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WAYS OF DECREASING OF AIRCRAFT NOISE IN CITIES ON THE EXAMPLE OF AIRPORT “KYIV” (ZHULYANY)

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Abstract. This article deals with the problems of aircraft noise, its impact on the people living near the airport. The recommendations to reduce aircraft noise on the locality are described. Adverse acoustic conditions for airports located within the city limits on the example of airport “Kyiv” (Zhulyany) are abstracted. The problems of building of new dwelling areas on the near aerodrome territory are considered. Development prospects of the airport “Kyiv” are determined.

Keywords: airport “Kyiv” (Zhulyany), aircraft noise, ICAO, aerodrome site, medium-range aircraft, charter flights.

Introduction

One of the leaders in technological progress is aviation. Unfortunately it is still a source of the most intense noise. If speed qualities of aviation remained on aircraft as at the beginning of the XX century, the problems of aircraft noise would not exist. But people are increasingly accelerating pace of life, forcing vehicles to move faster. This leads to the deterioration of the ecological environment of man, in which noise plays an important role.

Work on the new plane is a complex problem associated with the adoption of many compromises.

Acoustic performance in this case is very important. Of the four most important aspects of society only the culture and spiritual life are not directly related to this factor.

The rest – the economics, politics and technical progress – by their various segments (Fig. 1) are closely linked to the problem of aircraft noise, forming a system where everything is intertwined. The noise that accompanies the operation of aircraft is a source of discomfort to passengers, crew and people living in the vicinity of airports.

High levels of aircraft noise are one of the causes of fatigue damage of structural elements and the failure of the equipment.

The main reason that the problem of noise has such important significance in modern life (not only in aviation), is the physiological effects of noise. You cannot hide from it, the human ear has no natural defense mechanism. Today, noise, or rather its absence, has be-

come an universal indicator of the degree of perfection of technical products. As deeper technical systems will enter into the lives of people, as more important consideration will be given to mankind on the ecological state of the environment in which the noise factor will remain on the first.

Analysis of problem

The problem of aircraft noise is a major problem that is regarded by the International Civil Aviation Organization (ICAO).

ICAO is a specialized UN agency that sets international standards of civil aviation and coordinates its development in order to improve safety and efficiency, provides the organization and coordination of international cooperation in all questions of civil aviation.

Decisions of ICAO are not obligatory for the countries that are part of its membership rights, as they are advisory nature. But credibility of ICAO is so great that any buyer of civilian aircraft necessarily require a certificate of aircraft for compliance with ICAO. Initially, these requirements pertained only to safety of flights. Subsequently, these guidelines were complemented by other regulations. Specifically, Annex 16 to the main document ICAO – Chicago Convention on Civil Aviation includes requirements to the noise from the aircraft on the ground, and to emissions of engines.

This part includes both regulatory requirements and standardized methods of measuring and describing the parameters of noise.

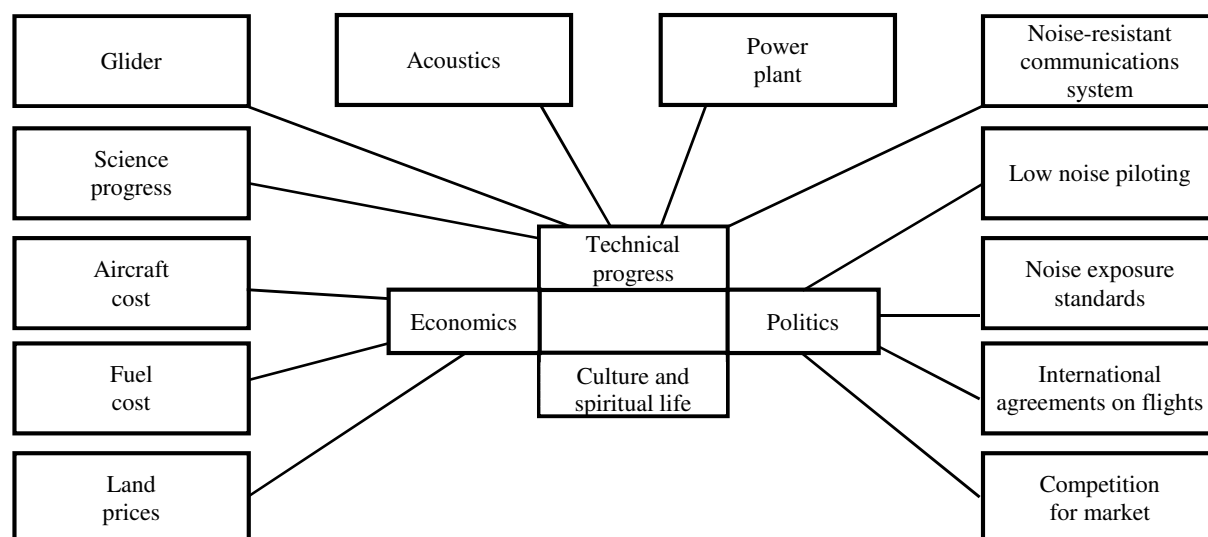


Fig. 1. Aviation noise problem

ICAO standards on noise are the compromise between the technical capabilities of industry and economic feasibility, on the one hand, and the reaction of society on the other. They are constantly changing, adjusted in accordance with the new noise reduction technology.

Decreasing of aircraft noise in cities has following points:

- Legal – developing of legislation to limit noise;
- Technical – reducing noise at a source of formation;
- Architectural planning – reducing noise on the way of its spreading.

The most effective noise reduction is at the source of its formation.

Over the years, the role of environmental factors on the scale of priorities in civil aviation continuously increases. Safety, as it should be, continues to be top priority and the other factors that are taken into account in the design of new passenger planes are noise and engine emissions.

However, it was not always. At first, for aircraft designers it was unusual that the parameters of the plane and the engine should be selected taking into account of acoustic characteristics. One famous aircraft designer Ilyushin said: “First, I would build the plane, and then will take care about its acoustic characteristics”.

In the aviation industry appeared its own experts in the field of acoustics aircraft.

In 1966 the First International conference devoted to Aviation Noise was held in London. The delegates of that conference were common aviation engineers and none of them had any idea that the problem of aircraft noise will shape their future.

In the nearest future Higher Attestation Commission will put this profession in its registry and will approve the dissertation on the subject, that the solution of this problem will require more knowledge of economics, politics, physiology, medicine, psychology, personality, society, etc.

However, the growths of world volume of transport lead to the fact that the airport become the sources of

noise in the cities, but not only certain types of aircraft. Unfavorable acoustic conditions for the population appear if the airport is situated too close to the city (including airport “Zhuliany” in Kyiv). During round-the-clock working of airport, equivalent sound levels at residential area reach 80 dB during the day and 78 dB – at night. The maximum levels are ranging from 92 to 108 dB.

Statistics revealed that the residents of nearby major airports consume drugs 2–3 times greater than in other areas. And although, as in any medical-sociological survey age, social and professional composition of the respondents, the saturation of the area by medical and sports facilities, water quality and affect the result, the important role of aviation noise in obtaining that result cannot be excluded. There is another reason for such public attention to the noise. The thing is that most often politicians, businessmen, sportsmen, artists use high-speed long-haul aircraft, and is experienced the effects of aircraft noise by other people. These people have purchased land for a cheaper cost on the outskirts of the city or get uncomfortable housing in the vicinity to the airports. Thus, in this situation, there may be a lot of protests, and the problem of noise will be the catalyst of social conflicts.

There are recommendations for reducing the aircraft noise: rational usage of airport and airspace around it (restrict ground tests of engines, prohibit usage of most noisy aircrafts), application of optimal modes of usage of aircrafts, development of noise reduction programs, based on the study of population complaints to noise). Program based on implement pay system for landing in view of noise monitoring aircraft noise.

There are some urban solutions that help to reduce noise:

- Increasing the distance between the source and the protected object;
- The usage of acoustic screens, slopes, walls and building screens;
- Usage of special noise protection vegetation strips, various techniques of planning and rational distribution of objects to be protected;

- Usage of terrain.

Maximum efficiency of screens for urban conditions is 10–14 dB.

To reduce the noise level by 15–18 dB is recommended to combine two – and three-row strip of green screening barriers.

Reduction of aircraft noise is achieved through efficient planning and zoning of airports and their surroundings. Protective zone should be allocated between the housing areas and limits of the airport, the size of which depends on the allowable levels of aircraft noise and on the class of the airport traffic and aircraft types.

During the developing of architectural and planning measures for reducing the noise in urban development, it is necessary to include in planning projects, construction, landscaping and beautification at all stages of development of the master plan for the city. During the district planning it is necessary to decide questions about the deployment of airports under development master plan for the city – form its plan structure that will reduce the number of noise sources.

At the design stage of residential areas and neighborhoods – effective usage of noise control characteristics of the urban environment should have placed.

Airport “Kyiv” named after Igor Sikorsky (Zhuliany) took the first passenger flight in 1924. Since the 70s of the last century the airport “Kyiv” (Zhuliany) has become one of the five busiest airports in the world located right in the city (located in the business center of the capital, 7 km from the city center)

Included in the three best airports in the world the category “International airport for small and medium-haul aircraft, up to 4 million passengers” according to The World Routes Awards 2013.

Landing strip is letting to receive aircrafts of type B-737, A-320.

In it’s category, “Zhuliany” can never make a serious competition to “Boryspol”. For this, airport has not enough territory: only 265 hectares (at the “Boryspil” –

about 4 hectares) – even some alarm landing lights in the “Zhuliany” has to be placed outside the perimeter fence. The airport is actually located in the city centre (Fig. 2). Systematic mass reception of passenger aircrafts will be a problem for the surrounding areas. In aviation circles there is no unambiguous assessment of the perspectives for the development of “Zhuliany” because of the location of the airport, not only in urban areas but also in the surrounding residential areas.

The field at the aerodrome site has not been touched by company developers in 60th and 90th, as a few kilometers near the airport had a strategic importance – it was set aside for an emergency landing. Currently, there is an active construction in the villages Zhuliany, Sophiivska Borshchagivka located almost adjacent to the airport. Nowadays here appeared whole housing estates. Housing prices here are lower than in Kyiv, that attracts potential investors to buy apartments, and developers – to build houses closer and closer to the airport “Kiev”. However, high-rise building on the aerodrome site may interfere the landing of airplanes and even lead to people deaths, so “State Aviation Service” has been fighting against the building near the airport for several years.

In accordance to the current “Order agreement location and height of the objects on the aerodrome area and objects activities of which may affect the safety and operation of civil aviation radio devices”. Construction on the aerodrome site is limited, and the height of the object is controlled on base off the maneuvering conditions of security, take-off and approach of landing aircraft.

At the aerodrome area specific requirements are set for the location of objects: for airfield classes A, B, C, D, aerodrome site is determined by a circle with a radius of 50 km from the aerodrome reference point; Class D, E and unclassified – 25 km from the control point of aerodrome. According to paragraph 3, Art. 69 of the Air Code of Ukraine, the conditions of use, which may be constructed, coordinated with the aerodrome operator and the State Aviation Service.



Fig. 2. Airport “Kyiv” (Zhuliany)

Nevertheless, only two or three kilometers away from the “Kyiv” airport settle 11-storey buildings are settled and the construction of new ones is continued. To learn how to live on the aerodrome territory, many tenants will know after they settled – when in their buildings instead of the promised suburban comfort and convenience, they will find round the clock noise pollution. Today planes arrive and take off from the “Kyiv” every 15 minutes, and the inhabitants of Sophiivka and Zhuliany are in a zone of high noise pollution. Noise from Boeing, which takes place at an altitude of 200–300 meters just above the houses, is not jammed most modern double-glazed windows. However, complaints about the noise from the aircraft not a whim of inhabitants. Studies airports influences on human life, scientists began to carry around the world at the end of the last century, and came to the unequivocal conclusion – airfield noise adversely affects the health and lives of people.

So, the scientists of the Department of Public Health and Medicine, University of Sydney have shown a direct link between the level of aircraft noise and the number of admissions to psychiatric hospitals, as well as the number of cases of the use of psychotropic drugs.

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Scientists of the University of London's Queen Mary in London carried out the study results of permanent impact of aircraft noise on children around Heathrow airport, and have proven that long-term air-noise exposure leads to increased levels of anxiety and stress notable states, the deterioration of reading skills and concentration and hearing loss.

And US scientists study was conducted among the population living near the airport in Los Angeles, whereby established: mortality among residents aerodrome site 5% higher than that of the inhabitants of the quiet areas.

Today, many residents of new buildings in Sophiivska Borshchagivka deeply disappointed with their choice. However, developers are not afraid, and just 200 meters from the wings of landing Boings continue to grow entire residential areas.

Conclusions

According to experts, high-rise buildings on the site of “emergency field” may adversely affect the conditions of take-off and landing of aircraft. In addition, at residents of apartment buildings are at risk, because accidents happen at are often or approach to airports. In terms of aviation there are no particular problems.