Improving the productivity of the Russian aircraft industry

A Schmeleva¹² and S Bezdelov¹

¹ Plekhanov Russian University of Economics, 117997, Russian Federation, Moscow, Stremyanny lane, 36

E-mail: ²schmelevaanna@mail.ru

Abstract. Currently, the pandemic has had an extremely negative impact on the economy, especially in the aviation industry. The airfreight's frequency has not fully recovered. The situation requires appropriate systemic measures to address it. The article describes the organizational and economic mechanisms to improve the Russian aviation's productivity and identifies the need to review approaches to assess the Russian aviation industry, considering that it has not achieved the target indicators set by the state program. There are two main directions: inclusion of the section "Evaluation of Integrated Aircraft Industry Structures (IS) Efficiency" into the state program, as well as a detailed evaluation of competitiveness and product portfolio of the aircraft industry's IS, development of IS competitiveness strategy both in the domestic and foreign markets. There have also been considered the prospects of using crowdfunding platforms in Russia as an alternative financial instrument to banks in the helicopter technology's P2B and B2B segments. There several factors facilitating this practice's development: the world sharing economy's active position; tightened requirements for customers and a decline in bank loans; the lack of profitable lending programs for small and medium-sized entrepreneurship; the regulations of crowdfunding platforms introduced in 2020; citizens' growing involvement in various IT platforms, including investment ones.

1. Introduction
Before the Russian lockdown, according to the Federal Air Transport Agency (FATA), passenger traffic showed a trend of active growth at regional airports, in some cases by 20%, in others by 59% from 2015 to 2018 [1]. Russian airports served about 205 million people by the end of 2018, which is the highest number for 95 years of the Russian civil aviation. Besides, the total fuel costs of airlines increased by 43% or 87 billion rubles for the first nine months of 2018 and now represents 288 billion rubles. Simultaneously, the consumption of aviation fuel increased only by 9%, which is seven million tons [2].

The Federal Air Transport Agency recorded an increase in passenger traffic on domestic airlines: in January-April 2019, it was 8.9%, the services of Russian airlines used 20.319.672 people [3]. Annual growth in passenger traffic (January-November 2018 to January-November 2019) was +13.1% for 15 airlines, accounting for more than 93% of civil aviation (Table 1). In January-October 2019, the following trends were on the passenger transportation market: maintenance of high (double-digit) growth rates (+17.7%) on international airlines (IA); the main driver of passenger transportation growth was transportation between Russia and foreign countries outside the CIS (+22.7%), the transportation growth in this market segment amounted to 7.2 million. The main driver of passenger traffic growth in this market segment was transportation between Russia and foreign countries outside...
the CIS (+22.7%). Transportation growth in this market segment was 7.2 million people; a significant decrease in transportation between Russia and the CIS (-11.6%); a slowdown in the growth rate of transportation by domestic airlines from +11.6% in March to +5.5% in October; a decrease in transportation by local airlines (-1.5%).

**Table 1.** Transportation of passengers and passenger turnover in January-November 2018-2019 (international and domestic traffic) [4].

| №  | Airline company                          | Carried passengers, people % 2019 to 2018 | Passenger traffic, thous. passenger-kilometers % 2019 to 2018 | Passenger seat occupancy rate, % % 2019 to 2018 |
|----|-----------------------------------------|-------------------------------------------|---------------------------------------------------------------|---------------------------------------------|
| 1  | Aeroflot - Russian Airlines             | 104.8                                     | 104.3                                                         | -1.3                                        |
| 2  | Siberia                                 | 118.2                                     | 124.7                                                         | +0.1                                        |
| 3  | Rossiya                                 | 104.5                                     | 115.2                                                         | -1.4                                        |
| 4  | Pobeda                                  | 144.4                                     | 142.5                                                         | -0.2                                        |
| 5  | Ural Airlines                           | 106.5                                     | 107.5                                                         | +0.2                                        |
| Total for 5 airlines                   | 110.8                                     | 111.6                                                         | -                                           |
| Share of 5 airlines in the total volume of civil aviation, % |                                          |                                                             |                                              |
| 6  | PJSC UTair Airlines                     | 102.4                                     | 104.9                                                         | +2.5                                        |
| 7  | AZUR Air                                | 137.3                                     | 127.9                                                         | -0.2                                        |
| 8  | North wind                              | 111.9                                     | 134.8                                                         | +1.6                                        |
| 9  | Globus                                  | 97.3                                      | 98.5                                                         | ***                                         |
| 10 | Red Wings                               | 118.5                                     | 122.9                                                         | +3.4                                        |
| 11 | ROYAL FLIGHT                            | 130.8                                     | 125.6                                                         | +0.3                                        |
| 12 | Icarus                                  | 109.4                                     | 88                                                            | -4.7                                        |
| 13 | Nordavia Regional Airlines              | 169.5                                     | 195.6                                                         | +5.7                                        |
| 14 | Aviation Transport Company              |                                          |                                                               |                                              |
| “Yamal”    |                                | 88.5                                      | 88.1                                                         | +2.4                                        |
| 15 | Aurora                                  | 102.5                                     | 95.9                                                         | -4.0                                        |
| Total for 15 airlines                   | 111.4                                     | 113.1                                                         | -                                           |

Having these positive dynamics, Russian airlines ended 2019 with a total operating loss of approximately 40 billion rubles (at the end of 2018, the loss was 51.7 billion rubles) [5]. Due to a passenger traffic increase by 11.2% in January-September, airline companies almost all costs increased by 14-23%, including airport taxes, aircraft rent and lease, salaries of employees, insurance. Kerosene price increased by 8.8%. Thus, even before restrictive measures on air travel due to the pandemic, there was a problem: Russians were ready to have more international and regional flights despite the relatively high cost. Airline companies insisted on reducing operating and repair costs of aircraft and compensation of the increased kerosene cost by the state. Meanwhile, the Russian airline companies did not meet several requirements of the "Development of Aviation Industry from 2013 to 2025" state program [6], referring to the sanctions against the Russian Federation. The problem was systemic and required appropriate measures to address it.

At present, it is evident that the pandemic has had an extremely negative impact on the economy, especially in the aviation industry, where the level of airfreight frequency has not fully recovered. At the meeting of the Russian Union of Industrialists and Entrepreneurs, it was noted that the world economy is changing, and the aviation industry also has to change, be global and competitive. The Russian aviation industry operates by outdated management principles and cannot act in the national interests without further changes. It is required to have a new national management paradigm of the aviation industry to achieve sustainable economic growth and increase international competitiveness globally. The combination of industry and particular competence in one state body would significantly increase the efficiency of management and industry [7].

One could agree with that, but there is no transparent interconnection between the Russian aviation industry's elements, which are air carriers, Russian airport and airfield network, fuel suppliers, federal executive authorities (FEA), passengers. In our opinion, this situation requires moving from the concept of the "Russian aviation industry" to the concept of the "Russian aviation infrastructure
system” with the development and description of the following organizational and economic mechanisms:

Mechanism 1 - Creation of the Russian Aviation Infrastructure System (RAIS) based on the value chain (VC);
Mechanism 2 - Development of an integrated management structure for the aviation industry strategic planning system based on the RAIS;
Mechanism 3 - Changing approaches to assessing the efficiency of the "Development of Aviation Industry from 2013 to 2025” state program;
Mechanism 4 - Application of crowdlending platforms as an alternative financial instrument to banks in P2B and B2B segments of helicopter equipment.

2. Materials and methods
There have been used practical and theoretical methods to write this article. The practical method includes information on the state management of the Russian aviation business. The main problem is the deficient representation in the open mass media and scientific publications of the information on the federal executive authorities' efficiency (FEA) in the aviation industry. The major part of the material is the regulations governing the Russian FEA’s activities, information from official websites of the Russian Government, FEA, Integrated structures of the aviation industry. This study’s area of interest were several works aimed at assessing the impact of public administration mechanisms on the aviation industry development in different countries [8-22]. There have also been used theoretical methods of generalization and analysis of practical information to form the organizational and economic mechanisms of public administration and to improve the efficiency of the Russian aviation business.

3. Results
Mechanism 1 – Formation of the Russian Aviation Infrastructure System (RAIS) [23] based on the value chain (VC) (Figure 1).
Figure 1. Russian Aviation Infrastructure System Based on the value chain (VC).

The value chain in RAIS should include 3 main elements: aviation industry (the industry in which the development, production, testing, repair and disposal of aviation equipment is performed); Russian airlines (organizations engaged in passenger and cargo air transportation, aviation work); airport and airfield network of Russia. RAIS combines the aviation industry and the Aircraft Transport System (ATS) of the Russian Civil Aviation (unity of naturally located and interconnected parts of the organization of people and cargo movement by air.

Mechanism 2 – Elaboration of an integrated management structure for the system of strategic planning of aviation industry development on the basis of the RAIS creation (Figure 2).

Figure 2. The scheme of integrated airline management structure based on RAIS creation.

The suggested scheme combines: the structure of Russian aviation industry management; process-value model of aviation products creation; Russian aviation infrastructure system on the basis of VC. Within the framework of this integrated structure, it is proposed: to transfer the training management functions for the RAIS to the National Research Center “Institute named after N.E. Zhukovsky”, which is currently conducting research in the aviation industry; to create an element of the aviation industry management structure that is currently missing, the main function of which will be the foresight of inquiries from the aviation transport market. The creation of this integrated structure meets the instructions formulated by the meeting of the Presidium of the Presidential Council for Strategic Development and Priority Projects dated March 22, 2017 No. 3, primarily “a significant reduction in the number of generated orders due to the transition to management based on project plans (programs) process regulations and key performance indicators.” The implementation of the integrated structure on the basis of RAIS implies the need to describe the main, managerial and auxiliary processes presented in the structure in terms of their decomposition, interrelation, regulation and development of performance and efficiency indicators. The structure is aimed at elimination of problems in corporate management processes of separate integrated aviation industry structures and, first of all, in marketing, distribution, sales, technical and after-sales service processes.

The integrated management structure focuses on the airline's market environment. The main focus is not on financing the integrated structures (IS) of the aviation industry itself, but on in-depth study of
the aviation products market, including customer needs and redistribution of financial support from IS to air carriers in the domestic Russian market.

**Mechanism 3** – Changing approaches to assessing the efficiency of the "Development of Aviation Industry from 2013 to 2025" state program. Under the current circumstances, it is necessary to drastically change the approach to assessing the efficiency of the "Development of Aviation Industry from 2013 to 2025" state program; we propose two main directions.

**Direction 1.** To include the section “Evaluation of the effectiveness of integrated structures (IS) of the aviation industry” into the state program, in which the main activities should be formulated in relation to specific IS with the identification of leaders, “catching up” and outsiders to achieve targets. The inclusion of this section will make it possible to identify IS - "high-risk zones" for budget investments. On the other hand, if an enterprise shows a negative trend of functioning in a significant period of time, we should think about the necessity of its further existence. The largest Russian air carriers are not ready for the global renewal of their fleet through the purchase of aviation industry products; in the 2018 report, the share of Russian-made aircraft is only 14.3%. In the proposed section “Evaluation of the effectiveness of integrated structures of the aviation industry” it is necessary to estimate the ROI (return on invested capital) indicator, used in financial analysis as an indicator of return on invested capital, in this case the governmental capital; in addition, the indicator will help to measure the management efficiency of specific IS of the aviation industry.

**Direction 2.** The need for a detailed assessment of the competitiveness of aviation industry IS, IS product portfolio, development of a strategy for IS competitiveness in both local and foreign markets. In the updated version of the state program “Development of the aviation industry” revised on April 12, 2019 [24] new indicators have appeared in the section "Targets and program indicators": share of aviation industry organizations implementing technological innovations in the total number of organizations of the aircraft industry; the share of intellectual activity results obtained within the framework of the program activities included in the economic turnover.

We see the government's intention to obtain more precise information on two important aspects: innovative activity of IS, which should be measured not only by cost indicators (as is currently being done), but also by indicators of by indicators of updatability and by ensuring the interconnection chain: the results of applied aeronautical science – their implementation in IS activity – increase of IS innovative activity- increase of aviation industry and IS products competitiveness. However, in the framework of the indicators of subprogram 7 "Aviation Science and Technology" this chain is not evaluated, we see indicators: the number of publications in scientific journals indexed in the database "Network of Science" per 100 researchers in aviation scientific organizations; the number of domestic and foreign patents (certificates) for intellectual property, i.e. those indicators that can be used in relation to fundamental, but not applied (aviation) science. Evaluating their own market competitiveness and the competitiveness of their products, the IS themself also demonstrate a lack of readiness.

A good example is the UAC (United Aircraft Corporation) Innovation Development Program [25], which presents the following key performance indicators: labor productivity; revenue from innovative products; the share of export revenue from innovative and high-tech products in corporate revenue; decrease in the production cost compared to the level of 2015; reduction of the energy and fuel consumption share in the total cost of sold products in relation to the previous year; the amount of R&D funding (as a percentage of corporate revenues); share of own funds in total R&D funding; number of intellectual property objects integrated into production (first year of use). We see the emphasis only on cost indicators (indicators of "entry"), but there is absolutely no information about the indicators of "exit": the level of competitiveness in terms of products; volumes of long-term agreements (on Russian and international markets), etc. However, in the passport of the state program for aircraft building the goal is indicated: the formation of a domestic competitive aircraft industry, and the result of the program: maintaining sustainable profitability of aviation industry organizations as a result of debt restructuring and the formation of a portfolio of long-term orders, which is a stable source of profit. Thus, in the UAC Innovation Development Program, these aspects are not formulated
to assess the competitiveness of the organization and products and on this basis to ensure long-term orders. The Ministry of Economic Development of the Russian Federation has already paid attention to the same situation in the report of 2017 "On the results of evaluation of innovative development programs of companies with state participation" [26], in which the UAC noted: insufficient completeness of the planned innovation projects and activities description as well as the substantiation of their financing (with the allocation of extra-budgetary funding volumes); superficial assessment of competitiveness; plans for the development of promising technologies (including additive ones) are not specified.

**Mechanism 4 – Application of crowdlending platforms as an alternative financial instrument to banks in the segments of P2B and B2B helicopters.**

On January 1, 2020, the Federal Law of August 2, 2019, N 259-FZ "On attracting investments by investment platforms and on amendments to certain legislative acts of the Russian Federation" [27], came into force in Russia, which is called the "crowdfunding law." According to the law, the flow of non-cash investments happens on Internet investment platforms under contracts [28]. The history of Russian investment platforms shows that the non-financial model of crowdfunding had the most predominant development. However, to increase crowdfunding transactions, it is necessary to activate the crowdfunding lending to legal entities - P2B and B2B-crowdfunding. A promising direction for the Russian crowdfunding's development (P2B and B2B-crowdfunding) can be operational leasing schemes, especially in the air and rail transport. At the end of the operational leasing agreement's duration, the lessor gets his property back, whereas, in the financial agreement, it is the lessee who gets the property (Figure 3).

Figure 3. Scheme of helicopter equipment operational leasing [29].

Therefore, it is possible to use the resource without ownership transfer, which is the sharing's distinctive feature. To date, there are three forms of financing the largest lessors: without bank loans, lending from the parent bank, and lending from a pool of banks [30-31]. Bank loans remain the primary source of funding for leasing transactions, whose share in the financed funds has been at least 60% over the past four years [32], making it possible to use crowdfunding (segment P2B and B2B-crowdfunding) as an alternative investment source with a focus on companies using loans from a pool of banks.

Today, 85% of Russian helicopters are older than 25 years, mainly Mi-8T and Mi-2. They perform most of the aviation work, including passenger transportation [33]. Boginsky A., General Director of JSC Russian Helicopters, believes that the Russian civil market's potential size for the coming years is about 100 helicopters of different classes per year, considering the equipment replacement, the growth of helicopter passenger transportation by 7% per year, the development of transport accessibility in the Far East and the development of the Arctic, and the sanitary aviation program [34]. In May 2018, the State Transport Leasing Company presented a program of trade-in helicopters in the Russian market to stimulate the helicopter equipment market. It implies an exchange of foreign-made aircraft for a new modern domestic helicopter [35-37]. The advantages of operational leasing in promoting helicopter
products are: for the market - access to new modern helicopters on more cost-effective terms; for JSC Russian Helicopters - an increase in sales plan and a promising tool to promote civil products, including foreign markets; for the leasing company - unique expertise and infrastructure to promote helicopter products.

In 2016-2019, the production of helicopters manufactured under commercial contracts with Russian leasing companies was unstable, and the market dynamics were under pressure from the reduced availability of borrowed funds. Figure 4 depicts the shares of contracts with particular leasing companies.

![Figure 4. The fraction of contracts for equipment delivery with leasing customers.](image)

Thus, there are several prerequisites for developing Russian investment platforms with a focus on the P2B and B2B crowdsourcing segments. On the one hand, a decrease in banking activity in the issuance of loans and tighter requirements to customers, on the other, low income from deposits, and on the third, the practical lack of profitable lending programs for small and medium businesses. However, we find that the prospects for the investment platforms development are to involve not only business representatives but also local authorities.

4. Conclusion

Thus, our proposed organizational and economic mechanisms of government management and improving the efficiency of the Russian aviation business aim at: evaluation of the efficiency of each IS (primarily by the indicator "return on invested capital") with identification of organizations on further financing and, accordingly, decisions on the existence of these organizations; evaluation of the competitiveness indicators of the airline industry IS and IS product portfolio; evaluation of the competitiveness indicators of the airline industry IS and IS product portfolio; change of indicators on evaluation of aviation science efficiency, which should provide the chain of interconnection: results of applied aviation science – their integration into IS activity – increase of IS innovation activity – increase of competitiveness of aviation and IS products. Smarteka is a platform for sharing sustainable development practices in the Russian Regions, which focuses on improving living conditions, brings together leaders of change, and collects efficient practices. On May 14, 2020, this platform published the list of winners of the All-Russian Contest of Best Practices and Initiatives of Social and Economic Development of the Russian Regions, held by the Agency for Strategic Initiatives. In 2019, 1452 practices were submitted to the contest in the following categories: "Construction and Housing and Communal Services," "Urban Development and Infrastructure," "Ecology and Attitude of Care towards Nature," "Tourism and Culture," and others. The winning practices will be placed on the platform to share efficient regional solutions for socio-economic development and be recommended to other entities [38]. However, we believe that it makes sense to implement such practices by investment.
platforms. It is possible to create projects to purchase expensive equipment (including helicopter) under the operational leasing, where the customer will be the regional authorities, and investors - individuals and legal entities interested in developing transport accessibility of specific territories. Therefore, in the operational leasing of helicopter equipment mentioned earlier, crowdfunding platforms will be an alternative investment resource, possibly with a sectoral or territorial orientation.

5. Acknowledgments
Prepared as part of the state assignment of the Ministry of Science and Higher Education No. FSSW-2020-0009 "Development of a methodology for managing the competitiveness of enterprises in the field of commodity circulation in the digital economy"

References
[1] Russian Union of Industrialists and Entrepreneurs. Presentation of the report "Trust as a prerequisite for economic development" prepared by subcommission on aviation and space activities
[2] Passenger traffic at Russian airports in 2018 set a record in the civil aviation’s history
[3] Aviaport. Russian Airlines increased passenger traffic by almost 12% in four months of 2019
[4] Ministry of Transport of Russian Federation. Transportation of passengers and passenger traffic for January-November 2018-2019 (international and domestic flights)
[5] Russian Airlines reduced their total operating loss by 20% in 2019
[6] State program "Development of Aviation Industry from 2013 to 2025." Approved by the Government Decree of April 15, 2014 No 303
[7] Meeting in the Russian Union of Industrialists and Entrepreneurs "On interaction of aviation business community with federal authorities on problematic issues of regulation of the Russian civil aviation." June 4, 2019
[8] Adler N, Gellman A 2012. Strategies for managing risk in a changing aviation environment. Journal of Air Transport Management, Vol 21: 24-35
[9] Choo Y Y, Corbo L, Wang K 2018 Joint impact of airline market structure and airport ownership on airport market power and profit margin. Transport Policy, Vol 72 pp 67-78
[10] De Paula, R O, Silva L R, Vilela M L, Cruz R O M 2019. Forecasting passenger movement for Brazilian airports network based on the segregation of primary and secondary demand applied to Brazilian civil aviation policies planning. Transport Policy, Vol 77 pp 23-29
[11] Dimitriou D, Sartzetaki M 2018 Assessing air transport socio-economic footprint. International Journal of Transportation Science and Technology, Vol 7, Issue 4 pp 283-290
[12] Dožić S 2019 Multi-criteria decision making methods: Application in the aviation industry. Journal of Air Transport Management, Vol 79 pp 101683
[13] Dray L M, Krammer P, Doyme K, Wang B, Zayat K Al, O'Sullivan A, Schäfer A W 2019. AIM2015: Validation and initial results from an open-source aviation systems model. Transport Policy, Vol 79 pp 93-102
[14] Eceral T Ö, Köröğlu B A 2015 Incentive Mechanisms in Industrial Development: An Evaluation through Defense and Aviation Industry of Ankara. Procedia - Social and Behavioral Sciences, Vol 195 pp 1563-1572
[15] Itani N, O'Connell J F, Mason K 2014 A macro-environment approach to civil aviation strategic planning. Transport Policy, Vol 33: 125-135
[16] Itani N, O'Connell J, Mason K 2015 Towards realizing best-in-class civil aviation strategy scenarios. Transport Policy, Vol 43 42-54
[17] Karagülle A Ö 2012 The Evaluation of Fleet Structures in Turkish Aviation Industry from Strategic Management Point of View. Procedia - Social and Behavioral Sciences, Vol 58 pp 93-97
[18] Lei Z, O’Connell J F 2011 The evolving landscape of Chinese aviation policies and impact of a deregulating environment on Chinese carriers. *Journal of Transport Geography*, Vol 19, Issue 4 pp 829-839

[19] Meichsner N A, O’Connell J F, Warnock-Smith D 2018. The future for African air transport: Learning from Ethiopian Airlines. *Journal of Transport Geography*, Vol 71 pp 182-197

[20] O’Connell J F, Avellana R M, Warnock-Smith D, Efthymiou M 2020 Evaluating drivers of profitability for airlines in Latin America: A case study of Copa Airlines *Journal of Air Transport Management*, Vol 84 pp 101727

[21] Saraswati S K 2001 Operating environment for a civil aviation industry in India. *Journal of Air Transport Management*, Vol 7, Issue 2 pp 127-135

[22] Vespermann J, Wald A, Gleich R 2008 Aviation growth in the Middle East – impacts on incumbent players and potential strategic reactions. *Journal of Transport Geography*, Vol 16, Issue 6 pp 388-394

[23] Schmeleva A N, Nizhegorodtsev R M, Kosterev N B, Panina A G 2016 Development of the basic provisions of the conception for the improvement of the strategic planning system of the aviation industry development. *Drukerovskij vestnik*, Vol 6(14) pp 4-17

[24] Decree of the Government of the Russian Federation of April 15, 2014 N 303 "On approval of the Russian state program" Development of the aircraft industry"(as amended on March 29, 2019)

[25] Uacrussia. Passport of the innovation development program Public Joint Stock Company “United Aircraft Corporation” for the period 2016-2020 with a perspective until 2025

[26] Economy.gov. Information on the results of evaluation of innovative development programs of companies with state participation of the Group 1

[27] Federal Law of August 2, 2019 N 259-FZ "On attracting investments by investment platforms and on amendments to certain legislative acts of the Russian Federation"

[28] National investment platforms are able to attract trillions of rubles to the country's economy

[29] Lease schemes

[30] Ekimovsky A Random growth. The market of leasing grew by 2% in nine months

[31] Moiseev S Who and how loans leasing companies

[32] Forecast of the leasing market for 2020: zero growth

[33] "Russian Helicopters" discussed the development of the helicopter services market in Russia

[34] Vorobiev A Director General of Russian Helicopters: "There is a task to increase the output of civil helicopters"

[35] Decree of the Government of the Russian Federation of December 30, 2011 N 1212 "On approval of the rules for granting subsidies from the federal budget to Russian airlines, regional unitary enterprises, which are not Russian airlines, in order to update the fleet of aircraft for domestic regional and local air transportation"

[36] Decree of the Government of the Russian Federation of 12.26.2019 N 1851 "On approval of the rules for granting subsidies to Russian leasing companies to reimburse part of the costs of interest payment on loans received from Russian credit institutions and the state development corporation "VEB.RF" in 2019 for the purchase of aircraft and simulators for Russian aircraft with subsequent transfer to Russian airlines under leasing (rental) agreements

[37] Talavrinov M The State Transport Leasing Company will launch the program of trade-in helicopters with import substitution in the Russian market

[38] The winners of the All-Russian contest of the best socio-economic practices were 10 regions