

BIRD STRIKES DURING 1980 TO EUROPEAN REGISTERED
CIVIL AIRCRAFT
(Aircraft over 5700 kg Maximum Weight)

J Thorpe - UK
R van Wessum - Netherlands

Summary

The strikes reported throughout the World in 1980 by operators from eleven 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, cost and airlines affected.

The strike rate in 1980 was similar to the two previous years at 4.5 per 10,000 movements. Gulls (*Larus spp.*) were involved in nearly half the incidents. The major effect was damage to 91 engines. During the year bird strikes were estimated to have cost European airlines at least 4.0 million US dollars in engineering repairs.

CONTENTS

		Page
1	INTRODUCTION	1
2	SCOPE	1
3	DISCUSSION	1
	3.1 Annual Rate for each Country	1
	3.2 Aircraft Types	2
	3.3 Aerodromes	2
	3.4 Bird Species	3
	3.5 Part of Aircraft Struck	3
	3.6 Effect of Strike	4
	3.7 Cost	4
	3.8 Aircraft Operator Reporting	4
4	CONCLUSIONS	5

APPENDIX 1 Tables of Data

This study is based on information supplied and the accuracy and detail are only as good as that reported.

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. After consultation with other member countries, sets of Analysis Tables with explanatory Notes were circulated to all members of the BSCE, together with a request that each country produced an analysis on their bird strikes. These analyses were consolidated to form an annual report on Bird Strikes to European Registered Civil Aircraft, and reports covering the individual years 1972 to 1979 inclusive have been presented to annual BSCE meetings. This paper presents the 1980 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 eleven European countries including for the first time, Italy. 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 1524 incidents contained in this analysis is 4.5 per 10,000 movements (two movements per flight). This is similar to the rate of 4.2 recorded during 1979 (5.5 in 1978).

- (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 is Switzerland with 12.3 per 10,000 movements, followed by Germany with 9.8.

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, BAC 1-11 and DC9. 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.
- (ii) Again in the 1980 data there is a distinct correlation between strike rate and aircraft frontal area, the rate for the four wide-bodied aircraft being 6.4, well above the mean for all jets of 4.8, although there are considerable variations between some aircraft of similar size. The most glaring discrepancy, for which no explanation has been found, is between the rates for the DC10 and L1011 Tristar. For reasons which are not clear, the reported DC10 rate has for several years been much greater than that for the L1011 Tristar.

(b) Turboprop Aeroplanes

The average strike rate for all turboprops (2.6) is significantly less than that for jets (4.8).

(c) Piston Aeroplanes

Very few strikes were recorded to piston engine aeroplanes.

(d) Helicopters

The number of strikes reported to helicopters is very low, only ten. 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 0.9 per 10,000 hours, similar to the 1.3 of previous years.

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.

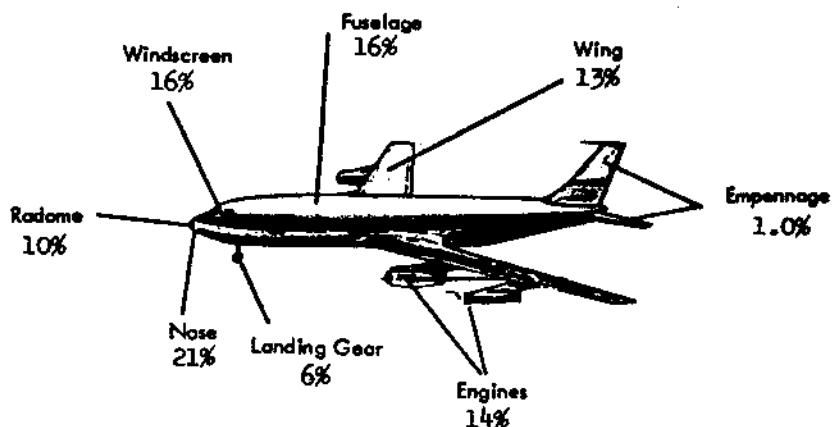
- (b) Strikes reported on aerodromes are influenced by one or more of the following:
 - (i) reporting standards
 - (ii) the prevailing bird situation which may vary according to place and time
 - (iii) the number of aircraft movements
 - (iv) the effectiveness of bird control measures
 - (v) local factors, 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) Significant numbers of strikes have been reported at some aerodromes outside Europe. Thirteen strikes were reported at Bangkok, twelve at New York JFK and ten at Delhi and the numbers at Dakar and Bombay appear to be rather high, since the number of movements by European aircraft at most of these aerodromes is comparatively low.
- (e) There were 67 incidents where the aircraft was considered to be en-route.

3.4 BIRD SPECIES (see Table 4)

Some knowledge of the bird species involved was available in 823 incidents (55%). 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*) and Herring gull (*Larus argentatus*) were the most frequently identified. Next on the list were the combination of swifts, swallows and martins with 15%, followed by Lapwings (*Vanellus vanellus*) with 12%, birds of prey at 10% and pigeons (*Columba spp*) with 7%. The percentage of gull and lapwing strikes was similar to the previous year. Less than 1% of incidents (8 cases) were believed to involve birds of greater than 1.81 kg (4 lb).

3.5 PART OF AIRCRAFT STRUCK (see Table 5)

- (a) From the figure it can be seen that the parts most frequently reported as being struck were nose with 21%, windscreen with 16%, fuselage 16%, followed by engines with 14%. It should be noted that there were 27 incidents where more than one engine was struck, of which nine involved all engines, a significant increase compared with previous years (two in 1979 and three in 1978 involved all engines).



3.6 EFFECTS OF STRIKES (see Table 6)

- (a) During the period covered by this paper 91 engines were damaged such as to require repair or replacement. Of these 40 were on twin-engined aircraft. It appears that 35% of engine strikes involved engine damage. This was higher than in previous years, 70 in 1979 and 60 in 1978.
- (b) Only three windscreens were changed, a small number when compared with 259 windscreen strikes. It is thought that none of these incidents involved penetration of the windscreen.
- (c) There were seven cases of radome damage, out of 166 radome strikes (4%). 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 (see Table 7)

Six countries (Austria, Belgium, Denmark, Netherlands, Switzerland and Sweden) have provided information on costs. From this it is estimated that the engineering cost to all European operators is at least 4.0 million US dollars. The estimate for 1979 was 1.1 million dollars and for 1978 7.7 million, which included the loss of a B737 aircraft.

3.8 AIRCRAFT OPERATORS (see Table 8)

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

CONCLUSIONS

- 4.1 The overall rate for the 1524 strikes reported during this period by European operators is 4.5 strikes per 10,000 movements. This rate is similar to that 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. However, despite considerable variations between types, there is a distinct correlation between strike rate and aircraft size. There is no evidence that the strike rate of executive jet aeroplanes is above that which would be expected for their frontal area. The continued long term collection of statistics may provide fuller information on these aspects.
- 4.3 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.
- 4.4 Gulls (*Larus spp*) were struck more frequently than other birds, being involved in 41% of incidents. Less than 1% of strikes were thought to involve birds of greater than 1.8 kg (4 lb). The application of measures to keep gulls away from aerodromes is therefore of prime importance.
- 4.5 The nose section including windscreen and radome were struck in 47% of incidents, followed by the fuselage with 16%. Approximately 2% of all incidents involved more than one engine.
- 4.6 The major consequence was damage to 91 engines, approximately 1 in 3 of the engine strikes. This was higher than in previous years.
- 4.7 Based on information provided by seven countries, the estimated minimum engineering cost of bird strikes to European airlines was at least 4.0 million US dollars in the year.

Table 1

National Reporting - 1980

(All airlines in each country, reporting world-wide)

Reporting Nation	Number of Incidents World Wide	Number of Movements World Wide	Rate per 10,000 Movements
Austria	21	70,000	3.0
Belgium	22	139,256	1.6
Denmark	51	156,463	3.2
Finland	22 (1)	131,208	1.7
France	134 (9)	477,637	2.8
Germany	307 (4)	487,448	6.4
Italy	171	355,286	4.8
Netherlands	117	197,908	5.9
Sweden	30	163,939	4.9
Switzerland	234	197,218	11.9
United Kingdom	356 (1)	1,016,821	3.5
Total	1524	3,393,184	4.5

- Notes:
- 1.1 Aircraft types with nil strikes are not included.
 - 1.2 The figures in the brackets are strikes for which no movement data is available.
 - 1.3 Helicopters are excluded from this table.
 - 1.4 Table 8 gives a breakdown by airline.

Table 2

Aircraft Type - 1980

Type	Aircraft	Number of Countries Reporting	Number of Incidents	Number of Movements	Rate per 10,000 Movements
JET					
4 engined	McDonnell Douglas DC8	8	49	67,336	7.3
	Boeing 707/720	7	88	147,902	5.9
	Boeing 747	8	68	139,508	4.9
	Concorde	2	1	8,194	1.2
	BAC VC10	1	3	9,052	0.3
	HS Comet 4	1	0	2,606	0.0
	TOTAL			211	374,594
3 engined	McDonnell Douglas DC 10	10	137	128,912	10.6
	Boeing 727	5	162	339,155	4.8
	HS Trident	1	39	136,136	2.9
	Lockheed L1011 Tristar	2	10	39,356	2.5
TOTAL			348	651,559	5.3
2 engined	McDonnell Douglas DC 9	7	373	585,705	6.4
	DAOL Mercure	1	25	43,932	5.7
	A 300 Airbus	6	66	123,858	5.1
	Boeing 737	6	197	449,204	4.4
	VFW 614	1	1	2,500	4.0
	Fokker F27 Fellowship	5	52	148,446	3.5
	Learjet	6	2 (7)	6,222	3.2
	BAC 1-11	2	50	235,298	2.1
	SE 210 Caravelle	3	30	146,987	2.0
	HS 125	2	4	30,540	1.3
	DA 20 Jet Falcon	7	0 (5)	3,853	0.0
	SN 601 Corvette	3	0 (1)	1,872	0.0
	Sabre A75	1	0 (1)	-	-
	Cessna 500 Citation	1	0	2,130	0.0
	TOTAL			800	1,780,554
TURBOPROP					
4 engined	HS Argosy	1	3	2,972	10.1
	BAC Viscount	1	43	96,052	4.5
	DHC Dash 7	2	2	4,748	4.2
	BAC Britannia	1	0	1,466	0.0
	BAC Merchantman	1	0	3,280	0.0
	Canadair CL44	1	0	660	0.0
	Short Belfast	1	0	620	0.0
TOTAL			48	109,798	4.4

Continued overleaf

Table 2

Aircraft Type - 1980 (Continued)

Type	Aircraft	Number of Countries reporting	Number of Incidents	Number of Movements	Rate per 10,000 Movements	
2 engine	Beech 200 Super King Air	1	1	2,448	4.1	
	HS 748	2	21	60,710	3.4	
	Fokker F27 Friendship	7	48	162,588	2.9	
	Short SD 330	1	1	3,446	2.9	
	HP Herald	1	17	88,814	1.9	
	EMB Bandeirante	1	5	62,090	0.8	
	Fairchild FH 227B	1	1	12,818	0.8	
	DHC 6 Twin Otter	2	1	46,162	0.2	
	Nord 262	2	0 (3)	410	0.0	
	Gulfstream 1	1	- (1)	-	-	
	Short Skyvan	1	0	306	0.0	
	Swearingen Metro	1	0	6,340	0.0	
	TOTAL			95	446,132	2.8
PISTON	DH 114 Heron	1	2	1,200	16.7	
	Convair 440	1	1	1,422	7.0	
	DC 3 Dakota	1	1	6,556	1.5	
	TOTAL			4	9,178	4.4
UNKNOWN		1	(43)	-	-	
HELICOPTERS	Sikorsky S76	1	2	3,360	6.0	
	Bell 47	1	1	1,820	5.5	
	Bell 206B	1	1	11,560	0.9	
	Sikorsky S61	1	5	69,438	0.7	
	Westland Wessex	1	0	4,542	0.0	
	SA 330/332 Puma	1	0	4,611	0.0	
	Sikorsky S58T	1	0	297	0.0	
	Unknown	1	1	15,539	0.6	
	TOTAL HELICOPTERS			10	111,167	0.9

Continued overleaf

Table 2A

Summary of Aeroplane Types

	Number of Incidents	Number of Movements	Rate per 10,000 Movements
Jet	1,358	2,806,707	4.8
Turboprop	143	555,930	2.6
Piston	4	9,178	4.4
Unknown	(61)	-	-
TOTAL	1,505	3,371,815	4.5

- 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 available.

Table 3

Aerodromes - 1980

Country/Aerodrome	Number of Incidents	Number of Movements	Rate per 10,000 Movements	Incidents to other European Aircraft	Total Incidents
<u>EUROPEAN AERODROMES</u>					
<u>Austria</u>					
Domestic	11	50,000	2.2		11
Linz				1	1
Salzburg				2	2
Vienna				9	9
<u>Belgium</u>					
Antwerp	2				
Brussels	10			12	22
Ostend					
<u>Czechoslovakia</u>					
Prague				1	1
<u>Denmark</u>					
Aalborg	1	2,579	3.8		1
Copenhagen/Kastrup	19	64,858	2.9	24	43
Odense	1	3,064	3.3		1
Ronne	1	1,178	8.5	2	3
Skydstrup	1	1,795	5.6		1
Thisted	1	1,107	9.0		1
Tirstrup	1	1,907	5.1		1
<u>Finland</u>					
Helsinki	3			1	4
Kuopio	2				2
Lappeenranta	2				2
Mariehamn	6				6
<u>France</u>					
Bastia				1	1
Bâle Mulhouse	3	5,723	5.2		3
Belfort				1	1
Chambery	2	3,455	8.5		2
Clermont Ferrand	3	6,116	4.9		3
St Etienne	2	1,499	13.3		2
Grenoble	2	3,455	5.8		2
Lille	2	9,570	2.1		2
Lourdes	2	1,137	17.6	2	4
Lyon	17	40,765	4.2		17
Marseilles	5	36,028	1.4		5
Montpellier	4	7,573	5.3		4
Nice	8	28,144	2.8	2	10
Paris Le Bourget	3	13,542	2.2		3
Paris Charles De Gaulle	7	65,262	1.1	5	12
Paris Orly	19	107,924	1.8	19	38
Pau/Pont - Long Uzein	2	4,257	4.7		2
Toulouse - Blagnac	11	16,569	6.6		11

Table 3 Aerodromes - 1980 (Continued)

Country/Aerodrome	Number of Incidents	Number of Movements	Rate per 10,000 Movements	Incidents to other European Aircraft	Total Incidents
<u>Germany (FRG)</u>					
Berlin				1	1
Bremen	12			1	13
Cologne	7			2	9
Dusseldorf	31			4	35
Frankfurt	53				53
Hamburg	27			1	28
Hannover	6				6
Munich	21			3	24
Nuremberg	3				3
Stuttgart	7			1	8
<u>Germany (GDR)</u>					
Leipzig	1				1
<u>Greece</u>					
Athens				4	4
Corfu				2	2
Heraklion				1	1
Rhodes				1	1
<u>Italy</u>					
Catania	2			1	3
Genoa	1			9	10
Milan (Lin)	11			16	27
Naples	4			1	5
Rome (Leonardo)	23			6	29
Turin				1	1
Venice	8			4	12
Verona				1	1
Villafranca				1	1
Milan (MAL)	4				4
Pisa	6				6
Alghero	2				2
Trieste	2				2
<u>Ireland</u>					
Cork				3	3
Dublin				4	4
<u>Netherlands</u>					
Amsterdam	49	73,670	6.6	7	56
Deventer	1	2,006	5.0		1
Eindhoven	1	8,590	1.2		1
Groningen	0	2,031	0.0		0
Maastricht	2	3,126	6.4		2
Rotterdam	3	6,410	4.7		3

Continued overleaf

Table

Norw
Berg
Bode
Oel
Sta
Tro
Pol
war
Por
Lis
Spa
Ali
Bar
Ibi
Mac
Mah
Mal
Pa
Por
Re
Se
Te
Sw
An
Go
Ha
Jo
Ma
Ro
St
St
Su
UM
Va
Vi
Sw
Ba
Ge
Zu
Tu
An
Is

Table 3

Aerodromes - 1980 (Continued)

Country/Aerodrome	Number of Incidents	Number of Movements	Rate per 10,000 Movements	Incidents to other European Aircraft	Total Incidents
<u>Norway</u>					
Bergen				2	2
Bodo				1	1
Oslo-Fornebu				2	2
Stavanger				5	5
Tromso				4	4
<u>Poland</u>					
Warsaw				1	1
<u>Portugal</u>					
Lisbon				5	5
<u>Spain</u>					
Alicante				2	2
Barcelona				9	9
Ibiza				4	4
Madrid				3	3
Mahon				2	2
Malaga				7	7
Palma				11	11
Porto Santo				2	2
Reus				1	1
Seville				1	1
Tenerife				2	2
<u>Sweden</u>					
Angelholm	4	3,600	11.1		4
Goteborg/Landvetter	7	32,400	2.2	3	10
Halmstad	2	3,200	6.3		2
Jonkoping	2	7,400	2.7		2
Malmo/Sturut				1	1
Ronneby	2	2,900	6.9		2
Stockholm/Arlanda	10	69,800	1.4	4	14
Stockholm/Bromma	15	45,100	3.5		15
Sundvall/Harnosand	2	5,900	3.4		2
UMEA	2	8,900	2.3		2
Vaxjo/Kronoberg	3	4,200	7.1		3
Visby	2	8,100	2.5		2
<u>Switzerland</u>					
Basle	21	10,447	20.1		21
Geneva	26	37,204	6.9	7	33
Zurich	64	58,269	10.9	9	73
<u>Turkey</u>					
Ankara					6
Istanbul					14

Continued overleaf

Table 3

Aerodromes - 1980 (Continued)

Country/Aerodrome	Number of Incidents	Number of Movements	Rate per 10,000 Movements	Incidents to other European Aircraft	Total Incidents
<u>United Kingdom</u>					
Aberdeen	10	77,378	1.3		10
Belfast-Aldegrove	21	27,135	7.7		21
Benbecula	1				1
Biggin Hill	1				1
Birmingham	18	27,933	6.4		18
Blackpool	1			1	19
Bournemouth-Hurn	4	13,782	2.9		4
Bristol-Filton	1				1
Bristol-Lulsgate	5	5,772	8.7		5
Brize Norton	1				1
Cambridge		4,086			
Cardiff-Wales	6	9,188	6.5		6
East Midlands	11	17,982	6.1		11
Edinburgh	12	27,565	4.3		12
Exeter	7	6,435	10.9		7
Gatwick	9	99,143	0.9	1	10
Glasgow	9	48,477	1.8		9
Heathrow	15	149,895	1.0	9	24
Inverness	5	10,024	5.0		5
Kirkwall	1				1
Leeds-Bradford	4	13,164	3.0		4
Liverpool	7	21,060	3.3		7
Lossiemouth	1				1
Luton	7	26,508	2.6		7
Manchester	9	46,339	1.9	4	13
Newcastle	13	17,093	7.6		13
Norwich	3	15,566	1.9		3
Prestwick	4	14,465	2.7		4
Ronaldsway-I.O.M.	9	14,670	6.1		9
Scatza	1				1
Stansted	3	10,677	2.8	1	4
St Marys	1				1
Tees-side	3	12,545	2.4		3
Wick	1				1
Oil rigs	4				4
<u>USSR</u>					
Moscow				4	4
En route					67
Unknown					11

Continued overleaf

List of Aerodromes where (more than one) strikes have been reported by European Operators

OTHER AERODROMES

Bangkok (Thailand)	13	Panama (Panama)	4
New York (U.S.)	12	Ahuas (Honduras)	3
Delhi (India)	10	Barbados	3
Dakar (Senegal)	9	Chicago (U.S.)	3
Bombay (India)	8	Guernsey (UK)	3
Jersey (UK)	7	Kano (Nigeria)	3
Gibraltar	6	Mombasa (Kenya)	3
Lagos (Nigeria)	6	Teheran (Iran)	3
Accra (Ghana)	5	Rio De Janeiro (Brazil)	3
Algiers (Algerie)	5	Entebbe (Uganda)	2
Banjul (Gambia)	5	Hongkong	2
Nairobi (Kenya)	5	Karachi (Pakistan)	2
Baghdad	4	Kinshasa (Zaire)	2
Kuwait	4	Lima (Peru)	2
Malta	4	Sao Paulo (Brazil)	2

Single Strikes

95

Note: 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.

Table 4

Bird Species - 1980

Scientific Name	English Name	Weight/ Weight Category in gms	Weight Cate- gory	Number of Inci- dents	% Based on 823
<u>Anseriformes</u>					
Anas sp.	Duck	900	B	2	0.2
Anser sp.	Goose	3000	C	1	0.1
Cygnus olor	Mute swan	10000-18000	D	1	0.1
<u>Apodiformes</u>					
Apus apus	Swift	40	A	10	1.2
<u>Charadriiformes</u>					
Charadrius hiaticula	Ringed plover	55	A	1	0.1
Charadrius sp.	Plover	55	A	1	0.1
Haematopus ostralegus	Oyster catcher	550	B	3	0.4
Larus argentatus	Herring gull	1100	B	20	2.4
Larus canus	Common gull	400	B	8	1.0
Larus fuscus	Lesser black-backed gull	1000	B	3	0.4
Larus marinus	Great black-backed gull	1800	B	3	0.4
Larus ridibundus	Black headed gull	300	B	63	7.7
Larus sp.	Gull	1000	B	240	29.2
Numenius arquata	Curlew	800	B	1	0.1
Philomachus pagnux	Ruff	1000	B	1	0.1
Pluvialis apricaria	Golden plover	200	B	4	0.5
Vanellus indicus	Red-wattled lapwing	300	B	1	0.1
Vanellus vanellus	Lapwing	250	B	99	12.0
<u>Ciconiiformes</u>					
Ardea cinerea	Grey heron	1800	B	4	0.5
Ardea sp.	Heron	1800	B	2	0.2
Bubulcus ibis	Cattle egret	340	B	1	0.1
<u>Columbiformes</u>					
Columba livia	Rock dove	250	B	3	0.4
Columba livia var	Racing pigeon	480	B	5	0.6
Columba oenas	Stock dove	250	B	4	0.5
Columba palumbus	Wood pigeon	450	B	19	2.3
Columba sp.	Pigeon	450	B	30	3.6
<u>Falconiformes</u>					
Accipiter nisus	Sparrow hawk	200	B	1	0.1
Aegypius monachus	Black vulture	7000	D	2	0.2
Aquila chrysaetos	Golden eagle	3800	D	1	0.1
Aquila sp.	Eagle	4000	D	1	0.1
Buteo buteo	Buzzard	880	B	33	4.0
Falco sp.	Falcon	800	B	15	1.8
Falco tinnunculus	Kestrel	200	B	8	1.0
Gyps bengalensis	Vulture	7000	D	1	0.1
Haliastur indus	Brahminy kite	780	B	1	0.1
Milvus migrans	Black kite	1000	B	5	0.6
Milvus milvus	Kite	1000	B	5	0.6
Pandion haliaetus	Osprey	1500	B	1	0.1
	Hawk	Up to 1000	B	7	0.9

Table 4

Scientific Name	Weight/ Weight Category in gms	Weight Cate- gory	Number of Inci- dents	% Based on 823
<u>Galliformes</u>				
Lyrurus tetrix				
Perdix perdix				
<u>Gruiformes</u>				
Grus grus				
<u>Passiformes</u>				
Alauda arvensis				
Corvus frugilegus				
Corvus corax				
Corvus corax				
Corvus sp.				
Delichon urbicum				
Hirundo rustica				
Passer domesticus				
Riparia riparia				
Sturnus vulgaris				
Turdus merula				
<u>Strigiformes</u>				
Asio otus				
Athene noctua				
Strix sp.				
Tyto alba				
<u>Chiroptera</u>				
-				
TOTAL KNOWN				
TOTAL UNKNOWN				
TOTAL				

Notes: 4.1

4.2

4.3

4.4

Table 4

Bird Species - 1980 (Continued)

Scientific Name	English Name	Weight/ Weight Category in gms	Weight Cate- gory	Number of Inci- dents	% Based on 823
<u>Galliformes</u>					
Lyrusus Tetrix	Black grouse	1100	B	1	0.1
Perdix perdix	Partridge	350	B	6	0.7
<u>Gruiformes</u>					
Grus grus	Crane	5500	D	2	0.2
<u>Passiformes</u>					
Alauda arvensis	Skylark	40	A	3	0.4
Corvus frugilegus	Rook	475	B	5	0.6
Corvus corone	Carrion crow	550	B	2	0.2
Corvus corone cornix	Hooded crow	550	B	1	0.1
Corvus sp.	Crow	550	B	7	0.9
Delichon urbica	House martin	20	A	3	0.4
Hirundo rustica	Swallow	20	A	119	14.4
Passer domesticus	Sparrow	30	A	25	3.0
Riparia riparia	Sand martin	20	A	1	0.1
Sturnus vulgaris	Starling	85	A	17	2.1
Turdus merula	Black bird	95	A	8	1.0
<u>Strigiformes</u>					
Asio otus	Long eared owl	300	B	1	0.1
Athene noctua	Little owl	170	B	1	0.1
Strix sp.	Owl	170-380	B	3	0.4
Tyto alba	Barn owl	330	B	4	0.5
<u>Chiroptera</u>					
-	Bat		A	3	0.4
TOTAL KNOWN				823	100
TOTAL UNKNOWN				766	
TOTAL				1589	

- Notes: 4.1 Bird weights and Scientific Names are based on information supplied by Aviation Unit, Worplesdon Laboratory, Agricultural Science Service, MAFF, Worplesdon, England and the average weight has been assumed.
- 4.2 The bird Categories based on current Civil Airworthiness requirements are:-
- A below 110 g ($\frac{1}{4}$ lb)
 B 110 g to 1.81 kg ($\frac{1}{4}$ 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 - 1980

	Number of Strikes by Bird Weight Category					% Based on 1637
	Unknown	A	B	C&D	Total	
Fuselage	87	42	139		268	16.4
Nose (excluding radome and windscreen)	146	66	129	1	342	20.9
Radome	76	29	61		166	10.1
Windscreen	118	52	89		259	15.8
1 engine struck	85	20	123	5	233	14.2
2 engines out of 3 struck	2		4		6	0.4
2 engines out of 4 struck	3		9		12	0.8
All engines struck	1	1	7		9	0.6
Wing/Rotor	61	19	136	1	217	13.2
Propellor	1	1	8		10	0.6
Landing gear	25	6	66	1	98	6.0
Empennage/Tail	2	5	10		17	1.0
Part Unknown	57	22	122	1	202	
TOTAL	664	263	903	9	1,839	

- 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.

Table 6

Effect of Strike - 1980

Effect	Number of Strikes by Bird Weight Category					% Based on 1560
	Unknown	A	B	C&D	Total	
Loss of life/aircraft					0	
Flight crew injured					0	
Engine damage requiring repair on:-						
2 engined aircraft	7	1	31	1	40	2.6
others	24		23	4	51	3.3
Windscreen cracked/broken	1		2		3	0.2
Radome changed	4		3		7	0.3
Deformed structure	4	1	17		22	1.4
Skin torn/light glass broken	5	2	14		21	1.4
Skin dented	10	1	24		35	2.2
Propeller/rotor transmission damaged	1		1		2	0.1
Aircraft system lost	5	1	8		14	0.9
Take-off abandoned	1		1		2	0.1
Nil damage	704	173	482	4	1363	87.4
Unknown		12	17		29	
TOTAL	766	191	623	9	1589	99.9

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.

Table 7

Cost - 1980

	Aircraft Movements	Cost (US Dollars)
Where cost is known	943,731	1,237,961
Where cost is unknown	2,449,453	-
LIKELY TOTAL COST	3,393,184	4,450,000

Notes: 7.1 The known cost is the engineering cost from six countries

Table

<u>Au</u>
<u>Fi</u>
<u>Fr</u>
<u>It</u>
<u>Ne</u>
<u>Sw</u>
<u>Sv</u>

Table 8

Aircraft Operators Reporting Strikes - 1980

Operator	Number of Strikes	Number of Movements	Rate per 10,000 Movements
<u>Austria</u>			
Austrian Airlines)	16	60,000	2.7
Austrian Air Transport)			
Montana Austria	1	4,000	2.5
Tyrolean Air	2	2,000	10.0
Lauda Air	-	2,000	-
Air Charter Austria	2	2,000	10.0
<u>Belgium</u>			
Sabena	14	82,200	1.7
Sobelair	1	12,984	0.8
Trans European Airways	6	17,630	3.4
Delta Air Transport	1	12,818	0.8
Air Belgium	0	2,024	-
C.E.R.	0	1,724	-
Unijet	0	894	-
Hessenatie	0	400	-
Abelag Airways	0	2,242	-
European Air Transport	0	6,340	-
<u>Finland</u>			
Finnair	23	-	-
<u>France</u>			
Air France	38	250,560	1.5
Air Inter	72	162,540	4.4
U.T.A.	6	32,000	1.9
Air Alpes	5	-	-
T.A.T.	4	27,560	1.5
Air Alsace	2	5,000	4.0
<u>Italy</u>			
Alitalia/Aerinti	171	355,286	4.8
<u>Netherlands</u>			
K.L.M.	83	116,226	7.1
N.L.M.	21	62,942	3.3
Martin Air	2	9,216	2.2
Transavia	11	9,524	11.5
<u>Sweden</u>			
S.A.S.	43	75,591	5.7
Lineflyg AB	37	89,796	4.1
Rikspolisstyrelsen	1	10,685	0.9
Laplandflyg	1	1,110	9.0
Ostermans	0	7,250	-
<u>Switzerland</u>			
Swissair	234	197,218	11.9

Continued overleaf

Table 8

Aircraft Operators Reporting Strikes - 1980 (Continued)

Operator	Number of Strikes	Number of Movements	Rate per 10,000 Movements
<u>United Kingdom</u>			
Air Europe	5	12,344	4.0
Air Ecosse	3	7,492	4.0
Air UK	35	131,704	2.7
Air Bridge	4	6,252	6.4
Bristow Helicopters	3	63,996 Hrs	0.7
Britannia	40	62,436	6.4
British Airways	117	410,220	2.8
British Airways Helicopters	4	31,861 Hrs	1.3
British Caledonian	32	78,554	4.1
British Cargo	1	1,290	7.8
British Midland Airways	30	65,356	4.6
Brymon	3	20,386	1.5
Dan-Air	43	115,712	3.7
Fairflight	1	-	-
Gibraltar Airways	3	-	-
Jersey European	2	6,574	1.5
Laker	11	22,884	4.8
Lease Air	1	-	-
Monarch	5	18,990	2.6
Orion	5	9,860	5.1
Pelican	1	1,410	7.1
Private Operators	7	-	-
Tradewinds	2	4,122	4.8
Vernair	1	-	-
Unknown	47	-	-

Note: 8.1 Leased aircraft are included against the Operators

er
00
ts

