BIRD STRIKE COMMITTEE EUROPE

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BIRD STRIKES DURING 1984 TO EUROPEAN REGISTERED CIVIL AIRCRAFT

(Aircraft over 5700 kg Maximum Weight)

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SUMMARY

The strikes reported throughout the World in 1984 by operators from fourteen 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, and airlines affected.

The strike rate in 1984 was at 5.0 per 10,000 movements, slightly lower than the two previous years. Gulls (Larus spp.) were involved in 41% of the incidents. The major effect was damage to 127 engines.

CONTENTS

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.

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 Authority Airworthiness Division at Redhill. Reports covering the individual years 1972 to 1983 inclusive have been presented to BSCE meetings. This paper contains the 1984 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 fourteen 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 1404 incidents contained in this analysis is 5.0 per 10,000 movements (two movements per flight). This is less than the rate of 5.6 recorded during 1983 (4.6 in 1982). Two of the most efficient reporting countries (Germany and Switzerland) are 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 possibly the most efficient reporting is Italy with 14.1 per 10,000 movements, followed by Ireland with 7.2.

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, eg DC8 and B707, 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 DC8, DC10, A300,A310 and Mercure have above average strike rates.

(iii) The aircraft with the greatest damage rate are Concorde, DC10, Mercure, A300, A310 and TU134.

(iv) 25% of strikes to four engined jet powered aircraft cause damage while for three and two engined aircraft only 7% result in damage.

(b) Turboprop Aeroplanes

The average strike rate for all Turboprops is 3.6 compared with 5.7 for jets. The damage rate is the same as for jets.

(c) Helicopters

The number of strikes reported to helicopters is very low, only 14. 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, the rate is low at 1.1 per 10,000 hours, the same as in 1983. There was only one case of damage to a helicopter.

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 could be 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, eg 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 is likely to be misleading.

(d) European aerodromes with five or more damaging strikes are Paris CDG,Paris-Orly,Toulouse and Amsterdam.This may in some cases be a reflection of the aerodrome movements, local bird populations and reporting efficiency.

(e) Significant numbers of strikes have been reported at aerodromes outside Europe. Eleven strikes were reported at Bangkok and Delhi. Three of the incidents at Nairobi resulted in damage.

3.4 **Bird Species** (See Table 4)

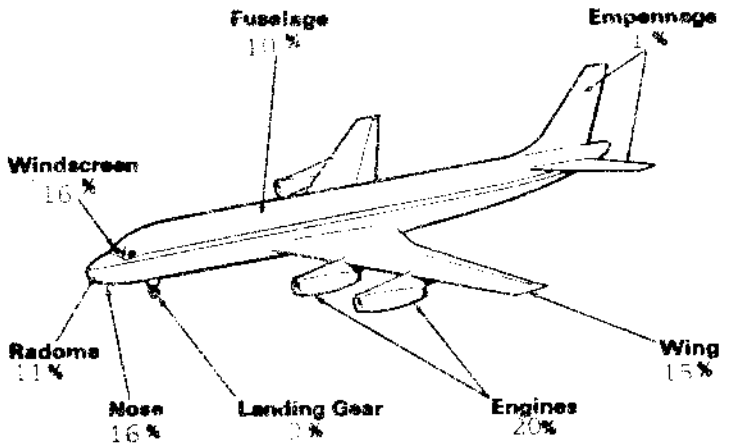
Some knowledge of the bird species involved was available in 56% of incidents. The identification standard ranged from examination of bird remains by a trained ornithologist to the fleeting glance of a pilot. Overall 41% of strikes involved gulls (Larus spp.) of which the Black-headed gull (Larus ridibundus) was the most frequently identified. This is similar to 1983. Next on the list was the Lapwing (Vanellus vanellus) with 17% and the combination of swift/swallow/martin at 11%. Birds of prey accounted for 7%. Eight incidents were believed to involve a bird heavier than 1,81 kg (4lb).

Gulls were involved in 60% of damaging incidents (but 41% of strikes) where the birds involved were known.

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

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

3.5 <u>Part of Aircraft Struck</u> (See Table 5)



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

It should be noted that there were 29 incidents where more than one engine was struck, of which 20 affected all engines (the same figures as in 1983).

3.6 <u>Effects of Strikes</u> (See Table 6)

(a) During 1984 a total of 127 engines were damaged such as to require repair or replacement (seven more than in 1983). Of these 68 were on twin engined aircraft. It appears that 35% of reported engine strikes involved engine damage.

(b) Only six windscreens were changed, a small number compared with the 302 windscreen strikes. None of these was known to involve penetration.

(c) There were 8 cases of radome damage, out of 214 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**

The number of countries able to provide cost information was too small to warrant analysis, although one country had experienced incidents which cost a total of 15 million U.S. dollars.

3.8 **Aircraft Operator Reporting** (See Table 7)

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 CONCLUSIONS

4.1 The overall rate for the 1404 strikes reported during this period by European operators is 5.0 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 is three times greater on 4 engined jet powered aircraft than 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 41% 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 43% of incidents, with engines being struck in 20%. There were 29 incidents where more than one engine was struck.

4.8 The major consequences were damage to 127 engines. There were no aircraft written off, or occupants injured.

APPENDIX 1

BIRD STRIKE ANALYSIS

EUROPEAN OPERATORS 1984

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.

Table 1 National Reporting - 1984

(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	20 (2)	2	54,380 *	0.4	3.7
Belgium	15	-	104,144	-	1.4
Czechoslovakia	26	4	48,584 *	0.8	5.3
Denmark	40	N/A	193,914	0.2	2.1
Finland	56	4	137,712	0.3	4.1
France	279 (29)	55 (12)	548,747	1.0	5.1
Germany	N/A	N/A (80)	N/A	N/A	N/A
Ireland	49 (1)	N/A	67,636 *	-	7.2
Italy	224	10	158,636 *	0.6	14.1
Netherlands	97 (6)	19 (1)	188,566	1.0	5.1
Norway	N/A (67)	N/A	N/A	N/A	N/A
Sweden	75	4	245,357	0.2	3.1
Switzerland	N/A(150)	N/A (5)	N/A	N/A	N/A
United Kingdom	523 (32)	39	1,084,548	0.4	4.8
Total	1404(287)	137 (98)	2,832,224	0.5	5.0

Notes:

1.1 There are two movements per flight.

1.2 * Movement data from ICAO sources.

1.3 Helicopters are excluded from this Table.

1.3 The figures in brackets are strikes for which no movement data is available.

1.5 Damage rate excludes those countries who did not supply damage

(A high rate may be due to efficient reporting)

Table 2 AIRCRAFT TYPE - 1984

(A high rate may be due to efficient reporting)

Aircraft	Number of Countries Reporting	Number of Strikes Damage	Number of Strikes All	Number of Movements	Strike Rate per 10,000 Movements Damage	Strike Rate per 10,000 Movements All
JET						
McDonnel Douglas DC-8	7	(1) 3	(6) 42	18,123	1.7	23.2
BAe 146	1	1	7	10,350	-	6.8
Boeing 747	10	(10) 34	(8)103	151,385	2.2	6.8
Illyushin 62	1	1	6	8,950	-	6.7
Boeing 707/720	4	(2) 2	(2) 10	18,488	1.1	5.4
Concorde	2	2	2	5,942	3.4	3.4
All 4 Engined Jets	-	(13) 43 25%	(16)170	213,238	2.0	8.0
McDonnell Douglas DC10	11	(5) 9	(49) 61	66,884	1.3	9.1
HS Trident	1	-	27	57,698	-	4.7
Lockheed 1011 Tristar	2	(5) 2	(5) 10	30,216	0.7	3.3
Boeing 727	6	(15) 2	(15) 36	162,270	0.1	2.2
Yak 40	1	-	-	9,166	-	-
All 3 Engined Jets	-	(20) 13 7%	(69)184	326,234	0.4	5.6
A300 Airbus	5	(3) 23	(3)232	154,196	1.5	15.0
DA01 Mercure	1	9	(5) 55	47,830	1.9	11.5
A310 Airbus	5	(5) 3	(19) 21	23,728	1.3	8.9
Boeing 767	1	-	3	4,762	-	6.3
Boeing 757	1	2	26	48,048	0.4	5.4
Boeing 737	8	(29) 13	(42)215	417,791	0.3	5.1
Tupolev 134	1	3	13	25,472	1.2	5.1
McDonnel Douglas DC-9	9	(4) 11	(117)268	531,608	0.2	5.0
SE 210/212 Caravelle	3	4	27	60,176	0.6	4.0
BAC 1-11	2	1	80	206,970	-	3.9
Fokker F28	4	2	40	218,351	0.1	1.8
HS125	2	-	7	50,390	-	1.4
Cessna 500/550 Citation	2	-	1	3,838	-	-
DA20 Falcon	5	(3) 1	(3) 1	2,128	-	-
Learjet	4	-	(1) 1	5,644	-	-
SN 601 Corvette	2	(1) -	(2) -	2,488	-	-
All 2 Engined Jets	-	(45) 72 7%	(192)980	1,811,670	0.4	5.4
ALL JETS	-	(78)128 10%	(277)1334	2,351,142	0.5	5.7
TURBOPROP						
Illyushin 18	1	-	7	4,996	-	14.0
BAC Viscount	1	1	(3) 23	32,546	-	7.0
DHC 7	4	-	7	34,874	-	2.0
Short Belfast	1	-	-	964	-	-
BAC Merchantman	1	-	1	4,604	-	-
HS Argosy	1	-	1	1,018	-	-
L188 Electra	1	-	(1) -	-	-	-
All 4 Engine Turboprops	6	1	(1) 39	79,002	-	4.9
HS 748	2	(3) 4	(3) 42	50,740	0.8	8.3
Short SD 330/360	3	2	48	118,350	0.2	4.1
Fokker F27/227	7	5	(1) 52	193,524	0.3	2.7
BAE Jetstream 31	2	(2) 0	(2) 5	19,830	-	2.5
HP Herald	1	1	4	28,174	-	1.4
Nord 262	2	(2) 0	(5) 0	8,974	-	-
C160 Transall	1	(1) -	(1) -	-	-	-
Gulfstream	1	-	(2) -	-	-	-
All 2 Engine Turboprops	-	(8) 12 8%	(18)151	419,592	0.3	3.6
ALL TURBOPROPS	-	(8) 13 7%	(18)193	498,594	0.3	3.9

PISTON						
Bristol 170 Freighter	1	-	-	194	-	-
Douglas DC3 Dakota	1	-	-	3,282	-	-
		-				
ALL PISTON	1	-	-	3,476	-	-
UNKNOWN	-	-	(34) -	-	-	-
TOTAL	-	(86)141	(329)1524	2,853,212	0.5	5.3

Aircraft	Number of Countries Reporting	Number of Strikes Damage	Number of Strikes All	Number of Hours	Strike Rate per 10,000 Hours Damage	Strike Rate per 10,000 Hours All
HELICOPTERS						
Bell 214	1	-	2	1,740	-	11.5
Sikorsky S61	3	-	(1) 7	60,056	-	1.2
AS332L	2	1	(1) 3	36,064	-	0.8
Boeing 234 Chinook	1	-	7	7,590	-	-
Westland WG 30	1	-	1	2,985	-	-
ALL HELICOPTERS	-	1	(2) 12	108,435	0.1	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.

2.4 Damage data not supplied by Denmark, Ireland and Norway.

TABLE 3 AERODROMES - 1984

(A high rate may be due to efficient reporting)

Country/Aerodrome	Incidents	Movements	Rate per 10,000 Movements	Incidents to Other European Aircraft	Total Damage	Total All
AUSTRIA						
Innsbruck	1	-	-	-	-	1
Klagenfurt	2	-	-	-	-	2
Linz	2	-	-	1	-	3
Salzburg	1	-	-	2	-	3
Vienna	15 (1)	-	-	-	1	15
Graz	1 (1)	-	-	-	1	1
BELGIUM						
Brussels	4	-	-	4	-	8
Ostend	2	-	-	1 (1)	1	3
CZECHOSLOVAKIA						
Bratislava	3	-	-	-	-	3
Kosice	1	-	-	-	-	1
Prague	11 (2)	-	-	-	2	11
DENMARK						
Aalborg	1	-	-	4 (1)	1	5
Beldringe	1	-	-	-	-	1
Billund	2	-	-	-	-	2
Copenhagen	9	58,422	1.5	19 (2)	2	28
Esbjerg	5	-	-	-	-	5
Ronne	3	-	-	-	-	3
Thisted	-	-	-	1	-	1
FINLAND						
Helsinki - Vantaa	16	84,640	1.9	1	-	17
Jyvaskyla	4	23,304	1.7	-	-	4
Kajaani	4	3,840	10.4	-	-	4
Kemi	2	8,476	2.4	-	-	2
Kuopio	1 (1)	34,540	0.3	-	1	1
Mariehamn	7 (1)	7,120	9.8	-	1	7
Oulu	6	20,838	2.9	-	-	6
Pori	2	18,502	1.1	-	-	2
Savonlinna	1	3,742	2.7	-	-	1
Tampere	1	19,376	0.5	-	-	1
Turku	1 (1)	31,248	0.3	-	1	1
Vaasa	1	18,566	0.5	-	-	1
FRANCE						
Ajaccio	6	7,686	7.8	-	-	6
Basle-Mulhouse	2 (1)	7,543	2.6	-	1	2
Bastia	3	6,652	4.5	-	3	-
Bezier	-	-	-	2	-	2
Bordeaux	8 (1)	16,587	4.8	-	1	8
Brest	8 (2)	6,495	12.3	-	2	8
Calvi	3	2,284	13.1	-	-	3
Clermont Ferrand	2 (1)	7,518	2.6	-	1	2
Lille	5	8,856	5.6	-	-	5
Lourdes	7 (1)	1,365	51.3	-	1	7
Lyon - Satolas	8 (1)	38,105	2.1	-	1	8
Marseilles	15 (2)	36,330	4.1	1	1	16
Montpellier	5	9,676	5.1	-	-	5
Nice - Cote d'Azur	6	33,355	1.8	1	-	6
Paris - Charles de Gaulle	33 (8)	62,448	5.3	7 (2)	8	33
Paris - Le Bourget	3 (2)	6,962	4.3	-	2	3
Paris - Orly	48 (5)	117,548	4.1	-	5	48
Pau/Pont	3 (1)	5,697	5.3	-	1	3
Nimes - Garons	3	2,676	11.2	-	-	3
Perpignan	3	3,803	7.9	-	-	3
St Nazaire	3	1,189	25.2	-	-	3
Strasbourg	7 (1)	10,458	6.7	-	1	7
Toulouse - Blagnac	32 (6)	17,752	18.0	2	6	34
Vichy	2	283	70.6	-	-	2

GERMANY						
Berlin	-	-	-	2 (1)	1	2
Dusseldorf	2 (2)	-	-	3	2	5
Frankfurt	-	-	-	5 (1)	1	5
Geilenkirchen	1 (1)	-	-	-	1	1
Hamburg	4 (4)	-	-	-	4	4
Hannover	2 (2)	-	-	-	2	2
Munich	2 (2)	-	-	1	2	3
Munster	1 (1)	-	-	-	1	1
Stuttgart	1 (1)	-	-	1	1	2
GREECE						
Corfu	-	-	-	10 (1)	1	10
Samos	-	-	-	1	-	1
IRELAND						
Cork	7	-	-	-	-	7
Dublin	26	-	-	-	-	26
Shannon	3	-	-	-	-	3
ITALY						
Brindisi	-	-	-	2	-	2
Catania	7	4,093	17.1	-	-	7
Genoa	5 (1)	2,617	19.1	3	-	8
Milan - Linate	33 (1)	33,000	10.0	2	1	35
Milan - Malpensa	3	3,846	7.8	-	-	3
Palermo	3 (1)	8,333	3.6	-	1	3
Rimini	-	-	-	1	-	1
Rome - Fiumicino	38 (1)	52,778	7.2	3	1	41
Venice	21	7,292	28.8	2	-	23
Verona	-	-	-	1	-	1
NETHERLANDS						
Amsterdam	35 (11)	77,403	4.5	8 (1)	12	43
Rotterdam	1	4,334	2.3	-	-	1
NORWAY						
Bergen	9	35,523	2.5	4	-	13
Bodo	3	29,647	1.0	1	-	4
Flesland		-	-	3	-	3
Honingvag/Valan	1	4,766	2.0	-	-	1
Kristiansand	3	12,786	2.3	-	-	3
Oslo - Fornebu	16	70,690	2.3	10	-	26
Sola	-	-	-	1	-	1
Stavanger	7	38,102	1.8	-	-	7
Svolvaer/Helle	2	3,828	5.2	-	-	2
Tromso	1	20,545	0.5	-	-	1
POLAND						
Warsaw	-	-	-	1	-	1
PORTUGAL						
Faro	-	-	-	3	-	3
Lisbon	-	-	-	2	-	2
Porto	-	-	-	1	-	1
SPAIN						
Alicante	-	-	-	2	-	2
Gerona	-	-	-	1	-	1
Ibiza	-	-	-	8 (2)	2	8
Mahon - Menorca	-	-	-	4 (1)	1	4
Malaga	-	-	-	7	-	7
Palma de Mallorca	-	-	-	13 (2)	2	13
Reus	-	-	-	2	-	2
SWEDEN						
Angelholm	3	5,400	5.6	-	-	3
Gothenburg - Landvetter	-	-	-	1	-	1
Halmstad	3	3,490	8.6	-	-	3
Lulea	2	14,218	1.4	1	-	3
Malmo - Sturup	2	17,504	1.1	1	-	3
Stockholm - Arlanda	16	149,804	1.1	6	-	22
Umea	7	11,490	6.1	-	-	7
Vasteras Hasslo	3	1,880	16.0	2	-	5
Visby	5	10,224	4.9	-	-	5

SWITZERLAND						
Basle - Mulhouse	2	-	-	-	-	2
Geneva	20	-	-	2	-	22
Zurich	39 (2)	-	-	4 (1)	3	43
UNITED KINGDOM						
Aberdeen	10	73,094	1.4	-	-	10
Belfast Aldergrove	18	24,622	7.3	-	-	18
Belfast Harbour	6 (2)	8,446	7.1	-	2	6
Birmingham	22 (2)	26,150	8.4	3	2	25
Blackpool	3	13,636	2.2	-	-	3
Bournemouth - Hurn	9 (2)	11,592	7.8	-	2	9
Bristol - Filton	2	-	-	-	-	2
Bristol - Lulsgate	4	7,959	5.0	2	-	6
Cardiff - Wales	5	8,235	6.1	-	-	5
Coventry	2	1,652	12.1	-	-	2
Dundee	7	3,142	22.2	-	-	7
East Midlands	12	23,533	5.1	-	-	2
Edinburgh	15 (1)	25,684	5.8	2	1	17
Glasgow	24 (1)	42,648	5.6	2	1	26
Hatfield	3	-	-	-	-	3
Inverness	2	8,412	2.4	-	-	2
Kirkwall	3	8,142	3.7	-	-	3
Leeds - Bradford	4	10,010	4.0	1	-	5
Liverpool	6	16,566	3.6	-	-	6
London Gatwick	19 (1)	89,574	2.1	-	1	19
London Heathrow	22 (1)	138,260	1.6	14 (2)	3	36
London Stansted	11	14,821	7.4	-	-	11
Luton	14	23,867	5.9	-	-	14
Manchester	33	48,774	6.8	-	-	33
Newcastle	15	16,207	9.2	-	-	15
Norwich	6	8,711	6.9	-	-	6
Prestwick	1	3,731	2.7	-	-	1
Ronaldsway I of M	14	13,732	10.2	-	-	14
Southend	2	6,739	3.0	-	-	2
Stornoway	2	2,865	7.0	-	-	2
Sumburgh	1	11,666	0.9	-	-	1
Tees-side	11 (1)	9,156	12.0	-	-	11
Wick	2	3,394	5.9	-	-	2
USSR						
Leningrad	-	-	-	1	-	1

LIST OF AERODROMES WHERE MORE THAN ONE STRIKE, OR ONE STRIKE WITH DAMAGE HAS BEEN REPORTED BY EUROPEAN OPERATORS

Other Aerodromes

Delhi (India)	11 (2)	Douala (Cameroon)	2
Bangkok (Thailand)	11	Kano (Nigeria)	2
Banjul (Gambia)	10	Kinshasa (Zaire)	2
Jersey (Channel Islands)	9	Monrovia (Liberia)	2
Guernsey (Channel Islands)	8	Robertsville (Liberia)	2
Tunis (Tunisia)	7 (2)	Adelaide (Australia)	1 (1)
Nairobi (Kenya)	6 (3)	Baltimore (U.S.A.)	1 (1)
Burgas (Bulgaria)	3 (2)	Doha (Qatar)	1 (1)
Algier (Algeria)	3 (1)	Gander (Canada)	1 (1)
Colombo (Sri Lanka)	3	Harare (Zimbabwe)	1 (1)
Mombasa (Kenya)	3	Karachi (Pakistan)	1 (1)
New York JFK (U.S.A.)	2 (1)	Monastir (Tunisia)	1 (1)
Agadir (Morocco)	2		

En Route	51 (16)
Unknown	68 (10)

Notes: 3.1 Because of 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 The figures in brackets are incidents with damage. (Not supplied by Denmark, Ireland and Norway.

3.3 UK data on Strikes near Aerodromes (between 500 ft and 2,500 ft) have been excluded (21 incidents) as have carcasses found on aerdromes with impact damage.

TABLE 4 BIRD SPECIES - 1984

Scientific Name	English Name	Weight/ Weight Category		Number of Incidents		% Based on 993
		Weight	Category	Damage	Total	
CICONIIFORMES						
Ardea sp	Heron	500 g - 4.5 kg	B	1	5	0.5
Ardea cinerea	Grey heron	up to 1.5 kg	B	-	2	-
Bubulcus ibis	Cattle egret	345 gr	B	-	1	-
Ciconia ciconia	White stork	2.4 kg	C	-	1	-
ANSERIFORMES						
Anas sp	Duck	250 g - 1.3 kg	B	1	5	0.5
Anas platyrhynchos	Mallard	1.1 kg	B	-	3	0.3
Anser sp	Goose	1.8 kg - 4.0 kg	C	3	3	0.3
Cygnus sp	Swan	4.7 kg - 12 kg	D	-	1	-
FALCONIFORMES						
Gyps sp	Vulture	up to 10 kg	C	1	1	-
Aquila sp	Eagle	1.1 kg - 4.2 kg	C	-	1	-
Aquila chrysaetos	Golden eagle	4.2 kg	D	-	1	-
Buteo sp	Buzzard	260 g - 1.3 kg	B	2	8	0.8
Buteo buteo	Common buzzard	800 g	B	1	6	0.6
Pernis apivorus	Honey buzzard	360 g - 1.5 kg	B	-	1	-
	"Hawk"	up to 1 kg	B	2	14	1.4
Accipiter nisus	Sparrow hawk	190 g	B	-	3	0.3
Accipiter gentilis	Goshawk	1.0 kg	B	-	1	-
Milvus sp	Kite	700 g - 1.0 kg	B	-	2	-
Milvus migrans	Black kite	780 g	B	2	8	0.8
Circus aeroginosus	Marsh harrier	320 g - 1.4 kg	B	-	3	0.3
Falco sp	Falcon	105 g - 1.3 kg	B	1	4	0.4
Falco tinnunculus	Kestrel	200 g	B	2	18	1.8
GALLIFORMES						
Tetrao tetrix	Black grouse	1.1 kg	B	-	2	-
Lyrurus tetrix	Common black grouse	810 g - 1.8 kg	B	1	3	0.3
Alectoris rufa	Red-legged partridge	450 g	B	-	1	-
Perdix perdix	Grey partridge	400 g	B	-	8	0.8
Phasianus colchicus	Pheasant	1.1 kg	B	-	2	-
CHARADRIIFORMES						
Haematopus ostralegus	Oystercatcher	500 g	B	-	5	0.5
Vanellus vanellus	Lapwing	215 g	B	12	166	16.7
Charadrius hioticula	Ringed plover	54 g	A	-	1	-
Pluricalis apricaria	Golden plover	185 g	B	-	1	-
Gallinago gallinago	Snipe	125 g	B	-	2	0.2
Gallinago megala	Forest snipe	150 g	B	-	1	-
Numenius arquata	Curlew	770 g	B	1	5	0.5
Philomachus pugnax	Ruff	140 g	B	1	2	-
Larus sp	Gull	280 g - 1.7 kg	B	39	299	30.1
Larus marinus	Great black backed gull	1.7 kg	B	-	4	0.4
Larus fuscus	Lesser black backed gull	820 g	B	-	3	0.3
Larus argentatus	Herring gull	1.0 kg	B	5	37	3.7
Larus canus	Common gull	420 g	B	1	18	1.8
Larus melancephalus	Mediterranean gull	280 g	B	-	1	-
Larus ridibundus	Black headed gull	275 g	B	1	41	4.1
Larus minutus	Little gull	80 g - 150 g	B	-	1	-
Sterna hirundo	Common tern	120 g	B	-	4	0.4
Chlidonias leucoptera	White winged black tern	40 g - 80 g	A	-	1	-
COLUMBIFORMES						
Columba sp	Pigeon	up to 465 g	B	4	37	3.7
Columbia oneas	Stock dove	345 g	B	-	2	0.2
Columba livia	Rock dove	395 g	B	1	8	0.8
Columba palumbus	Woodpigeon	465 g	B	3	15	1.5

STRIGIFORMES						
Strix sp	Owl	160 g - 380 g	B	-	7	0.7
Athene noctua	Little owl	164 g	B	-	1	-
Asio otus	Long-eared owl	275 g	B	-	2	-
Asio flammeus	Short-eared owl	350 g	B	-	3	0.3
Bubo bubo	Eagle owl	2.8 kg	C	-	1	-
Tyto alba	Barn owl	315 g	B	-	2	-
APODIFORMES						
Apus apus	Swift	40 g	A	1	26	2.6
PASSERIFORMES						
Alauda arvensis	Skylark	40 g	A	-	17	1.7
Hirundo neoxena	Welcome swallow	14 g	A	-	1	-
Hirundo rustica	Swallow	19 g	A	-	78	7.9
Caprimulegus europaeus	Nightjar	45 g - 100 g	A	-	2	-
Delichon urbica	House martin	17 g	A	-	4	0.4
Riparia riparia	Sand martin	13 g	A	-	3	0.3
Corvus sp	Crow	up to 530 g	B	1	14	1.4
Corvus corone	Carrion crow	530 g	B	-	2	-
Corvus frugilegus	Rook	430 g	B	2	7	0.7
Pica pica	Magpie	220 g	B	-	2	-
Turdus sp	Thrush	60 g - 125 g	A	1	3	0.3
Turdus pilaris	Fieldfare	98 g	A	-	1	-
Turdus merula	Blackbird	100 g	A	-	1	-
Turdus philomelos	Song thrush	50 g - 107 g	B	-	1	-
Motacilla alba	Pied Wagtail	23 g	A	-	1	-
Sturnus vulgaris	Starling	80 g	A	-	20	2.0
Carduelis chloris	Greenfinch	29 g	A	-	1	-
Carduelus Cannabina	Linnet	19 g	A	-	5	0.5
Passer domesticus	House sparrow	40 g	A	-	2	-
	Sparrow	18 g - 40 g	A	-	21	2.1
Fringilla coelebs	Chaffinch	15 g - 31 g	A	-	1	-
Plectrophenax nivalis	Snow bunting	35 g	A	-	1	-
Chiroptera	Bat	5 g - 20 g	A	-	1	-
UNKNOWN				69	783	
TOTAL				159	1776	

Notes: 4.1 Bird weights and Scientific Names are from '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.

4.2 The bird Categories based on current Civil Airworthiness requirements are:

A below 110 g (1/4 lb)
B 110 g to 1.81 kg (1/4 lb to 4 lb)
C over 1.81 kg to 3.63 kg (4 lb to 8 lb)
D over 3.63 kg (8 lb)

4.3 Those birds not positively identified are tabled as Unknown. Except where there is evidence that they are Large (C or D).

4.4 Percentages are based on incidents where birds are identified.

TABLE 5 PART OF AIRCRAFT STRUCK

INCIDENTS / PART STRUCK	BIRD WEIGHTS				TOTAL	% BASED ON 1878
	unknown	below 110g	110g to 1.81kg	over 1.81kg		
Fuselage	63	21	105	2	191	10.2
Nose (excluding radome and windshield)	118	63	121	-	302	16.1
Radome	89	39	85	1	214	11.4
Windscreen	116	67	119	-	302	16.1
Propeller	2	1	32	-	35	1.8
1 engine struck	128	35	172	5	340	18.1
2 out of 3 struck	-	-	2	-	2	0.1
2 or more of 4 struck	5	1	1	-	7	0.4
all engines struck	5	2	13	-	20	1.1
Wing / Rotor	88	17	168	6	279	14.8
Landing Gear	36	10	120	3	169	9.0
Empennage	9	1	7	-	17	0.9
Part unknown	58	24	142	3	227	-
TOTAL	717	281	1087	20	2105	100.0%

Notes: 5.1 The totals in Table 5 are higher than other tables as several parts can be struck in one incident.

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

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

5.4 110g = 1/4lb, 1.81kg = 4lb, 3.63kg = 8lb.

5.5 From one reporting country no data on parts struck available.

TABLE 6 Effect of Strike - 1984

Incidents / Effect	Bird Weights					Total	% Based on 1759
	Unknown	Below 110 g	110 g to 1.81 kg	1.81 kg to 3.63 kg	Over 3.63 kg		
Loss of life/aircraft	-	-	-	-	-	-	-
Flight crew injured	-	-	-	-	-	-	-
Engine repairs on:							
2 engined aircraft	19	4	44	1	-	68	3.9
Others	29	-	26	4	-	59	3.3
Windscreen cracked or broken	3	-	3	-	-	6	0.3
Vision obscured*	4	-	1	-	-	5	0.3
Radome changed	4	-	3	1	-	8	0.5
Deformed structure	2	-	3	-	-	5	0.3
Skin torn/light glass broken	14	1	21	6	-	42	2.4
Skin dented*	20	4	20	1	-	45	2.6
Propeller/Rotor/ transmission damaged	-	-	-	-	-	-	-
Aircraft system lost	6	1	9	-	-	16	0.9
Take off abandoned*	5	-	6	-	-	11	0.6
Nil damage	555	169	763	7	-	1494	84.9
Unknown	21	1	7	-	-	29	-
TOTAL	682	180	906	20	-	1788	100%

Notes: 6.1 If, for example, skin is torn in two places, or both windscreens are broken, two incidents are recorded.

6.2 The percentages are based on known effects.

6.3* Not counted as damage

6.4 From one reporting country no data on strike effect available

Table 7 Aircraft Operators 1984

(A high strike rate may be due to efficient reporting)

OPERATOR	NUMBER OF INCIDENTS	NUMBER OF MOVEMENTS	RATE PER 10,000 MOVEMENTS
AUSTRIA			
Austrian Airlines	20	54,380	3.7
Tyrolean Airways	2	-	-
BELGIUM			
Sabena	13	72,048	1.8
Trans European Airways	1	5,926	1.7
Sobelair	1	8,068	1.2
CZECHOSLOVAKIA			
CSA	26	48,584	5.4
DENMARK			
Cimber Air	-	23,174	-
Conair	3	7,224	4.1
Gronslandsfly	-	29,376	-
Maersk Air	13	45,116	2.9
SAS	19	87,178	2.2
Sterling Airways	5	26,844	1.9
Other	1	14,268	0.7
FINLAND			
Finnair Oy	56	137,712	4.1
FRANCE			
Air France	88	297,233	2.9
Air Inter	167	161,844	10.3
U.T.A.	12	16,722	7.1
T.A.T.	7	89,288	0.8
IRELAND			
Aer Lingus	-	-	-
Irish Helicopters	1	-	-
Avair	1	-	-
ITALY			
Alitalia	224	158,636	14.1
NETHERLANDS			
KLM	85	118,658	7.2
NLM	10	57,900	1.7
Martinair	2	12,008	1.7
Transavia	6	-	-
NORWAY			
SAS	47	-	-
Braathen	6	-	-
Wideroe	4	-	-
Helicopter service	2	-	-
Fred Olsen	1	-	-
Busy Bee	1	-	-
Other	6	-	-
SWEDEN			
SAS	47	121,357	3.9
Linjeflyg AB (LIN)	28	124,000	2.3
Ostermans Aero AB	1	7,189	1.4
SWITZERLAND			
Swissair	138	-	-
Balair	11	-	-
Omo	1	-	-

UNITED KINGDOM

Air Atlantique	-	3,480	-
Air Bridge Carriers	2	6,286	3.2
Air Ecosse	8	18,018	4.4
Air Europe	13	21,812	6.0
Air UK	18	75,118	2.4
Airways Int (Cymru)	-	2,308	-
Anglo Cargo	-	356	-
Birmingham Executive	1	7,418	-
Bristow Helicopters	4	46,887 hrs	0.8
Britannia Airways	91	72,836	12.5
British Aerospace	8	-	-
British Air Ferries	6	18,448	3.2
British Airways	143	380,592	3.7
British Airways Helicopters	5	26,772 hrs	1.9
British Caledonian Airways	43	69,498	6.2
British Caledonian Helicopters	2	9,812 hrs	2.0
British Island Airways	1	7,984	-
British Midland Airways	37	78,978	4.7
Bryan Aviation	1	188	-
Brymon Airways	2	26,394	0.7
Channel Express	1	6,334	-
Dan-Air Services	47	117,988	4.0
Euroair Transport	1	1,690	-
Euroflight	-	3,464	-
Ford	3	-	-
Genair (Lease Air)	7	15,318	4.6
Guernsey Airlines	1	3,770	-
Heavylift Cargo Airlines	-	964	-
Janus	3	N/A	-
Jersey European	-	2,288	-
Loganair	8	9,922	8.1
Manx Airlines	20	16,310	12.3
McAlpine	1	-	-
Metropolitan Airways	-	4,028	-
Monarch Airlines	13	21,688	6.0
North Scottish Helicopters	-	7,594 hrs	-
Orion Airways	25	24,576	10.2
Peregrine	2	-	-
Tradewinds Airways	1	2,428	-
Venture Airways	-	488	-
Virgin Atlantic	-	662	-
Other Operators	14	-	-

Note: 7.1 Leased aircraft are included against the operator.