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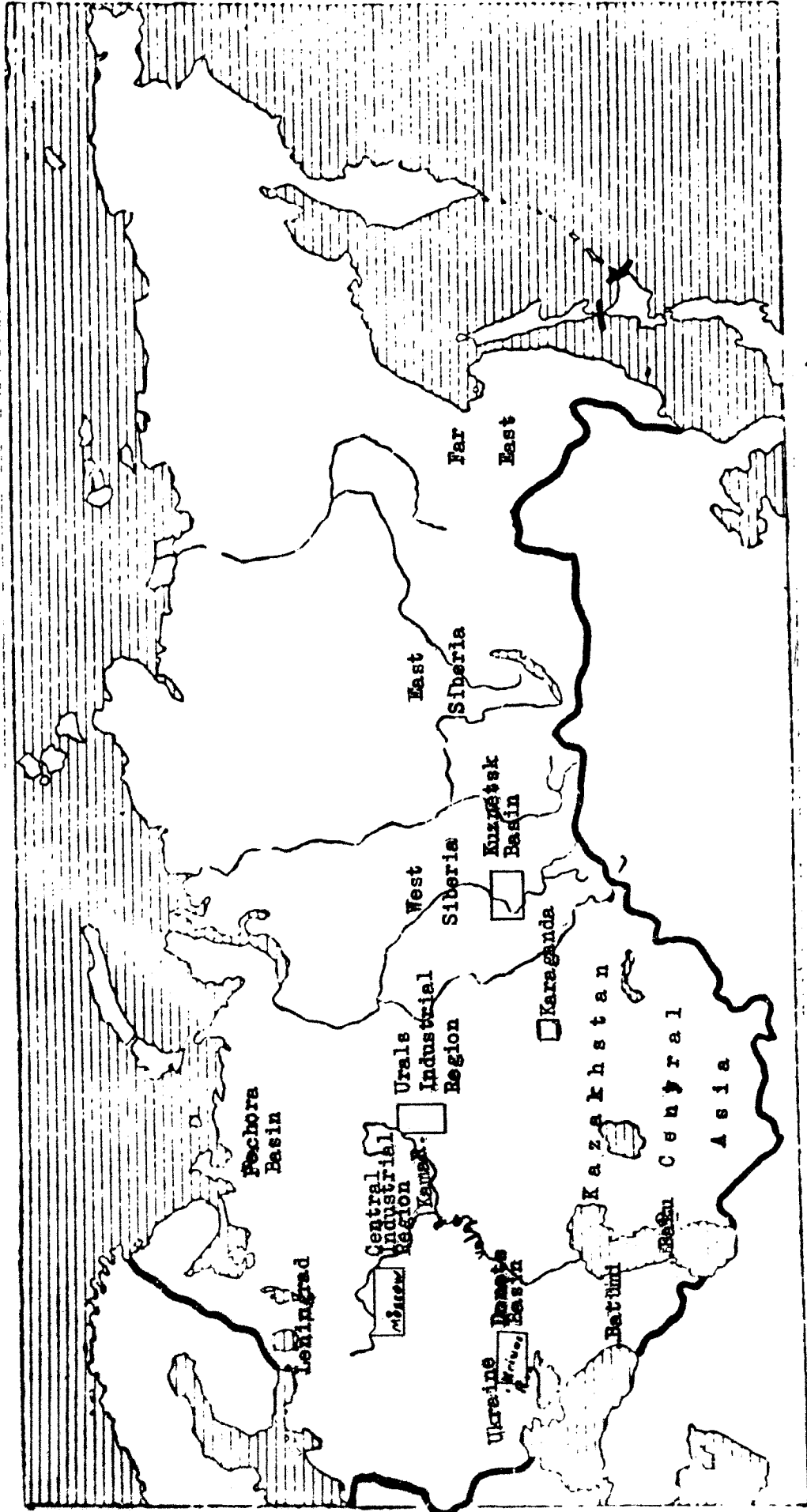
REVIEW OF FOREIGN DEVELOPMENTS

March 27, 1951

A Survey of Soviet Transport Problems
By Edward Ames

21 Pages

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Economic Regions of the U.S.S.R. (postwar frontiers)

March 27, 1951

A SURVEY OF SOVIET TRANSPORT PROBLEMS

Edward Ames

The Soviet Union is the largest continuous territory under a single rule in the world. It is well-known that the distance from Leningrad to Vladivostok is twice that from New York to San Francisco. The problem of uniting this vast expanse in an economic sense is in a considerable degree one of transportation. Whatever the political aspects of holding this territory together, the economic aspects of developing effective power over it are intimately linked with the existence of adequate transport.

This article deals with three topics which while by no means exhaustive are typical of those to be found in the study of Soviet transport.^{1/} They are:

I. Why is the railroad the predominant form of Soviet transport?

II. What are the main elements in the planning of railroad operations?

III. How has the regional pattern of Soviet freight movements changed over the past half century, reflecting the change in the distribution of industry over the country?

A. Freight traffic

The main facts with which a discussion of the importance of various types of freight transportation in the USSR must deal may be briefly summarized in Table 1. Here it will be seen that rail transport accounts for the overwhelming body of freight carried in the USSR. The railroads tended, in the period 1946-1950, to carry somewhat more freight and the river fleet somewhat less than the plans called for. Thus the actual importance of rail transport in the USSR today is closer to what it was in 1940 and 1945 than to the 1950 plan. It is thus possible to give only a relatively brief discussion of non-rail transportation, and to concentrate mainly on the railroads.

^{1/} A word of caution seems advisable in the use of Soviet material. Wherever the reader encounters a categorical statement, he should add the word "probably"; where he sees a number, he should add "approximately". There are numerous difficulties of detail in handling Soviet material, and considerable care should be exercised not to convey an illusion of precision.

Table 1 ^{1/}
Soviet Freight Haulings-By Type
(In billions of ton-kilometers and in percent of total)

	1940		1945		1950 plan	
	Ton km.	Percent of total	Ton km.	Percent of total	Ton km.	Percent of total
Total,	483	100	364.6	100	657.5	100
Rail Traffic	415	86.0	314.0	86.4	532	81.0
River Traffic	36	7.4	16.4	4.5	49	7.5
Maritime Traffic	23	4.8	28.8	7.9	51	7.8
Automobile Traffic	9	1.8	4.4	1.2	25	3.7

River traffic - Two sets of influences explain the relative economic insignificance of the Soviet rivers; the first are of a secular nature and have to do with geographical and climatological factors, such as shallowness, shortness of navigation season, remoteness of their outlets from internal economic or population centers, and their failure to pass through or near major industrial or raw material centers. The second are of a more short-term nature and have to do with organizational and administrative factors.

Certain exceptions may be made to this general statement as to the unimportance of the rivers. In the nineteenth century, the Ukrainian rivers served as sources for the export of grain from Black Sea ports. At present, the Volga serves as an important means of transport of lumber, oil, and grain.^{2/} Mention should also be made of the rivers of the Northern portion of the European USSR, notably the Pechora and North Dvina, which are of importance in lumber export trade.

^{1/} Bolshaya Sovetskaya Entsiklopediya, USSR volume, p. 95; Povorozhenko, V. V. Organizatsiya gruzovoi raboty na zheleznodorozhnom transporte: perevozka gruzov, Moscow, 1947, p. 66; Gorinov, A. V., Proektirovanie zheleznikh dorog, Moscow 1948, p. 30.

^{2/} The lumber originates in the northern forests, and is either sawed in these areas (the area between Gorki and the Western Urals) and loaded on river vessels, or is floated down as round timber in rafts to the steppe areas. The oil starts either in Baku, is transhipped in Astrakhan and brought upstream, or, with the development in the past fifteen years of oil fields in the Kuibyshev-Syzran area, it starts from these points for shipment north. Originally, this Volga oil went both east to the Urals, on the Kama, or west to the Moscow industrial region, but with the growth of oil output in the western Urals, the eastward movement will presumably cease. Finally, grain originates in the area between Stalingrad and Kazan and moves upstream to the Moscow industrial region.

Attempts to correct the difficulties brought on by the maldistribution of rivers by canal construction have been made since the time of Peter the Great. In the era before the railroad, special effort was made to build canals whereby grain surpluses in the Volga area could reach the Baltic for export. With the decline in foreign trade since the revolution, and with the growth of the urban population, Volga grain (and oil) has been needed in the Moscow industrial region, with the result that in the 1930's the Soviet government revived canal construction, building the Moscow-Volga canal to eliminate the need for transshipping from ship to rail at Gorki, Rybinsk, etc. In 1949, the Soviet government announced the construction of a canal connecting the Volga and Donets areas. The purpose of this canal is twofold: to provide cheap transport for Donets Basin (Ukrainian) coal to the Volga area, where it is to replace Siberian coal, and to provide a means of getting mine timbers from the northern forests to the Ukrainian mines.

Aggravating the long run problems imposed on Soviet internal waterways by geography and climate are a number of short-run problems, which can be summed up in the term "inefficiency". As of 1948, it was estimated^{1/} that haulings on the rivers were only the following percentages of the capacity of the rivers:

Coal	30-35	Timber (excl.	
Grain	67	floatings)	50
Salt	67	Mineral build-	
		ing materials	
		and cement	50

Five reasons were given for this poor utilization of capacity: 1. slowness of delivery to customers; 2. poor condition of the ships; 3. lack of initiative by the Ministry of the River Fleet in seeking new clients; 4. rates and fines (for failures by clients to deliver freight promptly to loading points, etc.) frequently in excess of those charged by the railroads; 5. failure to build adequate transfer points for transferring freight to and from railroads. These inadequacies led to the average cost of hauling one ton-kilometer of freight (excluding oil) on internal waterways exceeding by 60 percent the average cost of similar hauls on the railroads, in 1947. This situation is more or less chronic, and presumably results from the low priority given this branch of transportation by the government. Management of the railroads is clearly on a far higher level.

The traditional center of the internal waterway system is the Volga-Oka-Kama System, which, in 1947, carried the following percentages of all freight hauled on the internal waterway

^{1/} Koldomasov, Yu., Planovoe Khozyaistvo No. 2, 1948, reprinted in expanded form in Narodnoe Khozyaistvo SSSR, Sbornik No. 2, Moscow, 1948.

system: petroleum and petroleum products 95%, timber, other than floatings 60%, all freight other than petroleum 60%, all freight 70%. The role of the Volga is strengthened, percentagewise, by damage to facilities on rivers in the devastated areas.

Maritime Transport - The term "maritime transport" is designed primarily to designate coastal traffic. International trade enters into it only to the extent that such trade is carried in Soviet bottoms. Soviet writers go so far as to criticize Tsarist maritime policy not merely on the ground that it permitted foreign shipping to carry a large part of Russian foreign trade, but also that it conceived of foreign trade, rather than coastal shipping to be the major area of activity of the sea-going fleet.

As a result of this point of view, the volume of maritime transport declined after the revolution, both as a whole, and particularly in international trade: data to this effect are shown in Table 2. Since 1939, the situation with regard to coastal shipping in the Baltic has altered both because of the Soviet annexation of the Baltic republics, and because of greater trade with Poland and Finland. The postwar five-year plan called for an increase in the capacity of the merchant fleet by 1950 to 2.2 times the 1940 level; insofar as the plan depended upon an increase in foreign trade it may have been affected by the "cold war". Data on coastal shipping are lacking. In any case, this branch of Soviet transportation is clearly a marginal one.

Table 2
Soviet Maritime Transport, 1913 and 1939^{1/}

	<u>Exports and Imports</u>			<u>Coastal Traffic</u>			<u>Total Traffic on Sea</u>		
	As percent of 1939 all Maritime Transport on Sea		1939 as percent of	As percent of 1939 all Maritime Transport on Sea		1939 as percent of	As percent of all Maritime Transport		1939 as per- cent of
	<u>1913</u>	<u>1939</u>	<u>1913</u>	<u>1913</u>	<u>1939</u>	<u>1913</u>	<u>1913</u>	<u>1939</u>	<u>1913</u>
White and Barents	86	41.0	98	14	59.0	883	4.4	11.2	200
Baltic	91	97.0	17	9	3.0	50	16.5	3.3	15.5
Black and Azov	57	13.5	10	43	86.5	125	45.7	34.3	57
Caspian	2	.2	117	98	99.8	120	29.0	45.0	118
Pacific	40	12.5	33	60	87.5	161	4.4	6.2	111
All Seas (Average)	<u>47.7</u>	<u>13.0</u>	<u>21</u>	<u>52.3</u>	<u>87.0</u>	<u>130</u>	<u>100.0</u>	<u>100.0</u>	<u>78</u>

^{1/} An adaptation of Bernshtein-Kogan, S. U., Sdvigi v geografii zheleznodorozhnogo i vodnogo transporta za 30 let, published in Voprosy Geografii, sbornik 6, 1947, pp. 89, 99.

Trucking - Trucking in the USSR is primarily local in character. At the end of the war, according to a Soviet authority^{1/} although tonnages loaded into trucks were twice as great as those loaded into railroad and water transport combined, the average haul was only 1/70 as great as on the railroads (this would indicate that the average haul of trucks was about 15 kilometers, or 10 miles); hence, as was shown in Table 1, automobile transport accounts for only a negligible portion of freight haulings, in terms of ton-kilometers.

The Soviet authorities feel that there is room for considerable development of trucking as a short-haul phenomenon. Thus another authority^{2/} observes that one-quarter of all railroad freight is hauled for distances of less than 100 kilometers. On such hauls, the initial costs of rail operations, and the chronic overloading of the main station facilities are such that a development of further truck operations would be expedient.

The limitations upon the development of Soviet trucking are, however, considerable. Thus the postwar Five-Year Plan called for the development of automobile production to the level of 500,000 per year. Most of this output was to be trucks. It is clear, however, that this level of output was not attained, Table 3 gives estimates of automobile output in recent years.

Table 3
Soviet Automobile Production, 1940 and 1945-50
(In thousands of units)

<u>Year</u>	<u>Total</u>	<u>Trucks</u>	<u>Passenger Cars</u>
1940	147	n. a.	n. a.
1945	88	85	3
1946	121	118	3
1947	157	153	4
1948	227	218	9
1949	304	284	20
1950 plan	500	428	62
1950 actual	396	369	27

Source: Unpublished estimates of the U. S. Department of Commerce.

^{1/} Khachaturov, T. S. Osnovy Ekonomiki zheleznodorozhnogo transporta, Moscow, 1946, pg. 236.

^{2/} Levin, B. I., editor, Osnovnye Voprosy Pyatiletnogo Plana vosstanovleniya i razvitiya zheleznodorozhnogo transporta na 1946-1950 gg., Moscow 1947, p. 131.

The Soviet Union with output of 369,000 trucks and 27,000 passenger cars in 1950, is one of the largest producers of motor vehicles in the world, together with the United States, which produced 5,109,000 passenger cars and 1,129,000 trucks, and the United Kingdom, which produced 412,300 passenger cars, and 216,000 trucks in 1949.^{1/} The Soviet Union produces almost exclusively smaller sizes of truck, in the 1.5 to 3.5 ton classifications, and the total inventory of trucks which was 592,600 in 1940 and 2,250,000 in 1949^{1/} is probably not comparable in carrying capacity with the U. S. figure for truck and bus registrations for 1948 of 7,361,000 trucks.

The road system of the Soviet Union is badly developed. In 1940, there were only 100,000 kilometers (62,500 miles) of hard-surfaced roads in the USSR as compared with 196,904 miles of "high type" surfaced roads, and 1,543,041 miles of all types of surfaced roads in the much smaller U. S. in 1945.^{2/}

Despite great petroleum resources, Soviet petroleum output is relatively small, and there is a chronic shortage of refined petroleum output. The use of petroleum products in industry (except for lubricating purposes) has been severely limited; Soviet tractors now use almost exclusively diesel fuel rather than gasoline; and a major development of commercial trucking would involve a considerable strain upon this industry. For reasons of a strategic and political nature, the Soviet government may well hesitate to encourage trucking too far.

The Soviet Union has considerable maintenance problems. These are of the type usual in under-developed and recently developed countries, where the skill and ingenuity of repairmen cannot hide a general ignorance of the precept that "an ounce of prevention is worth a pound of cure".

B. Passenger traffic

With regard the movement of people, interesting figures are given in Table 4. The number of people in the USSR in 1940 traveling by train was almost double the United States average for 1939-1948. On the other hand, the number of people making trips on trains other than suburban was actually less than in the U. S. Taken as a whole, the average distance of an American journey was 60 percent greater than that of a Soviet journey.

^{1/} Economic Survey of Europe in 1949, Economic Commission for Europe, Geneva, 1950, pp. 283, 296.

^{2/} Shevyakov, Planovoe Khozyaistvo, No. 6, 1947. U. S. Statistical Abstract, "High type" roads include "high-type bituminous, Portland cement concrete, brick, block and dual-type surface"; "low-type" include in addition soil-surfaced, gravel or stone and low-type bituminous. Soviet "hard-surfaced" would presumably include "low-type" bituminous roads.

Granted the laws designed to prevent labor turnover and absenteeism, the problems of private travel are considerable under actual Soviet conditions. Long-distance travel is limited to those traveling on official business, or to those traveling under special circumstances (recipients of special rewards in the form of vacations at resort, recruits from the farms for city work, workers being moved to new locations in the east). On the other hand, the small development of passenger automobile transport creates heavy demands for transportation to and from work. Moscow and some of the other larger cities have "dacha zones", or suburban towns surrounding the central part of the city, but the railroad, rather than the car, is the main method of access. The growth in suburban passenger traffic has been striking compared to that of long-distance traffic.

Table 4
Freight and Passenger Service
in the USA and USSR

	U.S.A. ^{1/} (average 1939-1948)	U.S.S.R. ^{2/} (1940)
Total passengers carried (millions)	688	1343
Suburban	313	1003
Long distance	375	340
Average length of journey, all passengers (km)	130	79 ^{3/}
(miles)	81	50
Total passenger-kilometers (billions)	89.8	106.1 ^{3/}
Passenger-miles (billions)	55.8	65.9
Total freight ton-kilometers (billions)	854	592.6
Ton miles (billions)	585	405.9
Ton-kilometers of freight per passenger-kilometer	9.5	5.6

II. The Planning of Railroad Transportation

As indicated above, the prevailing form of transportation in the USSR is by rail. The balance of the paper will, therefore, discuss the planning of transportation as if all transport were by rail.

1/ I.C.C. Statistics of Railroads, 1948.

2/ Hunter, Holland, The Economics of Soviet Railroad Policy, Harvard Phd. thesis (1949, unpub.).

3/ Assumed to be the same as the 1936-1938 average.

In terms of the main objective of the Soviet government to "overtake and surpass the leading capitalist countries" in production, the investment of resources in the railroad system is, at best, a necessary evil. Not only are railroads expensive to build, but in and of themselves they contribute nothing to the end-product of usable consumer, capital or military goods. Hence the more "efficient" the railroads, the greater the portion of resources which can be "directly" allocated into production of such goods.

"Efficiency" may be defined in a variety of ways; in terms of freight handled per unit of manpower expended; in terms of freight handled per unit of railroad equipment in existence; in terms of freight handled per unit of line in use. These expressions, as stated, lack precision, but the general meaning is clear.

In a country as vast as the USSR, and with natural resources as widely scattered, the existence of a "satisfactory" rail service is vital. Without adequate rail services, the entire industrial mechanism must collapse for lack of supplies. While the Soviet Government may wish to minimize its investments in the field of transportation, it cannot ignore them. Indeed to some extent, the creation of new rail facilities may be a prerequisite for opening up new sources of raw materials. More particularly, however, the Government is faced with the problem of maximum utilization of existing equipment and line. If we consider the carrying capacity of the system to depend, at any point in time, on the distance which freight must be hauled, the speed at which freight cars move (including time they spend standing at stations, etc.), and the length of time it takes to unload a freight car, deliver it to the next loading point, and reload it, we obtain an idea of the principal elements which the planning authorities must control. The shorter the haul, the less the movement of empty cars, the quicker the station operations (loading, unloading, switching, etc.) the more tonnage can the system load and deliver with a given amount of line and equipment. The Soviet railroads have been under continuous pressure to improve their performance in these respects, and the primary attention of the planners of the railroad system are devoted to the attainment of optimum indices of performance. The expansion of the capital equipment of the network has been less than proportional to the volume of freight handled.

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Table 5
Principal Indices of
Soviet Railroad Operations, 1928-1950 ^{1/}

	Length of First Main Track in operation, end of year (thousand kilometers)	Freight Loadings (million tons)	Total Freight Carried (billion ton- kilometers)	Average Length of haul (kilo- meters)	Ton-Kilo- meters of turn- per line (kilometers)	Average around time (days)
1937	84.9	517.3	354.8	686.	4175	6.98
1938	85.0	516.3	370.5	718.	4363	7.52
1939	105.3	554.0	392.0	708.	4121	---
1940	106.1	592.6	415.0	700.	3926	7.37
1941 (first half)		664.	416.	693.		6.92
1942		271.	223.	823.		13.8
1943		296.	252.	851.		12.6
1944		370.	307.	830.		
1945	112.9	395.	314.	794.	2800 ^{2/}	10.92
1946		455.	338.	743.		10.07
1947		499.	354.	710.		9.61
1948		606.	450.	743.		8.68
1949		712.	525.	737.		8.08
1950 (plan)	123.2	771.	532.	690.	4400 ^{2/}	6.96
1950 (results) ^{3/}		805.				7.43

Table 5 presents some of the principal indices of Soviet railroad operations. Some of these are "absolute" figures, representing total length of line, total freight haulings and total freight loaded. Some are "indices of performance", such as "average length of haul", and "average turnaround time" (the average interval between loadings). These latter series are the main indicators available as to the extent to which the railroads are being "effectively utilized in the sense given above.

^{1/} Data for 1937-1940 are from Bernshtein-Kogan, S. U., Sdvigi v geografii zheleznodorozhnogo i vodnogo transporta za 30 let, published in Voprosy Geografii, sbornik 6, 1947, and those for 1941-1949 from Hunter, Holland, Soviet Railroads since 1940, Bulletins on Soviet Economic Development, Birmingham 1950.

^{2/} Gorinov, A. V., Proektirovanie zheleznnykh dorog, Moscow 1948.

^{3/} Izvestiya, January 26, 1951.

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In discussing the planning of rail transport, an article by the Soviet economist Bochkarev^{1/} has been used. This article presents a considerable body of factual material, the historical accuracy of which is less open to question than the theoretical assertions of the work. In considering his findings the reader will find it useful to remember that the greater the distances freight must be hauled, the more work for the railroad system, and the more government (budgetary) investments required in transportation. The average length of haul can be decreased by eliminating cross-hauls, and by developing local sources of supply (local food, fuel, consumer goods, lumber, etc. production) in preference to long-haul sources.

The main factual conclusion to be drawn from Soviet railroad statistics, says Bochkarev, is that there has been a continual tendency for the number of ton-kilometers of freight hauled per unit of commodity produced to increase. Projecting into the future, then, he would expect this trend to continue. Implicitly, this doctrine is a criticism of the postwar Five-Year Plan, which sought to reduce this index below 1940 levels. The basic data with which Bochkarev operates are given in Table 6.

Table 6
Volume of Rail Activity Per Unit of Production,
Selected Products
(In ton-kilometers of freight per ton of output)^{2/}

	<u>1913</u>	<u>1928</u>	<u>1932</u>	<u>1937</u>	<u>1940</u>	<u>1950 plan</u>
Coal	440	526	582	649	644	625
Petroleum products (rail) (rail and river)	379	538	679	996	1172	971
Steel		1054	1658	1486	1430	1496
Iron and manganese ore	238	438	520	633	578	607
Grain (harvested)	124		253	223	273	283

Obviously an increase in the ton-kilometers of transportation per ton of output can come about either as a result of increasing the average length of haul of freight loaded, or as a result of increasing the proportion of total output which is hauled by rail. Bochkarev bases his assertion as to the existence of a basic trend in the direction of more transport per unit of output on the following considerations:

- ^{1/} N. G. Bochkarev, voprosn o sootnoshenii mezhdu obemom proizvodstva i obemom perevozok SSSR, in Khanukov, E. D., and Chernyshev, V. I., editor Voprosy ekonomiki zheleznodorozhnogo transporta, Moscow 1948.
- ^{2/} Khanukov, E. D., and Chernyshev, V. I., editor Voprosy ekonomiki zheleznodorozhnogo transporta, Moscow 1948, pp. 370-374.

1. "As a result of capitalist wasteful exploitation" there has been a gradual exhaustion of certain types of resources located near consuming areas and some better grade ores.^{1/}

2. The industrialization and collectivization program tended in itself to increase transport requirements. The farm grain surplus has tended to increase faster than total harvests, for as a result of mechanization, it has been possible to produce a given amount of grain with less manpower. As a result, people have moved into the cities, and consumption on the farm has become a smaller part of total food consumption. Hence transportation requirements have tended to increase relative to grain harvested.

3. As technology has advanced, special demands have been created. To heat a boiler almost any type of coal will serve, but for coke and chemical output, special grades of coal may be required. To make roofing iron or many types of rails and girders, "ordinary" grades of metal are adequate, while to make the specialized, high-quality and alloy products required of an industrialized economy, there must be specialization of plants; in terms of transportation, such development is apt to imply cross-hauling.

4. The development of the eastern regions of the USSR, because of the distances between them, has involved longer hauls. Bochkarev^{2/} gives interesting data concerning the average lengths of hauls on Eastern and Western railroad administrations in 1938.

Administration	<u>Average length of haul of freight</u>	
	Loaded on railroad	Unloaded on railroad
European USSR		
North Donets	642	435
South Donets	517	345
Stalin	500	425
Asiatic USSR		
Tomsk	1285	810
Omsk and Karoganda	1470	1091
South Urals	1110	1005
Sverdlovsk and Perm	931	652

^{1/} The lower grade the ore the more transportation required per unit of metal contained in the ore.

^{2/} Khanukov, E. D., and Chernyshev, V. I., editor Voprosy ekonomiki zheleznodorozhnogo transporta, Moscow 1948, p. 364.

Hence, to the extent that Soviet industrial development has involved a relocation of industry to the east, it has involved a more than proportional increase in the volume of freight haulings, since distances involved are greater.

5. The development of new types of output will increase haulings. For example the creation of an automobile industry in Moscow and Gorki in the 1930's meant that a new product was to be shipped to all parts of the USSR.

6. Finally, transportation is involved in the process of industrial development, in that the development of a region is speeded up if equipment, building materials, etc., are brought in from the developed areas for a certain length of time, till local industries are available to supply the region.

In an authoritative and hostile review entitled "Against bourgeois methodology in questions of transport economics",^{1/} P. Krylov attacked the volume in which Bochkarev's article appeared and the article itself. The main object of the criticism ran in these terms: 1. the Five-Year Plans involved the deliberate creation of new industrial regions in remote areas; 2. in early stages of development such regions are inherently freight-absorbing; 3. in general industrialization will increase transportation requirements. On the other hand, the function of the railroad economist is to enable the railroads to operate, within the general framework of such a system, and this function requires that they endeavor to minimize average length of haul, and to improve the efficiency of the system. It is not their function, however, to state that if Soviet industrial policy were different, their task would be easier. In short, Krylov's attack is not based upon any factual disagreement with Bochkarev. Rather, it is based upon the position that it was not the function of the railroad economist to worry about such things.

Two more factors remain to be discussed. The first is the question of turnaround time, or the time elapsing between two successive loadings of a freight car. Obviously this time depends upon the distance that the car must travel with its load, and the distance it travels empty before being reloaded. In addition, however, it depends upon the speed of loading and unloading operations, the amount of time it spends standing still, and the speed with which it travels when in motion. Elaborate studies have been conducted in the USSR on how to decrease this

^{1/} Planovoe Khozyaistvo, No. 4, 1949, p. 85.

turnaround time, since the smaller it is, the more loadings a freight car can make per unit of time; putting the matter the other way around, the fewer freight cars it is necessary to operate in order to handle a given amount of freight. This index of the efficiency of utilization of rolling stock improved steadily throughout most of the interwar period; it fell during the war, presumably largely because of the increased length of haul in the eastern (unoccupied) sections of the country. By 1950, however, 1940 indices had virtually been regained.

Second, there is the question of the utilization of track. The volume of freight per kilometer of main line in operation rose steadily until 1938. It declined in 1939 and 1940, presumably because of the increase of relatively inactive line in the USSR resulting from the acquisition of the Baltic area and Eastern Poland. The 1950 plan, however, called for a larger volume of freight per unit of line than had been the base at the previous peak in 1938; since the total haulings plan was over-fulfilled, and the construction plan was probably not fulfilled, presumably the index was greater than planned.

Construction has therefore not kept pace with the increase in traffic. The conclusion to be drawn may be expressed in various ways: the Soviet government attempts to minimize its investment in transportation; the railroad lines are overloaded (the comparable indices for the U. S. are less than half those of the USSR); the Soviet railroad system, in this sense, is more efficient than that of the United States; Soviet industry is concentrated into a very small number of large cities, and hence railroad construction may be much more limited than in a country where industry is more dispersed, etc.

III. Changing regional patterns in freight movements.

In the eighteenth century, Russian heavy industry centered about the charcoal metallurgy of the Urals. This industry, however, stagnated in the early nineteenth century, and "modern" Soviet industry owes its development to a few principal origins: a textile industry in the Moscow-Ivanovo-Gorki area; the Donets Basin-Krivoi Rog industrial system; St. Petersburg and Moscow machinery plants; and Baku oil. From these islands of industry, others have emerged since the 1920's: a new Urals industry, a new West Siberian industry, a greatly expanded industry in the Central Volga region. There has been a decline in the importance of the older areas, but until the second World War, they continued to be extremely important. Thus, while the areas occupied by the Germans accounted for only about one-third of prewar Soviet output, the "frontal" areas included Moscow, Leningrad and many

other important industrial towns, which produced almost another third. Soviet policy before the war could not ignore the importance of increasing output in Europe, even though postwar policy has been to bring the devastated areas up to prewar output levels, and no more, concentrating net increases over prewar output in the east.

The unevenness in regional development at the turn of the century, and the turmoil of the past fifty years have made inevitable drastic changes not merely in the total level of freight traffic but in its geographical patterns. We may cite three patterns: that existing prior to the revolution (say 1910), that existing in the late 1930's, and that which is beginning to emerge as a postwar pattern. It is worth examining these patterns separately, as they reflect the changing pattern of economic activity and location. In the following discussion it is useful to recall that the "bulky" commodities such as coal and ore take up much more space than goods manufactured from them; and that grain flows in large quantities into the cities. Hence there is a net movement of freight into manufacturing centers, and a net movement of freight away from raw materials centers, insofar as processing is not carried on at the site. This fact leads to complications in planning the movement of freight cars, and the supply of empty cars at loading points, particularly where (as in the USSR) raw materials sources are scattered, and frequently at great distance from consumers.

Freight movements in 1913 - Freight movements in 1913 may briefly be characterized as follows:

1. There was considerable movement of goods across the frontier, along these principal channels:
 - a. Grain was exported from the Ukrainian Black-Sea ports.
 - b. Manganese ore and oil (from Baku) were exported from Batumi, on the eastern end of the Black Sea.
 - c. Grain was exported by rail into Germany.
 - d. To a small extent Volga grain was hauled northwest on a series of railroads built in the 1870's. These lines did not prove, however, to be profitable, because of the length of haul involved, and hence most grain exported was from the Ukraine.
 - e. Coal and heavy industrial materials for the Baltic and St. Petersburg areas was largely imported from England.

2. Internal transportation was primarily concentrated in three main types of movements:

- a. Movement within the heavy-industrial region of the Ukraine, particularly the iron ore-coal shuttle between Krivoi Rog and the Donets Basin.
- b. A movement of industrial freight converging on Moscow from St. Petersburg (imported), the Donets Basin, and to some extent from the Polish industrial areas and Germany.
- c. A southward movement of timber and lumber products.

Freight movements in 1937^{1/} Transport in the post-revolutionary period differed in important respects from the prerevolutionary period.

1. Finland, the Baltic countries, and Bessarabia (Moldavia) were detached from the USSR.

2. Foreign trade declined, in part for political reasons, and in part because of the impact of Soviet farm and industrial policies on export surpluses.

3. The first World War and Civil War had disrupted prewar conditions to a point where a return could no longer be expected.

With these major changes in mind, the framers of GOELRO, the first Soviet long-run plan, envisaged a T-shaped transportation system. The stem of the T was to be the railroad line Moscow-Urals-Siberia, while the cross-bar was to be the system Leningrad-Moscow-Donets Basin. The rail connections from Leningrad to the Donets Basin were inadequate, since this was a new channel of transport, and it took most of the 1920's to complete this readjustment.

Not until the first Five-Year Plan (1928-1932) was the "stem" developed. At that time, however, it became important. The planning authorities reasoned that the line would:

1. Increase the agricultural importance of Siberia and Kazakhstan and reduce urban dependence on the Ukraine, North Caucasus and Volga grain crops, all of which are subject to the same climatic influences;

^{1/} Volfson, L. Ya., et. al. Ekonomika Transporta, Moscow, 1941, p. 189; Khachaturov, T. S. Razmeshchenie Transporta, Moscow, 1939, Chapter XXI.

2. Open these areas for industrial development;
3. Stimulate the growth of industry in the area from Gorki to Kirov;
4. Permit the expansion of Urals industry, which was strategically located on the line;
5. Solve the problem of getting fuel and metal to the Volga area, by the development of Urals sources.^{1/}

In particular, the plan, as modified by the XVI Congress of the Communist Party in 1930, involved the establishment of a "Urals-Kuznetsk Combine", consisting of a shuttle of westward moving coal and eastward moving iron ore between two large metallurgical plants at Magnitogorsk (in the Urals) and Stalinsk (in the Kuznetsk coal basin of West Siberia).

As a result of this reformulation of traffic patterns, 316.9 million tons out of 517.3 million tons of "loadings" were "local haul freight", i.e. were unloaded in the same region in which they were loaded, leaving 200.4 million tons of "long-haul" freight. If we take the "crossbar" of the T to be the regions: South, Southwest, Center, and Northwest, and the "stem" to be the regions: Urals, West Siberia, East Siberia and Far East, and denoting by "intrasectonal" long-haul traffic within "cross bar" or "stem," we see the following traffic pattern (in millions of tons):

	<u>Local traffic</u>	<u>Intrasectonal</u>	<u>Total</u>
European (crossbar)	176.8	77.6	254.4
Asiatic (stem)	78.1	16.1	94.2
Total	254.9	93.7	348.6

Thus it is clear that about 70 percent of all traffic, and almost half of all interregional traffic in 1937 took place on the "T", even using somewhat crude definitions of regions.

The emerging regional pattern - The foregoing regional pattern of freight movements, while more adapted to Soviet post-revolutionary economic needs than the prewar pattern, nevertheless presented certain inconveniences. First the European railroad network had largely been constructed before the revolution, when the coal needs of St. Petersburg had largely been supplied by imports;

^{1/} A Five Year Plan for the Development of the National Economy, Moscow, 1929, Vol. 3 pp. 23 ff.

as a result, major reconstruction would have been required to set up direct rail communications between the Donets Basin and Leningrad, bypassing Moscow. Second, the coal-ore shuttle operating between the Urals and West Siberia was extremely long; since there was no alternative route, the line became very much overcrowded. Third, there was in general a strong tendency toward overloading a few key railroad lines, leaving others with relatively little traffic. Finally, the acquisition in 1940 of the Baltic republics by the USSR added further fuel-deficit areas to the European section of the country.

As a result of these difficulties, a gradual abandonment of the concept of the "T" pattern may be observed. With regard to the north-south movement of freight in European USSR, two outstanding facts are available. The first is the completion of the "North Pechora" railroad in 1942. Although at the time of its completion, the main need for the line was as a source of coal for European USSR to replace in part the coal-producing areas under German occupation, the line itself had been planned as a part of the third Five-Year Plan (1937-1942). Since the line itself is a major undertaking (over 1,000 kilometers), it must clearly have been based upon a desire to relieve congestion on the lines running north from the Ukraine. Second, in the discussions of railroad construction and repair which appeared in 1946 and 1947 in connection with the publication of the post-war Five-Year plan, although it was made clear that the damaged lines within the Donets and Dnepr industrial areas and those connecting these regions to Moscow were to be restored to prewar capacity (or in some cases were to exceed it) by 1950 the lines connecting the Donets Basin to Leningrad were not mentioned at all. Obviously, they were in use then, and have been repaired further; but they were not the center of attention that would have been expected on the basis of the earlier pattern of freight movement.

With regard the Urals-Siberian coal shuttle, a similar change has been observable. First, as of 1937, coal mined at Karaganda had to be transported north to the main Urals-Siberian road, and then hauled west. In 1940, therefore, the Soviet government completed a railroad from Akmolinsk, on this north-south line, running westward to Kartaly, in the Southern Urals, permitting Karaganda coal to reach Magnitogorsk without use of the main Siberian line, and correspondingly relieving congestion there. Second, from 1937 on, articles concerning Karaganda coal emphasized the importance of developing this basin, on the grounds that it was only half as far from the Urals as West Siberian coal deposits. Third, attempts have been made to eliminate the dependence of West Siberian metallurgy on Urals iron ore by developing low-grade deposits in

West Siberia itself, particularly in the Gorniya Shoriya area. Output of this type was negligible in 1937; by 1940, 32.6 percent of the ore requirements of the Kuznetsk plant were supplied locally; in 1949, 70.7 percent of the ore requirements were supplied locally.^{1/} Fourth, attempts have been made to increase the much as possible coal production in the Urals, to reduce as much as possible Urals on long-haul coal.^{2/}

Fifth, a proposal has been made for the construction of a railroad from the "Northern Urals" to the Pechora coal fields in the far north. Such a line would relieve further the congestion on the Urals-Siberian route.^{3/} This proposal is still only a proposal, and it is not known the extent to which it has reached an operational stage. Sixth, at the beginning of 1945, it was announced that the first open hearth furnace of a "metallurgical plant" in the Karaganda area had begun operations. Since that time a rolling mill has gone into operation; and the press has spoken of a "metallurgical combine" to be built in Kazakhstan. Such a combine would apparently operate as part of a coal-ore shuttle, similar to the existing Urals-Siberian shuttle. Apparently, however, this larger project remains to be completed.^{4/}

Before the war, West Siberia was a surplus coal and metal area; the former moved west (to the Urals) and South (to Central Asia). It would seem, then that at present it is to become more self-contained, with relatively fewer ties with other areas. The Karaganda area is to replace West Siberia as the supply of other regions.

^{1/} Pravda, June 12, 1950.

^{2/} In this connection it is important to remember that Urals coal cannot be used for coking purposes in ferrous metallurgy unless mixed with large amounts of long-haul coal, because of its technological characteristics; hence either Kuznetsk or Karaganda coal must be used in Urals metallurgy in the visible future.

^{3/} See, for example, Pravda, Sept. 29, 1945; Trud, March 20, 1946; V. Tyunov and B. Nazarovski, Zapadny Ural, Molotov, 1945.

^{4/} On the subject of the Karaganda plant, see Pravda, Jan. 1, 1945, Izvestiya, March 1, 1945, Trud, Jan. 18, 1945, Izvestiya, Jan. 19, 1945; Pravda, Nov. 22, 1947.

On the one hand, Soviet policy aims at developing as many parts of the country as possible in order to eliminate the extreme concentration of industry in a few areas which has been characteristic of the Soviet Union; on the other, Soviet policy aims at the creation of a few major, self-contained industrial regions rather than a system of interdependent, widely separated regions. For the immediate future, the main industrial centers will continue to be the Ukraine, Moscow, Leningrad, the Urals, and West Siberia; but whereas this classification is in decreasing order of present magnitude, it is probably in increasing order of magnitude of investment. Such a policy, as we have shown, will lead to considerable readjustments of freight movements as compared with the prewar pattern.

While data for recent years are not available from Soviet sources, Dr. Hunter has made a very interesting estimate^{1/} of changes in net interregional freight movements. This is presented in Table 7.

Table 7
Regional Net Outward (+) and
Inward (-) Rail Freight Movement, 1937-1949
(Millions of tons)^{2/}

Region	1937 a)	1940	1949	
			Unadjusted	Adjusted
Northwest (Leningrad-Industrial Region)	- 9.5	- 8.9	-10.8	- 8
West (Baltics)		- 4.0	- 4.3	0
North (European North)	10.3	10.7	12.9	11
Center (Moscow Industrial Region)	-50.1	-48.6	-58.4	-46
South (Ukraine)	30.9	32.7	39.2	23
Caucasus	- .9	- .7	- .7	- 1
Southeast (Middle and Lower Volga)	21.8	9.5	11.4	14
Urals	1.2	1.3	1.4	1
Kazakhstan and Central Asia	1.3	1.7	1.9	2
West Siberia		5.7	7.1	6
East Siberia		3.1	4.3	2
Far East	- 1.4	- 2.5	- 3.5	-4
Total net interregional balances (total plus items)		64.7	78.2	59
Total loading	517.3	592.6	712.0	712
Interregional balances as percent of total loadings		10.9	10.9	8.3

a) the 1937 data not being strictly comparable with those of the later years.
1/ Hunter, Holland, Notes on Postwar Soviet Transportation, unpub. ms., may be obtained from the author of the Dept. of Economics, Haverford College, Haverford, Pa.

2/ Ibid, p. 34.

There are two figures for 1949: the "unadjusted" figure represents the level at which Dr. Hunter estimates net inward or outward movements would have been in 1949, had rail movement patterns been the same in 1949 as in 1940; while the "adjusted" figures take into account the change in regional freight patterns since 1940. Thus he estimates that although total loadings increased from 592 million tons in 1940 to 712 million tons in 1949, net interregional balances declined from 64 to 59 million tons. This table, though not conclusive, is an indicator of the extent to which the Soviet Union is succeeding in its attempts at greater regional self-sufficiency.

With regard the changing location of Soviet industry, Dr. Hunter has made a further estimate, as shown in Table 8. To some extent the decrease in importance of the Northwest and South is the result of wartime destruction, but in 1949 the devastated areas as a whole had regained their prewar output levels, and it was clear that, percentagewise, they would not regain their former position in the country.

Table 8
Percentage Distribution of Soviet
Rail Operations, by Regions^{1/}

	<u>Percent of Loadings</u>			<u>Percent of Unloadings</u>		
	<u>1937</u>	<u>1940</u>	<u>1949</u>	<u>1937</u>	<u>1940</u>	<u>1949</u>
Northwest	8.9	7.4	6.0	10.9	8.9	7.2
West		2.5	2.5	3.1	3.1	2.5
North	6.2	5.4	4.5	4.3	3.6	2.9
Center	11.6	10.2	8.4	21.7	18.4	14.9
South	34.1	34.0	28.3	28.5	28.5	25.0
Caucasus	2.4	2.4	2.5	2.6	2.5	2.7
Southeast	11.7	10.7	12.5	7.6	9.1	10.5
Urals	8.9	9.5	12.0	8.7	9.3	11.8
Kazakhstan and Central Asia	3.9	4.7	6.0	4.2	4.4	5.8
West Siberia		6.5	8.3		5.5	7.4
East Siberia	9.3	3.6	4.6	8.1	3.0	4.4
Far East	3.0	3.2	4.4	3.3	3.7	4.9

^{1/} Hunter, Holland, Notes on Postwar Soviet Transportation, unpub. ms., p. 34, may be obtained from the author of the Dept. of Economics, Haverford College, Haverford, Pa.

IV. Summary and conclusions

In discussing Soviet transportation, it is reasonable to place primary emphasis upon the railroads, since of the possible alternative means of transportation the waterways operate under considerable geographical and climatic handicaps; trucking places considerable demands upon the petroleum industry, and is mainly suitable (as the Soviets view the matter) to local hauling needs; and maritime freight movements, which must be primarily of a coastal nature in an autarchic economy, are not apt to be of major importance in a primarily land-locked economy such as that of the U.S.S.R.

The planning of railroad transportation is based upon the following major assumptions: 1. the pattern of industrial location is decided on the basis of general political considerations, and is not within the scope of the transportation economist; 2. the state will seek to minimize its investment in the transportation industries, viewing these as means to the end of maximizing current output; hence the railroads must place major emphasis on their operating efficiency, and making increasingly good use of their limited resources; 3. within the general limitations imposed by the industrial location policy and the available resources for investment, the railroads must seek to minimize the amount of hauling required, by avoiding where possible cross-hauls, long hauls, etc. This task is a difficult one, for there are a number of secular forces involved in the industrialization policy in general, and the industrial location plan in particular which have tended to increase the volume of transportation activity per unit of output.

The economic development of the Soviet Union since the turn of the century has led to considerable changes in the pattern of freight movements. The first group of changes arose from the loss of territory after the first world war, and the increasingly autarchic nature of Soviet economic policy; the second group arose in the process of industrialization itself, and particularly the development of the eastern portions of the country. The pattern of freight movements which existed in the late 1930's, although it resembled closely in many respects that contemplated by the planners, has proved to be only transitional. The needs of the transportation system to eliminate congestion, to reduce the volume of long-haul transportation, and to provide particular sources of supply of mass freights to industrial areas is gradually leading to a readjustment of freight patterns, this time based upon the concept of regional self-sufficiency, and upon the replacement of longer interregional hauls by shorter ones. As yet this readjustment is not completed, and although some aspects of it are becoming clearer, the final pattern has not yet emerged.

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