

MILITARY AIRCRAFT
BIRD STRIKE ANALYSIS
1983-1984

Compiled by:

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MILITARY AIRCRAFT BIRDSTRIKE ANALYSIS - 1983/1984

INTRODUCTION

1. Five countries contributed data for the years 1983-84, a modest improvement in reporting over the previous 3 analyses. The following table shows a record of contributions to analyses since 1979:

	79	80	81	83	86
Belgian Air Force (BAF)	X	X	-	-	X
Royal Danish Air Force (RDAF)	X	X	X	X	X
French Air Force (EMAA)	(X)	-	-	-	-
German Air Force (GAF)	X	-	X	X	X
Royal Norwegian Air Force (RNoAF)	X	-	-	-	-
Royal Air Force (RAF)	X	X	X	X	X
Swedish Air Force (SAF)	X	-	X	X	X
United States Air Force (Europe) (USAF(E))	(X)	X	-	-	-
Total	6	4	4	4	5

2. Those contributions indicated as (X) denote that they were in an unusable format. One of the contributions for this report contained insufficient data to be included in Tables 7A, Effect of Strike which are, therefore, based on returns from 4 countries.

3. The small number of contributions, when compared with the number of countries participating in BSCE, may indicate that the usefulness of this report in its present format is in doubt.

BIRD SPECIES

4. Analysis of Tables 3 shows that the birds most commonly involved in strikes are Gull sp, Lapwing, Hirundinidae and Columbiformes. Annex A shows the trends for these birds from 1978-84. Both Lapwings and Gulls show a progressive decline from 1980-83 but this trend has been reversed in 1984. Hirundinidae have been increasingly involved in strikes up to 1982 and remained at about the same percentage for the next 2 years. In contrast, the percentage of strikes involving Columbiformes has varied over the years but shows a marked decrease in 1984 compared with previous years.

5. Tables 3, for the first time, contain details of those strikes which caused damage for each bird type. The birds identified in the previous paragraph are responsible for considerable damage, the heavier birds more than the lighter Hirundinidae. Also of note, with fewer strikes but a high proportion of damaging strikes, is the Buzzard, the trend for which is also shown at Annex A. It is evident that the heavier birds are more likely to cause damage, for example, Gull strikes in 1983-84 total 326 with 167 causing damage;

Skylarks were struck 67 times during the same period but only 3 caused damage.

6. An average of 43% of birds involved in strikes were identified during 1977-80. In 1981 the percentage fell to 30%. From 1982-84 an average of 39% were identified.

PART OF AIRCRAFT STRUCK AND EFFECTS

7. Four aircraft were lost in 1983-84. All were as a result of bird ingestion causing loss of engine power. All crew injuries involved with these losses were as a result of ejection. A further major injury was caused to a pilot when a Mallard penetrated a windscreen causing a major eye injury. The aircraft was recovered by the pilot, aided by the navigator.

8. Of the parts of the aircraft struck, engines showed a significant increase between 1979-82 but this levelled off in 1983 and reduced in 1984. This is illustrated at Annex B. Reported premature single engine changes over the same period varied significantly and did not follow the trends in single engine strikes. Also at Annex B is the percentage of windscreens struck, in 1984 at its lowest level since 1979. But over the period 1979-84 there is no definable improvement in the ratio between windscreens struck and windscreens cracked/broken. Reported damage of a minor nature, dents, continued to rise. More major damage, illustrated by structural deformation has, after peaking in 1981, recovered to close to the levels of 1979. Birdstrikes causing no damage continued, as in past years, to be about $\frac{2}{3}$ of the totals reported.

TABLE 3 - BIRD SPECIES

1983

COMMON NAME	LATIN NAME	AVERAGE WEIGHT	CATEGORY	STRIKES (DAMAGE)	% BASED ON 668
Gull (Various)	Laridae	120-1690	B	89(50)	13.3
Swift	Apus apus	41	A	61(16)	9.1
Lapwing	Vanellus vanellus	215	B	49(16)	7.3
Swallow/Martin	Hirundinidae	13-19	A	44(5)	6.5
Skylark	Alauda arvensis	39	A	39(2)	5.8
Pigeons (Various)	Columbidae	40-465	A/B	36(17)	5.4
Passeriformes	-	6-1105	A/B	30(8)	4.5
Herring Gull	Larus argentatus	1020	B	23(15)	3.4
Woodpigeon	Columba palumbus	465	B	21(11)	3.1
Starling	Sturnis vulgaris	80	A	20(7)	3.0
Chaffinch	Fringilla colebs	23	A	20(5)	3.0
Racing Pigeon	Columba livia var	393	B	19(9)	2.8
Black-headed Gull	Larus ridibundus	275	B	19(4)	2.8
Buzzard	Buteo buteo	800	B	15(13)	2.2
Crow (Various)	Corvidae	234-1105	B	15(9)	2.2
Common Gull	Larus canus	420	B	12(2)	1.8
House Martin	Delichon urbica	17	A	10(1)	1.5
Wader	-	22-770	A/B	10(5)	1.5
Buzzard (Various)	Buteo sp	785-1350	B	10(5)	1.5
Sparrow	Passer sp	20-32	A	8(0)	1.2
Kestrel	Falco tinnunculus	204	B	7(1)	1.0
Fieldfare	Turdus pilaris	99	A	6(3)	0.9
Rook	Corvus frugilegus	430	B	6(2)	0.9
Redpoll	Carduelis flammea	12	A	5(1)	0.7
Thrush	Turdidae	67-131	A/B	5(1)	0.7
Oystercatcher	Haematopus ostralegus	500	B	5(2)	0.7
Redwing	Turdus iliacus	67	A	4(1)	0.6
Mallard	Anas platyrhynchos	1080	B	4(3)	0.6
Duck	Antidae	324-2040	B/C	4(4)	0.6
Partridge	Perdix perdix	400	B	3(0)	0.4
Golden Plover	Pluvialis apricaria	185	B	3(3)	0.4
Song Thrush	Turdus philomelos	73	A	2(1)	0.3
Lark (Various)	Alaudidae	21-60	A	2(0)	0.3
Greenfinch	Carduelis chloris	29	A	2(0)	0.3
Yellowhammer	Emberica citrinella	27	A	2(0)	0.3
Pied Wagtail	Motacilla alba	23	A	2(0)	0.3
Great Tit	Parus major	19	A	2(0)	0.3
Meadow Pipit	Anthus pratensis	18	A	2(0)	0.3
Siskin	Carduelis spinus	14	A	2(1)	0.3
Plover	Charadriidae	34-280	A/B	2(1)	0.3
Falcon	Falconidae	105-1300	A/B	2(1)	0.3
Great B-backed Gull	Larus marinus	1690	B	2(2)	0.3
Grey Heron	Ardea cinerea	1500	B	2(1)	0.3
Hawk	Accipitridae	150-1026	B	2(0)	0.3
Grey Plover	Pluvialis squatarola	200	B	2(1)	0.3
Sparrowhawk	Accipiter nisus	190	B	2(0)	0.3
Snipe	Gallinago gallinago	125	B	2(0)	0.3
Greylag Goose	Anser anser	3325	C	2(2)	0.3
Gannet	Sula bassana	2900	C	2(2)	0.3
Blackbird	Turdus merula	106	A	1(0)	0.1
Cuckoo	Cuculus canorus	106	A	1(1)	0.1
Snow Bunting	Plectrophenax nivalis	35	A	1(0)	0.1
Brambling	Fringilla montifringilla	24	A	1(1)	0.1
Hedge Sparrow	Prunella modularis	21	A	1(0)	0.1

COMMON NAME	LATIN NAME	AVERAGE WEIGHT	CATEGORY	STRIKES (DAMAGE)	% BASED ON 668
Linnet	Carduelis cannabina	19	A	1(0)	0.1
Robin	Erithacus rubecula	18	A	1(0)	0.1
Coal Tit	Parus ater	9	A	1(0)	0.1
Tern	Sternus sp	45-570	A/B	1(0)	0.1
Pheasant	Phasianus colchicus	1100	B	1(0)	0.1
Kite	Milvus sp	240-1020	B	1(0)	0.1
Pintail	Anas acuta	840	B	1(1)	0.1
Goldeneye	Bucephala clangula	830	B	1(1)	0.1
Honey Buzzard	Pernis apivorus	785	B	1(1)	0.1
Marsh Harrier	Circus aeruginosus	630	B	1(0)	0.1
Hooded Crow	Corvus corone	530	B	1(0)	0.1
R-legged Partridge	Alectoris rufa	450	B	1(1)	0.1
Kittiwake	Rissa tridactyla	390	B	1(1)	0.1
Cattle Egret	Bubulcus ibis	345	B	1(1)	0.1
Woodcock	Scolopax rusticola	304	B	1(0)	0.1
L-eared Owl	Asio otus	273	B	1(1)	0.1
Jackdaw	Corvus monedula	234	B	1(1)	0.1
Magpie	Pica pica	220	B	1(1)	0.1
Ruff	Philomachus pugnax	139	B	1(0)	0.1
Turnstone	Arenaria interpres	112	B	1(0)	0.1
Owl	Strigiforme	66-2813	A-C	1(1)	0.1
Canada Goose	Branta canadensis	3600	C	1(1)	0.1
Cormorant	Phalacrocorax carbo	2430	C	1(0)	0.1
Goose	Anser/Branter sp	324-10K	B-D	1(1)	0.1
Vulture	Accipitridae	1880-9360	C/D	1(1)	0.1
Unknown				1065	
Total				1733	97.6

Notes:

3.1 Bird weights and Latin names can be obtained from Average Bird Weights by T Brough, July 1983. Unless there is positive evidence to the contrary the AVERAGE weight should be assumed.

3.2 The bird Categories, based on current Civil Airworthiness requirements are:

CAT A below .11kg ($\frac{1}{4}$ lb)
CAT B .11kg to 1.81kg ($\frac{1}{4}$ to 4lb)
CAT C over 1.81kg to 3.63kg (4lb to 8lb)
CAT D over 3.63kg (8lb)

3.3 Those birds not positively identified should be tabled as unknown.

3.4 Large (Cat C or D) birds are often not positively identified, but the Category these are assumed to be in should be stated.

3.5 Percentages should be based on the total of identified birds.

3.6 Table 3 could be repeated restricted to own country only.

TABLE 7 PART OF AIRCRAFT STRUCK

1983

PART	WEIGHT UNKNOWN	CAT A	CAT B	CAT C & D	TOTAL	% BASED ON 1578
Nose (excluding radome and windscreen)	103	17	47	-	167	9.6
Radome	77	12	32	-	121	7.0
Windscreen	230	40	43	-	313	18.0
Fuselage (excluding the above)	189	40	80	3	312	18.0
Engine:-						
1 engine struck	225	80	99	1	405	23.3
2 out of 3 struck	-	-	-	-	-	-
2 out of 4 struck	-	-	-	-	-	-
3 out of 4 struck	-	-	-	-	-	-
all struck (on multi-engined aircraft)	-	-	7	1	8	0.5
Wing + Air Intakes	106	22	82	3	213	12.3
Rotor/Propeller	21	8	13	-	42	2.4
Landing Gear	27	12	20	1	60	3.5
Empennage	20	2	14	2	38	2.2
Underwing Stores/Tanks	37	4	16	-	57	3.3
Part Unknown	66	8	26	-	100	-
TOTAL	1101	245	479	11	1836	100.1

NOTES:-

- 7.1 The Total in Table 7 and 7A may be higher than other tables, as one bird can strike several parts.
- 7.2 The percentages should be based on incidents where the part struck is known.
- 7.3 Multiple strikes should be counted as one strike unless, for example, both wings or both landing gears are struck, when two incidents should be recorded.

EFFECT	WEIGHT UNKNOWN	CAT A	CAT B	CAT C	CAT D	TOTAL	% BASED ON 1474
Loss of Aircraft	1	-	1	-	-	2	0.1
Flight Crew Injury							
Major	1	-	1	-	-	2	0.1
Minor	1	-	1	-	-	2	0.1
Slight							
Premature Engine Change:-							
on single engined A/C	26	3	16	1	-	46	2.7
1 on a 2 engined A/C	18	2	19	-	-	39	2.3
1 on a 3 engined A/C	-	-	-	-	-	-	-
1 on a 4 engined A/C	1	-	-	-	-	1	0.1
2 on a 3 engined A/C	-	-	-	-	-	-	-
2 on a 4 engined A/C	-	-	-	-	-	-	-
3 on a 4 engined A/C	-	-	-	-	-	-	-
all engines on a multi	-	-	1	-	-	1	0.1
Windscreen Cracked/Broken	26	3	9	-	-	38	2.2
Radome Changed	15	2	13	-	-	30	1.8
Deformed Structure	17	2	16	-	-	35	2.1
Skin Torn	40	9	25	4	1	79	4.7
Skin Dented	114	18	79	1	2	214	12.7
Propeller/Rotor Damaged	1	1	-	-	-	2	0.1
Aircraft System Lost	3	-	1	2	1	7	0.4
Underwing Stores/Tanks Damaged	25	2	11	-	-	38	2.2
Miscellaneous	19	4	18	1	-	42	2.5
Nil Damage	730	184	198	1	-	1113	65.8
Unknown	6	-	4	-	-	10	-
TOTAL	1044	230	413	10	4	1701	100

NOTES:

7A.1 Multiple strikes should be counted as one strike unless, for example, both wings are damaged or both windscreens are broken, in which case two incidents should be recorded.

7A.2 Definition of Injury requiring medical treatment:

 Major - causing absence of 21 days or over.

 Minor - causing absence of 7 to 21 days.

 Slight - injury not in above 2 categories.

7A.3 Injuries as a consequence of a strike, eg ejection injuries should be included.

7A.4 Aircraft system lost includes, for example, electrical, hydraulic, brake, air conditioning, de-icing.

TABLE 3 - BIRD SPECIES

1984

COMMON NAME	LATIN NAME	AVERAGE WEIGHT	CATEGORY	STRIKES (DAMAGE)	% BASED ON 647
Gull (Various)	Laridae	120-1690	B	107(64)	16.5
Swift	Apus apus	41	A	56(16)	8.7
Lapwing	Vanellus venellus	215	B	55(15)	8.5
Swallow/Martin	Hirundinidae	13-19	A	44(9)	6.8
Black-headed Gull	Larus ridibundus	275	B	41(8)	6.3
Passeriforme	-	6-1105	A/B	36(10)	5.6
Starling	Sturnis vulgaris	80	A	28(8)	4.3
Skylark	Alauda arvensis	39	A	28(1)	4.3
Pigeons (Various)	Columbidae	40-465	A/B	23(16)	3.6
Herring Gull	Larus argentatus	1020	B	17(11)	2.6
Buzzard	Buteo buteo	800	B	17(13)	2.6
Woodpigeon	Columba palumbus	465	B	14(7)	2.2
House Martin	Delichon urbica	17	A	13(1)	2.0
Common Gull	Larus canus	420	B	13(8)	2.0
Buzzard (Various)	Buteo sp	785-1350	B	11(4)	1.7
Racing Pigeon	Columba livia var	393	B	11(4)	1.7
Thrush	Turdidae	67-131	A/B	8(3)	1.2
Partridge	Perdix perdix	400	B	8(2)	1.2
Redwing	Turdus iliacus	67	A	6(1)	0.9
Meadow Pipit	Arthus pratensis	18	A	6(2)	0.9
Fieldfare	Turdus pilaris	99	A	5(1)	0.8
Kestrel	Falco tinnunculus	204	B	5(1)	0.8
Rook	Corvus frugilegus	430	B	5(2)	0.8
Sparrow	Passer sp	20-32	A	4(1)	0.6
Chaffinch	Fringilla colebs	23	A	4(1)	0.6
Wader	-	22-770	A/B	4(4)	0.6
Golden Plover	Pluvialis apricaria	185	B	4(3)	0.6
Brambling	Fringilla montifringilla	24	A	3(0)	0.5
Linnet	Carduelis cannabina	19	A	3(0)	0.5
Sand Martin	Delichon urbica	17	A	3(0)	0.5
Plover	Charadriidae	34-280	A/B	3(1)	0.5
Crow (Various)	Corvidae	234-1105	B	3(3)	0.5
Pheasant	Phasianus colchicus	1100	B	3(1)	0.5
Oystercatcher	Haematopus ostralegus	500	B	3(0)	0.5
Sparrowhawk	Accipiter risus	190	B	3(2)	0.5
Dunlin	Calidris alpina	50	A	2(1)	0.3
Lark (Various)	Alaudidae	21-60	A	2(0)	0.3
Yellowhammer	Emberica citrinella	27	A	2(0)	0.3
Owl	Strigiforme	66-2813	A-C	2(0)	0.3
Great B-backed Gull	Larus marinus	1690	B	2(2)	0.3
Kite	Milvus sp	240-1020	B	2(1)	0.3
Mallard	Anas platyrhynchos	1080	B	2(2)	0.3
Goose	Anser/Branter sp	324-10K	B-D	2(1)	0.3
Stork	Ciconia ciconia	3400	C	2(2)	0.3
G spotted Woodpecker	Dendrocopos major	80	A	1(0)	0.2
Song Thrush	Turdus philomelos	73	A	1(0)	0.2
Shrike	Lanius sp	27-62	A	1(0)	0.2
Ringed Plover	Charadrius hiaticula	54	A	1(0)	0.2
Sandpiper	Actitis hypoleucos	45	A	1(1)	0.2
Greenfinch	Carduelis chloris	29	A	1(0)	0.2
Pied Wagtail	Motacilla alba	23	A	1(0)	0.2
Tree Pipit	Anthus trivialis	22	A	1(0)	0.2
Dunnock	Prunella modularis	21	A	1(0)	0.2
Yellow Wagtail	Motacilla flava	17	A	1(0)	0.2

COMMON NAME	LATIN NAME	AVERAGE WEIGHT	CATEGORY	STRIKES (DAMAGE)	% BASED ON 647
Black Redstart	Phoenicurus ochruros	16	A	1(0)	0.2
Lesser Whitethroat	Sylvia communis	12	A	1(0)	0.2
Falcon	Falconidae	105-1300	A/B	1(0)	0.2
Tern	Sternus sp	45-570	A/B	1(0)	0.2
Grey Heron	Ardea cinerea	1500	B	1(1)	0.2
Rough-legged Buzzard	Buteo lagopus	985	B	1(0)	0.2
Goldeneye	Bucephala clangula	830	B	1(1)	0.2
Lesser B-backed Gull	Larus fuscus	820	B	1(1)	0.2
Curlew	Numerius arquata	770	B	1(1)	0.2
Carrion Crow	Corvus corone	530	B	1(1)	0.2
Red-legged Partridge	Alectoris rufa	450	B	1(0)	0.2
Puffin	Fratercula arctica	425	B	1(0)	0.2
Woodcock	Scolopax rusticola	304	B	1(1)	0.2
Moorhen	Gallinula chloropus	300	B	1(0)	0.2
L-eared Owl	Asio otus	273	B	1(0)	0.2
Red-footed Falcon	Falco vespertinus	155	B	1(0)	0.2
Snipe	Gallinago gallinago	125	B	1(1)	0.2
Duck	Anatidae	324-2040	B/C	1(1)	0.2
Greylag Goose	Anser anser	3325	C	1(1)	0.2
Gannet	Sula bassana	2900	C	1(0)	0.2
Cormorant	Phalacrocorax carbo	2430	C	1(1)	0.2
S Giant Petrel	Macronectes giganteus	4400	D	1(1)	0.2
Unknown				907	
Total				1554	101.5

Notes:

3.1 Bird weights and Latin names can be obtained from Average Bird Weights by T Brough, July 1983. Unless there is positive evidence to the contrary the AVERAGE weight should be assumed.

3.2 The bird Categories, based on current Civil Airworthiness requirements are:

- CAT A below .11kg ($\frac{1}{4}$ lb)
- CAT B .11kg to 1.81kg ($\frac{1}{4}$ to 4lb)
- CAT C over 1.81kg to 3.63kg (4lb to 8lb)
- CAT D over 3.63kg (8lb)

3.3 Those birds not positively identified should be tabled as unknown.

3.4 Large (Cat C or D) birds are often not positively identified, but the Category these are assumed to be in should be stated.

3.5 Percentages should be based on the total of identified birds.

3.6 Table 3 could be repeated restricted to own country only.

TABLE 7 PART OF AIRCRAFT STRUCK

1984

PART	WEIGHT UNKNOWN	CAT A	CAT B	CAT C & D	TOTAL	% BASED ON 1578
Nose (excluding radome and windscreen)	118	19	48	-	185	11.7
Radome	74	8	27	-	109	6.9
Windscreen	139	50	35	-	224	14.2
Fuselage (excluding the above)	148	36	67	3	254	16.1
Engine:-						
1 engine struck	171	52	100	2	325	20.6
2 out of 3 struck	-	-	-	-	-	-
2 out of 4 struck	-	-	2	-	2	0.1
3 out of 4 struck	-	-	-	-	-	-
all struck (on multi-engined aircraft)	2	2	3	-	7	0.4
Wing + Air Intakes	126	36	80	1	243	15.4
Rotor/Propeller	16	4	18	-	38	2.4
Landing Gear	33	11	36	-	80	5.1
Empennage	24	4	25	-	53	3.4
Underwing Stores/Tanks	34	4	19	1	58	3.8
Part Unknown	43	13	28	-	84	-
TOTAL	928	239	488	7	1662	100.1

NOTES:-

- 7.1 The Total in Table 7 and 7A may be higher than other tables, as one bird can strike several parts.
- 7.2 The percentages should be based on incidents where the part struck is known.
- 7.3 Multiple strikes should be counted as one strike unless, for example, both wings or both landing gears are struck, when two incidents should be recorded.

EFFECT	WEIGHT UNKNOWN	CAT A	CAT B	CAT C	CAT D	TOTAL	% BASED ON 1474
Loss of Aircraft	-	-	1	-	1	2	0.1
Flight Crew Injury							
Major	-	-	-	-	1	1	0.1
Minor	-	-	-	-	-	-	-
Slight	-	-	2	-	-	2	0.1
Premature Engine Change:-							
on single engined A/C	23	11	13	1	-	48	3.3
1 on a 2 engined A/C	16	3	20	-	-	39	2.6
1 on a 3 engined A/C	1	-	-	-	-	1	0.1
1 on a 4 engined A/C	1	1	1	-	-	3	0.2
2 on a 3 engined A/C	-	-	-	-	-	-	-
2 on a 4 engined A/C	-	-	-	-	-	-	-
3 on a 4 engined A/C	-	-	-	-	-	-	-
all engines on a multi	1	-	-	-	-	1	0.1
Windscreen Cracked/Broken	14	2	12	-	-	28	1.9
Radome Changed	15	2	9	-	-	26	1.8
Deformed Structure	21	1	10	-	-	32	2.2
Skin Torn	35	4	26	1	-	66	4.5
Skin Dented	98	21	83	1	1	204	13.8
Propeller/Rotor Damaged	3	1	3	-	-	7	0.5
Aircraft System Lost	4	1	-	-	-	5	0.3
Underwing Stores/Tanks Damaged	16	1	7	-	-	24	1.6
Miscellaneous	26	2	20	-	-	48	3.3
Nil Damage	575	176	195	-	-	946	64.2
Unknown	8	2	3	-	-	13	-
TOTAL	857	218	406	3	3	1487	100.7

NOTES:

7A.1 Multiple strikes should be counted as one strike unless, for example, both wings are damaged or both windscreens are broken, in which case two incidents should be recorded.

7A.2 Definition of Injury requiring medical treatment:

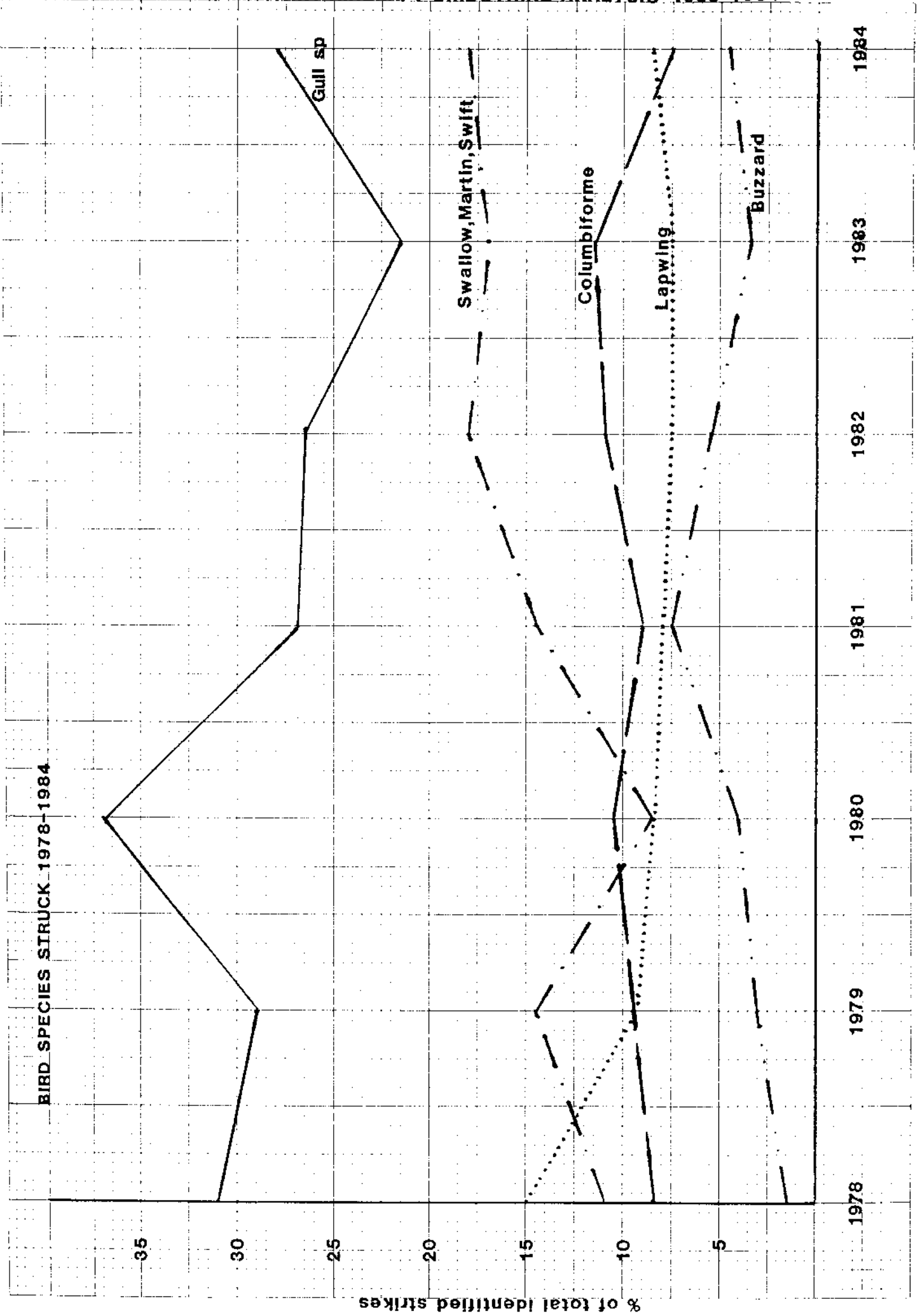
 Major - causing absence of 21 days or over.

 Minor - causing absence of 7 to 21 days.

 Slight - injury not in above 2 categories.

7A.3 Injuries as a consequence of a strike, eg ejection injuries should be included.

7A.4 Aircraft system lost includes, for example, electrical, hydraulic, brake, air conditioning, de-icing.



% of total identified strikes

ANNEX B TO MILITARY AIRCRAFT BIRDSTRIKE ANALYSIS 1983-1984

PART STRUCK AND EFFECT 1978-1984

