 per person/por night, sometimes even more
- spare engines needed as a replacement, at least during time needed for repair of the damaged engine, come up to DEM 8,000,000 and capital used for such investment is subject to interest

Although no permanent statistics are prepared it seems realistic to say that in many cases consequential damage caused by bird strike is considerably higher than the hull damage.

After this general description of the bird strike situation in Germany I want to focus the development and situation of a major German airport which, according my judgement, may be a good example to measure effectiveness of so called environment management recommended by the German Bird Strike Committee.

3.4. Changes in bird strike prevention done by a major German airport

As I do not intend to blame this particular airport for activities or decisions that are already part of the history I ask for your understanding that I do not name this airport.

This airport had been chosen as in the past the situation regarding bird strike prevention has not been as effective as desired by airlines or their insurers but now the situation has changed - which can be verified by the following data.

3.4.1. The History

This airport's management knew that it had some problems in respect of bird strikes. The rate per 10.000 movements was not within the line with that of other German airports, there was an area within the airport used for agriculture by outside farmers, the function of the bird strike prevention officer was said to be one of the tasks of the CEO of that airport.

Long and not always friendly discussions between airport management, German Committee for Bird Strike Prevention, airport insurers and Lufthansa caused the airport management to change its attitude towards the handling of its bird strike problem.

3.4.2. The Changes on the airport

The airport management asked (and paid) for an expertise regarding the environmental situation at and around the airport and also for advice regarding changes to be done. The expertise and adherence to the respective advice had, among others, the following results:

- agricultural area changed to long-grass-area
- trees and bushes attractive to birds were removed
- wet areas were drained
- a full-time bird strike prevention officer had been hired
- a constant bird monitoring and reporting system had been installed

3.4.3. The Changes to be seen in statistics

The following Table 12 shows the changes to be noticed by comparing the development of figures of this particular airport and those of all airports of Germany. To eliminate statistical clutter we also show the average rate of three years, the shown year and the two years before.

Table 12:

	annual bird strike rate		3 years average bird strike rate		annual bird strike damage rate		annual bird strike rate index (base = 1985)	
	Germany	X	Germany	X	Germany	X	Germany	X
1985	6,12	9,51	6,82	10,71	0,73	1,19	100,00	100,00
1986	5,61	6,81	6,29	8,74	1,07	0,94	91,67	71,61
1987	6,08	6,49	5,94	7,00	1,40	1,47	99,35	88,24
1988	4,85	7,61	5,45	6,97	1,17	1,37	75,98	80,02
1989	4,11	5,82	4,95	6,57	1,19	1,36	67,16	69,10
1990	6,08	5,83	4,96	6,35	1,09	1,70	99,35	61,30
1991	4,60	4,79	4,93	5,41	1,11	1,54	75,16	50,37
1992	4,32	4,67	5,00	5,10	1,93	0,90	70,59	49,11
1993	5,40	5,34	4,77	4,93	2,76	2,67	88,24	55,15
1994	7,11	6,37	6,61	5,46	2,73	2,07	116,18	65,98

4. Conclusions and Recommendations

4.1. Conclusions

As explained before the monetary damage resulting from bird strikes is, especially in times of hard competition between airlines and decreasing profit margins, a permanent hazard to profitability of an airline.

This is due to high deductibles in respect of hull damages, which leave a large piece of the cake at the airlines, and the consequential damage, for which most of the airlines have no insurance coverage at all.

The aviation insurers are not often faced with claims resulting from bird strike events. But, as also shown before, bird strikes can have an enormous loss potential.

Therefore airlines and their insurers are required all and any prevention activity that is possible and reasonable.

The methods used by German airports have proven to be effective in reducing the bird strike risk. Especially strict adherence to the advice given by the German Committee for Prevention of Bird Strike in Aviation seems to have best results as shown by deviating figures for the average of all German airports and the figure of one single airport which followed strictly such recommendations.

The increasing bird strike rate of the last years could have several reasons. This trend must be changed and investigations to explain the reason to enable corrective actions have been initiated.

The airport operators on the other hand have a variety of opportunities to reduce the risk of occurrence of a bird strike. Such activities will cost their money and increase their cost situation and consequently the fees to be paid by airlines using the airport.

In an open market airlines sometimes have the opportunity to choose between airports which are not too far away from each other.

Although landing fees are not the only factor to decide to operate from airport A or the neighbour airport B, fees can be the "the last drop" to fill the barrel.

Knowing about this airport managers might, contrary to their common sense which says "only a safe airport is a good airport", feel to be forced to save cost at the wrong spot in aiming to improve the chance of their airport to get additional traffic (and money).

To enable airport management to reach a justified decision regarding activities in respect of bird strike prevention it seems to be necessary to let them have all the information available in respect of bird strike situation at their airport.

To be able to find a fair compromise between the - sometimes - deviating interests of the parties in this area of business it seems to be necessary, or at least helpful, to have clear rules given by legislation.

4.2. Recommendations

Airlines and airports should support each other to reduce the hazard of bird strike events to a minimum.

Airlines should collect and submit data regarding bird strike events of their aircraft and the resulting costs to the airports to give them a feed-back regarding the effectiveness of their prevention activities.

Prevention activities should be checked regularly by use of statistical data.

Experts of the different countries should exchange their knowledge of the legal aspects as this might help to convince all the different parties to work at those standards necessary to perform aviation at best possible safety standards.

Keeping in mind the words I heard from John Thorpe some time ago:

"If You think that loss prevention does not pay off, try a loss !"

I want to add: **"Don't even think about such trial !"**

The original text of the "Guideline" is given on the following pages. The translation had been done by the author and therefore, the only legally binding text is the German one.

BIRD STRIKE COMMITTEE EUROPE

BSCE 23/ WP 9
London, 13-17 May 1996

Richtlinien zur Verhütung von Vogelschlägen im Luftverkehr vom 13. Februar 1974

Guidelines for the prevention of bird strikes in aviation

I. Vorbemerkungen

1. Die Richtlinien sind auf die Erfordernisse für Verkehrsflughäfen, die dem Fluglinienverkehr dienen, abgestellt. Für Maßnahmen bei anderen Flugplätzen können sie zweck- und sinnen-sprechend angewendet werden.
2. Die Richtlinien erfassen nicht flugsicherungstechnische Maßnahmen wie die Radarbeobachtung von Vogelbewegungen und die diesbezügliche Warnung an die Flugzeugführer.
3. Die Richtlinien beinhalten zusätzlich zu dem Vogelschlagproblem auch Maßnahmen hinsichtlich anderer den Flugbetrieb auf Flugplätzen gefährdende Tiere.

II. Allgemeines

Die Abwehr von Gefahren für die Sicherheit des Luftverkehrs sowie für die öffentliche Sicherheit oder Ordnung durch die Luftfahrt gem. § 29 LuftVG und die sichere und ordnungsgemäße Durchführung des Flughafenbetriebes gemäß § 45 Abs. 1 LuftVZO müssen auch auf die Verhütung von Schäden im Luftverkehr durch Vogelschläge (Zusammenstöße von Luftfahrzeugen mit Vögeln) ausgerichtet sein. Zu diesem Zweck sind im Rahmen der jeweils gegebenen rechtlichen und sachlichen Möglichkeiten die in diesen Richtlinien genannten Maßnahmen durchzuführen. Hierbei sind auch Bundes- und Landesgesetze über Naturschutz, Tierschutz, Jagdrecht und Abfallbeseitigung in Betracht zu ziehen.

III. Biotopepflichten

Der Flughafenunternehmer soll ein mit Beteiligung der zuständigen Naturschutzbehörde und des Deutschen Ausschusses

I. Preliminary Remarks

1. These guidelines are tailored to the requirements of airports that are serving scheduled air traffic. For measures at other airfields they may be applied accordingly.
2. The guidelines do not cover air traffic control measures like monitoring of bird movements by radar and corresponding warnings to pilots.
3. In addition to the bird strike problem the guidelines contain also measures in respect of other animals endangering air traffic operations on airfields.

II. General

The protection measures against hazards for safety of aviation as well as for public safety and order pursuant to § 29 LuftVG and safe and orderly operation of the airport pursuant to § 45 para 1 LuftVZO must also be directed towards prevention of damages in aviation caused by bird strike (collision between aircrafts and birds). To achieve this goal the measures named in this guideline have to be applied within the legal and factual capability. The federal law and the law of the individual states concerning environment protection, animal protection, game-law and law concerning disposal of waste have to be taken into consideration in this respect.

III. Biotope expertise

The airport operator shall obtain an expertise concerning the ecological situation (biotope expertise) regarding the airport

zur Verhütung von Vogelschlägen im Luftverkehr (DAVVL) zu erstellendes Gutachten über die ökologischen Verhältnisse (Biologgutachten) des Flughafengeländes und seiner für Maßnahmen nach diesen Richtlinien in Betracht kommenden Umgebung einholen. Das Gutachten soll Vorschläge für die nach den örtlichen Gegebenheiten zweckmäßig erscheinenden Maßnahmen beinhalten. Es ist der Flughafengenehmigungsbehörde zur Kenntnis zu bringen.

IV. Maßnahmen auf dem Flughafengelände

1. Das Flughafengelände soll nicht ackerbaulich, gartenbaulich oder weidewirtschaftlich genutzt werden. Auf ihm sollen kein Nutzvieh (z.B. Rinder, Schafe, Schweine, Federvieh u.ä.) sowie keine Tauben gehalten werden. Unkontrollierter Bewuchs soll auf dem Flughafengelände nicht bestehen. Erforderlichenfalls sind Maßnahmen zur Vogelvergrämung und zur Niederhaltung des Besatzes von Tieren, die den Vögeln als Nahrung dienen, zu treffen.
2. Auf dem Flughafengelände sollen keine Gehölze vorhanden sein, die von Vögeln bevorzugte Früchte tragen. Gegebenenfalls ist durch pflegerische oder planerische Maßnahmen darauf hinzuwirken, daß Wind-, Schnee- und Schallschutzpflanzungen, Baumgruppen, einzeln stehende Bäume sowie Neupflanzungen wenig anziehend für Vögel sind.
3. Die Flughafenumzäunung soll gegen Haarwild dicht sein. Gegen die den Flugbetrieb gefährdenden Tiere sind ggf. besondere Maßnahmen erforderlich (z.B. Abschluß von Wild, Besättigung von Nistplätzen, in Sonderfällen Fang und Ausleitung von Vögeln). Um den Vogel- und übrigen Tierbestand wirksam unter Kontrolle halten zu können, sollte der Flughafenunter-

area and the area in the vicinity of the airport, which may be subject to measures according these guidelines. The expertise shall be prepared with the co-operation of the relevant authority for conservation and nature and the German Bird Strike Prevention Committee. The expertise must contain proposals for measures best adapted to the local situation. The expertise has to be given to the knowledge of the airport licensing authority.

IV. Measures on the airport area

1. The area of the airport shall not be used for agricultural, horticultural or pasture use. No domestic animals (for example cattle, sheep, pigs, poultry or similar) nor pigeons shall be kept there. Uncontrolled growth shall not exist on the airport. If necessary measures to scare birds and to diminish animals serving as food for birds have to be performed.
2. On the airport area there shall not be any bushes carrying fruit preferred by birds. If necessary cultivating or planning activities have to strive for less attractivity of wind, snow or noise protection plantations, single trees and new plantations.
3. The fence around the airport must be safe in respect of furred game. Against animals endangering the aviation operations special measures are necessary (for example shooting of games, removal of breeding locations, in special cases catch and evacuation of birds). To keep an effective control on number of birds and other animals the airport operator

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nehmer grundsätzlich mit den zuständigen Jagdbehörden eine besondere, den Sicherheitsanforderungen der Luftfahrt Rechnung tragende Regelung über die Jagdausübung treffen.

4. Auf dem Flughafen sollen keine Pflanze, die Vögel und andere Tiere anziehen, wie Müll- oder Komposthaufen o.ä., vorhanden sein. Naß- und Sumpfflächen sollen beseitigt werden. Offene Gewässer, wie Gräben und Teiche, sollen möglichst vermieden werden, an vorhandenen im Rahmen der gegebenen Möglichkeiten vogelvergrämende Maßnahmen vorgenommen werden.

Nistplätze an Gebäuden sollen entfernt werden. Neue Gebäude sollen so geplant werden, daß sie Vögeln möglichst wenig Nist- und Aufsitzmöglichkeiten bieten. Soweit am Rand von Betriebsflächen, insbesondere der Start- und Landebahnen, Wasserablaufgräben vorgesehen werden, soll gegen das Aufkriechen von Regenwürmern und Schnecken den durchgehenden, parallel zum Rand verlaufenden Schlitzrinnen der Vorzug gegeben werden. Im Nahbereich der Start- und Landebahnen und der Rollbahnen sollen Einrichtungen der Flugsicherung, des Flugwetterdienstes sowie der Flughafenbeleuchtung und Rollbeschilderung, soweit erforderlich und möglich, mit Vorrichtungen versehen sein, die das Aufsitzen von Vögeln verhindern.

V. Maßnahmen in der Umgebung von Flughäfen

1. Bei Maßnahmen in der Umgebung von Flughäfen ist ggf. die Unterstützung von Stellen außerhalb der Luftfahrtverwaltung zu suchen, die hierfür aufgrund ihrer Befugnisse und Zuständigkeiten in Betracht kommen.
2. Auf landwirtschaftlichem Gelände unterhalb der inneren Hindernisbegrenzung

should in principle agree with the hunting authority in charge on rules regarding hunting which is adjusted to the security requirements of aviation.

4. On the airport there shall not be areas like garbage dumps, compost places or similar which are attractive to birds or other animals. Wet areas or bog have to be removed. Open waters like trenches or ponds should be avoided if possible, at existing possible bird scaring measures be taken.

Nesting sites on buildings should be removed. New buildings should be designed that they offer birds less possible breeding and resting opportunities. In case gutters are intended at the end of operation areas, especially at runways, slit-gutters parallel to the edges should be preferred to prevent earth-worms and snails from crawling.

In the vicinity of runways and taxiways the installations of air traffic control, meteorological services, runway lighting and taxi signs should, if necessary and possible, be equipped with appliances avoiding birds to roost.

V. Measures in the vicinity of airports

1. For measures in the vicinity of an airport the support of authorities outside the aviation administration must be requested, if these have to be considered competent or their powers are affected.
2. On agricultural ground within the inner obstruction prevention area it should

zungsfläche soll nach Möglichkeit durch Maßnahmen der Nutzung eine Niederhaltung des Vogelbesatzes erreicht werden. Bei ackerbaulicher und weidewirtschaftlicher Nutzung sollen ggf. vogelvergrämende Maßnahmen angestrebt werden. Bei forstwirtschaftlicher Nutzung ist Nadelgehölzen möglichst der Vorzug gegenüber Laubgehölzen zu geben.

3. Es ist anzustreben, daß im Bereich unterhalb der inneren Hindernisbegrenzungsfläche keine freifliegenden Tauben gehalten werden.
4. Auf dem Gelände unterhalb der inneren und der äußeren Hindernisbegrenzungsfläche sollten die jagdrochtlichen Belange mit den zur Verringerung des Vogelbesatzes erforderlichen Maßnahmen abgestimmt werden. Gegebenenfalls ist anzustreben, daß eine elektroakustische Vogelvergrämung durchgeführt wird und die als besonders gefährdend anzusehenden Vogelarten in erhöhtem Maß bejagt, gefangen, ausgesiedelt oder ihrer Nistplätze beraubt werden.
5. Im Bereich unterhalb der Inneren und der äußeren Hindernisbegrenzungsfläche sollten großflächige Gewässer, wie Bagger- und Stauseen, möglichst vermieden, und unvermeidbare Neuanlagen nur im Benehmen mit der Luftfahrtbehörde vorgenommen werden. Erforderlichenfalls ist anzustreben, daß an bereits vorhandenen Gewässern im Rahmen der gegebenen Möglichkeiten vogelvergrämende Maßnahmen vorgenommen werden.
6. Es ist anzustreben, daß auf dem Gelände unterhalb der inneren und der äußeren Hindernisbegrenzungsfläche und der um 5 km verlängerten An- und Abflugflächen vorhandene Müllplätze beseitigt und Neuanlagen nicht genehmigt werden.

be tried to keep the number of birds low by adequate use of the land.

In case of agricultural and pasture use bird scaring measures should be used if necessary.

In case of forestry the use of coniferous trees has to be preferred instead of foliage trees.

3. It has to be striven for that within the area of the inner obstruction prevention area no free-flying pigeons are kept.
4. On the area within the inner and outer obstruction prevention surface the requirements of game-law and the measures to reduce the bird population should be correlated.

If necessary electro-acoustic bird scaring should be performed and the bird species considered to be especially endangering should, at a forced level, be shot, caught, evacuated or their brooding places taken away.
5. Within the area below the inner and outer obstruction prevention surface large water-surfaces like excavation or storage lakes should as far as possible be avoided and unavoidable new implementations only be done in consent with aviation authorities. If necessary it must be achieved that bird scaring measures are carried out at existing lakes.
6. It has to be striven for that on the ground within the inner and outer obstruction prevention surface and the by 5 km enlarged approach and climb-areas existing garbage dumps are removed and new ones are not to be licensed.

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VI. Verschiedenes

1. Die aufgrund Nr. IV und V angewendeten Maßnahmen zur Verringerung der Vogelschlaggefahr sollen möglichst dem letzten Stand der Erkenntnisse entsprechen und mit den im Biotopgutachten enthaltenen Vorschlägen verträglich sein. Fachgerechte Versuche, die dem weiteren Fortschritt auf diesem Gebiet dienen, sind im Sinne dieser Richtlinie zulässig.
2. Bei ausgedehnten Änderungen der Betriebsflächengröße, der Art des Bewuchses auf dem übrigen Flughafen- oder Flughafen- o.ä. sind die eventuellen Auswirkungen auf den Biotop, ggf. aufgrund einer fachlichen Stellungnahme, zu berücksichtigen. In der Umgebung von Flughäfen ist anzustreben, daß wesentliche biotopverändernde Maßnahmen nur im Benehmen mit der Luftfahrtbehörde vorgenommen werden.
3. Der Flughafenunternehmer soll einen Beauftragten zur Überwachung der nach Nr. III und IV erforderlichen Maßnahmen bestellen und dessen Ausbildung und Fortbildung insbesondere durch Entsendung zu geeigneten Fachveranstaltungen sicherstellen.
4. Für den mit der Erstellung des Biotopgutachtens Beauftragten soll nach Möglichkeit eine Berechtigung zum Betreten des zu begutachtenden Gebietes erwirkt werden.
5. Die Start- und Landebahnen und die Rollbahnen sollten täglich auf getötete Vögel und sonstige Tiere überprüft werden. Dabei sollen die Kadaver so beseitigt werden, daß sie anderen Tieren nicht zum Fraß dienen können. Über Art und Anzahl der gefundenen Tiere sowie über den Fundort (z. B. "erstes Drittel Landebahn 27")

VI. Miscellaneous

1. The measures to reduce hazard of bird strike applied pursuant to Nr. IV and V should be according best standard of knowledge and be in line with the proposals contained in the biotop expertise.

Competent tests which are helpful for progress on this field are permitted within the sense of this guideline.

2. In case of extreme alterations of the operation area, the kind of growth on the other airport area or similar the influence on the biotop. If necessary based on an expertise, has to be obeyed.
In the vicinity of airports it must be achieved that measures significant to the biotop are only carried out in consent with the aviation authority.

3. The airport operator shall appoint a delegate for monitoring the measures pursuant Nr. III and IV and to ensure the education and advance training especially by sending to suitable professional events.

4. For the delegate to prepare the biotop expertise a permit to access the area to be reported on should be arranged.

5. Runways and taxiways have to be checked daily for killed birds and other animals. Corps should be deposited in such a way that they are not serving as feed for other animals. Regarding species and number of found animals and location where found (first third on runway 27) and date notes should be made on a uniform sheet which, after a

und Datum sollen Aufzeichnungen auf einheitlichem Vordruck geführt und nach Ablauf eines Kalenderjahres über die Flughafengenehmigungsbehörde dem Bundesverkehrsministerium zu Auswertungszwecken vorgelegt werden.

period of one calendar year has to be presented for analysing purpos to the Ministry of Transport via the airport licensing authority.

VII. Beginn der Anwendung

VII. Start of application

Nach diesen Richtlinien soll ab ihrer Veröffentlichung in den Nachrichten für Luftfahrer verfahren werden.

As soon as these guidelines have been published in "News to airmen" they have to be applied.

Following sketches may help to explain the meaning of different zones in respect of the guideline.

