THE SERVICE OF THE AIR ELECTRONIC SAFETY TECHNIC

Miroslava Tomašurová –Natália Kotianová- Milan Džunda

This diploma work deals with the operation of aviation security equipment. The biggest attention was paid to the safety management system of the air traffic electronic security equipment. We analysed the impact of the technology on the safety of the air traffic. The next part we paid attention to the concept of ATM/CNS, its introduction and contribution to the air traffic control. The main attention is paid to the economic aspects of the operation of the electronic security systems. We included the analusis od costs of their introduction into service and benefits from the use of this techniques.

K e y w o r d s: ATM systems, CNS systems, security technology, management, efficiency, cost, revenues

1 INTRODUCTION

The aviation electronic security equipment has a significant influence on ensure the flight safety at the airport system management. Resources being used in this system ensure the reliable operation of all nodes, elements, and parts that aew needed to make the plane safe at landidng. All functions are climbed in continuous or discrete time and in a certain way. The importatnt support to raise and improve the knowledge is to fullfil the legislative status category for the airport. These funds are supposed to be a part of the management process at the airport.

The area in which the effective and flight safety implements are present defines the airport and air traffic environment.

The basic climb system is maintly for ensuring the functional integration of safety of the land command and the indentification of a correlation.

The main task of this work was to point at the inductive and deductive methods of an analysis climb so that their objectivity has been practesed the analytical criticism of their effectiveness with the new operational and economic aspects.

2 ACTUAL CONDITION OF THE SERVICE OF THE AIR ELECTRONIC SECURITY SYSTEMS AND THEIR INFLUENCE ON THE SAFETY OF FLIGHT SERVICE

Development of aviation is characterized by constantly increasing requirements for increased speed and range, increase of the economy flights and decreasing dependence air transportation of the weather. Abrupt and fast development of aviation led to an increase in speed and also density o fair traffic. Between the biggest problems at the present that attract most attention include. ensuring high level of safety. Air transport include between the most safety transport in the world. Aviation safety technology significantly contributing to increase of aviation safety and in particular, that allows approximation of aircraft by devices, where the pilot can perform a safe landing or decision about discontinuation of landing. Safety technology sends the signals, which can be used for autopilot for the prevention of impending disaster. Locates the deteriorating meteorological conditions, that could endanger safety of aircrafts. Using this informations may be adjusted flight path and avoid various complications. This technique allows monitoring of air traffic and hereby keeps the speed and orderliness of flows, which has a direct influence to the safety and economic efficiency of air transport [1].

3 CLIMB CURRENT SYSTEMS AND THEIR PROSPECTS FOR THE FUTURE

For ensuring the safety and regularity air traffic is the initial point emphasis is on the air electronic systems, which are used for the air traffic control.

For the current aviation has safety technology priority importance, because without it, today would not be possible implementation of flights. Technical parameters of this technique are issued by international organization for safety of aviation ICAO, which seeks for the communication ground device to the devices, which are installed on the planes **Chyba! Nenašiel sa žiaden zdroj odkazov.**.

3.1 Systems omni-directional beacon

VOR – Omnidirectional Lighthouse

All directional beacon VOR belongs to the basic devices, which are used to the device navigation which determine the direction of flight of the aircraft. In aviation are used since 50 years of the 20. century. For their activities are using frequency band from 108 up to 118 MHz. Sends signals by witch is determined magnetic pointer on board of aircraft toward the lighthouse. Is characterized by their precision, because his deflection from selected pointer is just 1 rate. **Chyba! Nenašiel sa žiaden zdroj odkazov.**.

Obr. 1 "[Omnidirectional Lighthouse VOR]"

DME – Flashlights

Radio system for mensuration of distance DME is formed by a board part which is called responder and

transmitter, which is positioned on board of the aircraft. DME works on the principle secondary radar and his work is provide permanent information about speed, distance and time to the ground devicek. Airplanes shall send a pulse with direct codes to the ground devices and these answer to him with the same encrypted codes. This informations are calculated on the basis of wave propagation speed. DME like ever other navigation system have also differently limitations and can take up to 200 airplanes at the same time.

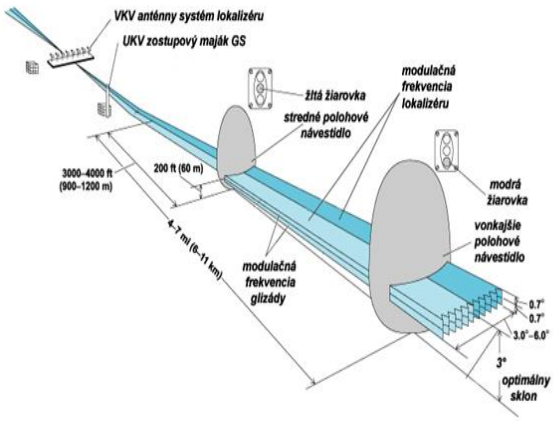
Distance meter is works at a frequency 960 up to 1215 MHz with the deviation 3 % of measured distance. Calculated distance is displayed on the indicator on the board of aircrafts as numeric value. [3].

Obr. 2 "[Flashlights DME]"

3.2 System precision approach landing

ILS – System precision approach lighthouse

System ILS is system internationally standardized since 1947 of organization ICAO, which is used for navigation of airplanes for the final guidance of landing. Is expanded around the world and for aircrafts, which have installed receiver ILS on the board, this system represents safe landing on the all airports, where is this system installed **Chyba! Nenašiel sa žiaden zdroj odkazov.**.



Obr. 3 "[Description of the ILS]"

Precision approach beacon system consists of the following major funds [4]:

Localizer

- belongs to the main parts of system ILS guides the airplane to the landing, i fit allows landscape so i tis located on the axis of the runway. Belongs to the system to zoom by devices.

Internal signal

- sends waves with frequency 3000Hz and in the form of dots. Is used for the operation II. and III. category.

Secondary signal

- is located at a distance 0,5 up to 0,8 NM from the runway threshold. Alternating light sends signals with a frequency 1300Hz and in the form of six dots and two commas.

External signal

- is located at a distance 3,5 up to 6 NM from the runway treshold. Beam of the glide path is interrupted of 426,72m of the runway.

MLS – Microwave Landing System

MLS (Microwave Landing System) is system used for landing, which was created on the basis of recommendations ICAO as a substitute for a universal system for the landing and approach ILS. The reason for refunds were some shortcomings of the system ILS which included the availability of a limited number of channels as well as broadcasted signals, which were sensitive to the surrounding terrain.

The advantages of microwave landing system are: possibility of installing in a limited landing space, cover the distance up to 37 km, availability 200 channels. System MLS is formed by ground equipment, which transmit the informations for guiding airplanes, which are processed by an on-board receiver **Chyba! Nenašiel sa žiaden zdroj odkazov.**.

4 New Generation LEZT

Implementation plan for the program of Next Generation created by FAA, whose main task is maintaining a safe and efficient air traffic for airlines and 24 hours a day. Committee FAA introduced a monitoring of aircrafts trough monitoring systems, which for the air traffic controller allow to better monitoring movements. The strategic plan is prepared every year on the basis of harmonized regulations and is oriented mainly for investment focused on the fulfillment the strategic objectives. It also includes increasing security, protection of the environment, training of workers as well as greater airspace capacity.

To achieve their objectives introduces NextGen FAA new system Performance Based Navigation PBN, which is composed from the required performance RNP and of spatial navigation RNAV. Spatial navigation allows flying in any flight path, where this system have coverage and also allows provide early warning of the

crew prior to the occurrence of rainfall **Chyba! Nenašiel sa žiaden zdroj odkazov.**.

The main areas include the new generation of climb **Chyba! Nenašiel sa žiaden zdroj odkazov.**:

- use and implementation of advanced satellite navigation systems which include WAAS, EGNOS,
- Development and Implementation GNSS (GLONASS, GALILEO, GPS),
- Data Communication and ADS-B for efficient and safe air traffic control procedures RNP and RNAV.

4.1 Concept Air Systems ATM/CNS

Philosophy ATM/CNS includes areas of navigation, communication and monitoring. Allows for the civil aviation overcome deficiencies of current systems and to use modern technologies for overcoming the problems associated with an increase o fair transport.

Communication

Within philosophy of ATM/CNS ensures communication precise and reliable transmission of data connection by existing communication channels. Transmits information medzi between air traffic control, flight crew and workplaces by means of the three types of data transfer.

Navigation

This block i sused for guidance of the aircraft by the landing, whose main task is to monitor aircraft on the track, determining their positions and safety at landing. For this purposes are used radionavigation devices, which assist in landing aircrafts to the axis of landing track **Chyba! Nenašiel sa žiaden zdroj odkazov.**.

Monitoring

The main task of monitoring is to collect an overview of airspace. It is based on the basis of secondary or primary radar or for speech reporting position. Block of tracking is used for distribution radar data and units in the format RMCDE and for their transmission, which are transmitted to the european network designated only for distribution and sharing of radar data RADNET, whose role is to assess the performance and quality of data **Chyba! Nenašiel sa žiaden zdroj odkazov.**. In the eighties of the 20th century, were operating air services between imperfect especially for high saturation of airspace and also complicated coordination. That is why in the year 1991 on the air conference created and instituted committee FANS, which was attended by 85 member of states ICAO. The main task of this committee was to analyze and propose necessary solutions for the poor state of air traffic. Within a few years of its activity created in 1988 the concept of air systems under the name ,,ICAO conception ATM/CNS,, [2].

4.2 Expanding the concept of satellite- based WAAS

Characteristic WAAS

Systém WASS provides corrected by the posting of this information:

- Differential correction and data to improve the accuracy of solutions,
- Data integrity for all GPS satellites,
- Errors which calculation erros WAAS borders **Chyba! Nenašiel sa žiaden zdroj odkazov.**.

WAAS architecture

Architecture of the system forms the ground infrastructure, satellite WAAS and onboard computer. In the ground infrastructure are located reference stations which will recieve data from the navigation sattelites, data to determine the distance, which generate signals in the area and determining the integrity.

Factors affecting the WAAS and its performance

WAAS system performce is affected by various factors including:

- GEO satellite coverage
- State of the stars
- Ionospheric error

5 Economic aspect of operation LEZT

Economic efficienty of air systems

For the determination of economic efficiency are used different methods. This includes the operational, investment indicators and costs of the amortization of these systems.

Economic efficiency consists of four basic elements **Chyba! Nenašiel sa žiaden zdroj odkazov.**:

1. operating costs
2. investment costs
   increase the efficiency of air traffic
3. cost savings

The cost of intalling and operating LEZT

Costs arising from the introduction, or in the actual operation can be divided into the following groups:

- cost up cost the purchase itself
- cost of maintenance and repairs
- Life to Date
- cost for rental of telecommunication channels
- cost for passenger transport

Usance LEZT

Owners of air security systems on the territory of Slovak Republik are the air traffic services, state

enterprise. Their role is to ensuring the operation of the aviation security technology and the collection of fees for the use of techniques from the air carriers, which also represent revenues from the traffic. These fees include navigation and route charges, which are provided in the flight information region of the state, where the flight is conducted.

Charges divided into: **Chyba! Nenašiel sa žiaden zdroj odkazov.**:

- Approach charges
- Flight charges
- Charges for radar signal

6 CONSLUSION

The task of this work was to demonsrtrate economic aspects of the air traffic safety technology, and its application in the management of the air traffic. The utilization of the aviation security technology ensures greater flexibility at the air traffic control, increases the capacity of runways, more efficient use of the airspace and greated safety in the aviation as well.

In the second part of the work we describe the operational safety management system to climb, which is very important for the air traffic control.In this work we also include organizations being involved in the aviation safety.

Finally, we analused the concept of the air ATM/CNS, which deals with the problem of a regular growth of the number of aircraft movements in the airspace. The main benefit of this approach is the possibility of more efficient use of the airspace and the operational cost savings. In this part we analyse the economic aspects of the air service electronic security technology. There are the costs being associated with the operation of aeronautical products and proceeds as well. The graph created by an international organization of the air carriers is concluded. It concerns the security technology influencing the ticket price.

The main goal of this diploma work was to evaluate the remittance and the total opening costs and revenues resulting from the operation of the air safety technology.

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Bc. Tomašurová Miroslava

The Technical University of Košice,Faculty of Aeronautics

Rampová 7, 041 21 Košice

E-mail: tomasurova.miroslava@gmail.com

Ing. Natália Kotianová

The Technical University of Košice,Faculty of Aeronautics

Rampová 7, 041 21 Košice

E-mail: natalia.kotianova@tuke.sk

prof. Ing. Milan Džunda, CSc.

The Technical University of Košice,Faculty of Aeronautics

Rampová 7, 041 21 Košice

E-mail: milan.dzunda@tuke.sk