

THE METEOROLOGICAL FACTORS IN THE MANAGEMENT OF AERODROME MAINTENANCE IN WINTER SEASON

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The thesis is devoted to meteorological factors in the management of aerodrome maintenance in winter season. The first section provides information about the purpose and methodology of work. The second section describes the meteorological and climatic factors occurring in winter and ways of providing meteorological services to meet the needs of the airport. The third part is devoted to the management of winter maintenance at the airport. Influence of meteorological factors on winter maintenance management is given in the fourth section. In conclusion is designed algorithm of decision in typical situations winter maintenance.

K e y w o r d s: Meteorological factors, Winter maintenance, Airport management

1 INTRODUCTION

We live in a zone where alternated four seasons are. Temperature between summer and winter are very different, which has an impact on the overall economy. For air transport is winter very challenging because of the need to maintain a smooth flow of transport requires a lot of effort. Summer for airport means an amount of holiday travelers as the airport increases yields, the need for maintenance does not require much effort and money than in the winter.

Winter at the airport was does not solve at the time when the first snow falls.

The process of preparing for the winter season begins in a time when many of us still bask somewhere by the sea. Plans for winter already processed before the end of the month September All equipment undergo a complete examination and employees must undergo various training to increase proficiency in securing winter maintenance. The preparation for the winter maintenance requires a lot of effort, as if still cannot predict exactly what will be this year's winter. Should winter maintenance not carry out properly, the very aircraft and airport operations would be compromised. Everything must be done within the framework of ensuring the safety and serviceability of the airport in winter.

The aim of this thesis was to elaborate the theoretical knowledge of meteorology and climatology, analyzing climatic and meteorological factors in the management of the airport winter maintenance. Justification which factors have relevance, what is the mechanism of action and what are the consequences are the second aim. The ultimate aim was to build decision-making algorithm in typical situations, winter maintenance and methodology for assessing individual factors.

2 CLIMATIC AND METEOROLOGICAL FACTORS

2.1 Rainfall

Atmospheric rainfall are products of condensation or sublimation of the water vapor to liquid, or solid form fall out of the cloud (fog) on the Earth's surface (vertical

precipitation), or settle - brushed on to the surface and the soil (horizontal precipitation).

Distribution of rainfall:

- 1) Vertical precipitation** - precipitation falling from clouds - rain, drizzle, drop-ice, frozen rain, snow, snow pellets, hail, snow hail, ice needles.
- 2) Horizontal rainfall** - dew, frozen dew, gray frost, hoarfrost, humidity, icing, black ice, frostbite. [2]

2.2 Storms in the winter time

Among the meteorological factors may be included the storm. Most storms arises during the summer, winter is a much less frequent their occurrence. They are accompanied by blizzards, heavy snow, gusty winds and hail. In meteorology, storms are defined as electrical phenomena, which can be seen either in flash or hear thunder. Can say that the electrical activity of thunderstorms in the summer, much stronger than in the winter.

The winter period is known that the sun's rays penetrate the Earth's surface is less intense than in the summer but radiation at night due to snow cover, which stabilizes the temperature stratification of the atmosphere, much stronger. Winds reaching speeds of up to 300 km / h in particular in the areas of jet flow.

Winter storms in most cases occur at the front or in close proximity to the queue. Analysis of some selected cases suggest that the dynamic generation of output movements may play a role in winter for the development of a thunderstorm compared to the summer case.

2.3 Temperature

One of the basic meteorological elements indicates the thermal state of the atmosphere. Its basic unit is K (kelvin). The temperature in the atmosphere constantly changing (taking into account along the vertical coordinates) decreases with increasing height. Ever again be maintained at a certain altitudinal range at the same level or increases.

Air temperature measurement

The air temperature is measured at two meters above the active surface with an accuracy of 0.1 ° C. Measured the temperature of dry, wet, minimum, maximum and minimum ground floor, which is measured 0,05 mm above the ground.

2.4 Influence of precipitation on aviation activity

Snow constitutes one of the riskiest meteorological factors that affect an entire serviceability. At a certain blanket of snow on the runway, taxiways and the snow drifts, it is necessary to remove either mechanically or otherwise. Expressiveness is placed mainly on the maintenance of operating areas as well as across the road. It is necessary that the surfaces of snow scavengers at regular intervals, since the use of chemicals at its freezing affect the quality of the pavement.

Layer of snow on the road surface causes:

- Resistance acting on the bogie wheels when accelerating,
- Deterioration of the aerodynamic characteristics of the aircraft at starting
- Reduce the braking effect runway surface

2.5 Meteorological phenomena of deteriorating visibility

Among the meteorological factors that most deteriorating visibility include water droplets and ice crystals or mixtures thereof that float at the surface layer of air. Significant impact on visibility also has smoke and haze, emitting industries or sand or dust particles and their mixture. Deterioration of visibility is also caused by the heavy rainfall or in the case of snow or snow showers. There may reduce visibility to less than 1 km. In the case of freshly fallen snow Drifting strong wind was also reduces visibility below 1,000 meters. He has a great effect during take-off, completing the descent and landing, and killed off most of the time the aircraft. Low drifting snow does not reduce visibility at eye of the observer, because the snow particles are lifted only in small amounts. At high blowing snow particles are raised to a considerable height above the ground and are driven by strong winds. [3]

2.6 Aeronautical climatological information

Aeronautical climatological information is prepared in the form of aerial surveys and tables and descriptions of air climatological conditions and is planning new lines, traffic at airports or evaluating performance of operations at the considered line.

In response to requests such information may be provided to other airlines and meteorological services. This information must be available to any international airport.

3 WINTER MAINTENANCE MANAGEMENT AERODROME

3.1 Planning a winter maintenance

The winter season is hectic for many airports, because it requires long-term planning and airports must count on extremely unfavorable weather conditions. They may, for the lack of preparedness of the airport cause significant financial aggregates, for example. In the absence of de-icing fluids may, in exceptional cases even limit the operation.

Airports every year to prepare for the winter enough deicing fluids , special airport mobile technology , which mainly use during abundant rainfall to maintain runway , taxiways , the trip surfaces , aircraft stands and other access and landside . Airport staffs, which are to determine, are required to undergo regular training aimed at improving their professional competence. SUMMARY training regarding winter maintenance airfields and aircraft de-icing is focused on quality and rapid intervention in ensuring the efficiency of the airport and also focuses on the safety of air navigation.

3.2 Personnel providing winter maintenance

At each aerodrome are set up individual opinions, which are responsible for a certain part. For the correctness of the assessment service capabilities LPP are responsible staff OLD. Any such employee who evaluates serviceability runway and taxiway must be controlled airport operations manual; especially Parts 1 to 4 Master winter maintenance service provides winter maintenance at the airport.

In the case when there is a calamity situation, (i.e., at a time when the gradient of rainfall within 24 hours is more than 10 cm, the intensity gradient is more than 3 cm for more than two hours, the area is continuous frost or icy surface) OLD employee must inform the Head Emergency Team of the situation.

3.3 Equipment for airport winter maintenance

Equipment appropriations for winter maintenance can be from the perspective of airport management include the long-term planning. The purchase of new technical means for every business represents a significant financial cost. Therefore, before a purchase you need to plan what resources need to purchase, after which they will be used and what will be the life of the equipment.

In a society such as the Košice airport is buying one machine at a very costly winter. The airport must consider your financial possibilities, since it is not a cheap affair. Price of a one milling cutter moves in several thousand Euros. Be taken into account that the price of fuel to individual means of mechanization is increasing every year and also chemical de-icing agents are rising in value every year. The airport is in such long-term

planning must also address the costs that the machine during its life will show.

3.4 Deciding on typical situations winter maintenance

In deciding, as one of the management functions, we encounter even in winter maintenance. Whereas manager in his work not only plans, organizes and leads, also accepts the important decisions. It is important to master ZAP decide on the use of appropriate resources that are necessary for snow removal and deicing possible. Work on airfields must provide immediately when there is a snowfall, because they lead to a reduction in braking efficiency and this may result in the restriction of the operation of the aircraft technology for the LPP. It is important to prevent the accumulation of snow on the surfaces, or the subsequent compression or adhesion to the maneuvering area of the airport. All works associated with snow removal are carried out according to the progress bar cleaning LPP to master ZAP must be available.

Kosice airport operator provides cleaning meaning of this Directive:

- RWY 01/19, TWY A, Z, C, D, APN,
- communication to ZHS,
- TWY E, J to THR RWY 19
- Other TWY only for the passage of vehicles
- Communication to store LPL,
- Access roads to radio navigation and radar equipment under contract.

4 INFLUENCE METEOROLOGICAL FACTORS IN THE MANAGEMENT OF WINTER MAINTENANCE ON AIRPORT KOSICE IN INDIVIDUAL YEARS

Winter maintenance for each airport is very expensive. Snow to a high degree affects the movement area as well as the airport building. On surfaces after changeable winter encounter numerous potholes and inequalities that need to be removed as soon as possible. It should also be paying money to the individual marking of airport operational areas. Machinery and equipment used for the removal of wear out and are expensive to maintain as well as aviation fuel, which are growing. Lastly, cannot forget the human power that controls these components. Salaries individual employees, also affect the total cost of winter operations.

To better understand how it can affect the amount of precipitation during winter operation, are processed following evaluation winter operation on the basis of information obtained from external sources.

4.1 Evaluation of winter traffic at the airport Kosice during 2001 - 2002

This winter season can be described as below average rainfall. A total of 44 days were with snow,

where over 323 hours of snow throughout the period attacked only 249mm of precipitation. First SNOWTAM was issued 24.11.2001 and the last 27.2.2001. Overall, 211 SNOWTAMs was issued. For the winter period was 3,347 aircraft movements and handled 38,415 passengers. The first step should be to provide an overview of the total precipitation during the winter operation will be shown.

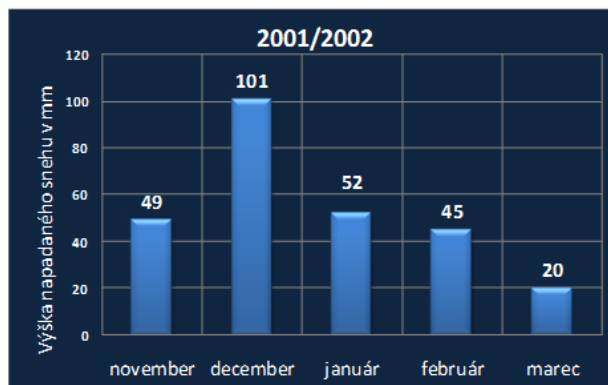


Diagram 1.
"Rainfall totals for the winter season 2001/2002"

Cost of the whole winter operation for winter 2001/2002 amounted to € 49,553. Cost of aircraft movements in this period amounted to € 49,551 and revenues for landing fees amounted to € 186,619.

4.2 1 Evaluation of winter traffic at the airport Kosice during 2002 – 2003

This winter season had a significant impact on the airport. Rainfall and performances to maintain LPP was above average. A total of 57 days with snow, representing 397.5 hours during which Snow attacked about 45 inches of snow. First SNOWTAM was issued 5.11.2002 and 6.4.2003 the latest. Overall, 231 SNOWTAMs was issued. For the winter period was 2,819 aircraft movements and handled 46,237 passengers.

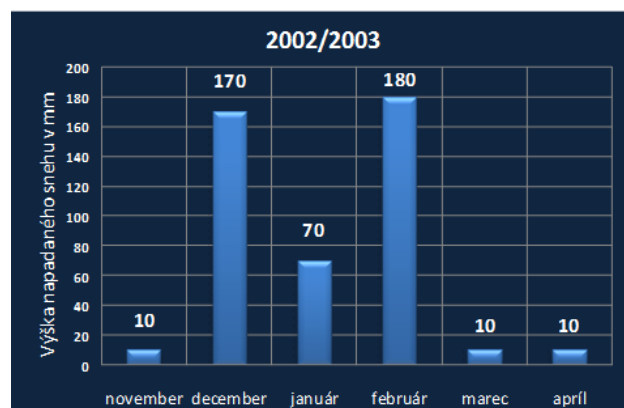


Diagram 2.
"Rainfall totals for the winter season 2002/2003"

Cost of the whole winter operation for winter 2002/2003 amounted to € 80,522. Cost of aircraft movements in this period amounted to € 81,128 and revenues for landing fees amounted to € 135,932 the end of February.

4.3 1 Evaluation of winter traffic at the airport Kosice during 2003 – 2004

This winter season was rainfall and performances to maintain LPP average. Maintenance was the most challenging month of January, when challenged to 270 mm of rain. Numbers of days with snow were together 55 Snowed 370.1 hours and attacked a total of 54 cm of snow. There were issued 241 SNOWTAMs, first 24.10.2003 and last 4.3.2004. At the airport with the number 3,260 aircraft movements handled 57,322 passengers.

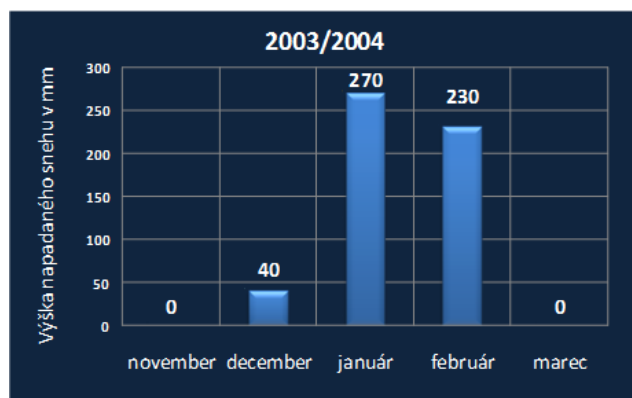


Diagram 3.

"Rainfall totals for the winter season 2003/2004"

Cost of the whole winter operation for winter season 2003/2004 was € 66,918. Cost of aircraft movements in this period amounted to € 66,875. Sales for landing fees climbed to € 277,115.

4.4 Overall evaluation of winter maintenance for the observed period

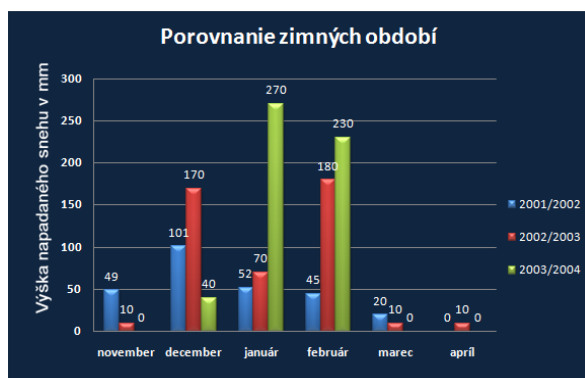


Diagram4.

"Overall comparison of the observed winter period"

From the graph can be read that invades each year in individual months a different amount of precipitation. Winter season 2001/2002 was the poor little rainfall, snowfall only 44 days and the total was only 24.9 cm of rainfall. This period did not affect winter maintenance so that the airport experienced some shortcomings. General maintenance was carried out without difficulty. In winter 2002/2003, the situation has changed somewhat. During this period failed most rainfall (see chart red bars). Winter lasted very long. April requested more precipitation, which mostly affect winter maintenance at the airport. Months of December and February necessitated largest maintenance costs; therefore it was necessary to purchase materials. And the last observed period Winter 2003/2004 also brought a lot of rain. Total fallen to 55 inches of rainfall, the most since the reporting period. Months of January and February as can be seen in the graph, were quite difficult to maintain, which increased individual cost items.

5. DRAFT DECISION ALGORITHM IN TYPICAL SITUATIONS WINTER MAINTENANCE AND METHODOLOGIES FOR ASSESSING INDIVIDUAL FACTORS

In conclusion is designed algorithm of decision in typical situations winter maintenance, which we divided into three parts. Algorithm is described after its individual steps.

5.1 Preview of the first algorithm

Description of the individual steps in the Algorithm. 1

Throughout the process of entering the beginning of the following components: Slovak Hydrometeorological Institute, Department of airport dispatching, master winter maintenance areas and employees who are authorized to carry out winter maintenance.

Before starting maintenance areas must Slovak Hydrometeorological Institute to provide meteorological information department of the airport dispatching.

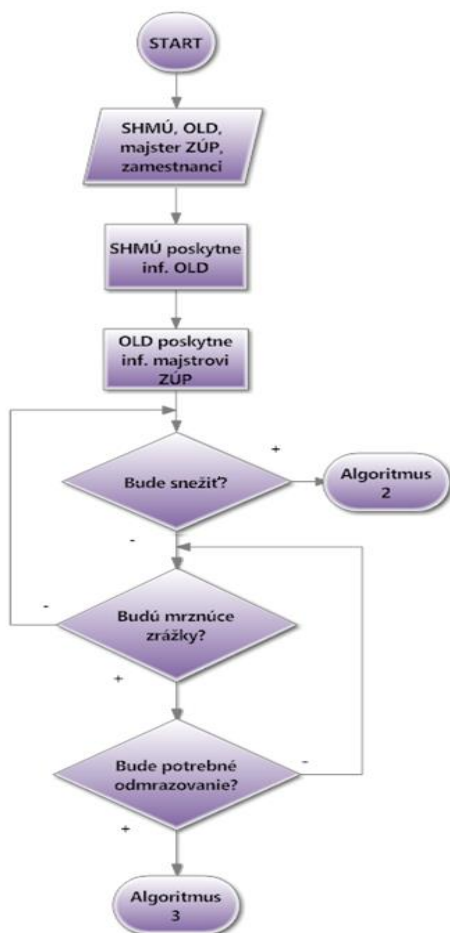
In the next step master winter maintenance areas will require meteorological information from departments airport dispatching.

Based on this meteorological information shall be decided on how the maintenance will conduct. In the case of snow will follow Algorithm. 2 in which is necessary to carry out important decisions.

If meteorological information does not report snowfall, so is further detects whether will be other freezing precipitation (black ice, black ice, ground frost ...). If freezing precipitation is not reported so maintenance is

not carried out and waits again for the next weather report.

In the case of freezing precipitation master of winter maintenance decides on a possible defrost airport operational areas. Where necessary defrosting of airport operational areas will be followed Algorithm. 3, otherwise it waits invades more rainfall.



5 CONCLUSION

At the end of this thesis can be concluded that each part in a spirit of meteorological factors, winter maintenance or management. The entire theoretical part was elaborated with intent to zoom meteorological and climatic factors.

In the analytical part, i.e. in the third chapter, we concentrate our attention on winter maintenance and management of the airport. Deciding on typical situations in winter maintenance, we showed two examples of the progress of work, where decisions are made on what mechanisms will be used in a given situation and how it will conduct throughout the cleaning.

Since the aim this work was the rationale consequences of meteorological factors on winter maintenance, we decided to process a separate chapter (No. 4). On the basis of the information we have tried to economically point out that each winter season affects spending otherwise the airport. When it is severe winter

airports costs can amount to double the amounts than it was last winter.

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