

Methodology for assessing the effectiveness of the management system

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Abstract. Restrictions on the range of components have affected all sectors of the Russian economy to varying degrees. Industrial and science-intensive industries and even agriculture were not spared. To reduce the negative consequences of these restrictions, the state undertook a set of various stabilizing measures. The article reveals the nature and orientation of the measures of state support of domestic production.

1 Introduction

The development trend of the national aircraft industry has long been based on cooperation with foreign suppliers of components. At the same time, all knowledge-intensive high-tech products were also purchased abroad.

The largest suppliers of aircraft parts since 2014 have been the UAE, Israel, China and South Korea. At the same time, some countries began to supply less, namely Canada, the Netherlands, Italy, Japan and Spain. In 2022, spare parts stopped coming directly to Russia. This situation in the aircraft industry cannot correspond to development plans and national interests. For these purposes, the state has adopted a set of measures.

Firstly, the Government of Russia adopted the State Program of the Russian Federation "Development of the Aviation Industry" (hereinafter referred to as the Program). Subsequently, changes were made to the Program in 2021. The program noted that the aviation industry is one of the key high-tech sectors of the Russian economy, within which activities are carried out in the development, testing, serial production, controlled operation, after-sales service and disposal of aircraft in order to ensure transport accessibility and economic connectivity of territories and ensure national defense Russian Federation.

From the assessment of the current state of the implementation of the Program, it follows that as of 2022, the aviation industry enterprises include 268 organizations and enterprises, and the total number of employees is 415.4 thousand people. At the same time, in order to combine competencies in the development and production of aircraft, engines, avionics and aircraft units, aviation industry corporations (public joint-stock company "United Aircraft Corporation", joint-stock company "Russian Helicopters", joint-stock company "United Engine Corporation", joint-stock company "Technodinamika" and the

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joint stock company "Concern Radioelectronic Technologies") were merged into the aviation cluster of the State Corporation "Rostec" [1-4].

2 Materials and Methods

Moreover, the program defines the following system-forming links in the areas:

Table 1 – System-forming links in directions

A system-forming link in the Russian aircraft industry	A system-forming link in the Russian helicopter industry	A system-forming link in the Russian engine industry
Public Joint Stock Company "United Aircraft Corporation"	Joint Stock Company "Russian Helicopters"	Joint Stock Company "United Engine Corporation"
implements projects: medium-haul aircraft MS-21, short-haul aircraft SSJ-NEW in modifications with maximum import substitution of components and systems, regional passenger aircraft Il-114-300 and wide-body long-haul Russian-Chinese aircraft.	implements projects: completion of the creation of Mi-38 helicopters and Ka-62, modernization of the Ansat helicopter and creation of a modification of the Mi-171A helicopter - Mi-171AZ "offshore"	implements projects to create engines for the civilian segment: PD-8, PD-14, PD-35 and TV7-117ST-01.

The program also highlights current problems in the aircraft industry. These included restrictions on the import of critical technologies, reducing the possibility of purchasing foreign purchased components and materials, as well as equipment within the framework of investment projects. In conditions of high import dependence of the domestic aircraft industry, this led to a delay or impossibility of completing programs for the creation of new types of aircraft and equipment [5-7].

This situation was a catalyst for the deployment, with the participation of the state, of import substitution programs in the domestic aircraft industry, in particular in such key aircraft manufacturing projects as MC-21 and SSJ-NEW in various modifications and such engine building projects as PD-14, TV7-117ST-01, SaM146 , PD-35 and PD-8.

To achieve the results of the development of the national aviation industry, eight main priority directions of the state policy of the Russian Federation in the field of aviation activities were identified.

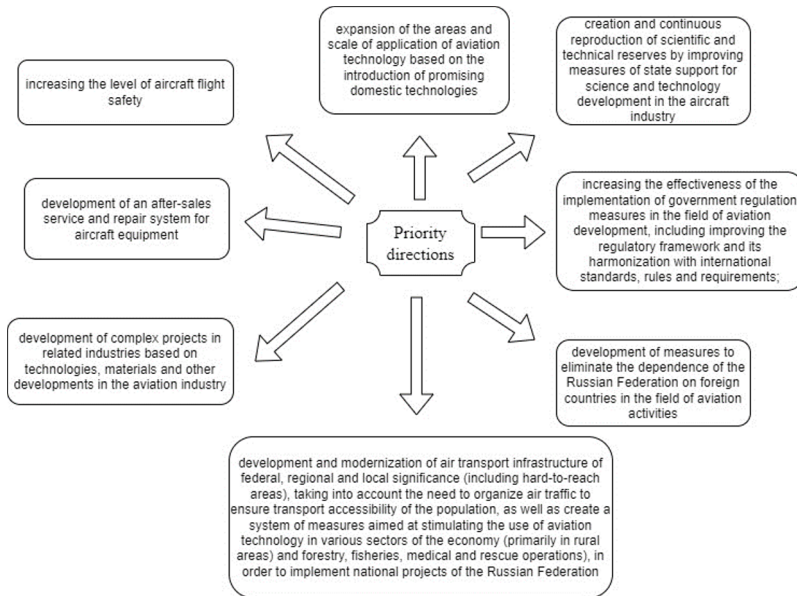


Fig. 1 -Main priority areas for the development of the aviation industry

Secondly, the Russian Ministry of Industry and Trade has developed and approved an action plan for import substitution in the civil aircraft industry of the Russian Federation for the period until 2024. In accordance with this plan, a significant transition to domestic components in the aircraft industry by 2024 is envisaged. Moreover, for many positions, guidelines are provided for the 100% use of the share of domestic products (including PD-14, PD-8, integrated aircraft control system, avionics complex, etc.)

Thirdly, the Government of the Russian Federation has developed and approved a comprehensive program for the development of the aviation industry until 2030 (hereinafter referred to as the Comprehensive Program). Despite the fact that the Comprehensive Program is a document defining the approaches of the Russian Federation to the development of the air transport industry of the Russian Federation, its nature and content is the vector for the development of the aircraft industry. In essence, this program reflects the national order for the production of domestically produced aircraft, emphasizes current problems and mechanisms for solving them [8-10].

From the analysis reflected in the Comprehensive Program it follows that the composition of the aircraft fleet of Russian aviation companies for commercial transportation in April 2022 consisted of 1,287 aircraft, of which 1,101 were passenger aircraft, 84 were cargo aircraft, 42 were business jets, and 60 aircraft that are not actually involved in commercial transportation (including those operated by the federal state budgetary institution "Special Flight Detachment "Russia" of the Administration of the President of the Russian Federation, the federal state budgetary institution "State Airlines "223 Flight Detachment" of the Ministry of Defense of the Russian Federation and Federal State Budgetary Institution "Aircraft Rescue Company of the Ministry of the Russian Federation for Civil Defense, Emergencies and Disaster Relief" and the joint stock company "Production Association "Cosmos".

The average age of passenger aircraft of aviation companies engaged in commercial air transportation is 14.6 years, of which mainline passenger aircraft are about 11 years old, regional passenger aircraft are 31 years old, including the most popular types of aircraft A321neo, A320neo - 2 years, A321, A320 - 11 years, A319 - 17 years, A330 - 12 years, B737-800, B737-900 - 10 years, B737-700, B737-500, B737-400, B737-300 - 22 years,

B777 -300 - 12 years, Sukhoi Superjet 100 - 4.3 years, Yak-42 - 28 years, An-24, An-26 - 48 years.

At the end of 2021, aviation industry enterprises supplied 83 aircraft to the foreign and domestic markets, of which 32 airplanes and 51 helicopters, 851 aircraft engines for civil and military purposes [11-13].

According to the Russian Government, the aviation industry makes a significant contribution to the country's gross domestic product (about 0.34 percent), creating about 240 thousand highly productive jobs (excluding related sectors of the economy). In 2021, the growth rate of civilian product output by industrial organizations in the aircraft industry increased by 5.6 percent (compared to 3.8 percent in 2020), with the share of civilian products amounting to 24.8 percent (in 2020 - 23.7 percent).

In addition to the above statistics, the reasons for the development of the Comprehensive Program were the following factors:

- airspace closure;
- a ban on the provision of maintenance and repair services for aircraft, components and systems;
- a ban on the sale of airplanes and helicopters, which also applies to previously concluded leasing transactions;
- a ban on the supply of components, components, systems, as well as technological equipment for manufactured and developed domestic aircraft;
- ban on updating aeronautical databases;
- ban on financial transactions, including insurance and reinsurance [14].

3 Research and results

Thus, subject to the successful implementation of import substitution programs in 2022 - 2030, it is planned to supply 1036 aircraft for the needs of civil aviation, of which 142 units SSJ-NEW, 270 units MS-21-310, 70 units Il-114-300, 70 units Tu -214, 12 units of Il-96-300, 140 units of TVRS-44 "Ladoga", 178 units of L-410 and 154 units of "Baikal" (LMS-901).

Table 2 - Forecast indicators supplies of domestically produced aviation equipment by year

Aircraft type	Capacity, people	2022 year	2023 year	2024 year	2025 year	2026 year	2027 year	2028 year	2029 year	2030 year	Total, units
Aircraft:											
SSJ-NEW	98 - 103	-	2	20	20	20	20	20	20	20	142
MS-21-310	181 - 211	-	-	6	12	22	36	50	72	72	270
IL-114-300	64 - 68	-	-	2	8	12	12	12	12	12	70
Tu-214	150 - 215	-	3	7	10	10	10	10	10	10	70
IL-96-300	237 - 300	-	-	-	2	2	2	2	2	2	12
TVRS-44 "Ladoga"	44	-	-	-	15	25	25	25	25	25	140
L-410	15 - 19	18*	20	20	20	20	20	20	20	20	178*
"Baikal" (LMS-901)	9	-	-	14	15	25	25	25	25	25	154
Total:		18*	25	69	102	136	150	164	186	186	1036*
Helicopters:											
Ansats	7 - 8	20	23	25	19	22	23	23	23	23	201

Mi-171A2	24	4	6	6	7	7	7	8	10	11	66
Ka-32A11M	13	-	4	5	6	5	5	5	4	3	37
Ka-62	15	-	-	-	11	11	14	16	18	20	90
Mi-38	30	4	4	1	5	5	5	5	5	5	39
Mi-171A3	24	-	5	6	6	7	7	7	6	5	49
Mi-8MTV-1	26	39	27	24	5	5	5	5	5	5	120
Mi-8AMT	26	24	42	30	10	10	10	10	10	10	156
Mi-26T2/TS	82	-	1	1	-	-	1	1	1	-	5
Ka-226	6-7	-	1	-	-	-	-	-	-	-	1
Total:		91	113	98	69	72	77	80	82	82	764

Under the conditions of sanctions restrictions, survey data from aviation companies confirm that these volumes of equipment will be in full demand by domestic operators.

At the same time, from 2024 it is planned to supply 20 units per year of SSSJ-NEW aircraft, and the program for the creation of MC-21 aircraft provides for the delivery of 72 units per year from 2029 with the start of deliveries of the first 6 aircraft in 2024. In addition, a large volume of deliveries of small aircraft is envisaged (TVRS-44 Ladoga, L-410, Baikal (LMS-901) - 20 - 25 aircraft annually, starting in 2026.

Helicopter deliveries in 2022 - 2030 will amount to 764 units, with the main focus planned to be on Ansat helicopters (201 units) and Mi-8 in the Mi-8MTV-1 and Mi8AMT modifications (276 units) as the most in demand [15-17].

The Comprehensive Program also plans the indicators of domestic components by year.

Table 3 – Production schedules of domestic components by year

Powerplant type	2022 year	2023 year	2024 year	2025 year	2026 year	2027 year	2028 year	2029 year	2030 year	Total
Power plants:										
PD-8	-	6	44	44	44	44	44	44	44	314
PD-14	-	-	14	26	52	80	108	152	152	584
PS-90	-	6	14	20	20	20	20	20	20	140
TV7-117ST-01	-	6	8	16	26	26	26	26	26	160
TV7-117V	20	20	20	20	25	25	25	25	25	205
VK-650V	0	86	120	120	100	100	100	100	100	826
VK-1600V	0	12	21	24	37	28	32	36	41	231
VK-2500/TV3-117	276	340	382	256	250	250	250	250	250	2504
Total:	296	476	623	526	554	573	605	653	658	4964

The approved Comprehensive Program defines the main measures of state support, aimed, among other things, at increasing the financial attractiveness of the operation of domestic aircraft, which provide for:

- reducing the costs of Russian leasing companies to repay interest on loans received for the purchase of aircraft and helicopters;
- reducing the costs of aviation companies to pay lease payments for aircraft, as well as costs associated with servicing aircraft;
- development of domestic regional and local air transportation using Russian-made aircraft;

- creation of a developed after-sales service network for domestic aircraft, helicopters and engines.

The following financial indicators have been established as sources of financing for the development of the aircraft industry for the period until 2030.

Table 4 – State program of the Russian Federation "Development of the aviation industry"

	for 2022 - 2025		for 2026 - 2030		2022 - 2030 years
	Total	including additional need for the database	Total	including additional need for the database	
Total, including:	173985006,3	-	226592280,5	-	400577286,8
federal budget	173985006,3	-	226592280,5	-	400577286,8
funds from the National Welfare Fund	-	-	-	-	-
Subsidies to manufacturers of aircraft and their components for financial support of part of the costs associated with the creation, production, sale and maintenance of aircraft of the MC-21 family (Resolution of the Government of the Russian Federation of January 25, 2019 N 36 "On approval of the Rules for the provision of subsidies from the federal budget manufacturers of aircraft and their components for financial provision of part of the costs associated with the creation, production, sale and maintenance of aircraft of the MC-21 family")					
Total, including:	19960447,8	-	27426158	-	47386605,8
federal budget	19960447,8	-	27426158	-	47386605,8
funds from the National Welfare Fund	-	-	-	-	-
Subsidies to Russian leasing companies to reimburse part of the cost of paying interest on loans received from Russian credit institutions and from the state development corporation "VEB.RF" for the purchase of aircraft with their subsequent transfer to Russian airlines under leasing (rental) agreements, as well as to these companies and aircraft manufacturers on loans received from Russian credit institutions and the state development corporation "VEB.RF" for the purchase of simulators for Russian aircraft (Resolution of the Government of the Russian Federation dated October 22, 2012 N 1073 "On providing subsidies to Russian leasing companies for reimbursement of part of the costs of paying interest on loans received from Russian credit institutions and the state development corporation "VEB.RF" for the purchase of aircraft with their subsequent transfer to Russian airlines under leasing (rent) agreements, as well as to specified companies and aircraft manufacturers under loans received from Russian credit institutions and from the state development corporation "VEB.RF" for the purchase of simulators for Russian aircraft")					
Total, including:	37601185,6	-	46008627,5	-	83609813,1
federal budget	37601185,6	-	46008627,5	-	83609813,1
funds from the National Welfare Fund	-	-	-	-	-
Subsidies to Russian leasing companies to reimburse part of the cost of paying interest on loans received from Russian credit institutions and from the state development corporation "VEB.RF" for the purchase of aircraft with their subsequent transfer to Russian airlines under leasing (rental) agreements, as well as to these companies and aircraft manufacturers on loans received from Russian credit institutions and the state development corporation "VEB.RF" for the purchase of simulators for Russian aircraft (Resolution of the Government of the Russian Federation dated October 22,					

2012 N 1073 "On providing subsidies to Russian leasing companies for reimbursement of part of the costs of paying interest on loans received from Russian credit institutions and the state development corporation "VEB.RF" for the purchase of aircraft with their subsequent transfer to Russian airlines under leasing (rent) agreements, as well as to specified companies and aircraft manufacturers under loans received from Russian credit institutions and from the state development corporation "VEB.RF" for the purchase of simulators for Russian aircraft")					
Total, including:	7392662	-	9294070	-	16686732
federal budget	7392662	-	9294070	-	16686732
funds from the National Welfare Fund	-	-	-	-	-
Creation of a system for after-sales maintenance of aircraft and training of aviation personnel for aircraft (Resolution of the Government of the Russian Federation dated March 19, 2018 N 301 "On approval of the Rules for the provision of subsidies from the federal budget to Russian companies for financial support of costs associated with the creation of an after-sales maintenance system for aircraft and training of aviation personnel for aircraft")					
Total, including:	7622443,6	-	7653054,5	-	15275498,1
federal budget	7622443,6	-	7653054,5	-	15275498,1
funds from the National Welfare Fund	-	-	-	-	-
Subsidies for airlines to compensate for part of the costs of paying leasing (rental) payments for aircraft, as well as costs associated with servicing aircraft (Resolution of the Government of the Russian Federation dated February 22, 2021 N 245 "On approval of the Rules for the provision of subsidies from the federal budget to airlines for compensation of part of the costs of paying leasing (rental) payments for aircraft, as well as costs associated with servicing aircraft")					
Total, including:	49083300	-	81848500	-	130931800
federal budget	49083300	-	81848500	-	130931800
funds from the National Welfare Fund	-	-	-	-	-
State support for Russian airlines, regional unitary enterprises that are not Russian airlines, in order to renew the aircraft fleet for domestic regional and local air transportation (Resolution of the Government of the Russian Federation of December 30, 2011 N 1212 "On approval of the Rules for the provision of subsidies from the federal budget Russian airlines, regional unitary enterprises that are not Russian airlines, in order to renew the aircraft fleet for domestic regional and local air transportation")					
Total, including:	35128700	-	52361925	-	87490625
federal budget	35128700	-	52361925	-	87490625
funds from the National Welfare Fund	-	-	-	-	-
Subsidies to Russian manufacturers of aircraft, helicopters and aircraft engines to reimburse part of the costs of paying interest on loans received from Russian credit institutions and from the state corporation "Bank for Development and Foreign Economic Affairs (Vnesheconombank)" in 2008 - 2011 for technical re-equipment, as well as parts costs of paying lease payments for technological equipment supplied by Russian leasing companies under leasing agreements concluded since 2006					

(Resolution of the Government of the Russian Federation dated February 16, 2008 N 91 "On approval of the Rules for providing subsidies to Russian manufacturers of aircraft, helicopters and aircraft engines for reimbursement part of the cost of paying interest on loans received from Russian credit institutions and the state corporation "Bank for Development and Foreign Economic Affairs (Vnesheconombank)" in 2008 - 2011 for technical re-equipment, as well as part of the cost of paying leasing payments for technological equipment supplied by Russian leasing companies under leasing agreements concluded since 2006")					
Total, including:	1799967,3	-	1999945,5	-	3799912,8
federal budget	1799967,3	-	1999945,5	-	3799912,8
funds from the National Welfare Fund	-	-	-	-	-
Property contribution of the Russian Federation to the State Corporation for promoting the development, production and export of high-tech industrial products "Rostec", including for the subsequent contribution to the authorized capital of the public joint-stock company "United Aircraft Corporation" for the purpose of refining and restoring the airworthiness of aircraft (resolution Government of the Russian Federation is being developed)					
Total, including:	15396300	-	-	-	15396300
federal budget	15396300	-	-	-	15396300
funds from the National Welfare Fund	-	-	-	-	-

The formation of a developed after-sales service network for domestic aircraft, helicopters and engines as an element of ensuring the life cycle of an aircraft product will require additional measures from the aircraft manufacturing industry [18-20].

The main problematic link in this process is the share of participation of Russian suppliers and their products in the after-sales service process.

4 Conclusion

Currently, this process lies in the area of responsibility of the system-forming units of the aircraft manufacturing industry (PJSC UAC, JSC Russian Helicopters, JSC UEC). Solving the problem of developing the share of participation in the processes of national production of aviation equipment of domestic suppliers, the public aircraft building community (Union of Aircraft Manufacturers of Russia) is proactively developing proposals for the development of aviation suppliers. Currently, work is underway to develop the project "Strategy for the Development of Aviation Suppliers until 2030."

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