

# Selected training aspects of air traffic controllers at the Faculty of Aeronautics, Technical University in Košice

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**Abstract**—Aviation education in Košice has a long tradition. The Faculty of Aeronautics of the Technical University in Košice has been operating in the aviation education market for more than 15 years. One of the most significant study programs at the Faculty of Aeronautics is Pilot. At present, this study program is divided into two specifications, to the Pilot and Air Traffic Controller specification. The aim of the article is to characterize selected aspects of the training of air traffic controllers. It is a practically oriented study, where the output of this educational process are highly professionally trained students ready for practice.

## I. INTRODUCTION

As part of the flight preparation of air traffic controllers, as well as in the elaboration of the study program Air Traffic Controller is used the analytical-synthetic method based on critical thinking, shaped by conceptual tools of situational control of complex systems, i. situation management method. [1] The Air Traffic Controller study program is based primarily on an analysis of legislative requirements for the training and education of air traffic controllers, an analysis of approved training organizations authorized to provide certified training regarding the types of training provided, and an analysis of current higher education of civil and military air traffic controllers.

The training of air traffic controllers in the EU must meet the relevant essential requirements according to Regulation (EC) No 216/2008. The output of this process is the fact, that students can already obtain a certificate accepted in practice during their studies. Air traffic controllers thus obtain a certificate or license, which will be issued to them after proving compliance with the essential requirements of the Regulation.

The European Certificate has proven to be an effective way of recognizing and certifying the competence of air traffic controllers, who, within their profession, play a unique role in the functioning of safe air traffic management. Through the standard for professional competence within the European Union has reduced inconsistencies in this area and thus contributed to a more efficient organization of work in the current context of growing regional cooperation between air navigation service providers.

Maintaining and improving the common licensing system for air traffic controllers working in the Union is an important element of the European air traffic management system. The provision of air navigation services requires highly qualified personnel, in particular

air traffic controllers, whose competence is demonstrated by a license in accordance with the detailed requirements laid down in the Regulation. [2]

At the Faculty of Aeronautics of the Technical University in Košice, a highly professional team of pedagogical staff at the Department of Flight Training is dedicated to the training of air traffic controllers. These adepts have prepared training programs not only for civilians but also for military air traffic controllers. The Department of Flight Training provides basic training for air traffic controllers as an ATCO - MIL training organization.

As a training organization for education in the field of military parachuting, it provides theoretical and practical training for parachuting specialists, and acts as a training organization for education in the field of alternative paratroop methods and transport of persons, using helicopters in the field of air rescue using rope and not rope procedures. Based on the permission of the Office of Military Aviation, it conducts training of experts in the field of Aeronautical Meteorology and the Meteorological Service of the Armed Forces of the Slovak Republic.

## II. SYSTEM OF HIGHER EDUCATION AND TRAINING OF CIVIL AIR TRAFFIC CONTROLLERS

In Slovakia, only the Faculty of Aeronautics of the Technical University in Košice devotes itself to the university education for civil air traffic controllers in the bachelor's study program Air Traffic Controller.

The training of air traffic controllers shall include the theoretical courses, practical exercises, including simulation and on-the-job training, necessary to acquire and maintain the skills for the purpose of providing safe, proper, and rapid air traffic control services.

Air traffic controller training consists of the following types:

- 1) Initial training - leading to the certificate of a student-air traffic controller or to the issuance of an additional rating and, if applicable, a rating endorsement, providing:
  - Basic training: theoretical and practical training designed to teach basic knowledge and practical skills related to basic operating procedures.
  - Rating training: intended for the teaching of knowledge and practical skills related to a specific qualification

- category and, if necessary, a qualification category endorsement.
- 2) Unit training: leads to the issuance of an air traffic controller license, the issuance of a rating endorsement, the validation of a rating or rating endorsement, and/or the issuance or renewal of a rating endorsement to the unit. It consists of the following phases:
    - Temporary training phase: designed primarily to expand knowledge and understanding of site-specific operating procedures and aspects of specific tasks; and
    - Unit training phase: which is the final phase of training, during which work procedures and skills can be integrated into practice under the supervision of a qualified on-the-job instructor in real traffic.
    - In the case of a unit endorsement, which requires the handling of complex situations and situations in heavy traffic, is the pre-unit training phase needed to improve previously gained qualification procedures and skills to prepare for the real traffic situations that may occur at the site.
  - 3) Continuation training phase: intended to maintain the validity of the endorsements of a license resulting from the following stages:
    - Refresher training
    - Conversion training if necessary [3]

The ATC license can be obtained by those graduates who, during the study of the ATC bachelor's program at the Faculty of Aeronautics of the Technical University in Košice, also complete the course "Basic ATC Training".

### III. BACHELOR'S STUDY PROGRAM AIR TRAFFIC CONTROLLER

The bachelor's course in the study program Air Traffic Controller at the Faculty of Aeronautics of the Technical University in Košice is focused on the education and upbringing of high-educated air traffic controllers, for air traffic control places in the Slovak Republic that require the proper level of education. The content of the study is based on the qualification prerequisites, which are newly created for EU countries and are enshrined in the regulations for the competence of air traffic management personnel (European Air Traffic Management) EATMP. The theoretical and general subjects, which are concentrated in the first year, will be followed in the next two years by special subjects defined by the European ECAC regulation for the acquisition of theoretical knowledge of the ATCO air traffic controller.

The study aims to ensure that the graduate not only obtains a comprehensive bachelor's degree in the field but also prepares him for the ATCO theoretical examinations, the completion of which is a prerequisite for the issuance of an ATCO license by the Transport Authority of the Slovak Republic.

A theoretical study is organized so that the student has the opportunity during the study to complete practical training on simulators. The study is a completed state exam associated with the defense of a bachelor's thesis. [4]

The basic condition for the admission of applicants to study according to the bachelor's study program Air Traffic Controller is the acquisition of a full secondary or a full secondary vocational education. The decisive criteria for selection for the study are their achievement in high school and the results of the written entrance exam. The entrance exams also include an interview with the applicant to find out the motivation for studying according to the submitted study program.

For the study program Air Traffic Controller, it is recommended to pass a medical checkup (for the performance of the ATC service, an aviation medical classification of the 3rd class is required), but it is not a necessary condition for this program.[4] The graduate is prepared to make an air traffic controller activity in accordance with European aviation regulations, which entitles him after passing specific examinations to perform the activity of an air traffic controller in any state of the European Union. A student who fails or is unable to complete the entire training during studies may apply to the Transport Authority of the Slovak Republic for an examination of theoretical knowledge and a practical examination for obtaining a license of another level within air traffic control.

The recommended study plan is compiled so that by completing it, the student meets the conditions for successful completion of studies within the standard length of study corresponding to the study program and at the same time meets the requirements for knowledge and skills set by international aviation regulations.

In the first year of study, the student completes basic subjects such as Mathematics, Physics, Fundamentals of Informatics, Fundamentals of Law, and Basic Theoretical Courses: Air Communication, Air Navigation, and Meteorology. By completing these subjects, the student will gain the basics for the study of professional subjects. In the second year of study, the student completes other theoretical foundations of the field such as Air Traffic Control, Automation in ATC, Air Navigation, and basic professional subjects including Procedural Control, Air Electronic Security Systems, and Practical Training in Procedural Control. In the last year of study, the student completes professional subjects such as Radar air traffic control, Operating procedures and subjects of economics and control such as Air Transport Economics and Practical Training in Radar Control. In the last semester, the student prepares a final work, in the solution of which he demonstrates the ability to solve traffic management tasks. The state examination also includes a colloquial examination in the field of knowledge of the study field of Transport. The graduate of the study is prepared to perform the activity of an air traffic controller for domestic air transport operators, or for the performance of other functions for which the competence of an air traffic controller with the appropriate qualification is required. The graduate has the required theoretical knowledge and practical experience to perform the function of military air traffic controllers in the Air Force of the Armed Forces of the Slovak Republic. [4]

#### IV. SYSTEM OF HIGHER EDUCATION AND TRAINING OF MILITARY AIR TRAFFIC CONTROLLERS

Higher education of air traffic controllers in Slovakia began in the sixties of the twentieth century [5], training of military air traffic controllers was in the specialization Air Traffic Controller - military section number 409, which underwent a few transformations processes during its existence. [6] Based on the availability of relevant information, it is possible to begin the analysis of this specialization in the 1960s. [7] During this period, new types of radars began to be introduced into armaments and there was a need for training both theoretically and practical preparation. This direction was necessary mainly since in most cases air traffic controllers have become former pilots who, due to health reasons, could not continue their career as a pilot. [8] The analysis presents models of preparation of the specialization in question, for the following periods:

- until 1973
- 1973 - 1993
- 1993 - 2004
- 2004 – 2016

The individual aspects and characteristics of the training of air traffic controllers on a historical scale are shown in Tab. 1-4 (own creation).

TABLE I.  
MODEL OF TRAINING OF AIR TRAFFIC CONTROLLERS - MILITARY SECTION NUMBER 409 UNTIL 1973

Indicator	Description
educational / training organization	Higher Aviation School, Košice
entry age at entry into course	18
requirements for inclusion in course	medical and mental certificate, physical condition, secondary education with GCSE
requirements for experience before inclusion in course	none
duration of course / preparation	4 years
completed university education after preparation	none
rank after course	Second lieutenant
Practical training Only at the workplace according to the classification as:	Air Traffic operator, Permanent Head of Flying, Head of Landings
Combat training	Only at the air traffic operators
preparedness after course	Air traffic operator without qualification
age after course	22 years
reaching the 3rd qualification at the age	23-24 years

TABLE II.  
MODEL OF TRAINING OF AIR TRAFFIC CONTROLLERS - MILITARY SECTION NUMBER 409 UNTIL 1973-1993

Indicator	Description
educational / training organization	Military Aviation School of Slovak National Uprising, Košice
entry age at entry into course	18

requirements for inclusion in course	medical and mental certificate, physical condition, secondary education with GCSE
requirements for experience before inclusion in course	none
duration of course / preparation	4 years
completed university education after preparation	yes, obtained Ing. degree
rank after course	lieutenant
Practical training Only at the workplace according to the classification as:	within the study 1973-88 simulator BUKVAR, within the study 1988-93 UZJ simulator Air Traffic operator, Permanent Head of Flying, Head of Landings
Combat training	Only at the air traffic operators
preparedness after course	Air traffic operator without qualification
age after course	22-23 years
reaching the 3rd qualification at the age	according to the flight hours and of the unit from 23-25

TABLE III.  
MODEL OF TRAINING OF AIR TRAFFIC CONTROLLERS - MILITARY SECTION NUMBER 409 UNTIL 1993-2004

Indicator	Description
educational / training organization	Military Aviation Academy GMRŠ, Košice
entry age at entry into course	19
requirements for inclusion in course	medical and mental certificate, physical condition, secondary education with GCSE
requirements for experience before inclusion in course	none, suitable if the applicant was a member of the aeroclub
duration of course / preparation	5 years
completed university education after preparation	yes, obtained Ing. degree
rank after course	lieutenant
Practical training Only at the workplace according to the classification as:	within the study 1993-98 UZJ simulator within the study since 1998 LETVIS simulator  since 2001 on the LETVIS simulator, each student has fulfilled at least 100 guidance to the air target (AT), 100 to the ground target (GT), 100 guidance to the turning point (TP), complex airport control outside the precision radar (PAR) further up to the workplace according to the classification as:  Head of Radar Control, Head of Combat control, Head of Flying, Head of Landings
Combat training	Only at the Head of Combat Control
preparedness after course	Air traffic operator without qualification
age after course	24 years
reaching the 3rd qualification at the age	26-29 years

TABLE IV.  
MODEL OF TRAINING OF AIR TRAFFIC CONTROLLERS - MILITARY  
SECTION NUMBER 409 UNTIL 2004-2016

Indicator	Description
educational / training organization	Marshal Andrej Hadik National Academy of Defense Career Development Center in cooperation with General Milan Rastislav Štefánik Academy of the Armed Forces, Liptovský Mikuláš or civil college
entry age at entry into course	19
requirements for inclusion in course	medical and mental certificate, physical condition, secondary education with GCSE
requirements for experience before inclusion in course	none
duration of course / preparation	5 years of university study plus an introductory professional officer course, after graduating from university 3 months at ANS followed by on-the-job training lasting 2 to 3 years
completed university education after preparation	yes, obtained Ing. degree
rank after course	Second lieutenant
Practical training Only at the workplace according to the classification as:	until 2006 on the LETVIS simulator, each student has fulfilled at least 100 guidance to the air target (AT), 100 to the ground target (GT), 100 guidance to the turning point (TP), complex airport control outside the precision radar (PAR), After 2006 only as part of training at ANS
Combat training	none
preparedness after course	without qualification
age after course	27 years
reaching the 3rd qualification at the age	29-30 years

The current concept of education and training of air traffic controllers is defined by Tab. 5-6 (own creation).

TABLE V.  
MODEL "A" OF TRAINING OF AIR TRAFFIC CONTROLLERS SECTION  
NUMBER 409 IN 2016-PRESENT

Indicator	Description
educational / training organization	Academy of the Armed Forces of General Milan Rastislav Štefánik, Liptovský Mikuláš Faculty of Aeronautics TUKE
entry age at entry into course	22
requirements for inclusion in course	medical and mental certificate, physical condition, secondary education with bachelor's degree
requirements for experience before inclusion in course	none
duration of course / preparation	2 years of university studying
completed university education after preparation	yes, obtained Ing. degree

rank after course	lieutenant
Practical training Only at the workplace according to the classification as:	none
Combat training	none
preparedness after course	without qualification
age after course	24 years
reaching the 3rd qualification at the age	assumption 30 years

In this model of preparation for a three-year bachelor's degree at a civilian university, he continues his two-year engineering studies at the TUKE Faculty of Aeronautics as an military cadet. Upon completion of the study, the graduate/air traffic controller must complete the basic training of air traffic control in one of the approved training organizations, which are approved by the Department of State Administration in Military Aviation.

TABLE VI.  
MODEL "B" OF TRAINING OF AIR TRAFFIC CONTROLLERS SECTION  
NUMBER 409 IN 2016-PRESENT

Indicator	Description
educational / training organization	Academy of the Armed Forces of General Milan Rastislav Štefánik, Liptovský Mikuláš Faculty of Aeronautics TUKE
entry age at entry into course	19
requirements for inclusion in course	medical and mental certificate, physical condition, secondary education with GCSE
requirements for experience before inclusion in course	none
duration of course / preparation	5 years of university studying
completed university education after preparation	yes, obtained Ing. degree
rank after course	lieutenant
Practical training Only at the workplace according to the classification as:	Practical skills training Procedural control - 13 hours Airport control on the LETVIS simulator - 15 hours
Combat training	none
preparedness after course	without qualification
age after course	24 years
reaching the 3rd qualification at the age	25-26 years

In this model of preparation for a three-year bachelor's degree at the TUKE Faculty of Aviation as a military cadet, he continues his two-year engineering studies at the TUKE Faculty of Aviation as a military cadet. Upon completion of the study, the graduate / air traffic controller does not need to complete additional Basic air traffic control training, as he has already graduated during his studies at the TUKE Faculty of Aeronautics.

## V. DISCUSSION

The evaluated training models in individual periods describe the most applied training models in the relevant period. In the 1980s, there were also one-year and two-

year officer courses for civilian air traffic controllers. One-year courses for high school graduates with a general certificate of secondary education (GCSE) and two-year courses for high school graduates without GCSE, where they subsequently did so. In both cases, they ended up without a title and qualification in the rank of lieutenant with minimal practical training. They gained practice and class only at the workplace according to the assignment. The age of assignment to the unit ranged from 20 to 22 years. [6]

In general, it can be said that in the evaluated period, the entry age before the start of course was 18-19 years. Except for the existence of the Military Aviation School (1973-1993), no previous experience in the field of air traffic control was required from applicants. The training of air traffic controllers (specialization number 409) has been carried out since 1973 as part of the university education system, namely in the range of 4 years (1973-1993) and since 1993 in the range of 5 years of study. After the completing preparation, the graduates were appointed to the rank of second lieutenant (until 1973) or lieutenant (since 1973). [7]

In the period up to the beginning of the nineties, only air traffic controllers completed combat training as part of their training, and everyone without a qualification completed their studies. Combat training has not been implemented since 1993. As a result, if air traffic controllers who has completed training before 1993 had achieved 3rd qualification, usually within 1-2 years from the end of the study, so for graduates after 1993, the achievement of the 3rd qualification has shifted to the limit of 2-5 years and from 2004 to 2-3 years. The described models of training and education of air traffic controllers describe the most applied model of training in the relevant period. Time values and methods of practical training are given only as a guide because the practical training was performed only in real traffic and the possible use of the simulator was used only as training of estimates, or methods of guidance to the air target. Some specific cases that occurred in the given period and are interesting from the methodological point of view of preparation are also described. [9]

For the period after 2016, a new concept of training air traffic controllers for the needs of the Air Force of the Armed Forces of the Slovak Republic was adopted. As part of this concept, cooperation was renewed with the Faculty of Aviation of the Technical University in Košice, which began training cadets for the General Milan Rastislav Štefánik Academy of the Armed Forces in Liptovský Mikuláš. Two preparation models (Model A and Model B) were developed for this preparation. Model A is based on the current concept of training air traffic controllers in a civilian study program and appears to be a low-perspective solution for the future training of military specialists. [10] The fact that this field of study is attractive to students is also evidenced by the rising numbers of students in recent years. It was the interest of students that led to the fact that the Faculty of Aeronautics of the Technical University in Košice modernized the premises of the LETVIS simulation

center, where practical and procedural training of students in the specialization of Air Traffic Controller takes place. Modernized spaces corresponding to ergonomic, study and technical requirements are shown in Fig. 1 and 2.



Figure 1. View of the reconstructed premises of the LETVIS simulation center (position of pseudo-pilot and controller)



Figure 2. View of the reconstructed premises of the LETVIS simulation center (position of the airport tower)

## CONCLUSION

Air traffic control is demanding and therefore preparation for this profession is also difficult. It requires professional skills and practical experience. At the same time, air traffic control is an integral part of air transport and thus also an integral part of aviation education.

At present, the interest of students in this field of study is constantly increasing, probably also due to the high

applicability in practice and the acquisition of practical experience through simulated training.

The aim of the paper was to point out selected aspects of the training of air traffic controllers who are studying at the Faculty of Aeronautics, Technical University in Košice. Although this study is limited and precisely defined by rules and regulations, which regulate the content of individual subjects, provides students with enough space for practical application in the form of simulated training.

A great benefit for the education at the Faculty of Aviation was the extension of the study of civilian controllers to include military air traffic controllers.

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