Artículo de investigación

Relevant tasks of professional orientation in aviation specialties: aircraft engineering and flight operation

Актуальные задачи профессиональной ориентации в области авиастроения и летной эксплуатации авиационной техники

Tareas importantes de la orientación profesional en especialidades de aviación: ingeniería aeroespacial y operaciones de vuelo

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Abstract

Relevant tasks of professional orientation for schoolchildren in this field of science and technology are: 1) preparation and continuous updating training manuals devoted to familiarity with engineering and flight professions; 2) implementation of simulator training, for example, glider simulators as demonstration of views about flight; 3) improvement the practice of leading aerospace universities for new students; 4) making use of video materials documentary, popular scientific context and feature films wore widely.

Keywords: Aerospace university, aircraft engineering, aviation, education, flight simulator training, professional orientation.

Аннотация

В статье раскрываются особенности профессиональной ориентации, связанной с авиастроением и летной эксплуатацией авиационной техники. Актуальные задачи профессиональной ориентации для школьников в данной области науки и техники следующие: 1) подготовка и постоянное обновление специализированных учебных пособий по введению в профессию по специальностям инженерного и летного профилей; 2) использование тренажеров, например, тренажеров планеров как демонстрации школьникам представлений о полете; 3) совершенствование комплекса мероприятий, сложившихся в практике ведущих аэрокосмических университетов; 4) более широкое использование видеоматериалов об авиации документальной, научно-популярной и художественной направленности.

Ключевые слова: авиастроение, авиация, аэрокосмический вуз, образование, профессиональная ориентация, тренажерное обучение.

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Resumen

En este artículo se describen las características de la orientación profesional relacionada con la aviación y la operación de vuelo. Los objetivos actuales de la orientación profesional para los alumnos en este campo de la ciencia y la tecnología son los siguientes: 1) la preparación y la actualización constante de los manuales especializados de enseñanza para la introducción en la profesión de las especialidades de los perfiles de ingeniería y de vuelo; 2) implementación de entrenamiento con simuladores, tales como simuladores de planeadores para demostraciones de vistas de vuelos; 3) mejorar el conjunto de actividades realizadas en la práctica de las principales universidades aeroespaciales; 4) aumentar el uso de materiales audiovisuales sobre la aviación en la orientación documental, científica, popular y artística.

Palabras clave: Aviación, construcción aérea, educación, entrenamiento, orientación profesional, universidad aeroespacial.

Introduction

Professional orientation is a system of scientific methods directed to professional self-determination of people and development of their professional qualities according personal abilities and current situation in labor market (Pavlova, 2006; Ponomarenko, 1997). Professional orientation is a subject of researches on the scale of world psychology, various aspects of its organization are considered: approach to better assist gifted and talented adolescents experiencing difficulty with their occupational decisions (Jung J., 2018), career guidance in multicultural societies (Sultana Ronald G., 2017), relationship between the professional/career orientation, awareness of female students and locus of control (Algadheeb Nourah A., 2015), study and analysis on the transversal competences of trainers/teachers, guidance professionals (Prats A. M., & Villalonga L. T., 2018), relevant methods of profession orientation in secondary schools (Kargopolov I.S., 2019) et al.

Theoretical foundation

The need to improve the vocational education of the aviation profession has been substantiated in a number of scientific papers (Gander, Lyssakov, Lyssakova & Shevchenko, 2008; Ponomarenko, 1997). An innovative approach to the organization of profession orientation is implemented by Moscow Aviation Institute (National Research University) (MAI). There are eight directions of such work there (Shemyakov, Tikhonov & Kraev, 2018).

1. The project «Engineering class in Moscow school» is a new-style of supplementary education for schoolchildren in general education programs (mathematics, physics, computer science) and additional engineering subjects, contributing to their professional self-determination. Within the framework of this project, schoolchildren are also being prepared for participation in scientific and technical competitions and competitions, organizing excursions to enterprises of the aerospace industry, and great attention is paid to working with gifted children. For teachers of Moscow schools, the university implements additional professional programs and conducts seminars on the organization of project activities of students.

2. Educational program for schoolchildren «University Saturdays» in MAI with the support of Moscow Department of Education. Then events are thematic courses of master classes «Aviation and cosmonautics: yesterday, today, tomorrow», devoted to the study of the history of aviation and cosmonautics, the designs of modern aircraft, the prospects for the development of aviation and rocket and space technology; excursions to institutes, faculties, research laboratories and resource centers, which demonstrate the most complex equipment and the latest models of equipment of the aerospace complex.

3. Center for technological support of education in the direction of «Unmanned aerial vehicles» one of the main tasks of which is to increase the interest of young people in the development of domestic unmanned aircraft. In particular, the activities of this Center are the development of educational programs, training courses and teaching aids for additional education, the development of a network of circles in the areas of

robotics and aeromodelling in schools and palaces of youthful creativity others.

4. Center for aircraft modeling. The main goal of this Center is to increase the interest of children and teenagers in aircraft modeling sport. Classes are taught by highly professional teachers; in the classroom, schoolchildren will not only learn everything about the device, the designs and the technology for making models but also participate in sports competitions, including world-class ones.

5. Camp sessions in Artek. In 2017, MAI became the thematic partner of Artek international children's center, where it organizes and conducts thematic technical education programs for children aimed at creating and developing engineering thinking, the ability to make independent decisions and effective teamwork in a group.

6. Children's technopark is a platform equipped with high-tech equipment, where programs are implemented, developed together with high-tech aviation enterprises of Moscow in selected areas. In MAI technology park schoolchildren acquire practical skills in working with modern equipment and become familiar with high-tech aviation enterprises. The children's technology park of MAI includes laboratories in the following areas: 3D modeling / industrial design, robotics, additive technologies, composite materials, unmanned aircraft systems (including flight stands for practical study of piloting and aircraft flight dynamics), augmented reality. Also, on the basis of the technology park operates IT-club.

7. Organization and holding of competitions and contests, in which more than three thousand people annually participate:

- Skills competition of National technology initiative (NTI) - «Unmanned aviation systems».
- Polytechnical engineering skills competition «Star».
- Joint intercollegiate mathematical olympiad of schoolchildren.
- Russian aerospace school skills competition.
- International youth scientific conference «Gagarin readings - young scientists' section».
- Moscow city competition «Through thorns to the stars».

8. Welcome days, which allowed schoolchildren to get maximum information about the university, to communicate with management and teachers, visit all the institutes and departments of the university, participate in discussing trends in modern technologies and, of course, learn everything about admission rules and areas of training.

Through professional orientation programs, the following positive trends and results can be stated. On average, in the main specialized areas from 2013 to 2017 the increasing in the passing score of the Unified State Exam was more than 30%. In average annual terms, the increase in its score was about 6% per year. According to official sources in 2017, MAI took the 4th place in Russia and the 1st place in Moscow and the Moscow Region. The average grade point in MAI for the 2017 admission results was 72.57 points. Training programs in information technology and programming have become one of the most sought-after areas among applicants. Also, the interest of those entering the field of engineering specialties for MAI, such as aircraft and helicopter engineering, rocket engineering and propulsion engineering, has significantly increased. Increased competition for training programs related to the study of control systems and integrated aircraft systems. For a number of training programs, the competition in this area amounted to more than 20 applicants per place (Shemyakov, Tikhonov & Kraev, 2018).

To solve the problems of professional orientation to aviation professions a network of specialized general education boarding schools has been launched in Russia. One of them is located in Monino (Moscow region) This is a State-owned educational institution, which is called the Moscow regional cadet boarding school with initial flight training named after three times hero of the Soviet Union A. I. Pokryshkin. Statistics showed that since 2000 more than half of graduates linked the choice of profession with aviation. Almost a quarter of graduates went to study in flight specialties. At the same time, military universities preferred about 50% of the above.

In studies obtained the fact of a significant relationship of profession orientation and level of professionalism in aviation. It is proved that the earlier an interest in the aviation profession arises, the more likely it will be sustainable, and the person who chooses this path will overcome all obstacles to achieving the goal. To confirm this fact, you can bring the results of the study, during which military pilots and test pilots were interviewed. It turned out that most of them, even at school (at the age of 10 to 15 years), were determined in the profession, while the motive for choosing the flight profession was carried out in flying clubs, aircraft modeling circles, parachute sections, through acquaintance with books about aviation. Then, when training in aviation schools, the motive to become pilots received reinforcements at a higher level of training (Gander, Lyssakov, Lyssakova & Shevchenko, 2008; Ponomarenko, 1997).

V.A. Ponomarenko writes that a pilot, after all, begins with a dream, with a belief in an ideal, with overcoming and controlling himself in terms of limiting desires, passions, habits (Ponomarenko, 1997). Flight profession is a dangerous profession. Experiments led by V.A. Ponomarenko showed that in an emergency, more than ¾ time of its localization spent for the decision-making. In 50-60% of cases it is the fear of the error. Psychological readiness for emergencies is not only based on the psycho-physiological organism reserves, but also based on the following qualities: capability for operational thinking; urgent restoration of knowledge necessary for decision-making, existence of high motivation and mind-set for happy outcome, a sense of duty (Ponomarenko, 1997).

In scientific school of V.A. Ponomarenko there was elaborated an integral system of professional important intellectual, psychological and physical qualities for pilots and substantiated the concept of dangerous professions. This concept represents a methodology of systematic and comprehensive medical, psycho-pedagogical, psycho- sociological and ergonomic studies of the human factor in dangerous professions (Ponomarenko, 1997). These researches once again prove importance of professional orientation in the interests of aviation.

Methodology

To identify the most significant methods of profession orientation in aviation specialties, we studied judgments of pupils in the Moscow regional cadet boarding school using specially designed questionnaire. The questionnaire presented the following list of events:

1. Training courses on aviation.
2. Attending the central museum of air force.
3. Welcome days of aerospace universities.
4. Attending Gagarin Research & Test cosmonaut training center, other educational and research organizations.
5. Meetings with air force veterans and cosmonauts.
6. Flights on an aircraft simulator.
7. Literature about aviation from the school library.
8. Information about aviation from the Internet. Instructions for the questionnaire: «What event of the list has the greatest influence on your choice of the aviation profession? Judgements are conducted anonymously. Thanks for participating». The study involved 15-16 years old men (N=50).

Results

Statistical treatment revealed event rating in decreasing of the importance for cadets (%). The study details are:

1. Flights on an aircraft simulator (32%).
2. Welcome days of aerospace universities (18%).
3. Attending Gagarin Research & Test Cosmonaut training center, other educational and research organizations (12%).
4. Meetings with air force veterans and cosmonauts (10%).
5. Training courses on aviation (8%).
6. Attending the central museum of air force (6%).
7. Information about aviation from the internet (4%).
8. Literature about aviation from the school library (2%).

Four survey participants submitted blank forms, i.e. 8% of students did not show interest to aviation. So, the respondents' answers were analyzed. All of the above positions are divided into three groups according to rating. The first group included questions numbered 1 and 2 (flights on an aircraft simulator and welcome days of aerospace universities). The second

group was covered numbers 3, 4, 5, 6. The events at numbers 7 and 8 presented the third group.

Discussion

During the initial flight training the simulator of basic trainer airplane is used. The results of the flights on the simulator are considered when selecting candidates for flight practice. Therefore, the cadets' emphasis on the importance of the simulator actually expresses their desire for real flights and, consequently, for mastering the profession. For engineering classes of secondary schools, we consider it possible to use a glider simulator, which is the simplest in its design, which will allow students to develop dynamic piloting experience and basic ideas about the capabilities and limitations of the aircraft operator.

Visits in aerospace universities, particulars, MAI is a common practice for the Moscow regional cadet. Acquaintance with aerospace universities is carried out in the framework of the Moscow regional cadet boarding school's planned practice, in particular, together with MAI. Excursions to MAI allow schoolchildren to get full information about the university, to communicate with the administration and academics, to visit all the institutes and faculties of the university, to participate in the discussion of trends in modern technologies and, of course, to get comprehensive information about admission rules and areas of training. Cadets attend MAI Military Institute with interest, get acquainted with its structure heads of departments of the institute in various specialties, samples of real aviation and rocket technology.

As a result of this approach whole picture for aviation is formed. Of all the variety of professions you can choose the one that causes the greatest interest corresponds to the psychological and physical qualities. In addition, pupils using knowledge about the characteristics of each profession study related areas with interest, for example, an engineer who will study at an engineering university and receive basic engineering education may begin to master the flight profession at the training airfield at MAI and continue to study at civil or military aviation. Graduates of all faculties and institutes of MAI have the opportunity to receive additional Teacher education in courses on vocational retraining and to link their professional activities with the teaching profession.

The group of events occupying the second position are the most numerous. Visit to Gagarin research & test cosmonaut training center, other educational and research organizations, meetings with Air force veterans and cosmonauts, classes in aviation disciplines, visiting the central museum of air force are allows cadets to form a stable motive for the aviation profession. The question of the impact of meetings with veterans of aviation and cosmonautics implied specially organized meetings, for example, in the Central museum of air force and Gagarin research & test cosmonaut training center. Thus, all the activities of this group have common grounds: communication with professionals, the study of the history of aviation and cosmonautics including the real exhibits of aviation and space technology.

The third group, which the students identified, was related to sources of aviation knowledge from the Internet and books from the school's library fund. It should be noted that aviation topics in the school library are very convincing. There are books on special aviation subjects (aerodynamics, navigation, aircraft and engine design, etc.), as well as books on aviation history, heroes: pilots, designers, engineers, astronauts, a textbook «Introduction to the military-aviation profession» (Gander, Lyssakov, Lyssakova & Shevchenko, 2008). We give the contents of the chapters, which reflects the historical, theoretical analysis of the flight profession includes a psychological workshop and video materials.

Chapter 1. Military aviation profession: recent years, nowadays, prospection.
1.1. The history of military aviation in Russia.
1.2. Maine professions in the air force.
1.3. New developments of military-aviation profession.

Chapter 2. The way to aviation.
2.1. The concept of profession orientation.
2.2. Essence of professional selection.
2.3. Flight and life experience.

Chapter 3. Personality properties in flight.
3.1. Temperament and individuality.
3.2. Character, character building.
3.3. Methods of general and special abilities' development.

Chapter 4. Psychological workshop devoted to qualities, necessary for flight.
4.1 Stress resistance and self-confidence.
4.2. Successful communication.
4.3. Memory, imagination, thinking.

It is clear that the textbook published in 2008 did not discuss topics related to the organization of

training and labor of operators of unmanned aerial vehicles, mainstreaming of augmented reality technology, the functioning of air force as a part of aerospace forces and other pressing issues. Therefore, it is necessary to create a modern fund of textbooks adapted for schoolchildren.

However, the studying of professionally-oriented historical sources is schoolchildren independent work which skills are not formed yet. In fact, a search of books is an important method of professional orientation because ability to obtain independently new knowledge and skills and apply them in vocational fields is essential professional competence.

Receiving information about aviation from the Internet as a method of professional orientation has great cognitive resource. It is necessary to understand the principles of e-learning, to make the fullest possible use of its advantages at a stage of the prior acquaintance to aviation professions. Watching by schoolchildren documentary, educational films and movies about aviation and its creators is relevant approach to the organization of professional orientation. Most importantly, all filmography must be reliable and emotional.

Still, the Soviet film «Only old men are going to battle» (1973) remains unsurpassed in terms of emotional impact and accuracy of professional characteristics telling about the everyday life of fighter pilots during World War II. It is based on certain historical events. Many characters had real prototypes. This famous movie took part in raising several generations of pilots.

Conclusions

Professional orientation in aviation specialties such as aircraft engineering and flight operation has significant pedagogical potential, because it has an applied character, connection with engineering and flight practice, patriotic and moral education. These professional areas have a great social value for development of defense capability, economy, transportation. Aircraft engineering and flight operation are high-tech professions therefore they are focused on the high intellectual level in graduates. Flight profession as a dangerous profession demands special preparation and existence of certain professionally important qualities of pilots.

The methodology of professional orientation to the engineering and flight directions is created and it showed the efficiency and undoubted applied value now. Nevertheless, this methodology is the developing system which has to consider features of technological advances in the aerospace sphere and requests of the aerospace industry.

Thus, relevant tasks of professional orientation for schoolchildren in this field of science and technology are the following: preparation and continuous updating training manuals, implementation of simulator training, improvement the practice of leading aerospace universities for new students and making use of video materials documentary, popular scientific context and feature films wore widely.

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