

NEW IN THE DESIGN OF THE INTERSECTION OF THE TAXIWAY AND THE ACCESS ROAD AT THE AIRPORT

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ABSTRACT

The task of the article is to show the rationale and essence of an innovative solution connected with reconstruction of Sheremetyevo Airport in the capital aviation hub. Option with inclusion of the third runway into infrastructure and design of its original location in the area near the aerodrome territory, where it is combined with the intersection of the taxiway, the

patrol airfield, the motorway road and the Klyazma river, which is located here. Two-level construction of the intersection, four-section closed river collector of reinforced type and other devices do not violate the integrity of the aerodrome and do not interfere with its further development. So far, there is only malfunctioning in the management of construction and the reconstruction process.

Keywords: airport, runway, infrastructure, reconstruction, research, design, innovative solutions.

Background. The program of development of the Moscow aviation hub along with other positions includes the reconstruction of existing airports – Sheremetyevo, Vnukovo, Domodedovo. For Sheremetyevo and Domodedovo it includes, among other things, the construction of a third runway. The existing infrastructure on the near-aerodrome territory – a number of holiday villages, individual houses, production and storage facilities – hinders the convenient placement of new runways and taxiway systems. Therefore, finding a suitable site in close proximity to them is a very difficult task.

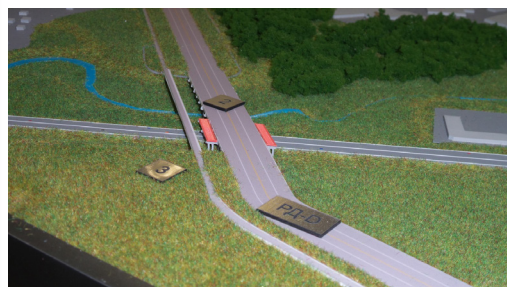
First, the solution of such a task, as a rule, involves partial or complete demolition of existing structures in the construction site, and this, in turn, leads to a serious rise in price and an increase in the period of work. Secondly, it is often necessary to look for new solutions that are radically different from traditional ones. At the same time, foreign experience in airport reconstruction, conducted under similar conditions, should also be taken into account.

Objective. The objective of the author is to consider new innovative solutions in the design of the intersection of the taxiway and the access road, which are being implemented at Sheremetyevo Airport.

Methods. The author uses general scientific methods, comparative analysis, economic assessment method, evaluation approach.

Results. The made design decision on the reconstruction of Sheremetyevo Airport and the construction of the third runway can undoubtedly be considered innovative.

All planned was supposed to be carried out on the site of the territory, located north-west of the airport.



Pic. 1. The design solution for the crossing of the taxiway, the patrol airfield road, the motorway road and the Klyazma river: 2 – taxiway ПД-D (22.5 m – artificial cover and 18 m – roadside cover); 3 – patrol airfield road.

There is not a large number of ready-made structures, and the appearance of a new runway will not entail a large amount of preparatory work related to the demolition of any objects. The peculiarity of the solution was that the airport territory and the site for a new runway are located on different sides of the existing access road to terminals A, B and C of Sheremetyevo.

It was not possible to change the route of the existing highway. Two variants of the intersection were considered: the construction of a tunnel on the road or a special bridge for the taxiway and a patrol airfield road. The place of possible intersection is characterized by the presence of complex engineering-geological conditions. In the immediate vicinity is the bed of the river Klyazma. In the case of variant No. 1, it is necessary to implement a number of engineering measures designed to protect the site from groundwater and to stabilize the base of the artificial cover and tunnel construction. In addition, the seasonal change in the water level in the river causes a change in the groundwater table of the surrounding massif. Due to the fact that the soils of the intersection section are mainly represented by heavy loams and clays, the natural drainage of water occurs very slowly and leads to formation of focal water-saturated areas. The accompanying measures increase greatly the cost of construction.

Under option No. 2 – construction of a special bridge – all work is carried out in the conditions of the existing highway without stopping its operation. The existing natural hydrogeological state of the territory is preserved and it is not necessary to implement costly measures to ensure waterproofing and stabilization of soils. This significantly reduces the cost of construction and ensures the accessibility of the structure during ongoing maintenance and repair work.



Pic. 2. A design solution for the location of a new runway on the selected section (layout).



Pic. 3. Fragment of the Klyazma River collector under construction at the intersection with the new runway.

When designing the intersection, several modifications of the structure were also considered, the corresponding calculations of their strength and stability were made and the final variants of the structural elements were chosen based on the results of the studies. In the domestic practice of building airfields, this crossing is performed for the first time. Pic. 1 presents the design solution for the crossing of the taxiway, the patrol airfield road, the motorway road and the Klyazma river.

Crossing the taxiway and the motorway road in two levels allows to ensure the integrity of the Sheremetyevo airfield and its further development. In particular, it provides in the future the possibility of modernizing the airfield infrastructure of a new site – for example, building a network of taxiways to increase the carrying capacity of the runway, installing additional parking spaces for current maintenance, and building a new passenger terminal. The implementation of such projects will ultimately help create a high-tech airport, designed to service all types of modern and prospective aircraft.

Pic. 2 shows a design solution for placing a new runway on the selected site.

At the end of 2014, construction work began. Including preparation of the territory – garbage collection, removal of wood and shrub vegetation, construction of temporary drainage structures for surface and ground waters, arrangement of temporary ways of traffic of road construction equipment, places for storage of materials and products, removal and removal for temporary storage of plant soil. During this period, the load was mainly borne by contractors of CJSC Inzhtransstroy. The works were carried out in rather complicated engineering and geological conditions, and the surveys made did not initially allow to make a reliable picture of the state of the construction site and it was necessary to make adjustments.

At the same time, work was begun on the construction of the intersection of the taxiway with the route of the existing driveway. They were carried out by the Spetstransmonolit organization.

When building a new runway, it became necessary to cross the existing riverbed of the Klyazma River and its tributaries. It was decided to change the trajectory of the channel. For this purpose, a special four-section closed collector of reinforced type is proposed, designed to withstand loads from aircraft carrying out landing operations. Pic. 3 shows a fragment of the reservoir under construction.



Pic. 4. Construction of coastal fortifications.



Pic. 5. Bridge supports and span structure.



Pic. 6. Span structure of the bridge for the patrol road.

The construction of a two-level crossing of the taxiway and the motorway route was conducted in the conditions of a large amount of work connected with the transfer of the Klyazma river bed and the strengthening of the coastal sections of the new riverbed (see Pic. 4).

The construction of a special bridge for the taxiway began with the reinforcement of the base and the erection of supports. The bridge was designed for the impact of loads not only from modern aircrafts, but also on advanced models. The upper part of the bridge had a gable cross-sectional profile, completely corresponding to the cross-section of the taxiway. Pic. 5 shows the construction of the bridge supports and partly the upper structure.

On the right, you can see traffic on the main access road to Sheremetyevo Airport.

In parallel, another bridge was built – for an airfield patrol road (see Pic. 6). The work was carried out without stopping the operation of the main access roads to the airport, which provided it with a normal life and compliance with the schedule for movement of aircrafts.

Conclusion. In 2015, due to the change of the general contractor organization, the process was suspended. Now the contracting construction company is the company Transstroyemkhanizatsiya and the work is continued. Although, probably, it is worth noting that when implementing such large-scale projects, management failures are hardly permissible. And the question here is not only in the fate of engineering solutions. ●

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