

# Automated Complex of Anti-Birds Airport Protection

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## Abstract

The article aims to determine the scientifically based methods and means within the scope of air transport ornithological protection.

The paper describes the automated complex of anti-birds airport protection. In order to increase the effectiveness of the birds scare cannon we developed a new type of automated complex as well as the birds scare cannon and a built-in system of video surveillance.

One presents the algorithm of bird detection and auto launch of the birds scare cannon.

**Keywords:** airport, birds, scaring, birds scare cannon, computer, surveillance system, equipment, block scheme, operation algorithm.

## 1.1 INTRODUCTION

There is the worldwide problem of ornithological aircraft safety.

Most recently, with a rapid increase in number and size of high-speed airplanes, the issue of birds collision became much more severe.

The birds pose a serious threat to flight operating safety.

Since the early days of aviation the birds collisions with aircraft often happened, sometimes there were fatal consequences. In addition, the behavior of bird species can influence the risks for aircraft. For example, the flight conditions may change due to such factors as flight altitude, the movement of birds flocks or certain models of birds migration [1-5].

In order to provide the ornithological airports safety of aircraft flights there are various methods of birds deterrents within the flight strip territory.

As you know, the operations to reduce the ornithological danger at the airport include visual observations, interview of employees, international experience analysis on the problem

and information from open sources, the professional training of specialists within the field under study, statistical data research in relation to birds collisions with the aircraft [6].

The paper [7] refers to visual bird-scare balloons with the image of predator's eyes as the birds deterrent. Such balloons have the effect of pupil mobility, which repel birds.

The airports widely use the ultrasonic devices, which are static sound-emitting bird deterrents [8-9].

There is a wide coverage of key birds deterrent approaches within the framework of ornithological flight safety [10].

The development of laser technology have made it possible to create an effective method of bird scaring on the basis of red (laser wavelength 650 nm) and green lasers (laser wavelength 532 nm) [11].

In accordance with the above-mentioned material, the study of anti-birds airport protection on the basis of the the survey output in respect to the airport and its surrounding area is currently relevant in order to maintain the flight safety.

## 1.1 The main part

Currently, in the Republic of Uzbekistan, the airports staff uses propane scare cannons in order to scare the birds, mostly by manual control. There is a special staff for this purpose, which always monitors and launches the birds scare system in case of necessity. It does not guarantee the safety of takeoffs and arrivals of aircraft from contact with the birds.

Nowadays, the computer automation systems are popular within various industries. They differ by reliability and ease of construction in order to solve various complex tasks [12-15].

In order to increase the effectiveness of the birds scare cannon, we developed a new type of automated complex, which includes not only a birds scare cannon, but also a built-in system of video surveillance.

Our system provides three launch options of the system (Fig. 1):

- automatic start of the system on the basis of pre-loaded schedule time set (in accordance with the take-off-arrival schedule of aircraft);
- automatic launch on the basis of bird detection by a special surveillance camera of the surveillance system;
- centralized manual launch in case of necessity.

This system applies to the modern programmable logic controller PLC110 [M02] of the Russian company «OBEH». In it, one developed the program on the basis of the programming language "CodeSYS".

The automatic process control system "Grom" has automatic

and manual control. The manual control has two modes. In the first manual control mode (start/stop), one can launch the scaring system by the corresponding button in the main panel of the system. In the second mode, one can use the manual launch by the buttons displayed in the operator touchpanel "СП310-Б" (products of the company "OBEH"). There is separate launch for each loud volume.

The system automatically produces launches of "Grom" on the basis of the above-mentioned algorithm. The control system operator can change the take-off and arrival schedules of aircraft by the operator touchpanel.

The system operation algorithm has the following form (Fig. 2:

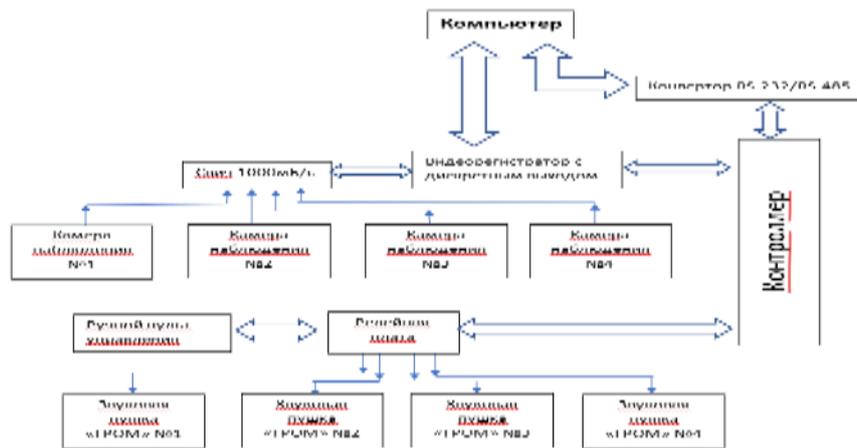


Fig. 1. The block scheme for the automated complex of anti-birds airport protection

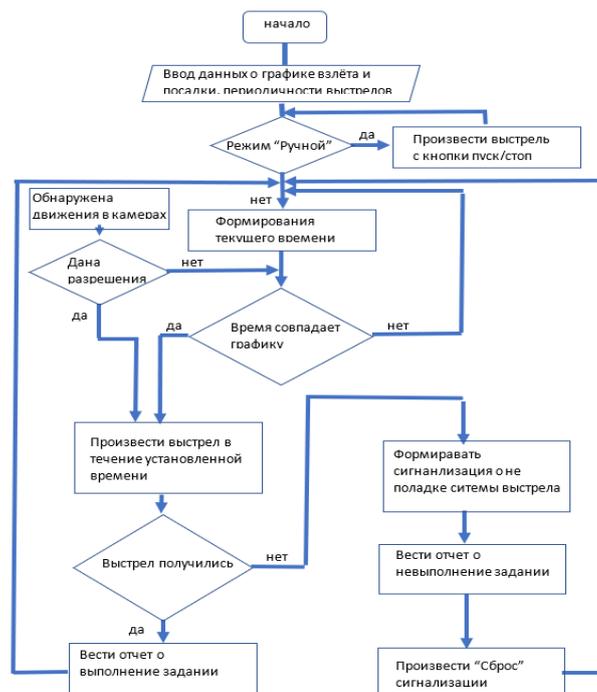


Fig. 2. Scheme of the program's operation algorithm

The operation program provides bird detection and automatic launch of the birds scare cannon.

The screen operator touchpanel displays the system menu.

The menu provides the following functions:

- Current time set;
- Flight schedule set;
- Response time set;
- Malfunctional response data reset;
- Display of process mnemonic scheme;
- The message about motion detection by surveillance cameras.

The system design includes the auto launch trigger, which works when the video surveillance cameras detect birds in the sky. There were system launches in cases of false objects detection within the system tests. One solved the problem of noises by software package of video recorder. One can adjust the sensitivity and desired surveillance settings by the video recorder. If necessary, one can use a specially installed toggle actuator in order to limit the auto launch trigger from video cameras.

The automatic process control system "Grom" has developed a system for the process data archivation. One can organize the archivation by the "Trace Mode" software package. One can transmit the information from the main controller by the RS-485 interface via the Modbus RTU Protocol.

The computer screen displays the trends of the process maintenance in real time.

## CONCLUSION

In order to provide the ornithological airports safety of aircraft flights there are various methods of birds deterrents within the flight strip territory.

As you know, the operations to reduce the ornithological danger at the airport include visual observations, interview of employees, international experience analysis on the problem and information from open sources, the professional training of specialists within the field under study, statistical data research in relation to birds collisions with the aircraft.

In order to increase the effectiveness of the birds scare cannon, we developed a new type of automated complex, which includes not only a birds scare cannon, but also a built-in system of video surveillance.

The paper offers the automatic detection of birds in the sky by the surveillance camera and automatic launch of the birds scare cannon.

## GRATITUDES

The study aimed to solve the problem of the birds collisions with aircraft in order to reduce the ornithological danger of air transport.

The work corresponds to the requirements of the scientific research institute 419 "U" of the international airport "Ferghana" of the Republic of Uzbekistan.

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