Algorithmization of the training process of military flight training controllers

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***Abstract*— This article focuses on the training of air traffic controllers of a specific air traffic service provider. Military air traffic controller training consists of several phases. The aim of the article is to point out the adoption of the new Law on the Civil Service of a Professional Soldier and the factors that can affect the length of military air traffic controller training. The article describes the requirements that a military air traffic controller must successfully complete. The article contains diagrams and examples from practice for an easier understanding of the issue and at the same time provides possible solutions for meeting the professional and military requirements for the independent performance of the management service in their area of responsibility. The article contains proposals for a review in the form of The American Language Course Placement Test (ALCPT test), which would aim to reduce the time of air traffic control training.**

Keywords: Military Air Traffic Controller, ATC training, examination, optimization, process

I. INTRODUCTION

Air traffic controllers must meet the relevant basic requirements set out in Regulation of the European Parliament and of the Council (EC) No. 216/2008. They will be issued with a licence after they meet all the necessary requirements. The qualification category in the license indicates the type of air traffic service on the basis of which the air traffic controller is authorized to provide the air traffic control service. The clauses in the licence indicate the authorization to provide services fot a specific job position or sector.

Theoretical courses, simulations, practical exercises and on-the job training form the basis for acquiring skills for the safe provision of air traffic control services. In the conditions of the Department of Defense, the consistent readiness of air traffic controllers for independent service performance is influenced by the quality of training. Every active military air traffic controller is periodically prepared to solve and manage crisis situations in the relevant area of responsibility. The main task is to eleminate the failure of the human factor, and this is the reason for maintaining the required level of safety in air traffic management. [1] The absence of a military university education program for abtaining the qualification of a military air traffic controller may result in increasing the risk in ensuring fluency and safe flow of air traffic over the territory of the Slovak Republic. The Slovak Ministry of Defense is forced to purchase training services from civilian organizations that do not have sufficient experience in providing military air traffic control services.

Air traffic controller training consists of the following types:

Initial training - leads to the issuance of a student air traffic controller license or to the issuance of a qualification category and, if necessary, a clause to the qualification category, within the framework of which the following is provided:

- basic training - theoretical and practical training designed to teach basic knowledge and practical skills related to basic operating procedures.
- qualification training - intended for the teaching of knowledge and practical skills related to a specific qualification category and, if necessary, a qualification category clause

Unit training - leads to the issuance of an air traffic controller license, issuance of a qualification category endorsement, verification of the validity of the qualification category(ies) or qualification category endorsement(s) and/or the issuance or renewal of the validity of the on-site endorsement . It consists of the following stages:

- transition training phase - intended primarily to expand knowledge and understanding of operational procedures related to the given location and aspects of specific tasks
- on-the-job training phase - is the final phase of training, during which the acquired work procedures and skills are integrated in practice under the supervision of a qualified instructor at the workplace in real operation.

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- in addition to the previous phases in the case of a position clause(s) that requires handling complex and heavy traffic situations, the phase of previous on-the-job training is necessary to improve previously acquired qualification procedures and skills procedures and skills and to prepare for real traffic situations, to which may occur at the site.

Continuing training - is intended to maintain the validity of the provisions of the license and consists of the following phases:

Refresher training - is intended to repeat, consolidate or improve the existing knowledge and skills of air traffic controllers in order to ensure a safe, orderly and fast flow of air traffic.

Conversion training - is intended to provide knowledge and skills that correspond to changes in the operating environment. It is carried out if the security assessment of the change has shown that such training is necessary.

Training of practical instructors - leads to the issuance, extension or renewal of the on-the-job training instructor (OJTI) or synthetic training device instructor (STDI) clause.

Appraiser training - leads to the issuance, extension or renewal of the appraiser's clause.

Foreign authors also deal with the issue of air traffic controllers and air traffic controller training. To clarify the issue, studies and publications in the field of Air Traffic Control (ATC) were searched. The main task was to clarify the latest trends and get acquainted with the development of new technologies and approaches in ATC training. The studies based on which they were selected made it possible to clearly define the requirements for ensuring the safe flow of air traffic, focusing on the area of air traffic control.

According to research by Ron J.C.M. Salden et.al, which was based on a selection of 4 different training methods, showed differences in training effectiveness. Research has shown that personalized task selection led to more effective training. The results were discussed and offered room for further observation.[2]

The main idea of the research according to Camp, Gino & Paas et.al, is the method of conducting the training of air traffic controllers. Training was conducted using 5 different instructional strategies. It was found that simulator training and real traffic training acted as two distinct training courses. In the future, there is an interest in aligning these two trainings so that they would lead to professional training with one goal.[3]

According to Oprins, Esther & Burggraaff et al., air traffic control in the Netherlands is based on a serious assessment system in the air traffic control simulator as well as in real traffic training. The authors analyze the current unsatisfactory system and describe the process of designing a new evaluation model, reporting on the results and characteristics of the competency-based system in air traffic management in the Netherlands.[4]

According to Updegrove, Jessica & Jafer, Shafagh, by analyzing the use of simulation in FAA (Federal Aviation Administration) academy ATC training and addressing a proposal to improve the course's training program, it was found that the training was conducted in an outdated way of teaching. After reviewing the available literature on current training techniques at training centers and the FAA academy, recommendations included voice synthesis and recognition technology and updating the simulator to current trends, so playback and recording functions could be utilized. [5]

According to Shirali, Gholamabbas & Malekzadeh, Maryam with increasing air traffic, the human factor research of future or current air traffic controllers also requires the use of new sophisticated systems. The main topic is the workload in performing the duties and tasks of an ATC officer. For progress in the theory and in the design of new systems and procedures, the currently valid methods of assessing the deficiencies of high-frequency radiation as well as the change in workload are important. [6]

II. MATERIALS AND METHODS

On the basis of comprehensive knowledge from practice and after the recommendation of professional authorities, it was necessary to deal with the topic in question, to conduct the scientific research itself, which could subsequently be used on a practical scale.

Research problems can be called the educational process in the preparation of military air traffic controllers in the conditions of a training organization and training at the workplace. The problem is also the inconsistency of the application of rules in training between the individual components of air traffic control, as well as the provision of training, the time span between individual trainings, staffing, funding and others. [7]

In order to fulfill the set objectives, the following research methods were used appropriately:

- Method of studying professional literature.
- The method of making statements, their processing and sorting.
- Test method,
- Questionnaire
- A natural pedagogical experiment

The methods intertwined and complemented each other. Each applied method was clearly defined and the data from them aimed at forming research conclusions. The problem-solving methodology was based on the collection and analysis of professional literature from available sources, summarization and synthesis of knowledge.

Methods of summarizing facts and summarizing available data, consulting activities for the interpretation of one's own opinion and the correct formulation of established facts, quantitative evaluation of empirical pre-research of opinions were used to obtain data.

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To fulfill the main part of the work, the following methods were used:

- analytical-synthetic method based on critical thinking;
- comparative analysis and deduction;
- induction;
- comparison;
- abstraction;
- generalization.

It was found that, in addition to health and language proficiency, the prerequisite for the performance of the function of air traffic controller is the completion and successful completion of approved training courses that lead to the acquisition of the relevant qualification categories and clauses for the qualification categories. For a military air traffic controller as a member of the Slovak Armed Forces, in addition to all the mentioned conditions, the fulfillment of marksmanship training and a regular annual examination of movement performance is a condition. .[8]

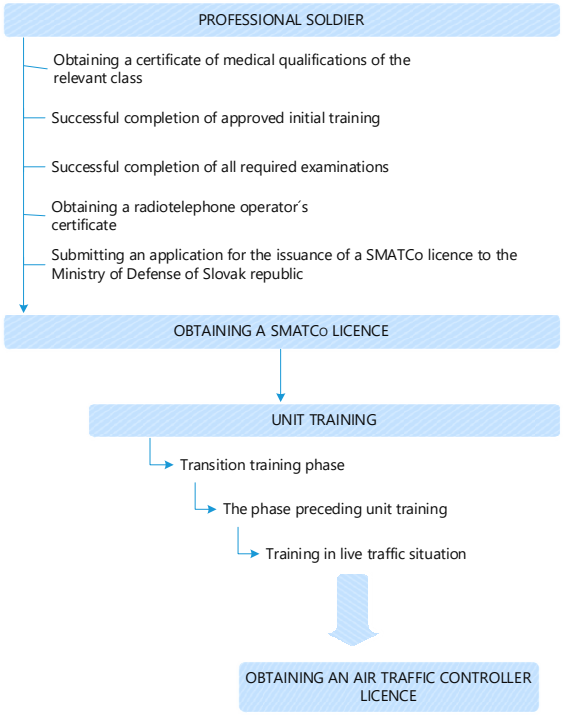

Fig. 1. Basic requirements and their consistency for obtaining a military air traffic controller license.

The chart shows the basic requirements and their sequence for obtaining a military air traffic controller licene.

According to the Act on the Civil Service of a Professional Soldier no. 281/2015 Coll. § 65 effective from 01.02.2023

A professional soldier may be appointed by the service office to a position in the military expertise of an air traffic control specialist, if:

a) meets the educational requirements to perform the function to which he is to be appointed,

b) meets the professional requirements for the performance of the function to which he is to be assigned,

c) meets the level of knowledge of a foreign language, if it is required to perform the function, a

d) the same or higher military rank than the one attained is planned for the position.

The following table shows minimum periods of civil service in military rank, maximum periods of civil service and age limits

military rank	Minimum period of civil service in military rank	Max. period of civil service (temporary civil service) Professional soldiers	Age limit Professional soldiers
Lieutenant	3 years	17 years	55 years
First Lieutenant	3 years	17 years	55 years
Captain	4 years	17 years	55 years
Major	4 years	17 years	55 years
Lieutenant Colonel	3 years	17 years	55 years

Fig. 2. Minimum periods of civil service in military rank, maximum periods of civil service and age limits

According to this regulation, in the rank corps of officers, the requirement for military rank:

a) Lieutenant, first lieutenant and captain is a military program or officer course for university graduates

b) Major is a basic command and staff course (course length 10 weeks)

c) Lieutenant colonel, colonel is a higher command-staff course (course length 15 weeks)

The level of knowledge of a foreign language for the military rank and for the performance of the function

If a level of knowledge of a foreign language is required for the performance of a function and military rank, this usually means the English language. According to the North Atlantic Treaty Organization (The NATO) standardization agreement STANAG 6001, the level of knowledge of English or another foreign language is assessed.

Level of knowledge of a foreign language for military rank:

- Lieutenant is not required
- The first lieutenant is SLP 1111
- Captain, Major, Lieutenant Colonel, Colonel SPL 2222

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The ways in which a professional soldier can obtain performance requirements are:

- In courses for military rank

- In language courses

- Specialized professional courses or in certified institutions.

Requirements for the performance of civil service a professional soldier obtains:

- In an educational and training facility under the jurisdiction of the Ministry of Defense of the Slovak Republic

- In an educational and training facility under the jurisdiction of the Ministry of the Interior of the Slovak Republic

- At civilian universities or civilian educational facilities in the Slovak Republic or abroad

- In educational and training facilities of NATO member states, EU member states, international organizations or other states on the basis of bilateral cooperation with the Ministry of Defense of the Slovak Republic

The requirements for military rank and the required level of knowledge of a foreign language for military rank are acquired by a professional soldier before promotion to military rank.

The requirements mentioned so far have a negative effect on the length of training. These prerequisites for promotion apply to both the air traffic control student and the trained controller during refresher training.

III. DISCUSSION AND RESULTS

From the following figure, it follows that a military student's training took approximately 4 years from the time he joined the Slovak Armed Forces to the time he received the clause at the station. Due to the implementation of the language course, the training was interrupted and thus his acquired habits and experience were lost. The student had to clarify the issue again, which was the reason for the extension of his training.

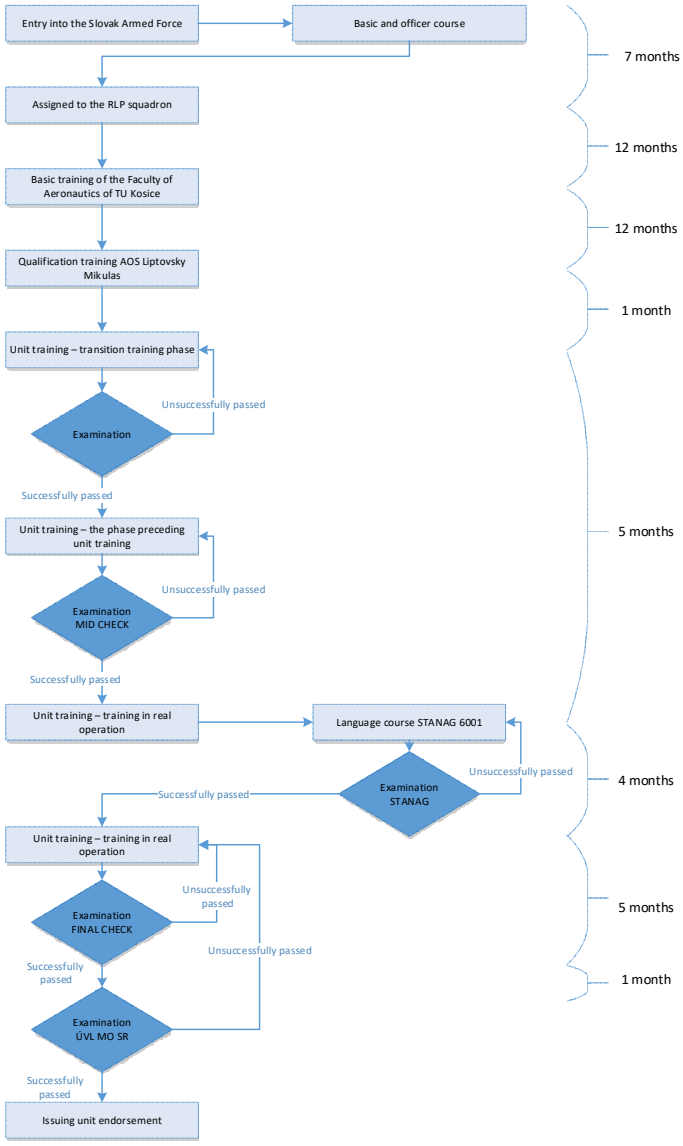

Fig. 3. Military student training scheme

The research results point to other open problems, descriptions of other proposed and planned activities, which directly result from the conclusions obtained in the course of processing the topic so far. Our main goal is the algorithmization of the task and the development of an information model for risk assessment of the practical educational process of preparing military air traffic controllers as part of comprehensive training in the conditions of a training organization and training at the workplace of a

specific provider of air traffic services, from initial training to refresher training. [9]

The mentioned topic of research creates a qualitative environment, necessary to solve the given issue with a significant influence on the area of implementation and security of the training of aviation personnel. The mentioned attributes became the basic element for the formulation of the main goal of the work, with the subsequent possibility of designing a new structure for the preparation of military air traffic controllers in all phases of training. [10]

The subject of the research work is the process of education of air traffic controllers, which is oriented towards the provision of training, the structure of training (physical and temporal) of military air traffic controllers.

The processing of the mentioned structure of the training of military air traffic controllers within the educational process is mainly influenced by the following factors:

• By analyzing the current state of the number of military air traffic controllers

By carrying out scientific research tasks within the scope of the given issue

• Appropriate application of empirical research methods.

To fulfill the main part of the work, the following methods were used:

• analytical-synthetic method based on critical thinking;
• comparative analysis and deduction;
• induction;
• comparison;
• abstraction;
• generalization.

Research has pointed out that a professional soldier can also prove his knowledge of the English language by taking The American Language Course Placement Test (ALCPT). The examination is carried out at the Language Institute and the examination results are recorded in the information system.

A professional soldier must have at least:
50 points for SLP 1111 level,
60 points for SLP 2222 level,
70 points for SLP level 2+2+2+2+.

The validity of the level of English language proficiency demonstrated by the ALCPT test is unlimited for appointment to the same planned military rank achieved by the professional soldier. However, the validity may be limited to 18 months in cases of appointment to a new position, promotion to a military rank or extraordinary promotion to a military rank. It is the examination in the form of the ALCPT test that would lead to the reduction of ATC training time and, above all, there would be no interruption of training and the repetition of certain exercises to clarify the issue of air traffic control.

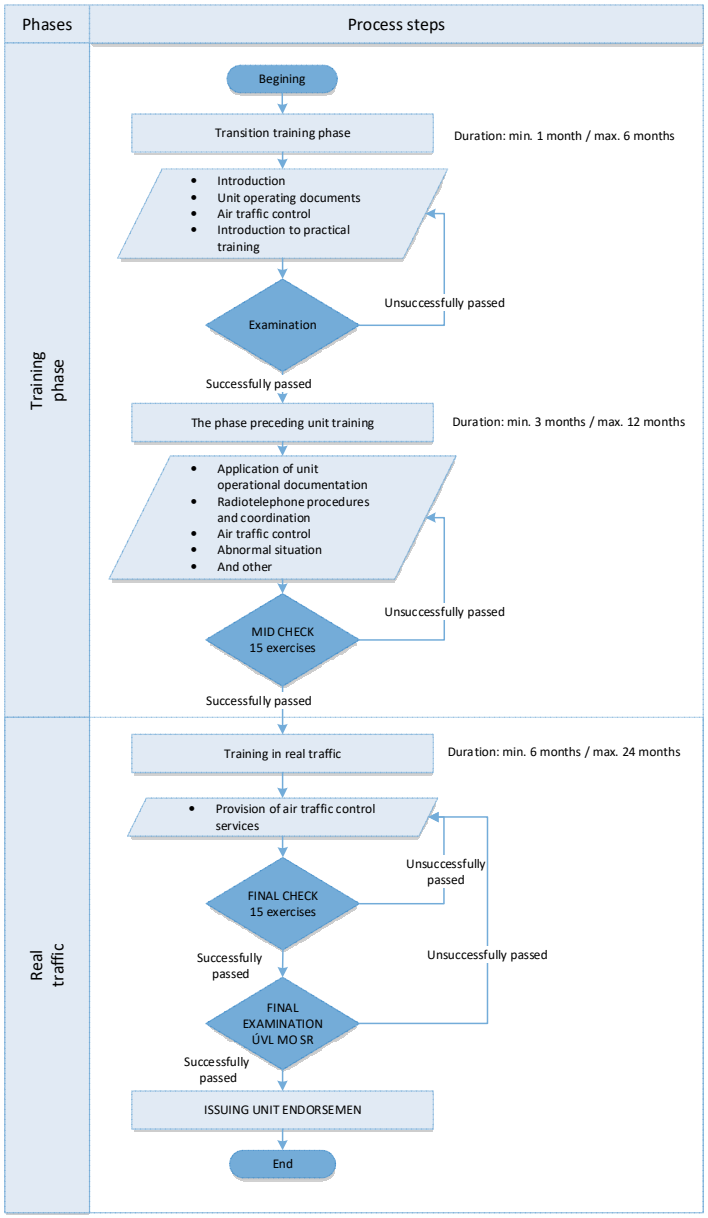

Fig. 4. Process steps of The Unit training

As is clear from the chart, Unit training as the third phase of ATC training can be completed within 10-24 months. With a shortage of military air traffic controllers, research into the algorithmization of training is an important attribute to ensure adequately trained controllers who provide air traffic control service in their area of responsibility.

IV. CONCLUSIONS

The military control of air traffic in the airspace of the Slovak Republic, the priority level of security of the services provided, as well as its effectiveness through military professionals, are complex matters. The dominant factor in it remains the quality of the provided education and training in all parts of the implementation of the educational process. [11] From preparation, through obtaining, to maintaining a valid license for the provision of ATC services in the airspace of the Slovak Republic. The article captures a clear and

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precise presentation of deductions based on the core of the topic. The presented article is a substantive summarization of the current view of the issue being addressed. Research has shown that demonstrating knowledge of the English language through the test ALCPT would lead to a reduction in ATC training time and, above all, there would be no interruption of training and the repetition of certain exercises to clarify the issue of air traffic control.

Based on the findings, the research focused attention on fulfilling the requirements for the performance of the function of a military flight controller, it is necessary to successfully complete two exams in the English language. In order to obtain an air traffic controller's license, it is necessary to fulfill the English language clause (ICAO), the condition for the procedure is the successful completion of the English language test (NATO STANAG 6001). The research points to other open problems, descriptions of other proposed and planned activities, which directly result from the conclusions obtained during the processing of the topic so far.

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