Development of Activities for Reduction of Noise Influence on the Work of Air Service Operators

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***Abstract* – Airport is an important link in the economic life of a country. However, it also is a great source of environmental pollution and enomous. Noise influences the inhabitants of territories around the airport, as well as the airport emloyees.**

The article examines the risks air service operators are subject to, the criteria of objective evaluation of such risks, establishing the noise levels leading to irreversible hearing damage and other professional diseases.

In connection with RIGA International Airport expansion and increase in the level of the flight intensity, it is especially topical to evaluate the influence of noise on the airport employees, in general, and on the air service operators, in particular, and to elaborate the activities for limiting such an influence.

***Keywords:* noise-level, evaluation of risks, the air service operators, activities for reduction of noise.**

I. Introduction

In the modern world passenger traffic and cargo transportation grow swiftly. This growth is ensured by the expansion and modernization of present airports and building new ones. These airports become the source of environment pollution, first of all, with noise.

The aims of the research are: define the criteria for objective evaluation of the risks air service operators are subject to, determine the levels of noise that lead to irreversible damage of hearing and other professional diseases.

Depending on the noise level and its characteristics, i.e., duration of effect, individual features of a person; noise may have different effects on a human health.

Thus, the noise produced by a person himself does not disturb him unlike the noise appearing around and causing irritation.

A sound within the range:

20-60 dB (A) is a daytime noise background;

60-80 dB (A) - causes overload of neural system;

80-110 dB (A) – physiological effect is noticed;

110 dB (A) –traumas of aural organs;

higher than 140 dB (A) – rupture of an ear-drum, deafness.

It is known that 90% of everyday noise level during production does not exceed 95 dB (A) and only 10% is higher than that.

Thus, significant part of emloyees is subject to noise influence and if noise level is reduced by at least 10 dB (A), it reduces the danger of negative noise influence on human health [1.2].

Our research has been conducted during the development period of the RIGA International Airport, when not only travellers' flow and flight intensity had increased sharply, but all the engineering structures had been changed.

In correspondence to the law „On Pollution" from 1st July, 2001 based on Council directions 2001.49.EEC „On evaluating noise environment and requirements to managing airports with flight intensity not more than 5,000 flights a year" from 25th June, 2001, it is necessary to perform noise mapping.

Drawing up noise maps gives specialists the possibility to:

- create a noise control system already at a design stage;
- design and install noise level control system at an aircraft;
- prepare qualified personnel, able to plan noise reduction activities and implement them.

The activities mentioned should include acoustic insulation technology for existing buildings as well as for buildings under construciton.

So, for example, in nearby dwelling houses, as well as at the working places, which are situated in discomfort area because of noise produced by airplanes, special building technologies – sound-proof windows, noiseless ventilation systems, etc. are required.

For performing the above mentioned and any other sound-proof activities it is necessary to define the actual noise level produced by an aircraft in the so-called „on-line" regime, as the rated data may differ from reality. This is why both methods - controlling „on-line" measurements applied for were used while drawing up the noise maps.

One more method of reducing the influence of noise on inhabitants and employees is elaborating a special manual, where flight paths of aircrafts are indicated. On the basis of noise level data maps and new manual of flight paths, angles of take-offs and landings, length of runways have been developed. These data allows controlling the compliance of airplane engines to the criteria accepted in the EU.

For qualitative application of the system offered, users should know the basics of acoustics well.

R&D Akustika Ltd. the accredited mobile laboratory, in 2004 has already analysed the issues of environmental pollution with noise and has provided answers to the following question: the distance from RIGA Airport, direction and degree of such pollution, what discomfort does it cause. Working places in ground areas and working rooms situated close to the epicentre of the source of noise have been investigated.

For the first time noise meters were installed together with weather-stations in 2007 during the reconstruction of RIGA

International Airport. It allows significantly reducing the cost of data transmission, processing and storage and, simultaneously, ensuring the automatic correction of noise level measurements,and in the changing weather condition. But what is the most important, it allows determining in due time whether the level of noise influence exceeds the permissible norms of noise level in decibels (by eight-hour working day).

On the basis of international experience it is offered to create a noise contour – effective and visual means of defining the noise influence risk for workers. It allows preparing for work in noise area, selecting individual protective means.

To create a contour, conversion of data – air pressure data, changes in sound effect – has been made. The data received from sound passing through filter A are taken for convertion. The sound is being cleared and perceived when repeated frequently.

Schematically conversion can be presented as a diagram:

LAS (t) dB(A)

where A - filtre

S - slow

F - fast

I - impulse

LAS(t)

Fig.1 Data convertation diagram

Characteristics of time factor:

where LA(t) – time factor filter

LAS(t) - slow time factor

LAF(t) - fast time factor

LI(t) – time factor impulse

LeqAS – average equivalent slow time factor

For international aircrafts the international LAS(t) - slow time factor - is accepted.

The measurements, performed with the filtre and without it, differ substantially. The task of the filtre is to identify high-frequency noises. Such filtres should also be in portable noise meters. Such meters are used by occupational safety specialists and inspectors of state health agencies. Otherwise measurements cannot be interpreted correctly.

The following values are important for an airport:

- maximal noise level - max level;
- noise duration – the time of noise lasting;
- power of noise;
- frequency of noise recurrence.

In practice international noise tables LEQS are used. The noise level in daytime, in the evening and at night is indicated there. All the noise levels are reflected in the maps. The items reflected in the maps are defined in different countries correspondingly to political and social peculiarities.

Noise contour of RIGA Airport (Fig.2) is created on the basis of measurements made in 2003, 2004 and 2007.

In take-off and landing places, in the zones where tractor drivers, bus drivers, special machinery drivers and loaders work, noise level exceeds 100 dB(A), but is not higher than critical value of 135 dB(A).

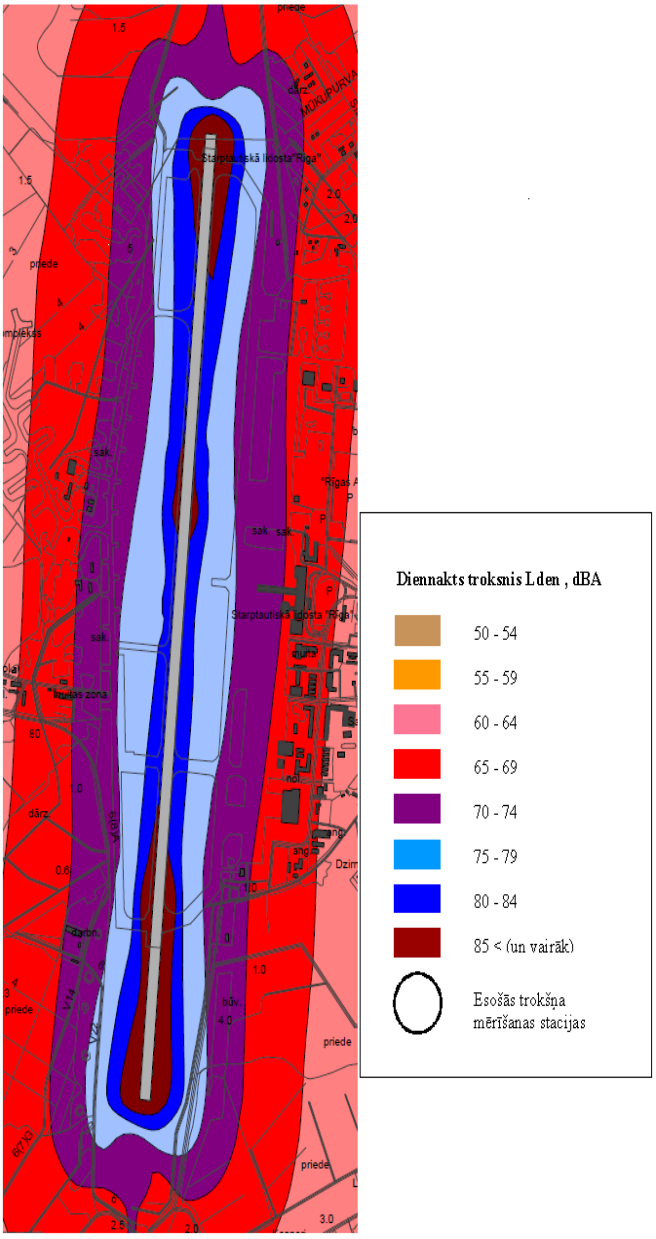

Fig.2. RIGA Airport noise contour

It can be well seen on the noise contour that working premises of air service operators, ensuring taking-off and landing of aircrafts, baggage loading and unloading, technical and sanitary services between flights, are close to the noise discomfort zone with a 70 dB (A) level.

Noise contour helped to elaborate and introduce the manual, in which take-off and landing paths of aircrafts are indicated, where the engine speeding-up and speed slowing-down noises are lowered to the maximum extent. In that way the problem of noise lowering is in technicians', instructors', pilots' and other aviation specialists' competence. Airport specialists are elaborating the so-called Fly Quiet Programme. Special hangars are built in the airport for checking engines between flights.

Measurements in noise contour allowed defining the groups of risk and they are:

- 20 technicians who take part in 10-minute engine starting up and are directly near an airplane and who talk on portable radio transmitter with the crew at the same time;
- 40 coordinators and air traffic control officers who are in charge of airplane being prepared for its departure as well as for its landing. They organize refueling, loading provisions for passengers, luggage loading and unloading, maintaining the correct aircraft centering.

This group of workers is connected with using mobile phones and portable radio transmitters by irregular and supernormal noise level (tables 1, 2).

TABLE 1

Nr.	Working places where workers are subject to noise influence	L_{Aeq}	General mistake	L_{Cpik}
		dB(A)	dB	dB(C)
1.	Bus driver, when in bus cab	73.0	2.7	116. 6
2.	Portable radio set working next to a worker	89.6	1.8	105.8
3.	K- escort an airplane to take-off	103.1	1,6	125.1
4.	Loaders in the airplane head	78.4	1.1	119.2
5.	Loaders in the luggage loading/ unloading part	75.2	1.2	94.0
6.	Loaders in the airplane tail	91.6	1.3	111.3
7.	Airplane tow car driver when putting it to take-off	81.7	3.0	118.1
8,	K-3 wait for an airplane at the aircraft stand	96.9	3.9	123.1
9.	Air traffic control officers at their room	52.3	3.0	77.3
10.	Airplane cleaners go up to an airplane and walk into it	80.0	3.0	104.3
11.	Airplane cleaners work in the salon	69.2	3.0	100.6
12.	Office of the head of a shift	41.3	3.9	78.2
13.	Airport background	67.2	3.0	88.9
14.	Background of the coordinators' room	58,4	3.0	89.6

TABLE 2

Nr. p.k.	Professions on the airport employees	$L_{ex,8\ st}$	General mistake	L_{Cpik}
		dB(A)	dB	dB(C)
1.	K-1 Supervisor	84.8	2.1	125. 1
2.	K-2 Coordinator	91,4	1,6	126,1
3.	Air traffic control officer	78 .9	1.8	105.8
4.	Loaders	83.3	1.5	119.3
5.	Airplane cleaners	72.7	3.0	104.0
6.	K-3 Technicians	88.7	3.6	123.1
7.	Bus driver	80.9	1.9	115.6
8.	Special transport driver	82.1	2.0	118.1

For these groups of workers special individual headphones were purchased. They work at different sound frequencies and have special marking.

Technical specifications of hearinh protection means were gathered and analyzed and optimum ones were offered for RIGA International Airport.

If workers are subject to especially high noise levels, it is offered to use noise dosage meters.

A worker has the microphone with built – in dosage metre, which fixes each noise influence, remembers noise level at the time of influence, calculates the levels and counts as dosage in per cents.

One should bear in mind that the workers of RIGA Airport, exposed to noise load, are highly qualified specialists with large working experience. They work in heightened noise zone characterized by the irregular noise load, therefore their organism get accustomed to such conditions and workers cannot evaluate the risk of noise influence on ear and organism as a whole correctly. Noise dosage metre should be used.

The rooms, where air traffic control officers and coordinators work, are decorated by sound absorbing materials (walls and ceiling as a decoration).

Air traffic control officers' work requires attention, quick decision making, and is characterized by high fatigability. This is why noise level should not exceed 55 dB (A). The analysis of noise measurements close to their office made it necessary to design and build protecting environment.

At an average, during one shift air traffic control services attend to 31 airplanes. In all measurement points the noise was not constant. It was of impulsive character outside as well as inside the room (tables 1, 2, 3). That is why noise absorbing wall should be set up (fig.2).

For calculating the noise level in premises the following formula was used:

$$L_{eq} = 10\lg\left(\frac{1}{n}\sum 10^{\frac{L_{eqi}}{10}}\right) dB;$$

where Leq – equivalent noise level dB;

Leqi – measured equivalent noise at i minute integration;

n – the number of measurements.

TABLE 3

Place of measurements	Time of noise integration (hh:mm)	Noise characteristics	L Aeg,151) [dBA]	L hour Day [dBA]	Notes
Point Nr.1 (according to the scheme)	0807 – 0822	Not constant	113.0±1.7	113.0±1.7	10 m to working airplane engine
Point Nr.2 (according to the scheme)	0833 – 0848	Not constant	103.0±1.7	100.0±1.7	5 m to administrative building wall. Source – airport noise
Points Nr.3;4 (according to the scheme)	0915 – 0930	Not constant	73.5 73.3	73.7±1.2	3 m from protective wall. Source – airport noise 4m away from protective wall.

After setting up walls the noise level can be reduced up to 34 dB(A).

Thus, creating noise contour, flight path manual; setting up the protective wall; performing noise monitoring and obligatory carrying noise dosage meters – those are only the initial stages required for creating noise protection management system. The whole range of organizational activities is needed.

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Valentīna Urbāne, Jānis Ieviņš, Vladimirs Jemeļjanovs, Jeļena Solujeva. Pasākumu izstrāde, lai samazinātu trokšņu ietekmi uz gaisa satiksmes darbiniekiem

Lidostām ir svarīga loma valstu ekonomiskajā dzīvē. Diemžēl tie ir arī liels trokšņa piesārņojuma avots apkārtējā vidē. Troksnis ietekmē gan lidostas apkārtnes iedzīvotājus, gan lidostas darbiniekus. Rakstā tiek aplūkoti riski, kuriem tiek pakļauti sauszemes gaisa transporta apkalpes darbinieki, kritēriji objektīvai šo risku novērtēšanai, kas radušies trokšņa ietekmē un var izraisīt neatgriezeniskus dzirdes bojājumus un arodslimības. Sakarā ar starptautiskās lidostas "Rīga" paplašināšanos un darbības intensitātes palielināšanos īpaši svarīgi ir izvērtēt trokšņa ietekmi uz lidostas darbiniekiem, un jo īpaši uz sauszemes pakalpojumu darbieniekiem, un izstrādāt pasākumus, lai samazinātu šo ietekmi. Mūsdienu pasaulē strauji aug kravu un pasažieru pārvādājumu skaits. Šis pieaugums galvenokārt ir balstīts uz jaunu lidostu celtniecību un esošo lidostu attīstību un modernizāciju. Lidostām kļūstot lielākām, tās veicina vides piesārņojumu, visbiežāk tas izpaužas, kā paaugstināts trokšņa līmenis.

Pētījumā izvirzītie mērķi bija: kritēriju izvēle objektīvai riska faktoru, kuriem pakļauti lidostas darbinieki, novērtēšanai un trokšņa līmeņa noteikšana, pie kura notiek neatgriezeniskas izmaiņas dzirdes orgānos un izraisa arodsaslimšanas.

Atkarībā no trokšņa līmeņa un tā raksturlielumiem, iedarbības ilguma un nodarbinātā individuālajām īpatnībām, troksnis var iedarboties dažādi.

Pētījums tika veikts laikā, kad Rīgas starptautiskajā lidostā palielinājās ceļotāju plūsmas un lidojumu skaits, kā rezultātātā mainījās lidostas struktūra.

Saskaņā ar likumu „Par piesārņojumu" no 2001. gada 1. jūlija, balstoties uz direktīvas 2001.49EEC, lidostām jānosaka trokšņa līmenis un jāveic tā iedarbības vizualizēšana.

Валентина Урбане, Янис Иевиньш, Владимир Емельянов, Елена Сулоева. Мероприятия по снижению шума в работе наземных служб аэропорта

Аэропорты являются важным звеном в экономической жизни страны. Но они же являются и большим источником загрязнения окружающей среды шумом. Шум оказывает воздействие как на жителей прилегающих к аэропорту территорий, так и на работников аэропорта. В статье рассмотрены риски, которым подвержены работники служб наземного обслуживания воздушного транспорта, критерии для объективной оценки данных рисков, установление уровней шума, ведущих к необратимому нарушению слуха и профессиональным заболеваниям. В связи с расширением международного аэропорта «Рига» и повышением интенсивности полётов особенно актуально оценить воздействие шума на работников аэропорта, а конкретно, на работников наземных служб и разработать мероприятия по ограничению данного воздействия.

В современном мире стремительно растут объем пассажирских и грузовых перевозок. Этот рост обеспечивается за счет расширения и модернизации Аэропортов и строительство новых. Аэропорты становится источником загрязнения окружающей среды, в первую очередь шумом.

Цели исследования: определение критериев для объективной оценки риска котораму подвергаются работники аэропортов, определение уровня шума, который приводит к необратимому повреждению слуха и профессиональным заболеваниям. В зависимости от уровня шума и его характеристики, продолжительность воздействия, индивидуальных особенностей человека, шум воздействует на здоровие по-разному.

Исследования провадились в период развития Рижского международного аэропорта, когда не только поток путешественников и интенсивность полётов резко возросли, но и менялась вся структура.

В связи с требованиями закона "О загрязнении" с 1 июля 2001 года на основании директивы Совета 2001.49.ЕЕС "Об оценке шумный среди и требований к управлению аэропортов с интенсивностью полетов не более 5000 рейсов в год" с 25 июня 2001 года необходимо проведение отображения воздействия шума.