SEA AND LAND LOGISTICS OF CARGO FRONT

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ABSTRACT

The authors analyze the organizational problems of the pre-war and wartime and the logistics methods of managing rail and sea transportation of the USSR in the period from 1938 to 1945. The article presents statistics, facts, a historical digression designed to assess the true scale of the «cargo front» and its role in protecting the country, people and overall victory over the enemy in the during the Second World War.

Keywords: war, evacuation, logistics, transportation management, railways, sea transport, lend-lease.

Background. *Logistical problems solved in the USSR in the period 1938–1945, have no analogues in world practice and deserve to be described and analyzed in detail.*

The term «logistics» was not used in domestic theory and practice until the end of the 1980s, instead of it the term «material and technical supply» was used. However, speaking in modern language, it can be argued that the principles and methods of logistics management of transportation and supply by scientists have developed in the years of the first Soviet five-year plans. First of all, this was reflected in positioning of enterprises and organization of their cooperation already at the design stage. The industrial centers under construction were tied to large railway junctions, which provided a convenient supply of building materials from the very beginning, and in the future – supplying production facilities with everything necessary for successful operation. In other words, in these years a systematic approach to construction of industrial facilities is being implemented, and the costs for construction and operation of future enterprises are planned.

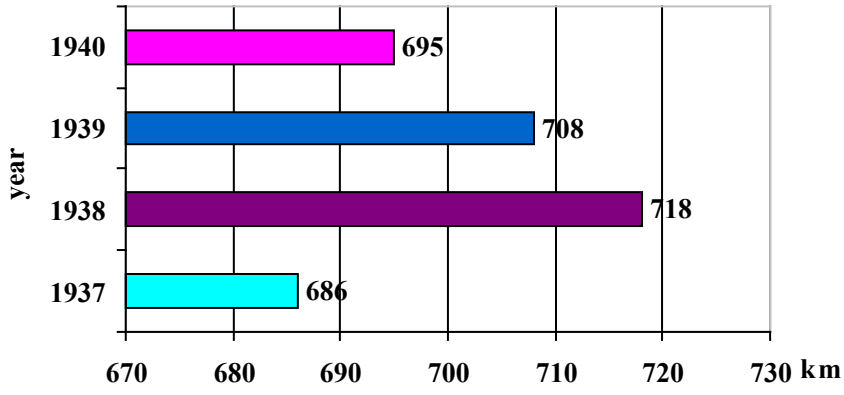
From the point of view of logistics, namely, optimal location of enterprises relative to sources of raw materials and their delivery routes, it should be noted, for example, construction of the Magnitogorsk Metallurgical Combine. In the second half of the 1920s, the People's Commissariat of Railways received a task of forcing the laying of a railway line to a future plant, the construction of which began in 1929, and this combination of combined terms and coordinated actions largely predetermined the expected result.

Similarly, metallurgical and machine-building complexes were formed near the deposits of metals and coal, which served as a source of energy for thermal power plants. The third five-year plan focused on development of the defense industry. In addition, construction of new industrial enterprises was moved to the east – the Urals and Siberia. By the beginning

Table 1

Classification of normal-gauge railway lines for steam traction

Name of a class of a line / Characteristics	Man lines of a reinforced type (super main lines)	Main lines of a normal type	Main lines of a lightweight type	Access roads and branches
	1	2	3	4
The lowest cargo turnover in the cargo direction	For one-track super main line not less than 8000000 t • km/km. For a two-track main line not less than 12000000 t • km/km	not less than 80000 t • km/km	not less than 80000 t • km/km	1. With the length less than 100 km regardless of cargo turnover. 2. With the length from 100 to 200 km inclusive – cargo turnover not less than 300000 t • km/km. 3. With the length from 200 to 250 km inclusive – cargo turnover not less than 150000 t • km/km
Number of tracks	Several or one track	One or two tracks	One track	One or two tracks
Number of pairs of commercial trains of calculated maximum parallel schedule	Depending on the operating conditions	In case of one track – 21 pairs, in case of two tracks not less than 40 pairs	14 pairs	Depending on the operating conditions



Pic. 1. The average range of cargo transportation.

of the war, almost half of the production of the Urals industry consisted of machinery and metal products. In the metallurgy, the leading positions were taken by the Urals and Kuzbass.

Objective. *The objective of the authors is to consider sea and land logistics of cargo front during the war and the postwar periods in the USSR.*

Methods. *The authors use general scientific methods, historical-retrospective method, comparative analysis.*

Results.

1. Rail transportation until 1941

The main mode of transport in the USSR in 1940 was railways. In the general cargo turnover, their share was 85,1 %, in passenger turnover – 92,4 % [6].

The most important characteristics of any type of transport, including railway, are throughput and carrying capacity. The idea of the potential for 1930, from which the pre-war development of the country started, is given in Table 1 [7]. In the 30s of the last century, close attention was paid, on the one hand, to increasing the capacity of the railway transport and rationalizing the transportation processes, on the other hand. Thus, in [8], a method is suggested for increasing the capacity of the limiting section of the road, which allows to increase the volume of cargo by 5–11 %.

The rationalization of transportation means elimination of counterpropagating cargo flows, the full loading of cars, and the like. In 1939, cargo flows were developed for ten major assortments, and petroleum products – in eight main types. In 1940, rationalization continued along peat, coke, cement, brick, rubble and cobblestone, molding sand, ballast, beet, forage, ferrous metals, window glass, etc. [9].

In addition, since many enterprises producing products important for livelihood of population were located in historically developed regions, their goods had to be transported by rail to other far regions. The best solution in this case was construction of appropriate enterprises near consumers.

The People's Commissariat of Transportation (NKPS) was engaged in analysis and rational distribution of cargo flows. «In 1940, the Cargo Administration of NKPS on a monthly basis excluded from transportation plans about 9 000 cars of cargoes, carriage of which would be irrational, requiring customers to replace them» [9]. Such work has allowed to reduce average range of transportations of the basic products and by that to raise turnover of cars. Pic. 1 shows the average range of rail cargo routes from 1937 to 1940.

The average range of cargo transportation reached its maximum in 1938, which corresponds to the scale and timing of construction of new industrial complexes in the eastern regions of the country, and decreased by 1940 to almost the level of 1937.

Attention was paid to the technical re-equipment of the railway transport: introduction of new switches, VHF radio communications, which, for example, made it possible to accelerate disassembly of the train by 2–3 times [10]. At the same time, the first container shipments in our country were tested. However, due to shortage of production capacities and material resources, modernization works were suspended and continued only in the postwar period.

As a result of reconstruction of the railway transport in the 1930s, the main opportunities were created to meet transportation needs necessary for development of the economy and strengthening of the country's defense capability. As the economy grew, so did the volume of cargo transportation. In 1940, rail transportation grew from 392 billion ton-kilometers in 1939 to 409 billion, river transportation increased to 36 billion ton-kilometers, compared with 33 billion [11].

The increase in carrying capacity of roads required an increase in the weight of trains, and hence creation of more powerful locomotives and cars with increased lift, as the task was formulated. And it should be noted that the technical means created by domestic scientists and specialists were not inferior to the best world models.

In 1931, the Lugansk plant began to produce steam locomotives of the FD series with an estimated traction force of 3300 hp. The locomotive fleet in 1940 was 2/3 consisting of powerful freight locomotives of the series FD, SO, E, passenger series of IS, S^U. The FD steam locomotives mastered almost 40 % of the total cargo turnover of railways [7]. Only for the first half-year the advanced machinists drove 131 thousand heavy trains and additionally carried 38 million tons of cargo.

In 1923, production of 2-axle covered cars with the carrying capacity of 20 tons was organized. Since 1925, 4-axle cars with the carrying capacity of 50 tons began to be manufactured at Sormovo, Kolomna, Bryansk, Mytischinsky and other plants. In 1928, domestic plants began to build on a new model project 4-axle long-distance passenger cars. By 1941, heavy trains accounted for 40,7 % of the cargo fleet.

Thus, it can be argued that in order to increase the volume of transportation and increase their efficiency, the same methods used by modern logistics today are used. Namely, a set of technical and organizational measures to increase the capacity of roads associated with the capacity of hauls, stations, water supply devices, traction devices for turning locomotives, supplying fuel, repairing locomotives and cars, etc.

In terms of the level of use of a number of technical means, the USSR railways surpassed the railways of developed foreign countries. A highly effective system of organization and technology of the transportation process was created (unified for the whole network of transportation plans, a traffic schedule, a technical plan, a system for regulating car fleets). New enterprises were positioned in such a way that when they are included in the technological chain in order to minimize transport work.

In terms of the volume of transportation, the USSR railways in 1937 came to the second place in the world (after the USA). The total length of the railway network by 1941 was 106,1 thousand km.

In the summer of 1938–1940, during an armed conflict near Lake Khasan, in the vicinity of the Khalkhin-Gol river, where Japanese troops invaded, railway transport provided military operational transport in the Far East and contributed to successful completion of military operations.

2. Transportation management during the evacuation period

The Great Patriotic War changed the conditions and nature of the functions, the duties of transport. At the same time, difficult tasks were solved: military transport for the front, evacuation of military stores and relocation of material values and people from the western regions of the country to the eastern, transport in the interests of the military economy. The direction of cargo flows has also changed.

The main burden of transportation during evacuation lay on the railway transport. In the People's Commissariat of Railways, organizational management of evacuation of population and material cargoes involved cargo management and traffic management.

With a view to streamlining the movement process by the Evacuation Council, a solid order was established for planning and organization of transportation. On its shoulders lay coordination of work with all interested people's commissariats, primarily with NKPS, and it also determined the terms of evacuation, the points of deployment and the number of railway cars required for this.

An additional difficulty was that military cargoes were steadily moving westward. The State Defense Committee ordered the echelons to move at a speed of 500–600 km per day, and this was impracticable. The USSR in those years was a country of predominantly single-track railways [12].

In case of an acute shortage of cars, careful consideration of the existing car fleet and its losses in the front zone was required, rigid schedules of provision of military cargoes for cars for evacuations, which had freed themselves from transportation, were needed. For the same purpose, part of empty cars and platforms were transferred to the frontline areas.

The principle of priority and stage-by-stage evacuation depended primarily on the prevailing situation, as well as the type and significance of enterprises. Streams of raw materials and components were immediately sent to new places of their location. The order of the People's Commissariat of Ammunition No. 567 says when, what and where to transport, and even in what order what to load [12].

Almost 70 % of the displaced industrial facilities were located in the Urals, in Western Siberia, Central Asia and Kazakhstan. Along with relocated factories and plants, up to 30–40 % of workers, engineers and technicians arrived to the East. In total, over 12 million people were transported to the rear areas by railways and highways, as well as by water and air routes from the beginning of the war to the end of 1941.

Already in March 1942, the industry of the eastern regions, taking into account the evacuated enterprises restored here, produced as much war production as at the beginning of the war it was produced throughout the USSR.

In the first period of the war (1941–1942), in conditions of great mobility of the front, enormous material losses and destruction, rail transport provided timely mobilization transportation, strategic deployment of the Red Army forces and the transfer of military equipment. At the same time, mass evacuation of population and enterprises was carried out.

In July-November 1941, to the east, more than 2500 enterprises were evacuated, including 1523 large plants, 18 million workers, employees and members of their families. To transport all this by rail, it took 1,5 million cars or 30 thousand trains.

In the second wave of evacuation, in the summer of 1942, equipment from 150 large enterprises and about 8 million people was transported along the Donetsk, Southeast, Stalingrad, North-Caucasian and Ordzhonikidze railways.

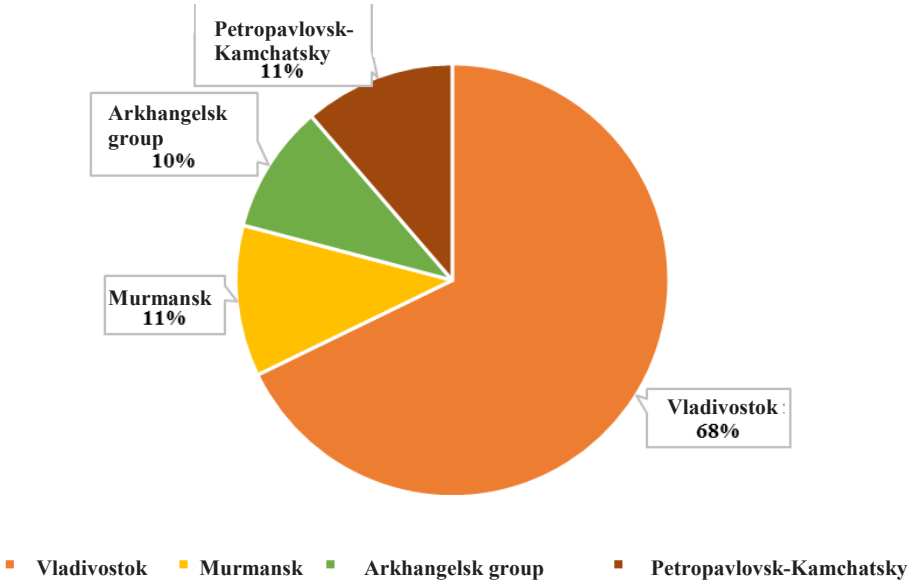
The transport support of Soviet troops played a decisive role in the Stalingrad and Kursk battles, in operations in the fields of Ukraine, Byelorussia and the Baltics, in the battle for Berlin.

The railways carried out the bulk of transportation of Red Army men and commanders, military equipment, weapons and ammunition. In total for the years of the Great Patriotic War, railway men transported more than 19 million cars with cargo and people. They accounted for about 80 % of military transportation.

At the same time, it was necessary to solve a number of logistical tasks, including the optimal use of the fleet of locomotives and cars, the choice of routes for movement of cargoes, servicemen and civilian population, places of forced stop at stations and crossings due to the large share of single-track railways, as well as part of the destroyed railways and bridges during combat operations. In addition, help was needed in choosing the location of relocated enterprises in order to organize their cooperation, supply all necessary for production, send finished products, create conditions for the life of evacuated workers.

Despite the above difficulties, the presence of biaxial and four-axle cars corresponding to the volumes of the car fleet was provided. At the end of 1941, heavy cars with carrying capacity of 50 tons accounted for 40,7 % of the freight fleet, cars with carrying capacity of 20 tons – 59,3 %.

Based on the received data, we will determine the volume of cargo transported in July-November 1941 V_1, as well as for the entire period of the Great Patriotic War V_0.



Pic. 2. Distribution of cargo volumes, processed by the USSR ports in lend-lease shipments.

$V_1 = 1500000 \cdot (0{,}407 \cdot 50 + 0{,}593 \cdot 20) = 48315$ thous. tons (the upper estimate).

$V_0 = 19000000 \cdot 32{,}21 = 611990$ thous. tons (the upper estimate)

3. Logistics for lend-lease shipments

The practice of applying methods of transport logistics has received the greatest development in the supply of lend-lease in the USSR during the Second World War.

In 1941, less than 1 % of the total volume of planned supplies was received by lend-lease. In 1942, this percentage was 27,6. Thus, more than 70 % of lend-lease shipments fell on 1943–1945 [13].

Military cargoes arrived in the USSR in different routes, but the main ones were three – Pacific, Trans-Syrian and Arctic convoys. In total, they provided 93,5 % of total supplies.

The fastest, but also the most dangerous route was the Arctic convoys. The sea part of the route from the eastern coast of the United States to Murmansk took about two weeks. 40 % of deliveries went exactly this route. However, about 15 % of the goods sent this way were lost.

Lend-lease cargoes along the Trans-Iranian route came to the ports of the northern extremity of the Persian Gulf: Basra, Khorramshahr, Abadan and Bandar Shahpur. Aviation and car assembly plants were built in them. This solution allowed to increase the cargo capacity of sea transport.

From the ports in the USSR, the cargoes went in two ways: overland through the Caucasus and waterways – across the Caspian Sea. However, the trans-Iranian route, as well as the Arctic convoys, saw their shortcomings: first, it was too long (the convoy route from New York to the Iranian coast took about 75 days, and then time was spent on delivering cargo to Iran and the Caucasus or the Caspian Sea), and secondly, dangerous because of the constant air raids of German aircraft. In 1945, instead of Iranian, the Black Sea route was used [14].

Since May 1942, deliveries averaged 80–90 thousand tons per month, and in the second half of 1943 – up to 200000 tons. Specially for the needs of lend-lease in Iran, several automobile plants were built [14]. Over the years of the war more than 184 thousand cars were sent from the Iranian enterprises to the USSR. The cars were driven along the routes Tehran-Ashgabat, Teheran–Astara–Baku, Djulfa–Ordzhonikidze.

The Pacific route, which provided about half of the lend-lease supplies, was relatively safe. Since the beginning of the war between the United States and Japan since December 7, 1941, all transportation in the Pacific Ocean was carried out «exclusively Soviet steamships», as stated in the report of the People's Commissariat of Foreign Trade. The sea part of the route from the western coast of the USA to the Far Eastern ports took 18–20 days. The main receiver was Vladivostok, where 15 ocean vessels could be unloaded at the same time.

The main drawback of the Far Eastern route was its remoteness from the front. Cargoes, relatively quickly delivered to the USSR, were delayed for two or three weeks on the Trans-Siberian Railway because of the limited capacity of the main line.

The fact that this route was given special significance is evidenced by the fact that practically all the vessels of the Soviet transport fleet were given to the Far Eastern State Shipping Company (DVGMP) in early 1943. Since 1942, American transports began to arrive via lend-lease, first old ones repaired under a special program, and since January 1943 – and new ones: dry cargo ships of the Liberty type and tankers.

In June 1941, the fleet of DVGMP was 85 ships. In 1941–1945, the Far Eastern Shipping Company included 39 vessels, taken from other shipping companies. In different American ports were accepted: in 1942 – 27, 1943 – 46, 1944 – 20, 1945 – 35 vessels. A total of 167 transports were received, of which lend-lease – 128, they were mostly large-tonnage. Four large-capacity high-speed vessels of Dalstroi of the NKVD also participated in transportation through the Pacific Ocean [15].

From 1941 to 1945, the Far Eastern Shipping Company transported more than 12 million tons of cargo, including 7,95 million imports, the Primorsky Railway – 46,3 million tons [15].

During the Great Patriotic War Vladivostok loaded and sent to the west almost 400000 cars and platforms, more than 10 million tons of cargo, processed 32000 transport vessels [15].

The port of Murmansk over the same period processed slightly more than 2 million tons of imports, and the Arkhangelsk Group of ports (Arkhangelsk, Bakaritsa, Ekonomiya, Molotovsk, now Severodvinsk), based on US data, approximately 1,7 million tons. It turns out that Vladivostok has processed imported cargo almost 4 times more than Murmansk and almost 5 times more than Arkhangelsk (meaning the whole group of the White Sea ports).

Based on the documents of the state archive of the Kamchatka region on the work of the port of Petropavlovsk-Kamchatsky in the war years, a calculation was made, yielding a figure exceeding 2 million tons.

The distribution of cargo volumes processed by the USSR ports for lend-lease shipments is shown in Pic. 2.

Instead of conclusion. *The article makes an attempt to provide an objective analysis of the contribution of domestic transport workers to development of logistics methods and transport logistics following the Second World War, with an emphasis on the practice of solving logistics tasks in the period from 1938 to 1945.*

Undoubtedly, the methods of logistic management were widely used in our country in solving various problems of supply and transportation of material resources in the First and not only World War II, although the term «logistics» in Russian science and practice was not applied until the end of the 1980s of 20th century.

It is characteristic that in 1925 the People's Commissar for Military and Naval Affairs, M. V. Frunze stated: «Without the most thorough organization of the rear, based on accurate mathematical calculations, without establishing proper nutrition of the front, without all that is necessary for conducting operations, without the most careful consideration of transport providing logistic support, without organization of an evacuation business, it is inconceivable any reasonable, reasonable conduct of large military operations ...» [5].

The researches of scientists about the period of the Great Patriotic War in the field of supplying troops and organization of transport logistics support, as well as organization of evacuation business, undoubtedly confirmed the correctness of logistic principles when carrying out a large-scale logistic operation for the mass migration of population and material resources to the East of our country, the time of war, the volume of cargo transportation by rail only amounted to more than 600 million tons in all directions. We will add sea, river, automobile, air transport, and it becomes clear what really was the grandiose and multidimensional logistic scheme of the cargo front (parallel to the battle fronts), which today is associated with the unusual concept of «logistics».

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