

BIRD STRIKE COMMITTEE EUROPE

LONDON, 24-28 May 1976

Ref: BSCE/11 WP 28

MILITARY AIRCRAFT
BIRDSTRIKE ANALYSIS
1974

Prepared by: Squadron Leader T S Austin RAF
MOD (Directorate of Flight Safety (RAF)) - UK

AF/627/74
MOD(DFS(RAF))

24 May 1976

ANALYSIS OF MILITARY BIRDSTRIKES - 1974

1. Because of the security regulations in the countries concerned 6 out of the 9 nations, who supplied information, were unable to provide aircraft or airfield movements. Therefore their strike rates could not be calculated. Information was received from the following countries:

Belgium
Canadian Armed Forces (Europe)
Denmark
France
Netherlands
Norway
Spain
Sweden
United Kingdom

2. It was not possible to compare aircraft of different Air Forces operating in similar roles due to the lack of strike rates.

3. This data supported what is now known to be the normal pattern of birdstrikes in that 80% of birdstrikes occurred below 1,000 feet, 46% occurred above 250 knots. 51% of recorded strikes occurred during the low level, en route and attack phase of flight, whilst 41% occurred in the vicinity of the airfield either during take off or landing.

MOD(DFS(RAF))
London

24 May 1976

TABLE 1

COUNTRY	NO OF STRIKES	NO OF MOVEMENTS	RATE PER 10,000 STRIKES
Belgium	NK	NK	4.20
CAF Europe	22	23,580	9.33
Denmark	44	135,282	3.25
France	121	NK	1.23
Netherlands	125	NK	NK
Norway	37	NK	NK
Spain	11	NK	NK
Sweden	172	284,400	6.0
UK	459	NK	NK
TOTAL	238 (991)	413,262	4.43

Note 1-1 Only 3 Nations supplied movements data.

1-2 Figures in brackets are total figures but are not used for calculation of strike rate.

TABLE 2 - AIRCRAFT TYPE

TYPE (a)	AIRCRAFT (b)	NO OF STRIKES (c)	NO OF MOVEMENTS (d)	RATE PER 10,000 MOVEMENTS (e)
Jet	<u>Belgium</u>			
	F/TF 104G	NK	NK	7.52
	Mirage 5B	NK	NK	5.65
	Fouga Magister	NK	NK	1.64
	T33	0	NK	0
	Falcon 20E	0	NK	0
	<u>Caf Europe</u>			
	CF 104	21	NK	NK
	CF 133	1	NK	NK
	<u>Denmark</u>			
	Hunter	1	1,700	5.9
	F 35	12	24,239	4.9
	F 100	11	22,806	4.8
	F 104	10	28,208	3.5
	T 33	5	19,172	2.6
	<u>France</u>			
	Mirage)			
	Mystere IV)			
	F 100)	73	NK	3.20
	SMB2)			
	Vautour)			
	Jaguar)			
	Etendard IV m)	12	NK	4
	CM 170R)			
	T/RT 33)	21	NK	.62
	MS 760 Paris)			
	C 135F)	4	NK	4.30
	Mystere XX)	3	NK	2.23
	DC8)	0	NK	0
	Caravelle)	0	NK	0
	<u>Netherlands</u>			
	F 104	49	NK	NK
NF-5	60	NK	NK	
<u>Norway</u>				
F 5	20	NK	NK	
F 104	9	NK	NK	
Falcon 20C	0	NK	0	
<u>Spain</u>				
Mirage	1	NK	NK	
F 5	3	NK	NK	
T 33	1	NK	NK	
T 6	2	NK	NK	

(a)	(b)	(c)	(d)	(e)
	<u>Sweden</u>			
	SAAB 32	58	44,300	13.09
	SAAB 35	55	134,500	4.09
	SAAB 37	16	16,400	9.7
	SAAB 105	37	45,200	8.2
	<u>United Kingdom</u>			
	Buccaneer	60		
	Canberra	42		
	Comet	1		
	Dominie	11		
	Gnat	5		
	Harrier	43		
	Hunter	37		
	HS 125	2		
	Jaguar	22		
	Jet Provost	51		
	Lightning	22		
	Mikrod	14		
	Phantom	45		
	Victor	4		
	Vulcan	18		
	VC 10	7		
Turboprop	<u>Belgium</u>			
	C 130H	NK	NK	5.07
	<u>Can Europe</u>			
	Nil			
	<u>Denmark</u>			
	Nil			
	<u>France</u>			
	C 160 Transall	6	NK	1.08
	DR 140 Mousquetaire	1	NK	0.2
	MR 1150 Atlantic	5	NK	4.0
	M262 Frigate	5	NK	1.84
	<u>Netherlands</u>			
	Piper Cub	3	NK	NK
	Beaver	1	NK	NK
	<u>Norway</u>			
	Nil			
	<u>Spain</u>			
	Light Trainer	1	NK	NK
	<u>Sweden</u>			
	Safir 91	1	18,600	0.5
	Balldog	4	17,500	2.3

(a)	(b)	(c)	(d)	(e)
	<u>United Kingdom</u>			
	Andover	7	NK	NK
	Argosy	1	NK	NK
	Belfast	2	NK	NK
	Britannia	6	NK	NK
	Hercules	36	NK	NK
	Jetstream	2	NK	NK
Piston	<u>Belgium</u>			
	SF260M	NK	NK	0.58
	DC3	0	NK	0
	DC6	0	NK	0
	Pembroke	0	NK	0
	<u>Car Europe</u>			
	Nil			
	<u>Denmark</u>			
	C54	2	2,102	9.5
	C47	2	6,243	3.2
	Chipmunk	1	24,072	0.4
	L 18c	0	961	0
	KZ-VII	0	5,779	0
	<u>France</u>			
	N2501 Noratlas	10	NK	0.72
	SA23 Aztec	2	NK	4.0
	P2V7 Neptune	2	NK	4.0
	Flamant	1	NK	0.2
	DC6	0	NK	0
	CAP 10/20	0	NK	0
	Broussard	0	NK	0
	<u>Spain</u>			
	Light Trainer	1	NK	NK
	<u>Sweden</u>			
	Safir 91	1	18,600	0.5
	Bulldog	4	17,500	2.3
	<u>United Kingdom</u>			
	Basset	1	NK	NK
	Bulldog	2	NK	NK
	Chipmunk	5	NK	NK
	Devon	4	NK	NK
	Hastings	1	NK	NK
	Pembroke	2	NK	NK
	Shackleton	1	NK	NK
	Varsity	5	NK	NK

(a)	(b)	(c)	(d)	(e)
Helicopter	<u>Belgium</u>		<u>HOURS</u>	<u>PER 10,000 HOURS</u>
	HSS-1	0	NK	0
	<u>Caf Europe</u>			
	Nil			
	<u>Denmark</u>			
	H-500	2	3,563	5.6
	S-61	0	2,736	0
	Alouette	0	2,494	0
	<u>France</u>			
	NK	3	NK	1.38
	<u>Netherlands</u>			
	NK	10	NK	NK
	<u>Norway</u>			
	Sea King	1	NK	NK
	UH1B 204	1	NK	NK
	<u>Spain</u>			
	NK	3	NK	NK
	<u>Sweden</u>			
	NK	5	4,200	10.7
	<u>United Kingdom</u>			
	Gazelle	8	NK	NK
	Puma	11	NK	NK
	Sioux	0	NK	0
Wessex	4	NK	NK	
Whirlwind	4	NK	NK	

TABLE 2A

TYPE	AIRCRAFT	NO OF STRIKES	NO OF MOVEMENTS	STRIKE PER 10,000 MOVEMENTS
JET	-	869		
TURBOPROP	-	74		
PISTON	-	52		
HELICOPTER	-	47		
UNKNOWN	-	0		

NOTE: Insufficient data to calculate strike rates.

TABLE 3 - AIRFIELDS

AIRFIELD	NO OF STRIKES	NO OF MOVEMENTS	RATE PER 10,000 MOVEMENTS
(a)	(b)	(c)	(d)
1. <u>DOMESTIC</u> (data from own country with known no. of movements)			
<u>DENMARK</u>			
Karup	5	33,324	1.50
Aalborg	8	25,179	3.18
Skrydstrup	6	30,584	1.96
Vaerlose	5	24,965	2.00
<u>SWEDEN</u>			
F1	11	23,500	4.70
F3	3	16,200	1.90
F4	4	18,300	2.20
F5	16	39,700	4.00
F6	6	13,900	4.30
F7	2	20,400	1.00
F10	4	20,100	2.00
F11	3	21,200	1.40
F12	3	13,900	2.20
F13	7	19,400	3.60
F15	2	13,000	1.50
F16/20	4	28,900	1.40
F17	4	18,100	2.20
F21	4	19,100	2.10
<u>UNITED KINGDOM</u>			
Thorney Island	16	35,052	4.56
Finningley	8	30,462	2.63
Leuchars	8	34,917	2.29
Topcliffe	7	29,150	2.40
Lynham	7	66,196	1.06
Fairford	7	23,334	3.00
Cottesmore	6	36,037	1.66
St Mawgan	6	29,964	2.00
Waddington	6	20,804	2.88
Benson	5	19,882	2.51
Kinloss	5	25,862	1.93
Shawbury	5	41,549	1.20
Brize Norton	4	19,720	2.03
Scampton	4	18,929	2.11
Binbrook	3	29,559	1.01
Cranwell	3	75,978	0.39
Leeming	3	65,532	0.46

(a)	(b)	(c)	(d)
<u>UNITED KINGDOM cont.</u>			
Marham	3	20,756	1.45
Abingdon	2	45,101	0.44
Andover	2	22,772	0.88
Barkston Heath	2	27,594	0.72
Chivenor	2	39,640	0.50
Coltishall	2	30,010	0.66
Coningsby	2	35,122	0.57
Honington	2	32,723	0.61
Lossiemouth	2	39,202	0.51
Manston	2	25,792	0.77
Tern Hill	2	80,298	0.25
Valley	2	96,469	0.21
Wittering	2	44,675	0.45
West Raynham	2	12,611	1.59
2. <u>DOMESTIC</u> (Incomplete data)			
<u>BELGIUM</u>			
Beauvechain	NK	NK	2.67
Kleine Brogel	NK	NK	2.11
Florennes	NK	NK	1.26
Melsbroek	NK	NK	0.83
<u>CAF EUROPE</u>			
Baden-Sokllingen	2	NK	0.85
Lahr	2	NK	0.85
<u>FRANCE</u>			
Avord	3	NK	0.72
Chateaudun	3	NK	1.53
Cognac	4	NK	0.49
Dijon	4	NK	0.75
Hyerres	3	NK	4.00
Istres	4	NK	0.73
Landivisiau	2	NK	4.00
Lorient	5	NK	4.00
Metz	4	NK	0.67
Nimes	2	NK	4.00
Salon	3	NK	0.21
Reims	2	NK	0.56
<u>NETHERLANDS</u>			
Leeuwarden	6	NK	NK
Ypenburg	4	NK	NK
Twenthe	8	NK	NK
Volkel	7	NK	NK
Soesterberg	2	NK	NK
Gilze-Rijen	5	NK	NK
Woensdrecht	2	NK	NK
Eindhoven	2	NK	NK

(a)	(b)	(c)	(d)
<u>NORWAY</u>			
Sola	2	NK	NK
Orland	4	NK	NK
Bodo	6	NK	NK
Andoya	2	NK	NK
<u>UNITED KINGDOM</u>			
Aldergrove	3	NK	NK
Belfast Harbour	3	NK	NK
Farnborough	2	NK	NK
Pershore	2	NK	NK
3. <u>DOMESTIC AIRFIELDS WITH SINGLE STRIKES</u>	28	NK	NK
4. <u>FOREIGN</u>			
Ramstein	2	NK	NK
Gutersloh	2	NK	NK
Wildenrath	3	NK	NK
Akrotiri	3	NK	NK
Luqa	7	NK	NK
5. <u>FOREIGN AIRFIELDS WITH SINGLE STRIKES</u>	35	NK	NK
6. <u>EN ROUTE</u>	532	NK	NK
7. <u>UNKNOWN</u>	150	NK	NK

TABLE 3A - SUMMARY OF LOCATION

Domestic	229	1,555,453	1.47
Domestic (Incomplete data)	133		
Foreign	52		
En Route	532		
Unknown	150		
	1096		

TABLE 4 - BIRD SPECIES

Common Name	Latin Name	Approx WT (g)	Category	No of Strikes	% Based on 442
Black Headed Gull	Larus Ridibundus	300	B	6	1.4
Herring Gull	Larus Argentatus	1100	B	19	4.3
'Gulls' (inc Common Gull)	Larus Spp	300-1800	B	122	28.9
<u>TOTAL GULLS</u>				147	34.6
Lapwing/Peewit	Vanellus Vanellus	200	B	51	11.5
Oyster Catcher	Haemotopus Ostralegus	550	B	7	1.6
Plover	Pluvialis Apricaria	220	B	12	2.7
Eider	Somateria Mollissima	2000	C	1	0.2
Heron	Ardea Cinera	1800	B	1	0.2
Feral Pigeon	Colomba Palumbus	600	B	36	8.1
Pigeon	Colomba Livia	250	B	7	1.6
Pheasant	Phasianus	1200	B	2	0.5
Partridge	Perdix Perdix	420	B	5	1.1
Buzzard	Buteo Buteo	900	B	8	1.8
Kestrel	Falco Tinnunculos	250	B	9	2.0
Hawk	Accipiter	350	B	2	0.5
Crow	Corvus Corone	550	B	4	0.9
Rook	Corvus Frugilegus	400	B	6	1.4
Starling	Sturnus Vulgaris	100	A	19	4.3
Swift/Swallow/Martin	-	14-40	A	49	11.1
Thrush	Turdus Philomelus	70	A	6	1.4
Blackbird	Turdus Merula	100	A	1	0.2
Fieldfare	Turdus Pilaris	115	B	3	0.7

Tawny Owl	Strix Aluco	300	B	2	0.5
Owl	Strigidae Spp		B	1	0.2
Bar Tailed Godwit	Limosa leponica		B	1	0.2
Horned Owl	Bubo Bubo		B	1	0.2
Teal	Anas Crecca	300	B	2	0.5
	Anas Spp	900	B	3	0.7
Wader	Charadriidae Spp		B	3	0.7
Puffin	Fratercula	400-530	B	1	0.2
Crane	Grus Grus	5500	D	1	0.2
	Passeriforme	10-110	A	14	3.2
Whinchat	Saxicola Rubetra	13-22	A	1	0.2
Snow Bunting	Plectrophenax Nivalus	35	A	1	0.2
Blue Tit	Parus Caeruleus	12	A	1	0.2
Grey Shrike	Lanius Excubitor	75	A	1	0.2
Linnet	Carduelis Cannabina	20	A	1	0.2
Muscovety Duck	Caririna Moschata		B	1	0.2
Pipit	Anthus Spp	23	A	1	0.2
Dunlin	Erolia Alpina	100	A	1	0.2
	Stringforme Spp		B	3	0.7
Sandgrouse	Pseudogyps Bengalensis	3200	B	1	0.2
Vulture	Fringilla Coelebs	22	C	1	0.2
Chaffinch	Motacilli Alba	25	A	2	0.5
Waptail	Alauda Arvensis	40	A	2	0.5
Skylark	Sterna Hirundo	100	B	17	3.8
Tern	Philonachus Pugmax	100	A	2	0.5
Ruff or Reeve			A	1	0.2
UNKNOWN				573	
TOTAL				1015	

Notes:-

4.1 Bird weights and Latin names can be obtained from Canadian Field Note No 51, by G Kaiser, unless there is positive evidence to the contrary, the AVERAGE weight should be assumed.

4.2 The bird Categories based on current Civil Airworthiness requirements are:-
 CAT A below .4 kg (1 lb)
 CAT B .41 to 1.81 kg (1 to 4 lb)
 CAT C over 1.81 kg to 3.63 kg (4 lb to 8 lb)
 CAT D over 3.63 kg (8 lb)

- 4.4 Large (CAT C or D) birds are often not positively identified, but the Category these are assumed to be in should be stated.
- 4.5 Percentages should be based on the total of identified birds.
- 4.6 A Flock should be regarded as more than 2 birds.
- 4.7 The percentage in Table 3A should be based on the total of strikes where the number of birds is known.
- 4.8 Table 3 could be repeated restricted to own country only.

TABLE 5 - MONTH OF YEAR - STRIKES IN EUROPE ONLY

MONTH	WEIGHT UNKNOWN	CAT A & B	CAT C	CAT D	TOTAL	NO OF MOVEMENTS	STRIKES/10,000 MOVEMENTS
JANUARY	6(14)	20(31)			26(45)	117,222	2.21
FEBRUARY	7(11)	11(18)			18(29)	129,697	1.38
MARCH	17(34)	16(22)			33(56)	136,948	2.40
APRIL	24(32)	8(12)	(1)		32(45)	166,405	1.92
MAY	26(38)	12(23)	(1)		38(62)	185,928	2.04
JUNE	26(45)	26(28)			52(73)	167,852	3.09
JULY	26(37)	27(54)	(1)		53(92)	157,088	3.37
AUGUST	55(67)	28(54)			83(121)	160,978	5.15
SEPTEMBER	36(55)	30(38)			66(93)	153,219	4.30
OCTOBER	57(69)	26(44)		(1)	83(114)	152,640	5.43
NOVEMBER	13(21)	23(32)			36(53)	126,570	2.84
DECEMBER	6(11)	22(28)	(1)		28(40)	96,693	2.89
UNKNOWN	-	-	-	-	-	-	-
TOTAL	299(434)	249(384)	(4)	(1)	548(823)	1,751,256	3.12

Note: 5.1 Only 3 Nations supplied movements data

5.2 Figures in brackets are total figures but are not used for calculation of Strike Rate.

TABLE T - AIRSPEED

AIRSPEED (KNOTS-1AS)	WEIGHT UNKNOWN	CAT A and B	CAT C	CAT D	TOTAL	% BASED ON 770
0 - 80	12	27			39	5.06
81 - 100	11	52			63	8.18
101 - 150	34	135			169	21.94
151 - 200	37	52	3		92	11.94
201 - 250	26	21	1		48	6.23
OVER 250	255	101	2	1	359	46.62
AIRSPEED UNKNOWN	99	45			144	-
TOTAL	474	433	6	1	914	

TABLE 6A - ALTITUDE

ALTITUDE (FEET)	WEIGHT UNKNOWN	CAT A and B	CAT C	CAT D	TOTAL	% BASED ON 929
0 - 499	255	282	1		538	57.91
500 - 999	147	56	2	1	206	22.17
1000 - 2500	111	47			158	17.00
OVER 2500	21	4	2		27	2.90
HEIGHT UNKNOWN	118	44	1		163	-
TOTAL	652	433	6	1	1092	

Note: 6.1 No information from Sweden on Altitude

6.2 Data from Sweden included under Weight Unknown.
in airspeed total.

TABLE 7 - FLIGHT STAGE

STAGE	WEIGHT UNKNOWN	CAT A and B	CAT C	CAT D	TOTAL	% BASED ON 916
Taxying	-	2	-	-	2	0.21
Take-Off	70	101	2	-	173	18.88
L/L, En-route and Attack	350	119	2	1	472	51.52
Climb	13	9	-	-	22	2.40
Cruise	8	5	-	-	13	1.41
Recovery	4	4	-	-	8	0.87
Descent	2	1	-	-	3	0.32
Final Approach	22	19	1	-	42	4.58
Landing	53	112	-	-	165	18.01
Touch and Go/Overshoot	3	13	-	-	16	1.74
Unknown	133	41	-	-	174	-
Total	658	426	5	1	1090	

Note: 7.1 Data from Spain entered under stage unknown

7.2 Data from Sweden entered under weight unknown

TABLE 8 PART OF AIRCRAFT STRUCK

PART	WEIGHT UNKNOWN	CAT A	CAT B	CAT C and D	TOTAL	% BASED ON 1217
Nose (excluding radome and windscreen)	87	12	38		137	11.25
Radome	39	5	11		55	4.51
Windscreen	131	23	52		206	16.92
Fuselage (excluding the above)	102	11	55	1	169	13.88
Engine:						
1 Engine struck	141	26	77	2	246	20.21
2 Out of 3 struck			2		2	0.16
2 Out of 4 struck						
3 Out of 4 struck						
All struck (on multi-engined aircraft)						
Wing/intake	109	21	75	2	207	17.00
Rotor/Propeller	9	3	22		34	2.79
Landing Gear	29	9	42		80	6.57
Empennage	5	-	4	1	10	0.82
Under Wing Stores/Tanks	39	2	29	1	71	5.83
Part Unknown	55	12	29	1	97	-
TOTAL	746	124	436	8	1314	

Note: 8.1 Engine intake combined with wing.

8.2 Date from Sweden in weight unknown column.

TABLE 8B EFFECT - AIRSPEED - WEIGHT OF BIRD

EFFECT	AIRSPEED		0-80		81-100		101-150		151-200		201-250		OVER 250	
	A&B	C&D	A&B	C&D	A&B	C&D	A&B	C&D	A&B	C&D	A&B	C&D	A&B	C&D
Loss of life/Aircraft													1	
Flight Crew injured	1						6		3				14	
Engine prematurely changed	2		1				2						6	
Windscreen cracked/Broken							2						2	
Radome changed							4						11	2
Deformed Structure			2				1		2		2		1	
Skin Torn													29	
Skin Dented	3		1				12		4		1		27	
Propeller/Rotor Damaged	1		2				2							
Aircraft System Lost							2							
Underwing Stores/Tanks Damaged							1		1				10	1
TOTAL	7		6		32		12		1		3		100	3

Note: 8b-1 Data from Spain and Sweden is not included.

TABLE 8A - EFFECT OF STRIKE

EFFECT	WEIGHT UNKNOWN	CAT A	CAT B	CAT C	CAT D	TOTAL	% BASED ON 1137
Loss of Life/Aircraft	1					1	0.08
Flight Crew Injury							
Major							
Minor	1		1			2	0.17
Slight							
Premature Engine Change on a							
Single Engined Aircraft	16	2	6	1		25	2.20
1 on a 2 Engined Aircraft	25	3	10			38	3.35
1 on a 3 Engined Aircraft							
1 on a 4 Engined Aircraft	1	1	6			8	0.70
2 on a 3 Engined Aircraft							
2 on a 4 Engined Aircraft			1			1	0.08
3 on a 4 Engined Aircraft							
All Engines on a Multi	1					1	0.08
Windscreen Cracked/Broken	16	5	7			28	2.47
Radome Changed	7	1	2			10	0.88
Deformed Structure	54	2	19	3		78	6.88
Skin Torn	41	5	42	1		89	7.85
Skin Dented	72	15	61	2		150	13.23
Propeller/Rotor Damaged	8	1	3			12	1.05
Aircraft Sytem Lost	1	1	3			5	0.44
Underving Stores/Tanks Damaged	19		13	1		33	2.91
Miscellaneous	25	2	5			32	2.82
Nil Damage	380	79	160	1		620	54.72
Unknown	2		2			4	-
TOTAL	670	117	341	9		1137	

NOTE: 8A-1 DATA from Spain not included.
8A-2 DATA from Sweden included in weight unknown column.