

**REVIEW OF BIRD STRIKE REPORTS SENT TO  
BNHS INDIA (1997-2000)**

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**Abstract**

This paper reviews the birdstrike reports received by the Bombay Natural History Society India from 1997-2000. The Society received 74 reports of bird hits from military and civilian airports in 1997, forty-five in 1998 and thirty-nine in 1999. There were 26 more reports till September 2000. There was no loss of life. Vultures have declined in numbers in North India and there were very few incidents of vulture hits on aircraft. Black kites and Blue Rock Pigeons and twenty other species of medium to small sized birds have struck aircraft. Bird hits occurred during all the months of the year. More strikes were reported during the morning hours. Birds have often hit engines and damaged fan blades. The quality and consistency of reporting need urgent improvement as the frequency of bird strikes on aircraft remain very high and many aerodromes do not use new techniques of bird scaring.

**Key words:** bird strike reports, BNHS, vultures, Black Kites, Blue Rock Pigeons

## 1. Introduction

The Bombay Natural History Society (BNHS) of Bombay was receiving the reports and identifying the birds involved in bird strikes on aircraft occurring in India for two decades. They stopped this work in 1998 due to lack of financial support. The various aerodromes and military air stations continued to send reports of bird hits to the BNHS.

The present authors were studying problems of bird hazards to aircraft in the aerodromes of South India from 1984 under the Calicut University till 1997, and then independently. In 2001 we formed an NGO called the Centre for Ecological Studies Calicut to anchor our studies. Our observations were restricted both by lack of financial support of any kind and the very strict security requirements of the aerodromes.

We had the co-operation of the Naval Air Stations of Cochin and Ramnad and the aerodromes of Trivandrum, Cochin, Calicut, Mangalore, and Coimbatore. The Director of CIAL\* Cochin joined our fieldwork on a few occasions. The Honorary Secretary of the Bombay Natural History Society made the records of bird strikes available to us.

## 2. Results

### 2.1 The Bird strikes reported to BNHS From January 1<sup>st</sup> 1997 to April 1998

In 1997 the BNHS scientists received 74 Bird strike reports from 34 different airfields of India, forty-seven of these from the IAF, five from the navy and six from private airlines. Fifty-four samples of remains were identified out of which 51 were from birds and three from bats (RAHMANI 1997).

The BNHS analyzed 10 more samples of remains till April 1998. The species of birds identified are listed in the *Appendix Table 1*.

### 2.2 The Bird strike reports received by BNHS in 1998

In all the BNHS received 49 bird-hit reports from 23 localities from all parts of India. Twenty-seven of these were from the IAF, 10 from the Navy and 12 from civilian aerodromes. The Black Kites (25%) and Blue Rock Pigeons (16%) were the more common species in the reports.

### 2.3 Bird strike report of 1999

The BNHS received 39 reports of bird hits on aircraft from 22 localities all over India. Of these 32 were from the IAF and 6 from Civil aerodromes. Blue Rock Pigeons and Black kites were the more numerous among the few species identified [*Table I Appendix*].

### 2.4 Bird strikes reported in 2000

Up to September 2000, twenty-eight cases of bird hit on aircraft were reported to the BNHS from 16 localities in India. Of these 24 were from IAF, 1 from Navy and 3 from civilian aerodromes. Many of the reports were incomplete. There was no way of identifying the species of birds correctly. The reports received in the years 1997 to 2000 are summarised in *Tables 2, 3 & 4 Appendix*.

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\* Cochin International Airport Limited

## 2.5 The species of birds striking (1997 to 1999)

Table 1 (Appendix) gives the list of 25 species of birds from 11 orders which were identified from the reports sent to the BNHS from 1997 to 1999. From this the BNHS scientists considered the following 9 species to be the most frequent during the period January 1997 to April 1998 (RAHMANI 1997, op cit)

*Species of birds common in the bird strike reports of 1997-1998 April (Rahamani.op cit)*

- |                         |                  |
|-------------------------|------------------|
| 1. Black Kite           | 6. Ring Dove     |
| 2. White backed Vulture | 7. Brahminy Kite |
| 3. Blue Rock Pigeon     | 8. Spotted Dove  |
| 4. House Swift          | 9. Barn Owl      |
| 5. Red wattled Lapwing  |                  |

In the last analysis of the bird strike reports till 1998 April Rahinani (op cit) has included the White backed Vulture among the common species striking. But during the rest of 1998 & 1999, we have seen only three cases of vultures colliding with aircraft. The populations of vultures have shrunk considerably in India during the last few years (SATHEESAN 2000). Whether this is the reason for the fewer vulture hits being reported from aerodromes is worth investigating.

## 2.6 Locations of accidents

Bird hits were reported from all the four parts of India, as is shown below.

*Number of bird strikes in different parts of India*

	S	C	N	W	E
1998	14	1	15	8	6
1999	10	1	18	4	5
2000	5	Nil	9	5	3

## 2.7 Distribution of bird strikes over the Months

Birds collided against aircraft during all the months of the years 1998 to 2000 [Figure 1 Appendix] Fewer bird strikes were reported during the months of April, May, June, November and December.

## 2.8 Timing of Bird strikes

Between the years 1998 - 2000 more hits (66%) occurred during the forenoon [Figure 2 Appendix]. Generally birds feed more actively in the forenoon. GRUBH (1989) found the Black Kites to be more numerous in Trivandrum Airport in the forenoon up to 14.00 Hrs.

## 2.9 Phases of Flight

In Calicut we have consistently observed a tendency for the Black Kites to stay on the runway even when aircraft are landing. Naval pilots attached to Ramnad Naval air station have informed us (Personal Communication 1994) that kites do not move away even when naval planes are approaching close to them. Among the bird hits reported during 1998 to 1999 more incidents occurred when the aircraft were landing as shown in the next table.

*Phases of flight when birds struck aircraft 1998-1999*

Phases	Landing roll	Take off	Taxiing	Enroute	Not mentioned
1998	11	8	8	Nil	17
1999	12	4	1	1	14

**2.10 Parts hit**

Bird hits on engines were the most numerous during the years 1998-1999. The compressor blades were damaged in most of these hits, as shown below.

*Parts of Aircraft damaged by bird hits*

	Engine	Compressor blades	Radome	Landing gear	Port main	Wing	No damage
1998	12	11	5	2	2		7
1999	17	10		3		6	10

*The other parts struck by birds in 1999*

Vertical Fin	1	Tail light	1
Landing Light	2	Wind shield	1
Port front intake	1	Fuselage	2

**3. Changes in the species composition of birds**

**3.1** The most remarkable change is the reduction in the number of larger birds like vultures striking aircraft and increase in the number of smaller species of birds ranging in size from a house swift to a myna causing collisions. The decline in the numbers of vulture hits appears to be related to the decline in their numbers in the wild. There appears to be a decline in the number of Black Kites also in Kerala. We are currently investigating this.

**3.2 Smaller Species of Birds**

As more and more of the wild areas and wetlands are being converted into housing colonies, wild animals of several kinds including birds are forced to use open spaces like the aerodromes for foraging and resting. It is not surprising that several smaller species of birds are striking aircraft.

**4. Methods of bird control used by the aerodromes**

**4.1** Perhaps as a result of the wide publicity given to the causes of bird hazards to aircraft and consequent measures taken to make aerodrome grounds less attractive to birds, there appear to be fewer serious bird strikes now, particularly in the military aerodromes. This is not true of the civilian aerodromes, which we have observed. Many of the civilian airports continue to have more or less the same rates of bird strikes as before.

**4.2.** There is also a decline in the standards of maintenance of the bird strike records. At least one civilian aerodrome we know has no specialist flight safety manager. Most of the aerodromes in India do not use the new methods of bird control like the use of Border Collie dogs which we tried to popularise in India. To the query whether an aerodrome suffers bird strikes the usual answer is that there are very few incidents, but that birds die regularly due to blasts of hot air from the aircraft. We suspect that many aerodromes are using lethal methods of control to remove birds.

## **5. Conclusion**

From the reports of bird strikes received by the BNHS during the years 1997 – 1999, it is clear that even in the absence of too many vultures, which were causing the maximum number of bird strikes, this form of hazard will persist as long as there are other species of birds. Nature abhors a vacuum and when one species disappears from a niche another will replace it. Lethal control of birds is no solution to solve bird hazards in Indian aerodromes. Every airport there must have a vigilant flight safety officer who keeps himself in touch with all the latest methods of bird control and one who stays in a station for a long duration. If this is not possible, each aerodrome must have a curator to manage problems created by vegetation small animals and birds.

## **6. Acknowledgements**

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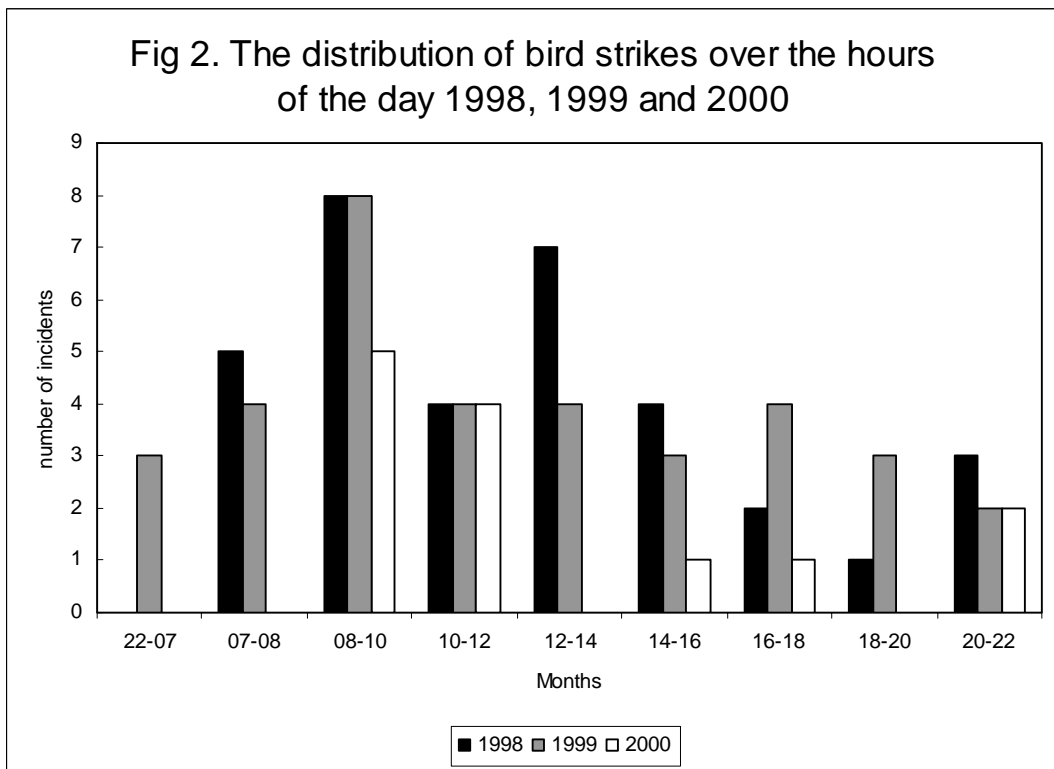
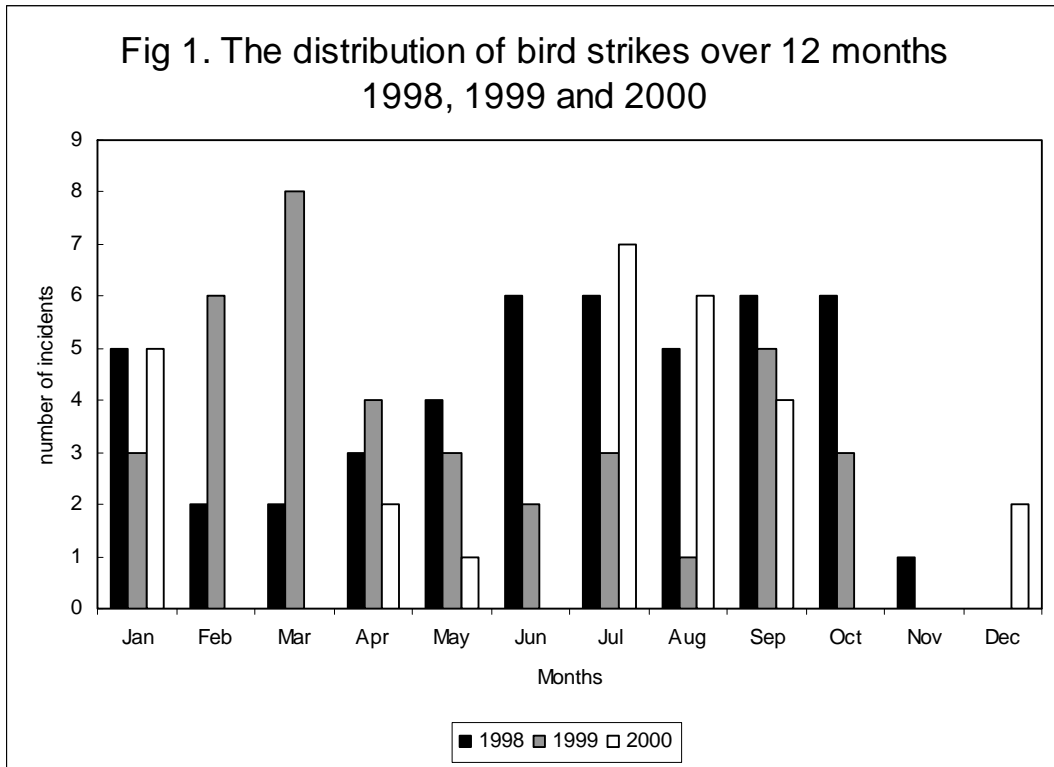
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We thank our families who were subjected to much inconvenience by our work.

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**APPENDIX**



**Table 1 List of Birds which struck aircraft in reports received by the BNHS 1997 to 1999**

S.No	Order	Species	1997	1998	1999
1	Ciconiformes	Pond Heron <i>(Ardeola grayii)</i>		+	
2	„	Cattle Egret <i>(Bubulcus ibis)</i>	+	+	
3	„	Night Heron <i>(Nycticorax nycticorax)</i>			+
4	„	Painted stork <i>(Mycteria leucocephala)</i>	+	+	
5	Anseriformes	Shoveller <i>(Anas clypeata)</i>		+	
6	Falconiformes	Black Kite <i>(Milvus migrans)</i>	+	+	+
7	„	Brahminy Kite <i>(Haliastur indus)</i>	+	+	
8	„	White Backed Vulture <i>(Gyps bengalensis)</i>	+	+	
9	„	Scavenger Vulture <i>(Neophron percnopterus)</i>	+		
10	Galliformes	Grey partridge <i>(Francolinus pondicerianus)</i>	+		
11	Charadriiformes	Red Wattled lapwing <i>(Vanellus indicus)</i>	+	+	
12	„	Yellow Wattled Lapwing <i>(Vanellus malabaricus)</i>	+	+	
13	Columbiformes	Blue Rock Pigeon <i>(Columba livia)</i>	+	+	+
14	„	Spotted Dove <i>(Streptopelia chinensis)</i>	+	+	
15	„	Little Brown Dove <i>(Streptopelia senegalensis)</i>	+		
16	Cuculiformes	Cuckoo <i>(Cuculus varius)</i>		+	
17	Strigiformes	Barn Owl <i>(Tyto alba)</i>	+	+	
18	Apodiformes	House swift <i>(Apus affinis)</i>	+	+	
19	Coraciiformes	Bluetailed Bee-eater <i>(Merops philippinus)</i>	+		
20	„	Roller <i>(Coracias benghalensis)</i>	+		
21	„	Hoopoe <i>(Upupa epops)</i>			+
22	Passeriformes	Short-toed Lark <i>(Calendrella cinerea)</i>	+		
23	„	Indian Myna <i>(Acridotheres tristis)</i>	+		
24	„	Jungle Myna <i>(Acridotheres fuscus)</i>	+		
25	„	Yellow Wagtail <i>Motacilla flava)</i>	+		

**Table 2.1 Bird strikes reported to BNHS India in 1998**

No	Species	Date	Part of India	Aircraft/ Type	Time	Phase	Remarks
1	Black Kite (Milvus migrans)	03/01/98	South	A 300	12.09	Landing Roll	No damage
2	Barn Owl (Tyto alba)	09/01/98	North	Mig 21	19.20	Taxi Lineup	Compressor blade bent
3	Shoveller (Anas clypeata)	10/01/98	South	A 320	-	T/o run	One Blade of compressor damaged
4	Myna (Acridotheres tristis)	21/01/98	South	TU 317	-	Landing Roll	
5	Black Kite	24-01-98	South	Passenger plane	08.30		No more data
6	Bird not Identified	27/01/98	South	TU 313	-	En route	Alt 3000 Reported from Arakkonam
7	Yellow Wattled Lapwing	06/02/98	South	TU 142	07.39	Run	Dent on leading edge of port main
8	Yellow Wattled Lapwing	11/03/98	South	IAF Plane	08.30	Descent	Speed 220
9	Passerine bird	28-03-98	North	Mig 21	17.00	Takeoff	Substantial damage to engine, flight aborted Speed 130 kts
10	Accipitriform	07/04/98	East	Mig 21	10.52	Takeoff	No damage Speed 780
11	Black Kite	29/04/98	South	HJT	11.55	Taxi	Speed 120
12	Jungle Myna (Acridotheres fuscus)	30/04/98	South	B 737	13.00	Taxi run	No damage Speed 170
13	Black Kite	02/05/98	-	B 737	-		No other data
14	Cattle Egret	08-05-98	North	Mig 27	11.09	Climb	Struck the nose, bird ingested compressor blade damaged plane landed Speed 500km
15	Dove (Streptopelia)	12/05/98	East	Mig 21	14.45	Taxi	Leading edge of fan blade damaged
16	Myna	25/05/98	South	B 737	12.36	Climb	No more data Speed 260
17	Blue Rock Pigeon	05/06/98	North	IL 76	13.20	-	Three blades damaged in No.3 engine
18	Not identified	11/06/98	South	B 737	12.36	Ground	No more data
19	Blue Rock Pigeon	13-06-98	West	Jaguar	09.36	Landing	Plane grounded compressor blades of both engines damaged
20	Blue Rock Pigeon	09-06-98	West	A 300	08.45	Landing	Flock of 20 pigeons crossed the runway during landing
21	Spotted Dove (Streptopelia chinensis)	13-06-98	East	B 737	08.22	Landing	No more data Speed 60
22	Swift (Apus affinis)	03-07-98	North	Mig 21	21.05-45	Ground	Air intake struck, Speed 200

**Table 2.2 Bird strikes reported to BNHS India in 1998**

No.	Species	Date	Part of India	Aircraft/ Type	Time	Phase	Remarks
23	Size of myna	09/06/98	North	Mig 21	13.40		No effect
24	White Backed vulture	02/07/98	South	TU 142	14.05	Take off	No damage
25	Swift (Apus affinis)	31-07-98	North	Mig 21	07.45-08.45	Take off	Compressor rotor blades 5 bent 1 blade damaged
26	Back Kite	21/07/98	North	B 747	-	Take off	Tade off aborted 1 blade damaged
27	Back Kite	22/07/98	North	IL 76	07.00	Take off	No other data
28	Blue Rock Pigeon	05/07/98	North	Mig 23	07.45	-	Air intake damaged in Engine 1
29	Charadriform	31/07/98	Central	Civilian aircraft	-	-	No other data
30	Charadridae	24/08/98	West	-	-	-	Damaged compressor blades
31	Kite	22/08/98	West	A320	09.25	Landing	Hit radome lights, glass slightly cracked
32	Brain fever bird (Cuculus varius)	02/02/98	North	Fighter aircraft			No other data
33	Charadriform	24/08/98	West	Fighter aircraft			No other data
34	Aredola grayi	25/09/98	East	Mig 29	13.45		Landing gear damaged Speed 450
35	Unidentified	21/09/98	North	Mig 21	08.50		Radome & bottom 7 air intake hit
36	Not identified	23/08/98	East	Civilian aircraft	11.50	Take off	Feathers in the engine
37	Not identified	06/09/98	South	Naval plane	11.50	Landing roll	No other data Speed 150
38	Not identified	23/08/98	East	Civilian aircraft		Take off	Feathers in engine
39	Not identified	05/10/98	West	Mig 21	20.35		No damage
40	Eagle	27/10/98	South	TU 142	07.45	Landing roll	Radome & engine no damage
41	Not identified	23/10/98	North	Mig 21	09.57		No other data
42	Not identified	13-10-98	West	Mig 21			Small nick on second stage rotor of compressor
43	Not identified	14/10/98	North	Mig 21	13.30		Radome & engine one air intake hit
44	Not identified	28/10/98	North	Mig 23	08.10		Nose and port intake hit
45	Not identified	11/10/98	West	Mig 23	16.10	Landing roll	Engine 1, Compressor damaged

**Table 3.1 Bird strikes reported to BNHS India in 1999**

No	Species	Date	Part of India	Aircraft/ Type	Time	Phase	Remarks
1	Falcon ?	05-01-99	West	Mig BIS	13.00		Left Side first stage of LP compressor bent at tip of leading edge
2	Size of Pigeon	22-01-99	North	Mig 21	15.15	Turn	Hit in flight on the stare board side. Tail fin dented skin torn
3	Size of Sparrow	29/10/99	Central	Mirage	09.50	Run	Engine 1, three compressor blades damaged
4	Hoopoe (Upupa epops)	04-02-99	North	Mig 21	14.30		Air intake, three blades of stage one of compressor bent at leading edge
5	Not identified	15/02/99	South	B 737	08.15	Ground	No damage
6	Kite	16/02/99	South	Jaguar	11.25	Landing roll	No damage
7	Size of Crow	22/02/99	North	Mig 23	13.17	Descending	Damaged Movable wing
8	Pigeon	24/02/99	North	Mig 21	16.04		250 m above ground, no effect
9	Size of Sparrow	26/02/99	West	Mig 21	10.10		Engine 1, Compressor blades damaged
10	Hawk ?	03-03-99	North	Jaguar Rolls Royce	21.20	Approach descent	Engine 2 intake & exhaust port flap damaged feathers and blood on portside of fuselage Speed 170knts
11	Pigeon ?	06/03/99	West	B 747	10.18	Landing	Cabin crew saw fire ball go out of engine
12	Small Bird	25/03/99	North	Mig 29	16.30 to 07.15	En route	Wing slat damaged Speed 700 to 800km
13	Pigeon	25/03/99	North	Mig 21	15.05	Climb	Engine 1 struck no damage reported
14	Parrot	25/03/99	North	Mig 29	17.35	Landing	Engine 1 struck no damage
15	Not Identified	25-03-99	South	HJT 16 Viper 22.8	01.00	Night flying	Yellow feathers on wingtip phase not mentioned
16	Pigeon	26-03-99	North	Mig 21	08.39	Landing	Wind shield, Engine Air intake tail fuselage, lights were hit
17	Dove	28-03-99	North	Jaguar	08.00	Parked	Bird ingested in to running engine prior to taxi out
18	Not Identified	06-04-99	North	Mig 23	08.00	En route	Bird ingested in engine nicks, an scratches on the 7th stage onwards blades of compressor
19	Size of Crow	21/04/99	South	B 737		Ground	Hit landing gear no damage
20	Sparrow	28-04-99	North	Mig 21	06.00 to 07.00		Post flight inspection showed feathers at air intake

**Table 3.2 Bird strikes reported to BNHS India in 1999**

No	Species	Date	Part of India	Aircraft/ Type	Time	Phase	Remarks
21	Size of Vulture	13/05/99	East	Mig 21	12.30	Approach	Wing Struck post flight inspection showed impact and shearing damage on the port flap of trailing edge
22	Cormorant ? Black Feathers	19/05/99	North	Mig 21	08.19	Climb	Engine 1 struck feathers on compressor blade
23	Not Identified	05/04/99	North	Jaguar	09.29		Compressor blades damaged
24	Myna ?	31/05/99	North	A 320	06.15	Runway	No damage
25	Kite	03/06/99	South	B 737	07.46	Landing	No damage
26	Small bird	13/07/99	North	Mig 23	08.35	Runway	Engine 1 struck cuts & nicks on Compressor blades 6-10th stage
27	Night Heron	23/07/99	East	M 127 ML	23.32	Ground	Glass of landing light smashed
28	Myna size	21/07/99	South	Mig 21	11.22	Engine	Small nick on II and III stages of Compressor
29	Kite ?	24/09/99	South	A 320		Engine struck	Feathers in the engine
30	Kite	11/08/99	North	A 320	07.35	Runway	No more data
31	Not Identified	20/09/99	North	Mig 21	08.02	Runway	Engine struck 1stage of compressor blades bent
32	Not Identified	23/09/99	South	Mig 21			Radome and air intake of engine 1 hit, No damage blood and feathers on radome
33	Not Identified	27/09/99	East	Mig 21	16.00 to 16.40		Engine 1 hit nicks and dents on 3rd, 4th & 5th sates of compressor
34	Not Identified	28/09/99	East	Mig 21	09.30 to 10.00		Engine struck feathers on intake no damage
35	Not Identified	02/10/99	North	Mig 29			Struck Wing no damage
36	Not Identified	17/10/99	South	Viper	22.40	Landing	Nose of landing light damaged
37	Not Identified	26/10/99	West	Mig 23	21.10 to 21.55	Over the air field	500 about air field no damage
38	Small bird	10/11/99	East	Mig 29	13.59		Engine 1 radome struck
39	Kite	03/06/99	South		07.46	Landing	Feathers in compressor no damage

**Table 4. Bird Strikes Reported to BNHS till September 2000**

Ser. No.	Species	Date	Part of India	Aircraft/ Type	Time	Phase	Remarks
1	Not available	20/01/00	South	HJT	9.00	Not available	Windshield air intake struck
2	„	28/01/00	East	Mig 21	9.00	„	Air intake hit, no damage
3	„	31/01/00	West	Mig 21		„	Three blades of first stage of compressor bent
4	„	31/01/00	North	AN 82		„	Bird ingested 1st stage compressor affected
5	„	18/04/00	North	Jaguar	20.-21.00	„	One compressor blade bent
6	„	18/04/00	North	Jaguar		Landing	Starboard radom ruptured skin
7	„	08/05/00	North	B 237		N.A	Small bird hit engine 1
8	„	04/07/00	East	Mig 27		„	Engine 1, three compressor blades damaged
9	„	07/07/00	North	Mig 21		„	Engine 1 feathers and flesh in the intake
10	„	09/07/00	South	A 300		„	Engine hit 2 blades damaged
11	„	11/07/00	North	Mig 21		Landing roll	No damage reported, feathers in intake
12	„	18/07/00	NorthWest	T 75		N.A	Engine 1 compressor damaged
13	„	24/07/00	South	Bristol Sydley	10.00	„	Starboard engine hit by large bird and extensively damaged
14	„	25/07/00	North	Ilyushin 76		Landing roll	4 blades 1st stage compressor engine 4 damaged
15	„	01/08/00	North	Canberra	10.00		Small dent on intake tip of engine
16	„	10/08/00	North	Mig 21		„	No damage
17	„	11/08/00		Jaguar		„	Port nose section had dent with two rivets sheared and one missing
18	„	31/08/00	South	Canberra	05.00	En route	Engine 1 inlet guide had small dent
19	„	04/09/00	N-West	Jaguar	04.53	N.A	No damage
20	„	11/09/00	West	Mig 21	15.35	„	Engine 1 blade of compressor had nick on 7th stage
21	„	20/09/00	East	Mig 21	20.30	„	Fuselage hit, no damage
22	„	21/09/00	?	Mig 21		„	Air intake of Engine 1 hit, turbine blades scratched
23	„	Not available	NorthWest	Mig 23		„	Hit air intake, no more data
24	„	„	North	Mig 21		„	Engine 1 blade of 3rd stage dented
25	„	„	North	Mig 23	18.00	Touchdown	Engine 1 hit, bird ingested, blades of 1st stage compressor bent
26	„	„	North	EA 32	12.00	N.A	No damage, flight continued

