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ISCE/A/R

BIRD STRIKE COMMITTEE EUROPE

MILITARY AIRCRAFT

BIRDSTRIKE ANALYSIS 1977

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ANALYSIS OF MILITARY BIRDSTRIKES - 1977

Introduction

1. The data used in this analysis was supplied by the following air forces:
 - a. Royal Netherlands Air Force (RNLAf)
 - b. Royal Norwegian Air Force (RNAF)
 - c. Royal Air Force (RAF)
 - d. Swedish Air Force (SAF)
 - e. United States Air Force (Europe) (USAF(E))
2. Unfortunately not all the data was complete, and some of the tables are not as comprehensive as they might have been. Nevertheless, all the submissions have been included and the number of contributors is included in the 'notes' to each table.

STRIKE RATES

3. Table 1 analyses the strike rates for aircraft in their main role. Strike and recce aircraft show the highest rates once again, although RNLAf continues to record a high rate for the F104 in the air defence role. The Buccaneer again suffered a much higher rate than other RAF Strike aircraft; this is almost certainly a result of its longer sortie length compared with the other types and the employment of some squadrons in the maritime strike and attack role.

AIRFIELD BIRDSTRIKES

4. Table 2 lists the number of strikes at individual airfields and the strike rates for domestic airfields only. The 1976 analysis showed high rates for the RNLAf airfields at Leeuwarden (18.0) and Twenthe (13.3) and it is interesting to note that both rates were reduced in 1977. The figure for Twenthe has been more than halved, and these encouraging improvements are almost certainly a result of the introduction of airfield bird control teams.
5. Excluding the strikes listed as 'unknown' in table 2, 53% occurred on and around the airfields and 47% occurred on route. This is a slight improvement on the 1976 results when 58% of the total were recorded as 'airfield strikes'.

BIRD SPECIES

6. Table 3 shows the bird species involved in strikes. Gulls of all types featured in 35% of the incidents when the bird was positively identified. Of the other types the Lapwing was once again a high scorer and featured in 12% of the total. However, of the total number of recorded strikes in table 3 (819), the bird was identified in only 46% of the incidents.

PARTS OF THE AIRCRAFT STRUCK AND EFFECT

7. Tables 4, 4A and 5 shows the parts of the aircraft struck, the effect of the strike and the effect against airspeed and weight of the bird. The distribution of strikes is very similar to that reported in 1976; the effect of strike is also very similar with 56% of strikes causing no damage. Two aircraft were destroyed, again the same as in 1976. Finally, in strikes where the bird was identified, 62% of the strikes occurred when the aircraft were flying at 250 knots or more.

TABLE 1 AIRCRAFT ROLE

Role	Aircraft Type	Strikes per 10,000 Movements
Strike and Recce	<u>Netherlands</u>	
	F-104G	25.1
	RF-104G	20.0
	NF-5A	17.4
	<u>Sweden</u>	
	AJ 37	14.6
	SH 37	2.9
	S 35	5.1
	A 32	18.5
	S 32	11.7
	<u>United Kingdom</u>	
	Buccaneer	17.29
	Harrier	3.58
	Jaguar	5.93
Vulcan	2.66	
Canberra	6.44	
Air Defence	<u>Netherlands</u>	
	F104	26.0
	<u>Sweden</u>	
	J 35	3.3
	J 32	3.4
	<u>United Kingdom</u>	
	Lightning	1.97
Phantom	2.54	
Transport	<u>Netherlands</u>	
	F 27	3.4
	<u>Denmark</u>	
	C-130H	.768
	<u>United Kingdom</u>	
	Andover	9.99
	Argosy	3.83
	Devon	4.38
	Hercules	4.60
	HS 125	1.70
VC 10	3.57	

TABLE 1 AIRCRAFT ROLE

Role	Aircraft Type	Strikes per 10,000 Movements
Transport (cont)	<u>Sweden</u> All types	4.2
Maritime	<u>United Kingdom</u> Nimrod	8.28
Training	<u>Netherlands</u> NF-5B	18.2
	TF-104G	14.1
	<u>Sweden</u> SK-60	5.5
	SK-61	6.3
	SK-50	2.5
	<u>United Kingdom</u> Bulldog	.43
	Dominie	5.86
	Gnat	2.44
	Hunter	3.82
	JP	2.65
	Hawk	1.49
	Jetstream	1.93
	Chipmunk	0.21
Helicopters	<u>Netherlands</u> Alouette 3	6.1
	BO-105C	6.9
	<u>Sweden</u> HKp 3,4,6	9.2
	<u>United Kingdom</u> Gazelle	2.27
	Puma	1.67
	Whirlwind	1.35
	Wessex	1.29

- 1.1 There is a minimum of 2 movements per flight.
 1.2 Aircraft with no recorded birdstrikes are not listed.
 1.3 Data supplied by 4 countries.

TABLE 2 AIRFIELD

AIRFIELD	NUMBER OF INCIDENTS	NUMBER OF MOVEMENTS	STRIKES PER 10,000 MOVEMENTS
1. <u>DOMESTIC</u> , strikes in own country			
<u>NETHERLANDS</u>			
Leeuwarden	27	15,434	17.5
Volkel	20	25,946	7.7
Twenthe	9	14,108	6.4
Eindhoven	6	8,386	7.2
Gilze Rijen	5	9,296	5.4
Ypenburg	2	NK	NK
Soesterberg	3	25,480	1.2
<u>SWEDEN</u>			
Malmstatt	5	16,186	3.0
Ostersumd	2	21,054	0.9
Ljungbyhed	8	33,270	2.4
Karlsborg	4	9,366	4.2
Satenas	7	17,532	3.9
Angelholm	7	23,760	2.9
Nykoping	5	13,250	3.7
Kalmar	4	14,082	2.8
Norrkoping	8	17,970	4.4
Soderhamm	3	14,722	2.0
Uppsala	2	25,374	0.7
Tullinge	2	4,574	4.3
Lulea	2	22,804	0.8
<u>DENMARK</u> (incomplete data)			
Aalborg			4.50
Karup			0.95
Tirstrup			2.27
Vandel			0.00
Skrydstrup			1.52
Vaerloese			1.77
Avnoe			0.00

AIRFIELD	NUMBER OF INCIDENTS	NUMBER OF MOVEMENTS	STRIKES PER 10,000 MOVEMENTS
<u>UNITED KINGDOM</u>			
Fairford	3	5,481	5.47
Benson	7	12,901	5.43
St Mawgan	8	23,796	3.36
Brize Norton	9	30,201	2.98
Llanbedr	2	6,819	2.93
Lyneham	11	40,073	2.72
Marham	7	28,927	2.42
Kinloss	4	16,802	2.38
Wyton	4	22,806	1.75
Boscombe Down	6	38,511	1.56
Dishforth	3	20,568	1.46
Leuchars	5	34,533	1.45
Finningley	5	39,550	1.26
Valley	13	107,311	1.21
Elvington	3	27,262	1.10
Coltishall	3	28,021	1.07
Cranwell	7	77,196	0.91
Lossiemouth	4	44,988	0.89
Honington	3	33,938	0.88
Scampton	2	25,191	0.79
Linton-on-Ouse	7	89,532	0.78
Barkston Heath	3	41,645	0.72
Abingdon	3	46,730	0.64
Coningsby	2	32,603	0.61
Mona	2	32,954	0.61
Binbrook	2	36,238	0.55
Leeming	3	88,934	0.34
Shawbury	3	101,448	0.30
Aldergrove	4	-	-
Cambridge	2	-	-
2. <u>DOMESTIC</u> Airfields with single strikes	18	-	-
3. En route	332		
4. Unknown	76		
5. Total (Data supplied by 4 countries)	697		

TABLE 3 - BIRD SPECIES

COMMON NAME	LATIN NAME	APPROX WEIGHT	CATEGORY	NUMBER OF STRIKES	% BASED ON 378
Gull (various)	Larus Sp	400-1800	B	73	19.3
Lapwing	Vanellus Vanellus	200	B	47	12.4
Blackheaded Gull	Larus ridibundus	400	B	33	8.7
Skylark	Alauda arvensis	40	A	24	6.3
Swift	Apus apus	40	A	23	6.1
Woodpigeon	Columba palumbus	500	B	23	6.1
Passeriformes	Passeriformes	20-110	A	16	4.2
Starling	Sturnus Vulgaris	100	A	14	3.7
Common Gull	Larus Canus	400	B	11	2.9
Thrush	Turdus Sp	60-150	A	8	2.1
Partridge	Ferdix perdix	400	B	7	1.8
Linnet	Acanthis cannabina	30	A	7	1.8
Herring Gull	Largus argentatus	1000	B	7	1.8
Meadow Pipit	Anthus pratensis	30	A	6	1.6
Oyster Catcher	Haemotopus ostralegus	550	B	6	1.6
Blacktailed Godwit	Limosa Limosa	250	B	6	1.6
Columbriforme	Columbiformes	180-500	B	5	1.3
Swallow	Hirundo rustica	18	A	5	1.3
Golden Plover	Pluvialis apricaras	170	B	4	1.1
Sparrow	Passer spp	40	A	4	1.1
Lesser Black-backed gull	Larus fuscus	800	B	4	1.1
Gannet	Sula bassana	3500	B	3	0.8
Crow	Corvus corone	550	B	3	.8
Kestrel	Falco tinnuculus	200	B	3	.8
Buzzard	Buteo buteo	800	B	3	.8
Little Bustard	Otis tetrax	900	B	3	.8
Fieldfare	Turdus pilaris	100	A	2	.5
Snipe	Gallinago gallinago	115	B	2	.5
Homing Pigeon	Columba livia	400	B	2	.5
Mallard	Anas platyrhynchos	1000	B	2	.5
Black Grouse	Lynurus tetrix	1100	B	2	.5
Pheasant	Phasianus corchicus	1000	B	2	.5
Stork	Ciconia Ciconia	3000	B	2	.5
Snow Bunting	Plectrophenax nivalis	35	A	2	.5
Heron (Grey)	Ardea Cinerea	1400	B	1	.3
Wheatear	Oenanthe Oenanthe	25	A	1	.3
Turtle Dove	Streptopelia turtur	200	B	1	.3
Grey Plover	Pluvialis Squatarola	200	B	1	.3
Common Tern	Sterna hirundo	150	B	1	.3
Knot	Calidris Canutus	110	B	1	.3
Woodcock	Scolopax rusticola	300	B	1	.3
Sandmartin	Riparia Riparia	14	A	1	.3
Willow Warbler	Phylloscopus trochilus	10	A	1	.3
Jackdaw	Corvus monedula	220	B	1	.3
Hawk	Accipiter Gentilis	1000	B	1	.3
Ruff	Philomachus pugnax	160	B	1	.3
Wader (Unident)	-	60-800	A/B	1	.3
Kittiwake	Rissa tridactyla	400	B	1	.3
Arctic Tern	Sterna Paradisea	100	A	1	.3
Redwing	Turdus iliacus	60	A	1	.3
Chaffinch	Fringilla coelebs	22	A	1	.3
Brambling	Fringilla monti fringilla	25	A	1	.3

TABLE 3 - BIRD SPECIES

Total identified -	378
Unknown -	441
GRAND TOTAL	819

Notes:

3.1 The bird categories based on current Civil Airworthiness requirements are:

CAT A below .11kg ($\frac{1}{2}$ lb)

CAT B - .11kg to 1.8kg ($\frac{1}{4}$ to 4lb)

CAT C - over 1.81kg to 3.63kg (4lb to 8lb)

CAT D - over 3.63kg (8lb)

3.2 Those birds not positively identified are tabled as 'unknown'.

3.3 Percentages are based on the total of identified birds.

TABLE 4 PART OF AIRCRAFT STRUCK

	WEIGHT UNKNOWN	CAT A	CAT B	CAT C & D	TOTAL	% Based on 870
Nose (excluding radome and windscreen)	78	17	36	-	131	15.1
Radome	38	2	9	1	50	5.7
Windscreen	90	14	16	-	120	13.8
Fuselage (excluding the above)	85	11	34	1	131	15.1
Engine:-						
1 engine struck	73	17	41	-	131	15.1
2 out of 3 struck	-	-	-	-		
2 out of 4 struck	2	-	-	-	2	0.2
3 out of 4 struck	-	-	-	-	-	
all struck (on multi- engined aircraft)	-	-	1	1	2	0.2
Wing	70	19	47	-	136	15.6
Rotor/Propeller	4	4	16	1	25	2.9
Landing Gear	20	10	31	-	61	7.0
Empennage	14	1	9	-	24	2.7
Underwing Stores/Tanks	34	2	21	-	57	6.5
TOTAL	508	97	261	4	870	
Part Unknown	51	5	15	-	71	
GRAND TOTAL	559	102	276	4	941	

Notes:

- 4.1. The Total in Table 4 and 4A may be higher than other tables, as one bird can strike several parts.
- 4.2. The percentages are based on incidents where the part struck is known.
- 4.3. Multiple strikes are counted as one strike, unless for example both wings or both landing gears are struck, when two incidents should be recorded.
- 4.4. Data obtained from 5 nations.

TABLE 4A EFFECT OF STRIKE

EFFECT	Weight Unknown	CAT A	CAT B	CAT C/CAT D	TOTAL	Base 67
Loss of Aircraft	2	-	-	-	2	0.1
Flight Crew Injury						
Major	-	-	-	-	-	-
Minor	-	-	-	-	-	-
Slight	1	-	-	-	1	0.1
Premature Engine Change:-						
On single engined aircraft	4	-	11	-	15	2.2
1 on a 2 engined "	22	7	13	-	42	6.2
1 " 3 " "	-	-	-	-	-	-
1 " 4 " "	1	1	-	-	2	0.3
2 " 3 " "	-	-	-	-	-	-
2 " 4 " "	2	-	-	-	2	0.3
3 " 4 " "	-	-	-	-	-	-
all engines on a multi	-	-	-	1	1	0.1
Windscreen Cracked/Broken	8	3	4	-	15	2.2
Radome Changed	5	-	3	-	8	1.2
Deformed Structure	8	-	3	-	11	1.6
Skin Torn/Light Glass Broken	19	6	21	1	47	6.9
Skin Dented	51	8	33	1	93	13.8
Propeller/Rotor/Damaged +	-	1	7	1	9	1.3
Aircraft System Lost	2	1	-	-	3	0.4
Underwing Stores/Tanks damaged	13	-	11	-	24	3.6
Miscellaneous	1	1	1	-	3	0.4
Nil Damage	271	42	84	-	397	
TOTAL	410	70	191	4	675	
Unknown	15	4	9	-	28	
Grand Total	425	74	200	4	703	

Notes:

4A.1 + Includes Helicopter transmissions.

4A.2 Data obtained from 5 Nations.

TABLE 5

EFFECT - AIRSPEED - WEIGHT OF BIRD

EFFECT	AIRSPEED		-80		81-100		101-150		151-200		201-250		over250	
	WEIGHT		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														
Flight Crew Injured														
Engine Prematurely Changed							2		4		1	2	9	
Windscreen Cracked/Broken			1		1		1						2	
Radome Changed							1						2	
Deformed Structure											1		4	
Skin Torn/Light Glass Broken			1								1		21	
Skin Dented					3		9		3		2	1	15	
Propeller/Rotor Damaged			1				1						1	
Aircraft System Lost														
Underwing Stores/Tanks Damaged									1				7	
TOTAL			3		4		14		8		3	5	61	

NOTES:

5.1. The TOTAL in Table 5 will be very small, as those incidents where the airspeed or the bird weight are unknown, together with the non damaging strikes, have been omitted.

5.2. Data supplied by 3 nations.