

# ПОВІТРЯНЕ, КОСМІЧНЕ, ЕКОЛОГІЧНЕ ПРАВО

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## ENVIRONMENTAL SUSTAINABILITY OF AVIATION: AIRPORT DEICING OPERATIONS

*This paper designates the environmental impacts of airport deicing operations and related aviation environmental legislation on international and national level.*

**Key words:** ecological safety, airport de-icing operations, sustainable development of aviation.

### **К. Ю. Водоласкова**

*Екологічний стабільний розвиток авіації: заходи з протиобледеніння в аеропорту*

*Стаття описує вплив на навколишнє природне середовище внаслідок проведення заходів з протиобледеніння в аеропортах, а також визначає відповідне законодавство на міжнародному та національному рівнях.*

**Ключові слова:** екологічна безпека, заходи з протиобледеніння в аеропорту, стабільний розвиток в авіації.

### **К. Ю. Водоласкова**

*Экологическое стабильное развитие авиации: меры с противообледенения в аэропорту*

*Статья описывает влияние на окружающую среду вследствие производства противообледенительных процедур в аэропортах, а также обозначает соответствующее законодательство на международном и национальном уровнях.*

**Ключевые слова:** экологическая безопасность, действия с противообледенения в аэропорту, стабильное развитие авиации.

**Problem setting and actuality of the research. Environmental sustainability refers to sustaining our natural resources and safeguarding our environmental assets for future generations.** The sustainable development of the aviation as an industry is one of the significant indicators of economic and technological development of any country.

In 2010, during the 37th meeting, the International Civil Aviation Organization (ICAO) has been re-confirmed its responsibility and its members in achieving the highest level of balance between security and the sustainable development of civil aviation, on one hand, and strict control relating conditions of environment quality, on the other hand [1]. However, balancing the capacity enhancing needs

of the airspace system with the need to protect the environment can be challenging.

**Analysis of resent research and publications.** Environmental aspects of civil aviation are widely studied by such domestic and foreign scientists, as T. K. Overkovska, S. I. Khomyachenko, V. V. Kostytskyi, E. K. Yeryashov, Z. I. Boyarska, Yu. A. Krasnova, V. P. Babak, V. P. Kharchenko, V. O. Maksymov, Sigifredo Castro, Lawrence C. Davis, Larry E. Erickson, H. L. Rogers, D. S. Lee, D. W. Raper, P. M. de F. Foster Frank Boons, Arwin Van Buuren, Geert Teisman and others.

The principal sustainability issues that impact upon airports include local concerns such as noise, air quality, biodiversity and water management, but also, increasingly, more global environmental issues such as CO<sub>2</sub>. Despite of the fact, that European airports consider noise to be the number one en-

vironmental priority, water and soil pollution is also makes a great impact on environment. Most studies and environmental management programs are concerned with large attention given to air and noise pollution and have been giving less focus on the impacts to soil and groundwater than it ought to give. Every third person on Earth suffers from water scarcity/ In the next 25 years, this will increase to two-thirds of water world population if we do not change the way in which we use this precious resource [2]. Therefore, **the main objective of this article** is to illustrate threat for water and soil, caused by airport deicing operations; investigate international and national legal regulations, standards and rules, which govern water and soil protection in the field of aviation; and provide examples of case study of positive progress towards water and soil protection during deicing operations in certain airports.

**Article's main body.** Airports are a critical component of the complex international aviation system. However, one of the main factors, which restrain civil aviation's rapid evolving around the world, is conditions of ground handling services level in airports, including negative impacts on environment.

De-icing/anti-icing fluids are chemical products with an environmental impact. Biological and chemical breakdown of deicing chemicals in airport runoff can cause severe dissolved oxygen demands on receiving waters. If not properly controlled, the resultant water quality impacts may adversely affect animal, plant, or human populations. Therefore, it is vital to evaluate deicing procedures, because they have the potential to affect navigable waterways, municipal drinking water supplies, important sole-source aquifers, or protected groundwater supplies.

When performed without adequate discharge controls in place, airport deicing operations can result in significant adverse impacts on water quality, such as reductions in dissolved oxygen (DO), which can lead to fish kills and other aquatic ecosystem problems. Aircraft deicing fluids also contain additives, and some of these have potential aquatic life and human health impacts due to their toxicity. In addition, deicing fluid discharges have been shown to affect drinking water treatment pro-

cesses and the quality of finished drinking water [3].

It is crucial to find new and combine well-known methods to invent and apply an effective mechanism to limit or reduce negative impacts on the water use caused by civil aviation ground handling in airports and gradually make civil aviation safer and greener.

Hence, specific legal rules on international and national levels with transparent, effective mechanism play an important role to provide sustainable development of airports according to environmental policy, particularly relating to airport de-icing measures.

#### INTERNATIONAL LEVEL OF LEGAL REGULATIONS

ICAO plays a leading role in addressing aviation's impact on the environment. Its standards and policies ensure that aviation's impact on the environment is addressed in a coherent way and guarantee the high degree of uniformity in regulations, standards and procedures that is required for the safe, orderly and efficient functioning of today's air transport system.

The successful treatment of ice and snow deposits on aeroplanes on the ground is an absolute necessity to the safety of winter operations. Requirements and guidance can be found in the following ICAO documents.

Annex 6 – Operation of Aircraft, Part I – International Commercial Air Transport – Aeroplanes. References to ground de-icing/anti-icing are in Part I, 4.3.5.4 with a requirement for de-icing/anti-icing treatment and inspection prior to take-off in suspected or known ground icing conditions: a flight to be planned or expected to operate in suspected or known ground icing conditions shall not take off unless the aeroplane has been inspected for icing and, if necessary, has been given appropriate de-icing/anti-icing treatment. Accumulation of ice or other contaminants shall be removed so that the aeroplane is kept in an airworthy condition prior to take-off [5].

Note. – Guidance material is given in the Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640).

Part I, Appendix 2, 5.6 requires instructions for the conduct and control of ground de-icing/anti-

icing operations to be included in an operator's Operations Manual.

The Preparation of an Operations Manual (Doc 9376) Second Edition 1997, 8.7.3 also provides guidance on the content of an operations manual with respect to de-icing/anti-icing operations.

Annex 14 – Aerodromes, Volume I – Aerodrome Design and Operations and the Aerodrome Design Manual, Part 2 – Taxiways, Aprons and Holding Bays (Doc 9157) also contain references to ground de-icing/anti-icing requirements.

The Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640) Second Edition 2000, provides a general description of the various factors relating to aeroplane icing on the ground. It addresses the minimum procedural requirements necessary to conduct safe and efficient operations during those conditions which require aeroplane de-icing and anti-icing activities. The «clean aircraft concept» is described. The second edition refers to Types I, II, III and IV fluids and also to methods for de-icing which do not use fluids. Examples of application and holdover time tables are provided for Types I, II and IV fluids. The second edition also contains material on equipment, quality assurance programmes and the annual updating of holdover time guidelines and de-icing/anti-icing procedures [6]. The primary purpose in the publication of this manual was to encourage international standardization of de-icing/anti-icing activities.

#### NATIONAL LEVEL OF LEGAL REGULATIONS

Environment that is safe for life and health is a human right, stipulated in Article 50 of Constitution of Ukraine. According to the Article 16 of Constitution of Ukraine to ensure ecological safety and to maintain the ecological balance on the territory of Ukraine, to overcome the consequences of the Chernobyl catastrophe – a catastrophe of global scale, and to preserve the gene pool of the Ukrainian people, is the duty of the State [7].

Subjects to state protection and regulation on the territory of Ukraine shall be: environment; natural resources (land, water, bowels, air, forest and other flora, fauna); landscapes; other natural complexes.

Based on the Article 16 of Constitution of Ukraine main directions of state policy of Ukraine in the field of protection of the environment, usage of natural resources and environmental safety guarantee were adopted in 1998 [8].

By enactment of the Law of Ukraine «On Environmental Protection» state defines the legal, economic and social basis of the organization of environmental protection for the benefit of present and future generations [9]. The protection and use of certain natural resources are regulated by the relevant codes. Thus, the protection and use of land is regulated by the Land Code of Ukraine (2001); Protection and Use of Water is regulated by Water Code (1995). Besides, 1) Law of Ukraine «On waste» determines legal, organizational and economic basis of the activities connected with the prevention or reducing amounts of formation of waste, their collection, transportation, storage, sorting, processing, utilization and removal, neutralization by burial and also with prevention of negative impact of waste on the surrounding environment and health of the person in the territory of Ukraine [10]; and 2) Law of Ukraine «On the protection of land» declares, that the land within the whole territory Ukraine is an object of special protection, provided by the state [11]. Aviation safety consists of flight safety, aviation safety, environmental safety, economic and information security (Article 10 of Air Code of Ukraine) [12].

Certificate of conformity of any airport in Ukraine confirms compliance with the requirements not only related to technological processes, organizational and technical systems, aviation security, labor protection etc., but also environmental safety [13].

#### CASE STUDIES

There are great amount of examples in the world, which illustrate positive practical tendency of airports' concern about making de-icing operations more eco-friendly. Article outlines few of such case studies.

1) Fraport Ground Services – an international airport operator with head office at the biggest airport in Germany – Frankfurt Airport (FRA) – actively practices environmental protection within the scope of Fraport AG's integrated environmental

management system, based on federal environmental policy [14].

2) In 2012, Munich Airport – Germany’s second busiest airport – adopted the German Sustainability Code as the first German airport operator. It is declared by Munich Airport management, that airport places a very high focus on environmental sustainability and one of its key corporate strategies is to operate and develop the airport in such a way that is compatible with and effectively limits any harmful effects on the environment (Flughafen München GmbH, 2014b) [15].

3) Hamburg Airport obtains reliable information on any contamination of the groundwater (or the soil) in further way. In winter, surface water occurring on the aprons may be contaminated with de-icing fluids, particularly from aircraft de-icing. A Total Organic Carbon measurement station, operating all year round, automatically determines the concentration of de-icing agents in drain water every 30 minutes. The Environmental Protection Centre operates a tightly-knit network of groundwater monitoring wells in order to obtain an overview of the quality and status of groundwater at the airport site. The wells are regularly sampled [16].

4) During the most recent winter season (2014/2015), Finnair adopted the CheckTime decision-support system. This uses precision weather measurement equipment, and real-time environmental data, to provide dynamic information to the pilot in the cockpit on the state of the de-icing and anti-icing fluids on the aircraft. This helps determine how long aircraft surfaces are sufficiently protected against icing thereby widening [17].

#### **Conclusion and prospects for the development.**

Nature is the mother of all living beings in all forms. But although we have a tendency to lord it over material nature, we should know that we are not the supreme controller [18]. Progress and quality of life are not depends only on GDP or growing amounts of goods to satisfy our needs, we, human, are responsible for our activity on the Earth and obliged to obey of adopted rules towards sustainable development.

Aviation has a tendency to increase the number of flights and passengers, and thus, consequently the environmental challenge for the sector will in-

crease. A comprehensive, coherent and effective package of measures, stipulated in international and national regulations, law, standards and their strict observance are required to continue to address this challenge in the future.

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