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**Agenda Item 3: Global, Regional and National Guidance/Best Practices on
Wildlife Hazard Management**

BEST PRACTICES ON WILDLIFE HAZARD MANAGEMENT AT IGI AIRPORT, DELHI

(Presented by India)

SUMMARY

Wildlife strikes have been a challenge since the dawn of aviation. Birds, mammals, reptiles, and aircraft may seem to share airport grounds in relative peace, but their co-existence can lead to extremely high-risk situations. A collision between an aircraft and an animal can cause severe damage that can bring about the loss of an aircraft, its passengers, and crew. To avoid this, an operator must have ‘Wildlife Hazard Management Plan (WHMP)’ in place. The plan must deliver strategies to mitigate wildlife hazard attractants and high-risk species. At DIAL, dedicated WHM team is proactively taking and implementing all the necessary mitigation measures to limit the bird strikes. This paper describes the mitigation measures and their effective results on bat menace at Delhi Airport and how DIAL has overcome the issue of bat menace.

1. INTRODUCTION

1.1 Wildlife management at any airport is a key activity to ensure the safety of aircraft operations. All airports are required to invest heavily in terms of manpower, resources and procedures to reduce the chances of wildlife strikes.

1.2 Delhi International Airport Limited (DIAL) – GMR is one of the largest and most complex airports located at New Delhi, India. It has four active runways (two pairs of dependent runways). This airport is spread over an area of 5500 acres of land and accounts for approx. 1400 ATMs per day. Despite being located in an urban and second most populated city in the world, the airport is also surrounded by many natural and restored green areas accounting for 22% green cover area. Further, the climate of Delhi is semi-arid, and there is a vast difference between summer and winter temperatures. The green areas and temperature variations ultimately lead to wildlife attractions which are a matter of concern to DIAL as wildlife may enter the airport, especially the birds and probabilities are there that the birds may get habitual to airport environment.

2. DISCUSSION

2.1 With the rise in the aviation industry, wildlife management is also expanding, especially during the nighttime due to nocturnal wildlife movement such as bats (both frugivore and insectivore). To develop mitigation measures for bird species, assessment of behavioral pattern and food preference of the said species is one of the most important requirements. The details of the mitigation measures developed by DIAL to control and eradicate the same are mentioned below:

2.2 **Early field observation:** At DIAL, the WHM team is well qualified and trained in respect to wildlife management for birds like Indian Rock Pigeon (*Columba livia*), Black Kite (*Milvus migrans*) and the Red-wattled Lapwing (*Vanellus indicus*) as these species are diurnal in nature. Whereas a new evolutionary trend was noticed from the year 2019 onwards as wildlife strikes were reported by the airlines during the nighttime and none of the species mentioned above were the reason for the same. During the runway inspections, our WHM team noticed few bat (insectivore) carcasses and that was an eye-opening observation. With time, the bat strikes incidents increased.

2.3 Field observations:

2.3.1 Biologist ground observation: Observed that bat movement was generally active for 40-50 minutes only during dusk time and mainly it was insectivore bat species. Further, it was observed that insectivore bat species were flying over a height of 20-30 ft only and made sudden dip over the grassland which is near to the runways to have airborne insect feeding. At that time, a good insect population and diversity was observed due to long grass policy. Further, it was observed that the bat activity started due to the constructional activities that happened inside as well as outside the airport and that may have resulted in the displacement/ disturbance to bat's natural habitat.

2.3.2 Biologist observation for frugivore bats: Additionally, it was observed that the frugivore bats were only crossing the airside areas and their flying route was observed, and it came to know that these are going to the *ficus* trees species like *Ficus racemosa*, *Ficus benghalensis*, *Ficus religiosa* and date palm trees to feed on their fruits which are available outside the airport.

2.3.3 Bat Detector: Since most of the strikes had occurred during the night time and it is very difficult to identify the strike species through naked eye visibility. Therefore, to observe the reason, nighttime surveys were carried out along with the bat detector device (device which records the bats audio (ultrasonic) calls and with the help of software, one can identify the bat species). Through the device, 07 species of bat (05 insectivore and 02 frugivore) were identified.



Blue color indicating the bat frequency



Recorded audios

Image 1: Bat detector device is used to record bat movements along with their frequency and time.

2.3.4 **DNA Analysis:** Most of the nighttime strikes, only blood stains were observed on the aircraft radome/ windshield. Therefore, DNA analysis is carried out to identify the species to robust the existing mitigation measures. In analysis results, it came to know that more than 95% of the bat strikes are of insectivore species.



Image 2: Blood sample taken for DNA analysis to identify the species.

2.4 **Mitigation measures:** As mentioned above, root cause analysis was carried out and based on those, the below mentioned mitigation measures were implemented.

2.4.1 **Change in grass height policy:** Since it was observed that most of the strikes are of insectivore bat species, and they were observed feeding on the airborne insects over the grassland. Therefore, to cut down the breeding and hiding spaces for the insects, the grass height policy was changed from 'Long' to 'Short'. Currently, a grass height policy of 6-8 inches is maintained.



Image 3: Comparative image of long grass policy vs Short height policy.

2.4.2 **Change in insecticides:** The insecticides were changed immediately as it was observed that the insects got prone to the spray and the same was confirmed by an entomologist (through external consultancy).

2.4.3 **Biological control methods:** To control the insect population and density, biological control methods were introduced like the application of *Entomopathogenic Nematode* (EPN) powder which infest on soil dwelling insects especially termite species. And *Trichogamma chelonis* cards, infest on the eggs of the lepidopterans. These measures are found to be effective as insect control measures.

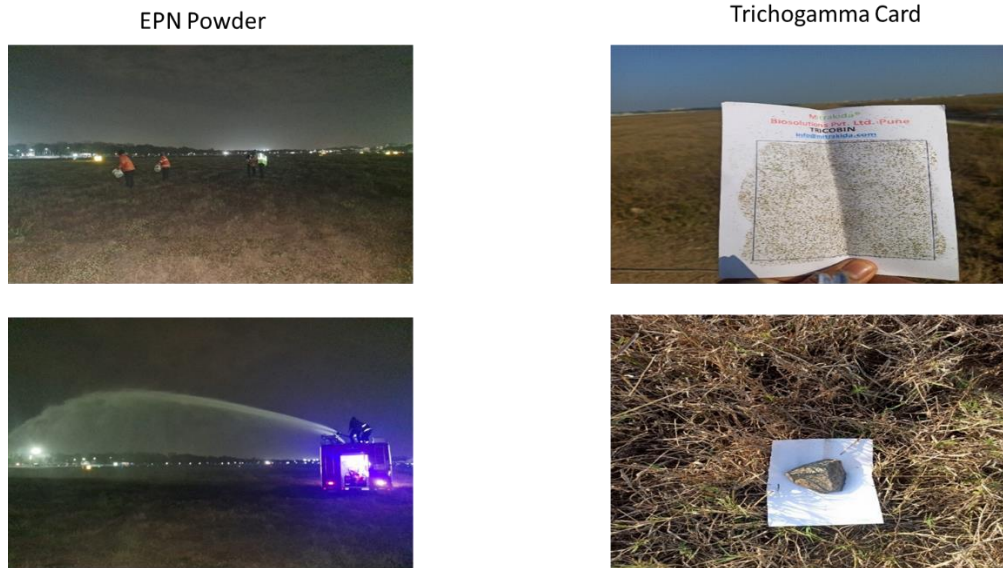


Image 4: EPN powder is sprayed followed by a water shower. Trichogamma cards were placed on the ground so that eggs can directly spread out to the grass.

2.4.4 **Monthly fig tree survey:** To limit the frugivore bat movement, monthly fig tree survey has been started in the vicinity of the airport. The survey is carried out by WHM team along with the horticulture team and both the teams survey the nearby areas to identify and locate Ficus trees. The purpose of these surveys is to keep the Ficus and palm trees in a vegetative stage so that there is no source of attraction of frugivore bats.

2.4.5 **Installation of Black Light Trap (BLT):** The insect traps work on a principle of black light bulb and black light (UV) is attractive to all types of insects including Grasshoppers. The insect gets attracted towards the bulb and ultimately gets trapped on the water available under the bulb. This equipment can collect 50 kgs of insect mass (depending upon the insect availability). As a new initiative, to reduce the insect mass, the BLTs were installed on every runway and the same were cleared on daily morning so that it does not becomes a source of attraction of insectivore birds.

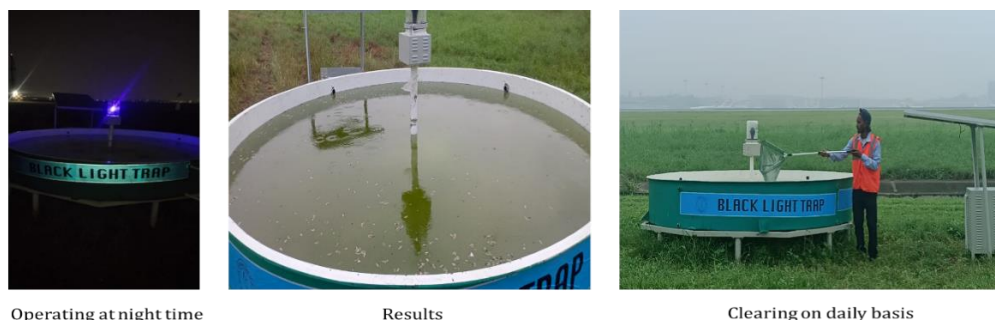
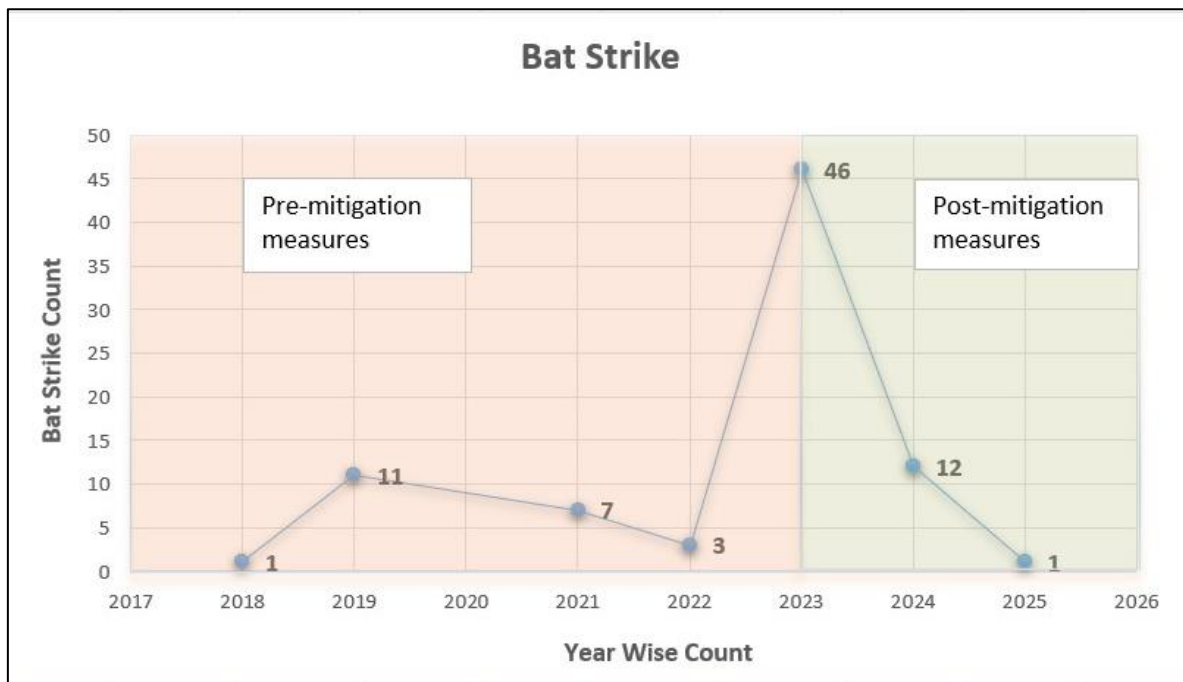


Image 5: Black light trap equipped with results.

2.4.6 **Use of traditional remedies:** With the application of new technologies, biological control methods, the traditional remedial methods like spray of peppermint oil, *Azadirachta indica* (neem) oil and naphthalene balls were considered to limit the insect count. Very less insect movement was observed with the implementation of these traditional measures.

2.5 Results:

2.5.1 As mentioned above, mitigation measures were implemented, and the bat strike results can be easily depicted in the graph mentioned below on how effectively the mitigation measures were implemented.



Graph 1: Year-wise strike rate of bat with pre and post mitigation measures

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.

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