

## 100 YEARS OF FATALITIES AND DESTROYED CIVIL AIRCRAFT DUE TO BIRD STRIKES

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### ABSTRACT

At the 1996 London and 2003 Warsaw meetings of the International Bird Strike Committee, illustrated Working Papers were presented that provided brief details of **all** known fatalities and destroyed aircraft due to bird strikes between 1912 and 2002. These papers were felt to be useful in drawing attention to the scale of the problem especially when dealing with those who know little about the subject or who are newly appointed to decision-making positions. Since the original papers were published, updated information has been provided in Papers presented at IBSC Meetings in Athens, Brasilia and Cairns. This 36 page Paper consolidates and updates the information and analysis.

It is now believed that the number of fatal accidents has risen to at least 55 killing 276 people in addition to the destruction of 108 aircraft. The Paper provides brief details on all the above accidents together with some photographs. Anyone with further information on these or other accidents should contact the Author. These are as follows:

- Airliners and Executive Jets – 16 fatal accidents killing 189, (which includes 7 third parties on the ground) and destruction of 44 aircraft.
- Aeroplanes 5,700 kg and below – 32 fatal accidents killing 69 and destruction of 56 aircraft.
- Helicopters – 7 fatal accidents killing 18 people and destruction of 8 helicopters.

Analysis reveals that the major threat to Airliners and Executive jets is engine ingestion, causing 76% of the accidents, it being noted that nowadays the vast majority of airliners are twin-engined thus increasing the consequences of a double engine ingestion. A high proportion of the losses were early Russian airliners and business jets operating where bird control measures may be minimal. Gull flocks (*Larus sp.*) were the cause of 40% of these accidents. Steadily improved engine ingestion requirements mitigate the risk but this cannot be applied to earlier engine designs.

General aviation aeroplanes of 5,700 kg and below are not subject to bird impact requirements, windshield penetration accounting for 56% of the accidents followed by wing damage at 13%. It is suggested that with the increased speed of kit/homebuilt aeroplanes giving birds less time to avoid them and often operating at heights where birds are most prevalent, manufacturers/builders should give serious consideration to the issue. Unlike airliners, birds of prey (*Accipitriformes*) caused 47% of the accidents followed by geese/ducks, gulls and pelicans/cormorants, many being heavy birds. Some accidents were the result of pilots attempting to avoid birds.

Similarly helicopters are most at risk from impact with large birds which caused windshield penetration in 50% of accidents. Faster, quieter helicopters will give birds less time to avoid them.

Although not a major cause of fatalities, bird strikes are a serious safety and economic hazard. Bird strike accidents are rare events that can happen out-of-the-blue, even at airports that may consider they have appropriate measures in place. **Complacency is the enemy of safety.**

(Key words: *civil aviation, general aviation, mishap investigation, statistics*)

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Gulls, DC10 Kennedy Airport, New York 1975 (airline staff – non fatal)

## 1. Introduction

1.1 The earliest known bird strike to a powered aircraft was on 7 September 1905, when Orville Wright was demonstrating their progress by flying complete circles near Dayton, Ohio. He chased a flock of birds and killed one, which according to US experts, were almost certainly Red-winged blackbirds (*Agelaius phoeniceus*, 50 gm). The first **fatal** bird strike was on 3<sup>rd</sup> April 1912 at Long Beach in California, when a gull (*Larus* sp.) lodged in the flying controls of a Wright Flyer, killing Cal Rodgers, a celebrity pilot who was the first to fly across the USA.

1.2 In the November 1925 Royal Aeronautical Society Journal, the then Director of Civil Aviation, Sir Sefton Brancker, wrote the following in an article entitled ‘The Lessons of Six Years Experience in Air Transport’:

*“There is one form of collision which must not be altogether forgotten; the possibility of colliding with birds in flight. We have had one mysterious incident in which the pilot lost control of his aircraft flying over the sea at a low height, the pilot’s opinion was that he had been struck on the head by a sea bird, several were flying nearby, but nothing was ever clearly proved. In the East, propellers of aircraft taking off have been broken by kites flying over the aerodrome. I have never heard of an aeroplane encountering a flock of ducks at night; such an eventuality might lead to danger of injury to the pilot, the propeller or wing structure”.* These were prophetic words from nearly 90 years ago.

1.3 At the 1996 London and 2003 Warsaw Meetings of the International Bird Strike Committee, illustrated Working Papers were presented that provided brief details of **all** known fatalities and destroyed aircraft due to bird strikes during the period 1912 to 2002. These Papers were felt to be **useful for Public Relations purposes** in drawing attention to **the scale of the problem**, especially when dealing with those who **know little about the subject or who have been newly appointed to decision-making positions**. Since the original papers were published, updated information has been provided in Papers presented at IBSC Meetings in Athens, Brasilia and Cairns. This paper consolidates and updates the information from all previous papers. Where available, the opportunity has been taken to include more comprehensive information on some of the accidents.

1.4 The paper contains brief details of each case of loss of life or destruction of the aircraft divided into three Sections:

- Section 1 - Transport aeroplanes over 5,700 kg (12,500 lb) and all executive jets
- Section 2 - Aeroplanes of 5,700 kg and below
- Section 3 - Helicopters

## 2. Overall Scale of the Problem

Birds are known to have caused at least:

- 55 fatal accidents
- 276 deaths
- the destruction of 108 civil aircraft

It is very likely there are more, as information is only accurate for the last 25 to 30 years. **The Author would welcome any new or additional information.** This will be made available in a Supplement and placed on the IBSC Web Site.

### 3. Airliner Impact Resistance

3.1 Currently newly Certificated engines have to meet a range of EASA European engine ingestion tests detailed in CS-E800, **all dependent upon intake throat area** and specifying the allowed loss of rated take off-thrust; in simple terms:

- No hazardous engine effect after impact with a single large bird of weight between 1.85 and 3.65 kg
- For a large flocking bird, no more than 50% loss of thrust following ingestion of mixed large birds of between 1.85 and 2.5 kg and for 20 minutes must be capable of thrust variation.
- For medium flocking birds the engine must be capable of ingesting a number of birds of varying mass, without a reduction of thrust of less than 75%
- For small birds of weight 0.85 kg, a number of birds must not result in loss of more than 25% thrust.

A number of relatively recent aeroplanes will meet these criteria but it should be borne in mind that they are not and cannot be applied retrospectively to previously produced engines likely to be in service for many years to come.

3.2 The airframe including windshield must be able to withstand, without hazard, impact with a bird of 1.8 kg at Vc at sea level or 0.85 Vc at 8,000 ft whichever is the most critical. In 1989 an A320 aircraft at 2,500 feet and 250 knots IAS, collided with a vulture (around 10 lb) just above the cockpit windscreen. Although the windshields were not penetrated, the impact destroyed 4 of the 6 cockpit display units (CRT's) and shock loaded an engine fire button in the roof panel causing one engine to shut itself down.

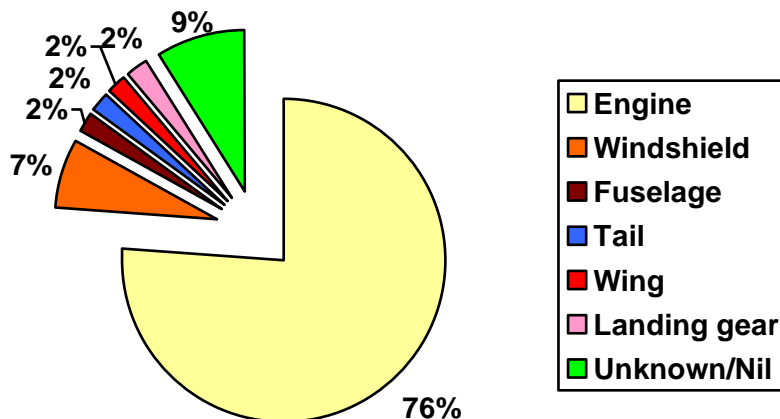
3.3 The lighter weight Executive jets of less than 5,700 kg (e.g. Lear 23 and some 24s) will have been Certificated to US Part 23 Requirements for general aviation aircraft which did not require bird impact resistance.

### 4. Analysis and Discussion

4.1 **Transport Aeroplanes and Executive Jets – 45 accidents, 16 fatal and 189 deaths.**

a). The 16 fatal accidents to the above aeroplanes is quite modest, however, 44 have been destroyed and 189 people killed, 7 of them being third parties on the ground. Surprisingly, there has only been **one** fatal accident to a jet powered airliner in over 1.4 million flying hours. This may, in part, be due to an improved awareness of the problem, implementation of better airport measures in many parts of the world and tougher airworthiness criteria for all but the oldest aircraft and engines.

Fig. 1 – Part Struck



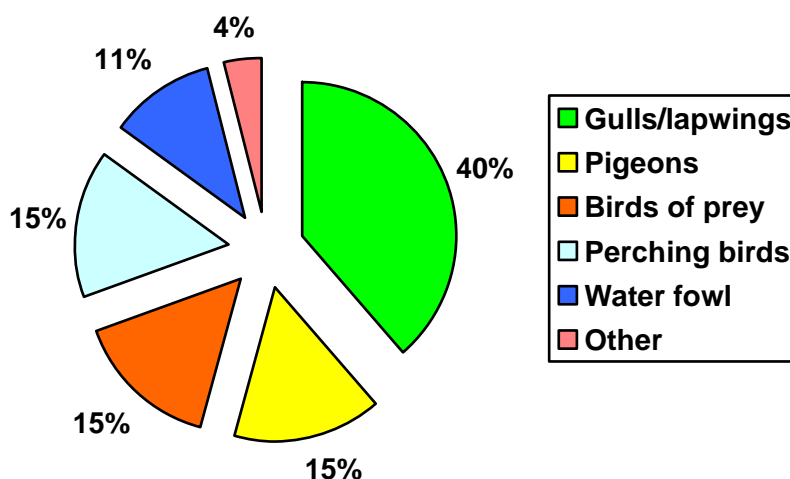
b). In Fig. 1 it can be seen that engine damage was the cause of 76% of the accidents in this group, followed by windshields with 7%. In recent years a high proportion are early Russian aircraft operating at airports, often in third world countries, where control measures are unlikely.

c). Although **not** included in this Study, there have been many cases of multiple engine damage, fortunately either with enough runway length to abandon take-off, or sufficient power available to return. European airlines continue to experience about 20 cases per year where **more** than one engine ingests birds. Forty years ago 65% of UK airline flights (Ref. 2) used 4-engined aeroplanes falling to 30% in the early 1980s (Ref. 3) whereas in 2010 (Ref. 4) this has fallen to 4% of flights. There is no reason to believe that the world situation is markedly different. This has increased users to a much greater chance of the serious consequences that can result from a double engine strike.

d). It has been estimated (Ref.1) that bird strikes world-wide cost the aviation industry over €1 billion per annum in engine and airframe damage and the associated cost of delays. It should be borne in mind that for example a Rolls Royce Trent engine, which is in widespread use, costs close to € 20 million.

e). Executive jets comprise 32% of the accidents in this section. These often operate from aerodromes with little or nothing in the way of bird control measures and may be more vulnerable as in many cases their engines are of an age which pre-dates requirements for bird ingestion testing, see para. 3.3.

**Fig.2 - Bird Species – where known**



f). Where the bird species is known (68% of 30 cases) it can be seen in Fig. 2 that gulls (*Larus sp.*) are the major cause of the accidents followed by birds of prey (*Accipitriformes*), pigeons (*Columbiformes*) and water fowl (*Ciconiiformes & Anseriformes*).

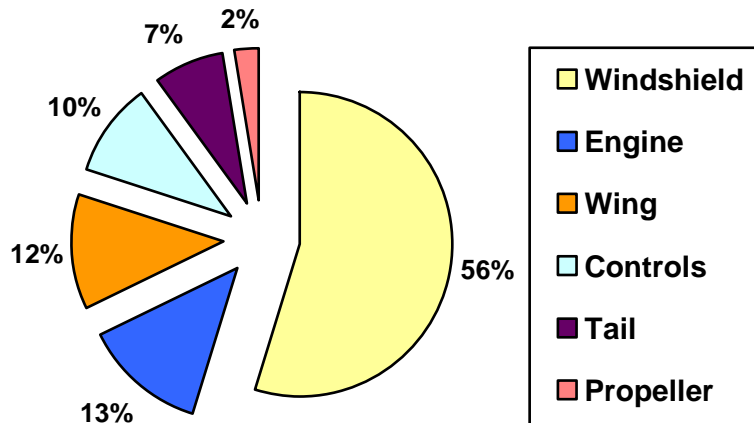
**4.2 Aeroplanes of 5,700 kg & Below – 32 fatal accidents, 69 deaths, and 56 write-offs.**

a). Thirty two of the fatal accidents involve general aviation aeroplanes. These aircraft are **not** required to be designed to withstand bird strikes and are therefore more vulnerable, particularly the windshield which can be holed by a bird as small as a Swift (*Apus apus*, 40 gm).

b). In Fig. 3 it can be seen that the windshield is struck in 54% of accidents with the engine and the wing in 12.5% of cases followed by controls with 10% and the tail at 8%. Pilots who habitually fly fast at low level or in a bird-rich environment should consider wearing head protection with visor or goggles. Many single-engine training aircraft such as the Cessna 152 and Piper PA28 fly at a modest speed which enables birds to get out of their way; past evidence shows that up to about 80 kts birds can successfully avoid an aircraft. Currently, it is the homebuilt/kit built aircraft that have a considerably higher cruising speed bearing in mind that impact force is proportional to the square of the collision speed so that a small increase in speed results in a big increase in the impact force.

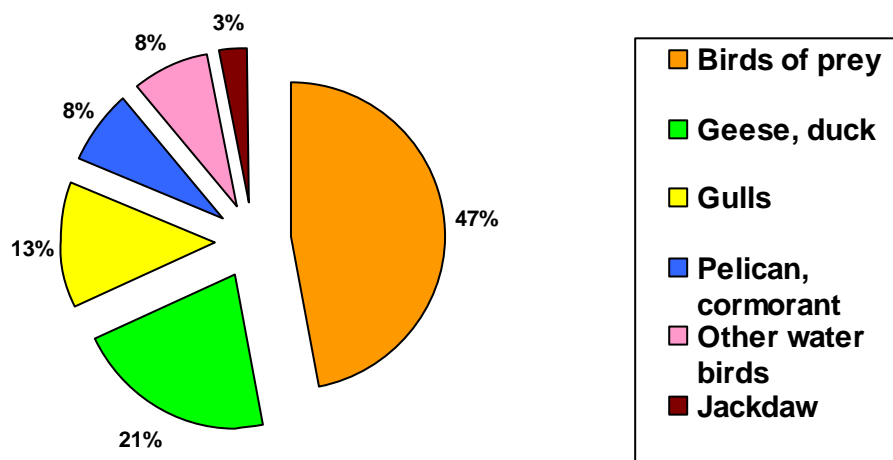
c.) In 8 of the general aviation accidents, 14%, the pilot was attempting to avoid birds by taking evasive action and either losing control or colliding with ground objects.

**Fig. 3 - Part Struck - where known**



d.) Fig. 4 shows that the where known, (67% of cases), birds causing general aviation accidents are markedly different from those of transport sized aeroplanes. In these cases the major threat is birds of prey (*Accipitriformes*), which are frequently heavy and have little or no fear of other airspace users, causing 47% of the accidents. The group comprising geese and ducks (*Ciconiiformes* & *Anseriformes*), which are also heavy, caused 21% followed by gulls (*Larus sp.*) at 13%.

**Fig. 4 - Bird Species - where known**



#### 4.3 Helicopters – 7 fatal accidents, 18 deaths and 10 helicopters destroyed

The total of 10 accidents of which 7 were fatal is small considering most helicopters operate low-down where birds fly most frequently. The high proportion of helicopter accidents in the USA (70%) is probably a reflection of the number of helicopters operating in that country. In the past the relatively slow cruising speed, coupled with rotor noise, acts as sufficient warning for birds to get out of the way. However, the trend towards faster and environmentally quieter helicopters might result in increased problems especially as vulnerable windshields were holed in 50% of the helicopter accidents particularly after collision with heavy birds, Raven (*Corvus corax*), Black vulture (*Coragyps atratus*) and Red-tailed hawk (*Buteo jamaicensis*). Vibration, probably as the result of impact on the rotor system, was also a feature in several hull losses.

## 5. Associated Serious Incident Papers

Similar papers covering 'serious' incidents are available on the IBSC web site:

- 1912 to 1982 - WP16 and 16A BSCE16, Moscow, August 1982
- 1981 to 1984 - WP27 BSCE17, Rome, October 1984
- 1984 to 1985 - WP4 BSCE18, Copenhagen, May 1986
- 1985 to 1987 - WP22 BSCE19, Madrid, May 1988
- 1987 to 1989 - WP29 BSCE20, Helsinki, May 1990
- 1989 to 1991 - WP31 BSCE21, Jerusalem, May 1992
- 1992 to 1993 - WP26 BSCE22, Vienna, August 1994
- 'Bird Strikes to Airliner Turbine Engines' - WP63 IBSC 23, London, May 1996
- 'Implications of Recent Serious Bird Strike Accidents and Multiple Engine Ingestions' - WP3 IBSC24, Slovakia, September 1998

In the papers above 'serious' has been defined as:

- Loss of life
- Injury to occupants
- Destruction of aircraft
- Loss of, or damage to, more than one engine
- Damage to one engine, together with ingestion in another engine
- Uncontained engine failure
- Fire
- Significant sized holes, eg. windshield, radome
- Major structural damage
- Particularly unusual or dangerous features, eg complete obscuring of vision, multiple or significant system loss, propeller damage, helicopter rotor or transmission damage.

## 6 Conclusions

6.1 Aircraft continue to be destroyed and occupants killed or injured in accidents due to:

- Striking birds
- Attempting to avoid birds
- Birds being the start of a chain of events

6.2 Although **not** a major cause of accidents, bird strikes are nevertheless a serious safety and economic hazard. Remedial measures and tougher aircraft/engines appear to have improved transport aircraft safety but twin-engined airliners have by and large replaced those with 3 or 4 engines so there is an increased risk of ingestion in all engines. Engine damage is the major risk for this group of aircraft, with flocking gulls (*Larus sp*) the major threat causing 33% of the accidents. This underlines the importance of the thorough application of aerodrome bird control measures by dedicated staff.

6.3 Business jets appear to be particularly vulnerable especially when operated from aerodromes with little or no bird control measures.

6.4 In recent years a significant number of accidents involve early Russian aircraft operating from 'remote' or third world areas where bird control measures are unlikely.

6.5 'General aviation' aeroplanes are most vulnerable to the windshield being holed, the cause of 54 % of the accidents. Birds of prey (*Accipitriformes*), generally heavy were responsible for half of the accidents. This group of aircraft mostly fly at heights where almost-impossible-to-spot-birds are most prevalent.

6.6 In the absence of any legislation for general aviation aircraft, where there is the option of a thicker windscreen, owners should take the opportunity to fit one, which will also provide a quieter cockpit environment. Although this will not prevent penetration by a large bird it will absorb some of the impact force and reduce pilot injury. Furthermore, manufacturers of kit/homebuilt aircraft should consider the windscreen thickness and its structure in relation to the aircraft cruise speed.

6.7 A high proportion, 50%, of helicopter accidents was due to the windshield being holed, sometimes by heavy birds. Again, helicopters mainly operate low down where most birds fly and the trend towards faster, quieter helicopters, provide less time for birds to take evasive action.

6.8 Bird strike accidents are a rare event that occur out-of-the-blue even at airports which may consider that adequate measures are in place to minimise the risk. It should be borne in mind that **complacency is the enemy of safety**.

## Acknowledgements

- Bird weights from 'Average Weight of Birds' - Trevor Brough, UK Agricultural Science Service, July 1983
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  4. 'UK Airline Statistics 2010' Table 1.11.1, CAA London
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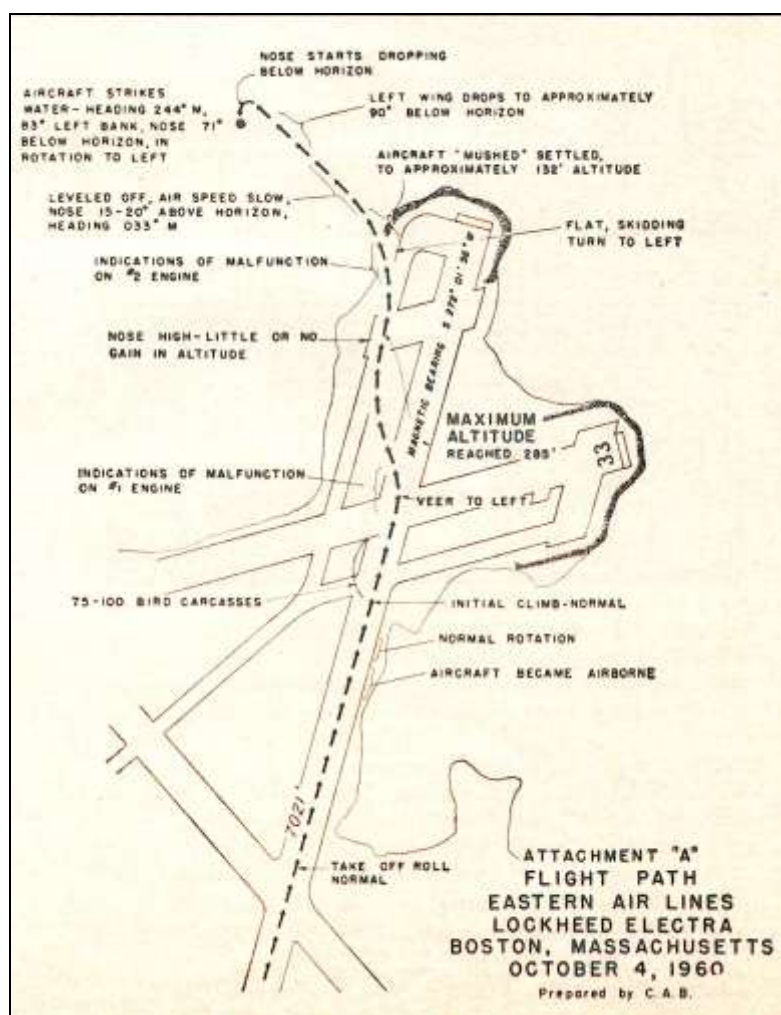
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## WORLD-WIDE BIRD STRIKE ACCIDENTS INVOLVING DESTRUCTION OF AIRCRAFT OR FATALITY, 1912 - 2011

### Section 1 – TRANSPORT AEROPLANES and EXECUTIVE JETS

Date/ Regn.	Aircraft/ Engine	Location/ Country	Part Struck/ Birds	On Board/ Deaths
04.10.60 N5533	Lockheed L188 Electra 4 Allison 501 turboprop	Boston Airport, Mass, USA	Engines Starlings	72 <b>62 fatal</b> 9 serious injury



A few seconds after the Eastern Airlines flight became airborne from runway 09, the aircraft passed through a flock of **Starlings** (*Sturnus vulgaris*, 80 gm). A number were ingested in engines 1, 2 and 4. Engine 1 was shut down and its propeller auto-feathered. Numbers 2 and 4 experienced substantial intermittent loss of power which resulted in the aircraft yawing and decelerating to the stall speed, the left wing dropped, the nose pitched up and the aircraft rolled left into a spin and fell almost vertically into the water. About 75 carcasses were scattered over a large area. At least 4 birds were ingested in engine 1, about 6 in engine 2, which flamed out and re-lit and with less in number 4. This was the worst ever bird strike accident, 59 passengers and 3 crew died, and 9 passengers were seriously injured.

<b>15.07.62</b> VT-AUS	<b>Douglas DC3</b> 2 P&W R1830 piston	Nr Lahore, Pakistan	Windshield Vulture	3 <b>1 fatal</b>
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The Indian Airlines freight flight from Kabul to Amritsar was in the cruise when the crew spotted a **vulture** (*Gyps sp.*, wt up to 10 kg) above and to one side of them. The co-pilot was killed when it attacked the aircraft and penetrated the windshield.

<b>23.11 62</b> N7430	<b>Vickers Viscount</b> 4 RR Dart turboprop	Ellicott City, Maryland, USA	Tailplane Whistling Swan	17 <b>17 fatal</b>
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While the United Airlines flight was in the cruise at 6,000 ft en-route from New York, Newark to Washington at night, the aircraft struck **Whistling swans** (*Cygnus columbianus*, 6 kg). Two were struck, one holed the leading edge of the tailplane and exited from the rear surface damaging the elevator, weakening the structure causing the tailplane to detach and the aircraft to crash. As a result of this accident aircraft tail areas are now required to withstand impact with a 3.7 kg bird.

<b>28.07.68</b> N367E	<b>Falcon 20</b> 2 GE CF700 turbine	Lake Erie, USA	Engines Gulls	3 Nil
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During take-off from Burke Lakefront Airport, **gulls** (*Larus sp.*, 280 gm to 1.7 kg.) were ingested into both engines causing severe damage. The aircraft hit a fence and crash landed in the lake where the three crew were rescued by a pleasure boat. 315 dead birds were found on the runway and engine 1 was 20% filled with debris and number 2 by 17%.

<b>23.07.69</b> F-OCKT	<b>Douglas DC3</b> 2 P&W R1830 piston	Nr Khar, Ambadu, India	Engines Cranes	4 Nil
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The Air Djibouti aircraft was operating a freight flight from Tadfours to Djibouti. While flying at 300ft the aircraft struck a flock of **Cranes** (*Grus sp.*, up to 6 kg). There were multiple propeller strikes and debris blocking both carburettor intakes. The aircraft was ditched in the sea 9 nm from Khar Ambadu, a passing boat rescued the four crew.

<b>26.02.73</b> N-454RN	<b>Lear 24</b> 2 GE CJ610 turbine	De Kalb, Chamblee, Georgia, USA	Engines Cowbirds	7 <b>7 fatal,</b> 1 3 <sup>rd</sup> party injury
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Just after take-off there was severe loss of power on both engines after the aircraft collided with a flock of **Cowbirds** (*Molothrus ater*, 44 gm). The aircraft crashed into buildings and burned. The left engine had 14 strikes and the right at least 5. The birds were from a landfill near the end of the runway. (Litigation against the airport was unsuccessful).

<b>04.12.73</b> LV-JNR	<b>BAC 1-11</b> 2 RR Spey turbine	Bahia Blanca, Argentina	Engine -	74 Nil
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Shortly after rotation on take-off and while retracting the landing gear there was loss of power and severe vibration from the left engine and the aircraft lost height. The pilot had seen a large bird on

the left side of the aircraft. He attempted to land back on the remaining 950 metres of runway and was slowed by arrester cables used for the operation of navy fighters. The cables broke damaging the aircraft and causing a fuel leak that resulted in a fire. The aircraft was damaged beyond economic repair.

<b>12.12.73</b> LN-FOE	<b>Falcon 20</b> 2 GE CF700 turbine	Norwich, Norfolk, UK	Engines Gulls	9 3 minor injury
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Photo – Eastern Counties Newspapers, Norwich

The co-pilot a qualified commander on the type was flying the aircraft from the left hand seat. The aircraft took off for Gothenburg, Sweden at 15.37 hrs. As it became airborne about half way down the runway the pilot avoided two flocks of birds but between 1 and 200 ft collided with a third flock extending from the ground to well above the aircraft. There were multiple strikes and both engines were heard to run down and fail. The landing gear was still down and avoiding trees he force landed in a field about 1,000 metres off the runway end. All three landing gear legs were torn off and it came to rest on its belly. The two pilots and cabin attendant suffered cuts and bruises but the passengers were uninjured. A total of 35 gull carcasses (**Common gulls** *Larus canus*, 420 gm, **Black-headed gulls** *Larus ridibundus*, 275 gm) were found towards the end of the runway. Both engines had been damaged by one or more birds. Visibility from the Control Tower was restricted by the onset of darkness, and by condensation and rain on the windows. (Litigation was awarded against the airport).

<b>24.04.74</b> CCCP-75405	<b>Ilyushin Il-18D</b> 4 Ivchenko AI 20M t'prop	Tashkent, Uzbekistan	Engine -	115 <b>1 fatal</b>
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During the initial climb No 4 engine ingested a bird and lost power. The Aeroflot aircraft crashed and was destroyed. One passenger died as a result of the accident.

<b>14.06.75</b> N67KM	<b>NA265 Sabreliner</b> 2 P&W JT12A turbine	Watertown, USA	Engines Gulls	6 3 serious injury
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Shortly after take-off the pilot informed ATC there was a problem. Moments later the aircraft crashed after the right wing tip struck the ILS installation, the wreckage ending up about 150 metres from the initial ground contact. The aircraft was destroyed by fire. As the aircraft had rotated and become airborne, the pilot saw a flock of **Franklin's gulls** (*Larus pipixcan*, 260 gm), that went through the engines, which lost power and they force landed straight ahead. 13 young gulls were found dead near the runway and there were bird remains in the left engine. (Litigation)

<b>12.11.75</b> N1032F	<b>McDonnell Douglas DC10</b> 3 GE CF6 turbine	Kennedy Airport New York, USA	Engine Gulls	139 2 serious, 11 minor
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At 13.10 hrs local the Overseas National Airways DC10 on a company positioning flight crashed while taking off from runway 13R. As the aircraft accelerated past 100 kts, but before reaching V1, gulls (**Great black-backed**, *Larus marinus* 1.7 kg, **Ring-billed gulls**, *Larus delawarensis* 385 gm and **Herring gulls**, *Larus argentatus* 1.1 kg) rose from the runway. The aircraft struck many birds and the take-off was abandoned on the wet runway. As the aircraft was being decelerated on the

wet runway, number 3 engine disintegrated and caught fire. Several wheels and tyres failed and the captain steered the aircraft onto a taxiway where the landing gear collapsed and ultimately the aircraft was destroyed by fire. All on board were airline employees who escaped successfully although two received serious injuries.



Due to the loss of No 3 hydraulic system, number 2 brake system, number 3 engine thrust reversers and number 3 spoiler system were all unavailable. Engine imbalance caused the epoxy abrasible fan shroud to catch fire due to blade rub. Engine 3 ingested at least one Great black-backed gull and 9 more were found on the runway together with 13 Herring gulls. An Airworthiness Directive required replacement of the fan shroud material.

<b>20.11 75</b> G-BCUX	<b>BAe 125</b> 2 RR Viper	Dunsfold, Surrey, UK	Engines Lapwings	9 <b>6 fatal 3<sup>rd</sup> party</b>
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Photo – Southern News Service, Guildford

At about 75 ft just after becoming airborne on a dusk demonstration flight the aircraft encountered a flock of **Lapwings** (*Vanellus vanellus*, 215 gm). Both engines lost power and surged and the pilot attempted to land back on the runway. It over-ran the runway end and crossed a road and deep ditch into a field before being destroyed by fire. The two pilots were slightly injured, the seven passengers were unhurt. As it crossed the road, it had struck a car killing the lady driver and five children. Subsequently, traffic lights were installed to stop vehicles when aircraft were taking off.

<b>06.02.76</b>	<b>Lear 24</b>	Bari Airport,	Engines	2
I-AMME	2 GE CJ610 turbine	Italy	Gulls	2 minor injury

Just before lift-off **gulls** (*Larus sp.*) were ingested in both engines, power was lost and during the attempt to land on the remaining runway the aircraft ended up in a field.

<b>12.11.76</b>	<b>Falcon 20</b>	Naples, Florida,	Engines	11
N27R	2 GE CF700 turbine	USA	Gulls	11 serious injury

Airport employees had been dispersing a flock of **Ring-billed gulls**, (*Larus delawarensis*, 485 gm) by driving a luggage cart along the runway. The majority went away but about 30 returned. As the aircraft took off, just after becoming airborne it passed through the flock, the engines lost power and it crashed heavily, the fuselage breaking apart. The two over-wing exits could not be opened and the occupants escaped via the fuselage break and the left forward cabin door. Gull remains were found about 1,400 ft from the end of the 5,000 ft runway and in the engines.

<b>04.04.78</b>	<b>Boeing 737</b>	Gosselies,	Engine	3
OO-SDH	2 P&W JT8D turbine	Belgium	Pigeon	Nil



A trainee co-pilot was making touch and go landings under the supervision of an instructor. As the aircraft was about to lift-off, a flock of **Woodpigeons**, (*Columba palumbus*, 465 gm) were seen ahead. Because he believed both engines might have ingested birds, the pilot abandoned the take-off even though the speed was beyond V1. The aircraft over-ran into an industrial estate with a collapsed right landing gear and the right engine torn from the wing. The wreckage ended up 300 metres from the runway on the extended centre-line and was destroyed by fire. Only the left engine was found to have suffered bird strike damage.

<b>25.07.78</b>	<b>Convair 580</b>	Kalamazoo,	Engine	43
N4825C	2 Allison 501 turboprop	Michigan, USA	Sparrowhawk	3 serious



As the North Central Airlines aircraft was taking off at 07.02, a **Sparrowhawk** (*Falco sparverius*, 105 gm) struck the left engine just as the aircraft passed V1. The left propeller auto feathered as the aircraft lifted off and it turned to the left and flew for 79 seconds before crashing in a cornfield. One crew member and two passengers were seriously injured. Investigation found that the probable cause was the failure of the captain to follow the prescribed procedures, allowing the aircraft to decelerate into a flight regime from which he could not recover, whilst inadequate cockpit co-ordination also contributed.

<b>26.07.78</b>	<b>Douglas DC3</b>	St. Elena Peten,	-	-
TG-ATA	2 P&W R1830 piston	Guatemala	-	-

The Aviatega aircraft was taking off when it collided with birds; a forced landing was attempted at the end of the runway but the aircraft ended up in a swamp.

<b>07.04.81</b>	<b>Lear 23</b>	Lunken, Cincinnati	Windshield	2
N400PG	2 GE CJ610	USA	Loon	<b>1 fatal</b>



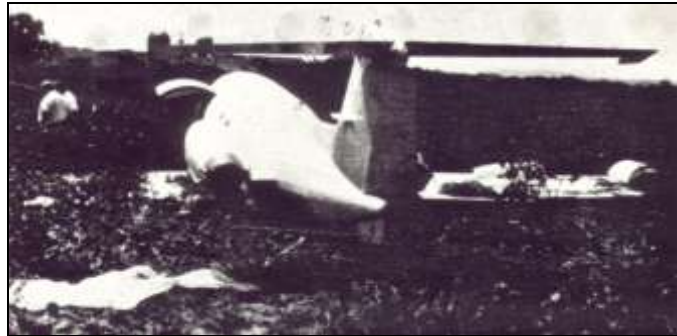
While climbing through 4,000 ft in a left turn, a **Loon** (*Gavia immer*, 3.7 kg) penetrated the right windshield killing the co-pilot and seriously injuring the pilot. Windshield debris damaged engine 2 which had to be shut down. Loss of hydraulics caused inoperative flaps and brakes and wind-blast resulted in communication difficulties. The injured pilot demonstrated great skill in returning to Lunken Airport. (Successful Litigation against aircraft manufacturer)

<b>06.12.82</b>	<b>Lear 35A</b>	Paris Le Bourget,	Nil	4
HB-VFO	2 Garrett TFE731 turbofans	France	Gulls	1 crew injury



As the aircraft was taking off on a wet runway, a flock of **Black-headed gulls**, (*Larus ridibundus* 275 gm) was encountered when the speed was above V1. Take-off was abandoned and the aircraft over-ran the runway by 56 metres into the ILS installation, which penetrated the cockpit injuring the co-pilot. The brake chute had failed and the emergency brake source was not used. Neither engine had suffered bird damage.

<b>17.08.83</b> N108PA	<b>Lear 25</b> 2 GE CJ610 turbine	Wilmington, USA	Engines Starlings	2 -
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At 500 ft after take-off, the aircraft passed through a flock of 200 **Starlings**, (*Sturnus vulgaris*, 80 gm). Both engines failed and the aircraft force landed, struck a tree between industrial buildings and bounced across a road into a field. There was no fire. The pilot reported it was only 10 seconds from the bird encounter to ground impact.

<b>29.09.86</b> VT-ELV	<b>Airbus A300</b> 2 GE CF6 turbine	Madras, India	Engine Black kite	196 11 minor
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The Indian Airlines flight to Bombay had 11 crew and 185 passengers, the co-pilot was handling. During the take-off run both pilots saw a large bird to the right hand side and the Commander told the co-pilot to continue with the take-off. At about 150 kts the co-pilot reportedly saw another large bird on the runway centreline so he rotated the aircraft. When it had attained 5 to 8° nose-up attitude a loud noise was heard from the right side followed by severe vibration. The Commander took control and abandoned take-off. Reverse thrust and brakes could not stop the aircraft, which over-ran sustaining damage beyond economic repair. During the evacuation 4 crew and 10 passengers sustained minor injuries. The bird was identified as a **Pariah kite** (*Milvus migrans govinda*, 680 gm).

<b>15.09.88</b> ET-AJA	<b>Boeing 737</b> 2 P&W JT8D turbine	Bahar Dar, Ethiopia	Engines Pigeon	104 35 fatal, 21 injured
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During the take-off run of the Ethiopian Airlines aircraft at the airport 5,800 ft amsl, at a speed between V1 and VR the aircraft encountered a flock of **Speckled pigeons** (*Columba guinea*, 320 gm). These were ingested in both engines, which started to surge and lose power with loss of EPR and very high EGT. The gear was retracted, full power applied and a slow climb made in order to complete a circuit and return. The aircraft reached a maximum of 7,100 ft and 190 kts. On base leg about 3 ½ minutes after take-off both engines failed and a wheels up forced landing was attempted in open country about 10 km SW of the airport. The aircraft encountered a small riverbank disintegrated and caught fire. The airport only has 2 or 3 jet movements per week. It is believed 10 to 16 birds were ingested in each engine causing the fan damage and surging. The pigeons had been feeding on grass seed that had grown from soil brought to the airport to fill in trenches that had been dug for cable laying.

<b>25.07.90</b>	<b>Boeing 707</b>	Addis Ababa,	-	5
ET-ACQ	4 P&W JT3D turbine	Ethiopia	Pigeon	1 serious injury

As the Ethiopian Airlines aircraft was taking off a flock of **pigeons** (*Columba* sp.) was encountered. Take-off was abandoned after V1 and it over-ran and was damaged beyond economic repair.

<b>13.10.92</b>	<b>Antonov 124</b>	Nr Ulyanovsk, Nr. Kiev	Fuselage	9
CCCP-82002	4 Lotarev D18T	Russia	N/K	<b>8 fatal</b>

The second prototype was on a test flight when at about 19,700 ft, during a high speed descent, a bird, believed to be about 1.8 kg, was struck holing the nose. This allowed the area between the nose and the front bulkhead to become pressurised by the ram-air causing failure of the upward opening freight door. Control was lost and the aircraft crashed, one of the crew managed to eject but the others were killed when it crashed in a forest. The aircraft had been flying at a speed of 330 kts and was outside the normal flight envelope.

<b>20.08.93</b>	<b>Antonov An-12</b>	Slavgorod,	Engines	7
CCCP-11375	4 Ivchenko AL20 turboprop	Russia	-	Nil

During a freight flight, as the aircraft climbed through about 150 ft, engines 2 and 4 failed. The crew attempted to return but had to force land beyond the end of the runway. It touched down with the landing gear retracted and slid for about 460 metres before it caught fire and was destroyed. At the time of the take-off a large flock of birds was reported in the vicinity of the runway and it is believed the engine failures were the result of multiple ingestion.

<b>20.01.95</b>	<b>Falcon 20</b>	Paris Le Bourget,	Engine	10
F-GHLN	2 GE CF700	France	Lapwings	<b>10 fatal</b>

Just after the aircraft rotated on take-off on a charter flight to Romania from runway 25 at Paris, Le Bourget, it encountered a flock of **Lapwings** (*Vanellus vanellus*, 215 gm). A number were ingested in engine 1. The aircraft was climbing but the pilot reported he was returning due to an engine fire. A number of witnesses saw the rear of the aircraft engulfed in flames. A tight left hand circuit was flown at a height of about 500 ft agl in an attempt to land back on the runway. The aircraft was about 30° off the runway heading and landed heavily with 15° of left bank in a nose-down attitude just to the right of the runway close to the intersection with runway 21. The aircraft was destroyed by impact and fire. About 15 dead birds were found on the runway close to the point where the aircraft lifted off.





The engine rear cowling, exit guide vanes and a number of fan blades were found further along the runway whilst the fan disc with most of the blades sheared off at the root was found about 500 metres to the side of the runway. The fan had separated and shrapnel had penetrated the rear fuselage puncturing the engine feeder tank and fire had immediately broken out. The cockpit voice tape revealed that while taxiing the pilots had remarked 'look at those birds there'. The person responsible for airport bird control had gone off duty due to illness. There was considerable litigation involving the Airport Authority, and the aircraft and engine manufacturers. (The full 76 page Report is available in French on the French Accident Investigators web site <www.bea-fr.org>).

<b>04.04.96</b>	<b>SA227 Merlin III</b> 2 Garrett TPE 331	Ushuaia, Argentina	Windshield -	2 Nil
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While landing the aircraft struck several large birds, one breaking the windshield and others striking the left engine. Control was lost and the aircraft ran off the side of the runway and was damaged beyond repair.

<b>27.07.98</b>	<b>Antonov An-12</b> 2 Ivchenko AI-20 turboprop	St Petersburg, Russia	Engine -	9 1 serious
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The aircraft was taking off at 03.42 in the morning with 13 tonnes of freight, 7 crew and 2 passengers. Immediately after lift-off one engine suffered bird ingestion and the pilot lost control. The aircraft descended from about 600 ft onto the runway and caught fire. All occupants were lucky to escape but one suffered severe burns. Crows and gulls frequent the area.

<b>14.09.98</b>	<b>Antonov An-32</b> 4K-66759 2 Ivchenko AI-20	Lokichar, Kenya	Engines -	4 1 serious
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Just after rotation on a flight to Kigali the aircraft suffered multiple bird strikes with ingestion and power loss in both engines. After touching down on the remaining runway it overran into rough ground and trees. The right gear collapsed and it caught fire and was destroyed. The accident was in daylight, VMC and with a wind of 14 kts.

<b>20.03.99</b>	<b>Yakovlev 40</b> RA-87587 3 Ivchenko AI-25 turbine	Bata, Equatorial Guinea	Engine N/K	33 Nil
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At a reportedly late stage in the take off run No 2 engine suffered bird ingestion. Take off was abandoned but the aircraft over-ran into trees and was sufficiently damaged that it was written off.

<b>19.04.00</b>	<b>Antonov An-8</b> TL-ACM 2 Ivchenko AI-20	Pepa, Zaire	Engine -	24 <b>24 fatal</b>
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The Central African Airlines aircraft reportedly suffered bird ingestion shortly after take-off on a flight to Kigali. It could not maintain height on one engine and crashed while attempting to return to the airstrip. All on board were killed.

<b>30.04.02</b>	<b>Antonov An-12</b> ST-AQP 2 Ivchenko AL20 turboprop	Heglig, Sudan	Engine -	- -
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At about 60 ft on finals of a daylight visual approach following a freight flight from Khartoum, the crew saw a flock of birds rising from the right and it is believed engine 4 failed due to ingestion. The aircraft yawed to the right, descended and undershot, the right main gear struck the top of earthworks and was torn off. It landed on the runway and veered to the right with the remaining gear collapsed.

<b>24.12.02</b>	<b>Swearingen SA227 Metroliner</b> OY-BPH 2 Garrett TPE331 turboprops	Aberdeen Airport Scotland		2 Nil
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At 07.45 while taking off on a positioning flight to Aalborg, Denmark, handled by the co-pilot, just after lift-off the aircraft yawed to the right and there was smell of smoke. The Commander felt the aircraft roll about 15° to the right and realised there was a problem with the right engine and looking at the EGT gauges he noted that the left indicated about 650°C, the normal maximum, whilst the right indicated about 600. The Commander feathered the right engine but did not raise the landing gear.

The aircraft descended and impacted with the ground some 500 metres to the right of the runway slid along a field and onto a public road and collided with a moving car.



The foam covered wreckage of the Metro on the road

The right wing was on fire and the crew left the aircraft via the left door and co-pilot checked that no one was trapped in the car, they then moved well away from the intense fire along with the car driver. Bird remains were found where the aircraft had rotated and were identified as two Herring gulls (*Larus argentatus*, 1.1 kg), one Common gull (*Larus canus*, 420 gm) and one Black-headed gull (*Larus ridibundus*, 275 gm). Large portions of the Herring gulls were missing. The left engine was found to have ingested at least part of a bird and a first stage impeller blade had been distorted with feather residue in the combustion chamber. There was no ingestion in the right engine. An Operations Officer had inspected the runway at 05.55 and had dispersed some birds which had not returned at the time he completed his next inspection at 07.05. Between then and the departure of OY-BPH there had been four movements. (19 page report in AAIB Bulletin 6/2004, available on [www.aaib.gov.uk](http://www.aaib.gov.uk))

<b>01.06.03</b>	<b>Lear 45</b>	Milan Linate,	Engine(s)	2 on board
I-ERJC	2 TFE 731 turbofan	Italy	Feral pigeons	<b>2 killed</b>

The aircraft owned by Eurojet Italia, was taking off for Genoa, Italy with two crew on board to collect the famous Italian architect Renzo Piano and take him to Paris. The crew reported a birdstrike stating they were returning. The pilot's voice was reported to be calm and everything seemed under control. A policeman near the accident site reported that the engine was making a strange noise right from take-off. At the end of the downwind leg, approximately 1,000 ft from the threshold it crashed into a warehouse, fortunately unoccupied on a Sunday, and was destroyed by fire. At least six bird fragments identified as Feral pigeons (*Columba sp.*) were found on the runway. An unconfirmed report suggests that the flock came from outside the airport, suddenly crossed the runway during the take-off heading for other off-airport buildings. At least one engine ingested birds and failed, it is not yet known if the remaining engine also failed or if control of the aircraft was lost. The accident was close to the most important cycle race in Italy with thousands of spectators lining the race route through the suburbs, it resulted in extensive TV and press coverage. Investigation could lead to criminal charges against a number of individuals.



<b>12.11.03</b> N77JL	<b>Lear 24</b> 2 GE CL610 turbine	Cahokia, St Louis Downtown, USA	Engine(s) Blackbirds?	4 on board 2 minor
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The charter company aircraft was taking off on a flight to North Platte, Nebraska, with two crew and two passengers. At about 500 ft agl the pilot heard a thump as he flew through a flock of small blackbirds. Both engines lost power, during the forced landing the aircraft skidded across a field and caught fire about four miles from the airport. The pilot was taken to hospital with facial cuts, the others for observation. No bird remains were found on the runway or in adjacent fields. The aircraft was destroyed.

<b>10.09.04</b> ZS-OLS	<b>SA227 AC Metro 3</b> 2 Garrett TPE331	George Airport South Africa	Engine Spotted thick-knee	2 on board Minor
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The aircraft operated by Skyhaul (converted to cargo), was carrying freight from Bloemfontein Airport and was on final approach at a time when the airport was not yet open, 05.40 hrs. While over-flying at 200ft a Spotted thick-knee (*Burhinus capensis*, 425gm) was ingested in engine 2 resulting in the aircraft failing to gain height during the attempted go-around. The aircraft came down in open countryside and was sufficiently damaged that it has been written off. The two crew suffered minor injuries. There was clear evidence of engine fan damage. The aircraft weight at the time of the accident is under scrutiny.



<b>29.11.04</b> PH-BTC	<b>Boeing 737-406</b> 2 CFM56	(Barcelona, Spain) strike - Amsterdam	Landing gear Buzzard	146 on board 10 minor
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Shortly after take off from Amsterdam-Schiphol, the crew of the KLM aircraft experienced a bird strike. They re-cycled the landing gear resulting in normal indications. After consultation with KLM Engineering it was decided that as there were no indications of anything abnormal, the flight continued to its planned destination of Barcelona where an inspection would be made. On landing the pilots were unable to keep the aircraft on the runway by use of rudder, differential reverse or nose wheel steering. The aircraft left the runway at about 100 kts into an area of work-in-progress next to the runway. During the emergency evacuation at about 18.50 hrs local of the 140 passengers and 6 crew, 10 people were treated on the spot for minor injuries with two needing hospital treatment. The bird remains were identified as a buzzard (*Buteo buteo*, 800gm) and were found in the nose gear jamming the steering cables to one side. Due to the landing gear damage and engine ingestion of debris from the runway work, the aircraft is likely to be deemed a constructive write off. The accident is under investigation.



**Photo of Buzzard in nose gear bay** courtesy of Dani Burgas (Minuartia, Estudis Ambientals), with the permission of AENA (Barcelona Airport) and KLM Station Manager Barcelona.

<b>28.03.06</b>	<b>Antonov 12</b>	Payam Airport	Engines	12 on board
EK-46741	4 x Ivchenko AI-20	Iran	N/K	Nil Injuries

The aircraft was taking off on a cargo flight to Sharjah when it encountered a flock of birds causing engines 1,3 and 4 to fail. An attempt was made to return to Payam but an emergency landing had to be made about 3 miles from the airport. The aircraft broke up and caught fire.

<b>25.01.07</b>	<b>Fokker F28-100</b>	Pau-Pyrénées Airport,	Nil	54 on board
F-GMPG	2 x RR Tay turbofans	France	Lapwings?	1 3 <sup>rd</sup> Party, Nil inj



The aircraft was taking off at 10.26 hrs from runway 13 at Pau Pyrénées, 616 ft amsl, France for Paris Charles de Gaulle. Just as the aircraft lifted off at 128 kts birds were seen. The Captain, the handling pilot, rotated the aircraft at 6.1 degrees per second, instead of the more usual 1.3 to 3°/sec reaching 11.9°. Control was lost as it suddenly banked left to 35° followed by 67° to the right. It reached a height of 107 ft before descending and bounced off the right main landing gear and the captain abandoned take-off at a speed of 160 kts. Engine power was reduced and it contacted the ground again near the end and to the right of the runway. The thrust reversers were briefly deployed. The aircraft ran 340m off the end of the runway, crossing a road where the left main landing gear struck a truck, killing the driver. Both main gears were sheared off as the airplane continued 535m into a field. There was no fire and the aircraft was evacuated without injury. No birds struck the airframe or engines. The accident resulted from a loss of control caused by the presence of ice on the wings and by the rapid rotation reflex reaction to a flock of birds. The temperature was 0°C, dew point -1 and humidity above 90% defined in the Operations Manual as icing conditions. The Operator did not have anything available to enable the crew to check for ice on the wings. An Airbus A320 had an iced wing and had defrosted the aircraft. The birds were thought to be Lapwings (*Vanellus vanellus*, 215 gm) which are prevalent on the airport in January and February. Three bird inspection runs had been made prior to the accident, nothing had been seen. The Pilot was charged with

homicide/ unintentional injuries and in January 2012 the Pau Criminal Court found him guilty and he was given a six months suspended sentence and the airline fined 20,000 Euro. (*BEA Final Report*).

<b>29.07.07</b> RA-93912	<b>Antonov 12</b> 4 x Ivchenko AI-20	Moscow Domodedovo, Russia	Engines N/K	7 on board <b>7 Fatal</b>
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The aircraft was flying from Domodedovo to Komsomol via intermediate stops at Omsk and Bratsk. Engines were started at 04.01 hrs and 6 minutes later the aircraft taxied to runway 32C for departure. As they were lining up the crew commented on the presence of birds in the area. They took off at 04.15 and the landing gear was retracted. At about 230 ft and an airspeed of 159 kts there was the sound of an engine surge. Engine 4 propeller auto-feathered, almost simultaneously No 3 also auto-feathered. The aircraft at a weight of 60,500 kg lost height, the airspeed decreased and in a right bank of more than 100 degrees the aircraft struck trees disintegrated and burned about 4 km from the runway end. The temperature was 14°C, wind less than 2 kts and visibility 100 m in fog. It was concluded that full rudder and aileron was insufficient to counteract the turn and bank due to loss of power on two engines due to birds. Small parts of organic origin as well as feathers were found in the exhaust ducts of engines 3 & 4. There are three previous cases in which AN-12s have crash landed after encountering birds immediately after take off which affected two or more engines

<b>08.11.07</b> ST-JUA	<b>Antonov 12</b> 4 x Ivchenko AI-20	Khartoum, Sudan	Engine N/K	4 on board <b>2 third party deaths</b>
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At about 08.00 hrs the aircraft was taking off from Khartoum for Juba, Sudan carrying 11 tons of cargo. One engine failed shortly after take off according to the Juba Air Cargo President due to a bird strike. The pilot attempted to return to land but crash landed on the military part of the airport killing two soldiers. The aircraft was destroyed by fire but the crew, three Russians and a Sudanese escaped.

<b>04.03.08</b> N113SH	<b>Cessna 500 Citation</b> 2 x P & W JT15D	Oklahoma City USA	Wing White Pelicans	5 on board 5 fatal
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Shortly after taking off at 15.13 EST for Mankato, Minnesota and climbed to 3,100 ft, (the airport is 1,300 ft amsl) before it made a steep descent over a lake and crashed in woodland 4.1 nm from the airport killing the two crew and 3 passengers. A witness fishing on a lake near the airport said it may have flown through a flock of birds as one was landed in the lake. The aircraft appeared to spin and turn almost upside down. NTSB report AAR-09/05 reveals that the probable cause was wing structure damage with one or more large birds which resulted in loss of control of the 1975 built, original model, Citation. The birds were American white pelicans (*Pelecanus erythrorhynchos*, 10.5 kg).

<b>15 01.09</b> N106US	<b>Airbus A320</b> 2 x CFM56-5	Hudson River, New York USA	Engines Canada geese	155 on board 1 serious inj
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The US Airways Flight 1549 took off at 15:26 from New York La Guardia's runway 04 for Charlotte, Carolina. The first officer was handling pilot. As they were reaching an altitude of 3,200 feet the crew encountered a formation of Canada geese (*Branta Canadensis*, 3.6 kg). Impacts were felt and both engines began to lose power and there was a burning smell. The captain took over control of the flight while the first officer attempted to relight the engines. ATC were informed that they had lost thrust in both engines and were turning back toward LaGuardia. It quickly became evident that they were not able to reach LaGuardia and the possibility of Teterboro, New Jersey was considered. The captain realized that it was too far stated his intention of going for the Hudson River. They descended over the George Washington Bridge and ditched opposite mid-town Manhattan. The occupants evacuated the aircraft onto the wing and aboard escape slide rafts. Coast Guard, commuter and tour vessels rescued everyone on board in spite of some people in the water and the strong current. The maximum altitude reached was 3,200 feet and the last radar return received was at 300ft and 153kts. The aircraft was retrieved from the river. Both DNA and feather analysis confirmed that both engines had ingested Canada geese. It was fortunate the captain had considerable gliding experience. (NTSB Report AAR-10/03).

<b>25 .05.09</b> N704CK	<b>Boeing 747F-200</b> 4 x P & W JT9D	Brussels Airport, Belgium	Engine Kestrel	5 on board 5 uninjured
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The Kalitta Air flight was a cargo flight from New York-JFK to Bahrain with a technical stop at Brussels with 73 tonnes of cargo. The Boeing 747 was taking off at 13.30 from runway 20 (2,987 m) when the right engine experienced a momentary loss of power accompanied by a loud bang, heard by the crew and external witnesses, and by flames, seen from the control tower. CVR data revealed this was 4 seconds after V1. Two seconds later and in spite of being 6 seconds past V1, the take off was abandoned. All four engines were brought back to idle, and braking action was initiated but the thrust reversers were not deployed. The aircraft came to a stop 300m beyond the end of the runway, above a railway embankment. The aircraft was severely damaged; breaking into three parts. The crew were highly experienced the Captain having over 15,000 hrs with 3,000 on the B747. DNA revealed a Kestrel (*Falco tinnunculus*, 200 gm) strike. (Belgian Investigators Preliminary Report)

<b>10.11.09</b> EI-DYG	<b>Boeing 737-800</b> 2 x CFM56-7	Rome, Ciampino Italy	Engine Starlings	172 on board 1 serious injury
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At about 7.56 am while below 500 ft on short finals to land, the Ryanair flight from Frankfurt Hahn, encountered an enormous starling flock (*Sturnus vulgaris*, 80 gm). The First Officer as pilot flying initiated an immediate go-around but there were multiple strikes on the nose, wings, windshield and both engines lost power with burning smell and vibration. Engines did not respond and remained at 40% N1 so elected to land. The aircraft impacted hard with stick shaker and the left hand landing gear was forced into the aircraft structure. The aircraft slid to a halt on the runway with one engine resting on the runway. One person was injured when evacuating via the one slide which had been deployed, the rest were evacuated via steps. The aircraft has been written-off. (*Italian Report awaited*).

End of Section1

## Section 2 – AEROPLANES OF 5,700 KG And BELOW

03.04.12	<b>Wright Flyer</b>	Long Beach	Controls	1
-	1 piston	California, USA	Gulls	<b>1 fatal</b>



Cal Rogers the first person to fly across the USA was making a demonstration flight along the beach when he encountered a flock of **gulls**, (*Larus sp.*). One of them jammed the rudder control causing the aeroplane to dive into the surf breaking the pilots neck.

10.02.39	<b>Arado (Ar79?)</b>	Madras Airport,	-	2
D-	1 piston	India	large	<b>2 fatal</b>

The aeroplane had recently flown from Benghazi and was giving a demonstration flight. Witnesses stated that just after take-off the pilot lost control attempted to avoid a large bird and the aircraft crashed killing the pilot, the passenger died in hospital.

--.--.55	<b>Cessna</b>	Aberdare Mtns,	Controls	1
	1 piston	Kenya	Vulture	<b>1 fatal</b>

While flying en-route the pilot attempted to avoid a **vulture (Gyps sp.)**. The bird hit the wing tip jamming the ailerons causing the aircraft to crash.

10.01.59	-	Serengeti,	-	1
	-	Tanganyika	Griffon vulture	<b>1 fatal</b>

The aircraft struck a **Griffon vulture** (*Gyps fulvus*, 5.4 kg) and crashed.

--.03.63	<b>Beech 35 Bonanza</b>	Bakersfield,	Tailplane	1
	1 piston	California, USA	Common loon	<b>1 fatal</b>

Collision with a **Common loon** (*Gavia immer*, 3.7 kg) removed the tailplane. (Note: This one does not appear to be on the NTSB database so it cannot be confirmed)

01.02.64	<b>D31 Turbulent</b>	Nr Belfast,	Windscreen	1
	1 piston	UK	Gull	<b>1 fatal</b>

The single seat open cockpit aircraft spun into the ground after striking or attempting to avoid a **gull**. A dead gull was found 60 metres away and avian blood was found on the windscreen.

16.08.70	<b>Stampe SV4</b>	Nr Wicklow,	Cockpit	2
	1 piston	Ireland	Jackdaw	1 serious

While filming aerial sequences low over a lake with the windshields removed from the open cockpit biplane, a **Jackdaw** (*Corvus monedula*, 230 gm) passed through the propeller disc. The pilot was struck in the face and almost knocked unconscious. He pulled up sharply to avoid the water and hit power lines. There was a flash and the aircraft dived into the lake, both occupants escaping. The pilot suffered severe facial cuts needing 50 stitches.



<b>02.07.71</b>	<b>Cessna 180</b> 1 piston	British Columbia, Canada	- Bald eagle	3 <b>2 fatal</b>
While en-route the aircraft struck a <b>Bald eagle</b> ( <i>Haliaeetus leucocephalus</i> , 5 kg).				
<b>16.04.72</b>	<b>Mitsubishi MU2</b> N132MA 2 turboprop	Nr Atlantic City, NJ USA	Windshield Geese	3 <b>3 fatal</b>
While in the climb on a flight from Atlantic City to Philadelphia, PA the aircraft struck a flock of <b>geese</b> ( <i>Anser sp.</i> ) destroying the windshield. One or both pilots were incapacitated resulting in an uncontrolled descent into the sea.				
<b>28.12.75</b>	<b>Mooney M20</b> 1 piston	Stockton, California, USA	- Geese	5 <b>5 fatal</b>
The aircraft crashed shortly after take off following a collision with three geese ( <i>Anser sp.</i> ). In previous Papers this had been quoted as a bird strike accident, the NTSB records do not mention this, it is given as an in-flight failure of the fin and rudder with evidence of rot due to improper maintenance.				
<b>30.08.76</b>	<b>Saab MFJ15</b> 1 piston	Nr Awassa, Ethiopia	- Vulture	2 <b>2 fatal</b>
Climbing through 200 ft, struck a <b>vulture</b> ( <i>Gyps sp.</i> ), control lost and crashed vertically.				
<b>23.04.77</b>	<b>Aero Command 690</b> N847 2 turboprop	Meigs Field, Chicago, USA	Engine Gulls	4 <b>4 fatal</b>
During take-off from the lakeside airport, a <b>gull</b> ( <i>Larus sp.</i> ) was ingested in one engine causing loss of power. Emergency procedures were incorrectly executed, the flaps were left down and the aircraft spun into the water.				
<b>19.10.79</b>	<b>Fairchild SA26 Merlin</b> N65103 2 turboprop	Palo Alto, California, USA	Engine Gulls	4 <b>2 fatal, 1 injured</b>
During the approach, a flock of <b>gulls</b> ( <i>Larus sp.</i> ) clogged an engine intake, although the engine was not damaged. Pilot attempted a go-around but lost control crashing inverted into a parking area destroying or damaging 7 other aircraft.				
<b>06.08.81</b>	<b>Cessna 402</b> 2 piston	Nr Musiars, Kenya	Windshield Griffon vulture	1 <b>1 fatal</b>
A <b>Ruppell's griffon vulture</b> ( <i>Gyps rueppellii</i> , 7.5 kg) holed the windshield killing the pilot.				
<b>---.81</b>	<b>Callair A9</b> 1 piston	- Australia	Controls Black kite	1 1 minor injury
While glider towing, a <b>Black kite</b> ( <i>Milvus migrans</i> , 780 gm) became lodged between the strut and the left wing top surface causing loss of aileron control. The aircraft was forced into a turn descending into woodland where it was destroyed by fire.				
<b>11.07.83</b>	<b>Boeing Stearman</b> 1 piston	Webb, Texas, USA	Wing -	1 1 serious injury
Just before flying under wires during a dusk agricultural spray run, a bird broke a plastic fuel gauge under the centre section of the upper wing. Fuel sprayed onto the windshield and pilot's face restricting visibility. In an effort to miss power lines, the aircraft struck trees destroying the aircraft and seriously injuring the pilot.				
<b>21.07.84</b>	<b>Piper PA18 Cub</b> 1 piston	Seboomook Lake, USA	Windshield Cormorant	- 1 minor injury
As the floatplane was on final approach to a water-landing a bird, believed to be a <b>Cormorant</b> ( <i>Phalacrocorax sp.</i> , up to 2.4 kg) holed the windshield. The pilot was stunned and his face cut by his glasses, he came-to in the water. He released himself from the submerged, inverted aircraft and was rescued by a nearby boat.				

<b>30.08.84</b>	<b>Boeing Stearman</b> 1 piston	Kalispell, Minnesota, USA	Canopy Red-tailed hawk	1 <b>1 fatal</b>
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While turning during an agricultural spray run at about 15 ft and 55 kts, struck a bird believed to be a **Red-tailed hawk** (*Buteo jamaicensis*, 1 1 kg). The impact broke the canopy, distracted the pilot and the aircraft struck the ground and overturned killing the pilot.

<b>25.11.84</b>	<b>Ercoupe 415</b> 1 piston	Wixom, Minnesota, USA	None -	2 <b>1 fatal, 1 serious</b>
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Turning finals into a low sun a large flock of birds flew in front, the pilot dived to avoid them and collided with power lines. The crash killed the pilot whose blood alcohol level was 0.11%.

<b>29.01.87</b>	<b>Cessna 150</b> 1 piston	Vancouver, Washington, USA	None -	2 <b>2 fatal</b>
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Returning from an instructional flight the aircraft passed through an area of heavy bird activity and the student made a nose-down avoidance manoeuvre. The instructor took control with a rolling pull-up, overstressed the right wing which failed, and the aircraft crashed.

<b>--.08.87</b>	<b>Hang glider</b> Nil	Flinders Ranges, Australia	Wing tip Wedge-tailed eagle	1 1 sers
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While thermalling at 2,700 ft a **Wedge-tailed eagle** (*Aquila audax*, 3.5 kg) attacked the hang-glider, on it's third attack it dislodged the wing tip tensioner slackening one wing. It spiralled down and was wrecked hospitalising the pilot. There had been similar incidents in the area.

<b>17.09.87</b>	<b>Schweizer 164</b> 1 piston	Weiner, Arizona, USA	None -	2 <b>1 fatal, 1 serious</b>
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During an agricultural flight to chase birds from a rice field, the aircraft struck a large flock of birds. The pilot was distracted and the wheels touched the crop and the aircraft overturned. Neither occupant was restrained, the passenger of the single seat aircraft was found dead outside the cockpit. Several dead birds were found at the accident site.

<b>24.11.87</b>	<b>Osprey Homebuild</b> 1 piston	Cape Liptrap, Australia	Windshield -	1 -
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At 70 kts just after take-off, the windshield was shattered by a bird, wind blast impairing the pilot's vision. After landing and shutting down, the back of the aircraft was found to be on fire. The pilot escaped but the aircraft was burnt out. It is believed the bird damaged a fuel line allowing fuel to spray onto the hot exhaust.

<b>11.02.88</b>	<b>Cessna 172P</b> 1 piston	East Hampton, NY USA	- -	1 <b>1 fatal</b>
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Shortly after take-off on a local flight the pilot radioed that he had struck birds and could not maintain control, the aircraft crashing into the sea about 1 mile off-shore killing the pilot.

<b>26.12.91</b> 5Y-SRV	<b>Piper PA31 Navajo</b> 2 piston	Musiara, Maasi- Mara, Kenya	Windshield Vulture	9 <b>9 fatal</b>
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A DC3 had suffered a collapsed landing gear and had over-run the runway. The PA 31 flew over the site, which was not its destination, probably to show the passengers. At about 250 ft and a fairly high cruise speed it struck a **White-backed vulture** (*Gyps africanus*, 5.4 kg). It oscillated, banked and pitched down uncontrollably before crashing and burning just beyond the end of the runway killing all occupants. Witnesses had seen a black object fall from the aircraft, these were found to be the vulture and part of the windshield. The autopsy on the pilot revealed pre-impact spinal injuries.



<b>25.01.92</b>	<b>Cessna 401</b>	Maasi-Mara,	Controls	7
5Y-BGW	2 piston	Kenya	Marabou stork	<b>7 fatal</b>

While in the cruise another aircraft heard a radio transmission “I have been hit by a large bird and I’m having difficulty flying it, I can hardly control the aircraft”. It crashed killing all occupants. The wing tip fuel tank and aileron were found about one mile from the main wreckage. Avian blood believed to be from a **Marabou stork** (*Leptopilos crumeniferus*, 5.9 kg) was found on the wing leading edge.



<b>05.06.92</b>	<b>SA300 Starduster Too</b>	Willis Point, Texas	-	1
N5649	1 piston	USA	-	<b>1 fatal</b>

During low-level aerobatics over a field, the aircraft collided with a large black bird. The pilot lost control, the aircraft crashed and was destroyed by fire.

<b>10.06.92</b>	<b>Grumman G164</b>	Klamath Falls,	None	1
	1 turboprop	Oregon, USA	-	1 minor, 3 3 <sup>rd</sup> party minor

At the end of a crop spraying flight the pilot was paralleling a road on which his son was driving a pick-up. As he reached down to turn off the spray pump the truck disturbed a flock of birds. The pilot took evasive action, the aircraft struck the truck cab and was destroyed when it crashed in a ditch.

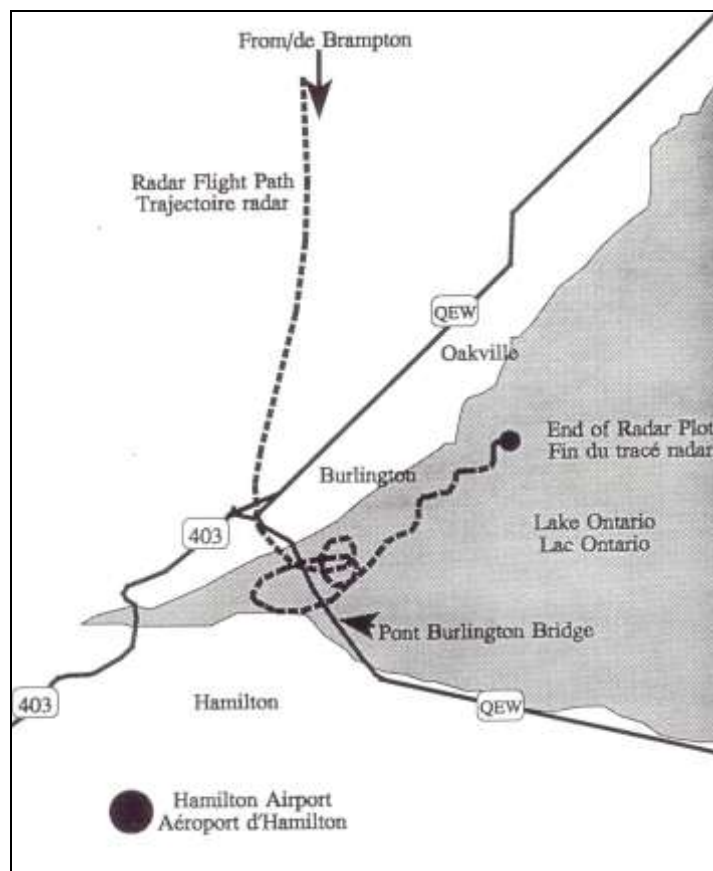
<b>10.08.92</b>	<b>Cessna 441 Conquest</b> 2 turboprop	Gainesville, Georgia, USA	Engine -	1 1 serious
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At about 50 ft after take-off a flock of birds caused power loss on the right engine. The aircraft lost height and crashed about 1½ miles beyond the runway. The pilot had failed to feather the right propeller or raise the flaps and landing gear. The NTSB Report states there was a partial loss of power and evidence of ingestion in the right engine, he shut down the wrong engine and did not follow the Emergency Check List. The pilot had over 8,000 hours with 2,500 multi.

<b>06.05.93</b>	<b>Cessna 207</b> 1 piston	Holy Cross, AK, USA	Windshield -	1 Nil
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While cruising the pilot was looking at birds out of the left side cockpit window when peripherally he saw a white flash fill the right side of the windshield. The aircraft began an uncontrollable descent and right yaw. The engine continued to run smoothly but adding power did not arrest the descent. The aircraft was destroyed in the crash landing. No evidence of a bird strike was found.

<b>24.02.94</b> C-GXGB	<b>Piper PA28 Warrior</b> 1 piston	Lake Ontario, Canada	Windshield -	1 <b>1 fatal</b>
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While flying from Brampton to Hamilton Airport, Ontario, at 13.22 the 17,000-hour pilot was instructed to hold over the bay because of IFR traffic. At 13.34 he told ATC that something had come through the windshield, that he could hardly see and was disoriented. Six minutes later radar showed the aircraft in an 'S' pattern over the lake before it disappeared 14 miles NE of Hamilton airport. An aviation witness on the ground reported the weather was sunny, visibility unlimited and cloud base 5,000 ft. There has been no trace of the aircraft.

<b>18.06.94</b> N441C	<b>Cessna 441 Conquest</b> 2 turboprops	Fort Frances, Ontario, Canada	Engine Gulls	7 Nil
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The aircraft was making a night take-off at 04.25 hrs. As the pilot rotated the aircraft at 98 kts he saw a bird flying towards the left side of the aircraft and it yawed to the left as the engine torque reduced. He lost control and it crashed ending up sliding backwards to the left side of the runway. He got the passengers out and ran to the Terminal Building to raise the alarm. The left engine, nose gear and

right flaps and aileron were torn off and the left gear was driven through the wing. The aircraft was found to be 620 lbs overweight and with the c of g 2 inches behind the aft limit. **Gull** (*Larus* sp.) feathers and a wing were found on the runway and a gull or gulls had been ingested in the left engine.

<b>15.07.94</b> N2827V	<b>Cessna 172XP</b> 1 piston	Indian Shores, Florida, USA	Windshield Pelican	1 <b>1 fatal</b>
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At 16.10 hrs the aircraft was flying south along the coast at about 200 ft and about 300 metres off-shore. A witness had videoed it and what appeared to be a large bird collided with the windshield area, the aircraft rolled inverted and crashed into the water. Enhancement showed two dark objects in front of the aircraft just before it pitched up and rolled inverted, one appeared to strike the aircraft. The video showed numerous **Pelicans** (*Pelecanus occidentalis*, 7 kg) in flight and on the water. The pilot's facial injuries were consistent with the windscreen shattering. The Commercial pilot who had flown at least 596 hours was ferrying the aircraft to a new owner.

<b>18.10.94</b> N83KK	<b>Beech B58 Baron</b> 2 piston	Fort Wayne, Indiana USA	Windshield geese	2 Nil
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Just after take off the pilot spotted **geese** (*Anser* sp.) but one penetrated the windshield and hit the pilot. He cut the power and attempted to re-land but went off the end of the runway into a building. The aircraft was destroyed.

<b>22.10.95</b> ET-AIO	<b>DHC-6 Twin Otter</b> 2 turboprop	Bole Airport, Ethiopia	Windshield Vulture	20 4 serious
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About 20 miles from Addis Ababa, the aircraft collided with a **White-backed vulture** (*Gyps africanus*, 5.4 kg). It struck the windshield causing the support structure and both windshields to fail and collapse into the cockpit. The crew, although injured, maintained some control and continued to Bole airport. On arrival they were unable to position the aircraft correctly for landing and rather than go-around force landed some 300 metres south of the runway. During the ground run it fell into a depression and sustained damage beyond economic repair.

<b>18.07.96</b> F-BRVF	<b>Robin DR380</b> 1 piston	Nr Ciriza, Navarre Spain	Wing Griffon vulture	3 <b>3 fatal</b>
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About 10 minutes after taking off from Pamplona, Spain for the 30 minute flight to Vitoria, the pilot made an emergency call on 121.5. The aircraft had been flying at about 2,300 to 3,300 ft agl when it collided with a **Griffon vulture** (*Gyps fulvus*, 8kg). Although pilot incapacitation after windshield penetration had been suspected, it was believed the propeller had struck the bird slicing a wing off the bird causing the heavy body to strike the aircraft at the wing root. It is most likely that impact damage caused the wing to come off the wooden structured aircraft rather than the pilot being incapacitated. The aircraft crashed almost vertically into the ground. In 1997 the Spanish AIP was amended to warn pilots of the large colony of Griffon vultures that live in the area.

<b>04.09.97</b> ZS-MOT	<b>Beech B95 Travel Air</b> 2 piston	Nr Hectorspruit S Africa	Windshield White-backed vulture	2 <b>2 fatal</b>
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While flying from Komatipoort to Nelspruit at low level beneath cloud at about 1,000 to 1,500 ft agl and 170 kts, the aircraft collided with a vulture, believed to be a **white-backed** (*Gyps africanus*, wt 5.8kg). It penetrated the windshield, the aircraft crashed killing both occupants. First at the scene was a local pilot who reported there were many vultures in the vicinity.

(15.11.97	N/K	Nr Pic du Midi, France		4 fatal
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*Enquiries via French and Spanish accident investigators show that this was not a bird strike but a collision with wires and has been **deleted**, having been included in earlier Papers.)*

<b>24.11.97</b> HR-AQY	<b>GAF N24A Nomad</b> 2 Allison 250 turboprop	La Ceiba, Honduras	engine vulture?	12 1 serious
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The aircraft was returning due to bad weather at destination Roatan. At 10.15 hrs while on the approach the aircraft hit a **buzzard** (*Buteo sp*) or **vulture** (*Gyps sp.*). The right engine suffered an uncontained failure and fire, partially breaking away and moving down and inboard with the propeller cutting into the fuselage. The aircraft was force landed on a football field short of the airport. Three passengers and the pilot suffered serious injury.

<b>04.03.98</b> N3374P	<b>Piper PA23 Apache</b> 2 piston	Somerville, New Jersey, USA	Tail -	2 <b>2 fatal</b>
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The aircraft was in the cruise, radar data showing it to be at about 1,500 ft agl and 146 kts. Witnesses saw the top of the fin start to oscillate and the entire tail section separate from the aircraft, which crashed into the roof of a family housing unit and exited through the front wall into the street. The pilot and his pilot passenger were killed. The tailplane and rudder were 670 ft from the main wreckage. Several witnesses had seen a large number of birds in the area. Laboratory tests on the tailplane leading edge showed impact evidence with a relatively soft object. There was no sign on it of blood, feathers or remains and nothing was found on the ground in the surrounding rural area populated by small animals and carnivores.

<b>14.06.98</b>	<b>Lake LA-4</b> 1 piston	St Mary's, AK USA	Nil Ducks	1 Nil
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The commercial pilot was taking off from a river, at about 15 ft two **ducks**, (*Anser sp.*) flew in front distracting his attention. They passed on the right about 6 ft from the windshield. The next thing the pilot remembered were trees filling the windshield. The aircraft collided with the trees resulting in substantial damage to almost certainly beyond economic repair.

<b>15.10.99</b>	<b>Cessna 208 Caravan</b> 1 turboprop	Ranger Lake, Canada	None -	1 <b>1 fatal</b>
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While on a VFR cargo flight to Red Lake Airport, the pilot was asked to remain clear of controlled airspace, as the weather had deteriorated such that Special VFR was required. Another aircraft on an IFR approach saw the Caravan through the broken cloud layer and queried ATC on his intentions. The Caravan pilot descended to about 300 ft agl where he reportedly encountered a flock of birds and took evasive action. It appears that the pilot lost directional control and a wingtip touched the lake surface causing the aircraft to cartwheel and come to rest submerged.

<b>25.05.00</b> N30RA	<b>Cessna 310R</b> 2 Piston	Wolf Point, Montana USA	Windshield Geese	N/K 1 serious
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At about 600 ft agl shortly after taking off the aircraft collided with a number of geese. The pilot heard 3 or 4 loud bangs just before the windshield shattered. The aircraft subsequently collided with the ground and was destroyed by fire. The pilot was unable to recall any other details.

(22.04.01	<b>Edge 360</b> 1 piston	Barksdale AFB, USA	Propeller -	1 1 serious
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Near the end of an air display routine the pilot had just completed a 16-point roll and was flying level at about 30 ft and nearly 200 mph when reportedly a bird flew into the propeller. The aircraft bounced off the grass infield bending the fixed landing gear and into the air again. The pilot suffered two cracked vertebrae and the aircraft was damaged beyond repair. Later enquiries reveal that this was NOT a bird strike accident but may have been a convenient explanation at the time.)

<b>04.02.02</b>	<b>Piper PA28 Saratoga</b> 1 piston	Mocimboa da Praia, Mozambique	Windshield Vulture	4 <b>2 fatal, 2 serious</b>
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The South African registered aircraft was on final approach to the airport in the eastern coastal port town near the Tanzanian border. It collided with a **vulture** (*Gyps* sp), which came through the windshield breaking the pilot's neck. The aircraft crashed and burned killing the front seat passenger and resulting in severe burns to the passengers in the rear seats.

<b>03.05.03</b> N2938J minor	<b>Cessna 150G</b> 1 x Continental O-200	over Montgomery, Alabama, USA	1 on board geese	<b>destroyed, 1</b>
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While in cruise VFR from Columbus to Montgomery at 4,500 ft amsl the aircraft collided with a flock of geese (*Anser* sp.) causing bad vibration so the pilot decided to land in a field. On touchdown the pilot realised the field was marshy and rough and attempted a go-around but the engine did not produce full power. He guided it into a clearing but clipped trees and crashed and overturned. After transmitting a distress call an Air National Guard helicopter took the pilot to hospital. The aircraft suffered buckled wing spars and was a write-off.

<b>23.06.03</b> N/K	<b>PZL Wilga 35</b> 1 piston	- Ukraine	- -	1 on board <b>1 killed</b>
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The aircraft was engaged in glider towing during the 51<sup>st</sup> Open Gliding Championships of Ukraine. A bird collided with the tug aircraft; the pilot was killed. (Further information needed).

<b>08.07.03</b> N166ME	<b>Cessna 172 Skyhawk</b> 1 piston	McKinney, Frisco Texas, USA	Wing Vulture?	2 on board <b>2 killed</b>
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The aircraft was at about 800 ft on it's way to the training company designated practice area when the 1,100 hour flight instructor made a Mayday call that a bird (most likely a vulture) had impacted with the left wing, could not keep the aircraft straight with power on and they were going down. A witness saw the aircraft flying over at 500 to 1,000 ft and said the wings were pitching up and down and looking uncontrollable with the tail swinging from side to side. Marks at the accident site, about 2 nm from the airport and crush angles were consistent with it stalling prior to impact killing both occupants.

(25.02.04 N5450T	Cessna 182 Skylane 1 piston	Evansville, Indiana USA	- None	1 on board Nil
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The aircraft called when at about 7 nm NE of the airport for a VFR pick-up for low-level pipeline patrol. When at 500 ft and 130 kts the pilot reported that during an emergency landing he had manoeuvred violently to successfully avoid a Red-tailed hawk (*Buteo jamaicensis*, wt 1.1 kg). There

was no strike but the aircraft was destroyed due to a mechanical malfunction not related to the bird avoidance. The pilot was uninjured. THIS IS THEREFORE **NOT** A BIRD STRIKE ACCIDENT)

<b>26.09.06</b> A2-	<b>Cessna 206</b> 1 Continental TSIO-520	over Okavanga Reserve, Botswana	Windshield Vulture	5 on board <b>destroyed</b> , Nil injuries
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The aircraft was flying at 2,500 ft agl over the Okavango nature reserve en-route from Nxabega to Tsigaro when a vulture smashed through the pilot's windshield destroying some of the instruments panel and becoming entangled in the flight controls. The pilot managed to shove the bird aside and regain control but the excessive drag from the holed windshield prevented the aircraft from maintaining height. The pilot force landed in the swamp resulting in the aircraft overturning. All five on board escaped with minor injuries thanks in part to the 4 point harnesses fitted to all seats by FMS. The ELT signal was picked up by Cape Town and the Rescue Co-Ordination centre alerted. The bird was identified as an **African white-backed vulture** (*Gyps africanus* wt 5.8 kg).

<b>02.10.06</b>	<b>Piper PA32 Saratoga</b> 1 x Lycoming IO-540	Nr Pinheiros NE Brazil	- Black vulture	3 on board, <b>3 fatal</b> Minor
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As the aircraft was approaching to land after an air taxi flight transporting money for the Brazil Central bank from Maranhao 50 miles away, it collided with a **Black vulture**, (*Coragyps atratus* wt 1.7kg). The aircraft crashed in dense forest 100 metres from the airfield killing the 3 occupants. The airfield is near a garbage dump and it is common to have birds swarming around.

<b>04.02.07</b> VT-	<b>Cessna 152</b> 1 x Lycoming O-235	Nr Nadergul India	Windshield 'Eagle'	2 on board <b>1 minor injury</b>
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Whilst returning to the airfield an **'eagle'** struck the windshield smashing it and causing the aircraft to 'spin out of control'. The aircraft crash landed in a field, the student suffering a deep cut on her forehead. The aircraft was very badly damaged in the forced landing. It was the first case in 10 years.



<b>21.07.07</b> N531M	<b>Cessna 150</b> 1 x Continental 0-200	Woodland, California, USA	Windshield 'Hawk'	2 on board Nil inj
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Shortly after take off on a student training flight a 'hawk' came through the windshield causing minor injuries. The drag prevented the aircraft from maintaining level flight resulting in a forced landing in a field. The aircraft overturned in the soft ground and was damaged such as to be a write off.

<b>2310.07</b> N327ND	<b>Piper PA44 Seminole</b> 2 x Lycoming 0-360	Browerville, Minn. USA	Tailplane Canada goose	2 on board <b>2 killed</b>
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The University of North Dakota aircraft was on a routine late evening night training flight from St Paul to Grand Forks. It was flying normally when according to stored memory on cockpit devices (from GPS?) it went out of control and 26 seconds later crashed into a swampy area killing the 22 year old instructress and the 20 year old student. The NTSB Report states it was likely to have been caused by two or more Canada geese (*Branta canadensis* wt. 3.6 kg) hitting the aircraft. There was a large dent on the left wing along with Canada goose DNA and another on the left tailplane which had been bent upwards at 90 deg causing loss of control.

<b>11.09.08</b> ZS-NZU	<b>Air Tractor AT-502B</b> Lycoming IO-360	Nr Caledon, Western Cape, South Africa	Windshield Blue crane	1 on board <b>1 killed</b>
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During an agricultural spraying operation a **Blue Crane** (*Anthropoides paradisea* wt. 4 kg) struck the windshield and apparently incapacitated the pilot as feathers were found in the cockpit. The aircraft flew into the ground, bounced and overturned.

<b>02.05.08</b> N269SD	<b>Vans RV-7A</b> Lycoming IO-360	Frazier Lake, California USA	Wing Canada goose	2 on board <b>2 minor inj</b>
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At about 50 ft while climbing from a touch and go, the left wing struck a Canada Goose (*Branta Canadensis* wt. 3.6 kg). The pilot lost control and the aircraft was destroyed after cartwheeling and crashing in a field 500 ft south west of the runway.

<b>28.06.08</b> CS-XAK	<b>Jabiru SK</b> 1 x Jabiru 2200	Tavira, Algarve Portugal	Nil -	2 on board 1 minor inj
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At about 11.00 hrs after flying from Portimão the three axis microlight was on the final approach about 1 km from the landing strip when the pilot dodged a bird by turning and diving. The aircraft struck power lines which became entangled with the aircraft. It crashed 180 metres from the displaced threshold. The two occupants escaped, the pilot suffering a minor arm injury but the aircraft was destroyed by fire.

<b>29.08.08</b>	<b>Ercoupe 415C</b>	Sebring, Florida	Propeller	2 on board
N87376	1 x Continental C75/85	USA	Cormorant	Nil injuries

At about 1,300 ft in the climb the pilot found pieces of wood and feathers coming into the cockpit via the open canopy. He shut down the engine and made a forced landing in a field. The aircraft impacted a shallow ditch obscured by tall grass causing the nose gear to collapse bending the right main spar and buckling the firewall. One blade of the wooden propeller was splintered.

<b>01.02.09</b>	<b>Schweizer G-164B</b>	Ferriday,	Windshield	1 on board
N737B	1 x P & W R1340	Louisiana,USA	Cormorant	1 minor/nil

While on short final the agricultural spraying biplane struck a flock of birds. The remains penetrated the windshield and struck the pilot in the face temporarily blinding him. He attempted a go-around but the aircraft impacted the runway, nose over and came to rest inverted. The fuselage sustained structural damage. Bird remains confirmed as **Double-crested cormorant** (*Phalacrocorax auritus* wt. 2 kg) and Red-winged blackbirds (*Agelaius phoeniceus* wt. 50gm).

<b>30.06.11</b>	<b>Piper PA31-350 Navajo</b>	Broomfield,	Windshield	1 on board
N59798	2 x Piston	Colorado, USA	-	1 Nil

At 5 to 10 ft prior to touchdown a large bird broke and penetrated the front centre windshield. It covered the entire windshield and the pilot reacted by leaning to the right. The aircraft wing contacted the runway causing the aircraft to nose into the ground severely damaging the left wing, collapsing the left landing gear, bending both propellers and damaging the aircraft beyond economic repair. The bird species is unknown.

End of Section 2

## Section 3 – HELICOPTERS

<b>02.03.81</b>	<b>Bell 206 Jet Ranger</b> 1 turbine	Vancouver State, Canada	Windshield Raven	4 <b>4 fatal</b>
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The helicopter went missing during a wildlife research flight involving bighorn sheep. The helicopter was flying low over a mountainous area. It crashed in dense timber and snowfall covered the wreckage delaying its discovery until 8 June. At least one **Raven** (*Corvus corax*, 1.2 kg) had struck the plexiglass front windshield and probably entered the cockpit. The four occupants were dead. The pilot had over 9,600 hours on type.

<b>29.01.83</b>	<b>Bell 47</b> 1 piston	Riverview, Florida, USA	- -	2 1 minor
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The helicopter was flying at about 45 kts 15 ft above the water when a bird came through the door opening and hit the pilot's right temple. He lost control and it crashed into the sea. The passenger suffered minor injuries.

<b>20.01.85</b>	<b>Hughes 369</b> 1 turbine	Honolulu, USA	Rotor -	1 Nil
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While flying at about 400 ft about ½ mile offshore the pilot was unable to avoid a large flock of birds. An extreme vibration developed so he ditched the helicopter, which rolled over and sank. The pilot swam ashore.

<b>30.05.90</b>	<b>Schweizer 269C</b> 1 piston	Tallulah, Louisiana, USA	- -	1 Nil
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While en-route from Meridian to Shreveport at 800 ft, the helicopter struck a flock of birds resulting in severe vibration so the pilot made a precautionary landing. During the flare the main rotor blade flexed and struck the tail boom causing the helicopter to become uncontrollable and roll over.

<b>24.03.93</b>	<b>Bell 47</b> 1 piston	- USA	Tail rotor -	2 <b>1 fatal</b>
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The helicopter was being used for fish spotting with the ship's captain on board as passenger. When in the cruise there was a loud bang and all yaw control was lost. The pilot thought the tail rotor had been struck by one of the many large sea birds in the area. He was able to maintain directional control at 60 kts and small boats were lowered from the ship so that the captain could jump out (there were language/communication difficulties). While slowing and without being instructed the captain at about 75 ft and 45 kts dived out head first but sustained fatal injuries. The pilot made a run-on landing on the water and was hoisted onto the ship. The tail rotor blades showed impact damage.

<b>16.05.94</b>	<b>Bell 47</b> 1 piston	Tulsa, Oklahoma USA	- -	1 <b>1 fatal</b>
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Witnesses heard a loud noise and saw an object separate from the second of two helicopters, which then inverted and crashed into the back yard of a house. The left synchronized elevator and end cap were found 240 ft away. The pilot of the lead helicopter said he warned the other pilot about a flock of birds and had banked sharply to avoid hitting them. Investigation determined that improper use of the cyclic and collective controls when he manoeuvred abruptly to avoid birds had caused the in flight separation. The 3,919-hour pilot had only flown 87 hours on helicopters.

<b>27.01.00</b> HP-2599	<b>Bell 407 Long Ranger</b> 1 turbine	Nr Playa Leona, Nr Panama City,	Windshield Black vulture	5 <b>2 fatal, 3 serious</b>
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While about 25 nm SW from Panama City, Panama and at about 1,500 ft and 90 kts, a bird, identified as a **Black vulture** (*Coragyps atratus*, 1.7 kg), penetrated the windshield and struck the pilot knocking him unconscious. He fell across the controls and the co-pilot attempted to take over but the helicopter crashed onto a hillside and rolled down a slope. The pilot and one passenger were killed and the co-pilot and two passengers were seriously injured. The dead bird was found in the cockpit.



<b>19.03.00</b>	<b>Bell 212</b>	Nr Snelling, California	Windshield	1
N-415B	2 turbine	USA	-	<b>1 fatal</b>

The helicopter was being positioned from Fresno to Sacramento, California in company with another helicopter. The lead pilot reported they were cruising at about 4 to 500 ft agl over rolling terrain at about 100 kts with the other helicopter echelon right and about 8 rotor discs to the rear. They had been communicating regularly on a common frequency. Nearing Merced the lead pilot did not get an answer to his call and turned to look for the other helicopter. He saw a column of smoke and found the Bell 212 had crashed and was engulfed in flames. He landed in an attempt to rescue the other pilot but was driven back by the fire. He reported that he had an encounter with a large bird about a mile back from the accident site. The wreckage trail was nearly 1,000 ft long one of the first pieces was a 12 ft section of main rotor blade. The complete right windshield was found by the main wreckage but the left windshield was not found.

<b>28.10.03</b>	<b>AS 350 Ecuriel</b>	French Guyana	Windshield	N/K
F-OGUZ	1 turbine	-	N/K	<b>1 killed</b>

The Heli Inter Guyana helicopter was flying low over the jungle when it suffered a bird strike. The bird entered the cabin through the left hand windscreen resulting in the left rear door opening. A passenger fell from the helicopter and was killed.

<b>04.01.09</b>	<b>Sikorsky S76C</b>	Morgan City,	Windshield	9 on board
N748P	2 x Turbomeca Arriel	Louisiana, USA	Red-tailed hawk	<b>8 Fatal, 1 Serious</b>

The helicopter operated by PHI Petroleum Helicopters was ferrying oilfield workers to an oil platform in the Gulf of Mexico. Seven minutes after take off from Amelia, Louisiana, 12 miles, it was cruising at 135 kts IAS at 850 ft when a loud bang was recorded on the CVR followed by the sound of rushing wind, power reduction on both engines and decay of main rotor rpm. It departed from controlled flight and crashed partly submerged in marshy ground near Bayou Penchant. Examination revealed both left and right sections of the windshield had shattered after a bird had struck the canopy just above the top edge of the windshield. Feather and other bird remains collected from the canopy and windshield resulted in laboratory identification as being from a female **Red-tailed hawk** (*Buteo jamaicensis wt. 1.1 kg*). The engine controls are in an overhead panel and impact with the bird near the engine control quadrant jarred the controls such that engine control levers were moved out of their stops to near flight idle rpm. A similar event happened to another S-76 in 1999. There is no audio or visual alert to warn the flight crew of the low rpm condition, the flight crew would have had 6 seconds at the most to react to the decaying rpm and restore power whilst distracted by possible disorientation and the rush of air through the broken windshield. The original laminated glass windshields had been replaced a year previously by lighter weight cast acrylic windshields approved but not impact tested by the FAA under a Supplemental Type Certificate. When the S-76 was certificated in 1978 there was no windshield bird strike requirement for helicopters but FAR 29.631 effective 8 Aug 1996 states that a transport sized helicopter should be capable of safe landing after impact with a 2.2 lb (1kg) bird at a specified velocity. (NTSB Report CEN09MA117).