

## **THE POPULARITY OF STUDY PROGRAMMES IN AVIATION AREA AMONG THE APPLICANTS TO LITHUANIAN HIGHER SCHOOLS**

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The integration of Lithuania to the European Union made transport (including air transport) one of the most important branches of national economy. Presently, economic development is hardly possible without an efficient transport system (providing both local and international transportation via aircrafts). The operation of industrial, construction and agricultural enterprises as well as work efficiency and a public opinion largely depend on the reliability and effective performance of air transport system which is not possible to exist and operate without qualified specialists in aviation area (bachelors and masters). The paper presents requirements raised for controlling the abilities and level of educating specialists in Aviation area. Specialists in Aviation area are trained at vocational and higher schools of Lithuania. Experts in the field of Aviation are trained at two university-level higher schools in Lithuania (Bachelors, Masters and Doctors) including Vilnius Gediminas Technical University and The General Jonas Žemaitis Military Academy of Lithuania (the introduced higher schools are located in Vilnius, the capital of Lithuania). A brief survey of admission to Lithuanian higher schools is analysed in the article, as well as some statistical data on the popularity of study programmes chosen by the applicants participating in the joint admission programme to Lithuanian higher schools, and the popularity of the study programmes of Aviation (competition, competitiveness indices and average competitive marks and motivation indices) available at two higher schools of Lithuania.

**Keywords:** *aviation, higher schools of Lithuania, applicants, joint admission, study programmes, statistical data, competition, competitiveness index, motivation index, average competitive mark, popularity*

### **1. Introduction**

A modern society places a particular emphasis on technological and social sciences because of prosperity of a state depends on a sufficient amount of highly qualified specialists in technologies, economics and management (for example aviation technologies, aviation management). The demand for specialists in technological and social sciences, their competitiveness in the labour market, prestige and payment as well as the popularity of these specialities among school-leavers have changed considerably during the nineteen years of Lithuanian independence.

The integration of Lithuania to the European Union made transport (road transport, railway transport, water land transport, aviation) one of the most important branches of national economy [Prentkovskis, et al. 2008; Vasiliauskas and Barysienė, 2008]. Presently, economic development is hardly possible without an efficient transport system (providing both local and international transportation via aircrafts). The operation of industrial, construction and agricultural enterprises as well as work efficiency and a public opinion largely depend on the reliability and effective performance of transport systems [Prentkovskis, et al. 2007, 2008; Burinskienė, 2009]. Transport is a branch of producing material values associated with the transportation of people and goods.

Every country (not only Lithuania) needs highly qualified specialists in the aviation area. The issues of training specialists in aviation (for example, aircraft pilots, air traffic controllers, aviation mechanics, etc.) as well as in other sectors are not new because they are closely connected with the general problems of education. All these questions have been investigated by scientists from various countries, for example [Prentkovskis, et al. 2009], [Ledauskaitė and Bazaras, 2008], [Lin and Juan, 2007].

### **2. About Study Programmes in Aviation Area at Lithuanian University-Level Higher Schools**

Specialists in aviation area are professionally trained by the higher schools of Lithuania. There are two types of higher schools in Lithuania providing university-level education (universities and academies) and non-university-level education (colleges) [Prentkovskis, et al. 2007 and 2009; Kliukas, et al. 2007; Daniūnas, et al. 2007; Kliukas and Vadlūga, 2008]. Graduates from professional training schools obtain professional staff qualification. Those from university-level higher schools are awarded diplomas

certifying higher university-level education and the Bachelor’s degree while graduates from non-university-level higher schools get diplomas certifying non-university-level education and a particular qualification. Since 2007, the graduates from colleges have been awarded the Professional Bachelor’s degree [Prentkovskis et al. 2007, 2008 and 2009; Ginevičienė, et al. 2007].

There are 6 groups of study areas in Lithuania: Technological Sciences, Social Sciences, Physical Sciences, Biomedicine Sciences, Humanities and Fine Arts.

The study programmes of aviation area belong to the group of Technological Sciences [Kliukas, et al. 2006; Open Information ...; Website of Vilnius Gediminas...; Website of the General ...].

Specialists in the aviation area are trained at two university-level higher schools of Lithuania [Open Information ...; Website of Vilnius Gediminas ...; Website of The General ...] – Vilnius Gediminas Technical University and The General Jonas Žemaitis Military Academy of Lithuania (see Table 1). Both institutions are located in Vilnius, the capital of Lithuania.

Specialists in aviation area with Bachelor’s, Master’s and Doctor’s degrees are trained at Vilnius Gediminas Technical University [Website of Vilnius Gediminas ...].

The General Jonas Žemaitis Military Academy of Lithuania trains only specialists with Bachelor’s degree and Engineers [Website of The General ...]. The graduates are awarded not only the Bachelor’s degree but also a military rank of Platoon Commander. For getting the Master’s and Doctor’s degree, the graduates should choose another study programme or higher school (university) of Lithuania. Bachelor’s studies and Integrated Studies of the Academy are held in collaboration with Vilnius Gediminas Technical University.

The popularity of programmes leading to the Bachelor’s degree in aviation area in two Lithuanian universities is considered below (see Table 2 and the following Chapters).

**Table 1.** Study programmes available at university-level higher schools of Lithuania in the aviation area

Bachelor’s study programmes	Integrated or Master’s study programmes	Doctor’s (PhD) study programmes
<b>Vilnius Gediminas Technical University</b>		
<b>Aircraft Piloting</b> <i>Qualification – Bachelor of Transport Engineering</i>	<b>Aircraft Piloting</b> <i>Qualification – Pilot, Engineer of Aviation</i>	<b>Transport Engineering (Technological Sciences)</b> <i>Qualification – Doctor of Technological Sciences</i>
<b>Air Traffic Control</b> <i>Qualification – Bachelor of Transport Engineering</i>	<b>Air Traffic Control</b> <i>Qualification – Air Traffic Controller, Engineer Aviation</i>	<i>Qualification – Doctor of Technological Sciences</i>
<b>Aviation Mechanics</b> <i>Qualification – Bachelor of Mechanical Engineering</i>	Aviation Mechanics <i>Qualification – Master of Mechanical Engineering</i>	<b>Mechanical Engineering (Technological Sciences)</b> <i>Qualification – Doctor of Technological Sciences</i>
<b>Electronics Engineering (Avionics)</b> <i>Qualification – Bachelor of Electronics Engineering</i>	Avionics <i>Qualification – Master of Electronics Engineering</i>	<b>Electronics Engineering (Technological Sciences)</b> <i>Qualification – Doctor of Technological Sciences</i>
<b>Automation and Control (Aviation Electrical Equipment)</b> <i>Qualification – Bachelor of Electrical Engineering</i>	Aviation Electric Equipment and Systems <i>Qualification – Master of Electrical Engineering</i>	<b>Electrical Engineering (Technological Sciences)</b> <i>Qualification – Doctor of Technological Sciences</i>
<b>The General Jonas Žemaitis Military Academy of Lithuania</b>		
<b>Aircraft Piloting</b> <i>Qualification – Bachelor of Transport Engineering</i> Platoon Commander Training	<b>Aircraft Piloting</b> <i>Qualification – Pilot, Engineer of Aviation</i> Platoon Commander Training	–
<b>Air Traffic Control</b> <i>Qualification – Bachelor of Transport Engineering</i> Platoon Commander Training	<b>Air Traffic Control</b> <i>Qualification – Air Traffic Controller, Engineer Aviation</i> Platoon Commander Training	–
<b>Aviation Mechanics</b> <i>Qualification – Bachelor of Mechanical Engineering</i> Platoon Commander Training		–
<b>Electronics Engineering (Avionics)</b> <i>Qualification – Bachelor of Electronics Engineering</i> Platoon Commander Training		–
<b>Automation and Control (Aviation Electrical Equipment)</b> <i>Qualification – Bachelor of Electrical Engineering</i> Platoon Commander Training		–

**Table 2.** Bachelor's study programmes in aviation area in Vilnius Gediminas Technical University and The General Jonas Žemaitis Military Academy of Lithuania

Bachelor's study programme	The objectives of the study programme and competencies acquired	Professional status, access to further studies
<b>Aircraft Piloting</b>	Completion of BSc programme assures of gaining higher education in the area of technological sciences. Graduate is awarded the Bachelor's degree in Transport Engineering and the pilot's licence. The graduates are ready to apply their knowledge in companies which provide different service in aviation or continue studies for the qualification of a pilot-aviation engineer.	Graduates have been prepared to work applying their knowledge in enterprises involved in the maintenance of single-engine aircrafts, the ones concerned with the aviation equipment, service and infrastructure, or the service in tourism and commerce.
<b>Air Traffic Control</b>	The Completion of BSc programme assures gaining of higher education in transport engineering the area of technological sciences. The graduates are awarded the Bachelor's degree in Transport Engineering. The graduates are prepared to apply their knowledge in companies which provide different service in aviation or they can continue special professional studies in air traffic control.	Graduates are prepared to apply their knowledge working in organisations concerned with the air traffic control and the ones concerned with service and infrastructure of air traffic, though they cannot work as air traffic managers.
<b>Aviation Mechanics</b>	A Bachelor of Mechanical Engineering can demonstrate a sound understanding of the principles upon which modern aircraft are designed, demonstrate a knowledge of the aircraft industry as a business enterprise in a national and international economy, demonstrate an ability to organize and manage people and resources, and work within and lead teams.	Graduate are prepared to work in the government air transport institutions, different kinds of research and design enterprises, industrial and transport enterprises, private aviation business, or they may enter Master studies.
<b>Electronics Engineering (Avionics)</b>	A Bachelor of Electronics Engineering is acquainted with the up-to-date electronics technologies, their development tendencies and design principles, is able to formulate and solve electronics engineering problems, is able to make use of information technologies, is competent to use computers for getting and processing the problem solution data, to design modern computerized systems, different microcomputer-controlled devices and systems, has the ability to maintain and administer electronic, computer equipment, is able to experiment, analyse data and can develop software.	Graduates are prepared to work at enterprises designing, manufacturing or maintaining electronic, computer and telecommunication equipment as well as at enterprises implementing and updating information systems or they can enter Master studies.
<b>Automation and Control (Aviation Electrical Equipment)</b>	Bachelor of Electrical Engineering gets acquainted with up-to-date electrical and electronics engineering technologies, automation development tendencies and design principles of their systems, is able to use information technologies; is competent to use computers for getting and processing the problem solution data, for control of technological processes and equipments, automated design, is able to design automated systems, electrical systems of objects, to experiment, analyse and interpret data, is able to programme, is interested in science innovations.	Graduates are prepared to work in enterprises designing and maintaining automated devices and automatic systems as well as in different kinds of enterprises of industry, transport, engineering and construction, or they can enter Master studies.

### 3. Briefly of the Admission System for Lithuanian Higher Schools

Lithuanian higher schools formed the Association of Lithuanian Higher Education Institutions to implement the programme of joint admission [Kliukas, et al. 2006 and 2007; Prentkovskis, et al. 2007, 2008 and 2009; Kliukas and Vadlūga, 2008] helping the applicants to enter a higher school and to reduce the risk of a single possible choice making the selection of potential students more objective and simplifying the entrance by allowing them to apply to several higher schools simultaneously.

Based on this programme, an applicant is given an opportunity to choose a higher school and a study programme according to his/her order of preference and depending on the marks obtained in a secondary school. An applicant submits an application to any of the higher schools of the Association allowing him/her to select a number of study programmes in several higher schools [Kliukas, et al. 2006; Prentkovskis, et al. 2007, 2008 and 2009].

Seventeen university-level higher schools and two non-university-level higher schools formed the Association (sixteen higher schools are state-owned and three higher schools are private).

In 2008, Lithuanian higher schools participating in the joint applicants' admission programme offered 732 study programmes including full-time (daytime) studies, part-time (evening) studies, part-time (extra-mural) studies in 62 fields falling into 6 groups of study areas: Technological Sciences, Social Sciences, Physical Sciences, Biomedicine Sciences, Humanities and Fine Arts [Prentkovskis et al. 2008; Database of Joint Admission...].

A chart and description of the main parts of the joint applicants' admission programme to Lithuanian higher schools are presented in other papers [Prentkovskis, et al. 2007, 2008 and 2009; Daniūnas, et al. 2007; Kliukas and Vadlūga, 2008].

The applicants to Lithuanian higher schools are admitted based on their competitive marks calculated for each study programme mentioned in each application. Competitive marks are calculated for particular study programmes according to the standing rules of particular schools. Actually, there are no entrance examinations to Lithuanian higher schools. They should be taken only by the applicants to some specific study programmes such as architecture, arts, design, fire prevention, aircraft piloting, aircraft traffic control, etc.

Competitive marks [Website of Vilnius Gediminas ...; Website of the General ...]; [Prentkovskis, et al. 2008] of the applicants allowing them to study according to the programmes in aviation area at two Lithuanian higher schools are presented in Table 3.

**Table 3.** Competitive marks (without any additional points) of applicants to study according to the programmes in aviation area Vilnius Gediminas Technical University and The General Jonas Žemaitis Military Academy of Lithuania in 2008

Examination mark at secondary school	Weighted coefficient	A yearly mark in school-leaving certificate at secondary school	Weighted coefficient	The highest competitive mark (without any additional points) available at higher school
<b>Aviation Mechanics, Electronics Engineering (Avionics), Automation and Control (Aviation Electrical Equipment)</b>				
mathematics	0.50	a foreign language	0.15	21.35
Lithuanian language	0.20			
physics	0.15			
<b>Aircraft Piloting, Air Traffic Control</b>				
mathematics	0.50	a foreign language	0.15	21.35
Lithuanian language	0.20			
physics	0.15			
test on physical preparation	0.00 (evaluation must be positive)			
test on professional suitability	0.00 (evaluation must be positive)			

#### 4. Some Statistical Data on the Popularity of Study Programmes Chosen by the Applicants Participating in the Joint Admission Programme for Lithuanian Higher Schools

*General statistical data* are given based on the Database of Joint Admission to Lithuanian higher schools [Prentkovskis, et al. 2009]. As mentioned above, there are 6 groups of study areas in Lithuania: Technological Sciences, Social Sciences, Physical Sciences, Biomedicine Sciences, Humanities and Fine Arts. As shown in above mentioned research, the major part of applicants (46.72%) makes a motivated choice of the study programme in a particular area of knowledge, 34.20% – in two areas, 15.31% – in three areas, 3.32% – in four areas, 0.44% – in five areas, 0.01% – in six areas. Referring the above mentioned research, the average number of study programmes in school-leavers’ applications has been constant for some years and makes about 9 points.

*The popularity of the study programmes* in aviation area in school-leavers’ applications (competition based on choice No 1 and all choices) in 2008 is shown on Figure 1. This may be accounted for by the fact that the study programmes at Vilnius Gediminas Technical University are intended for civilians, whereas the study programmes offered by The General Jonas Žemaitis Military Academy of Lithuania is specific (being intended for training not only specialists in aviation area but also military specialists – Platoon Commanders). The applicants for the Academy are required to be in an especially good physical form and professionally fit while school-leavers, as a fact, often fail these requirements.

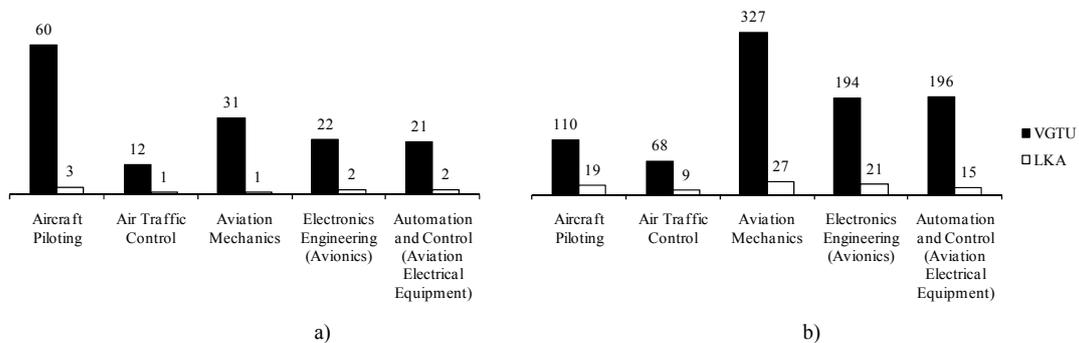


Figure 1. The popularity of the study programmes in aviation area in 2008: a – competition based on choice No 1; b – competition based on all choices

**The competitiveness index** [Kliukas, et al. 2006; Prentkovskis, et al. 2007, 2008 and 2009] shows preparation for studies and the intellectual potential of the admitted to a particular study programme. It is calculated as the average mark of the key subjects in the school-leaving certificates of all admitted to study this programme.

The competitiveness index of the admitted to study a particular study programme is calculated in the following way:

$$I_c = \frac{\sum_{i=1}^m \left( \frac{LL + M + P + FL + H}{5} \right)}{m},$$

where:  $I_c$  – the competitiveness index of the admitted to a particular study programme;  $m$  is the number of the admitted to the study programme;  $LL$  – a mark for Lithuanian language in school-leaving certificate;  $M$  – a mark for mathematics in school-leaving certificate;  $P$  – a mark for physics in school-leaving certificate;  $FL$  – a mark for a foreign language;  $H$  – a mark for history in school-leaving certificate.

To calculate  $I_c$ , a mark obtained at secondary school-leaving state examination [Kliukas et al. 2006] is considered. In case this exam was not taken, the mark obtained at school-leaving examination is considered. The competitiveness index shows the competitiveness of an applicant to study any programmes at a higher school (compared to other applicants). The higher is the competitiveness index of a study programme the higher is the general level of education of a person admitted to study a particular programme.

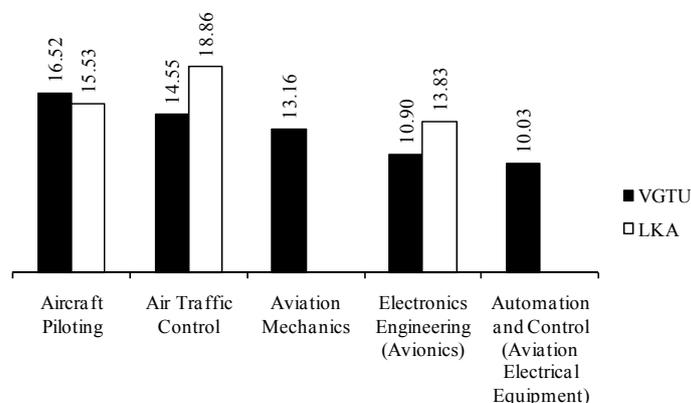
The highest possible competitiveness index of the best applicant is equal to  $I_c = 23.00$ .

The competitiveness indices of full-time studies in aviation area study programmes are given in Table 4 and Figure 2. As shown, more qualified applicants were admitted to study *Aircraft Piloting* programme at Vilnius Gediminas Technical University and *Air Traffic Control* programme at The General Jonas Žemaitis Military Academy of Lithuania in 2008.

**Table 4.** The competitiveness indices of full-time studies in aviation area university-level study programmes in 2005–2008 (the best possible value of the competitive index is 23.00)

Study Programme	2005		2006		2007		2008	
	VG TU	LKA	VG TU	LKA	VG TU	LKA	VG TU	LKA
Aircraft Piloting	15.01	–	16.14	–	14.75	11.91	16.52	15.53
Air Traffic Control	11.99	–	13.79	–	11.73	–	14.55	18.86
Aviation Mechanics	14.12	–	13.67	–	13.72	16.98	13.16	–
Electronics Engineering (Avionics)	12.45	–	12.16	–	8.57	15.36	10.9	13.83
Automation and Control (Aviation Electrical Equipment)	10.02	–	11.75	–	9.71	9.02	10.03	15.53

VG TU – Vilnius Gediminas Technical University  
LKA – The General Jonas Žemaitis Military Academy of Lithuania



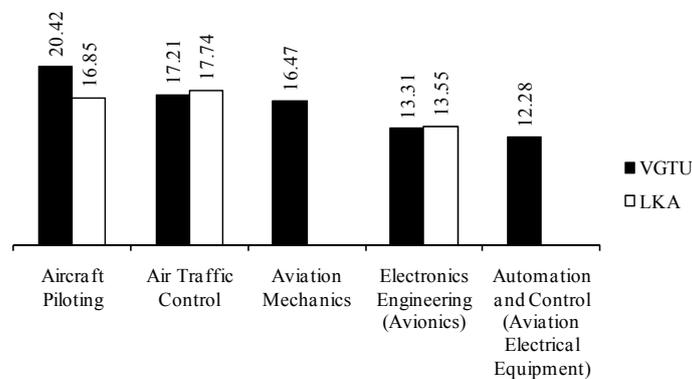
**Figure 2.** The competitiveness indices of full-time studies in aviation area university-level study programmes in 2008 (the best possible value of the competitive index is 23.00)

**Average competitive mark.** The preparation level of the admitted to study according to a particular programme may be determined based on the average competitive marks of all admitted students, particularly, taking into account that the competitive mark (21.35) is the same for the above discussed study programmes in aviation area. Average competitive marks for full-time studies in aviation area study programmes are given in Table 5 and Figure 3. As shown above, more qualified applicants were admitted to study *Aircraft Piloting* programme at Vilnius Gediminas Technical University and *Air Traffic Control* programme at The General Jonas Žemaitis Military Academy of Lithuania in 2008.

**Table 5.** The average competitive marks of full-time studies in aviation area university-level study programmes in 2005–2008 (the best possible value of the average competitive mark is 21.35)

Study Programme	2005		2006		2007		2008	
	VG TU	LKA	VG TU	LKA	VG TU	LKA	VG TU	LKA
Aircraft Piloting	18.26	–	18.93	–	18.89	15.72	20.42	16.85
Air Traffic Control	15.38	–	16.69	–	13.49	–	17.21	17.74
Aviation Mechanics	16.24	–	17.21	–	15.77	19.31	16.47	–
Electronics Engineering (Avionics)	14.08	–	14.81	–	10.53	18.20	13.31	13.55
Automation and Control (Aviation Electrical Equipment)	13.11	–	14.72	–	11.65	12.65	12.28	16.85

VG TU – Vilnius Gediminas Technical University  
LKA – The General Jonas Žemaitis Military Academy of Lithuania



**Figure 3.** The average competitive marks of full-time studies in aviation area university-level study programmes in 2008 (the best possible value of the average competitive mark is 21.35)

**Motivation index.** Training a qualified specialist depends not only on the number of qualified university teachers, well-equipped laboratories and training centres but also on the thirst for knowledge and the eagerness of an applicant to become a qualified specialist in the selected field, i.e. his/her motivation that is reflected by the order of preference given by an applicant to a particular study programme in the application to a higher school.

The motivation index [Kliukas, et al. 2006; Prentkovskis, et al. 2007, 2008 and 2009] is calculated by the formula:

$$I_m = \frac{\sum_{i=1}^m O_i}{m},$$

where:  $I_m$  – the motivation index of a particular study programme;  $O_i$  – the order of preference (No) given by the  $i$ -th applicant to a particular study programme;  $m$  – the number of applicants admitted to a particular study programme.

The lower is the index value the higher is the motivation of applicants taking a particular study programme.

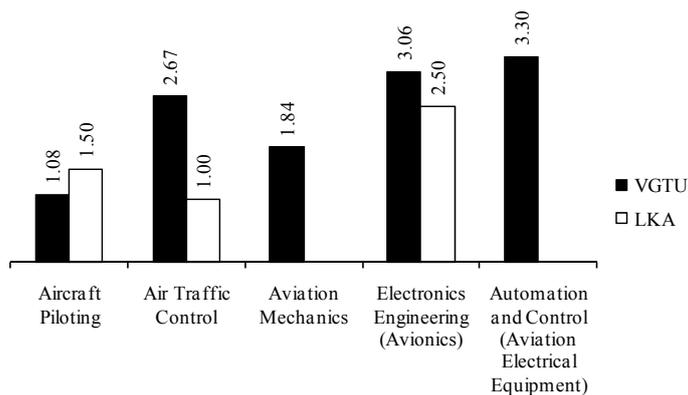
The ideal motivation index is  $I_m = 1.00$  when all school-leavers admitted to a particular study programme mention it in the application as choice No 1.

The motivation indices of full-time studies in aviation area study programmes are given in Table 6 and Figure 4. As shown, higher motivated applicants (eager to make a career in National Defence) were admitted to study *Aircraft Piloting* programme at Vilnius Gediminas Technical University and *Air Traffic Control* programme at The General Jonas Žemaitis Military Academy of Lithuania in 2008.

**Table 6.** The motivation indices of full-time studies in aviation area university-level study programmes in 2005–2008 (the best possible value of the motivation index is 1.00)

Study Programme	2005		2006		2007		2008	
	VG TU	LKA	VG TU	LKA	VG TU	LKA	VG TU	LKA
Aircraft Piloting	1.00	–	1.00	–	1.00	1.25	1.08	1.50
Air Traffic Control	1.82	–	1.64	–	1.82	–	2.67	1.00
Aviation Mechanics	4.47	–	2.62	–	1.66	1.00	1.84	–
Electronics Engineering (Avionics)	5.11	–	3.06	–	3.21	1.00	3.06	2.50
Automation and Control (Aviation Electrical Equipment)	4.67	–	3.67	–	2.71	7.00	3.30	1.50

VG TU – Vilnius Gediminas Technical University  
LKA – The General Jonas Žemaitis Military Academy of Lithuania



*Figure 4.* The motivation indices of full-time studies in aviation area university-level study programmes in 2008 (the best possible value of the motivation index is 1.00)

**5. Conclusions**

1. The integration of Lithuania to the European Union made transport (including air transport) one of the most important branches of national economy. Presently, economic development is hardly possible without an efficient transport system (providing both local and international transportation via aircrafts).
2. The operation of industrial, construction and agricultural enterprises as well as work efficiency and a public opinion largely depends on the reliability and effective performance of air transport system which is not possible without qualified specialists in aviation area (Bachelors and Masters).
3. Specialists in Aviation area are trained at vocational and higher schools of Lithuania. Experts in the field of Aviation are trained at two university-level higher schools in Lithuania (Bachelors, Masters and Doctors) including Vilnius Gediminas Technical University and The General Jonas Žemaitis Military Academy of Lithuania.
4. Lithuanian higher schools formed the Association of Lithuanian Higher Education Institutions to implement the programme of joint admission helping the applicants to enter a higher school and to reduce the risk of a single possible choice as well as making the selection of potential students more objective. This also simplifies the entrance by allowing school-leavers to simultaneously apply to several higher schools. Based on this programme, an applicant is given the opportunity to choose a higher school and a study programme according to his/her order of preference and depending on the marks obtained at a secondary school. An applicant submits an application to any of the higher schools of the Association, which allows him/her to select a number of study programmes in several higher schools. Most of the applicants to the higher schools of Lithuania indicate study programmes in one or two groups of study areas. The average number of study programmes in the school-leaver’s application is about nine.
5. The educational level of the applicants and those admitted to take various study programmes can be defined by their competitive marks and competitiveness indices. The competitiveness index shows the level of preparation for studies and intellectual potential of the applicant admitted to a particular study programme. Average competitive marks for full-time studies in aviation area study programmes are given (the best possible value of the average competitive mark is 21.35). As shown

in the paper, more qualified applicants were admitted to study *Aircraft Piloting* programme at Vilnius Gediminas Technical University and *Air Traffic Control* programme at The General Jonas Žemaitis Military Academy of Lithuania (eager to make a career in National Defense) in 2008. The competitiveness indices of full-time studies in aviation area study programmes are given (the best possible value of the average competitive mark is 23.00). As indicated in the paper, more qualified applicants were admitted to study *Aircraft Piloting* programme at Vilnius Gediminas Technical University and *Air Traffic Control* programme at The General Jonas Žemaitis Military Academy of Lithuania (eager to make a career in National Defense) in 2008.

6. Motivation is reflected by the order of preference given by an applicant to a particular study programme in the application for admission to a higher school. The motivation indices of full-time studies in aviation area study programmes are given (the best possible value of the average competitive mark is 1.00). As presented in the paper, higher motivated applicants were admitted to study *Aircraft Piloting* programme at Vilnius Gediminas Technical University and *Air Traffic Control* programme at The General Jonas Žemaitis Military Academy of Lithuania (eager to make a career in National Defense) in 2008.

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