

Bird Strikes during 1985 to european registered civil aircraft

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BIRD STRIKE COMMITTEE EUROPE

BIRD STRIKES DURING 1985 TO EUROPEAN REGISTERED
CIVIL AIRCRAFT

(Aircraft over 5700 kg Maximum Weight)

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SUMMARY

The strikes reported throughout the World in 1985 by operators from twelve European countries have been analysed. The analysis includes rates for countries, aircraft types and aerodromes based on aircraft movements. It also covers bird species, part of aircraft struck, effect of strike, airlines affected and cost.

The strike rate in 1985 was at 4.6 per 10,000 movements, slightly lower than the 5.0 of 1984, probably due to one of the best reporting countries not being in a position to provide full information. Gulls (*Larus spp.*) were involved in 37% of the incidents. There were 16 cases where more than one engine suffered ingestion. The major effect was damage to 88 engines, and the cost was at least 35 million US dollars.

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This study is based on information supplied and the accuracy and detail are only as good as that reported. Any opinions expressed are those of the author.

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1 INTRODUCTION

- 1.1 In order that a common basis for the analysis of bird strike data could be agreed, a Working Group of the Bird Strike Committee Europe was formed in 1972, led by the representative from the United Kingdom Civil Aviation Airworthiness Division at Redhill. Reports covering the individual years 1972 to 1984 inclusive have been presented to BSCE meetings. This paper contains the 1985 analysis.
- 1.2 Appendix 1 contains the Tables of data relating to this paper.

2 SCOPE

For the following reasons, the analysis includes all civil aircraft of over 5700 kg (12 500 lb) maximum weight, and executive jets which weigh just less than 5700 kg, eg Lear and Citation.

- (a) the airworthiness requirements relating to bird strikes are different for the smaller class of aeroplanes,
- (b) much more is known about the reporting standards of operators of transport types, and their movement data is more readily available than that for air taxi or private owner aircraft.
- (c) aircraft of less than 5700 kg are in general, much slower with a different mode of operation, requiring less airspace, and a noticeably different strike rate would be expected.

3 DISCUSSION

3.1 Annual Rate/Country (See Table 1)

- (a) Information has been obtained from a total of twelve European countries. A few of these were not able to provide full information, and their data therefore, appears in some tables and not in others.
- (b) The overall strike rate for the 1387 incidents contained in this analysis is 4.6 per 10,000 movements (two movements per flight) This is less than the rate of 5.0 recorded during 1984 (5.6 in 1983). One of the most efficient reporting countries, Germany, is only partially included; this may have resulted in the apparent lowering of the rate.
- (c) The strike rate reported by each country is dependent upon two major factors -
 - reporting standard
 - the bird strike problem at airports within that country, and that country's airlines route structure.
- (d) The country with the highest reported strike rate and possible the most efficient reporting is Switzerland with 8.8 per 10,000 movements, followed by Austria with 7.5.
- (e) The highest rates of damage has been reported by Czechoslovakia and France, while German registered aircraft are also thought to experience a high rate of damage.

3.2 Aircraft Types (see Table 2)

(a) Jet Aeroplanes

- (i) For several years there appears to have been no consistent correlation between aircraft of similar design, e.g. DC10 and L1011. It may be that aircraft which appear similar to humans are not similar to birds, and there are other factors such as noise patterns, which can affect the strike rate. There is some difference in the strike rate of 4, 3 and 2 engined jets.
- (ii) The small sample of IL62, the DC10, B767, A300, A310 and Mercure have above average strike rates.
- (iii) The aircraft with the greatest damage rate are DC10, A300, A310, TU134, DC8 and B747.
- (iv) 21% of strikes to four engined jet powered aircraft cause damage while the average for all jets is 11%.

(b) Turboprop Aeroplanes

The average strike rate for all turboprops is 3.5 compared with 5.2 for jets.

(c) Helicopters

The number of strikes reported to helicopters is very low, only 17. Because helicopters fly mainly at low altitude where birds are most frequently found, they are continuously exposed to the risk of a strike. Therefore flying hours have been used to determine a strike rate. For reasons which are not at present known, but may be associated with their comparatively low speed and forward noise levels, the rate is low at 1.1 per 10,000 hours, the same as in 1984. There were two cases of damage.

3.3 Aerodromes (See Table 3)

- (a) The aerodrome data is of particular importance as it may indicate where bird control measures need to be taken. Some countries were able to provide aerodrome movement data for their nationally registered aircraft, so that a national rate has been quoted.

The total number of strikes at each aerodrome, reported by all European sources has also been included.

- (b) Strikes reported on aerodromes are influenced by one or more of the following.
 - (i) reporting standards
 - (ii) the prevailing bird situation which may vary according to place and time
 - (iii) the number of aircraft movements
 - (iv) the effectiveness of bird control measures
 - (v) local factors, perhaps beyond control of the aerodrome, e.g. a rubbish dump or bird roost site in the vicinity.

- (c) Because of factors outlined in (b), direct comparison of the reported strike rates for different aerodromes could be misleading.
- (d) European aerodromes with five or more damaging strikes at* the aerodrome are Paris CDG, Frankfurt and Hamburg. This may in some cases be a reflection of the aerodrome movements, local bird populations and reporting efficiency.
- (e) Some aerodromes have a high number of strikes near* the airport in particular Prague, Paris CDG, Frankfurt and London Heathrow. This may be a reflection of the high number of movements by European registered airliners.
- (f) Only Paris CDG reported many cases of damage near* the airport.
- (g) Significant numbers of strikes have been reported at aerodromes outside Europe. Ten strikes were reported at Arusha (Tanzania). Four of the incidents at Nairobi and three at Monrovia resulted in damage.

3.4 Bird Species (See Table 5)

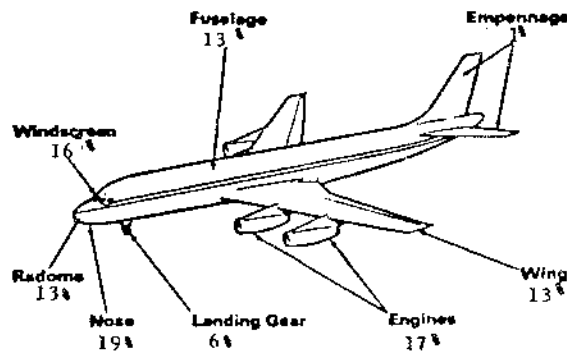
Some knowledge of the bird species involved was available in 61% of incidents. The identification standard ranged from examination of bird remains by a trained ornithologist to the fleeting glance of a pilot. Overall 37% of strikes involved gulls (Larus spp.) of which the Black-headed gull (Larus ridibundus) was the most frequently identified. This is similar to 1984. Next on the list was the Lapwing (Vanellus vanellus) with 13% and the combination of swift/swallow/martin at 16%. Birds of prey accounted for 12% compared with only 7% in 1984. Eight incidents were believed to involve a bird heavier than 1.81 kg (4lb).

The birds struck during the last ten years are summarised overleaf. There does not appear to be a clear trend.

Birds	YEAR									
	76	77	78	79	80	81	82	83	84	85
Gulls (Larus spp.)	44	41	41	41	41	45	33	35	41	37
Lapwing (Vanellus vanellus)	14	10	11	10	12	9	14	13	17	13
Birds of Prey (Falconiformes)	8	9	8	8	10	12	9	8	7	12
Pigeons (Columba spp.)	7	9	7	7	7	7	7	8	6	5
Swift/swallow/martin	11	12	13.5	18	15	11	13	18	11	16

* On - up to 500 ft in the climb and 200 ft and below on approach
Near - 501 to 1500 ft on climb and between 1000 ft and 201 ft on approach.

3.5 Part of Aircraft Struck (See Table 6)



From the figure the parts most frequently reported as being struck can be seen.

It should be noted that there were 16 incidents where more than one engine was struck, of which 5 affected all engines.

3.6 Effects of Strikes (See Table 7)

- (a) During 1985 a total of 88 engines were damaged such as to require repair or replacement (39 less than in 1984). Of these 64 were on twin engined aircraft. It appears that 30% of reported engine strikes involved engine damage.
- (b) Only seven windscreens were changed, a small number compared with the 273 windscreen strikes. None of these was known to involve penetration.
- (c) There were 26 bases of radome damage, out of 236 radome strikes. In most cases the radome was only delaminated, but in a few cases it was shattered. The radome strength is limited by the need for dielectric properties enabling satisfactory operation of the weather radar.

3.7 Cost

Only three countries (Denmark, France, Netherlands) were able to provide cost information, from which it was estimated that the minimum cost to European airlines was 35 million US dollars.

3.8 Aircraft Operator Reporting (See Table 8)

This table provides a guide to the reporting efficiency and problems of individual airlines. It is probable that it is considerably affected by the airport(s) at which the airline has its main base.

4 CONCLUSION

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4 CONCLUSIONS

- 4.1 The overall rate for the 1387 strikes reported during this period by European operators is 4.6 strikes per 10,000 movements. Probably due to a change in the reporting countries, this rate is slightly lower than in previous years.
- 4.2 There does not appear, from the available data, to be any close correlation between the strike rate and the aeroplane type in terms of speed, engine type etc.
- 4.3 Some aircraft for reasons which are unknown, have a much higher strike rate, whilst others have a higher rate of damage.
- 4.4 The percentage of strikes which cause damage to 4 engined jet powered aircraft is double that on 3 or 2 engined aircraft.
- 4.5 There are some airports outside Europe where the number of bird strikes reported by European operators is high even though movements by European registered aircraft at these airports are believed to be low. Damage occurred at several of these airports.
- 4.6 Gulls (*Larus spp.*) were struck more frequently than other birds, being involved in 37% of incidents where the bird species were known. Less than 1% of birds struck were believed to be greater than 1.8 kg (4 lb).
- 4.7 The nose section including the windscreen and radome were reported as being struck in 48% of incidents, with engines being struck in 17%. There were 16 incidents where more than one engine was struck.
- 4.8 The major consequences were damage to 88 engines. There were no aircraft written off, or occupants injured.
- 4.9 The estimated cost of European airlines is a minimum of 35 million US dollars.

BIRD STRIKE ANALYSIS

EUROPEAN OPERATORS 1985

CIVIL AIRCRAFT OVER 5700 KG (12.500 lb) MAXIMUM WEIGHT

Notes:

- 0.1 The following are excluded from this Analysis:
 - (a) aircraft of maximum weight 5700 kg (12.500 lb) and under, except for those few executive jets, which have been included, eg Lear and Citation.
 - (b) all military type and operated aircraft.
- 0.2 All Tables are for strikes reported world-wide.
- 0.3 The Total columns of many of the Tables are different, as some countries have not been able to provide full information for every table.
- 0.4 There are two movements per flight.
- 0.5 Where the number of incidents, or number of movements are small, and particularly where they are both small, the derived rate should be treated with caution.

Reporting Nation
Austria*
Belgium
Czechoslovakia
Denmark
Finland
France
Germany
Italy*
Netherlands*
Sweden
Switzerland*
United Kingdom
Total

- Notes
- 1.1
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Table 1 National Reporting - 1985

(A high rate may be due to efficient reporting)

Reporting Nation	Number of Incidents World Wide	Damaging Incidents	Number of Movements World Wide	Rates per 10,000 Movements	
				Damage	All
Austria*	41	1	54,512	-	7.5
Belgium	31	6	112,750	0.5	2.7
Czechoslovakia*	33	8	50,494	1.6	6.5
Denmark	59	6	292,204	0.2	2.0
Finland	64	2	113,232	0.2	5.7
France	254	52	555,095	0.9	4.6
Germany	(354)	(55)	N/A	N/A	N/A
Italy*	48	3	99,000	0.3	4.8
Netherlands*	74	7	168,863	0.4	4.4
Sweden	92	6	262,005	0.2	3.5
Switzerland*	161	7	182,326	0.4	8.8
United Kingdom	530	34	1,118,754	0.3	4.7
Total	1387 (354)	132 (55)	3,009,235	0.4	4.6

Notes:

- 1.1 * Movement data for Austria, Czechoslovakia, Italy, Netherlands and Switzerland is from ICAO sources.
- 1.2 Helicopters are excluded from this Table.
- 1.3 The figures in brackets are strikes for which no movement data is available.

Table 2 Aircraft Type-1985

Aircraft	Number of Countries Reporting	Number of Strikes		Number of Movements	Strike Rate per 10,000 Movements	
		Damage	All		Damage	All
JET						
Ilyushin 62	1	1	10	9,952	-	10.0
BAe 146	1	-	9	14,396	-	6.3
McDonnell Douglas DC-8	6	3	10	16,373	1.8	6.1
Boeing 707/720	2	-	4	6,520	-	6.1
Boeing 747	6	23	94	196,649	1.2	4.8
Concorde	1	1	2	4,514	-	4.4
All 4 Engined Jets	-	28 (21%)	129	248,927	1.1	5.2
Yak 40						
Yak 40	1	-	3	7,142	-	4.2
McDonnell Douglas DC10	10	12	112	110,758	1.1	10.1
Lockheed 1011 Tristar	2	2	33	50,566	0.4	6.5
HS Trident	1	-	16	28,558	-	5.6
Boeing 727	4	16	99	233,035	0.7	4.2
All 3 Engined Jets	-	30 (11%)	263	430,059	0.7	6.1
Tupolev 134						
Tupolev 134	1	5	15	29,856	2.0	5.0
Boeing 767	1	-	10	9,302	-	10.8
BA01 Mercure	1	3	41	50,302	0.8	8.2
A300 Airbus	5	15	115	140,727	1.1	8.2
A310 Airbus	6	9	62	81,846	1.1	7.6
Boeing 757	2	2	33	50,566	0.4	6.5
Boeing 737	5	40	314	596,633	0.7	5.3
McDonnell Douglas DC-9	8	16	321	635,956	0.3	5.0
BAC 1-11	1	1	85	188,552	-	4.5
SE 210/212 Caravelle	2	2	27	65,586	0.3	4.1
Fokker F28	4	4	44	223,645	0.2	2.0
Cessna 500/550 Citation	3	-	1	3,768	-	-
DA20 Falcon	4	-	-	2,266	-	-
HS125	1	1	8	50,000 (EST)	-	1.6
Learjet	3	1	1	4,928	-	-
SN 601 Corvette	1	-	-	2,500	-	-
All 2 Engined Jets	-	100 (91%)	1077	2,136,453	0.5	5.0
ALL JETS	-	158 (11%)	1469	2,815,439	0.6	5.2
TURBOPROP						
Ilyushin 18	1	-	3	2,932	-	10.2
BAC Viscount	1	-	20	41,728	-	4.8
DHC Dash 7	2	-	3	30,272	-	0.1
Short Belfast	1	-	1	862	-	-
BAC Merchantman	1	-	1	5,264	-	-
HS Argosy	1	-	-	1,514	-	-
All 4 Engine Turboprops	-	-	28	62,572	-	3.4
Let 410						
Let 410	1	1	2	612	16.3	32.7
Fokker F27/227	6	3	20	127,682	1.8	6.1
Short SD 330/360	2	2	72	121,256	0.2	5.9
HS 745	2	3	28	77,458	0.4	3.6
HP Herald	1	-	5	15,108	-	3.3
Word 262	1	1	2	9,570	1.0	2.1
BAE Jetstream 31	1	-	4	20,672	-	1.9
SAAB SF-340	3	-	1	6,718	-	1.5
ATR 42	1	-	-	6,942	-	-
All 2 Engine Turboprops	-	10	134	386,028	0.3	3.5
ALL TURBOPROPS	-	10	152	468,600	0.2	3.5

PISTON	
Bristol 170 Freighter	
Douglas DC3 Dakota	
ALL PISTON	
UNKNOWN	
TOTAL	
HELICOPTERS	
Sikorsky S61	
Boeing 234 Chinook	
AS332L Puma	
Bell 212/214	
Westland WG 30	
ALL HELICOPTERS	

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PISTON						
Bristol 170 Freighter	-	-	-	640	-	-
Douglas DC3 Dakota	1	1	-	1,266	-	-
ALL PISTON	-	1	-	1,906	-	-
UNKNOWN	-	-	-	-	-	-
TOTAL	-	169	1631	3,284,039	0.5	5.0
HELICOPTERS						
Sikorsky S61	2	-	9	55,192	-	1.6
Boeing 234 Chinook	1	-	-	5,666	-	-
AS332L Puma	1	-	4	47,882	-	0.6
Bell 212/214	2	2	3	42,238	-	0.5
Westland WG 30	1	-	2	3,276	-	6.1
ALL HELICOPTERS	-	2	18	154,254	-	1.1

- Notes: 2.1 Because of the low altitude of operation, and difficulty in collection of movement data, helicopter operations are quoted in hours.
- 2.2 The figures in brackets are for aircraft for which movement data is unavailable.
- 2.3 Where the number of incidents, or the number of movements is small and particularly where they are both small any derived rate should be treated with caution.

TABLE 3 AERODROMES - 1985

(A high rate may be due to efficient reporting)

Definition - up to 500ft on climb
- 200ft and below on approach

Country/Aerodrome	Incidents	Movements	Rate per 10,000 Movements	Incidents to Other European Aircraft	Total	
					Damage	All
AUSTRIA						
Klagenfurt	1	-	-	-	-	1
Salzburg	1	-	-	2	-	1
Vienna	14	-	-	2	1	16
Graz	1	-	-	-	-	1
BELGIUM						
Antwerp	1	-	-	-	-	1
Brussels	5	-	-	5	3	10
Charleroi	1	-	-	-	-	1
CZECHOSLOVAKIA						
Bratislava	3	15,561	3.8	-	2	6
Kosice	1	4,594	-	-	-	1
Prague	13	39,106	3.3	-	2	13
Poprad	1	12,751	-	-	-	1
DENMARK						
Aalborg	1	-	-	2	-	3
Billund	3	-	-	-	1	3
Copenhagen	8	61,874	2.7	19	4	27
Esbjerg	6	-	-	-	-	6
Odense	1	-	-	-	-	1
Ronne	2	-	-	-	-	2
Roskilde	1	-	-	-	-	1
Sonderborg	1	-	-	-	1	1
Stauning	1	-	-	-	-	1
Thisted	1	-	-	-	-	1
Tristrup	1	-	-	4	-	5
FINLAND						
Helsinki - Vantaa	13	61,138	2.1	-	1	13
Kajaani	6	1,316	45.6	-	-	6
Kemi	3	3,078	9.7	-	-	3
Kuopio	1	5,582	-	-	-	1
Mariehamn	4	4,178	9.6	-	-	4
DuTu	2	9,612	2.1	-	-	2
Porv	1	2,906	-	-	-	1
Turku	1	10,672	-	-	-	1
Yarkaus	2	1,668	12.0	-	-	2
FRANCE						
Aix - Le Milles	1	-	-	-	-	1
Aurillac	1	826	-	-	1	1
Bale Mulhouse	2	7,998	2.6	-	-	2
Bastia	4	7,323	5.4	-	-	4
Beauvais - Tillie	1	42	-	2	-	3
Bezler	1	198	-	-	-	1
Biarritz	8	3,525	22.7	-	1	8
Brest	5	6,850	7.3	-	-	5
Cannes	1	299	-	-	-	1
Chambery	1	1,697	-	-	-	1
Cherbourg	1	716	-	-	1	1
Clermont Ferrand	2	7,403	2.7	-	-	2
Coltair - Houssen	1	904	-	-	-	1
Epinal - Mire Court	1	927	-	-	1	1
Hyenes - Le Octeville	3	2,743	10.9	-	-	3
Grenoble - St Geoirs	1	4,496	-	-	-	1
La Rochelle	1	1,120	-	-	-	1
Lille	2	8,857	2.2	-	-	2
Le Harve	5	959	52.1	-	-	5
Le Puy Loudes	1	894	-	-	-	1
Lorient - Lan Bihou	5	1,967	25.4	-	-	5
Lourdes	10	1,548	64.6	-	2	10
Lyon - Satolas	8	38,066	2.1	1	1	9
Marseilles	8	37,567	2.1	2	-	10
Merville - Calonne	1	-	-	-	-	1
Montlucon - Dumerat	1	-	-	-	-	1
Montpellier	4	10,035	4.0	-	1	4
Morioux - Ploujean	2	900	22.2	-	2	2

Nice - Cote d'Azur
Nimes - Garons
Paris - Charles
Paris - Le Bour
Paris - Orly
Pau/Pont
Perpignan
Pleurtuit
Quimper
Rennes - St Jacq
St Brieux
St Etienne
St Yan
Strasbourg
Toulouse - Blagnac

GERMANY

Berlin
Cologne - Bonn
Dusseldorf
Frankfurt A.M.
Gellenkirchen
Hamburg
Hannover
Lechfeld
Munich
Munich
Nurnberg
Stuttgart

IRELAND

Dublin

ITALY

Bologna
Brindisi
Cagliari
Genoa
Milan - Linate
Milan - Malpensa
Olbia
Palermo
Pisa
Rome - Fiumicino
Ronchi
Venice

NETHERLANDS

Amsterdam
Curacao
Eindhoven
Rotterdam

NORWAY

Alta
Bergen
Oslo - Fornebu
Sola

POLAND

Warsaw

PORTUGAL

Funchal
Lisbon
Porto

SPAIN

Alicante
Barcelona
Malaga
Mahon
Palma
Reus

	Nice - Cote d'Azur	12	35,777	3.3	-	3	12	
	Nîmes - Garons	1	2,582	-	-	-	1	
	Paris - Charles de Gaulle	25	64,606	3.9	4	5	29	
	Paris - Le Bourget	5	-	-	-	2	5	
	Paris - Orly	32	118,092	2.7	1	2	33	
	Pau/Pont	3	6,287	4.7	-	-	3	
	Perpignan	3	2,833	10.4	-	-	3	
	Pleurtault	2	984	20.3	-	1	2	
	Quimper	1	2,270	-	-	-	1	
	Rennes - St Jacques	1	2,855	-	-	-	1	
	St Briault	1	2,035	-	-	1	1	
	St Etienne	2	2,135	9.3	-	-	2	
	St Yan	6	-	-	-	-	6	
	Strasbourg	1	10,229	-	-	-	1	
	Toulouse - Blagnac	14	17,865	7.8	3	3	17	
	GERMANY							
	Berlin	-	-	-	5	-	5	
	Cologne - Bonn	-	-	-	-	-	5	
	Dusseldorf	-	-	-	4	4	8	
	Frankfurt A.M.	-	-	-	-	7	7	
	Geilenkirchen	-	-	-	1	-	1	
	Hamburg	-	-	-	3	7	9	
	Hannover	-	-	-	-	1	1	
	Lechfeld	-	-	-	-	-	1	
	Munich	-	-	-	2	4	6	
	Munich	-	-	-	1	-	1	
	Munster	-	-	-	-	2	2	
	Nurnberg	-	-	-	-	1	1	
	Stuttgart	-	-	-	1	2	2	
	IRELAND							
	Dublin	-	-	-	3	-	3	
	ITALY							
	Bologna	1	-	-	-	-	1	
	Brindisi	1	-	-	-	-	1	
	Cagliari	1	-	-	-	-	1	
	Genoa	3	-	-	2	1	5	
	Milan - Linate	4	-	-	1	2	5	
	Milan - Malpensa	1	-	-	-	1	1	
	Olbia	2	-	-	-	1	2	
	Palermo	1	-	-	-	-	1	
	Piza	1	-	-	-	-	1	
	Rome - Fiumicino	5	-	-	6	-	11	
	Ronchi	1	-	-	-	-	1	
	Venice	1	-	-	2	-	3	
	NETHERLANDS							
	Amsterdam	20	61,990	3.2	14	3	34	
	Curacao	-	-	-	2	-	2	
	Eindhoven	-	-	-	1	-	1	
	Rotterdam	2	3,942	5.1	-	-	2	
	NORWAY							
	Alta	-	-	-	2	-	2	
	Bergen	-	-	-	2	1	2	
	Oslo - Fornebu	-	-	-	2	-	2	
	Sola	-	-	-	1	-	1	
	POLAND							
	Warsaw	-	-	-	1	-	1	
	PORTUGAL							
	Funchal	-	-	-	1	1	1	
	Lisbon	-	-	-	8	1	8	
	Porto	-	-	-	3	2	3	
	SPAIN							
	Alicante	-	-	-	1	1	1	
	Barcelona	-	-	-	1	-	1	
	Malaga	-	-	-	4	2	4	
	Mahon	-	-	-	2	-	2	
	Palma	-	-	-	5	2	5	
	Reus	-	-	-	5	-	5	

SWEDEN

Angelholm	2	5,426	3.7	-	-	2
Gothenburg - Landvetter	4	37,036	1.1	1	-	4
Halmstad	2	3,200	6.3	-	-	2
Kalmar	5	6,494	7.7	1	1	7
Karlstad	2	4,580	4.4	-	-	2
Kristianstad	3	3,052	9.8	-	-	3
Malmo - Sturup	3	16,230	1.8	-	-	3
Stockholm - Arlanda	19	162,800	1.1	4	-	22
Sundsvall	2	11,734	1.7	-	-	2
Umea	3	11,600	2.5	-	2	3
Vasteras Hasslo	2	2,122	9.4	-	-	2
Vaxjo	2	5,590	3.6	-	-	2
Visby	6	10,595	45.7	-	-	6

SWITZERLAND

Basle - Mulhouse+	3	31,386	0.9	-	-	3
Geneva	7	74,208	0.9	2	-	9
Zurich	31	128,230	2.4	2	-	33

UNITED KINGDOM

Aberdeen	11	68,773	1.6	-	1	11
Bangor	-	-	-	1	-	1
Belfast Aldergrove	25	25,269	11.5	-	3	29
Belfast Harbour	5	8,582	5.8	-	-	5
Birmingham	22	26,925	8.1	1	2	23
Blackpool	4	13,619	3.7	-	-	5
Bristol - Lulsgate	8	7,911	15.1	-	-	8
Cardiff - Wales	-	7,464	9.4	-	-	7
Coventry	-	-	-	1	-	1
East Midlands	-	21,001	4.8	-	-	10
Edinburgh	11	28,498	3.9	-	1	17
Exeter	4	-	-	-	-	2
Glasgow	8	39,253	2.0	-	-	8
Humberside	2	-	-	-	-	2
Kirkwall	2	-	-	-	-	2
Leeds - Bradford	11	11,711	9.4	-	1	12
Liverpool	11	17,077	6.4	-	-	11
London Gatwick	9	93,535	1.0	-	1	9
London Heathrow	32	145,967	2.2	9	3	41
London Stansted	7	15,821	4.4	-	-	7
Luton	18	22,041	8.2	-	4	18
Lydd	4	3,345	12.0	-	-	4
Manchester	30	49,570	6.1	1	1	31
Newcastle	14	17,598	8.0	-	1	14
Norwich	4	16,337	2.4	-	-	4
Oil Riggs	9	-	-	-	-	9
Ronaldsway I of M	32	12,659	25.3	-	-	32
Southend	3	7,769	3.9	-	-	3
Sumburgh	3	12,610	2.3	-	-	3
Tees-side	7	9,211	7.6	-	1	7
Warton	1	-	-	-	1	1

USSR

Moscow	-	-	-	1	-	1
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LIST OF AERODROMES WHERE MORE THAN ONE STRIKE, OR ONE STRIKE WITH DAMAGE HAS BEEN REPORTED BY EUROPEAN OPERATORS. Damaging strikes in brackets.

Other Aerodromes

Accra (Ghana)	2	Jersey (UK)	6 (1)
Alger (Algeria)	3	Johannesbourg (South Africa)	3 (1)
Arusha (Tanzania)	10	Juba (Sudan)	1 (1)
Bamako (Mali)	2	Kano (Nigeria)	3
Bangui - M'Poko	-	Lagos (Nigeria)	5
(Rep. of Central Africa)	2 (2)	Libreville (Gabon)	3
Bangkok (Thailand)	2 (1)	Los Angeles (USA)	2 (1)
Banjul (Gambia)	2 (1)	Malta	3
Barbados	1 (1)	Monrovia (Liberia)	3 (3)
Bombay (India)	2 (1)	Montevideo (Uruguay)	1 (1)
Casablanca (Morocco)	3 (1)	Nairobi (Kenya)	2 (4)
Corfu (Greece)	3	Ouagadougou (Burkina Faso)	1 (1)
Dakar (Senegal)	1 (1)	Rio de Janeiro (Brazil)	6 (2)
Delhi (India)	3 (1)	Sao Paulo (Brazil)	2 (1)
Freetown (Sierra Leone)	2	Shangri (Singapore)	3 (1)
Guernsey (UK)	15	Tahiti	1 (1)
Hong Kong	2	Tangier (Morocco)	1 (1)
Istanbul (Turkey)	5 (1)	Tokyo (Japan)	2 (1)
Jakarta (Indonesia)	2 (1)	Tunis (Tunisia)	1 (1)
En Route	71 (18)		
Unknown	32 (3)		

Notes: 3.1 Because of the variability in reporting, bird population, aircraft movement pattern, control measures and features beyond control, any comparison between the rates calculated for different aerodromes is likely to be misleading.

3.2 Germany did not report non-damaging strikes

TABLE 4 INCID

Defin

Country/Aerodrom

AUSTRIA

Salzburg

BELGIUM

Brussels

BULGARIA

Burgas

CYPRUS

Larnaca

CZECHOSLOVAKIA

Bratislava

Ostrava

Prague

DENMARK

Aalborg

Copenhagen

FINLAND

Helsinki - Vantaa

Juensuu

Turku

FRANCE

Bastia - Poretto

Marseille

Paris - Charles

Paris - Orly

St Yan

Toulouse - Blagnac

GERMANY

Cologne - Bonn

Dusseldorf

Frankfurt

Hamburg

Munich

Nurnberg

Stuttgart

IRELAND

Dublin

ITALY

Milan - Linate

Milan - Malpensa

Rome - Fiumicino

Venice

TABLE 4 INCIDENTS NEAR AERODROMES - 1985

Definition - Between 500ft and 1500ft on climb
- Between 1000ft and 201ft on approach

Country/Aerodrome	Incidents	Movements	Rate per 10,000 Movements	Incidents to Other European Aircraft	Total Damage	All
AUSTRIA						
Salzburg	-	-	-	1	1	1
BELGIUM						
Brussels	3	-	-	-	-	3
BULGARIA						
Burgas	-	-	-	1	-	1
CYPRUS						
Larnaca	-	-	-	1	-	1
CZECHOSLOVAKIA						
Bratislava	4	15,561	2.6	-	-	4
Ostrava	1	4,197	-	-	1	1
Prague	11	39,106	3.1	1	3	12
DENMARK						
Aalborg	1	-	-	-	-	1
Copenhagen	3	61,874	0.6	1	1	4
FINLAND						
Helsinki - Vantaa	2	61,135	0.3	-	-	2
Joussuu	1	3,114	-	-	-	1
Turku	1	10,672	-	-	-	1
FRANCE						
Bastia - Poretta	1	7,323	-	-	-	1
Marseille	1	37,567	-	-	-	1
Paris - Charles de Gaulle	5	64,606	1.4	4	2	9
Paris - Orly	3	118,898	0.3	-	1	3
St. Yoh	1	-	-	-	1	1
Toulouse - Mignac	1	17,865	-	-	-	1
GERMANY						
Cologne - Bonn	-	-	-	1	-	1
Dusseldorf	1	-	-	-	1	1
Frankfurt	7	-	-	-	7	7
Hambourg	4	-	-	-	4	4
Muncheu	2	-	-	-	2	2
Nurnberg	1	-	-	-	2	2
Stuttgart	1	-	-	-	1	1
IRELAND						
Dublin	-	-	-	1	-	1
ITALY						
Milan - Linate	2	-	-	2	-	4
Milan - Malpensa	1	-	-	-	-	1
Rome - Fiumicino	3	-	-	-	-	3
Venice	3	-	-	-	-	3

SPAIN						
Ibiza	-	-	-	1	-	1
Malaga	-	-	-	2	-	2
Palma	-	-	-	1	-	1
SWEDEN						
Gotenborg - Landvetter	-	37,038	-	1	-	1
Stockholm - Arlanda	-	162,800	-	1	-	1
Kalmar	-	6,494	-	1	-	1
UNITED KINGDOM						
Aberdeen	1	68,773	-	-	-	1
E. Midlands	1	21,001	-	-	-	1
Glasgow	4	39,253	1.0	-	1	4
London - Gatwick	1	93,535	-	-	-	1
London - Heathrow	7	145,987	0.5	-	-	7
Luton	1	22,041	-	-	1	1
Manchester	1	49,570	-	1	-	2
U.S.A.						
New York - J.F.K.	-	-	-	2	-	2

TABLE 5 BIRD SPECIES

Scientific Name
<u>PODICIPEDIFORMES</u>
Podicipedidae
<u>PELICANIFORMES</u>
Phalacrocorax sp.
<u>CICONIIFORMES</u>
Ardea sp.
Ardea cinerea
Bubulcus ibis
Eudocimus albus
<u>ANSERIFORMES</u>
Anas sp
Anas platyrhynchos
Anser sp.
Cygnus sp
<u>FALCONIFORMES</u>
Falconiformes
Milvus sp
Milvus migrans
Accipiter nisus
Accipiter gentilis
Buteo sp
Buteo buteo
Falco tinnunculus
<u>GALLIFORMES</u>
Tetrao tetrix
Lyrurus tetrix
Phasianus colchicus
Alectoris rufa
Perdix perdix
<u>GRUIFORMES</u>
Tetrax tetrax
<u>CHARADRIIFORMES</u>
Larus sp
Larus marinus
Larus fuscus
Larus argentatus
Larus canus
Larus delawarensis
Larus ridibundus
Haematopus ostralegus
Pluricallis apricaria
Vanellus vanellus
Numenius arquata
Scolopax rusticola
Callidris alpina
<u>COLUMBIFORMES</u>
Columba sp
Columba oneas
Columba livia
Columba palumbus
<u>CUCULIFORMES</u>
Cuculus canorus

TABLE 5 BIRD SPECIES - 1985

Scientific Name	English Name	Weight/ Weight Category		Number of Incidents		% Based on 1001
		Weight	Category	Damage	Total	
<u>PODICIPEDIFORMES</u>						
Podicipedidae	Grebe	150 g - 990 g	B	-	1	-
<u>PELLICANIFORMES</u>						
Phalacrocorax sp.	Cormorant	1.7 kg - 2.7 kg	C	1	1	-
<u>DICONIFORMES</u>						
Ardea sp.	Heron	500 g - 4.5 kg	B	-	1	-
Ardea cinerea	Grey heron	up to 1.5 kg	B	1	3	0.3
Bubulcus ibis	Cattle egret	345 g	B	2	7	0.7
Eudocimus albus	White ibis	830 g	B	-	1	-
<u>ANSERIFORMES</u>						
Anas sp.	Duck	250 kg - 1.3 kg	B	-	6	0.6
Anas platyrhynchos	Mallard	1.1 kg	B	1	3	0.3
Anser sp.	Goose	1.8 kg - 4 kg	C	2	4	0.4
Cygnus sp.	Swan	4.7 kg - 12 kg	D	-	2	0.2
<u>FALCONIFORMES</u>						
Falconiformes	Bird of Prey	105 g - 1.3 kg	B	1	29	2.9
Milvus sp.	Kite	780 g - 1.0 kg	B	2	4	0.4
Milvus migrans	Black kite	780 g	B	2	9	0.9
	"Hawk"	up to 1 kg	B	-	3	0.3
Accipiter nisus	Sparrow hawk	190 g	B	-	6	0.6
Accipiter gentilis	Goshawk	1.0 kg	B	1	2	0.2
Buteo sp.	Buzzard	250 g - 1.3 kg	B	6	26	2.6
Buteo buteo	Common buzzard	800 g	B	2	15	1.6
Falco tinnunculus	Kestrel	200 g	B	4	26	2.6
<u>GALLIFORMES</u>						
Tetrao tetrix	Black grouse	1.1 kg	B	-	3	0.3
Lyrurus tetrix	Common black grouse		B	-	1	-
Phasianus colchicus	Pheasant	1.1 kg	B	-	2	0.2
Alectoris rufa	Red-legged partridge	450 g	C	-	1	-
Perdix perdix	Grey partridge	400 g	B	3	6	0.6
<u>GRUIFORMES</u>						
Tetrax tetrax	Little bustard	180 g	B	-	1	-
<u>CHARADRIIFORMES</u>						
Larus sp.	Gull	250 g - 1.7 kg	B	23	216	21.6
Larus marinus	Great black backed gull	1.7 kg	B	-	2	0.2
Larus fuscus	Lesser black backed gull	620 g	B	-	4	0.4
Larus argentatus	Herring gull	1.0 kg	B	3	31	3.1
Larus canus	Common gull	420 g	B	2	22	2.2
Larus delawarensis	Ring-billed gull	485 g	B	-	1	-
Larus ridibundus	Black-headed gull	275 g	B	15	93	9.3
Haematopus ostralegus	Oystercatcher	500 g	B	-	3	0.3
Pluricalis apricaria	Golden plover	185 g	B	-	2	0.2
Vanellus vanellus	Lapwing	215 g	B	12	127	12.7
Numenius arquata	Curlew	770 g	B	-	4	0.4
Scolopax rusticola	Woodcock	300 g	B	1	1	-
Calidris alpina	Dunlin	50 g	A	-	1	-
<u>COLUMBIFORMES</u>						
Columba sp.	Pigeon	up to 465 kg	B	6	36	3.6
Columba oenas	Stock dove	345 g	B	-	3	0.3
Columba livia	Rock dove	395 g	B	3	3	0.3
Columba palumbus	Woodpigeon	465 g	B	2	9	0.9
<u>CUCULIFORMES</u>						
Cuculus canorus	Cuckoo	105 g	A	-	1	-

TABLE 6 PART OF AIR

STRIGIFORMES						
Strix sp	Owl	160 g - 380 g	B	1	12	1.2
Tyto alba	Barn owl	315 g	B	1	4	0.4
Athene alba	Little owl	164 g	B	-	1	-
Asio otus	Long-eared owl	275 g	B	-	1	-
APODIFORMES						
Apus apus	Swift	40 g	A	-	31	3.1
PASSERIFORMES						
Passeriformes	Swallow/Martin	25 g	A	-	6	0.6
Alauda arvensis	Skylark	40 g	A	-	17	1.7
Lullula arborea	Woodlark	27 g	A	-	1	-
Galerida cristata	Crested lark	40 g	A	-	1	-
Hirundo rustica	Swallow	19 g	A	2	112	11.2
Caprimulgus europaeus	Nightjar	45 g - 100 g	A	-	1	-
Delicia urbica	House martin	17 g	A	-	7	0.7
Corvus sp	Crow	up to 530 g	B	2	12	1.2
Corvus frugilegus	Rook	430 g	B	1	3	0.3
Pica pica	Magpie	220 g	B	-	2	0.2
Turdus sp	Thrush	60 g - 125 g	A	-	4	0.4
Turdus pilaris	Fieldfare	98 g	A	-	1	-
Turdus merula	Blackbird	100 g	A	-	7	0.7
Turdus philomelos	Song thrush	50 g - 107 g	B	-	3	0.3
Turdus iliacus	Redwing	70 g	A	-	2	0.2
Anthus pratensis	Meadow pipit	18 g	A	-	1	-
Sturnus vulgaris	Starling	80 g	A	-	29	2.9
Carduelis spinus	Siskin	-	-	-	1	-
Passer domesticus	House sparrow	40 g	A	-	2	0.2
Fringilla coelebs	Sparrow	18 g - 40 g	A	-	13	1.3
Carduelis cannabina	Chaffinch	18 g - 31 g	A	-	1	-
	Linnet	18 g	A	-	1	-
UNKNOWN				34	639	
TOTAL				138	1640	

- Notes: 5.1 Bird weights and Scientific Names are based on 'Average Weights of Birds' by T. Brough of Aviation Bird Unit, Worplesdon Laboratory, Agricultural Science Service, MAFF, Worplesdon, England. The average weight has been assumed.
- 5.2 The bird Categories based on current Civil Airworthiness requirements are:
 A below 110 g (1/4 lb)
 B 110 g to 1.81 g (1/4 lb to 4 lb)
 C over 1.81 kg to 3.63 g (4 lb to 8 lb)
 L over 3.63 kg (8 lb)
- 5.3 Those birds not positively identified are tabled as Unknown. Except where there is evidence that they are Large (C or L).
- 5.4 Percentages are based on incidents where birds are identified.

PART STRUCK	
Fuselage	
Nose (excluding radome)	
Radome	
Windscreen	
Propeller	
1 engine struck	
2 out of 3 struck	
2 or more of 4 struck	
all engines struck	
Wing / Rotor	
Landing Gear	
Empennage	
Part unknown	
TOTAL	

- Notes: 6.1 The total struck 1
- 6.2 The perc
- 6.3 Where bo
- 6.4 110g = 1
- 6.5 No data

TABLE 6 PART OF AIRCRAFT STRUCK - 1995

PART STRUCK	BIRD WEIGHTS				TOTAL	% BASED ON 1742
	unknown	below 110kg	110g to 1.81kg	over 1.81kg		
Fuselage	65	48	107	9	229	13.1
Nose (excluding radome and windshield)	113	79	126	7	325	18.7
Radome	78	69	83	6	236	13.5
Windscreen	88	82	96	7	273	15.7
Propeller	4	1	22	1	28	1.6
1 engine struck	81	42	148	6	277	15.9
2 out of 3 struck	-	1	4	-	5	0.3
2 or more of 4 struck	2	-	4	-	6	0.3
all engines struck	-	-	5	-	5	0.3
Wing / Rotor	51	33	147	5	236	13.5
Landing Gear	17	7	74	3	101	5.8
Empennage	8	1	12	-	21	1.2
Part unknown	53	32	145	2	232	-
TOTAL	550	356	973	46	1974	100.0

Notes: 6.1 The totals in Table 5 are higher than other tables as several parts can be struck in one incident.

6.2 The percentages are based on incidents where the part struck is known.

6.3 Where both landing gear or both wings are struck, two incidents are recorded.

6.4 110g = 1/4lb, 1.81kg = 4lb, 3.63kg = 8lb.

6.5 No data on parts struck available from Netherlands.

Table B Aircraft Operators - 1985

OPERATOR	NUMBER OF INCIDENTS	NUMBER OF MOVEMENTS	RATE PER 10,000 MOVEMENTS
<u>AUSTRIA</u>			
Austrian Airlines	41	38,226	10.7
<u>BELGIUM</u>			
Sabena	29	75,888	3.8
Sobelaair	2	8,604	2.3
<u>CZECHOSLOVAKIA</u>			
CSA	33	50,494	6.5
SLI	2	612	32.7
<u>DENMARK</u>			
Cimber Air	2	18,540	1.1
Conair	4	8,030	5.0
Gronslandsfly	-	33,646	-
Maersk Air	6	57,202	1.0
SAS	29	92,944	3.1
Sterling Airways	2	27,752	0.7
Other	13	26,908	4.8
<u>FINLAND</u>			
Finnair Oy	60	124,456	4.8
<u>FRANCE</u>			
Air France	97	309,278	3.1
Air Inter	145	162,188	8.9
Efat	15	-	-
U.T.A.	8	15,514	5.1
T.A.T.	5	83,184	0.6
Taxis	8	-	-
Others	24	-	-
<u>NETHERLANDS</u>			
KLM	74	168,863	4.4
<u>SWEDEN</u>			
SAS	52	126,787	4.1
Linjeflyg AB	38	130,000	2.9
Swedair	2	5,218	3.8
<u>SWITZERLAND</u>			
Swissair	155	-	-
Balair	11	-	-
Omo	1	-	-
<u>UNITED KINGDOM</u>			
Air Atlantique	1	1,400	-
Air Bridge Carriers	1	5,264	-
Air Ecosse	3	13,590	2.2
Air Europe	7	13,556	5.2
Air Luton	1	-	-
Air UK	26	93,950	2.8
Airways Int (Cymru)	4	5,192	7.7
Anglo Cargo	-	502	-
Birmingham Executive	2	9,768	2.0
Bristow Helicopters	7	17,086 hrs	-
Britannia Airways	64	62,972	10.1
British Aerospace	4	-	-
British Air Ferries	7	23,758	2.9
British Airways	143	403,528	3.5
British Airways Helicopters	5	27,543 hrs	1.8
British Caledonian Airways	41	63,432	6.5
British Caledonian Charter	2	3,663	5.5
British Caledonian Helicopters	2	9,834 hrs	2.0
British Island Airways	-	9,060	-
British Midland Airways	32	74,748	4.3
Brymon Airways	2	11,838	1.7
Channel Express	-	5,988	-
Dan-Air Services	57	129,202	4.4

Dravidian	2	-	-
Euroair Transport	1	2,470	-
Euroflight	-	2,992	-
Ford	2	-	-
Goodman/MAM	1	244	-
Guernsey Airlines	3	4,554	6.6
Heavy Lift Cargo	-	862	-
Janus	4	-	-
Jersey European	2	8,554	2.3
Loganair	6	12,400	4.8
London European	-	1,970	-
Manx Airlines	37	22,312	16.6
McAlpine	2	-	-
Metropolitan Airways	4	8,120	4.9
Monarch Airlines	8	19,848	4.0
North Scottish Helicopters	-	6,648 hrs	-
Orion Airways	6	18,946	3.2
Peregrine	1	1,626	-
Spacegrand	5	-	-
Tradewinds Airways	-	1,988	-
Virgin Atlantic	-	1,210	-
Other Operators	10	-	-
Unknown	14	-	-

Note: 8.1 Leased aircraft are included against the operator.

Evaluation airports: 0

(Pablo Morera, S