Means and methods of bird number reduction within the airport area

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MEANS AND METHODS OF BIRD NUMBER REDUCTION WITHIN THE AIRPORT AREA

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The airport of Tallin serves as an illustration of some bird hazard specifical features in airports. The methods of the hazard investigation are described. The efficiency of different measures is analysed directed at elimination of the causes of bird concentrations as well as at their timely detection and scaring. Major characteristics of various acoustic systems designed for the last three years are considered.

The problem of bird strike prevention remains urgent for the USSR civil aviation. In 1987 393 strikes were registered which caused significant material damage and in some cases created a real hazard for aircraft operation.

Incidents connected with birds take place in some 100 airports of the USSR. However, often they are registered in 10 to 15 airports only, mainly in the vicinity of the Black Sea and the Baltic Sea shores. The authorities of the airports mentioned carry out intensive work directed at reduction of bird strike hazard and based on acologically "soft" methods excluding killing of birds.

The contents and efficiency of the work may be illustrated by Tallin airport where it is particularly active.

The airport is situated at the Baltic Sea shore, in the region of complex ornithological conditions. The probability of bird strikes here is 10 times greater than the average around the country.

The paths of mass bird migrations pass over the aerodrome itself as well as over the Gulf of Finland lying 2-3 km from it. The aerodrome is surrounded by the objects attracting large numbers of birds: a lake, a canal, ponds, quarries, a meat products factory, a poultry plant, a fur farm, a granary and cultivated fields. Thousands of birds fly over them daily. For a long time the most numerous among them were lake-gulls. Some years ago hundreds of them rested on the airfield in bad weather or after feeding at a dump 1.5 km from the aerodrome. In 1976 the dump was moved 14 km away on the request of the airport authorities. However, since then the number of gulls on the lake 250 m away from the runwat began to increase. In five years their number increased six times and they started flocking at the aerodrome again.

Consequently, in 1980 the airport personnel began to collect eggs at bird settlements on the recommendation of scientists and with the permission of the State Animal Protection Society. By 1986 it resulted in four times reduction of young gulls population. Part of the colony moved to another site, more distant from the airport.

Besides that, the construction of a dike began in the vicinity of the bird colony on the lake. The dike at once became the main site of their rest and overnight stops instead of the runway where they had gathered earlier. Some part of the birds began to gather at night at an asphalt-paved site for special purpose vehicles. From May to July up to 3000 gulls stayed there overnight attracted by the absence of people, a high fence and lighting. It is worth noting that several couples of gulls started nesting there yearly on the vehicles unused.

In 1986, after the dike on the lake had been constructed, all the gulls moved to the lake's part distant from the aerodrome. However, by this time the number of other birds within the airport area had increased greatly, particularly of crows, pigeons and ducks, which led to intensification of measures directed at making the aerodrome territory less attractive for birds. The

measures included shrubbery cutting out, boggy strewing, water reservoirs drainage, stretching of ropes with red flags over fire ponds, mowing down the grass up to 10-15 cm height, etc. Gas acoustic guns, plastic balloons with stereo images of an eye of a bird of prey and mirror balls were installed at the sites of probable bird gathering. The measures listed permitted to preclude continuous presence of birds at the aerodrome. If the birds gathered there for a short period of time they were scared by flare pistols, guns and a stationary bio-acoustic system, the only one in the country. Great importance was attached to observations of bird movements hazardous for aircraft. To this end in 1980-1987 about 3000 gulls nesting on the lake were ringed. Consequently more than 70 of them were registered at wintering sites of various countries of Western Europe. In 1986 several dozens of lake-gulls were caught and painted. Observations revealed that lake-gulls flied for feeding as far as 25 km.

Since 1980 observations of bird migrations have been carried out with the aid of airport surveillance radars. In case of bird detection the information was quickly transmitted to the crews of the aircraft within the airport area. According to the recommendations of the 16th and the 17th BSCE Meetings, from 16 to 31 May, 1986-1987, Helsinki-Vantaa airport was informed on mass waterfowl migrations by the radio. Concurrently with the observations mentioned statistics on near-collisions of birds with aircraft was collected, particularly for heights of more than 1000 m.

Since 1986 short-term forecasts of bird migrations have been produced based on their dependency on 20 different meteorological factors. The dependency resulted from long studies.

Special attention has recently been payed to testing of new bio-acoustic systems for scaring birds in different situations. In 1983 one of such systems named "Bars" with power supply from a vehicle battery was developed and tested. Its effective range was more than 500 m. Technical and operational performances of the system were presented in a Soviet delegation report at the 18th Meeting in copenhagen. High electroacoustic characteristics of "Bars" resulted from manual adjustment of several assemblies which made it inacceptable for industrial production. To optimize the requirements to production samples "Bars" was tested together with a special signal processing block limiting the frequency range at the level of 3 dB with the slope of 12 dB/oct at minimum steps of 0.2, 0.4, 0.6 and 1.0 KHz and maximum steps of 10, 8, 6 and 4 KHz.

The processing block permits to introduce frequency pre-distortions, higher than 1 Khz with positive amplitude-frequency slope of 1.5, 3.5, 5.0 and 7.0 dB/oct, to descretely compress the dynamic range with the aid of inertial and non-inertial compressors and a limiter at the level of 3, 6, 9 and 12 dB. It should be noted that the block characteristics were determined by way of spectral analysis of the signals of birds hazardous for aircraft, first of all gulls and crows.

Introduction of frequency pre-distortions with the positive slope permitted to compensate significant attenuation of high-frequency components resulting from the medium viscosity,

molecular absorption ans the atmosphere turbulence. Grequency pre-distortion values were selected on the basis of the bird signal energetic spectrum pattern and the distance.

To increase the system range in conditions of the airport high noise background without nominal output power augmentation it appeared reasonable to compress the signal transmitted and in some cases to clip it. The results of the tests showed that the frequency range limitation of 0.6-0.8 KHz did not influence bird scaring efficiency. Moreover, introduction of non-inertial compression at the level of up to 9 dB and frequency pre-distortions with the positive amplitude-frequency slope of 3.5 dB/oct when broadcasting at a distance of 2000 m increased the scaring efficiency due to signal/noise ratio augmentation and the signal being natural at the point of its reception. The above mentioned was taken into account when developing a production prototype "Berkut" produced since I988.

To scare birds in vast areas another version of the mobile bio-acoustic installation was developed with total output power of I.2 kW. The installation comprises two acoustic systems consisting of I2 horns 50 W each. The acoustic systems are fixed on both sides of a vehicle perpendicular to its movement direction. This permits to cover a vast territory, to avoid air sucking into the horns, and the Doppler effect arises as well. To support the acoustic signals the vehicle flash lamps are used operating in random mode or timed with acoustic signals.

To scare birds in inaccessible parts of the airport a portable bio-acoustic system was developed, its weight being I8 kg. It consists of a tape-recorder, an amplifier with maximum output power of 75 W, a battery of I2 V and a horn. The electroacoustic bandwidth is 0.5-7.0 KHz, maximum sound pressure at a distance of I m on the acoustic antenna axis - I30 dB. The system can be powered by the vehicle battery with simultaneous recharge.

A compact portable bio-acoustic system has been developed and is tested now, its weight being about 6 kg. Instead of a tape-recorder a repellent signal synthesizer is used permitting to imitate species characteristics of the bird repellent signals and to transmit "discomfort" sounds.

Intensive and regular complex measures for bird hazard reduction in Tallin airport permitted to decrease the number of bird strikes with aircraft almost two times.