WAYS OF REDUCING NOISE AND NOISE PROTECTION

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Reducing noise at airports is currently paid increased attention. Generally, noise reduction can be achieved by reducing noise at source, contain noise or take measures to protect exposed persons. The most effective and most are caused directly by the noise source. Due to measurement noise levels are drawn airport noise studies. Based on measurements of noise levels as set out in the vicinity of aircraft noise protection zones. To reduce noise levels around airports passive measures (noise walls, ramparts and curtain), active measures and technical measures are used. Monitoring of compliance with noise limits makes it necessary to build a modern airport noise monitoring system.

K e y w o r d s: air transport, noise, vibration, noise studies, noise protection zones (Noise Contours), sound wall, soundproof walls, passive measures, active measures, technical measures.

1 INTRODUCTION

Limiting noise at airports and mitigating the effects of air traffic noise is currently paid increased attention. It has lead to the adoption of a package of measures to monitor the implementation of partially reducing the adverse effects of noise on the environment. The most serious problems in the protection against noise are close to major hub airports. Noise from the operation of aircraft technology is assessed using equivalent noise levels. In addition to these noise levels are prescribed and limited, and the maximum permissible sound levels of flight operations, respectively noise events. The territory near the airport, where we want to achieve acceptable noise load, maximum mean levels must meet the established standards and regulations. Otherwise, the use of technically available and effective noise control measures is to follow. In general, in an effort to reduce the noise level three solutions can be selected:

- limiting the generation of noise at source,
- preventing the spreading of noise from the source to the receiver,
- converting measures to protect the persons exposed.

Most preferred are in reducing the noise source as much as possible. After their implementation one can proceed to other measures. The result is one of the socially most preferred set of measures based on the priority of reducing and noise protection. Currently on the bases of high technical progress, it is possible with sufficient accuracy to measure noise levels around the airport and develop airport noise studies that capture the current state of aircraft noise on populations around airports. Comprehensive noise study evaluated the situation around the airport. They elaborated ICAO standards in prescribed manner of calculation and graphic representation and evaluation of air traffic noise. Calculation and graphical representation of the noise is used to build new airports and runways, the expansion of existing airports in the reconstruction of airports and identifying new routes to protect the population against excessive noise. Noise study based on the following documents:

- ordered trajectory for the movement of aircraft types,
- standard density of air traffic,
- noise of aircraft types,
- airport planimetry and altimetry.

Any noise study consists of texts and graphics. The text section contains information on the composition and density of air traffic, the maximum noise level of the aircraft types, the method of acquisition, the characteristics of the proposed buffer zones, the technical and organizational measures to reduce noise, etc. The graphics section contains noise map, showing the movement of aircraft and system noise contours (noise protection zone). Noise contours are processed for take-off, landing and aircraft movements on arrival and departure. This is based on directly measured values or values verified maximum or equivalent noise level and noise contours are calculated on the basis of mathematical and physical formulas valid for noise transmission. Noise Contours are in steps of 5 dB and Noise Contours at 100 dB lower than the maximum permissible noise level determined norm. Noise study is the basis for management to issue a binding opinion of the competent authority of the government.

2 NOISE MONITORING

In order to check compliance with the noise limits, noise tracks and penalize excess noise limits and cooperate effectively with the public, it is necessary to be built airport noise monitoring system. The system shall allow the set trajectory and assign each position of the aircraft measured noise level of the aircraft. It is possible the processing of signals from noise measures devices and output from the secondary radar. Computer processing of inputs is based on the noise data along the flight path of the aircraft. The output of such a monitoring device can be used to alert the pilot of the aircraft, which limits exceeded or a relevant material to solve the noise problem. Existing monitoring devices meet thanks to technological advances the strictest criteria. The monitoring system consists of stationary and mobile measuring stations, the operations centre and the software and hardware equipment for the transmission and processing of data. The system continuously monitors the sound level and the measured data are processed by adequate software for further use in the form of trajectory of flights that can be displayed in 2D and 3D.

3 NOISE REDUCTION AND NOISE PROTECTION NEAR THE AIRCRAFT

Assessment of the impact of aircraft noise in the vicinity of the ground staff, respectively introduction of known and demonstrable harm (for example e.g. auditory organs) into a causal connection with the individual noise load is far too imprecise. But the fact is, the noise near the aircraft reaches extremely high levels (up to 150 dB near the outlet nozzle) and has particularly affected aircraft technical service personnel, working in close proximity to the aircraft for operation of the power unit. Therefore, based on extensive measurement noise set out in the proximity of aircraft boundaries of noise bands 1 to 5 for each aircraft type. Noise buffer zones down to the free space around the aircraft in control operation powerplant in motor tests, pre-flight preparation and the like. Demarcation of the buffer zones shall be subject to necessary simplification. To avoid hearing damage, the determination of noise bands are considered the most adverse conditions - mode of the loudest engine, longer exposure time for each band etc.. So for example, when operating helicopters extends protection zone 2 and 3 to 25 m from the aircraft, buffer zone 4 within 50 m, buffer zone 5 within 50-100 m. Protection zone 1 does not provide.

Description of individual protection zones:

Zone 1: An area near the aircraft to which access is prohibited and the use of acoustic protection helmets. The risk of injury is also single exposure. The maximum noise level is more than 125 dB. Departments of technical personnel, located in this zone are classified as hazardous workplaces category D.

Zone 2: The area to which entry is prohibited to all persons without protective antinoise helmet. The maximum noise levels are in the range 115 to 125 dB. Such workplaces are classified as risk category D.

Zone 3: The area in which it is allowed a short stay attached to the helmet noise. The maximum noise levels are 110 to 115 dB. The workplace is characterized as risk category C.

Zone 4: The area in which it is allowed to stay with the protective helmet for 30 minutes. The maximum noise levels are in the range 100-110 dB. The workplace is classified as risk category B.

Zone 5: The area in which it is allowed a short stay without a helmet.

Aircraft noise protection zones are not required by the laws of the land use planning, but are important in relation to health personnel from the harmful effects of noise.

4 NOISE REDUCTION AND NOISE PROTECTION NEAR THE AIRCRAFT

Reducing noise around the airport can be achieved by the following measures:

1) Passive measures - are the use of protective barrier houses of projects, green areas, noise barriers, walls and ramparts.

Noise wall captures harmful substances reduces noise by 6 to 12 dB.

Noise barriers in situ or precast concrete, asbestos-cement, metal, ceramics and the like. Acoustic energy passing through the wall is less than absorbed. Reduction of the noise level the wall is 8-10 dB.

2) Active measures - in the design of operating areas at the airport with respect to noise in the projection and airports need to follow some restrictions:

- facilities for maintenance of aircraft, hangars surround the area in front of an appropriate space, spread dampen noise barriers used for habitat aircraft,
- residential buildings near the airport shoot so as not to increase noise by reflection,
- buildings construction with sealing windows and air conditioning.

The active measures to reduce noise levels and include operational procedures. The effectiveness of these procedures depends on factors which should be respected:

- primary must be maintained security design flight,
- converting processes must be safe for the pilot not require special skills or bother him,
- must be maintained safe aircraft height above terrain, obstacles.

The processing of these procedures is necessary to know:

- the distribution of the noise-sensitive,
- the noise characteristics of the aircraft or several aircraft types,
- the type of procedure that significantly reduces noise in the study area,
- limit the amount which can be used in practice.

Operational procedures to reduce noise during take-off, landing and approach may include:

- use the most favorable runway in terms of noise to dissipate and landing trajectory from noise-sensitive areas,
- use curves to dissipate aircraft from areas sensitive to noise,
- the use of noise most accessible and most convenient flight trajectory,
- use a larger pitch angle for take-off, of course, where technically possible,
- use reduced engine power over sensitive areas,
- change the angle downhill plane, of course, if technically possible,
- displacement threshold of the runway, but on condition that the remaining length must ensure the safety of air traffic.

Generally not use procedures and changes that would reduce noise at the expense of safety. Among active measures also include airport noise study.

3.) Technical measures - to reduce the noise of aircraft engines did not produce the expected results.

Combining air mixers, exhaust and sound absorbers or noise nozzles some aircraft engines reduced to one-third. Sucking air into the hot outlet gases to reduce their escape velocity and using absorbent system and aircraft noise about 15 dB. The simplest and cheapest solution is to build earth mounds of concrete or steel reflecting walls around the stands. Technically and financially demanding as shock absorbers, which are slipped on the outlet of the engine. High-frequency noise generated by the compressor is particularly effectively damped natural way - atmospherical absorption. If there is sufficient distance stands the test motor axis of housing, not struts to the engine needed.

As alternative measures against noise for technical staff to use personal protective equipment. They should provide greater noise reduction than the difference between the actual and the maximum permissible noise levels. As such, they are prescribed for workplaces where noise levels exceed 85 dB.

Another possibility to reduce the impact of high levels of noise on auditory organ is yawning tuition breaks at work. This will allow full recovery of hearing organ after exercise excessive noise. The number and length of breaks is determined by the noise. For extremely noisy work is the use of such breaks a necessary measure in protecting the health of personnel.

4.) Economic measures - depending on the amount of noise around airports forcing carriers to use the most modern and also the quietest aircraft. Amount of noise charge for a specific aircraft MTOW (dependence on a particular airport) is determined according to which aircraft noise category is included. According to international standards ICAO, Annex 16/I, known the five noise categories. Noise charge be included in the landing fee depending on how loud airplane produces (categorization of airports by ICAO), or may be introduced separately. Revenue from metal-noise charges are used to cover the costs of monitoring air traffic noise and noise control measures for financing.

5 OTHER SOLUTIONS TO REDUCE NOISE LEVELS IN THE VICINITY OF AIRCRAFT

Out of the said measures to reduce noise levels around airports, the use of protective equipment and noise compliance period of stay of noise protection zone is to reduce noise levels in the vicinity of aircraft and thus can reduce the risk of damage to the body and must implement additional measures:

- restrict the operation of power units to a minimum,
- trial operation, adjustment and other work requires a relatively long time running powerplant aircraft carry on dedicated stands,
- where possible, make arrangements so that the joint work was not running at the same time more noise sources,
- limit the time spent in the field of aircraft noise to minimum,
- consistently using acoustic protection equipment and other supplies,
- restrict the use of the full power drive unit for the shortest time possible,
- work on the aircraft at the time of operation, which does not require operation of the power unit, converted away from stands aircraft,
- near the aircraft only person as signed to this work may operate,
- comply with the noise protection zones,
- the use of measures for dampening exhaust and intake.

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