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COMPARATIVE ANALYSIS OF AVIATION MARKET DEVELOPMENT MODELS IN KAZAKHSTAN AND SLOVAKIA

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Abstract. The relevance of the study is that in conditions of the modern geopolitical instability and global transformation of logistic chains the aviation segment of the countries possessing a significant transit potential is encountering unprecedented systemic challenges. The effectiveness of aviation industry management in these conditions directly affects the national economic security and the depth of state integration into the global economic space. A comparative analysis of aviation market development models in fundamentally different regulatory environments, represented by EAEU and EU, allows to identify the most adaptive strategies for overcoming external shocks. The aim of this study is to conduct the complex comparative analysis of the current state and development prospects of different aviation markets of Kazakhstan and Slovakia, emphasizing the identification of structural differences and assessment of the impact from the national and supranational mechanisms on the industry stability. During the research, a systemic approach and the comparative statistical analysis methods for the data over the 2019-2024 period have been utilized, along with the quantitative analysis of regulatory and legal framework, ICAO standards and regional

safety regulations. The obtained results demonstrate that the aviation market of Kazakhstan is characterized by the high growth dynamics and belongs to the vertical integration model, whereas the aviation market of Slovakia differs in terms of high fragmentation level and critical dependency on the strategies of foreign low-cost carriers. The practical significance of this study is in the possibility of using its conclusions by the aviation authorities of both countries while developing long-term strategies for aircraft fleet modernization and perfecting state safety programs.

Keywords: transit potential, low-cost carriers (LLC), vertical integration, flight safety, ICAO standards, regulatory environment, airport infrastructure

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ҚАЗАҚСТАН МЕН СЛОВАКИЯНЫҢ АВИАЦИЯЛЫҚ НАРЫҚТАРЫНЫҢ ДАМУ МОДЕЛЬДЕРІН САЛЫСТЫРМАЛЫ ТАЛДАУ

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Аннотация. Зерттеу өзектілігінің мәні қазіргі геосаяси тұрақсыздық және логистикалық тізбектердің жаһандық трансформациясы жағдайында айтарлықтай транзиттік әлеуеті бар елдердің авиациялық сегменті бұрын-соңды болмаған жүйелік қиындықтарға тап болуында. Осы жағдайларда авиация саласын басқарудың тиімділігі ұлттық экономикалық қауіпсіздікке және мемлекеттің әлемдік экономикалық кеңістікке интеграциялану тереңдігіне тікелей әсер етеді. ЕАЭО мен ЕО ұсынған түбегейлі әртүрлі реттеуші ортадағы авиация нарығын дамыту модельдерін салыстырмалы талдау сыртқы күйзелістерді еңсерудің ең бейімделгіш стратегияларын анықтауға мүмкіндік береді. Бұл зерттеудің мақсаты құрылымдық айырмашылықтарды анықтауға, ұлттық және одан жоғары механизмдер

саланың тұрақтылығына әсерін бағалауға баса назар аудара отырып, Қазақстан мен Словакияның әртүрлі авиациялық нарықтарының қазіргі жағдайы мен даму перспективаларына кешенді салыстырмалы талдау жүргізу болып табылады. Зерттеу барысында 2019-2024 жж. деректерді талдаудың жүйелік тәсілі мен салыстырмалы статистикалық әдістері, сондай-ақ нормативтік-құқықтық базаны, ICAO стандарттарын және аймақтық қауіпсіздік ережелерін сандық талдау қолданылды. Алынған нәтижелер Қазақстанның авиациялық нарығы өсудің жоғары динамикасымен сипатталатынын және тік интеграция моделіне жататынын көрсетеді, ал Словакияның авиациялық нарығы фрагментацияның жоғары деңгейімен және шетелдік арзан тасымалдаушылардың стратегияларына сыни тәуелділігімен ерекшеленеді. Бұл зерттеудің практикалық маңыздылығы оның қорытындыларын екі елдің авиациялық органдарының әуе кемелері паркін модернизациялаудың ұзақ мерзімді стратегияларын әзірлеу және мемлекеттік қауіпсіздік бағдарламаларын жетілдіру кезінде пайдалану мүмкіндігінде.

Түйін сөздер: транзиттік әлеует, төмен бюджеттік тасымалдаушылар (LCC), вертикалды интеграция, ұшу қауіпсіздігі, ИКАО стандарттары, реттеуші орта, әуежай инфрақұрылымы

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СРАВНИТЕЛЬНЫЙ АНАЛИЗ МОДЕЛЕЙ РАЗВИТИЯ АВИАЦИОННЫХ РЫНКОВ КАЗАХСТАНА И СЛОВАКИИ

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Аннотация. Актуальность исследования заключается в том, что в условиях современной геополитической нестабильности и глобальной трансформации логистических цепочек авиационный сегмент стран, обладающих значительным транзитным потенциалом, сталкивается с беспрецедентными системными вызовами. Эффективность управления авиационной отраслью в этих условиях напрямую влияет на национальную экономическую

безопасность и глубину интеграции государства в мировое экономическое пространство. Сравнительный анализ моделей развития авиационного рынка в принципиально разных регулятивных средах, представленных ЕАЭС и ЕС, позволяет выявить наиболее адаптивные стратегии преодоления внешних шоков. Целью данного исследования является проведение комплексного сравнительного анализа текущего состояния и перспектив развития различных авиационных рынков Казахстана и Словакии с акцентом на выявление структурных различий и оценку влияния национальных и наднациональных механизмов на стабильность отрасли. В ходе исследования были использованы системный подход и методы сравнительного статистического анализа данных за период 2019-2024 гг., а также количественный анализ нормативно-правовой базы, стандартов ICAO и региональных правил безопасности полетов. Полученные результаты демонстрируют, что авиационный рынок Казахстана характеризуется высокой динамикой роста и относится к модели вертикальной интеграции, тогда как авиационный рынок Словакии отличается высоким уровнем фрагментации и критической зависимостью от стратегий иностранных лоукостеров. Практическая значимость данного исследования заключается в возможности использования его выводов авиационными властями обеих стран при разработке долгосрочных стратегий модернизации парка воздушных судов и совершенствовании государственных программ обеспечения безопасности полетов.

Ключевые слова: транзитный потенциал, лоукост-перевозчики (LCC), вертикальная интеграция, безопасность полетов, стандарты ИКАО, регуляторная среда, аэропортовая инфраструктура

Introduction. The aviation sectors of the Republic of Kazakhstan and the Republic of Slovakia demonstrate structural differences, conditioned by different geopolitical directives and regulatory environments. Located at the Eurasian crossroads, Kazakhstan implements the strategy of extensive development, directly oriented towards the global transit hub status establishment. Within this strategy, aviation transcends the role of auxiliary transportation sector and acts as a key element of national infrastructure and a tool of geopolitical power. These ambitions can be empirically confirmed in the state roadmap, overseeing the development of six international aviation hubs and creation of specialized sovereign cargo air carrier.

Slovakia, on the contrary, functions in the conditions of the Single European market, choosing in favor of intensive integration and narrow specialization. Its aviation system, the core of which is Bratislava Airport (BTS), develops in the commercial shadow of dominating Vienna International Airport (Flughafen Wien-Schwechat). As a result, the Republic of Slovakia virtually takes the secondary position in the regional logistic network, re-orienting its business model towards low-cost carrier (LLC) servicing, as opposed to competing in the full-service airline segment.

A principal asymmetry of the regulatory philosophies of the given markets can be observed. Striving towards the maximization of the external cohesion and promotion of competitiveness, Kazakhstan sequentially implements the Open Skies policy, including giving the foreign air carriers fifth freedom of the air. This approach displays a firm loyalty to the standards of the International Civil Aviation Organization (ICAO) and orientation towards increasing the aviation market transparency.

The regulatory architecture of Slovakia, in turn, is integrated into the supranational system of European union. The aviation activity of the country is strictly governed by the requirements of European Union Aviation Safety Agency (EASA), the Single European Sky initiative (SES) and mandatory measures regarding decarbonization issued by, above all, ReFuelEU Aviation procedures.

Thus, the following study offers a comparative systemic analysis, contrasting the orientation of Kazakhstan towards the strategic autonomy and vertical integration, characterized by the significant capital investments, with Slovakia's model of intensive integration. The latter is represented by the strategy of adapting to highly regulated supranational network, suggesting exchanging institutional autonomy to specialization in niche market segments.

Materials and methods. The following study applies a comparative systemic analysis, within which a model of strategic autonomy, represented by the Republic of Kazakhstan, is being compared with a model of intensive regulatory integration, typical for the Republic of Slovakia. The choice of the given countries is justified by diametrically opposed trajectories of aviation sector development: Kazakhstan implements the strategy of extensive, capital-intensive growth, oriented towards the global transit hub establishment, while Slovakia emphasizes the intensive integration into European aviation logistics network combined with the niche specialization in conditions of strict regulatory control from European Union. This comparison allows to conduct a systemic analysis of the vertically integrated growth, represented by the Air Astana group and the model of outsourcing growth, oriented towards the low-cost carriers (LLC) attraction.

The methodological basis of the study has multifactorial nature and includes four key analytical dimensions:

1.Geostrategic and macroeconomic analysis. The contribution of aviation sector into gross domestic product and formation of national logistic architecture is evaluated. Within the analysis, the demarcation between the specialized transit hub and historically oriented towards road transportation logistics hub is conducted. The data sources are represented by Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, Mordor Intelligence analytical materials and specialized industry databases.

2.Assessment of commercial models. The study compares the strategies of vertically oriented, capital-intensive expansion and price leadership models.

Vertical integration: the Air Astana group illustrates the following model, using the high profitability indexes for financing the fleet expansion – with the target

index of 84 aircraft units by 2029 – at the expense of operating cash flow and influxes from the initial public offering (IPO).

Outsourcing growth: the Bratislava airport, on the contrary, demonstrates the model oriented towards traffic volume. By prioritizing the high-volume traffic of low-cost carriers (Wizz Air, Ryanair) and database expansion, the airport replaces the asset ownership by the aggressive price leadership policy.

3.Regulatory and aviation security regimes. The transaction costs and operating efficiency, formed by various regulatory systems, are being analyzed. There is a comparison of upholding the standards of the International Civil Aviation Organization (ICAO), including the audit results and aviation incidents statistics in Kazakhstan, with the mandatory directives of the European Union Aviation Safety Agency (EASA), along with the standards of European Union, above all, Single European Sky (SES) and ReFuelIEU Aviation.

4.Geopolitical and ecological externals. Within the following study, an asymmetrical impact of the external shocks on market stability and cost structure is highlighted. There is an exploration of operating volatility, conditioned by the closure of the Middle Eastern airspace (relevant for Kazakhstan), along with the determined cost increase, related to the upholding mandatory ecological regulations, including the quotas for sustainable aviation fuel (SAF) utilization, relevant for Slovakia.

Results. The role of aviation in the national economies of the Republic of Kazakhstan and the Republic of Slovakia is determined by their fundamentally different geopolitical and logistic conditions.

Kazakhstan sequentially uses aviation sector as a tool for implementation its strategic objective of the transcontinental transit hub establishment, ensuring the effective connection between Europe and Asia. This geostrategic positioning allows the country to diversify the global supply chains and reinforce its status of the central node for cross-border movement of passengers and cargo with high added value.

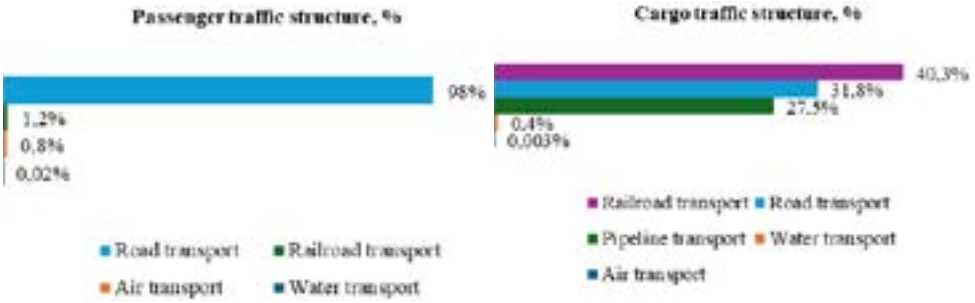

Figure 1 — The structure of passenger and cargo traffic by transport types in the Republic of Kazakhstan, %

Remark: compiled by the authors using data from (Bureau of National Statistics, 2025)

The overall economic contribution of aviation sector to the economy of Kazakhstan is significant. In 2023 the industry ensured the added value of around 6.4 billion US dollars for the national economy. A wider transport sector comprises the share of goods-producing industries in GDP estimated at 2.5%, while the transport and warehousing logistics act as the main drivers of growth, significantly contributing to the GDP volume index. Besides the direct fiscal effect, the industry provides employment for 191,000 people (International Air Transport Association). The focused attention allocated by the state towards aviation development highlights its role as not just a peripheral service sector but a fundamental macroeconomic driver.

At the same time, although Slovakia positions itself as a logistic node of Central Europe, its transport market is historically and structurally oriented towards road transportation. It is forecast that the volume of logistic service market will reach 3.02 billion US dollars by 2025 and will increase to 4.18 billion US dollars by 2029 with the compound annual growth rate (CAGR) of 6.74% (Mordor Intelligence, 2025a). However, the traffic structure remains heavily imbalances: as of 2024, the share of road transport comprises 81.71% from the overall cargo traffic income.

Figure 2 represents the modal structure of passenger and cargo traffic in the Republic of Slovakia, as of 2024.

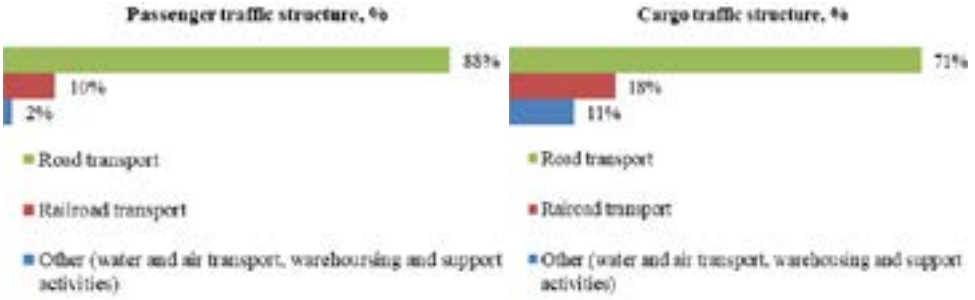

Figure 2 — The structure of passenger and cargo traffic by transport types in the Republic of Slovakia in 2024, %

Remark: compiled by the authors using data from (Statistical Office of the Slovak Republica), (Statistical Office of the Slovak Republic, b)

The air cargo traffic in Slovakia exhibits a niche but growing trajectory, mostly due to high-tech industry, especially, in automotive cluster. The forecasts point out the compound annual growth rate of 5.25% for the 2025-2030 period (Mordor Intelligence, 2025b). Nevertheless, this growth does not eliminate the fundamental structural imbalance: aviation remains an auxiliary tool, completing but not replacing the road transport.

The difference in regulatory systems – a comparison of ICAO flexibility and the fifth freedom of the air in Kazakhstan with the strict architecture of EASA/EU in Slovakia – directly determines the extent of strategic autonomy, available for each country. Kazakhstan preserved the ability to proactively shape the market dynamics

and operatively react to volatility due to centralized management. Slovakia, on the contrary, has to optimize operations within the supranational European consensus, which considerably limits its tactical flexibility.

Table 1 represents a comparative synthesis of these market parameters, highlighting the fundamental strategic divergence between two countries.

Table 1 — The main characteristics of aviation markets of the Republic of Kazakhstan and the Republic of Slovakia

The analysis parameter	Kazakhstan	Slovakia
Geostrategic role	• Trans-Eurasian transit hub; • A bridge between Europe and Asia.	• Logistic hub of Central Europe; • Member of the Schengen Area and EU, compliance with EASA/EU (SES, ReFuelEU Aviation).
Regulatory framework	ICAO (active compliance and elevation of standards) and the fifth freedom of the air	EASA/EU (SES, ReFuelEU Aviation)
Macroeconomic contribution	High: 6.4 billion US dollars; GDP share - 2.5% (2023)	Niche: logistics dominates due to automotive transport (81,71%); the forecast for air transport CAGR - 5,25% (2025–2030)
Financial orientation	Capital-intensive strategy, aimed at the fleet and MRO infrastructure expansion (the Air Astana group is planning to invest 1.3 billion US dollars in fleet modernization by 2029)	Orientation towards optimization, lowering LCC operating costs, dependency on foreign air carriers

Remark: compiled by the authors using data from (International Air Transport Association), (Mordor Intelligence, 2025b), (Finance.kz, 2025)

The comparative analysis of commercial models identifies profoundly marked divergence: Kazakhstan opted for the strategy of vertically integrated, capital-intensive expansion, whereas Slovakia is oriented towards the model of growth outsourcing, with the emphasis on price leadership.

The strategic position of the Air Astana group is the key element in national transport policy of Kazakhstan. It functions in the dual-brand architecture, uniting a full-service carrier (Air Astana) with a low-budget sub-brand (FlyArystan). Such market segmentation allows the group to effectively calibrate the demand, minimizing the internal competition among brands, simultaneously maximizing market penetration and reinforcing the dominant position.

The commitment of Kazakhstan to the extensive development is documented in an unprecedented capital expenditure roadmap of the AirAstana group, totaling 1.3 billion US dollars until 2039 (Finance.kz, 2025). The capital-intensive trajectory is aimed at ensuring future powers and long-term operating stability.

The detailed analysis of these investments highlights two strategic directions:

1. Fleet expansion: the group plans to increase the number of aircraft from 50 to 85 airplanes, which constitutes growth by 70%. Such an aggressive power scaling

is a necessary condition for fulfilling the ambitions to create the transit hub and satisfying the growing demand for Asian and Middle Eastern destinations.

2. MRO infrastructure: simultaneously 140 million US dollars are allocated towards building two hangars for maintenance, repair and overhaul in Almaty (Finance.kz, 2025). This allows the aviation sector to transcend simple exploitation and gain technical autonomy.

Figure 3 illustrates the correlation between dynamics of capital investments in passenger air transport sector and evolution of fleet numbers in the Republic of Kazakhstan over the 2015-2024 period.

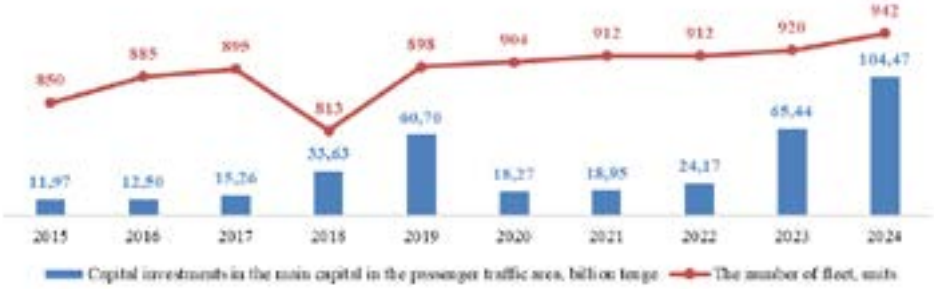

Figure 3 — The dynamics of capital investments in passenger air transport sector and fleet numbers in the Republic of Kazakhstan over 2015-2024, in billion tenge

Remark: compiled by the authors using data from (Bureau of National Statistics, 2025), (Civil Aviation Administration of Kazakhstan), (Aviation Week), (Ministry of Transport RK, 2025)

Investments in own infrastructure of maintenance, repair and overhaul (MRO) represent the key element of the vertical integration strategy. Considering accelerated expansion (growth by 70% over a compressed timeframe), relying on external MRO centers would mean significant operating risks and a critical dependency on third-party providers. Creating own powers for capital maintenance acts as a protective measure, aimed at ensuring the uninterrupted operational flow and lowering the overall costs from aircraft possession throughout their lifespan. Moreover, this step allows the group to transform the traditional cost center into a potential revenue source, providing the deficit MRO services to third-party air carriers. Therefore, the strategy of Kazakhstan demonstrates the evident aspiration to maintain strict control over the internal market, determine the price policy and flexibly react to rapid changes in market conjecture.

On the contrary, the aviation market of Slovakia is characterized by a structural dependency on external operators. The Bratislava Airport (BTS) is primarily focused on attracting foreign low-cost carriers (LCC) such as Wizz Air and Ryanair, positioning itself as an economic alternative to Vienna International Airport on account of strictly following the price leadership model. Despite the fact that this strategy ensures a stable passenger flow, it inflicts critical strategic limitations. Refusing to develop the dominating national carrier, Slovakia virtually cedes the

significant strategic control – over route development, price policy and power distribution – to those third-party LLC. The country's economy, already limited by the strict EU supervision (for example, ecological requirements), becomes strategically vulnerable to external changes in price and operating policy of these operators.

Despite the domination of automotive transport in logistics, the segment of air cargo transportation demonstrates a stable growth. This growth is stimulated not by transit flows (as is in Kazakhstan) but logistic requirements of the local high-tech and manufacturing industries, especially, the automotive one. The forecasted compound annual growth rate (CAGR) of 5.25% for air cargo transportation over the 2025-2030 period confirms that, although aviation is not the main macroeconomic driver, it represents a critically important and growing segment of niche high-revenue logistics.

The comparative analysis of regulatory environments identifies key risks, typical for each system: for Kazakhstan it is potential divergence between the formal ICAO standards and factual operating security; for Slovakia – structural ineffectiveness, grounded in complex supranational European systems (EASA/EU).

Figure 4 represents the dynamics of aviation accidents and incidents, registered in Kazakhstan over the 2018-2024 along with the relative safety indicators over the 2023-2024.

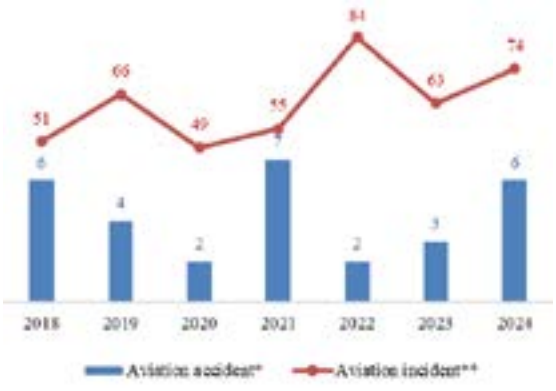

Figure 4.1 Figure 4.2

Figure 4 — The dynamics of aviation accidents and incidents over 2018–2024 (4.1) and the relative safety indicators in the Republic of Kazakhstan 2023–2024 гг. (4.2)

Remark: compiled by the authors using data from (Aviation Administration of Kazakhstan, 2023), (Aviation Administration of Kazakhstan, 2024), (Aviation Administration of Kazakhstan, 2025), (Government of Kazakhstan, 2015)

***Aviation accident:** an event, related to aircraft exploitation, which led to the death (or the fatal injury) of any person onboard and/or the damage or destruction of the aircraft itself.*

****Aviation incident:** an event, related to aircraft exploitation, which could or virtually threatened the integrity of aircraft and/or lives of its passengers, but did not result in aviation accident (crash).*

Kazakhstan undertook significant efforts to increase the compliance with international standards, which is confirmed in the last ICAO audit. During the following assessment, a considerable progress in the area of air security and procedure simplification has been documented since 2017, while the compliance metrics grew from 83% (2017) to 95% (2025) (24KZ, 2025). The ICAO experts particularly highlighted the tightening of national legislation for bringing it into compliance with the Standards and Recommended Practices (SARPs) of ICAO, along with the strengthening the governmental supervision, regulatory system and qualification of aviation personnel. Apart from this, the Government of Kazakhstan actively promotes the creation of Permanent Mission in ICAO, which is the formal step towards solidifying the international status of the country.

Despite this "paper-based" regulatory progress, the sector encounters an alarming tendency in the realm of operating security. The number of aviation incidents increased from 63 cases in 2023 to 74 cases in 2024 (Aviation Administration of Kazakhstan, 2025). This measurable growth of incidents signals a critical divergence between the successful completion of the ICAO audit and actual implementation of security culture in practice.

It can be observed that there is an evident discrepancy between the large-scale investments in tangible assets (new aircraft, MRO hangars) and necessary development of intangible assets (procedural security, effective supervision, complex education). For preserving the growing reputation of the global transit hub, Kazakhstan has to focus efforts on eliminating this operating gap. External investors and international partners evaluate the risks not according to the standard compliance reports but according to the objective statistics of accidents and incidents.

Slovakia, as an indispensable part of European structure, upholds the strict security standards, implemented by the European Union Aviation Safety Agency (EASA). Nonetheless, its trajectory of development is structurally limited by the systemic problems, typical for the supranational aviation infrastructure of EU, namely the Single European Sky (SES) initiative.

The SES initiative was primarily designed for increasing the effectiveness and safety of air traffic management in Europe. However, it regularly encounters the main problem – fragmentation of the national airspace management. The necessity to achieve supranational consensus for any structural reform results in preservation of ineffective routes and flight trajectories.

The most significant consequence of such fragmentation is a measurable increase in operating costs. On average, aircraft fly 42 km more than necessary due to suboptimal routes (Efthymiou and Papatheodorou, 2018). This structural ineffectiveness factually functions as a permanent "operating tax" for all European air carriers, including those, who constantly uses the Bratislava airport.

For Slovakia, which market strategy is oriented towards LLC attraction, such ineffectiveness directly undermines its main competitive advantage. The LLC model is built upon the maximal optimization of operations and minimization of

costs. Forced fuel and time overspending due to mandatory 42-kilometer detours considerably decreases the operating margin and weakens the competitive positions of Bratislava regarding the hubs, not burdened by SES. It is important to note that Slovakia has the limited opportunities for overcoming this problem because elimination of airspace fragmentation requires a complex intergovernmental coordination at the entire EU level.

Table 2 presents the quantitative summary analysis, comparing the investments, economic contribution and regulatory risks for both countries.

Table 2 — Quantitative indexes of strategic investments, economic contribution and regulatory risks

Parameter	Kazakhstan	Slovakia	Significance
Investments in fleet and MRO	1.3 billion US dollars (the Air Astana group)	Depends on external LCC	Strategy: vertical integration and growth
Increase in fleet (from 50 to 85 aircraft units)	Increase of 70%	-	Goal: achieving the global transit hub status
Operating security (aviation incidents)	Increase from 63 (2023) to 74 (2024)	High compliance with EASA	Risk: inner operating discrepancy
Regulatory ineffectiveness (SES)	-	Average route overspending of 42 km	Limitation: decreasing LLC price advantage
Mandatory SAF use (2025)	Focus on effectiveness (young fleet, DRM)	Minimum blending share of 2%	Limitation: mandatory additional costs

Remark: compiled by the authors using data from (Finance.kz, 2025), (Aviation Administration of Kazakhstan, 2025), (Efthymiou and Papatheodorou, 2018), (European Union, 2023)

For Slovakia and European Union in general compliance with ecological requirements is not only a strategy to increase effectiveness but a necessary capital-intensive directive, aimed at achieving the ambitious goals of decarbonization. The main regulatory tool in this area is the ReFuelEU Aviation Regulation.

Starting from 2025, all flights, departing from the European Union airports, are obliged to use aviation fuel with the 2% minimal share of sustainable aviation fuel (SAF). This index has to be gradually increased: up to 6% by 2030 and a substantial 70% by 2050 (European Union, 2023). SAF is an effective tool of decarbonization, allowing to reduce CO_2 emissions during the lifespan by approximately 65% (European Union, 2018).

However, SAF implementation is paralleled by considerable economic consequences. Currently SAF carries a significant price premium compared to the conventional jet fuel, and the EU production capacities are insufficient for ensuring even the initial mandatory share of 2% (European Union Aviation Safety Agency). The following increase in price directly affects the operating costs of low-cost carriers (LLC), which comprise the structural backbone of Slovakian market. Combined with the structural ineffectiveness of the Single European Sky (SES) initiative, the mandatory utilization of costly SAF creates a dual structural

burden, which fundamentally undermines the price competitiveness of Slovakian air transport sector.

The approach of Kazakhstan to the Environmental, Social, and Governance (ESG) issues is focused on increasing the operating efficiency and fleet modernization, which naturally results in emission reduction. The key strategic priority is aggressive digitalization of processes, necessary for managing rapidly growing aircraft fleet.

In 2025 the Air Astana group established a strategic partnership with the Flydocs company for Digital Records Management (DRM) system implementation. The Flydocs solution is integrated into the existing system of Maintenance and Engineering, (MandE), TRAX, allowing to transition the entire technical documentation of aircraft into digital format – from the service bulletins to the repair reports. This step decreased the dependency on paper-based archives and significantly increases the data accuracy and operational responsiveness (Flydocs).

Discussion. Digitalization plays a decisive role in the Air Astana strategy, fulfilling several key functions:

Operational risk mitigation: elimination of paper-based archives and increasing the accuracy and tracking of MandE operations is the direct response to increase in the number of aviation incidents. Considering the rapid fleet growth by 70% and related to it strain on the MRO system, precise documentation management is a necessary condition for upholding the high security standards.

Ensuring stable growth: the DRM system forms a solid basis for scaling operations, ensuring that the maintenance documentation management processes will not become a bottleneck in servicing 85 aircraft units by 2029.

Thus, for Kazakhstan digitalization is a strategic tool, precisely aimed at the internal operational risk mitigation and ensuring the stability of extensive growth trajectory.

The geopolitical environment exerts direct and asymmetrical impact on two explored markets.

The geographical advantage of Kazakhstan as a transit hub is considerably negated by the instability in the neighboring regions. Against a backdrop of escalating tensions in the Middle East, Aviation Administration of Kazakhstan had to introduce bans for flying over the high-risk airspace, including the areas of Iran, Iraq, Syria, Israel, Jordan and Lebanon (Kazinform).

These bans have serious operating and economic consequences. Air carriers have to utilize longer and more detouring routes, which inevitably leads to an increase in fuel consumption, operating costs growth and, paradoxically, an increase in carbon footprint. High and variable risk, connected to the mandatory expensive detours, casts doubt on the reliability of Kazakhstan as a stable transit corridor, despite its strategic position.

Slovakia, on the contrary, enjoys considerable geopolitical protection due to its EU membership and secure airspace of the bloc. Its vulnerability to the external

conflicts in the Middle East is minimal, ensuring the stability of the routes and low variability component of the geopolitical bloc.

This discrepancy in geopolitical risks creates a unique opportunity for collaboration. For Slovakia, aspiring to gain reliable corridors to Asia, Kazakhstan can be strategically represented as an alternative, secure transit hub, allowing to diversify logistic and geopolitical risks, bypassing more unstable conventional routes.

Aviation markets of Kazakhstan and Slovakia develop according to the fundamentally different trajectories, displaying different national priorities: Kazakhstan aspires to gain strategic autonomy and market domination via extensive growth, whereas Slovakia is oriented towards the niche effectiveness within a wider European system throughout intensive integration.

Recommendations for Kazakhstan:

1. To accelerate the mitigation of the security discrepancy: it is necessary to displace the accent from the formal ICAO standards compliance with precise implementation of operational security culture. This requires consistent investments not only in the equipment but also in the strengthening of supervision and education of personnel for changing the increasing trend of accidents.

2. Digitalization for stability: to continue the strategic implementation of digital tools such as Flydocs DRM platform, integrated into the MandE systems. This is necessary for achieving high operating efficiency and flawless tracking of technical maintenance, which directly decreases the internal operating risk with unprecedented fleet expansion.

3. Diversification of transit corridors: to actively promote safer northern routes to Asia to minimize the direct dependency on the corridors, vulnerable to conflicts in the Middle East and geopolitical instability.

Recommendations for Slovakia:

1. Active utilization of Kazakhstan's transit: it is recommended to actively utilize Kazakhstan as a reliable transit hub for passenger and cargo traffic to Central and Southeast Asia. This effectively diversifies logistic risks, considering the stability, ensured within EU.

2. Supporting the SES reform: it is necessary to reinforce the participation in the supranational dialogue regarding the Single European Sky initiative reform for facilitating its implementation. Optimization of the airspace and elimination of excessively long routes (42 km per flight on average) will decrease the operating costs and foster the competitiveness of Bratislava as an LLC-oriented hub.

3. Development of a direct link: it is necessary to explore the possibility of opening of a direct Astana-Bratislava route to solidify the role of Kazakhstan as a stable transit point and provide Slovakia with a stable access to Asian markets with minimization of geopolitical risks.

Conclusion. The comparative analysis of aviation markets of Kazakhstan and Slovakia identifies diametrically opposed trajectories of development. Kazakhstan implements the strategy of extensive growth, aimed at the creation of trans-Eurasian

transit hub, based on the vertical integration model. This is confirmed by a roadmap of the capital investments of 1.3 billion US dollars from the Air Astana group and planned fleet expansion by 70%. On the contrary, Slovakia has opted for a way of intensive integration into the European network, focusing its attention on providing niche services for low-cost carriers (LLC) within the strict regulatory architecture of EU/EASA.

The main risks and recommendations:

– The key risks for Kazakhstan are represented by the discrepancy between the formal compliance with ICAO standards and actual security indexes, which is confirmed by the increase in aviation incidents from 63 to 74 over the 2023-2024 timeframe along with the geopolitical vulnerability of critically important transit structures;

– The structural burden of Slovakia is related to inefficiency of the supranational Single European Sky (SES) initiative, which, combined with the mandatory and costly use of Sustainable Aviation Fuel (SAF), fundamentally decreases the price-based competitive advantage of its LLC sector.

For ensuring stable development Kazakhstan needs to critically accelerate elimination of the inner discrepancy in the realm of operational security via digitalization (Digital Records Management, DRM) and foster the security culture. For Slovakia, it is recommended to actively use Kazakhstan as a stable alternative transit hub for air transport to Asia and strengthen the support of the SES reform for decreasing the growing operating costs.

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