

Ways of decreasing of aircraft noise in cities

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 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, in which noise plays an important role.

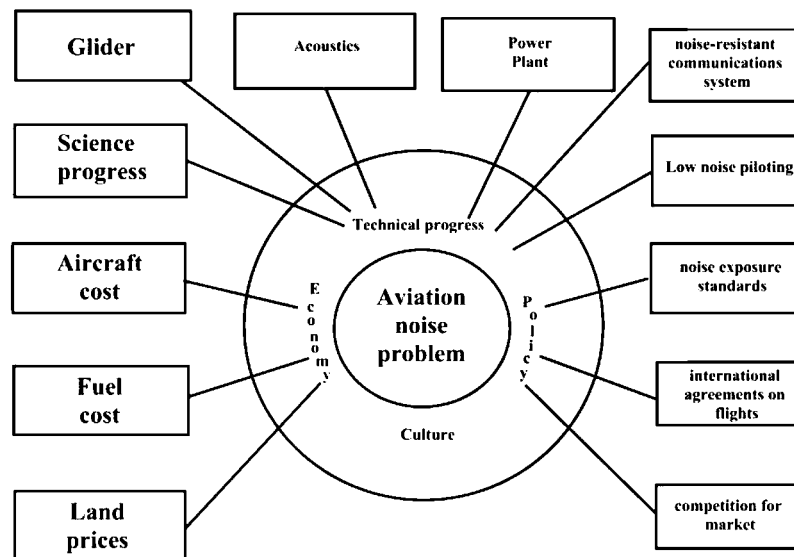


Fig.1

Work on the new plane is a complex problem associated with the adoption to 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 economy, politics and technological 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 noise problem is of such importance in modern life (not just in aviation), is the physiological effect of noise. You cannot hide from it, the human ear has no natural defense mechanism. Today, noise, or rather its absence, has become a universal indicator of the degree of perfection of technical products. The deeper technical systems will enter the lives of people, the more important consideration will be given to mankind on the ecological state of the environment in which the noise factor will be on the first place.

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 obliged for the countries that are ICAO members, as they have 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. 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 document includes both regulatory requirements and standardized methods of measuring and describing the parameters of noise.

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

Decreasing of aircraft noise in cities is provided in such directions:

- Legal – developing of legislation to limit noise;
- Technical - reducing noise at the source of formation;
- Architectural planning - reducing noise on the way of its spreading;
- Construction - Noise reduction at the facility of protection.

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 (Fig. 2) Only safety, as it should be, continues to place top priority and all the other factors that are taken into account in the design of new passenger planes have replaced noise and engine emissions.

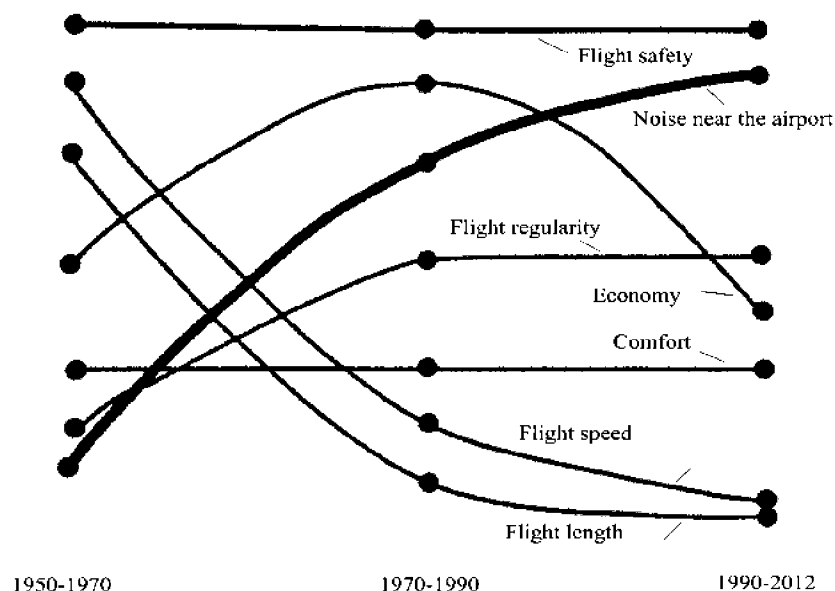


Fig. 2

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 the acoustic characteristics. One famous aircraft designer S.V.Ilyushin said to acousticians of Central

Aerohydraulic Institute: "First, I will build the plane, and then you, acoustics, will take care about its acoustic performance".

In the aviation industry its own experts appeared in the field of acoustics aircraft. One of the authors had the opportunity in 1966 to participate in the First International Meeting on Aircraft Noise, which was held in London. The delegation of the country had the usual aeronautical engineers, and none of them had any idea that the problem of aircraft noise will shape their future. Higher Attestation Commission will put this profession in its registry and will approve the dissertation on the subject, the solution of this problem will require more knowledge of economics, politics, physiology, medicine, psychology, personality, society, etc.

However, the growth of world volume of transport leads to the fact that the sources of noise in cities are also the airports, not only certain types of aircraft. Unfavorable acoustic conditions for the population appear if the airport is situated too close to the city borders (including airport "Zhuliany" in Kyiv). During round-the-clock work of airport, equivalent sound levels at residential area reach 80 dBA during the day and 78 dBA – at night. The maximum levels are ranging from 92 to 108 dBA.

Statistics revealed that the residents of nearby large airports consume medicine in 2-3 times more often than in other areas. And although, as in any medical-sociological survey the result is affected by age, social and professional structure of the respondents, the richness of the area in medical and sports facilities, water and purity, air and other indicators of compared regions, 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 high-speed long-haul aircraft are mostly used by politicians, businessmen, sportsmen, artists, but the effects of aircraft noise are experienced by other people, those who have purchased land for a cheaper cost on the outskirts of the city or get uncomfortable housing in the vicinity of airports. Thus, in this situation, there may be mass protests, and the problem of noise is the catalyst of that social conflict.

There are recommendations for reducing the aircraft noise: rational usage of airport and airspace around it (apply rational as to the noise runways and routes of flight, restrict ground tests of engines, prohibit the usage of the most noisy aircrafts), apply optimal noise modes of aircrafts, to develop noise reduction programs (based on the study of population complaints to noise, implement pay system for landing in view of noise, monitoring of 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 strips of landscaping;
- 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 dBA.

To reduce the noise level by 15-18 dB it is recommended to combine the 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 to reduce the noise in urban development, it is necessary to include them to planning projects, construction, landscaping and beautification at all stages of development of the general plan of the city. During the district planning it is necessary to decide questions about the location of airports under the development of general plan of the city – form its plan structure that will reduce the number of noise sources. At the stage of design of residential areas and neighborhoods – it's effective to use the noise control characteristics of the urban.