

3.2 AVIATION INDUSTRY OF XXI CENTURY: DEVELOPMENT AND NECESSITY OR SERIOUS THREATS FOR NATURAL ECOSYSTEMS

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At this stage scientific and technological progress, which reaches unprecedented levels is characterized by the continuous creation of new and improved existing technologies and means of production. In turn the aviation industry is the realization of new achievements and achievements in the practical aspect of application. There are the developments of new equipment, both on-board and on-board; creation of powerful engines; updating fleet of aircraft, as well as designing new types. But along with such positive achievements at the first glance, aviation transport remains a large source of harmful factors for the environment, the first of which is usually in the vicinity of large cities, and the latter, in turn, within large cities. Therefore, the current situation leads to the necessary, development and implementation of a comprehensive environmental safety program in aviation transport.

Most recently, experts and specialists in the field of the aviation industry have concluded that the using of passenger flight services as well as freight aircraft services have been much more efficient from an economic point of view than the using of automobile transport. So, in general, a passenger jet needs 100 times more fuel for a flight than an automobile. But if you talk about fuel consumption for a trip to a particular distance, in this case, that the needs of the aircraft will be almost 2 times less than for the automobile transport.

Let's consider this situation on a concrete example. How will the amount of necessary fuel for the Boeing 747 passenger aircraft and the Honda Civic passenger car differ, in overcoming the distance from Chicago to London?

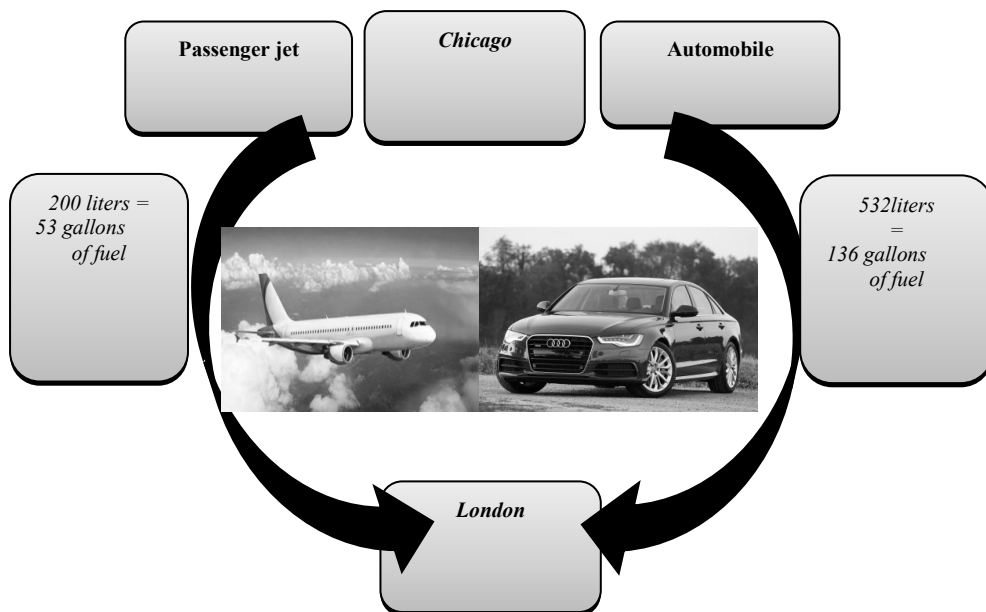


Fig. 1. Airplane and automobile movement relative to the same distance with different costs of high-quality fuel

During the movement of the passenger jet 4 liters (1 gallon) of jet fuel are being burnt, and as a result 11 kg of carbon dioxide emissions are got into the environment, taking into account that the number of passengers might reach 200 people. At the same time, 4 liters (or 1 gallon) of gasoline, during an automobile trip, produce almost 10 kg of carbon dioxide emissions, taking into account the transportation of 4–6 passengers. As you can see, the difference in emissions during combustion of one and the same amount of fuel is practically absent. But let's take into account that in one passenger jet has more passenger seats and makes flights at greater distances in a shorter time than a car. And that information means that our natural ecosystems get more emissions from the automobile transport functioning than as a result of the aviation transport work.

For today, the expert's observation proves once again that using of aviation industry is more efficient and more economical than an automobile industry. But at the same time production and using of both aircraft and automobile does not decrease, but increases with each passing day as a result of increase in consumer and industrial demand for modes of transport [1].

But is the situation with development and the benefits of the aviation industry so transparent as it seems? According to the article of the international magazine «The Guardian's», experts note that «... aviation travel might not be a major source of carbon emissions, but it has become one of the fastest growing causes of global warming for many years, taking into account the fact that the industry annually increases by 5 %». At the same time, in the most populous country in the world, which today becomes one of the richest, hundreds millions of Chinese citizens might become the largest number of passenger traffic soon. According to the experts' conclusion of The Boeing Company, China's flights will increase threefold by 2030.

Is the functioning of the aviation industry really such a serious imprint on the natural environment, including ecosystems and individual land territories? Of course, it is not news that frequent flights have caused serious damage to the environment, life and health of the population. But experts might not argue that the aircraft is more serious problem than the latter in the background of other modes of transport.

According to estimates of international experts and specialists, the aviation industry is produced 1.5–2 % of carbon dioxide (CO₂) emissions and other negative chemicals, hazardous compounds in the ratio to the 100 % world's emissions [3].

Official statistics from UK experts inform, that the aviation industry is responsible for releasing hazardous substances to the environment not only during passenger and freight transportation, but also during various airport maintenance activities.

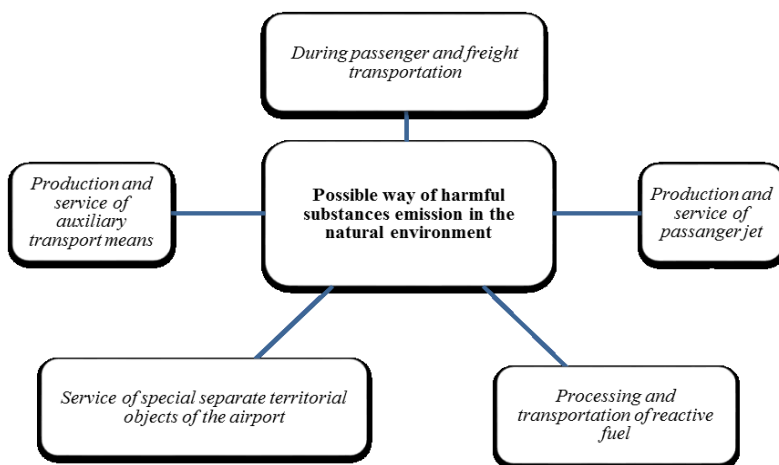


Fig. 2. Ways of harmful substances emission in the natural environments a result of aviation industry's work

According to Fig. 2, there are different ways of harmful substances emission into the environment as a result of the aviation industry functioning. It is the cause of ever greater and more acute problems in preserving the integrity of natural ecosystems and global thermal balance, as well as the conservation of land and the preservation of soil fertility. Scientists, specialists and world-class experts are constantly working on the creation of new technologies, modern equipment. For today a lot of that things, which have been designed to reduce the impact of flights on the environment, have already been explored, tested and implemented [5].

Compared to more environmentally sustainable automobiles, where the technology of electric motors is fully justified and feasible, while energy-saving resources are enormous, the potential for ecologically balanced and clean flights looks quite transparent and limited. Some future studies in terms of efficiency, economy and environmental friendliness of the engines will be available in the coming decades, and larger passenger jet with a correspondingly larger number of seats will reduce the amount of harmful substances to the environment per passenger. But such transformations will not be related to working with the transformational potential of an electric automobile. After all, the electric motors engines might not produce enough energy to allow the aircraft to climb from the ground into airspace, which is the main problem in that situation. At present, there are special types of biological fuels (which are based on aviation fuel jet) as an alternative to conventional gas.

Now it's an indisputable fact that an alternative fuel option is a technically robust solution that will not require changes to the aircraft or the delivery of other fuels. In November 2009, the Council of the International Civil Aviation Organization (ICAO) held the Conference on the Use of Alternative Fuels (CAAF) to demonstrate the most advanced production technologies. One of the main questions, which was considered in the conference, was the issue of sustainable development, economic realization of production and infrastructure. Member States representatives of the ICAO Council agreed to develop, deploy and use sustainable alternative fuels to reduce atmospheric emissions. The main purpose of the Conference was to facilitate, on a global basis, and to promote the harmonization of initiatives that would encourage and support the sustainable development of alternative fuels for aviation [4].

The well-known Japanese scientist Keichi Okay, in his work and research, is considering and proposing the use of potential hydrogen alternative aviation fuels, fundamental combustion and aerodrome system concepts.

Radical efforts are needed to introduce low-toxic fuels, in order to achieve a significant reduction in CO₂ emissions. Using of hydrogen as a promising alternative fuel is based on the assumption of rapid realization, and its undeniable compatibility with the normal life of society.

World research activities related to hydrogen and fuel elements of its implementation, undoubtedly related to the preservation of the integrity of land-resource potential in a separate territory.

The technology of fuel cells attracts attention in more electric planes (MEA). Kaichi Okey is considering the potential of sub-commercial production using hydrogen fuel for other modes of transport.

As aviation fuel, hydrogen clearly has strong and weak sides. The predicted configuration of hydrogen fuel allows future use of subsonic aircraft, which is invariably a compromise solution.

Richard Altman is a Director of Commercial Airlines in the USA, Nate Brown is an Alternate Fuel Manager at the FAA's Environment and Energy Office, USA, Christine S. Lewis is an Environmental Biologist from Volpe; Lourdes K. Maurice is a Chief Scientific and Technical Advisor for Environmental Safety at the Office of the Federal Aviation Administration of England, explore the potential requirements for use and scale of fuel availability level [5].

Although, in spite of everything, the use of alternative fuels is not perfect solution at 100 % according to experts conclusions. After all, the production of biological fuels, which requires a large

amount of organic materials, alcohol, wood, waste, might also cause environmentally unstable environment.

So, according to expert estimates at the world level, for the production of biological fuels will be needed almost 5 parts of all land plots on the Planet, which requires the cultivation of such special crops as flax, rape, corn and soybeans. But, this sphere of activity would have a fairly negative impact in order to ensure the work of all aviation industry. But again, we have two important question: will this situation be more serious for the problems of spatial planning and the development of world territories, or for the preservation of soil fertility and the protection of land from degradation processes?

Nevertheless, experts are inclined to believe that such a threat will be the same and serious for both parts of question. In this case, there is such a situation that one problem stems from another. These issues will be interconnected, and accordingly, the question of finding optimal, rational and effective decisions will be more serious.

The main important questions of land use development are solved by means of spatial planning prognostication and development processes. These processes are interconnected with main levers of economic growth, population life, protection and rational natural resources use.

The questions of spatial (territorial) development are the main tool in realization of state policy in the field of effective regulation of land relations for all economically developed countries. That process functions at the national (federal), regional and local levels. State authorities solve many important land use tasks, in particular questions of environmental protection and rational land use.

Of course, the agricultural land necessary for the production of biological fuels will increase significantly due to the need to provide this product for the world aviation industry. As a result, solving of one serious problem would cause of other equally important problems of world significance. After all, during this period of time, the actual number of the earth's population will increase, again the problems in territorially located public settlements will grow, and consumer needs will increase, including the basic nutritional needs for maintaining the vital activity of the population. But we know that only land resources and their unique qualities can provide a normal level of human activity.

Another problem that arises from the provision of aviation industry's needs in the biological fuels production is the problem of reducing the level of soil fertility and the undeniable degradation of quantitative and qualitative characteristics of land resources as a result of the cultivation of technical cultures, for preservation the of natural ecosystems integrity.

Specialists in the field of agricultural activity have been studying the issue of maintaining soil fertility, holding rainwater events, preserving, re-cultivating unproductive and degraded lands for many years. According to expert estimates in the sphere of spatial planning, as well as territorial development and improvement of land resources, almost 15 % of the world's land area are degraded due to the influence of anthropogenic load. Of course, this part includes agricultural land on which the cultivation of biotech crops was carried out. Well-known fact that corn, rape, soybeans require a large amount of nutrients for sufficient development, and as a result, a high level of crop. But without proper measures, in particular crop rotation every 2 years, the fertile soil layer decreases and deteriorates of its quality. Restoration of such exceptional properties naturally takes decades. Of course, the latest technology allows to increase the fertility and high yield and artificial, in the form of organic and inorganic fertilizers. But, all the quantitative and qualitative characteristics of land resources do not change at the better way.

If you look at the situation on the passenger side, then we can conclude that the number of aviation transportation should be reduced, without flights for short distances. But will a modern person refuse such services? And the most important question, whether will all spheres of production, politics and socio-economic spheres of influence be able to abandon air transport forever?

About flights for short distances. Leading EUROCONTROL experts, in the course of constant research and development, argue that short-range flights result in more fuel combustion and, as a result, increase the quantitative emission of hazardous chemical compounds.

Also, none of the activity above-mentioned spheres would be able to refuse of the aviation industry services without changes or losses. As for the political and economic activities of the international community, this is primarily the loss of a number of international transport connections, a decline in the level of socio-economic activity. Of course, the picture of the political system would also have a different look.

Considering of the other modes transport functioning, the railway transport using allows significantly reduce carbon emissions – perhaps five to ten times compared to air transport. Nevertheless, railway transportation is much longer than the aircraft transportation, which is a problem for the modern man. In general, in a certain number of countries, the train uses diesel fuel rather than an electric motor, which, accordingly, causes significant releases of harmful chemicals substances in the environment, and in this case it might be argued that railway transport is more environmentally sustainable than the aviation transport. After all, the outdated model of a diesel train, which is traveling on large distances, might cause the same amount of harmful combustion products as an aircraft. Although in this case the train would not have such a serious impact on the preservation of the thermal balance as a passenger jet. And the last, the ticket for railway transport services might be more expensive than the ticket for aviation transport services .

The influence of harmful substances, that are formed as a result of fuel combustion, on climate processes and their changes is unquestionably difficult, but at the moment, however, is not completely understood. Emissions of carbon dioxide (CO₂) emissions are quite widespread in this area, but flat-air engines also create many other emissions and new chemically-hazardous compounds. There are nitrogen oxide, water vapor and carbon black. These emissions create conditions for the emergence of new dangerous climatic effects that only increase the negative impact on the environment. That effects depend from flight heights in the upper troposphere and lower stratosphere.

Table 1

Type of harmful substance, which are generated as a result of the aircraft engines' work and the effects of their impact

№ in order	Type of harmful chemicals substances	The name of the climatic effect, as a consequence impact	Short characteristics
1	2	3	4
1.	Carbone dioxide	Greenhouse effect	<p>This substance has an enormous impact on climate change. Carbon dioxide is one of the greenhouse gases. It absorbs and holds infrared radiation from the Earth's surface, which contributes to temperature increase in on the planet eventually .This process is called the greenhouse effect. If that process has not happened, the Earth's temperature would be about 30 °C below.</p> <p>The increase in the level of CO₂ in the Earth's atmosphere leads to an increase in the greenhouse effect, which can cause irreversible changes in the climate.</p> <p>Already, you might observe the melting of glaciers. For example, the level of famous Kilimanjaro snow cap has fallen over the past 100 years by 80 %</p>

Table 1 continue

1	2	3	4
2.	Nitrous oxide	The formation of ozone, which is called greenhouse gas	This substance, like carbon dioxide, has the same effect as greenhouse gas. It causes reactions that destroy methane, which is another greenhouse gas from the atmosphere.
3.	Soot and water vapor	Contrails (condensed water paths)	<p>The interconnection of these substances leads to the "contrails" during the flight of aircraft at high altitudes and at minus temperature.</p> <p>That concept means complex of the condensed water paths, or cirrus clouds. Of course, the research nature of this concept has not reached the unconditional, final conclusions yet. But the scientists believe that this effect is close to the concept of greenhouse effect, especially at night, when the temperature of air is lowered.</p>

So, the analysis of climatic effects (Table 1), which are formed as a result from the release of harmful chemicals substances as a consequence of the aircraft engines functioning, shows that the problems' level are huge and without proper measures the situation will not change for the better. According to data from world-class experts, the overall impact of the aviation transport industry work is almost twice the amount of carbon dioxide emissions according to possible maximum permissible level in the international norms and standards. But the exact values of these data always depend on the individual plane, local climate and time of day.

For an example, consider the features of an aviation flight between New York and California, and according to expert estimates, we get a number of dangerous harmful substances – greenhouse gases, which are equal to 20 % of the emissions generated as a result of the internal combustion engine of a single general automobile for the whole year. Currently, aviation industry accounts for 11 % of all world emissions.

According to the statistical reports, about 20,000 aircraft, which function around the world, are served three billion passengers each year. Experts predict that by the year 2040 more than 50 planes may be in service, and they are expected to fly much more frequently. But there are several ways to make your plane travel a little green.

According to the World Bank, the average citizen of the United States of America in 2016 formed about 16.4 metric tons of carbon dioxide as a result of constant flights. According to some estimates, an aircraft, that crosses the distance from New York to San Francisco, throws about 0.9 metric tons of carbon dioxide per person. About one eighteenth of carbon emissions falls for an american per year.

According to the experts information of NASA organization 2010, about 25 % of the aircraft's emissions are due to landing and take-off and 2–4 % at the flight period. But, what can flight attendants and passengers make for decreasing harmful substances emissions in the atmosphere?

Table 2

Some interesting facts of local impact zone, that may help to reduce amount of harmful substances in the natural environment

№ in order	Fact	Short characteristics
1.	Compensation for carbon dioxide emissions by transferring funds for additional planting of trees	<p>Some amount of aviation companies (Delta, United and JetBlue) offer passengers compensation for carbon dioxide emissions to the environment by transferring funds for an additional planting of tree trees – the "green lungs of our Planet. It should be noted that such services are offered not only by airlines, but also by other organizations that deal with ecologically safe use and conservation of natural resources.</p> <p>The Sustainable Travel International organization, which specializes in the implementation and operation of the regulation program, compensation for losses and losses in all corners of the United States, offers the following options: 1) donations of \$ 8.95 for the needs and functioning of the Texas Winery; 2) donations of \$ 10.75 for the forest conservation program in Peru. Such actions will be able to compensate for almost 0.9 metric tons of carbon per passenger, who will fly from New York to San Francisco in July and in the opposite direction.</p>
2.	Rules for lowering and increasing the window shades of an airplane during landing and take-off	<p>Some rules on the aircraft, reducing and increasing window shades might help reduce emissions.</p> <p>How is it possible? «.....When you land at a warm destination, stewardess may ask you to close the windows» as stated by Christine Busher, who is the Delta Air Lines director. According to him, this reduces the amount of required jet fuel used to cool the aircraft when it is on temporary parking site.</p> <p>That actions will be only a small fraction of which ones might be done to counter the entire amount of emissions as a result of aviation engines work.</p> <p>But that is an example, how aviation companies will be able to use fuel efficiently and economically.</p>
3.	Use of a mixed fuel type for the passenger jet needs	<p>Commercial airlines have been using biological fuels for a certain number of passenger flights since 2011. But at the same time biological fuel is mixed with traditional fuel oil in various quantities. Last year United Airlines started to use biological fuel for all its passenger flights from Los Angeles.</p> <p>According to the company «United» information, biofuels, which have been produced by AltAir Fuels, have reduced at least 60 percent of greenhouse gas emissions compared to conventional jet fuels. Other companies and the US government are working on the development of alternative biofuels for use in aircraft engineering.</p> <p>Recently, more than 190 countries have agreed to reduce carbon emissions from aviation travel by combining compensation and improving efficiency.</p> <p>According to the data and services of the airlines, the passenger is able to check the efficiency, quality and type of fuel, also other characteristics which are used by the particular airline. According to the report of the International Council for Clean Transport, Alaska Airlines and Spirit Airlines were the most efficient carriers in the United States in 2010. American Airlines and Allegiant Air were in the second part of the 15 largest airlines list in the world.</p>

So, as the information analysis from Table 2 shows, even insignificant at first sight actions by the public and aviation staff might have a positive effect on the reduction of harmful influence and efficiency of the reactive fuel using.

If we consider more global methods of reducing the aviation activities impact, then a bright example of world experience is creation of the «green zones». It is the effective environmental decision-making on the territory of the airport and beyond. «Green zones» are included such actions:

- development, exploitation of technologies and equipment for control and reduction of harmful substances emissions and greenhouse gases;
- conservation and replenishment of green plantations in the airport and beyond;
- monitoring and forecasting of climate change;
- introduction of technological processes in the field of energy and resource saving and renewable energy [10].

The concept of «green zones» is widely used in the United States and European countries. They have developed a number of long-term programs and initiatives by 2025. Experts plan to develop new-generation planes with radically new technical and operational characteristics in accordance with the rules and requirements of these zones functioning.

Table 3

Example of functioning «green zone» in the world's airports

№ in order	Country	Airport name	Features of «green zone» implementation and functioning
1	2	3	4
1.	Thailand (Bangkok)	Suvarnabhumi International Airport	The green garden is situated on the ground floor of the airport, which is stylized to the sea, with swam boat on a green wave, also with a small island «a house of spirits». The airport is similar to a tropical garden.
2.	South Korea (Seoul)	Incheon International Airport	The infrastructure of the airport has an energy-saving terminal, with a mini-city, which includes gardens, waterfalls, and green areas. The latest energy-saving technologies have been used during the construction of the terminal. Optimization of natural ventilation has been made, lighting and large-scale installation of photocells.
3.	Maldives	Hanimadhoo airport	The air transport system is considered in the context of industrial infrastructure. For example, the infrastructure of the Hanimadhoo Airport (Maldives) is characterized by the efficient use of natural resources and the preservation of natural design. The roof of the airport is designed in the form of a shell on which solar panels are located. This feature ensures not only environmental friendliness, but also compliance with the surrounding landscape. At the aerodrome territory, which is located on the coast, remains untouched. Developers have introduced such high-performance solutions as rainwater and natural light regarding this territory
4.	Canada (Edmonton)	Edmonton International Airport	On the airport territory, Green over Gray company has created a vegetative installation in the form of a vertical green garden on a wall that occupies an area of 430 m ² and employs more than 32 plant species. This design solution reduces the amount of Carbon dioxide emissions, as well as increases the level of water use efficiency.
5.	England (East Midlands)	East Midlands Airport	The airport uses wind turbines, ground water sources for electricity generation, and water purification systems to reduce unwanted emissions into the atmosphere. In the future, it is planned to install an additional number of wind turbines, to develop programs of utilization and reuse of materials. The priority task for management is preservation of unpolluted territory around the airport and establishment of more environmentally friendly transport links between the city and the terminal.

Table 3 continue

1	2	3	4
6.	USA (Boston)	Logan International Airport	In the United States, it was the first airport, that started to use environmentally friendly materials when handling premises, and has been awarded the LEED (Leadership in Energy & Environmental Design) Certificate of Conformity. In the design of the airport buildings, some factors have been taken into account. There were location, convenience of transport and the use of local building materials. The light is energy efficient, the roof has been made of a membrane that filters water and lets it onto those.
7.	USA (Wisconsin)	Stevens Point Airport	The airport uses solar energy and wind turbines to reduce the consumption of exhaustive natural resources.
8.	USA (Florida)	Northwest Florida Beaches Airport	The airport has been built on environmentally friendly materials, taking into account the site of construction, water indicators and flora, which is easily recover on the treated area. Lighting at this airport is energy efficient, and, among other things, it uses the maximum of daylight due to the special architecture of the building. Renewable energy sources are used for heating and cooling the building.
9.	USA (Denver, Colorado)	Denver International Airport	The Denver Airport project has been designed to make the building truly «green». Airport management has developed a special strategy, which allows gradually reducing harmful emissions to the atmosphere. The airport uses solar energy for heating and power supplies, processing materials. Taxi Park is equipped with electric cars and one of the greenest car parks in the world operates on its territory.
10.	Germany (Berlin)	Berlin Airport	Flughafen Berlin Brandenburg GmbH company has been elaborated strategy, which was called «Berlin Green Airport». Its purpose is to ensure the operation of the air handling unit in an energy efficient, resource-saving and environmentally sound manner. The environmental strategy defines the main directions of work towards the establishment of the «green airport», setting new standards for sustainable operations. This is supported by its own system of environmental management, which controls all operational processes at the airport affecting the environment and climate. The management of environmental resources involves using of innovative storage technologies in order to increase transport volumes at lower resource costs.
11.	India (Kerala)	Cochin International Airport Limited	Cochin International Airport has been the first Indian and the first world airport that has completely switched to solar energy. Also, the airport's activities will be projecting to reduce carbon emissions by 300 thousand tons for the next 25 years, which is equivalent to planting three million trees.

Consequently, we may conclude that the use of «green zones» for airports is a necessary innovative solution for the conservation, protection of natural resources and reduction of the negative impact on the integrity of the ecosystem. An important tool for ensuring the functioning of these zones is the formation of an effective system of environmental management, the introduction and harmonization of environmental policies, taking into account the specific conditions of operation.

As we see the danger from the work of the aviation industry is quite significant, but despite all the leading airline enterprises, international organizations in the field of conservation and environmental use of natural resources, including the International Civil Aviation Organization (ICAO), are investigating the balance between the environmental, social and economic

consequences as a result of growth infrastructure capacity and work closely with management bodies, environmental groups, various Planning and Forecasting Institutes, in order to achieve this balance and ensure fulfillment of their obligations to the public and to satisfy requirements for international mobility.

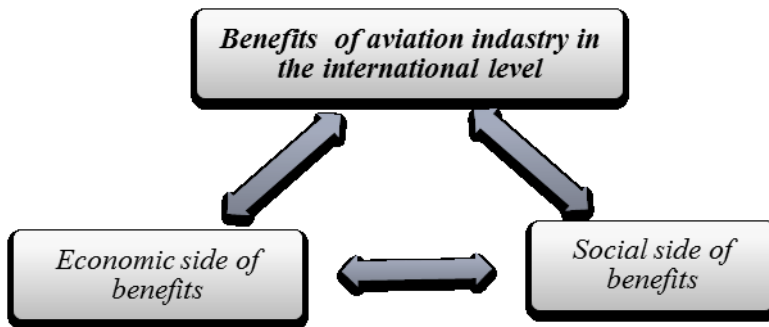


Fig. 2. Socio-economic benefits from the aviation industry

Let's consider the information in Fig.1 in more details.

Economic benefits as a result of aviation industry functioning:

- Aviation Transport is the single global transport network that makes it extremely important for world business and tourism. This sphere plays an important role in the issues of economic growth, especially in developing countries.
- It carries about 2 billion passengers annually and 40 % of inter-regional export of goods.
- According to the percentage ratio, 40 % of tourist trips are carried out by aviation transport.
- The aviation sector provides a total of 29 million jobs worldwide (through direct, indirect, induced and catalytic effects).
- The ratio of global economic consequences as a result of the aviation industry (direct, indirect, induced and catalytic) is estimated at \$ 2.960 billion, equivalent to 8 % of the world's gross domestic product. On the whole, the world aviation networks are counted 900 airlines with 22,000 aircrafts.
- The world aviation sphere is served approximately 1,670 airports through a network of routes close to 2 million miles and operated through 160 air navigation service providers.
- It is a highly efficient user of natural, productive resources and infrastructure.
- It is equipped with high-quality technologies and the appropriate level of services in comparison with other modes of transport.
- It needs significant maintenance and infrastructure costs. Unlike other modes of transport, it provides a net contribution to the national budget through taxation.
- New generation aircraft (A380 & B787) focused on the efficiency and economy of the jet fuel using. So less than 3 liters falls per 100 passengers per 1 km, which exceeds the efficiency of any modern compact car on the market.

Social benefits as a result of the aviation industry functioning:

- Provide a significant amount of social benefits.
- Improve quality of life, expanding the public's outlook as cultural and aesthetic qualities.
- Provides a wide range of places rest in all corners of the world and it is an accessible means of visiting friends and relatives living in separated places.

- Helps to improve life's level and standards of living, reduce poverty, for example, through tourism services, which is offered by either country.
- Promotes sustainable development by expanding tourist and trade routes, which generates economic development, new workplace, increased taxation revenues.
- Facilitates the delivery of emergency and humanitarian assistance to either corner of the Planet, as well as the rapid delivery of medical supplies and organs for transplantation.

As a result of researches, analysis of the threats and benefits of the aviation industry, the public can see, that like any other transport systems, which ultimately depends on the availability of natural and productive resources, aviation might not be considered stable in the very long prospect. Due to the limited natural resources, this area is more realistic at a certain time to think what might we do to improve sustainability rather than to achieve future sustainable development.

Consumer demand for aviation transport services is steadily increasing, and if this demand is satisfied with all related benefits, then it is clear, the level of threat and harmful impact grow (noise, pollution, climate change, risk, excessive use of resources, etc.).

Well, although it is impossible to make the development of the aviation industry stable in the very long term, nevertheless, some improvements in aviation stability remain real and priority:

- Flight safety;
- Efficient optimization of available power;
- Cooperation of international aviation organizations in order to achieve a common vision of a more stable development of aviation;
- Decision-making based on optimizing the balance between social, economic and environmental imperatives;
- Ensuring mobility needs in this way of meeting the stakeholders needs;
- Use of measures to minimize negative impacts and use of resources by creating, managing more efficient systems, equipment and technologies.;
- Raising the quality of citizens life;
- Investing in a number of research, education, education;
- Transparency and honesty in both the positive and negative aspects of the aviation industry;
- Avoiding controversial policies and regulations.

РЕФЕРАТ

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АВІАЦІЙНА ПРОМИСЛОВІСТЬ ХХІ СТОЛІТТЯ: РОЗВИТОК ТА НЕОБХІДНІСТЬ ЧИ СЕРЙОЗНІ ЗАГРОЗИ ДЛЯ ПРИРОДНИХ ЕКОСИСТЕМ

На сучасному етапі науково-технічного прогресу авіаційна галузь характеризується розробкою нового обладнання, створенням потужних двигунів, оновленням парку літаків, а також проектуванням нових видів. Та попри все авіаційний транспорт був і залишається масштабним джерелом впливу шкідливих факторів на навколишнє природне середовище. Тож сучасна ситуація призводить до необхідності розроблення та реалізації комплексної програми екологічної безпеки в авіатранспортній діяльності.

Яскравим прикладом світового досвіду щодо прийняття ефективних рішень екологізації середовища на території аеропорту та за його межах є створення так званих «зелених зон» та використання альтернативних видів палива (біологічного палива).

Ключові слова: авіаційний транспорт, вплив шкідливих речовин, розвиток, соціально-економічні переваги.

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АВИАЦИОННАЯ ПРОМЫШЛЕННОСТЬ XXI ВЕКА: РАЗВИТИЕ И НЕОБХОДИМОСТЬ ИЛИ СЕРЬЕЗНЫЕ УГРОЗЫ ДЛЯ ПРИРОДНЫХ ЭКОСИСТЕМ

На современном этапе научно-технического прогресса, авиационная отрасль характеризуется разработкой нового оборудования, созданием мощных двигателей, обновлением парка самолетов, а также проектирование новых видов. И тем не менее авиационный транспорт был и остается масштабным источником воздействия вредных факторов на окружающую среду. Поэтому современная ситуация приводит к необходимости разработки и реализации комплексной программы экологической безопасности в авиатранспортной деятельности.

Ярким примером мирового опыта принятия эффективных решений экологизации среды на территории аэропорта и за его пределами является создание так называемых «зеленых зон» и использования альтернативных видов топлива (биологического топлива).

Ключевые слова: авиационный транспорт, влияние вредных веществ, развитие, социально-экономические преимущества.

ABSTRACT

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AVIATION INDUSTRY OF XXI CENTURY: DEVELOPMENT AND NECESSITY OR SERIOUS THREATS FOR NATURAL ECOSYSTEMS

At current stage scientific and technological progress, aviation industry is characterized of new equipment, creation of powerful engines, updating fleet of aircraft, as well as designing new types. But, for today, aviation transport remains a large source of harmful factors for the environment. Therefore, the current situation leads to the necessary, development and implementation of a comprehensive environmental safety program in aviation transport.

Now it's an indisputable fact that an alternative fuel option is a technically robust solution that will not require changes to the aircraft or the delivery of other fuels.

A striking example of the global experience in making effective environmental decisions is the creation of so-called "green zones" inside and outside to the airport.

Key words: aviation transport, influence of harmful substances, development, socio-economic advantages.

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3.3 ANALYSIS OF THE ENVIRONMENTAL PROPERTIES OF THE COMPONENTS OF TRADITIONAL AND ALTERNATIVE AVIATION GASOLINE

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Millions of years under the Earth's surface, oil, did not cause toxic effects on the environment, but people removed it from the bowels of the earth and intensively use for their purposes [1]. Oil, with benefits to person, raises the question the existence not only of people, but every living thing on Earth [2].

The toxicity of petroleum products and gases emitted is determined mainly by the hydrocarbons that are part of their composition. Heavy oil is more toxic than light, and the mixture of hydrocarbons is more toxic through separate components. Significantly increases the toxicity of petroleum products during the processing of sulfuric oil. The most harmful to the human body is the combination of hydrocarbons and hydrogen sulfide, the central nervous system and the brain are attacked.

High regulations on the ecological quality of fuel and lubricants require effective and informative methods for their evaluation. Nowadays, the most environmentally hazardous bioactive polycyclic arenes (PA) – a group of compounds with fused benzene rings. The most carcinogenic include the highest number of PA rings from 4 to 7. These compounds are damaging the immune system of humans and animals, can cause infertility (mostly men), cancer and other serious diseases [3]. Investigated and obvious facts of products' toxicity of oil refining, make it necessary to further study the toxicity of gasoline components.

The purpose of this article is analysis of the environmental properties of components of traditional and alternative aviation gasoline.