

Bird Strikes and Preventive Methods used at Malaysian Airport

Abdul Ghani Abdul Samad, Adi Harith Mohd Tahir

Abstract: *The main objective of this project is to determine the cause and effect of bird attack and the most effective way to prevent this bird attack. In general, birds are very dangerous to the aircraft because when birds attack the parts of the aircraft, especially the engine parts of the aircraft, it will damage the aircraft system in small or large. According to the International Civil Aviation Organization (ICAO) report, the number of bird attack accidents increased from 2010 to 2017. The project is to track and identify the best way to prevent and reduce the number of bird attacks. These projects are primarily to implement theory over the Bachelor's time and are based on reports of flight safety authorities. Among the relevant subjects are human factors, aircraft structure maintenance, piston engines and aviation law are among the subjects we use in conducting this project. Collecting reports from flight authorities and data from aviation industry workers will be implemented in this project. The end result is to find ways to effectively prevent and reduce the number of bird attacks.*

KeyWords: *bird attack, International Civil Aviation Organization, aircraft structure maintenance, piston engine.s*

I. BACKGROUND

Nowadays the threat to aircraft safety from aircraft collisions with wildlife especially birds has increased. Globally, bird strikes have resulted in loss of human life and cost airline industry. Modern commercial aircraft such as Boeing and Airbus have quieter engines than older aircraft which make birds difficult to detect and prevent bird strike. The aim of this research is to produce a complete research about the trends of bird that caused bird strikes during aircraft flight, landing and take-off. In order to achieve the aim of this research, there are several objectives were set as guidance. The objectives of this research are:

- i) To determine the parts of aircraft that is most often hit by birds
- ii) To identify the current prevention methods used at Malaysian airport
- iii) To recommend the most effective way to prevent bird strikes happen during flight, take-off and landing.

II. METHODS

This research unitized quantitative research methodology, the instruments used to collect the data were questionnaire and google form.

Revised Manuscript Received on March 08, 2019.

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A set of questionnaires containing 11 questions divided into 4 sections was self-developed based on previous literature. Different question-types, such as yes-no, listing, category and open-ended questions were used in the questionnaire. The different sections of the questionnaire were:

- i) demographic information
- ii) aircraft parts that are often hit by birds
- iii) the best method to prevent bird strike on airplane
- iv) preventive methods used at Malaysia airports.

The questionnaire was piloted to a group of 5 aviation senior lecturer that have qualification and certificate in aviation to assess its validity before it was distributed. The survey questionnaire is distributing to the selected respondent via online and offline form.

Before the actual data collection period, a pilot study was conducted to assess the validity of research instrument. A total 3 senior lecturer and technicians of UniKL MIAT were involved in create the survey questionnaire based on the three main research objectives.

During the actual study, the questionnaires were distributed at various location and place, such as Sultan Abdul Aziz Shah Airport, Kuala Lumpur International Airport and UniKL MIAT. Respondents were approached with an initial question of bird strikes accident information, before the questionnaire was given to them.

To analyse the data, a total of 5 variables were taken into consideration namely the causes of the bird strike, the effect of bird strike and the methods to prevent the bird strike. Data were collected by google form and entered into computer using Microsoft Excel software. Results were presented through frequency counts and other descriptive statistics. The data were transcribed. The analysis of data went through coding technique using identification of categories of patterns and themes that emerged from the analysis.

III. RESULTS

Aircraft parts that are often hit by birds

Figure 1 below shows the results for the part of aircraft that mostly strike by bird. This part of aircraft is filling to determine the serious effect and the damage to the aircraft. The respondents have their own reasons for choosing an engine and a nose than other part of aircraft.

A part C which is engine part was highest chosen by the respondent because the engine part has widest area compare to other part of aircraft. There are 28 (41%) respondents are choosing the engine part as a most aircraft part that strike by bird. Next, the part B which is nose is the second highest part that chosen by 27 (40%) of respondent as the part that most



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strike by bird. The third highest part that most strike by bird is part A which is wing where six (9%) respondents voted for this part. The fourth part that most strike by bird, is part D which is fuselage with 3 (4%) respondents. The lowest part that bird strike happen is part E which is elevator and part F which is Stabilizer.

Only 2 (3%) respondents are choosing for both parts.

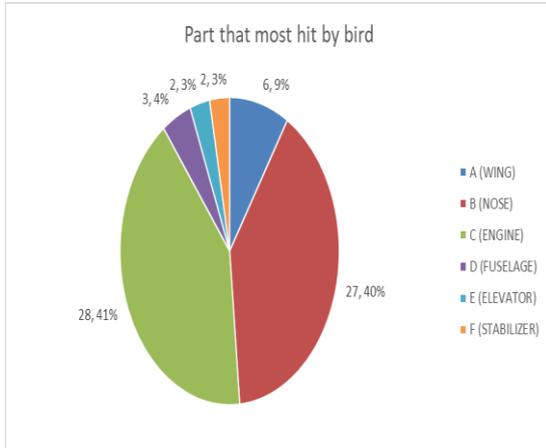


Fig.1 Aircraft parts that are most hit by birds

The reasons for aircraft engine that are mostly hit by birds

Based on figure 2 the engine part was highest chosen than other reason by 14 (35%) respondents because it has a widest area compare to other part of aircraft. Large and small bird that fly near the aircraft is easily to ingested into the engine due to the size of engine is bigger than other part. The second reason that eight (20%) respondents choose why engine is most hit by bird is because the engine suctions the bird. Generally, aircraft will fly with 350-500 knots per hours. The airflow near the aircraft is increase. When the bird that fly with low speed near the aircraft, the bird will suction directly into the engine. Regarding to the accident report, most bird strike and stuck into the engine because the speed of bird fly is very low compare to the speed of aircraft fly, and it give force to bird fly directly into the engine.

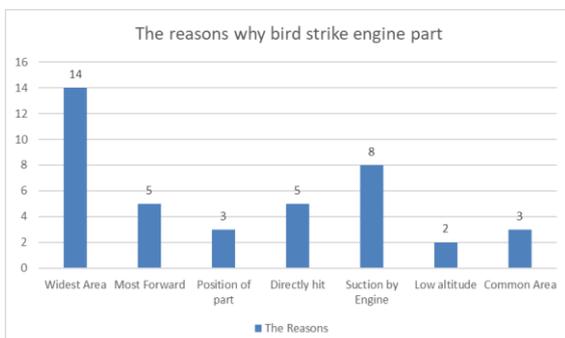


Fig. 2 Reasons why bird strike at engine part

The best way to prevent bird strike

Based on figure 3, the result show that the respondents choose to use sonic cannons or noise generator as the best method to prevent the bird strike at airport area. There are 28 (38%) respondents choose use sonic cannons or noise sound, 20 (27%) respondents choose

use avian radar system, 15 (20%) respondents choose modify bird habitat, five (6%) respondents turn on light of aircraft, four (5%) respondents choose bird repellent, two (3%) respondents choose adjust flight times and one (1%) respondents choose use dog repellent. No respondents choose to use chemical solution as the preventive of bird strike methods.

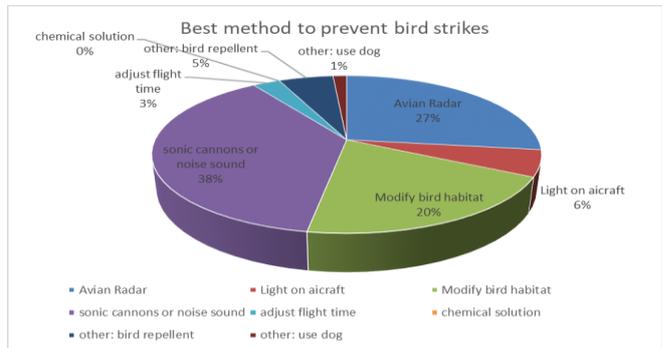


Fig. 3 Methods of preventive bird strike

The reasons why airport management should choose the preventive methods

Based on the figure 4, the result show that 15 (38%) respondents choose the method because it more economic and effectiveness, eight (20%) respondents choose the method because it can avoid bird strikes, seven (17%) respondents choose the method because it can control bird activities, six (15%) respondents choose the method because it friendly environment, three (6%) respondents choose the method because due to safety issues and two (4%) respondents choose the method because it prevents additional maintenance cost.

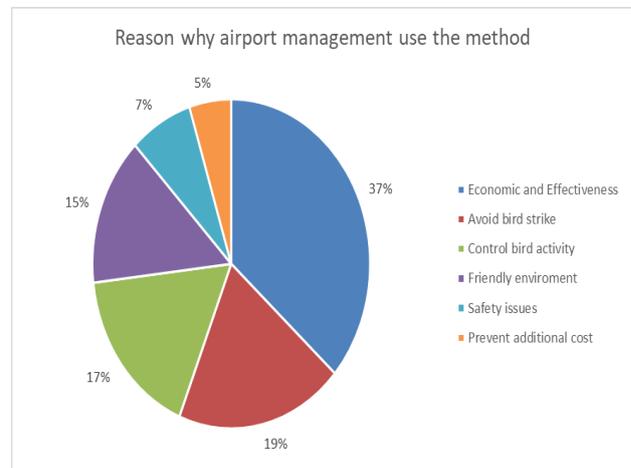


Fig. 4 The reasons why airport management should choose the preventive methods

The preventive of bird strike method that use at airport in Malaysia

The current preventive method that use in Malaysia based on Civil Aviation Authority Malaysia (CAAM) is modifying the bird or wildlife habitat near the airport. But this method are not effectiveness to airport that locate near coastal area compare to the airport that locate at city area.



Based on figure 4.5, there are 20 (50%) respondents vote to use sonic cannon or noise sound as suggestion to airport management in Malaysia as a bird strike prevention method. Meanwhile, 12 (30%) respondents vote to modifying bird habitat as a suggestion method, and 8 (20%) respondents vote to use avian radar system as suggestion bird strike preventive method use in Malaysia.

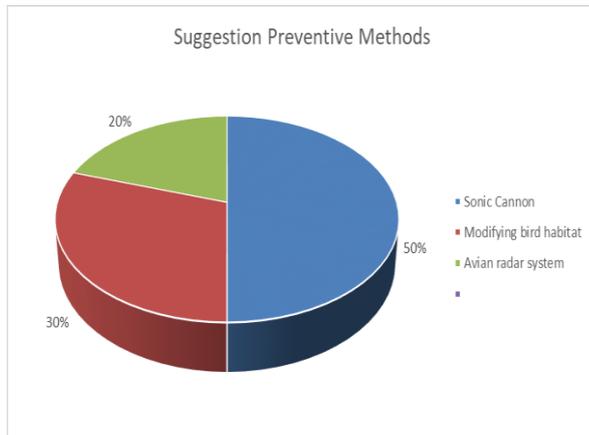


Fig. 5 Suggested preventive methods

Aircraft parts that are mostly hit by birds

Based on Figure 4.1, the result from the respondents, the engine with (41%) is the most hit by bird compare to other part like nose wheel (40%), wing (9%), fuselage (4%), elevator (3%) and stabilizer (3%). The reasons of why engine most hit by bird because engine part is the widest area (35%) compare to other part and it cause bird easily to get into the engine area. The other reason from the result is; the engine will ingest (20%) the bird that fly near the aircraft especially when bird cross in front of engine. Generally, engine blade will rotate with high full speed and this cause the bird easy to ingest into the engine. The speed of airflow also near the engine also causes bird easy to be ingested to engine. When the bird stuck in engine part, it will affect to the engine blade and engine performance. This finding is similar to the findings of FAA (2016) report that state from 16,636 bird strike report, 27% happen at engine. This finding also similar to Gebicki (2017), Dolbeer et al (1993) and Kmetz (2016).

Preventive methods

Based on Figure 4.3, the respondents more choose to use sonic cannons or noise sound (38%) as the best way to prevent the bird strike compare to avian radar (27%), light on aircraft (6%), modify bird habitat (20%), adjust flight time (3%), and bird repellent (5%). The reasons why (38%) respondent which is most choose sonic cannons or noise sound is this method is more economic and effective compare to other methods. This is because when the noise sound is use at area near airport, the numbers of bird that fly are lowest compare to other area. This is because when the noise sound is used, the bird cannot communicate directly to another bird because the noise sound interference the bird communication. So

normally, bird will find to another place that far from the airport that has noise sound. The cost for maintenance of the sound generator is low than use the avian radar system. Generally, airport management just need 2 -6 sound generator to cover all airport area. This finding is similar to the findings of Loughran (2016) that state the device can emit sound equivalent to bird. This finding also similar to the findings of Swaddle (2016).

Best preventive methods for Malaysian airports

Based on Figure 4.5, most of the respondent's opinion to choose sonic cannons and noise sound (50%) as the best preventive method to be use at Malaysian airport compare to modify bird habitat (30%) and use avian radar system (20%). This is because, the bird strike incident in Malaysia are different with other country. Mostly, the airport in Malaysia is locate at near the coastal area such as Kuala Lumpur International Airport (KLIA), Langkawi International Airport, Terengganu Airport and Kota Kinabalu International Airport (KKIA). Coastal area is the best place for bird to find their food source. By using sonic cannons or noise sound method, the airport management can handle with care and easily the bird activities near airport area. This method also needs low cost to maintenance but more effective compare to other methods. Due to the functional of sonic cannon or noise sound, the number of birds can be decrease time by time at airport area. This method also gets high vote from respondents because by using sonic cannons and noise sound can give advantages to airport management because it need a low cost of maintenance and more effectiveness to the bird activity.

IV. CONCLUSIONS

Based on the result above, in the conclusion, the engine of aircraft mostly hit by bird because the area of engine is widest and easier for bird to suction into the engine. The other part also hit by bird, but engine is the part most because the speed of airflow is high at engine area compare to other part. The several methods are used to prevent the bird strike and the sonic or noise sound is the best way of prevention compare to other because it more economic and effectiveness. This method also gives easier to airport management to handle and control the bird activities at airport area. Most of airport in Malaysia is located near the coastal or beach area. This area mostly a favourite area for bird and other wildlife due to food resources and it will affect the number of birds that fly or migrate to this area and need cross airport area. When the number of birds is increases, it gives high potential to bird strike happen at airport. It is recommended that further studies be carried out on the engineer and technicians from other airports¹⁻² and hangars³⁻¹⁷ in Malaysia to see whether there are any similarities and differences in the findings.

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