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CLUSTER MARKET OF CIVIL AVIATION TRAINING COMPLEX SERVICES

Fuad Mirzayev, Gulnara Ahmadova, Kovsar Dadashova, Dmytro Bugayko. *"Cluster market of civil aviation training complex services". Classification and features of the educational services market are of interest due to the commercialisation of education and the widespread increase in the level of requirements for staff qualification. Vocational education represents a special segment of this market. The market of professional education of aviation specialists is an important and dynamically developing segment of the educational industry that can offer promising opportunities for training and career development in aviation. According to many researchers, the special importance of this element of the educational services market structure should be based on the integration of joint efforts of corporate training centres, industry agencies and the government with the needs of customers and industry standards. Personnel training itself is a complex multi-disciplinary system. Based on the research in the field of professional education of aviation specialists, the authors define the market of civil aviation simulator complexes services, characterise the market products and*

identify other features of the market and propose the concept of "cluster market of aviation simulator complexes services".

Keywords: flight training center; cluster market; civil aviation training; simulator; professional training

Фуад Мірзоєв, Гульнара Ахмадова, Кевсар Дадашова, Дмитро Бугайко. "Кластерний ринок комплексних послуг з підготовки фахівців цивільної авіації". Класифікація та особливості ринку освітніх послуг становлять інтерес у зв'язку з комерціалізацією освіти та підвищення рівня вимог до кваліфікації персоналу. На цьому ринку особливий сегмент представляє професійна освіта. Ринок професійної освіти авіаційних фахівців є важливим сегментом освітньої індустрії, що динамічно розвивається. Він здатний запропонувати перспективні можливості для навчання і кар'єрного зростання у сфері авіації. На думку багатьох дослідників, особливе значення цього елемента структури ринку освітніх послуг має базуватися на інтеграції спільних зусиль корпоративних навчальних центрів, галузевих відомств та держави з потребами клієнтів та галузевими стандартами. Сама підготовка кадрів є складною багатопрофільною системою. На основі досліджень у галузі професійної освіти авіаційних фахівців авторами дано визначення ринку послуг тренажерних комплексів цивільної авіації, проаналізовано характеристики продукції ринку, виявлено інші його особливості та запропоновано поняття «кластерний ринок послуг авіаційних тренажерних комплексів».

Ключові слова: льотний навчальний центр; кластерний ринок; підготовка у цивільній авіації; тренажер; професійна підготовка

Introduction. The air transport system involves a wide range of stakeholders with diverse functional backgrounds, including international organizations, aviation authorities, operators, infrastructure companies, and others. The civil aviation industry operates air transport in its commercial activities. Its economic entities are linked by the goal of supplying safe and quality products to the air transport market. The aviation industry is presently recuperating from the Covid-19 pandemic crisis, following the guidelines of international civil aviation organizations. In order to improve management, it is recommended that the existing problems be addressed and that new forms of interaction and management be established for both the training and flight safety improvement segments. International civil aviation organizations encourage States to priorities the improvement of aviation training as part of national education policies and to actively participate in the development of the civil aviation workforce.

Numerous professionals are involved in guaranteeing the most crucial aspect of the system: the safety of civil aviation. Flight personnel have received special attention among aviation professionals, experts, and researchers.

Boeing reports that the global pilot training market was valued at \$8.09 billion in 2023 and is projected to reach \$20.02 billion by 2030, with a CAGR of 13.8% during the forecast period. In 2022 and 2023, the European pilot training market was valued at \$2.02 billion and \$2.31 billion, respectively. (Boeing, 2023)

However, although the pandemic has caused a reduction in the number of active pilots due to the inability of simulator training in the remote training format for aviation personnel, it is expected that over the next 20 years, the global commercial fleet will require 649,000 new pilots, 690,000 new maintenance technicians, and 938,000 new crew members. (Boeing, 2023)

The aviation industry worldwide is grappling with a shortage of pilots, which is

affecting numerous airlines and aviation businesses. The shortage of pilots is mainly caused by the retirement of a significant number of ageing pilots. The civil aviation personnel training system does not fully meet the needs of air transport organizations for qualified personnel. Experts and researchers pay special attention to targeted personnel training to meet industry needs which is ensuring the successful system functioning.

Aviation simulator complexes as the subjects of the educational services market. Currently, personnel training in civil aviation aims to achieve high labor results, reduce airline costs for additional training of young specialists and personnel retraining, and stimulate the growth of aviation training complexes (ATC).

Establishing new simulator training centers is easier than opening new flight training schools. Flight training schools require their own airfields away from major air transport centers, airspace for training flights, and instructors who meet strict health, age and skill requirements. Therefore, simulator training centers are a more practical option. Simulator training centers are typically located near airports, making them convenient for current pilots. This is in contrast to flight schools. Training centers may recruit retired pilots who have retired from flying due to age or medical reasons, but who have a wealth of professional experience and can provide valuable insight and knowledge to trainee pilots as instructors. Undoubtedly, initial pilot training requires both flight schools and simulator training centers. The following definition of an aviation training complex is considered appropriate on the basis of the above characteristics:

The Aviation Training Complex (ATC) is a civil aviation company dedicated to developing and maintaining the professional knowledge, skills and abilities of aviation personnel through the usage of an interactive flight simulator system.

ATCs provides theoretical and practical retraining for flight and technical personnel of civil aviation companies and offers comprehensive services in that field. Their technical facilities, training and education programmes enable the airlines-owners to provide airlines' personnel with such a range of services, as well as to provide these services to other air carriers on a commercial basis. As previously mentioned, the material and technical infrastructure of ATC represents a significant expense, which may not be feasible for all airlines. Analyzing the simulator base of the global civil aviation industry, we find a limited number of enterprises such as ATC, and fierce competition in the oligopolistic market of aviation simulator manufacturers. Due these reasons outsourcing is a prevalent practice in the provision of simulator training services.

All stakeholders in civil aviation, including international organizations, aviation authorities, operators, and other interested parties, should collaborate to create new forms of cooperation that benefit everyone involved in the development of the flight training and simulation market. The education sector is crucial in providing the air transport industry with competent and highly professional employees.

The classification and features of the educational services market are of interest because of the commercialization of education and the widespread increase in the level of requirements for staff qualifications. Professional education is a distinct sector within this market. There is a growing body of research that suggests that there is a need for a market structure for education and training services that is based on an integration of corporate training centers, industry bodies, and government.

Although training and retraining of specialists in civil aviation is an essential part of the production process, it can also be argued that aviation introduces innovations to the education sector through the use of new technical means, modern material and technical base, staffing, and the creation of

new forms and methods of training. The aviation specialist training industry is a component of the educational market. It provides training for aviation and encompasses a diverse range of characteristics that graduates acquire and industry specialists cultivate.

Markets are classified into different types based on the commodity and business peculiarities. However, they all share certain obligatory features below:

- Unregulated demand: Airlines and individuals determine the amount of training and retraining services they need to purchase.
- Unregulated supply: Flight schools, training centers, and aviation universities make independent decisions on how to offer their products to the market;
- Commodity prices are determined by supply and demand rather than by directive methods.

Therefore, it could be contended that the market for ATC services possesses all of these characteristics and is a distinct market. At the same time, it is a cluster market of aviation training professional training market.

Cluster market of civil aviation training complexes services. The term 'cluster' is borrowed from economic science, specifically from the competition theory. The term 'cluster' is often used interchangeably with 'destination' or 'complex'. The term 'cluster' is derived from the Old English word 'clustre' or 'clyster'. (Webster, 1994) This term was first coined by Michael Eugene Porter in his book named *Competitive Advantage of Nations*, published in 1990 by Free Press. According to M. Porter, a cluster is defined as 'geographical concentrations of interrelated companies, specialized suppliers, service producers, firms in closely related industries, and associated institutions (such as universities, standards agencies, and trade associations) in separate areas that compete but also cooperate.' (Porter, 1998)

It is important to note that M. Porter introduced this concept for firms and companies located in the same geographical

area and united by common goals when entering the market. It was demonstrated that a company's competitiveness is primarily influenced by the competitiveness of its economic environment. This, in turn, is dependent on the underlying conditions (common resources) and competition within the cluster.

From a systems approach perspective, a cluster is a group of economic entities from different industries that are interrelated and united under a single organizational structure. The elements within the structure are interdependent and function together for a specific purpose. (Peter Maskell and Mark Lorenzen, 2004)

Since the start of the 21st century, the term has been commonly used in foreign theory and practice in relation to the conceptual field of education.

In our case, a cluster is defined as an economic complex of enterprises concentrated in the regional air transport market. The participants are connected in a single chain of value creation for a complex educational product. They have a management structure, a mechanism for coordinating and regulating economic activity, and cooperate in the common interests of attracting customers and increasing the international competitiveness of the destination.

The aviation training complex cluster comprises the relationships between civil aviation entities to provide training center services and ATCs (see Fig. 1).

The market for civil aviation training complexes is a set of economic relations between producers, represented by ATC, and consumers, represented by airlines, state civil aviation authorities, and private individuals. It operates based on the laws of the market economy model, including the laws of supply and demand, value, accumulation, and growth of labor productivity.

The ATC services cluster has its own unique development trends and characteristics. Considering the expansion of international relations in air transport, the

growing proportion of international air traffic, the use of increasingly complex equipment, and the rising demands for safety and quality of flight personnel, there is a need to establish aviation training centers that provide in-

depth study of the English language and various types of aircraft. In summary, the market is expected to continue its upward trend in the near future.

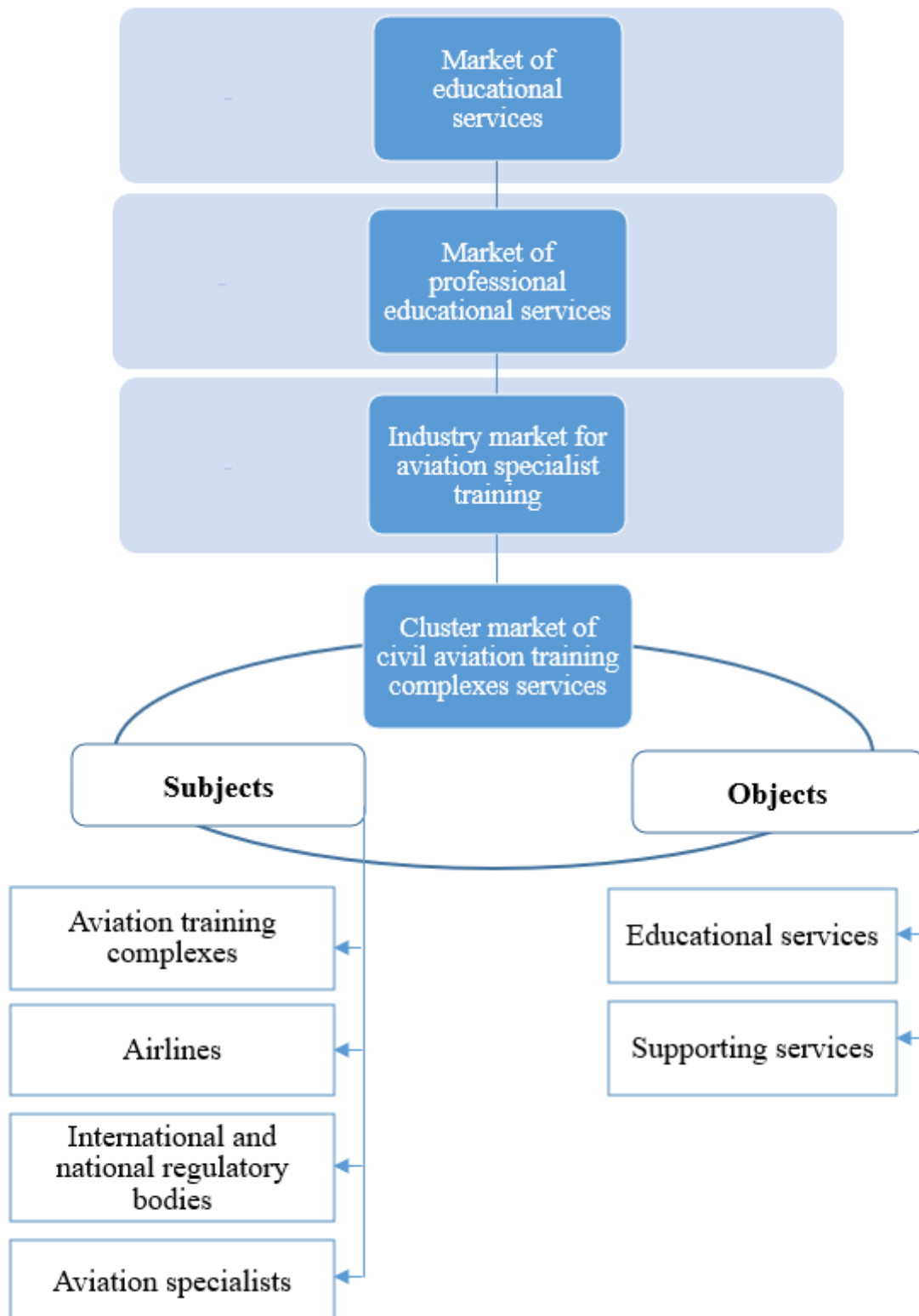


Fig. 1 The cluster market of civil aviation training complexes' services.

The ATC services cluster market has a specific feature below:

- as a system it is connected to multiple components that are interdependent;
- market conditions undergo frequent fluctuations and require constant monitoring for flexible response;
- the product must be differentiated based on the consumer's needs;
- presence of market entry barriers (certification, ICAO requirements);
- there may be a potential mismatch between the consumer and the payer being the same person.

Producers in the cluster market of civil aviation training complexes' services are legal state and commercial training centers that have undergone appropriate accreditation and obtained a license to conduct educational activities. They offer educational programs for initial training, retraining, and advanced training of aviation specialists in accordance with the requirements of ICAO and EASA standards, as well as the state educational standard. These entities interact with flight schools and higher education institutions in the aviation field to form a comprehensive and coherent system of aviation education and providing high-quality training for professionals.

The ATC services market is developing under the guidance of ICAO, which aims to provide civil aviation enterprises and States with access to skilled professionals to support the sustainable development of air transport.

To enhance air transport safety and efficiency worldwide in a cost-effective manner, ICAO implements the TRAINAIR PLUS programme (ICAO, 2024). This cooperative network of civil aviation training centers works together to develop and deliver courses based on ICAO-agreed standardized training package methodology. The programme provides technical expertise, resources, and quality assurance to support both new and existing aviation training centers. Public and private civil aviation training centers share an international pool of training courses and have access to an

international system for the exchange of model training materials.

Aviation Voice provides an annual ranking of the world's aviation training centers. Aviation training centers are evaluated using a comprehensive methodology. A panel of data experts assesses the centers against 18 carefully selected performance indicators to provide a comprehensive and balanced rating that covers all areas of training. This includes the number and types of programmers, availability of cadet courses, aviation research, student and instructor enrolment data, and information on the size of the fleet and the network of flight training facilities. As of 2023, there are 186 aviation training facilities worldwide, with 60 in European countries, 25 in North America, 38 in Asia-Pacific, nine in CIS countries, 23 in Africa, 15 in the Middle East region, and 26 in Latin America (Aviation Voice, 2023).

The primary means of production for the cluster market of civil aviation training complexes services are aircraft simulators of various types and their spare parts.

One of the primary semantic units in defining a market is its product. The market deals with the products of training centers and ATK resulting from labor activities that directly impact a person during the learning process. The aviation training market produces the following products:

- Training aviation specialists involve providing instruction to flight crew members, cabin crews, aviation technical support staff, aviation safety and regime management staff, operations management staff, ground support staff, and air traffic controllers. Special training is also provided to employees as needed;
- Advanced retraining of aviation specialists;
- Retraining of aviation specialists;
- Organize and conduct training for flight, dispatch, and engineering personnel on flight simulators and aircraft.

The competitiveness of an aviation training center's product is determined by a

complex of various factors that affect its ability to attract and retain consumers, such as airlines (customers) and aviation specialists (trainees), in a competitive environment. (Faster Capital, 2024) The competitiveness of the ATC services is determined by several factors:

- Licenses and accreditation (availability of all necessary licenses for simulators and educational programmes, ATC accreditation);
- Quality of education (effectiveness of educational programmes, experience and qualification of teaching staff, as well as learning outcomes in the form of successful graduates of the educational process);
- Infrastructure and technical equipment (availability of modern training facilities, laboratory and various types of flight simulators);
- Innovation in learning (use of latest learning methodologies (e.g. competence-based learning), technologies (e.g. microlearning) and modern educational platforms (e.g. e-learning));
- Trainees support system (tutoring, career counselling, etc.);
- ATC's image;
- Pricing strategy (tuition fees, discounts or flexible payment terms);
- Partnership (possibility of providing additional services (hotel, tourist trips, etc.));

Aviation personnel training and retraining centers aim to provide employees with theoretical knowledge, practical skills, high efficiency, stress resistance, creativity, teamwork abilities, and a sense of responsibility for their actions. ATCs currently offers the following types of aviation training services in the specified areas: Ab-initio pilot training; preparation for authorization to operate a certain type of aircraft (Type-rating); students training; training and retraining of flight attendants; training and retraining of ground handling specialists; training and retraining of helicopter pilots; training of unmanned aerial vehicle operators.

Conclusions. The demand for aviation training and related services is displaying indications of a quicker recovery. However,

the training industry is still encountering challenges in fulfilling this demand. Insufficient training capacity and staff shortages are limiting factors in the aviation industry. Additionally, training of the aviation specialists is a time-consuming process. ATCs should modernize and expand their training capabilities by procuring new simulator equipment to train more aviation specialists, while complying with regulatory certification criteria.

A study of the aviation training complex market reveals that in addition to aviation training centers operated by airlines (joint activity - joint venture training centers), there are also those operated by the government (government-owned, contractor-operated), state-owned (government-owned, government-operated), or an independent legal entity (company-owned, company-operated). An example of aviation trainer complexes can be seen in the market leader who established the network of civil aviation training centers, such as CAE Training Centers and BAA Training Centers.

It is financially impossible for even large, successful airlines to create training centers equipped with a full range of technical means for training aviation personnel with simulators of the highest standards, due to the high market value of these enterprises. Experience has shown that when purchasing and implementing new aircraft simulators, investors, including the state and air carriers, face high operating and maintenance costs in addition to the initial purchase price of the equipment.

ATC, along with other educational institutions, is not considered a commercial organization. Therefore, the management of ATC's commercial activities and profitability is not well studied. It should be noted that while there are numerous studies on civil aviation training and technical aspects of aviation simulators, there is a lack of comprehensive research on management processes and marketing in ATC. The commercial aspects of ATC activities require a comprehensive study to improve efficiency and increase its profits

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