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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

INCREASING THE EFFICIENCY OF COMMERCIAL ACTIVITY OF THE FLIGHT TRAINING COMPLEX

Specialty: 5312.01 – Field economy

Field of science: Economics sciences

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GENERAL CHARACTERISTICS OF THE WORK

Relevance of the issue and degree of development of the problem. An important feature of the air transport system is the involvement of aviation professionals from various disciplines to ensure the safety of aviation, with flight personnel being of particular importance. In this context, the training of pilots and other civil aviation (CA) professionals is seen as one of the important elements in the process of providing and selling aviation services.

The growing demand for air travel and the increasing number of new airlines around the world are stimulating the growth of aviation companies such as flight training complexes (FTC).

Given the rapid development of the aviation industry, improving the commercial efficiency of such centres is becoming a key element in ensuring their competitiveness and sustainability.

Establishing training centres equipped with a full range of technical means for training aviation personnel with simulators of the highest standard is a financially impossible task, even for large successful airlines, due to the high market value of these enterprises.As practice shows, when purchasing and introducing new aviation simulators, investors represented by the state and airlines are faced with high operating and maintenance costs in addition to the initial purchase price of this equipment.This determines the necessity and relevance of a comprehensive study of the commercial aspects of FTC activity in order to improve its efficiency and, as a consequence, to expand, at least partially, the possibilities of reimbursement of costs for the creation and operation of simulator complexes.

As FTCs are currently considered to be predominantly non-profit enterprises, there is very little research on managing their commercial activities and improving the value creation process. Although there is sufficient research on both the training of CA personnel and the technical aspects of the use of aviation simulators, there are no comprehensive studies of the management and marketing processes in FTCs. In this regard, the dissertation addresses a number of issues related to increasing the efficiency of FTC's commercial activities, the need to improve the level of management, organisation and evaluation of the effectiveness of actions related to FTC's commercial activities.

The relevance of the research topic is also conditioned by the need for continuous development of strategic management and marketing technologies and the use of these technologies in improving the efficiency of management of CA enterprises. The efficiency of FTC activities has a direct impact on the quality of training and, as a consequence, on the safety of aviation operations. Taking these factors into account, the dissertation presents the results of the research, which identifies the possibilities for optimising FTC's business processes and increasing the efficiency of its commercial activities.

There is a considerable body of literature devoted to the analysis of management challenges in various aspects of the business activities of aviation enterprises, particularly airlines and airports. Research in this field encompasses such dimensions as the examination of airlines' financial strategies and business models, adaptation to changing market demands and regulatory frameworks, as well as the optimization of professional training processes and the development of innovative educational programs.

There is an extensive database of research articles, dissertations and reports on airline management strategies, marketing approaches, financial analysis and the quality of aviation professional training. It is also possible to find a significant number of scientific papers and dissertations dedicated to the specificities of the market of training services, systems of management and regulation of CA pilot training, innovations in training, as well as the technical operation of FTC.

The issues of quality of flight training, its connection with safety objectives, development of the civil pilot training market, organisation and technologies of professional flight training have been studied by such scientists as A. Somerville, T. Linar, G. Wild, N. Perpitch, T. Pallini, A. Aldridge, M. Dowling, R. Grabtree, R. Allen and others.

The process approach to the management of FTC's commercial activities was chosen for the study on the basis of the works of A. Osterwalder, I. Pinje, J. Harrington, K. Eseling, M. Hammer, J. Champy, J. Meshkisi, M. Cumberlich, P. Harmon, M. Rosman, Y.G. Larchenko and others.

Significant contribution to the development of theoretical views on the effectiveness of commercial activity of enterprises was made by Azerbaijani scientists such as T.A. Huseynov, T.A. Kuliyev, N.M. Imamov, T.N. Aliyev, T.I. Imanov, Sh.M. Muradov and others. Issues of

efficiency of commercial activity of CA enterprises were also deeply researched by Azerbaijani economists S.Y. Muslumov, G.S. Hasanov, F.F. Alekperova, T.T. Tagiyev, V.I. Veliyev, G.T. Ahmedova, F.M. Mirzoyev, who played an important role in the formation of new scientific approaches and in the development of the industry.

However, the representation of management business processes of FTC as a commercial organisation in the complex is currently practically absent. Taking this into account, this thesis is devoted to the problems of increasing the efficiency of commercial activities of flight training complexes, improving the level of management, organisation of measures for this activity and evaluation of their effectiveness. In other words, this study develops methods, tools, proposals and recommendations for increasing the efficiency of commercial activities of FTCs, which can contribute to the growth of their role in the training of aviation specialists and accelerated development of this field.

Object and subject of the study. The object of the study is the aviation simulator complex "Pilot Training Centre" at the National Aviation Academy of Azerbaijan Airlines CJSC. The subject of the research are the components of the commercial activity of the flight training complex and the modelling of the organisational and managerial business processes connected with it.

Aims and objectives of the research. The main objective of the study is to identify and systematise possible ways to improve the efficiency of FTC's commercial activity management using modern approaches and tools of economic institutionalism and management, taking into account current challenges and trends in the aviation sector. As a concrete practical example, the thesis develops and substantiates the concept of improving the management mechanism of commercial activities of AZAL “Pilot Training Centre”.

In accordance with the objective set, the following **tasks** have been defined within the framework of the problem under study:

- to determine the specific features of the continuous education process from the perspective of simulator training of civil aviation specialists;
- to define the concepts of the services market of civil aviation simulator complexes and their products, as well as to investigate other elements of this market;
- to analyze the business processes of the commercial activities of FTCs and to develop a model reflecting the interrelations among them;

– to develop the existing business model of the commercial activities of FTCs and to evaluate its efficiency;
– to design a new dynamic business model in accordance with the strategic development directions of FTCs;
– to elaborate indicators for evaluating the efficiency of the commercial utilization of FTCs.

Research methods. Both empirical methods (observation, comparison, measurement, modelling) and theoretical methods (analysis and synthesis, induction and deduction, qualitative methods to explain and interpret the characteristics of the studied economic object, systems analysis) were used in the research process. The combination of these methods made it possible to conduct a comprehensive study based on various sources of information and analytical approaches, as well as to prepare practical recommendations for improving the efficiency of FTC's business activities.

The primary provisions that have been proposed for the purpose of defence. The following main provisions and results of the dissertation research are hereby submitted for defence:

1. A methodological approach founded upon the integration of stages and types of training for civil aviation specialists has been developed. This model, which reflects the cyclical nature of the educational process and the existing functional relationships between participants, can be considered a theoretically and practically sound model for the commercial organisation of educational services.

2. The conceptual foundations of the concept of the "civil aviation flight training complexes services market" have been developed, and a systematic analysis of its main determinants has been carried out. In light of the research findings, it is recommended that this market be regarded as a segment of the civil aviation specialist training market. This market operates within the framework of market relations as an independent economic environment.

3. A functional model has been developed for AZAL “Pilot Training Centre”s commercial activities, based on an analysis of the business processes. The model presents the processes in a structured manner according to management, education, and support blocks. It also systematically presents the interrelationships between the processes. The model under discussion establishes a methodological basis for the coordinated management and analysis of commercial activities.

4. A comprehensive modelling and evaluation of the existing commercial activities of AZAL “Pilot Training Centre”. was conducted. The approach applied resulted in the systematisation of the main components and interrelationships of commercial activities, and the identification of shortcomings in its organisation. Following a thorough analysis, a decision-making matrix was formulated.

5. An innovative business model has been developed to facilitate the adaptation of AZAL “Pilot Training Centre”s operations to evolving external conditions. The model incorporates novel components, including the introduction of training methodologies, the establishment of alternative sales channels, the development of international partnership frameworks, and the provision of services tailored to diverse customer segments. This approach is conducive to enhancing the strategic flexibility of the enterprise, ensuring its competitiveness, and strengthening its position in the regional market.

6. In consideration of the particularities inherent to the operations of aviation training complexes, a system of key performance indicators (KPIs) has been formulated for the purpose of evaluating the efficacy of their commercial activities across the following domains: finance, production, customer relations, and development. In the production area, load factors and methodological formulas have been proposed. The utilisation of simulators at the AZAL “Pilot Training Centre”was examined through the application of specific calculation formulas. The findings indicated that the actual commercial utilisation rate of these simulators ranges from 0.03 to 0.41. It was determined that the utilisation rate corresponding to the break-even point is set at 0.45.

Scientific novelty of the research. The scientific novelty of the dissertation lies in deepening and expanding the theoretical and methodological approaches to the study of the vocational education system in civil aviation, enhancing the quality of aviation specialists’ training, and developing management mechanisms that create opportunities for increasing the efficiency of the commercial activities of aviation simulator complexes.

The research results reflecting the author’s contribution to scientific novelty are as follows:

- For the first time in the country, the role of simulators in the system of aviation specialist training has been comprehensively examined, and their crucial significance in the process of commercialization of

educational services has been scientifically substantiated. This approach strengthens the position of aviation simulator complexes as active subjects of the commercial market;

- The concept of the *"Civil aviation flight training complexes services market"* has been introduced into scientific circulation, and its individual elements (market product, types of services, technical base, customer groups, and competitive indicators) have been clarified in line with contemporary requirements;
- a business process model for managing the commercial activities of aviation simulators has been developed;
- a commercially oriented business model has been designed for improving the organization and management of commercial activities in the production operations of the AZAL "Pilot Training Center";
- a management system for implementing strategic objectives aimed at ensuring the competitiveness of aviation simulator complexes has been elaborated;
- marketing tools aimed at enhancing the quality and flexibility of managing the commercial activities of aviation simulator complexes have been proposed. To improve the efficiency of consumer and sales strategies, measures such as marketing research, benchmarking, corporate crowdsourcing, and other approaches have been suggested.

Theoretical and practical significance of the research. The practical significance of the dissertation lies in its focus on updating the management mechanisms of the commercial activities of FTCs. The practical application of the developed models will enable the creation of a comprehensive and efficient business model for FTC development, allow for the flexible adjustment of this model to increase revenues from commercial activities, and provide conditions for the successful automation of business processes.

The dissertation presents practical results on identifying opportunities for optimizing the business processes of AZAL "Pilot Training Center" and increasing the efficiency of its commercial activities.

Based on sectoral analysis, precise definitions have been provided for concepts such as the "market for aviation simulator complex services," "aviation simulator complex," "simulator park," and "slot," with clarification of their functional roles and scientific content within operational frameworks. The research results may serve as a theoretical

basis for the economic analysis of the commercial activities of aviation simulator complexes and create a conceptual foundation for future research in this field.

Approbation of the work and implementation of the results. The main provisions and results of the thesis were presented at the international scientific-practical conference "Creative potential of youth in solving aerospace problems" in 2016, 2017, 2018 (Azerbaijan, Baku, National Aviation Academy); at the international scientific conference "Modern challenges of tourism" in 2022 (Bulgaria, Veliko Tarnovo, St Cyril and Methodius University,) at the International Symposium on Unmanned Systems: AI, Design and Efficiency, held by the National Aviation Academy together with the scientific society SARES in 2024. The author has published 8 scientific articles in prestigious journals of Azerbaijan and other countries, as well as 5 abstracts in conference proceedings related to the research topic.

Name of the institution where the dissertation was carried out. The research work was carried out at the Management Department of the National Aviation Academy of Azerbaijan Airlines CJSC

General structure of the dissertation. The dissertation consists of an introduction (21,076 characters), three chapters (Chapter I – 64,074 characters, Chapter II – 66,889 characters, Chapter III – 64,856 characters), a conclusion (6,993 characters), a list of references, and a list of abbreviations. The total volume of the work is 250,898 characters, amounting to 154 pages; excluding figures, tables, the list of references, and the list of abbreviations, the volume is 220,937 characters.

MAIN STRUCTURE OF THE THESIS

MAIN CONTENT OF THE THESIS

The I chapter of the dissertation, **"Theoretical and methodological foundations of the commercial efficiency of simulator training in civil aviation",** analyzes trends in the global aviation market, the theoretical and methodological foundations of training aviation specialists, the role of aviation simulators in the process of training aviation personnel, and the main determinants of the market for aviation simulator services.

At present the personnel needs of civil aviation are changing rapidly, which requires changes in the process of training of specialists. The key point in solving the problem of creating an effective system of professional training in civil aviation is the commercialisation of educational services. This is connected with the transition of the professional education system to market relations, which changes the tasks and functions of training centres.

Commercialisation of educational services in aviation is an inevitable process, and it is advisable to take into account the following

factors, which contribute to this process and create uniform standards of competences of specialists in aviation:
- the impact of scientific and technological progress on the structure of personnel needs in the industry;
- existing and projected changes in the aviation labour supply;
- the need for continued compliance with international and national standards of safety and quality of training;
- ensuring the financial sustainability of training centres in the face of economic shocks or downturns, particularly in the aviation industry;
- the significant investment required to upgrade and maintain training infrastructure, including state-of-the-art simulators and training facilities.

In our opinion, commercialisation of educational services in civil aviation is a multi-layered process that requires a balanced approach and strict control to ensure a balance between economic interests and the quality of educational services[1]. This process requires to manage of the FTC as an enterprise, and the main focus is on the search for additional financial resources and new relations between the participants of the educational process.

Based on the study of numerous scientific works in the field of professional education of aviation specialists, we have developed a structural scheme of the training process in aviation simulator complexes, reflecting the cyclic nature of the training process (fig. 1).

Taking into account the peculiarities of the training process of aviation specialists, it is reasonable to offer the following definition of an flight training complex:

An flight training complex is a civil aviation enterprise designed to develop and maintain professional knowledge, skills and competences of aviation specialists based on the use of an interactive system of flight simulators.

Airlines that own FTC provide analogous services both for their own needs and, on a commercial basis, to other air carriers by means of the available technical facilities, training, and educational programs. An analysis of the global simulator base of civil aviation demonstrates that institutions such as ATCs are relatively limited in number, while the

[1] Grebnev, L.S. Market, services and education: Between economics and law // Economics of education. – 2012. No. 2. – pp. 144–149.

market for aviation simulator manufacturers is characterized by strong competition within an oligopolistic structure.

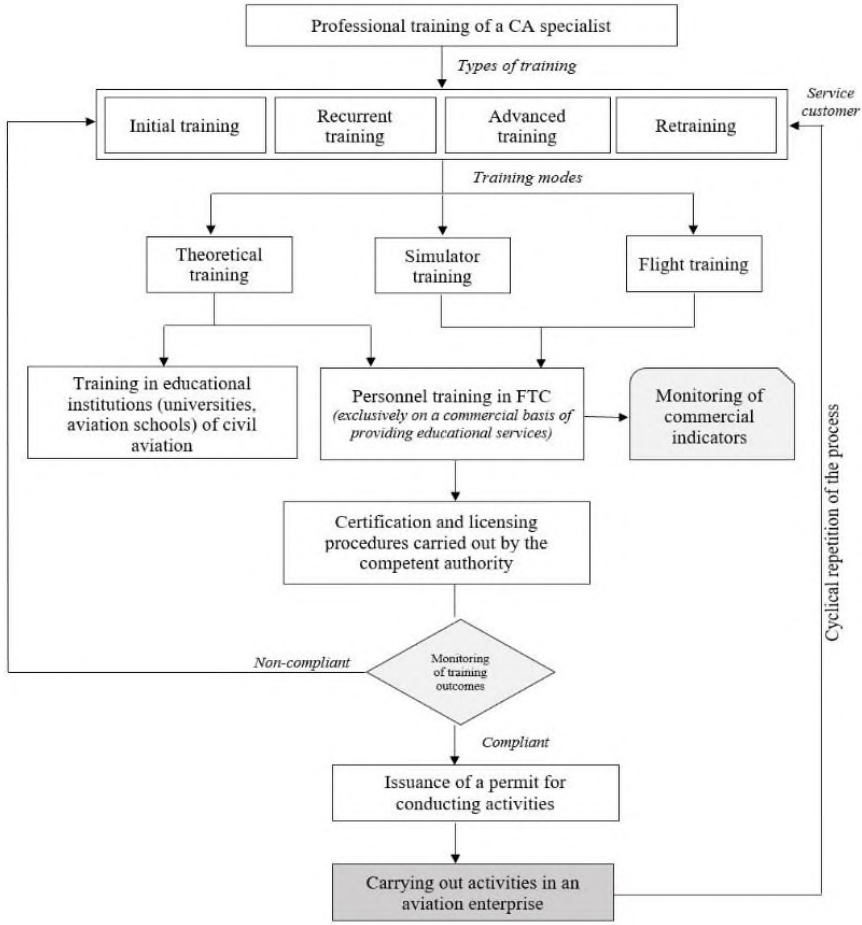

Figure 1. The process of training aviation professionals

Source: compiled by the author.

The assertion is made that the existence of an independent market for FTC services is indeed a possibility, and that said market would possess all the characteristics of a market. In view of the above, **it is reasonable to define the FTC services market as a segment of the professional training market for aviation specialists and to consider it as a set of relationships arising in the process of providing services by training centers to civil aviation entities (fig. 2).** It operates on the

basis of the laws of the market economy model — the laws of supply and demand, the law of value, the law of accumulation, the law of labor productivity growth, and others.

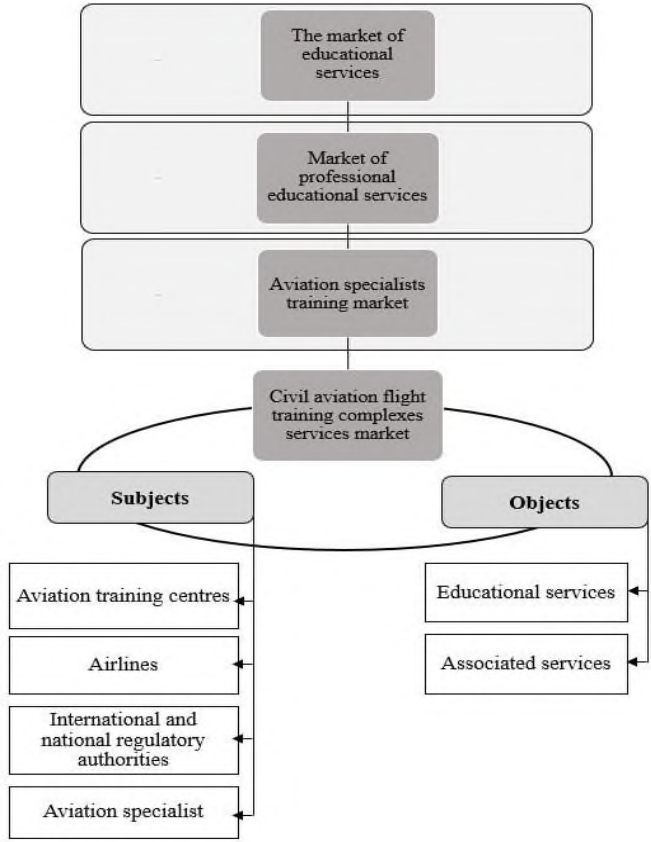

Figure 2. Civil flight training comlexes services market
Source: compiled by the author.

The features of the FTC services market include:

- it is a system connected with many components interconnected with each other;
- market conditions are subject to frequent fluctuations and its changes should be constantly monitored for flexible response;
- the need for product differentiation depending on consumer needs;
- the presence of market entry barriers (certification, ICAO requirements);
- possible inconsistency of a consumer and a payer in one person.

The civil aviation flight training complexes services market – is the totality of economic relations among the market participants, where aviation simulator complexes act as producers (service providers), international and national civil aviation authorities act as regulators, and airlines and individuals act as consumers.

In the FTC services market, service providers are state and commercial training centers that have undergone the relevant accreditation and obtained licenses[2] to engage in educational activities, offering training programs for the initial preparation, retraining, and professional development of aviation specialists in accordance with ICAO and EASA standards, as well as national educational standards in civil aviation. These training centers, operating in cooperation with flight schools and higher education institutions in the field of aviation, form a comprehensive and consistent system of aviation education that ensures the high-quality training of aviation specialists.

The products of the FTC services market include the specialized training and professional development of specialists, their retraining, and the organization of training sessions on aviation simulators and flight training devices.

The competitiveness of an aviation training centre's product is determined by a complex of various factors that influence its ability to attract and retain consumers (airlines - customers, aviation specialists - trainees) in a competitive environment. The main factors that determine the competitiveness of an FTC service are

- licences and accreditation: availability of all necessary licences, simulators and training programmes, FTC accreditation;
- quality of training: efficiency of the training programmes, experience and qualification of the training staff, as well as the results of the training in terms of successful completion of the training process;
- infrastructure and technical equipment: availability of modern classrooms, laboratories and different types of flight simulators;
- innovation in training: use of the latest training methods (e.g. competency-based training), technologies (e.g. microlearning) and modern educational platforms (e.g. e-learning);
- support system for trainees: tutoring, career guidance;

[2] Manual on aeroplane upset prevention and recovery training (Doc 10011) / İnternational Civil Aviation Organization. – 1st edition, 2014.

– FTC image;
– pricing: cost of training, discounts or flexible payment terms;
– partnership: possibility of offering additional services (hotel, trips, etc.).

The means of production in the civil FTC services market are various types of aviation simulators and their spare parts.

The II Chapter, **"Analysis of the commercial mechanism of flight training complexes and identification of their specific features",** provides a well-founded analysis of the main elements of the FTC business model and the specifics of its commercial activities.

The AZAL "Pilot Training Centre", selected as the object of the research, has been operating under the National Aviation Academy since 2010. The centre, which is made up of theoretical and practical training departments, has a modern training base that provides initial training, retraining and advanced training for aviation personnel. The training complex is one of the most modern and largest in the CIS and Eastern Europe and is certified by the competent CA authorities.

Between 2012 and 2023, a total of 105,909 hours of simulator training (Fig. 3) and theoretical training for 52,137 civil aviation specialists across 6,939 courses (Fig. 4) were conducted at the AZAL "Pilot Training Center."

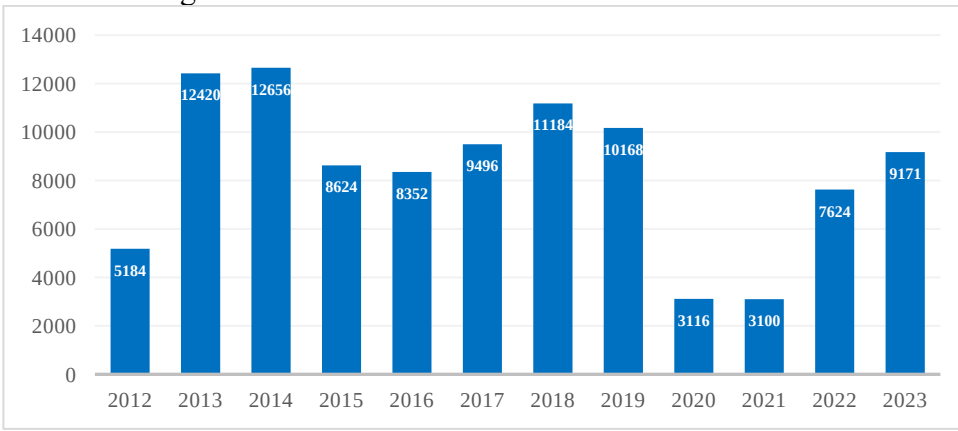

Figure 3. Volume of simulator training services provided by the AZAL "Pilot Training Center" during 2012–2023, in hours.

Source: Compiled by the author based on the reports of the AZAL "Pilot Training Center"

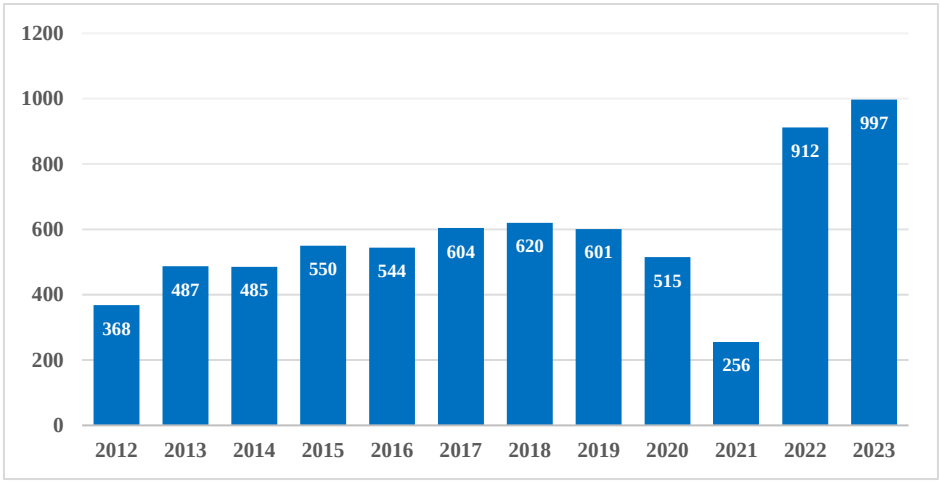

Figure 4. Volume of theoretical training services provided by the AZAL "Pilot Training Center" during 2012–2023, by number of courses.

Source: Compiled by the author based on the reports of the AZAL "Pilot Training Center"

In our opinion, the starting point for building the business model of AZAL "Pilot Training Centre" can be the analysis of FTC's commercial activity management processes, as the main idea of this approach is to describe the interaction of processes and flows to create the final result. **For this purpose, we conducted a system analysis of the current state of FTC - its main assets, capabilities and structure of relationships with stakeholders.**

It is reasonable to posit that in order to construct a business process model of AZAL "Pilot Training Centre", it is necessary to define the types of activities that comprise the different functions: training, management and support. These activities are aimed at achieving different objectives and include sets of business processes, which is reflected in the business process model in figure 5 (Fig. 5).

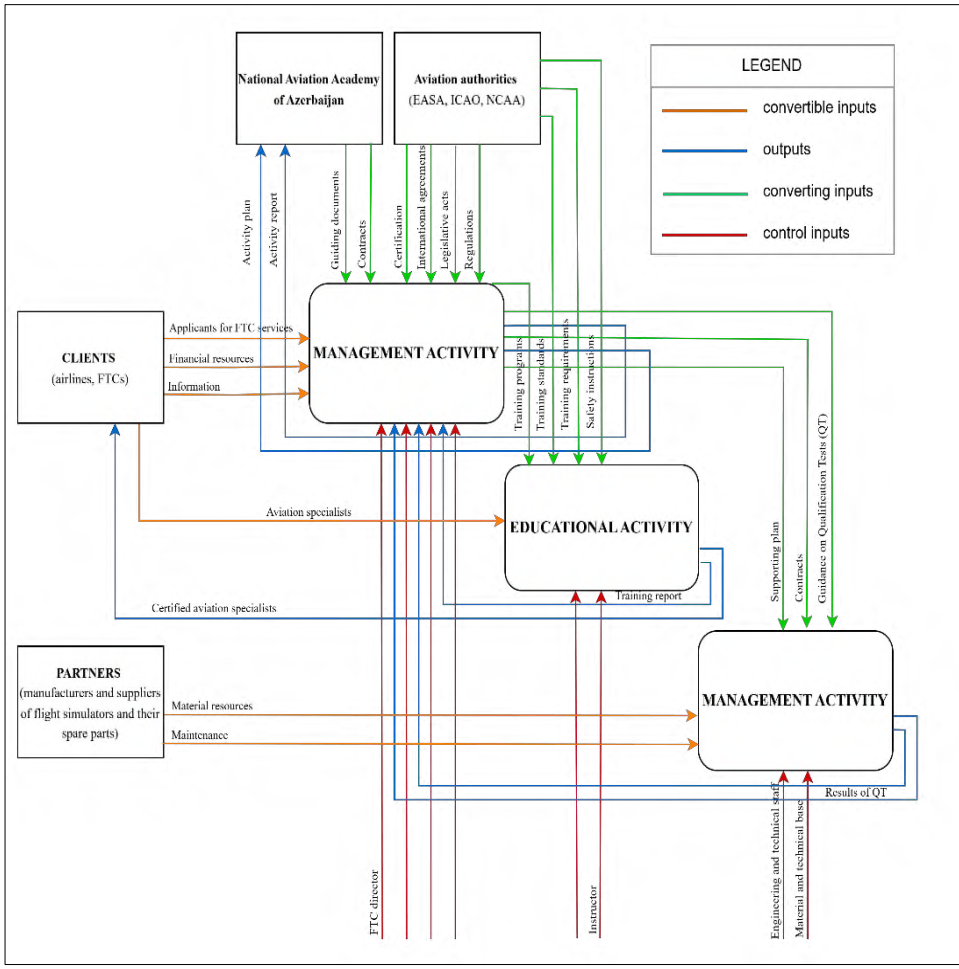

Figure. 5. AZAL "Pilot Training Centre" business processes model
Source: compiled by the author.

High demands on the quality of FTC services require management to review its approaches to management and business systems. Based on this, it is necessary to form a business model for FTC's commercial activities, since FTC is considered a commercial enterprise engaged in entrepreneurial activities. Obviously, business models may vary depending on the growth rate of the enterprise and the duration of the planning period.

For a more effective development of the business model of AZAL "Pilot Training Centre", aimed at achieving strategic objectives,

increasing the efficiency of commercial activity and improving competitiveness, we have studied various strategic management tools and selected the most common and effective of them (SWOT analysis, PESTEL analysis, Porter's Five Forces, value chain analysis, business model canvas, VRIO analysis, BCG matrix), carried out a comparative analysis of these tools, identifying their advantages and disadvantages.

According to the results of the comparative analysis of the business modelling tools and their evaluation by the multi-criteria decision making method, the Business Model Canvas is the most appropriate tool for modelling the commercial activities of the AZAL "Pilot Training Centre", due to its flexibility, comprehensive approach and focus on key aspects of the business.

Using the Business Model Canva[3], we have developed the current business model of the AZAL "Pilot Training Centre" (fig. 6).

<table>
<tr>
<td rowspan="2">KEY PARTNERS
1. Aviation authorities (EASA, ICAO, SCAA)
2. National airlines (Azerbaijan Airlines, SilkWay Airlines)
3. Suppliers of aircraft and spare parts (Rockwell Collins, Flight Safety International and etc.)
4. Maintenance (SilkWay Technics and etc.)</td>
<td>KEY ACTIVITIES
1. Theoretical training
2. Simulator training
3. Simulator outsourcing</td>
<td rowspan="2">VALUE PROPOSITIONS
1. Compliance with international standards (EASA, ICAO)
2. Competitive prices
3. Additional services
4. Park of simulators equipped with popular models of aircraft types</td>
<td>CUSTOMER RELATIONSHIP
Personalised support</td>
<td rowspan="2">CUSTOMER SEGMENTS
1. Airlines of the Asian, Middle East, European and CIS regions with such aircraft models as Airbus A320/319, Boeing 757/767, Embraer 170/190, IL-76, ATR-42/72 in their fleets
2. Customers of FTC services outsourcing (BAA Training, etc.)</td>
</tr>
<tr>
<td>KEY RESOURCES
1. Comprehensive simulators meeting the requirements of international standards
2. Instructor-teaching staff
3. Educational programmes
4. Infrastructure</td>
<td>SALE CHANNELS
Direct sales and co-operation with airlines</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
1. Technical support of simulators
2. Simulators software
3. Technical support of the complex
4. Certification costs
5. Salaries of managerial and technical staff.</td>
<td colspan="2">REVENUE STREAMS
1. Income from the provision of educational services in the field of aviation personnel training
2. Income from outsourcing of educational services</td>
</tr>
</table>

Figure 6. Current business model of AZAL "Pilot Training Centre".
Source: compiled by the author based on Business Model Canvas.

The business model has been analyzed by us using the SWOT analysis method, which is a relevant tool for assessing the efficiency of FTC operations.

[3] Osterwalder, A. Business model generation: A handbook for visionaries, game changers, and challengers. Book. / A. Osterwalder, Y. Pigneur. – John Wiley & Sons, – 2013. – 288 p.

The results of analysis of the business model of AZAL Pilot Training Centre did not reveal any deficiencies related to human resources and technical support, problems requiring improvement of the internal organisation and management of commercial activities were found.

The analysis of the elements of the current business model of the enterprise under study allows identifying a number of management challenges to be addressed by its management (table 1).

Table 1.

AZAL "Pilot Training Centre" strategic decision matrix

STRENGTHS AND OPPORTUNITIES:	WEAKNESSES AND OPPORTUNITIES:
- implementation of Learning Management System (LMS); - creation of virtual educational e-learning platforms and mobile application for distance theoretical training; -integration of innovative teaching methods (IoT, microlearning); -Expansion of partnerships with other FTCs (Turkish Airlines Flight Training Centre, Istanbul Aviation Club, BAA Training); - provision of simulator maintenance services for other FTCs; - increasing the range of outsourcing services (development of training programmes and materials, outstaffing); - expansion of partnerships with UAV simulator manufacturers (CAE, L3Harris); - development of training programmes for UAV pilots and operators for civil aviation; - development of corporate programmes for airlines that are both partners and clients of FTC.	- strengthening of marketing activities on brand formation (emphasis on advantages in PR and advertising, promotion of the official website, participation in exhibitions and conferences, creation of FTC social networks); - entering new segments of FTC service consumers (training of pilots and UAV operators); - increasing the commercial load factor for each type of simulator by identifying potential customers based on marketing research of the ATC services market; - sale of the ATP 72 simulator; - use of a key performance indicator system to assess the effectiveness of commercial activities;
STRENGTHS AND THREATS:	**WEAKNESSES AND THREATS:**
-actively monitoring regulatory and legal developments; -improvement of flexible training programmes based on customer requirements; -focus on ATK's advantages; -modernisation of the simulator fleet (models of narrow-body aircraft types, e.g. Boeing 737, 787, Airbus A320neo).	-development and implementation of Revenue Management (RM); -implementation of Business Process Management (BPM); -strengthening the level of customer focus by creating unique offers for different customer segments; - supporting feedback from customers; - development of loyalty programmes and rewards for regular customers.

Source: compiled by the author.

Based on our study, a new business model was developed to improve the process of creating a value proposition for the growth and development of AZAL "Pilot Training Centre" (Figure 7).

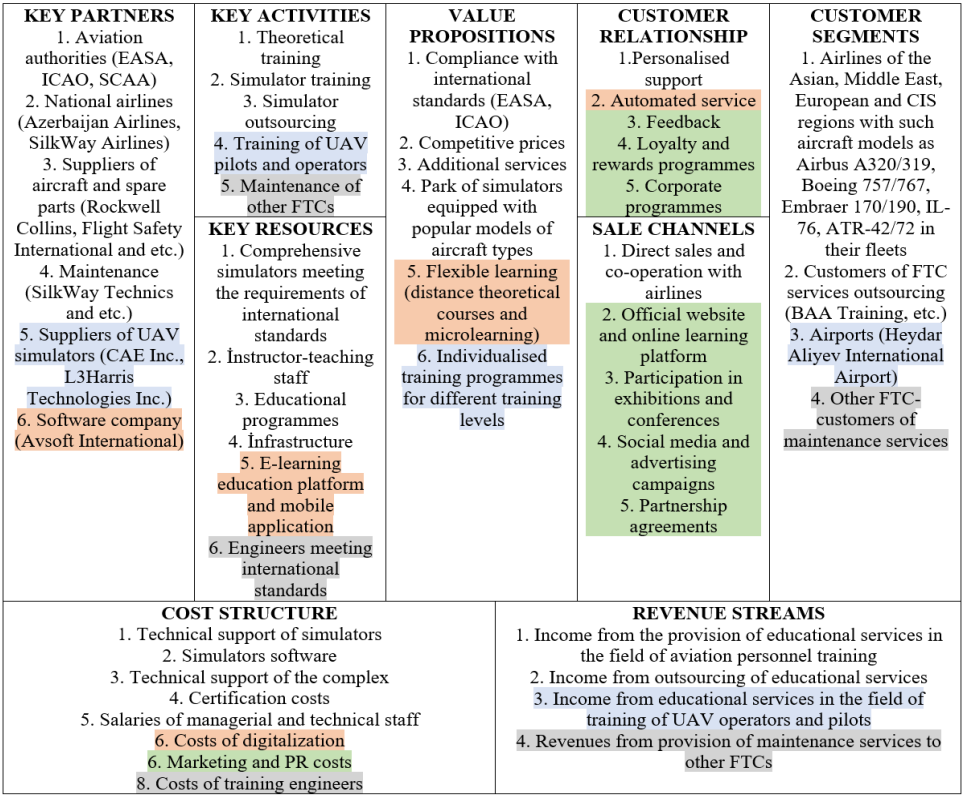

Fig. 7. New business model of AZAL "Pilot Training Center".
Source: compiled by the author based on Busines Model Canvas.
Note: different colors reflect the relationships between elements of the new model.

In order to improve the effectiveness of FTC's commercial activities, the following strategic measures should be considered:

a) The relationship between overall strategy and marketing should be strengthened. Management should develop a business strategy that takes into account the target audience, services offered, positioning and distribution channels. Our research shows that the main distribution channel for educational services is direct sales, but using only this channel significantly limits the market for educational products. Possible solutions to this problem could be to expand distribution channels with consistent use of marketing efforts to stimulate sales and advertising; to increase the use of marketing communications (e.g. advertising in professional

literature, placing all information about FTC's activities on its website, etc.); to increase the efficiency of communication channels.

b) FTC does not have the resources to conduct regular marketing research that would provide insight into the key players in the aviation education market, the competitive environment and potential customers.

c) FTC does not use key performance indicators (KPIs) to evaluate its commercial activities.Based on the analysis of the current business model of AZAL “Pilot Training Centre” and assessment of its efficiency, we believe that for the development of FTC's business it is advisable to consider the following activities: use of core assets in key activities (e.g., expansion of outsourcing services); provision of new services (e.g., maintenance of simulators of flight training complexes); entry into new markets (e.g., expansion of the range of educational services, search for new customers and expansion of the consumer base).

In Chapter III of the dissertation, titled **“Ways to ıncrease the effıcıency of the commercıal actıvıtıes of flıght traınıng complexes,”** innovative strategies, marketing methods, and management mechanisms for enhancing the efficiency of FTC commercial activities have been examined, and scientifically substantiated recommendations have been proposed.

In accordance with the concept of our proposed new business model (fig. 8) of the AZAL “Pilot Training Centre”, we have developed a system for managing the implementation of strategic objectives in the main directions of FTC's activity efficiency improvement (table 2).

Table 2.

Management system for implementing strategic objectives

Strategic goals	Objectives	Activities	Key Performance Indicators
Formation of a flexible financial model	Increase in net profit	- automation and digitalisation of operations; - implementation of revenue management systems.	Income from educational services
	Increase profit potential	- optimisation of the revenue structure.	Marginal profit
	Strategic capital allocation	- evaluation and prioritisation of projects; - monitoring and optimisation of capital investments.	Return on investment
	Effective utilisation and management of assets	- sale or modernisation of inefficient assets; - improving the efficiency of asset management and reducing associated costs.	Return on assets
	Reducing the cost of service	- optimising processes to reduce actual costs; - optimising the supply chain and managing material and service costs.	Break-eeven-point
Improving the efficiency of production and commercial business processes	Optimising the use of resources	- optimisation of simulator training planning schedules; - effective maintenance planning.	Simulator commercial load factor
	Improving the efficiency of the organisation of educational activities	- expanding partnerships with industry participants; - optimising education programmes through the introduction of an online platform and microlearning.	Training volume
	Ensuring continuity of training	- monitoring of spare parts status - maintaining adequate inventory of spare parts and materials.	Production Supply Coefficient
Strengthening FTC's position in the market	Creation of a stable client base	- strengthening long-term customer relationships and developing loyalty programmes.	Net Promoter Score
	Improving the quality of services (consumer characteristics)	- adapting services to customer needs; - personalisation of services and prompt response to feedback.	Customer Satisfaction Index
	Increasing the efficiency of marketing activities	- developing and implementing targeted marketing campaigns; - optimising marketing strategies to attract and retain customers.	Lifetime Value
Ensuring compliance with industry standards	Development and modernisation of the material and technical base	- developing and implementing strategies to maintain and improve existing assets; - updating and expanding the material and technical base, including modern simulators, training places and equipment; - integration of the latest technologies into the educational process (learning management systems).	Fixed assets growth coefficient
	Ensuring relevance and competitiveness of training programmes	- updating training programmes to reflect changes in the industry; - creation and introduction of new courses and programmes in accordance with market needs and customer requirements; - ensuring continuous professional development of FTC instructors and teaching staff.	Course renewal coefficient

Source: compiled by the author.

The system of KPIs in the main directions of activity - financial, production, work with customers, development - for comprehensive assessment of this activity efficiency was developed (fig. 8).

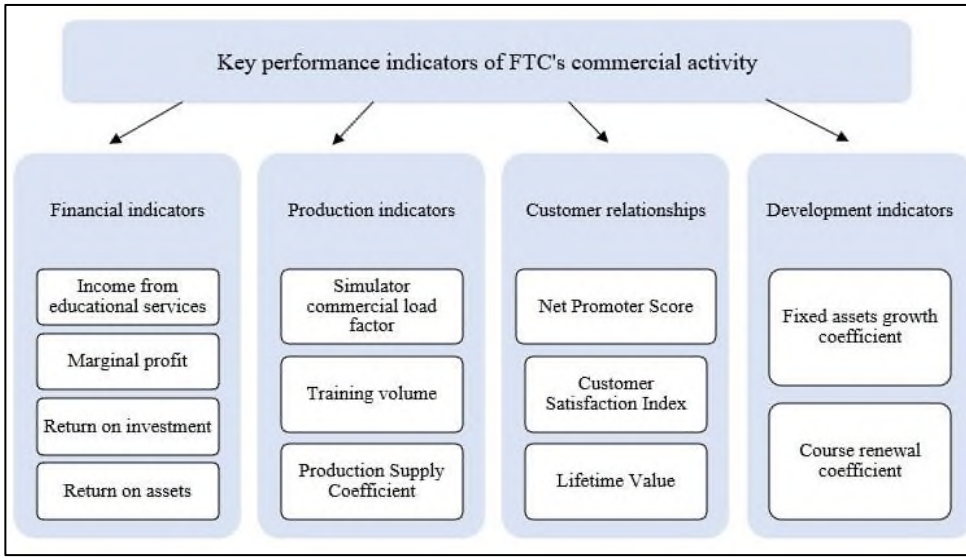

Figure. 8. System of key indicators of FTC commercial activity
Source: compiled by the author.

The study of FTC commercial activity and the analysis of theoretical studies allowed us to develop the coefficients of commercial load, taking into account the industry features, specialisation and directions of FTC activity, which it is reasonable to include in the system of key performance indicators:

1. Simulator commercial load factor (CLF_t^m) - determines the maximum possibility of using each aviation simulator during a certain period taking into account technical limitations (formula 1):

$$CLF_t^m = \frac{UR_t^m - (S_t^{\text{TO}} + S_t^{\text{C}})}{UR_t^m} \qquad (1)$$

here, UR_t^m– maximum simulator utilisation rate during period *t*;

S_t^{C} - number of certification hours for period *t*;

S_t^M - number of maintenance hours during period *t.*

2. Simulator planned commercial load factor (CLF_t^P) - reflects the planned load level of each aviation simulator, taking into account the maximum load norms, the actual load level for the previous period and industry forecasts (formula 2):

$$CLF_t^p = CLF_{t-1}^f \times CAGR \quad (2)$$

here, CLF_{t-1}^{A} – is the coefficient of actual commercial load of the simulator in the previous period;

$CAGR$ – average annual growth rate of the FTC services market.

3. Simulator actual commercial load factor CLF_t^A – determines the actual level of utilisation of each aviation simulator (formula 3):

$$CLF_t^A = \frac{TH_t^A}{UR_t^m - (S_t^C + S_t^M)} \quad (3)$$

here, TH_t^A – is the actual number of hours of simulator training in period *t*.

Note that according to calculations based on the AZAL "Pilot Training Centre" report, the coefficients of actual commercial simulator utilisation in 2023 were as follows: A320 – 0.31, B757/B767 – 0.36, ATR72 – 0.17, ERJ190 – 0.41, MI171 – 0.03(table 3).

Table 3

Actual commercial utilization of simulators at the AZAL "Pilot Training Center" in 2023

Type of simulator	Certification hours, S_t^C	Maintenance hours, S_{1y}^M	Utilization norm, UR_{1y}^m	Simulator training hours, TH_{1y}^a	Actual commercial utilization coefficient, CLF_{1y}^A
A320	4	224	7300	2218	0.31
B757/767	4	224	7300	2606	0.36
ATR-72	4	224	7300	1180	0.17
ERJ190	4	224	7300	2927	0.41
MI171	4	224	7300	240	0.03

Source: compiled by the author.

These indicators indicate the need to review ways to improve the efficiency of FTC's commercial activities.

4. Simulator break-even commercial load factor (CLF_t^{BEP}) – determines the level of load required to reach the break-even point in the provision of services, and together with the actual coefficients characterises the current state of FTC (formula 4):

$$CLF_t^{BEP} = \frac{BEP \times 4 \times t}{UR_t^m} \quad (4)$$

In planning simulator training activities, managers of aviation simulator complexes must ensure that the planned commercial load coefficient for each simulator does not exceed its upper limit (0.96) and does not fall below the breakeven commercial load coefficient (0.45), thereby ensuring the financial stability of the FTC.

Other indicators and their calculation formulas are quite widely presented in the scientific literature. However, given the peculiarities of commercial activity of the object under study, we considered it appropriate to consider in the thesis these indicators in the context of FTC peculiarities.

In our view, an objective assessment of the overall efficiency of the commercial activities of an aviation simulator complex requires not only the independent analysis of individual indicators but also their integration into a unified system. **For this purpose, it is proposed to use an integral evaluation model based on comparing the results obtained for each KPI with the planned (target) values.**

In international practice, including in the guidance documents of leading aviation organizations (ICAO, EASA), priority attention is given to financial and production indicators when assessing training centers. On this basis, a weighting ratio of 0.30–0.20 is considered more appropriate for optimal assessment.

CONCLUSION AND RECOMMENDATIONS

As a result of the research, the objective of the dissertation was achieved, which was to identify possible ways to improve the efficiency of management of commercial activities of aviation training complexes using strategic management and marketing tools, as well as to develop and justify the concept of improving the mechanism of management of commercial activities of AZAL "Pilot Training Centre". The obtained results have both theoretical and practical significance:

1. The study of the system for the initial and recurrent training of flight crews and specialists in civil aviation has identified a number of factors affecting this system:

– the system for training aviation specialists possesses a complex, multifunctional structure;

– the quality characteristics within the aviation specialist training system significantly influence the safety of the air transport system;

– simulator training demonstrates high effectiveness in enhancing the quality of professional competence formation among aviation specialists and in improving their career advancement opportunities.

2. The scale of aviation simulators' usage and the improvement of their functions shape an independent FTC service market, which is viewed in the study as a segment of the professional training market and a network of relationships between training centers and civil aviation entities.

3. The commercialization of FTC educational services is subject to innovative changes related to the methodology of training programs and the software of flight simulators. In the context of contemporary challenges, modeling the commercial activities of the FTC has been selected as the main tool for fully utilizing its potential. For constructing the business model of AZAL's "Pilot Training Center," an analysis of its commercial activity management processes was conducted, and the processes of training, management, and support activities—comprising various business process sets aimed at achieving multiple objectives—were modeled.

4. For the purpose of business model construction, the existing business model of AZAL's "Pilot Training Center" was developed, covering four areas of commercial activity and reflecting the logic of the value creation process in interconnected blocks such as customer interaction, offerings, infrastructure, and organizational financial efficiency. The efficiency of this model was also evaluated.

5. For strategic planning and decision-making, a SWOT analysis was conducted to examine the current business model of AZAL's "Pilot Training Center," identifying key success factors, problems and weaknesses, and development opportunities. The analysis of the elements of the enterprise's existing business model allowed the identification of a number of managerial tasks to be addressed by its leadership.

6. The improvement of FTC activities necessitates the development and implementation of a development strategy and highlights the need for organizational changes aimed at transforming the FTC into a flexible and adaptive organization. For the development of FTC business, it is advisable to focus on the following areas: utilization of core assets in main activities, provision of new services, and entry into new markets. Based on our research, a new business model has been developed to enhance the value creation process for the growth and development of AZAL's "Pilot Training Center."

7. The constantly changing conditions of the FTC market, the need for agility in decision-making, multitasking in asset management, and risk mitigation require modern approaches to organizing commercial activities. To achieve the strategic goals and successful development of AZAL's "Pilot Training Center," a "Business Process Tree" for the FTC was developed by us, based on the decomposition of business processes, aiming to improve management and increase the efficiency, quality, and flexibility of commercial activities.

8. In accordance with the concept of the new business model proposed by us for AZAL's "Pilot Training Center," a management system has been developed for implementing strategic objectives in the main directions of enhancing FTC operational efficiency, as well as a comprehensive evaluation of this efficiency. For this purpose, a system of key performance indicators has been formulated for the main areas of activity: financial, operational, customer relations, and development.

9. Based on the study of the commercial activities of aviation simulator complexes and the analysis of theoretical research, commercial load coefficients for simulators have been developed, taking into account the sectoral characteristics, specialization, and specific activity directions of the FTC.

10. The primary means of increasing the efficiency of FTC commercial activities is marketing research of the FTC services market. In the dissertation, a methodological algorithm for conducting marketing research of this market has been developed. This research will enable the studied enterprise to better understand customer needs and market trends. It may leverage competitive advantages such as lower prices, the provision of additional services, the availability of a simulator park with different types of simulators, compliance with industry standards, and the quality of education.

11. In order to assess the success and effectiveness of FTC marketing activities, a methodology for managing and evaluating business processes has been developed, taking into account both financial and non-financial aspects. Based on a balanced scorecard system, performance indicators have been formulated for the business process "Conducting FTC marketing research" across financial results, customer interaction, business processes, personnel, and development areas. It is recommended that benchmarking be applied for FTCs based on the analysis of methods

for improving business processes, as well as their strengths and weaknesses.
12. Effective management of FTC processes requires constant monitoring and automation. The implementation of Microsoft Power Automate and a corporate crowdsourcing system is recommended.

The main points of the dissertation work are reflected in the following published scientific works of the author:

1. Dadashova K.K., Mirzayev F.M. Analysis of the main directions of development of air transport of the Republic of Azerbaijan. Azerbaijan University of Cooperation, Scientific and practical journal "Cooperation", №2 (41), 2016, pp. 221-229.
2. Dadashova K.K. Innovative business model of the airline's development strategy in the Republic of Azerbaijan. "Creative potential of youth in solving aerospace problems" I International Scientific and Practical Conference. Baku, 2016, pp. 341-344.
3. Dadashova K.K. The role of flight simulations in pilots training. "Creative potential of youth in solving aerospace problems" II International Scientific and Practical Conference, Baku, 2017, p. 233-235.
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5. 11.Alekperova F.F., Dadashova K.K. Study of key aspects of the industry interaction between aviation and tourism. "Challenges of modern tourism", Collection of reports of an international scientific conference, University of St. Cyril and Methodius, Bulgaria, 2022. pp. 755-763.
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