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New Challenges and Prospects for the Development of Employment within Aviation Industry

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ABSTRACT

The article considers the current problems of transformation of the labour and employment environment in the sector of air transport in Russia in connection with the aspects of sustainable development of this industry. The use of this approach to analyse the current state and forecast development prospects is based on the trends of increasing importance of intangible assets of air transport companies.

Air transport, influencing the mobility of the population, the volume of rapid cargo transportation, has a feedback effect both for the entire country's economy and for the sphere of employment, which must be considered when determining development strategies for this sector. The objective of the study is to identify new challenges and substantiate methodological approaches to revealing quality trends in employment prospects in the sector of air transport.

The employment model acts in the case not only as a marker of the success of economic transformation, but also as a necessary factor in sustainable development and efficiency of the aviation industry. The study has revealed ambiguous trends in transformation of the employment model at air transport enterprises under the influence of both long-term and market factors in development of air transportation, digitalisation, national features of its functioning, the consequences of the «corona crisis» and modern challenges for the Russian economy. It has been determined that under the influence of these processes, there is a reduction in employment in the economic activity of air transport with a simultaneous qualitative change in the structure of jobs, an increasing need for digital skills of employees of all skill levels, and differentiation of wages. It has been shown that digitalisation in the aviation industry can have an ambivalent effect on the demand for labour in the professional and qualification context. The study applied statistical and analytical methods, methods of content analysis, analysis of domestic and foreign publications on the examined problem. The sources of information include data from Federal State Statistics Service, large recruitment agencies and Internet job search web-portals as well as data on the labour market of air transport employees. Based on the results of the study, promising vectors for the transformation of the labour environment and new employment management strategies were identified considering changes in labour demand in response to new challenges in the development of the aviation industry to ensure its sustainable development.

Keywords: employment, air transport, vacancies, digital competencies, wages.

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BACKGROUND

The sectoral employment indicators are one of the markers of ongoing transformation processes, including in such a specific and significant sector for the country's economy as air transport. The dynamics and structure of employment in the aviation industry are determined by the structure and quality of jobs, as well as by the state of the labour market in terms of the potential supply of labour for this sector.

The growing introduction of new air transportation technologies, and particularly, the increasing complexity of technical equipment of airliners dictates the need for highly qualified flight personnel. Therewith, there is a risk that this factor comes into conflict with the decline in manual piloting skills and the ability of the crew to act as a team in an extreme situation, with excessive dependence of flight safety on automatic control, a decrease in significance of the human factor in development of qualifications, which can cause air crashes. Therefore, there is a risk of transformation of the employment structure and the concept of qualified flight personnel towards the ability to operationally manage technical on-board systems to the detriment of flight skills and the ability to make a quick decision as a synthesis of technical and personal competencies.

Changes in the structure and directions of air transportation, the conditions of the infrastructure of domestic transportation (especially intraregional) have led to a conjunctural increase in the risks of staff reduction and loss of key competencies during personnel retraining. Nevertheless, a fairly rapid reorientation of air transportation to domestic needs from international transportation and their gradual increase helped to prevent a sharp decline in employment in aviation industry. The need for qualified personnel not only did not decrease, but also increased against the background of a growing personnel shortage in all sectors of the national economy.

In view of the above, strategic personnel planning is needed in the aviation industry based on changes in the employment structure and qualification characteristics, finding a balance between requirements for qualifications and motivation in the context of risks of personnel shortage. Despite a fairly high degree of adaptation of the air transport sector to the ongoing changes, the lack of qualified personnel in such a high-tech area as air transport can potentially serve as a brake on development of the entire aviation industry. Temporary changes in the number of aircraft accompanied in the short term by a reduction in the number of flight and maintenance personnel, the retraining of specialists and the loss of unique competencies, may, if no proactive actions are taken to prevent it, serve as a deterrent to subsequent growth of the aircraft fleet in the long term.

The objective of the study is to identify the problems and prospects for transformation of employment in air transport in the context of changing requirements for the competency model of employees, technologies, business models, logistics, and infrastructure. The transformation of operating conditions has a significant impact on the state of the human resources potential of air transport enterprises and servicing infrastructure. The availability and need for qualified personnel largely determine sustainability and development prospects of the industry, set the need to develop employment and staffing strategies taking into account long-term efficiency, which expands and complements the objectives of the study. While achieving this objective, the authors examined key employment trends, its prospects, analysed statistical data, current labour market data, and internal studies of the personnel needs of air transport enterprises.

METHODOLOGY

The methodological basis of the study comprises general scientific and statistical methods of analysis, a systems approach. The information sources for the study include the Comprehensive plan for modernisation and expansion of the trunk infrastructure for the period up to 2024; the Transport Strategy of the Russian Federation until 2030 with a forecast for the period up to 2035; Order of the Government of the Russian Federation No. 1693-r, dated 25.06.2022, on approval of a Comprehensive program for development of the air transport industry of the Russian Federation until 2030; data of Federal State Statistics Service on sample surveys of the labour force; Federal State Statistics Service data on the salaries of air transport employees; results of a survey of employers conducted in 2018 by National agency for development of qualifications as part of testing a single toolkit

for monitoring the labour market; materials from periodicals and Internet sources.

With dynamic changes in aviation industry, labour market, development of additional methodological tools of its survey, the study has focused on long-term trends in total number of persons employed in economic activity of air transport and on development of integrated methodological approaches instead of analysis of actual situation during a certain time lapse. Besides, additional research may be conducted on the issues of employment within specific occupations, regarding, first, flight crews and pilots.

REVIEW OF RESEARCH

Several vectors can in modern scientific literature be identified in the studies on issues of employment transformation in the air transport sector.

Digitalisation and New Technology

The determinative trend in research in recent years has been associated with the problems of digitalisation covering almost all structural elements of labour processes [1]. The works of researchers emphasise the importance of digitalisation trends; the need to create digital twins of aircraft; the use of BIM technology; high capacity of technological and logistics elements of modern air transport for artificial intelligence technologies, for example, for ML (machine learning), Big Data, BI solutions, uberisation of the industry; the use of VR/AR in design, production and support of aircraft operation; industrial Internet of things. Also, a significant trend in the context of digitalisation and urgent cyber threats is the need for continuous training and development of relevant expertise among the entire industry's employees, growth in the efficiency of IT services.

The specified changes objectively require revision of industry personnel strategies for dynamic compliance of technological basic knowledge and synthesis of operational analysis of flight information, forming special competences of decision-making in a non-standard situation, as well as for advanced development of labour potential. Changes in requirements for skills of airline employees, new formats of personnel training for air transport logically follow digital trends of industry development [2]. The need to train air transport employees in management, digital and cross-border skills is noted by various researchers. Thus, the study [3] using group data of 12 airfields in Poland over nine years, performed an analysis of the influence of human managing capital of top managers on the technical efficiency of airports, i. e. the influence of cumulated expertise of top managers along with possessed knowledge on technical performance of airports, which will contribute to optimisation of aviation management, since they are intangible exogenous factors that are difficult to assess.

It is possible to highlight the research of domestic and foreign scientists on issues of demand and modelling of passenger air transportation [4–6] using AI, neural networks and other methods.

Post-Pandemic Air Transportation Recovery

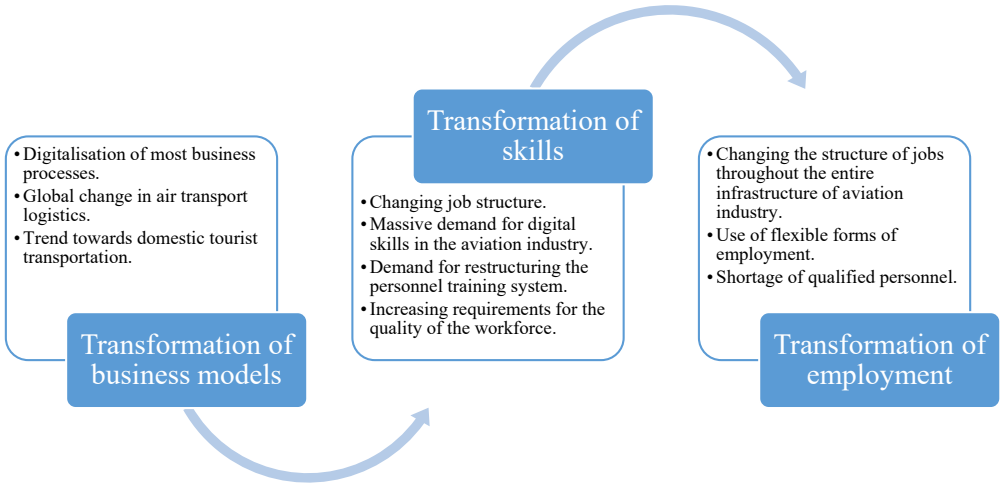
A whole range of studies are related to the impact of COVID-19 on the condition of air transport. The pandemic-induced halt in cross-border travel in the spring of 2020 forced all airlines to take large-scale measures to reduce their workforce [7]. According to the International Air Transport Association (IATA), the air transport sector provides 25 million jobs worldwide. Since the beginning of March 2020, all these jobs have clearly been at risk, along with daily announcements of layoffs to airline and airport employees [8].

Thus, in long-term perspective, regardless of the number of employees and the relationship between employer and employee, HR strategies must be shaped to consider various scenarios and provide for emergency (such as a pandemic) response plans, to set reasonable standards for both the company and the employees [8].

Intangible Assets and Transformation of Skill Sets

An analysis of studies [9–11] allows us to state that one of the key features of new business models in the air transportation sector is an increasing dependence on intangible assets, including digital ones, but at the same time, the importance of the quality of such assets is increasing.

Modern airlines are faced with the problem of transforming the traditional system of jobs and skill sets. There is a demand for intra-organisational business changes (redistribution of employees to digital business segments, managing the impact of automation on employment) [12], which determines the relevance of the study. At the same time, it is



Pic. 1. Logical scheme of employment transformation [developed by the authors].

necessary to consider the need to follow strict regulations for conducting aviation operations at all stages of passenger servicing, transportation of cargo, mail, etc.

Interdependence of Development Vectors of Air Transportation and Employment

Thus, the prospects for development of the air transportation sector are implemented within the coordinates of «transformation of business models – transformation of skills – transformation of employment» (Pic. 1) under the influence of a whole range of external and internal factors.

The above-mentioned problems have not yet received proper scientific study, which significantly slows down the selection of new models for development of the sector, adaptation to changed conditions and determines the relevance of the research there-of.

RESULTS

Dynamics of Air Transport Indices and Main Trends

The importance of air transport in ensuring a country's economic growth is difficult to overestimate. According to calculations by the International Air Transport Association, every 10 % growth in air traffic adds 0,5 % to a respective country's GDP.

In 2019, Russian airlines carried 128,1 million passengers (57 % of which were on domestic routes). During the corona crisis in 2020, there was a 42 % decrease in the number of passenger flights by Russian companies, mainly on international routes, but in 2021, the main indices of air transport performance were recovering quite quickly.

The dynamics of passenger flows of internal air transportation for the past seven years have shown an increase of almost 1,5 times, even taking into account the pandemic decline in 2020 (Pic. 2).

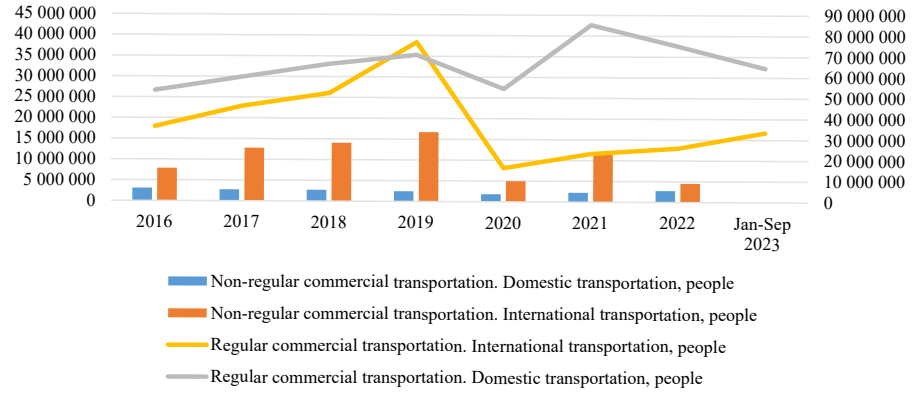
Scheduled international traffic has shown signs of growth after a sharp decline in 2020 and is almost 30 % ahead of 2022 figures for the first nine months of 2023, while domestic traffic is growing at a slower pace, only 8,3 % ahead of 2022 figures for the same period. This growth in passenger traffic under these conditions has a direct impact on employment in the air transport sector.

As for aircraft fleet, «in April 2022, Russian airlines operated 1287 aircraft for commercial transportation, most of which were imported»[1]. The average age of airline passenger aircraft was 14,6 years. The government has approved a comprehensive program to expand production of aircraft, engines and instruments, which envisages the production of 1689 aircraft for domestic market and exports by 2040[2].

Within the framework of the Transport Strategy of the Russian Federation until 2030

[1] Order of the Government of the Russian Federation dated 25.06.2022, No. 1693-r,»On approval of a comprehensive program for development of the air transport industry of the Russian Federation until 2030». [Electronic resource]: https://npalib.ru/2022/06/25/rasporyazhenie-1693-r-id297739/. Last accessed 24.03.2024

[2] Order of the Government of the Russian Federation dated 13.01.2024, N 7-r, on amendments to the Order of the Government of the Russian Federation of November 5, 2013, N 2044-r, and Approval of the Investment Project Passport «Comprehensive Program for Expanding the Production of Aircraft, Aircraft Engines, Instruments and Units, Including for the Purpose of Creating an After-Sales Service System for Civil Aircraft».[Electronic resource]: https://www.garant.ru/products/ipo/prime/doc/408264869/. Last accessed 24.03.2024.



Pic. 2. Dynamics of passenger transportation by air transport in Russia [developed by the authors based on the data of Federal State Statistics Service in the number of passengers transported: the number of passengers carried from the initial to the final point of their transportation on the flight. [Electronic resource]: https://fedstat.ru/indicator/59496. Last accessed 24.02.2024].

with a forecast for the period until 2035, it is noted that the volume of passenger air transportation through civil aviation airports (by Russian and foreign airlines) will grow at an average annual rate of 2,9 % and will increase by 59 % in 2035 relative to 2019: from 147,5 to 234 million passengers in 2035.

Besides forecast indices for the air transportation sector, it is necessary to note the existing problems of its development, which require new approaches to the solution. The urgent problem for development of aviation mobility remains the high cost of air transportation in comparison with the level of income of the population, high unevenness of domestic transportation, territorial disproportions in the level of development of airfield infrastructure, etc. High transport safety requirements remain valid for regional and local airports with low traffic intensity, which reduces profitability of regional transportation.

Here, it is important to consider the potential impact of investments in passenger air transport on the regional economy:

– Presence of an airport stimulates development of the regional economy, which provides additional income, promotes new and direct investments in creation of jobs and new infrastructure.

– Indirect and forced costs associated with large-scale, ongoing capital investment create benefits for local economic development and employment.

– Air route networks created by airlines can change region's economic ties with other regions and countries [13].

Generally, based on the analysis of development trends in aviation industry and review of research, several factors can be identified that influence the structure of industry employment in the air transport sector:

– A complex structure of interconnected elements of the aviation industry, shaped according to the cluster type, which requires an end-to-end long-term approach to planning staffing.

– Significant direct and indirect contribution to the domestic economy.

– A new format for functioning of the air transport sector under the influence of a set of external, technological, demographic, behavioural, cultural and socio-economic conditions, which presuppose a qualitative transformation of the demand for labour resources.

– Growing competition, requiring a revision of the basic business models of carriers and, accordingly, leading to new flows in the employment structure in air transport.

– Technological innovations based on attaining technological sovereignty, import substitution, digitalisation and autonomy, changing the requirements for staff qualifications.

– Expansion of the range of air transport services; emergence of new service delivery models, the need to consider new consumer behaviour models, including those caused by development of digital platforms and online aggregators.

– Accumulated problems caused by high unevenness of transportation, exogenous shocks and national regulatory rules.

– New tasks set for the industry in the Transport Strategy of the Russian Federation until 2030 with a forecast for the period up to 2035.

Some of these factors determine long-term trends in employment development, while others determine short-term effects and shifts. The mutual influence of these and many other factors affecting development of air transport requires in-depth research to minimise risks and take advantage of growth opportunities, including in the field of employment and staffing in the air transport sector.

The ongoing transformation of the air transport sector is directly reflected in the indices of the number and structure of employees and their remuneration.

Trends in Employment

To identify the nature of transformational shifts in the employment structure in air transport, an analysis was conducted on the condition of labour resources in the industry in recent years.

The number of people employed in aviation and aerospace transportation sector for the period from 2019 to 2021 slightly decreased (from 84,9 thousand people to 84,1 thousand people) and is 1,8–1,9 % of the number of people employed in the transportation and storage sector[3]. In civil aviation in 2021, the number of flight personnel was about 43 thousand people [[2], P. 18–19].

For the first nine months of 2023, the average monthly number of air transport employees, excluding small businesses, was 73549,5 people, which is 4,5 % less than during the same period of the previous year. At the same time, the share of air transport employees is 3,8 % of the total number of employees of the entire transportation sector.

There were multidirectional trends in labour demand in the passenger and cargo transportation sectors. In 2017–2021, there was a 16,3 % decrease in the demand for payroll employees for vacant positions at the end of the reporting quarter (Q1–Q2) for air and aerospace transportation activity, of which the absolute majority were to be employed in scheduled passenger air transportation (6767 people, which is also 17,1 % less than in 2017). An increase in the demand for employees was observed in the activities of cargo air transport and aerospace transportation – by 1,6 times over this period – from 487 to 777 people (of which 648 people were to be employed in cargo air transportation) as well as in auxiliary services related to air transport – by 1,2 times (from 10891 to 12962 – the majority were to be employed in airport activities (9144 people)).

Thus, the situation in the transport labour market changed dynamically under the influence of measures taken to combat COVID-19, then to minimise the effects of unilaterally imposed sanctions. For example, the number of pilots in the Russian Federation as of 01.01.2020 was 14800 people, as of 01.01.2021 it was 14600 people, i. e. the absolute reduction in the number of pilots was 200 people, the relative reduction was 1,4 %, while over the specified period, the world air transport system saw a reduction of more than 50000 pilots with a total number of approximately 400 thousand people at the beginning of 2020[4].

If we consider the dynamics of the number of employees of companies in the air transport sector, we can see fluctuations in the number of employees of up to 10 %, which are within the limits of natural staff turnover, which is generally lower than in organisations in the entire transport industry.

Reproduction of Human Resources of Civil Aviation

The main sources of labour resources for enterprises of civil aviation are educational organisations.

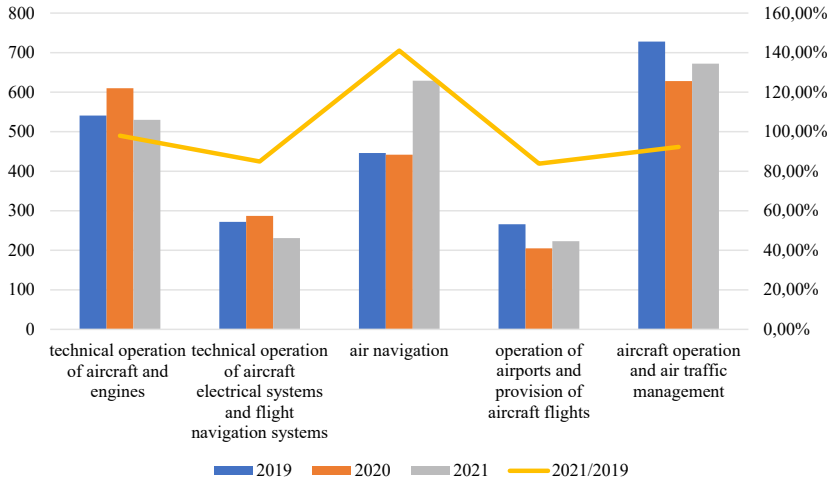
About 3,5 thousand people graduate annually to be employed as civil aviation personnel from educational institutions, of which more than two-thirds graduate from higher education programs, including about 800 pilots (Pic. 3).

The increase in the number of graduates with higher education from 2019 to 2021 took place only in the Air Navigation (by 41 %), in other directions there was a slight decrease in number of graduates.

Upon the emerging employment model in air navigation, we note that air transport is

[3] Ministry of Transport of the Russian Federation: Transport of Russia. Information And Statistical Bulletin 2022. [Electronic resource]: https://mintrans.gov.ru/storage/app/media/files/3_bulleten_transport_russia.pdf. Last accessed 22.09.2023.

[4] Results of the activity of the Federal Air Transport Agency in 2020. [Electronic resource]: https://www.aviastat.ru/reports/84-itogi-deyatelnosti-rosaviacii-v-2020-godu. Last accessed 20.10.2023.



Pic. 3. Bachelors, specialists, masters graduated from state and municipal educational institutions of higher education and scientific organisations in specialties and areas of training regarding operation of air transport.
(Federal State Statistics Service. Transport of Russia 2022. Statistical Digest. P. 17. [Electronic resource]: https://rosstat.gov.ru/storage/mediabank/Transport_2022.pdf. Last accessed 24.03.2024).

a fairly dynamically developing sector of the modern economy, so employees are required to be flexible, ready for change, and to constantly improve their professional level within the framework of the work life cycle. The conducted studies of the target settings and motivators of students – future pilots [14] have revealed the high significance in the structure of motivators of income, conditions and structure of job activity, but low indicators of readiness for change.

The urgent task is to forecast the demand for staff in connection with changes in the labour market, with the set tasks of air transport development.

Several regulatory documents adopted in recent years indicate that significant measures have been taken to ensure secure staffing and develop the human resources potential of air transport. The Comprehensive Program for Development of the Air Transport Industry of the Russian Federation until 2030 identifies among the main objectives of the Program the task of stabilising the number of professional aviation personnel of the industry enterprises at a sufficient level [[2], P. 3]. The Program notes that forecasting the number of people employed in the industry is complicated by a high degree of uncertainty associated with geopolitical factors; the risk of an outflow of qualified personnel due to their transition to foreign aviation companies; a shortage of personnel for the production, operation and maintenance of new and newly produced types of aircraft, which may cause a shortage of pilots to ensure the fulfilment of the volume of air transportation in the future [[2], pp. 18–30].

The task of educational institutions is to train the relevant personnel. In addition, it is necessary to ensure targeted training of specialists for the air transport industry in Russian universities. Several Russian airlines have such experience.

Respective problems can also be solved through development of succession planning in aviation industry. The order of the Federal Air Transport Agency dated June 21, 2021, No. 426-p «On approval of the Regulation on the succession pool of the Federal Air Transport Agency» [5] defines the goals, principles, procedure for developing and work of management succession pool for air transport industry. The management succession pool will allow training of a strategically important resource for air transport management.

The Structure and Quality of Vacancies and Resume on Job Search Sites

Analysis of the structure and dynamics of supply and demand in the air transport labour market can be suggested based on the data from online job search portals. The situation in the labour market is not too simple: after a drop in

[5] Order of the Federal Air Transport Agency dated June 21, 2021, No 426-P «On approval of the Regulation on the personnel reserve of the Federal Air Transport Agency». [Electronic resource]: http://publication.pravo.gov.ru/document/0001202107160028. Last accessed 10.02.2024.

Table 1

Data on the total number of vacancies and CVs by filters: 1. Air transport, 2. Air transportation, 3. Civil aviation for Russia

Name of the website	Number of vacancies during the last month			Number of CVs during the last month (Russia/world)			Ratio of number of CVs to the number of vacancies (Russia/ world)		
	1	2	3	1	2	3	1	2	3
hh.ru	899	235	535	3639/ 30 610	2582/ 24 202	1017/ 10 102	4,05/ 34,05	11,0/ 103,0	1,9/ 18,9
trudvsem.ru	464	207	565	4/-	30/-	217/-	0,01/ -	0,14/-	0,38/-
zarplata.ru	204	23	40	7/ 121	7/ 133	14/ 87	0,03/ 0,59	0,3/ 5,7	0,35/ 2,18
gorodrabot.ru	387 161	132 818	28 971	37/-	43/-	25/-	0,00/ -	0,00/ -	0,00/ -
superjob.ru	383	21	51	1063/ 1522	451/ 633	546/ 815	2,77/ 3,97	21,47/ 30,14	10,7/ 15,98

Source: Compiled based on data of Internet websites, shown in Table.

supply indicators, there has been a slight increase since June 2021, which is significantly lower than the indicators of 2020 and 2019. At the same time, the dynamics of supply depends on the occupational field. The field of transport and logistics has not undergone significant changes, unlike many other sectors of the economy. Table 1 presents data on the number of vacancies and CVs collected using the filters regarding «Air transport» from the main job portals. The largest number of vacancies in the studied sector are posted on the job sites Superjob, Gorodrabot [City of Jobs], HeadHunter.

The situation in the air transport labour market, if we focus on the data of open job search databases, is ambiguous and varies depending on specialisation of the electronic job search resource, the popularity of the resource among employers and job seekers, the specifics of filter settings and search algorithms embedded in the programs. Some job search information systems provide a possibility to submit CVs from other countries, which significantly expands the process for selecting specialists. Job seekers in air transport are represented from almost all over the world and exceed the Russian segment in the number of CVs by tens of times in some areas, which shows the demand and competitiveness of Russian jobs in the air transport segment.

The situation with data on requests for foreign labour to work in Russia on jobs in air transport requires a separate analysis of the structure and quality of the labour force, which is necessary for designing staffing for the strategic perspective. Considering the global labour market, the situation in the air transport sector is characterised by labour surplus: the number of vacancies offered is significantly less than the number of CVs, the average ratio of the number of CVs to the average number of vacancies is 50 (for the entire period of posting vacancies and CVs) and 43,35 (when analysing data for a month).

According to the hh.ru portal, air transport, included in the «Transport, logistics» activity type, is among the ten types of activity with the highest demand for specialists and among the ten types of activity in which specialists most often post CVs. At the same time, transport invariably remains one of the leaders in terms of the number of CVs and applications from young applicants (about 34 %)[6].

The conducted analysis showed that the greatest demand from employers is for aviation technicians and technicians in aviation technic equipment (19 % of all vacancies) and technical engineering employees (18 % of all vacancies). The number of CVs for the specified occupational groups exceeded the declared demand, the indices characterising this gap or imbalance were 53,18 and 69,91, respectively. A high gap index is typical for the following areas: flight attendants, early career and company representatives. However, the ratio of supply and demand in the air transport labour market according to open job search databases cannot be called completely objective, since the relevance of all CVs included in this sample cannot be established (there is duplication of

[6] Young specialist: current trends of employment. [Electronic resource]: https://hh.ru/article/29416. Last accessed 20.10.2021.

Table 2

Total number of jobs created by groups of organisations where the average number of employees changed and by newly created organisations for the period 2017–2022, people

Years	2017		2018		2019		2020		2021		2022	
Share, %		%		%		%		%		%		%
Activities of air and space transport	7826	5,03	12022,6	6,48	6565	4,83	4454	2,63	3949	2,84	6098	3,60
Activities of passenger air transport	7461	4,80	11376,64	6,13	5489	4,04	3490	2,06	3477	88,05	5479	3,23
Activities of cargo air transport and space transport	365	0,23	645,96	0,35	1076	0,79	964	0,57	472	13,57	618	0,36

Source: compiled based on Federal State Statistics Service. [Electronic resource]: https://www.fedstat.ru/indicator/58698. Last accessed 02.10.2023.

CVs and vacancies in the databases: one applicant can create a CV on all of the named portals, the number of CVs created on each portal is not limited; when finding a job, applicants do not always delete their CVs from the databases).

Of the active CVs submitted in the air transport sector, the desired salary level was indicated in 1280 CVs, of which 16,56 % claimed a salary from 15000 to 45000 rubles, and 17,7 % – a salary over 170000 rubles. In comparison, the current average salary for the entire list of vacancies presented on the website https://www.adzuna.ru was in 2021 43815 rubles, in the air transport sector – 38633 rubles[7]. In general, based on websites, it is impossible to accurately determine the scale of imbalances between supply and demand in terms of salary levels, since its actual size is often determined only based on the results of interviews with potential employees. At the same time, according to the above websites, the levels of offered and requested salaries are higher than the average salary level for all other types of activities.

The analysis of graduate employment showed that most graduates successfully find work within the first six months after graduation, which confirms the demand for highly qualified specialists in this field.

[7] Vacancy portal adzuna.ru. Vacancies in Moscow and throughout Russia. adzuna.ru. [Electronic resource]: adzuna.ru. Last accessed 01.10.2021.

Creation of New Jobs

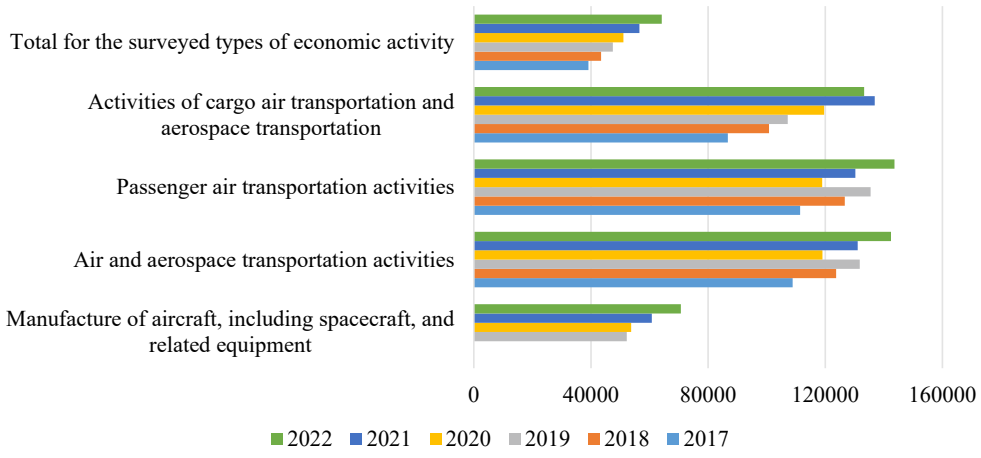
Table 2 shows the data on jobs created at enterprises related to air transport. In general, for the «Air and aerospace transportation activities» activity type, the number of jobs created has significantly decreased from 7826 people in 2017 to 4454 people in 2020 (almost twice as much, from 5,03 % in 2017 to 2,63 % in 2020). A similar decrease is observed for passenger air transport activities (from 4,8 % in 2017 to 2,06 % in 2020).

Table 3

Average monthly nominal accrued wages of those employed in economics from January 2017 until March 2023, RUB

Types of economic activities	2017	2018	2019	2020	2021	2022	2023
	January-December	January-December	January-December	January-December	January-December	January-March	January-March
Air and space transport activities	108866	123691,15	131776,38	119044	118669,7	138097,3	149729,8
Passenger air transport activities	111434	126670,7	135481,32	118960,9	117625,1	138097,3	149729,8
Activities of cargo air transport and space transport	86714	100786,2	107204,51	119597,2	126212,7	135769,0	152398,9
Warehousing and auxiliary transport activities	45983	46255,58	49158,53	51608,9	55525,4	88368,5	92074,5

Source: compiled based on Federal State Statistics Service data. [Electronic resource]: https://www.fedstat.ru/indicator/57824. Last accessed 17.01.2024.



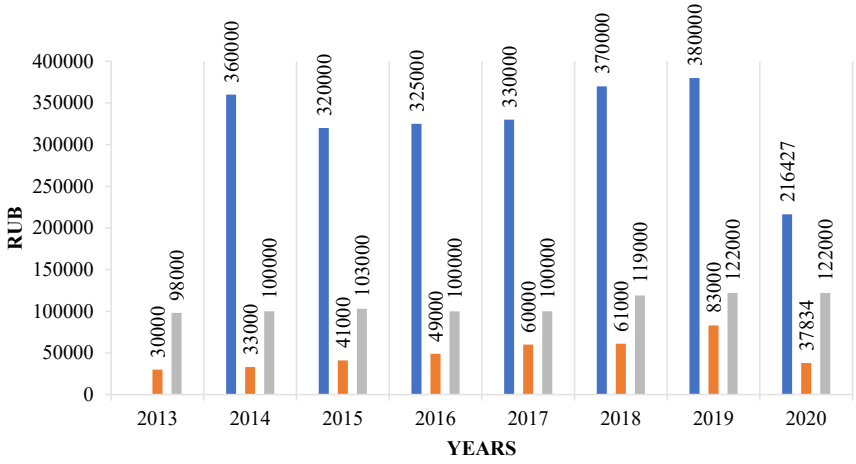
Pic. 4. Average monthly nominal accrued wages for some types of activities in the sector of air transport and manufacture of aircrafts, RUB (2017–2022). [Compiled by the authors based on Federal State Statistics Service data. [Electronic resource]: https://www.fedstat.ru/indicator/57824. Last accessed 17.01.2024].

Wages

The next problem that needs to be considered when studying employment is the wages rate which is among determinant factors of attraction and retention of employees.

It is worth noting a fairly high level of wages of employees in air transport compared to the average wage both in the entire economy and in transportation sector (Pic. 4) (the average monthly wage in the air transport sector and aircraft manufacture in 2017–2022) and in Table 3 (average monthly nominal accrued wages of employees in the sector of air (passenger and cargo) and aerospace transportation activities and in warehousing and auxiliary transportation activities from January 2017 to the period January – March 2023). Thus, in 2023 average monthly wage in air transportation was about 157 thousand rubles.

Pic. 5 shows the dynamics and differentiation of salaries for the main job positions of aviation personnel. As can be seen from Pic. 5, the difference in the level of salaries of an aircraft commander and flight attendants is on average four times, with engineers for aviation and radio-electronic equipment – three times. At the same time, the salaries of flight attendants (from 30000 in 2013 to 83000 in 2019), of aviation radio electronics engineers (by 24,5 % over the period 2014–2019) grew at a higher rate



Pic. 5. Dynamics of wages of the aviation personnel for the period from 2013 until 2020. [Analysis of the labour market in the aviation industry by the consulting company «Aviapersonal» [Electronic resource]: https://aviapersonal.ru/uploads/s/l/n/f/lnfblxkq8jfa/file/LhMgyXEv.pdf?preview=1. Last accessed 27.09.2023].

compared to the salaries of aircraft commanders (by 12 %). The drop in wages in 2020 is associated with a sharp contraction in the labour market due to the pandemic. In the period from January to March 2023, there was an increase in average wages across all air transport by 8,4 % compared to the same period in 2022, while there is an increase in average wages in passenger transportation by 12,2 % and a decrease by 23,9 % in the cargo segment of air transport.

Forecast and Perspectives

Despite the active recovery of the air transport sector in 2023, shortage of personnel and structural imbalance in professional groups of specialties represent a significant risk for long-term planning. Quantitatively, the growth in demand for labour may arise due to the planned growth in transportation volumes. Thus, according to forecasts, the volume of passenger transportation by Russian airlines will grow at an average annual rate of 3,1 % and will increase by 63 % in 2035 compared to 2019, from 128,1 to 209 million passengers. For comparison, the historical growth rate of transportation by Russian airlines was 8,6 % per year from 2015 to 2019, in 2023 the growth compared to 2022 data was 10 % (and this does not consider full import substitution in aircraft manufacturing and serial production of domestic airliners). This will require an increase in employment and its structural transformation.

Structural Transformation of Employment

The coronavirus pandemic has highlighted several issues regarding the employment structure in the air transport industry.

International research shows that air carriers have found themselves in different situations during the COVID-19 pandemic [15]. Based on this, it can be argued that employment has been most affected by those air carriers that were focused on international markets, premium traffic and leisure travel, which require more time to recover, i. e. on the segments that according to some research ensure main growth of economic benefits of air transport (including form growth in tourism, foreign direct investment and trade), which ultimately lead to increased productivity, GDP growth and more jobs with higher wages [16].

The author of [17], estimating the impact of COVID-19, concludes that recovery from the uncertainty shocks will take between four and six years.

Another conclusion of experts is that specialist responsible for policymaking in airport communities should evaluate training and education programs to determine whether these programs meet the needs of businesses. The employment structure will be most influenced by long-term technology trends. New technologies in the aviation industry have reduced dependence on some professions but created demand for others. Larger, more technologically sophisticated aircraft, capable of carrying more passengers and more cargo more efficiently, are replacing smaller, less efficient aircraft. This change reduces demand for core air transport jobs but increases demand for IT engineers and specialists.

So, an examination of the processes of transformation of the air transport sector operating model through the prism of employment patterns would be incomplete without considering the modification of the professional environment. According to the Atlas of New Professions 3.0, several professions will be in demand in aviation in the future. They include aeronautics infrastructure designer; aircraft recycling technologist; unmanned aerial vehicle interface designer; airship designer; operational data analyst; small aircraft production engineer; composite repairman; aircraft digital modelling specialist; load optimisation engineer; intelligent dispatch systems developer; drone controller [18]. Major airlines around the world are stating their need for qualified flight and ground personnel in the future: pilots, flight attendants, air traffic controllers [19].

Unmanned aviation is an important area of development in the aviation industry. The Order of the Government of the Russian Federation dated June 21, 2023, No. 1630-r, notes the provision of qualified personnel as a key driver for development of unmanned aviation. However, the pace of implementation of unmanned aviation technologies is outpacing the capabilities of the education system to train personnel in this area and areas of «competency gaps» are being formed, the elimination of which is critically important for development of this segment. The development of unmanned aviation creates jobs and dictates the need for training in related fields, in such professions and specialties as «unmanned aviation interface

designer», «small aircraft production engineer», «operational data analyst», «aircraft recycling technologist», «aeronautics infrastructure designer», «automation control systems programmer», «unmanned aircraft systems operation technician», «designer of ground infrastructure for operation of unmanned aircraft systems», «specialist in development of unmanned space aircraft», «developer of automatic navigation systems for unmanned aircraft», etc[8].

According to some forecasts, digitalisation may further lead to a reduction in the number of employees in some segments of the activity associated with robotisation of routine labour, which can be replaced by mechanised labour built on algorithms. At the same time, on the contrary, one should expect an increase in the number of personnel associated with information technology and personal interaction with clients. This trend, for example, is closely linked to introduction of chat bots with artificial intelligent for customer support services. It is eloquent that if in late 2017 this technology, according to some estimates, was used by only 14 % of airlines and by 9 % of airports, then in 2020 already 68 % and 42 % respectively planned to use it[9][10],. Currently the application of this technology in aviation industry is widespread and covers almost all operations, from customer support to baggage claim, providing significant economic effect. Thus, the share of passengers proceeding with check-in at the airports decreased from 49 % in 2017 to 27 % in 2021, 68 % of passengers applications are automated, the number of passengers addressing call-centres decreased by 49 %[11].

The specifics of the employment model change as a projection of the main transformations in the air transport sector do not allow us to see the latent processes in the sector. The processes of employment transformation within the air transport cluster also affect the issues of the new model of infrastructure employment, in particular, the so-called uberisation [20]. Thus, foreign researchers consider development of airport servicing infrastructure. The author of [21] studies in his article the relationship between the Uber job platform and the geography of an international airport. It is noted that at the junction of the Uber platform and the airport infrastructure, various opportunities arise that could be of strategic importance for new initiatives [21].

The article [22] presents the general trend in the field of airport operational management, discusses changes in the management of education, vocational training and marketing. Since technological progress in aviation provides for increased efficiency, the authors believe that it is necessary to create a digitalisation department that would deal with optimisation of airport operations and their adaptation to technological and air traffic trends [22].

Air transport has a significant impact on production output, income and employment. The importance of the feedback effect must be considered when designing and implementing strategies for development of the sector. In the article [223], the authors examine the relationships of the air transport development as a source of economic growth and poverty reduction in developing countries and countries with economies of transition. An increase in final demand for air travel will lead to an increase in labour income, with the highest increase coming to highly skilled employees. It is concluded that the government could reduce the dispersion of income from air transport by implementing reforms aimed at increasing the level of skills. This study shows that for the sector to play a significant role in social and economic growth, its integration into the local economy needs to be strengthened [23]. This approach will allow one to explore cross-sectoral employment flows at the local level.

Generally, it can be concluded that it is necessary to elaborate sustainable employment development programs focused on specific

[8] Order of the Government of the Russian Federation dated June 21, 2023, No 1630-r, «On approval of the Strategy of development of unmanned aviation in the Russian Federation for the period until 2030 and for the period until 2030 and an action plan for its implementation. [Electronic resource]: https://www.garant.ru/products/ipo/prime/doc/407003744/. Last accessed 27.02.2024.

[9] Airlines and the growth of chatbots: potential and brand awareness. [Electronic resource]: https://centreforaviation.com/analysis/reports/airlines-and-the-growth-of-chatbots-potential-and-brand-awareness-424982. Last accessed 10.02.2024.

[10] E.g.: Lufthansa told about it development strategy (In Russ.). [Electronic resource]: https://www.frequentflyers.ru/2017/05/31/lh_strategy/. Last accessed 10.02.2024.

[11] Caballé, M. Airline Chatbot Benefits, Use Cases, and Examples for 2024. [Electronic resource]: https://www.hubtype.com/blog/airline-chatbot-use-cases-examples. Last accessed 10.02.2024.

strategies that are adequate to the new model of functioning of the air transport cluster in the interests of all regions of Russia.

The issues of structural transformation are long-term and are determined by both the changing landscape of business strategies and technological changes. It should be emphasised that the ongoing technological and organisational changes in the air transport sector will require appropriate change agents, engineers, managers with knowledge of technical aspects and innovation factors, highly motivated for innovation and owing the ability to influence teams and manage changes.

Thus, urgent is the need for advanced training, flexible interaction between educational institutions and the aviation industry, contractual training for specific jobs

CONCLUSIONS

The conducted study showed that the current state and strategic objectives of sustainable development of the air transport sector determine the corresponding changes in the employment model in the medium and long term. Based on the identified dependence, it can be concluded that employment trends and the structure of the labour market allow one to determine the forecast characteristics of future changes in business systems. We have identified key trends in the quantitative and qualitative context regarding those employed in the air transport sector. Thus, the change in dynamics occurs in parallel with the change in the structure and requirements for personnel qualifications, the service provision model, the transformation of business processes in aviation, the growth of differentiation in remuneration of different categories of employees, the emergence of new patterns of behaviour of job seekers in the labour market in this sector (in terms of labour preferences and formats for converting accumulated human capital).

Considering the challenges facing the aviation industry, it is possible to define a system of priorities in the employment strategy:

1) Formation of strategically oriented human capital for sustainable and uninterrupted operation of this mode of transport.

2) Development of an employment cluster in the air transport sector, which implies achieving effective employment not only within the framework of operation of aircraft and emerging hubs, but also considering interconnected areas and a system of jobs, employment in which will ensure successful implementation of business processes in the entire aviation industry.

3) Creation of the necessary environment for training future specialists and leaders of change in the air transport sector having high qualification and expanded set of competences.

As part of achieving strategic goals, it is necessary:

- To improve monitoring of the labour market and the potential of the personnel training system for the air transport sector.

- To wider use targeted training formats in universities.

- To popularise the entire range of occupations and professions related to aircraft crew members and support personnel.

- To update vocational education programs for all categories of employees in the air transport sector, considering new trends in the development of this sector.

Development of training models within the system of life-long professional training of the civil aviation specialists is of particular importance [24].

Along with mechanisms of staff training, it is necessary to develop motivation systems for those employed in the entire air transportation cluster providing external and regional transportation. Such programs should be focused on retaining flight personnel to ensure regional transportation and sustainable development of air transport.

Thus, it is necessary to ensure the effectiveness of employment in the context of the ongoing transformation through the development of human resources strategies consistent with the emerging business systems in the entire air transportation cluster, identifying and eliminating «zones of efficiency losses».

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