Incidents in Air Transport

Wildlife Hazards

n° 11
October 2009

Prevention of wildlife hazards consists of identifying and assessing the danger of animal presence so that measures to reduce the associated risks are as effective as possible. The incidents presented in this publication, chosen from a large number, show the main risks subsequent to jet engine bird ingestion. Recent accidents in November 2008 in Rome and January 2009 in the Hudson River underline the necessity of assessing these risks.

Abandoned take-off after V1

History of Flight

The crew of an A321 was undertaking its fourth rotation of the day. They lined up on runway 20 in Ajaccio from taxiway D[1].There were broken clouds at 600 ft and it was raining. The co-pilot, PF, applied take-off thrust without stopping on the runway.

Shortly after the “100 knots” callout, the Captain caught sight of a flock of gulls on the right of the runway, in front of the aeroplane. He decided to continue the take-off run. Two seconds later, a heavy thud and significant vibrations were noticed in the cockpit. The Captain called out “V1” and decided to abandon the take-off. He reduced the thrust and realized that the indicated airspeed was above V1. Despite maximum manual braking, the use of thrust reversers and automatic spoiler extension, the crew was afraid of not being able to stop the aeroplane before the runway end and the sea. They decided to take exit taxiway A at the runway end. The crew stopped the aeroplane on the taxiway. After a visual examination of the aeroplane by the rescue and fire fighting services, the crew taxied to the ramp and the passengers disembarked as usual.

The first braking action was recorded at 14 knots above V1, two or three seconds after the VI callout.

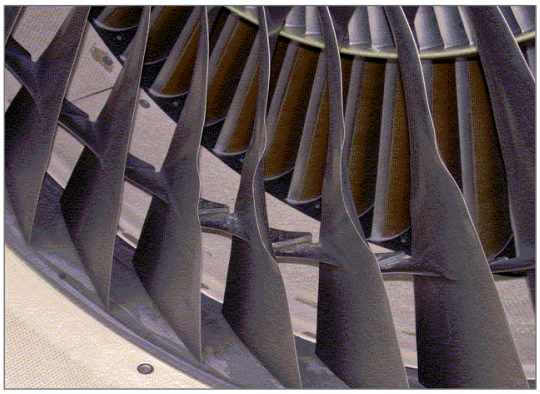
[1]Works on the threshold neutralized the first 435 metres

Additional Information

Damage to aircraft

A gull was ingested by the right engine. Several fan blades were damaged and had to be replaced. Analysis of the recorded parameters showed that the gull ingestion did not lead to the loss of thrust on this engine.

The end of braking carried out on a bend in the exit taxiway at a speed of about 25 knots led to lateral acceleration requiring a landing gear inspection.



Weather conditions

The runway was wet and the wind was from 320° at 3 to 6 knots.

Aeroplane performance

Because of works at the threshold level of runway 20, line-up was carried out from taxiway D. The ASDA[2] declared on runway 20 was thus 2,175 m.

For the estimated aeroplane weight of 71.3 tons at take-off, the speeds chosen for a wet runway were as follows:

V1	126 kt
Vr	137 kt
V2	139 kt

This V1 was calculated for reduced thrust, given the take-off conditions. It depended on the ASDA limitation and allowed the crew to stop the aeroplane at the end of the runway. Because of a heavy shower during the stopover, the crew had first planned to take into account performance on a contaminated runway before deciding to take off with full thrust with take-off parameters set for a wet runway.

[2]Acceleration Stop Distance (usable length of acceleration-stop).

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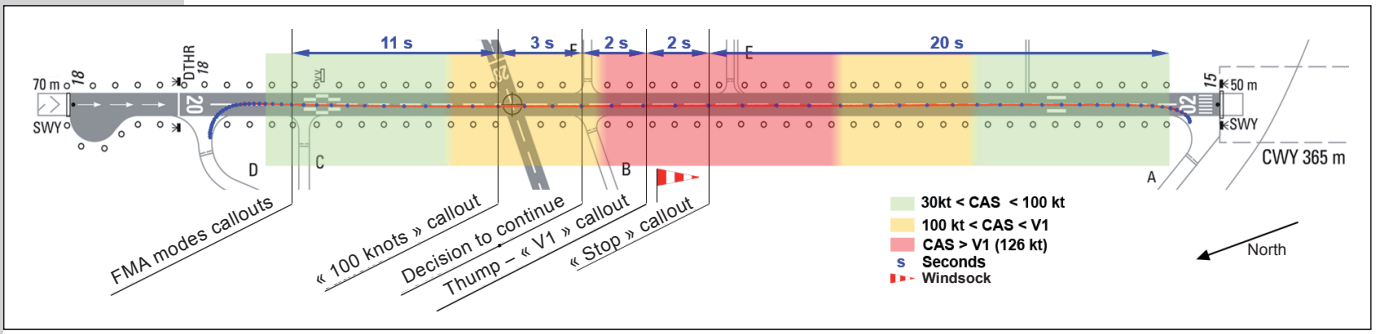

History of abandoned takeoff

Wildlife hazard prevention service

The number of annual commercial aeroplane movements in Ajaccio being less than 25,000, the 24 July 1989 decree was in force until September 2009 (see box below). Bird hazards were dealt with by an SSLIA[3] employee and the service was carried out from time to time or on request. It required the air traffic controllers to monitor the airport (especially when aeroplane arrivals or departures were expected) and the BRIA[4] officers to monitor the runway inspections. On the day of the incident, the two most recent scaring operations had been carried out at the request of the air traffic controller three and two hours before the abandoned take-off. Before the A321 take-off, the controller checked for any birds with binoculars, but did not see the gulls on the grass close to the runway. The rain may have made it harder to see them from the control tower.

Local ornithological situation

Training for SSLIA officers and an inspection of the local ornithological situation had been carried out (three years before the incident) by the STAC[5] at the request of the Corsican territorial delegation and the Chamber of Commerce and Industry of Ajaccio and southern Corsica, with a view to transferring the wildlife hazard prevention service to the airport operator. The inspection showed that the proximity of La Gravona river[6] and the pond at its mouth attracted grey herons and a small population of laridae (gulls). The gulls would visit the aerodrome in bad weather, particularly near to the wind sock, where a pool of water would form when it rained[7].
Analysis of data on collisions between birds and aircraft in Ajaccio[8] showed that the rate of serious incidents over a ten-year period was three times greater than the national rate (one serious incident for 20,000 commercial flights in France) and that the highest number of collisions at the aerodrome in the period from the year 2000 to 2004 involved gulls.

Measures to implement

After inspection, STAC put forward several preventive measures for consideration to reduce the number of bird strikes at Ajaccio aerodrome. They involved:
- reducing sources that attract birds;
- improving coordination between air traffic controllers and the wildlife hazard prevention service:
- either by alerting the prevention service as soon as possible before commercial air flights,
- or by considering the possibility of the prevention service employees, always in coordination with air traffic controllers, intervening from a list of planned flights or according to the ornithological situation of the moment (bad weather, ploughing, mowing, etc.);
New local instructions, whose draft had been suggested by the STAC as a preventive measure, were integrated into the airport operating manual.
On the date of the event, these measures had not been put in place. In particular, the pool near the wind sock (zone V1 Vr in red on the diagram on page 1) had not been drained.

Lessons Learned

Acceleration-stop

The choice of full thrust on a weight when the choice of a reduced thrust was available would have enabled an increase in the remaining distance, due to the greater acceleration on the very wet runway, in case of acceleration-stop at V1. This margin was lost the moment the decision to abort take-off was initiated after V1, increasing the acceleration-stop distance by about 1,000 metres. The speed at which all the braking options were carried out kept the aeroplane within the runway limits. Deactivating the automatic and manual brakes damaged the aeroplane's deceleration performance.

[3] *Aircraft Rescue and Fire Fighting Service.*

[4] *Regional flight information and assistance bureau*

[5] *Civil aviation technical service*

[6] *Its estuary is located about 400 metres south-east of the threshold of runway 02, itself only a few metres from the beach.*

[7] *On the former site of a building now demolished*

[8] *With the aid of the PICA programme, programme of information on bird strikes*

Regulatory aspects wildlife hazard prevention in France

A ministerial decree on 24 July 1989 relating to the prevention of bird hazards at aerodromes, the main addressee of which was the minister responsible for civil aviation, introduced the notion of risk of collision betweens birds and aircraft. A bird hazard prevention service was set up, under the State's responsibility, during the working hours of the aerodrome's air traffic organization, excluding night time. All the means of protection, arrangements for developing the area within the airport's control as well as rules for delivering the bird hazard prevention service were defined for each airport depending on the local ornithological situation.

In 1998 law N° 98-1171 of 18 December 1998 (in particular article L213-3 of the Civil Aviation Code) entrusted bird hazard control to civil airport operators, under prefectural power. This development was accompanied by raising the corresponding financial means through the airport tax in force since 1 July 1999. The arrangements for this law were specified in 2007 in implementing regulations. They were no longer limited to reducing the risk of collision between birds and aircraft (bird hazard) when the scope of application was broadened to include all animals (wildlife hazard). The bird hazard prevention service could be entrusted to the SSLIA, to the military or to an authorized organization. Associated prevention measures were organized by the airport operator:
- Appropriate management of the natural environment and installation of adapted fencing to minimize animal presence (ecological control) to make the airport site unattractive to animals.
- appropriate scaring measures or culling, carried out permanently or occasionally, should keep animals away from aircraft.

The necessity and implementation details of these preventive measures were determined from the number of annual commercial movements of aeroplanes over 12 metres long (N):

	N < 1 000	1 000 ≤ N	N < 25 000
Aerodromes involved		About 140 in France	
			Roissy, Orly, Nice, Toulouse, Marseille, Lyon, Nantes, Bordeaux, Bâle, Strasbourg, Tahiti
Type of intervention	No obligation	occasional	Around the clock
Wildlife hazard prevention measures in place	According to the wildlife situation	At the time of commercial aeroplane movements, during the aeronautic day	During the aeronautic day
Date of enforcement of implementation texts	Not applicable	From September 2009(1)	Since July 2007

(1)For these aerodromes, the 1989 decree of stays in force until this date.

Preventive measures were also applied:
- Each time a crew or an air traffic body indicated the presence of animals likely to pose a risk;
- Day and night whenever the wildlife situation in the airport justified it.

The crew's decision

When taxiing and monitoring the edges of the runway to see the possible presence of animals such as birds, flight crews could ask for the wildlife hazard prevention service to intervene before take-off.

On take-off, monitoring the outside and the perception of noises or vibrations following bird strikes could take precedence over the monitoring of thrust and speed parameters and influence the crew's decisions.

The wildlife hazard prevention service

Since September 2009, airport operators have been responsible for the organization and performance of the wildlife hazard prevention service. Airport approval would be an opportunity to ensure that the means of wildlife control were appropriate to the danger that the airport is exposed to.

Ingestion of birds after Vr

First case

History of Flight

The crew of a B767-300 was cleared for take-off from runway 04R in Nice. The co-pilot was PF. The weather was misty and rainy.

On rotation, the crew noticed a flock of birds to the right of the runway. As the aeroplane took off, the crew heard several thuds and unusual noises coming from the engines. The crew felt vibrations and a yawing movement to the right. The PF turned to the right to comply with the departure trajectory in case of engine failure. The aeroplane entered the clouds. The crew reduced the thrust on the right engine and the vibrations lessened. There was no alert and the engines' parameters stabilized. With no indications of fire and fearing that the left engine had also ingested some birds, the Captain decided not to go ahead with shutting down the right engine.

The PF continued climbing to 3,000 ft then connected the auto-pilot. The Captain declared an emergency situation and requested assistance from the controller to land on runway 04L[(9)].

While taxiing to landing, the PF used thrust reversers. The EGT temperature on the right engine increased. The crew proceeded to shut down this engine once the aeroplane was stationary. After an examination by the fire and safety services, the crew taxied to a parking area.

[(9)] *Runway 04R was longer but means of guidance were not available*

General points on bird biology

The risk of collisions with birds is not the same all year and depends on their activity. In order to ensure its survival, a bird must meet a number of biological needs: food, rest and reproduction. The duration of these activities varies according to the species, the environment in which the bird lives, and the season. The migration periods (March and October), the period of young birds (not used to aeroplanes) taking flight (June and July) as well as dawn and dusk are the times when the risk of collision is greatest. Knowledge of the types of birds on airports, of their behaviour and habits is indispensable for effective bird hazard control.

Additional Information

Damage to right engine

The remains of nine yellow-legged gulls[10] were found on the runway.

Numerous pieces of debris from the right engine were found on the runway over a length of 1,200 metres. The external part of the exhaust nozzle was 300 metres from runway 22L threshold.

Three gulls had struck two of the right engine's fan blades. The blade hit by two of the birds had broken. The blade fragments then severely damaged the leading edges of the other blades. Debris had gone through the inlet nozzle and pierced it in five places. One of the pieces of debris had pierced the engine cowling and been propelled outside but without enough force to damage the fuselage.

The separation of the exhaust nozzle was due to the vibrations following the fracture of the blades. The duct between the oil filter and the scavenge pump had been severed. The oil tank had emptied and the bearings that had not been lubricated had been damaged or had melted. The engine showed no signs of fire.

Weather conditions

The weather conditions observed at the moment of departure were as follows: visibility between 2,500 and 3,000 metres, light rain, mist, scattered clouds at 600 ft, broken at 2,500 ft.

Engine protection

To reinforce aircraft's capacity to withstand bird strikes, airworthiness standards relate mainly to the parts of the airframe and engines oriented to the forward part of the aeroplane, which are the most vulnerable in case of impact. In this way, aeroplane structure has to resist bird strikes of 1,850 kg at aircraft cruising speed.

European engine certification regulations indicate that all engines must react in a reliable way following bird ingestion or strike on the parts at the front (air intake) of the engine. The engines are designed so that a strike or ingestion does not cause any dangerous effects (uncontained high energy debris, uncontrolled fire, impossibility of shutting off the engine, fracture of the engine attachment system, etc.). Bird strike or ingestion on more than one engine should not prevent the flight from continuing or landing. Proof of compliance is carried out using tests that anticipate the ingestion of small, medium-size (species flying in a group, possibly affecting more than one engine) and large birds (an individual species affecting only one engine) whose weight depends on the surface area of the air inlet. Criteria for passing the test associated with medium-sized bird ingestion (as in the case of this incident) require that the engine not lose more than 25% power for 20 minutes.

Prevention of bird hazards

The ATIS message received by the crew reported bird activity on the airport. The control service did not provide specific information relating to the presence of birds.

The wildlife hazard prevention service was carried out around the clock by an authorised contractor. Four employees were in this service and had two specialized vehicles[11]. On the day of the incident, two employees carried out bird control with one vehicle. They were positioned on the edge of runway 04R ten minutes before the incident when the controller called them to carry out a scaring operation on a parking area.

[10] They weigh between 600 g and 1.8 kg and can have a wing span of 1.4 metres. These birds come to aerodromes to feed. They can also rest there in unfavourable weather conditions.

[11] In exceptional circumstances, SSLIA personnel can provide the service

Lessons Learned

Wildlife hazard prevention service

A monitoring report of the prevention service, carried out after the incident, mentioned that resources could be increased when weather conditions were bad so that an employee with a vehicle could stay around the clock on the site of highest risk, that is zone V1-Vr for take-offs. A fixed optical (laser) scaring system was recommended in this report. The airport operator has committed to acquiring this complementary resource.

Not all airport zones are exposed to the same risks.

Second case

History of Flight

One December day, the crew of an A321 lined up for take-off on runway 32R in Toulouse when the pilot of an Embraer 135 announced on clearing the same runway "there were numerous birds the length of the runway, on the runway". The tower controller announced that it had received the information and cleared the A321 crew for take-off. The co-pilot was PF.

On rotation, the pilots saw some lapwings fly away and heard some thudding on the sides of the aeroplane. Intense vibrations at fan level (N1) of the left engine triggered the ECAM "advisory" alert(12) associated with this engine one second after take-off. The Captain reported to the controller that he had struck some birds and that he planned to come back and land by doing a circle to land. When the aeroplane reached the altitude cleared by the controller, the crew carried out the ENGINE HIGH VIBRATIONS procedure. Thrust reduction increased the fan-level vibrations of the right engine which also set off the associated ECAM advisory alert. The two ECAM advisory alerts disappeared when the crew reduced the N1 parameters to below 60% for the right engine and to 52% for the left. The crew deactivated the auto-pilot. The thrust displayed enabled the aeroplane to maintain only a speed lower than 10kt to the manoeuvring speed displayed on the PFD. The crew started the APU.

During the landing roll, the crew used thrust reversers at slow speed to avoid vibrations. When the engines were shut down at the ramp, the ground handler noticed a fuel leak in the left engine and warned the crew who fired the fire extinguishers. The leak stopped.

(12) *The level of vibrations was greater than the maximum ECAM level displayed.*

Additional Information

Damage sustained by the engines

The remains of three lapwings were found on the runway.

Examination of the left engine showed significant damage on most of the fan blades, a perforation of the air inlet as well as material wrenched off around the fan and from the acoustic panels. The left engine was changed. On the right engine, four fan blades were changed. An engine ground run helped to check the level of vibrations. No failures were noted during the boroscope examination.

ATIS

The information recorded in the hour preceding the event stated: CAUTION HEAVY BIRD PRESENCE ON LAND. The air navigation services indicated that ATIS only mentioned the presence of birds at the airport when a significant bird hazard was reported by the SSLIA. Twenty-seven days were defined as such in December, and twenty-one in November.

The weather conditions reported in ATIS were as follows: visibility over 10 km, few clouds at 600 ft, broken at 5,300 ft.

Bird strike reports

Each strike or near strike with birds (or animals) must be the subject of bird encounter reports by the crews (using ICAO and STAC models) generally available at airlines. If bird presence is detected during take-off or landing phases, the crews must warn the controllers who will make the bird control service intervene in time for the next aeroplanes. Reports must also be provided by airline maintenance companies and aircraft engine manufacturers who notice signs of collision on the airframe or engines during their maintenance operations, and by the wildlife hazard prevention service employees from specimen forms of bird remains found dead on runways.

All these reports allow information to be fed into databases in numerous countries held by civil aviation bodies (like STAC in France). The increase in information gathered at the site of the strike enables accurate analysis of fauna development on airports with a view to establishing effective wildlife hazard management strategies. Analysis of these databases also provides information to engine and airframe manufacturers to design engines and airframes better able to withstand wildlife strikes. To complement these reports, and whenever possible, it is important to try to identify the birds involved, from feathers or remains, not only to ensure that the resources in place in airports correspond to the hazard associated with the airport but also to review the certification standards if necessary.

Local ornithological situation

The airport was located on the migratory routes of the Northern lapwing and other species such as raptors. Because of global warming, the character of migrations has evolved. These avian populations were more present in winter in the south-west of France. The protection of numerous species has tended to increase the size of the populations.

Bird hazard prevention

Bird control in the airport was entrusted to the SSLIA and was carried out permanently (see the box on page 2) during the aeronautical day[13]. A fireman, relieved hourly, patrols the airport in a specific vehicle and monitors frequency on the ground.

The control tower operating manual specified that all information from crews which could facilitate operations was to be relayed to the employee responsible for bird hazard control. The bird control log did not mention any specific demand on the morning preceding the incident.

Anomalous HIGH ENGINE VIBRATIONS procedure

It said to reduce the thrust lever for the engine concerned in order to maintain the level of vibrations below the "advisory"[14] values. It was also stated that vibration detection on its own did not imply shutting down the engine. The procedure did not allow for vibrations on both engines. Faced with this unusual situation of no procedure, the crew had to devise a solution.

Lessons Learned

Wildlife control prevention service

The new regulation defines the scope of wildlife control from the number of commercial aeroplanes as well as the minimum resources for the airport operators to implement. The size of the zone involved (dual runways for example), the size of the bird population, possible difficulties in keeping them away on a permanent basis and the significant number of non-commercial flights (for example, Airbus test flights in Toulouse) could all justify additional mandatory resources for some airports.

Risk assessment

The danger linked to bird presence had been identified by the Embraer 135 crew. The handling of the associated hazard in real time by the controller and the crew was based on analysis of the advantages of a take-off and the "costs" of a runway inspection and a possible scaring before undertaking take-off. This "costs/benefits" analysis could lead to the hazard being underestimated to favour operational efficiency first. Prior consultation between SSLIA employees and the crews would likely improve hazard awareness and decision making.

> *These two events showed that observations carried out by SSLIA employees were not based on any formal criteria. Strictly speaking, they did not constitute an assessment of the level of bird hazard. Such information, relayed by controllers in ATIS messages were subject to diverse interpretations by crews. In a wider sense, the absence of relevant and targeted information on bird hazards in ATIS messages, based on a common referential, did not enable the expected level of prevention to be reached.*

[13] *From thirty minutes before sunrise to thirty minutes after sunset.*

[14] *N1 > 6 units or N2 > 4.3 units*

Bird ingestion during a missed

History of Flight

The crew of an Airbus A319, carrying out an ILS approach for runway 03 in Nantes, was cleared for landing. The airport was in LVP[15] conditions. Coming out of the cloud layer, the Captain noticed considerable bird presence between the runway 03 threshold and the aim point markings. At a height of about 100 ft he decided to fly over them by performing a go-around. The birds flew up and the aeroplane struck twenty of them. Immediately after the impacts, which the Captain called "disturbing", the crew felt strong vibrations on the airframe and at left engine level which set off the associated ECAM "advisory" alert. The crew carried out the anomalous HIGH ENGINE VIBRATIONS procedure. The crew declared an emergency situation, requested a scaring operation and made an aerodrome circuit. The aeroplane landed without further problems.

The runway inspection found 25 dead birds on the runway (24 gulls and a crow). The aeroplane inspection showed several marks on the airframe. Two gulls were found in the main landing gear. The two engines had ingested some birds and several of the left engine's fan blades were damaged.

Additional Information

Wildlife hazards at Nantes airport

Nantes airport's bird hazard was significant considering the presence:

- of a protected nature reserve between the airport and the Grand Lieu lake;
- of a game farm close to runway 03 threshold where food, distributed in the open air, attracted a large number of birds;
- of an isolated military zone closed to all traffic, making an attractive area for mammals, and, more specifically, for wild boars.

Bird hazard prevention

Bird control was carried out all year by an authorised company. However, in LVP configurations, bird operations were only carried out at the Captain's request. This information on Nantes airport was available in the aeronautical information publication (AIP). On the day of the incident, the bird control officer was on standby at the communications centre and had been informed of the implementation of LVP measures by the tower controller. In compliance with local instructions and without a Captain requesting a bird scaring operation, bird control was suspended. A check on the wildlife hazard prevention service by the DGAC five months after the incident showed that the airport operator did not have certain pyrotechnic and fixed resources for wildlife control. Furthermore, the fencing around the airport was not buried and was regularly damaged (particularly at the level of the former military zone) by animals entering the airport zone.

Weather conditions

According to the weather observations, visibility on the airport was between 800 and 1,200 m and the ceiling was 100 ft at the time of the incident. Nantes' control tower operating manual showed that the LVPs were applied when the RVR was less than 800 m or the ceiling was less than 200 ft.

Similar incident at Lille

On final ILS approach to runway 26, at a height of about 400 ft, the crew[16] of an A320 noticed the presence of a number of lapwings on the ground between the threshold and the endpoint. A few seconds later, the crew decided to carry out a go-around. A lot of lapwings were ingested by the jet engines. Landing was carried out after a scaring operation by ground services. Examination of the left engine showed that the fan blades and the third stage blades had been damaged.

Lessons Learned

Information to crews

The crew had received no specific information relating to bird strike risks. It was noted with several operators that, following several incidents, they had included advice on procedures in their documentation to follow in case of bird presence on landing.

Landing or go around?

On approach or landing, a crew that sees bird presence on or close to a runway has little time to act. If the weather conditions worsen, there is even less time.

A reflex action to avoid birds could lead the crew to undertake a go-around. Bird ingestion with high rotation speeds of fan blades or helixes at the time of the go-around could cause severe damage on these parts. This could limit or indeed cancel thrust when the crew had to carry out a new approach. Furthermore, on final approach, bird ingestion at low speed (which is not allowed for in certification) does not necessarily enable a go around.

On the contrary, landing without using thrust reversers if it were possible would reduce blade speed and thus the energy absorbed in case of bird strike. Engine damage in the case of bird ingestion would be limited and the plane would be on the ground. The lowest aeroplane speed on landing would also reduce the risks of damage to the structure.

[15] *Low Visibility Procedure.*

[16] *From a different operator to the Nantes incident*

Bird control in LVP conditions

During development of LVP procedures, the bird control path was in the ancillary services. It had then been decided to limit bird control to crew requests. This information, available in the AIP, was not necessarily known to crews and, in any event, bird presence on or near a runway was hard for a crew on approach in LVP conditions to detect.

The local instructions in Nantes were modified after the event to maintain the wildlife hazard prevention service in LVP conditions. From then on, the bird control worker was monitoring outside the runway ancillary services according to visibility.

Importance of ecological control

The absence of effective ecological control in Nantes was a factor in attracting various types of animals and in increasing wildlife hazard. The game farm's food sources were modified to make them less attractive for birds.

Wildlife hazard prevention measures

Reducing wildlife strikes on and around airports requires preventive measures being put in place:

Ecological control: The presence of wildlife in airports is often due to an attractive spring inside or in the immediate vicinity. Understanding why animals come to the airport enables their presence to be minimised, by modifying the airport environment appropriately to make it inhospitable. Lessening the attraction of the airport is done using appropriate passive techniques:

- temporary or permanent water points must be drained or covered with netting;
- crops that are too attractive to wildlife are banned within the airport area;
- knowledge of bird food allows control to be exercised over food access;
- management of grassy areas has to be adapted to the bird populations that visit the airport. The more short grass areas that are available, the more gregarious birds will gather there. Except in radio-electric and marking ancillary zones, grass should be 20 cm tall at minimum;
- installation of adapted fencing prevents the incursions of dogs, deer, wild boar and other animals in airports;
- opening rubbish dumps is regulated within airports' vicinity.

Scaring methods: Scaring methods and resources, permanently or occasionally in place, have been developed to allow bird control workers to keep animals away from airports. They include:

- broadcasting specific distress calls from a vehicle;
- firing short, medium or long range projectiles (shell crackers, propane or double detonation cannons,);
- using hunting rifles to shoot selected species authorised by Prefects;
- use of fixed or portable lasers (green, better seen by birds) sweeping across the runway disperses birds especially at night and in poor light. This method works on all species;
- falconry, tested in the 1980s on civil airports, has been abandoned because of questions of cost and liability.

The aeroplane must not be considered as a means of bird-scaring. The use of on-board weather radar, landing headlights and flashing lights, for example, does not produce any results.

Summary

- The presence of animals on runways and airport areas is inevitable. The incidents presented in this issue showed that the associated risks cannot be underestimated and remain relatively unknown to the parties involved. Currently wildlife hazard assessment at airports does not take into account the real risks of operation, the seriousness of which depend on the consequences of bird ingestion.

- At a regulatory level, the scale of scaring resources depends only on the number of commercial movements of aeroplanes longer than 12 m, movements subject to a tax that includes the financing of bird control resources (1-2% of this tax). This criterion is without any correlation to the wildlife hazard to which airports are exposed. Though additional resources could be recommended according to the local ornithological situation, the aforementioned incidents show the limits of their application.

- The presence of scaring resources is not sufficient in itself. They must be accompanied by coordination between the various parties, whose respective actions and decisions must be defined, known to all and allow smooth operation. Such coordination must be based on a common referential, standardised, which would allow the parties involved to share the same appreciation of the level of risk detected.

For a better understanding of these phenomena and their consequences, some on-line publications, some of which have been used to produce this issue, provide complementary information on the management of the risks associated with wildlife strikes. In particular, we note:
http://www.stac.aviation-civile.gouv.fr/
Canada, Transports Canada, Un ciel à partager, Ottawa, Transports Canada, 2004
Bird Strike Committee www.birdstrike.org/
Manual of Safety Management, ICAO, 2009

Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer
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