No 198

GEOGRAPHIC INTELLIGENCE REPORT

THE EXPANSION OF THE SOVIET RAILROAD NETWORK BETWEEN 1950 AND 1960

CIA/RR GR 60-2
August 1960

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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THE EXPANSION OF THE SOVIET RAILROAD NETWORK BETWEEN 1950 AND 1960

I. Introduction

The development of railroads in the USSR in the last decade closely parallels the economic growth of the country and varies from region to region in relation to differences in type of economic development. In areas of emerging economic significance, emphasis has been placed on the building of new railroads and on line extension, whereas improvements in efficiency of operation take precedence in areas where established industries are being expanded.

Railroad development has been most evident in northern Kazakhstan, and southern Siberia from the Urals eastward to Lake Baikal.* In this region, railroad facilities of the early 1950's were inadequate to meet the traffic demands imposed on them by Soviet long-range economic planning. Throughout much of the region, alternate modes of transport were also inadequate. Few of the roads were modern, and most of the inland waterways, which are frozen during a large part of the year, provide routes for north-south traffic only. Consequently, an ambitious program was undertaken for the construction of new rail lines to connect the mushrooming areas east of the Urals with the main industrial centers of European USSR and the economically growing republics of Soviet Central Asia and to construct major through lines to relieve congestion on the Trans-Siberian trunkline. Although this program was formulated as early as 1946, it was not implemented until 1950 or later. Feeder lines have been constructed, and the efficiency of the railroads has been increased by double tracking, a shift from steam to electric or diesel traction, and the modernization of traffic-supporting facilities.

In contrast to the large-scale construction program undertaken in northern Kazakhstan and southern Siberia, railroad development in the European USSR has been focused chiefly on increasing the efficiency of operations and the traffic capacity through modernization of existing lines. New lines were added in the Arctic region, in the Carpathian and Donbass areas, and in the Volga-Kama region (where many originated as supply lines to huge hydroelectric projects on the Don and Volga

* These areas are henceforth referred to as the "Urals-Baikal" region.

Rivers). Greater emphasis, however, was placed on double tracking and electrifying or dieselizing existing lines, improving road beds, modernizing signal facilities, and streamlining operations of railroad stations, centers, and classification yards.

This report reviews major factors involved in the development of Soviet railroads during the decade from 1950 to 1960, and describes the nature of the development and the progress made to date. Progress of railroad construction is evaluated, current strengths and inadequacies of the Soviet rail system are noted, and a brief comparison of trends in railroad operations of the United States and the USSR is presented. This report is accompanied by a three-sheet map, USSR: Railroads, 1960,* which summarizes current knowledge on the status of Soviet rail trackage, gauge, and construction. A second map, USSR: Status of Electrification and Dieselization of Railroads, 1 January 1959, is a translated reproduction of a recent Soviet map that provides the best available map data on dieselized traction as of January 1959 and on plans for the period 1959-65.**

* This map, which follows p. 24, supersedes USSR: Railroads, 1958 (CIA Map 25888), and is available for distribution in quantity through the CIA Map Library under Call No. 27991.

** This map, which follows p. 24, was originally published in Zheleznodorozhnyy Transport, No. 2, 1959, under the title Elektricheskaya i Teplovoznaya Tyaga. The English translation is available from the CIA Map Library under Call No. 28674.

II. Major Objectives Underlying New Construction

The expansion of Soviet railroads in the period between 1950 and 1960 has been dominated by three major objectives.* These are (a) the exploitation of new mineral deposits and the development of industries based upon them, (b) the extension of agriculture into new areas, and (c) the initiation of large-scale hydroelectric power projects to exploit the tremendous power potential of Soviet rivers. The first two objectives apply mainly to the area east of the Ural Mountains and the third to the area west of the Urals. Power projects east of the Urals are huge in size and scope, but they are generally in earlier stages of construction than those in the European USSR. Although some power projects in European USSR are still in their initial stages, many others have been completed and are already operating.

A. Exploitation of New Resources

Railroad development has been most pronounced in the Urals-Baikal region, which contains approximately three-quarters of all known Soviet coal reserves, about 80 percent of the nation's power potential and timber reserves, large deposits of ferrous and rare metals, and vast quantities of iron ore and chemical raw materials. East of Lake Baikal, railroad expansion is in the planning stage, being dependent upon the development of known but as yet unexploited mineral resources and of projected industrial centers based upon these reserves. In European USSR most of the resources are already being exploited. The chief exception is the far north, where lines are being constructed to increase timber exports from the Karelian ASSR and to make coal and oil from the Pechora Basin available to existing industrial centers.

1. Kazakhstan

Kazakhstan ranks particularly high among areas of increased exploitation of mineral resources, and, consequently, railroad construction there has ranked high in Soviet planning. Major fields of iron ore

* The period in this report coincides with those of the Soviet Fifth (1951-55) and Sixth (1956-60) Five Year Plans. In September 1957 the Sixth Five Year Plan was abandoned and was superseded in 1959 by the Seven Year Plan, which is to continue through 1965. In order to remain within the time limits set, the planning figures used in this report have been taken from the Sixth Five Year Plan. This procedure is considered valid in view of the fact that the railroad development program set forth in the Sixth Five Year Plan has, in most instances, been incorporated into the successor plan and been projected through 1965.

were discovered in the Turgay Steppe of northern Kazakhstan, near the town of Kustanay. Here, centered on the village of Rudnyy, one of the largest iron ore concentrating combines in the Soviet Union is being developed. When the initial stage of the combine is completed in 1961, its yearly output of processed ore will reach some 5.6 million tons.* Essential to the completion of the combine, as well as to the exploitation and distribution of the iron ore, was the construction of a new railroad line connecting the Rudnyy complex near Sokolovskaya with the Central-Siberian and South-Siberian trunklines (No. 1).** In southern Kustanayskaya Oblast' a new railroad line to the settlement of Arkalyk also makes possible the industrial exploitation of the reportedly best bauxite deposits in Kazakhstan (No. 2).

The expansion of coal mining in Kazakhstan has been accompanied by increases in rail transport capabilities. Expanded operations at the vast Karaganda coalfields, for example, have involved double-tracking the Karaganda-Magnitogorsk trunkline (No. 3). On the other hand, plans for increased coal production at the Ekibastuz and Kushmurun mining centers (located in Pavlodarskaya and Akmolinskaya Oblasts, respectively) call for the construction of two additional railroad lines. One is to facilitate coal shipments from Ekibastuz-Ugol' to Omsk and other industrial centers to the north (No. 4). The other line is to provide a more direct rail route from Kushmurun to the Chelyabinsk metallurgical center via Kustanay (No. 5). Currently, both Ekibastuz-Ugol' and Kushmurun have to rely upon the already congested South-Siberian trunkline.

2. South-Central Siberia

Railroad expansion in south-central Siberia is associated with increased mining activities at coal and iron-ore deposits already under exploitation as well as with the development of newly discovered fields. The recently completed Stalinsk-Abakan railroad (No. 6) will facilitate direct shipment of iron ores from the Abaza deposits (south of Abakan, in the Khakasskaya AO) and from the more recently discovered Teysk deposits in the Kuznetskiy Alatau to the large industrial center of Stalinsk. The second, the Abakan-Tayshet line (No. 7), is still under construction. When completed, it will provide a direct rail route to Kuznetskiy metallurgical complexes for the shipment of additional iron ore as well as timber and processed lumber from newly exploited areas in eastern Siberia.

* Metric measurements are used throughout this report.
** Numbers following the names of specific rail lines refer to corresponding numbers on Map 29075, USSR: Index Map of New Railroads, following p. 24.

Three new branch lines of the Trans-Siberian trunkline will provide access to remote areas in south-central Siberia, where sizeable reserves of important raw materials are earmarked for exploitation. The Achinsk-Abalakovo line (No. 8), currently under construction, is designed primarily to open up the large timber reserves in the Yenisey-Angara River Basin, as well as large iron-ore deposits in the Angaro-Pitskiye Basin. The Reshety-Boguchany line (No. 9), which was about half completed by 1950, will facilitate exploitation of coal and timber resources in the Central Angara Basin. Farther to the east, the completed Tayshet--Bratsk--Ust'-Kut line (No. 10), provides an important route to the Bratsk hydroelectric powerplant, to large timber reserves, and to the Angaro-Ilimskoye iron-ore deposits (located roughly between the settlements of Bratsk and Zayarsk). The last includes the Korshunovskoye deposit (east of Bratsk), which is already being developed, and the Rudnogorsk deposit north of Bratsk, where the planned exploitation will depend on the construction of several projected rail lines that will connect the deposits in the greater Angara River basin with the Trans-Siberian trunkline.

3. The Region East of Lake Baikal

Railroad expansion in this region is largely projected and will coincide with steps taken to exploit sizeable coal and iron-ore deposits discovered in the southern part of Yakutskaya ASSR. Closely associated with these plans is the construction of a railroad trunkline leading northward from the present Bam-Tyndinskiy branch line of the Trans-Siberian trunkline to the coal and iron-ore deposits. The new line will connect the settlements of Chul'man, Aldan, Tayezhnaya, and Yakutsk (No. 11).

Longer range plans call for the construction of an east-west trunkline running north of Lake Baikal, which would serve as an alternate to and roughly parallel the Trans-Siberian trunkline. The projected trunkline is designed to serve future coal and ore mining and lumber processing centers in the Chul'man-Angaro-Ilimskoye region and to link the region with the main Trans-Siberian Railroad System by connecting it with the Tashkent--Bratsk--Ust'-Kut line.

4. European USSR

In European USSR, railroad expansion has been stimulated chiefly by the desire to exploit the forest resources in the Karelian Lake region and Arkhangel'skaya Oblast' and the mineral resources from such areas as the Pechora Basin (mineral fuels) and the Kursk Basin (iron ore).

To facilitate the cutting and processing of large forest stands in the Karelian ASSR, a railroad line is being pushed northward from Suoyarvi into the heart of the wooded lake district. To date, the line has been completed to the settlement of Sukkozero and plans call for its extension as far north as Yushkozero (No. 12). Later, the line may well be extended to Pechenga on the Barents Sea. An important branch has also been built from Sukkozero to Lendery, near the Finnish border (No. 13). Both lines have military as well as economic significance. Since they parallel the Murmansk trunkline and run relatively close to the Finnish border, they would facilitate the logistic support for operations involving the Scandinavian Peninsula.

Exploitation of forest resources in the Severnaya Dvina and Mezen' River basins has similarly stimulated railroad construction in these two areas. A projected line is to connect the milling and timber-processing center of Arkhangel'sk with various timber-felling sites around the village of Leshukonskoye on the Mezen' River (No. 14). At Leshukonskoye the line will join another projected timber railroad, which will generally follow the Mezen' Valley from the White Sea port of Mezen' in the north to the railroad settlement of Mikun' on the Pechora trunkline to the south (No. 15). Mezen', currently a secondary port for river-maritime traffic, is earmarked for development into a major lumber port on the Northern Sea Route.

The flow of coal and oil traffic from the Pechora-Ukhta Basin to industrial complexes in the Urals will be shortened considerably by north-south rail links between the Pechora trunkline (Konosha-Kotlas-Vorkuta) and the existing railroad net in the Urals area. Three possible routes apparently are under consideration. Although construction is reportedly under way along parts of each of the three routes, it has not yet been established which of the three will provide the through route.

One route would link the Pechora with the Moscow-Gor'kiy-Perm' trunkline, passing through the settlements of Mikun', Syktyvkar, Nyuv'chim, Rudnichnyy, and Yar (No. 16). As of January 1960, construction activity has been reported along half the length of this route. Construction was nearing completion on the stretch between Mikun' and Syktyvkar, and train service was already operating between Rudnichnyy and Yar.

The second route is to skirt the western slopes of the Ural Mountains. It would connect the oil and gas fields at Ukhta (on the Pechora trunkline) with Borovsk, the northernmost railhead along the western foothills of the Central Urals (No. 17). Construction has already been reported along a 160-kilometer stretch of the route that extends north-northeastward from Borovsk through the settlements

of Cherdyn, Bondyug, and Omut (a workers settlement reportedly located some 30 kilometers north of Bondyug).

The third and longest of the three routes connecting the Pechora-Ukhta Basin with the Urals industrial complexes skirts the eastern slopes of the Ural Mountains. It will branch off the Salekhard-Vorkuta line at Stantsiya Podgornaya and proceed southward via Nyaksimvol' to Polunochnoye, the northernmost railhead on the eastern slopes of the Urals (No. 18). Construction has recently been reported on the 50-kilometer stretch between Polunochnoye and Burmantovo. The primary purpose of this rail route would be to facilitate the flow of Vorkuta coal to the industrial centers of Serov, Kushva, Krasnoural'sk, and Sverdlovsk.

Requirements of the Leningrad industrial complex for Pechora coal and oil, as well as for processed lumber from the Arkhangel'sk region, have also increased considerably in recent years. To expedite the increasing flow of traffic, a new and more direct rail connection between Leningrad and the Pechora-Arkhangel'sk regions is being constructed. From Konosha, at the junction of the Moscow-Arkhangel'sk and the Pechora trunklines, a new railroad leading almost due west to Lodeynoye Pole on the Leningrad-Murmansk line (No. 19) is now under construction. This route will pass north of Beloye Ozero (Lake) via Annenskiy Most and Vytegra and will be approximately 200 kilometers shorter than the old route via Konosha, Vologda, Cherepovets, and Volkhov.

The iron-ore deposits of the Kursk magnetic anomaly, perhaps the most significant of the new resource bases under exploitation in the European USSR, constitute one of the world's largest reserves of iron ore. To facilitate the initial mining operations at Mikhaylovskiy, an industrial railroad line about 45 kilometers long is being built from Mikhaylovskiy to Abruzovo on the Moscow-Bryansk-Khar'kov trunk-line (No. 20). The construction of additional spurs and branch lines will be required as mining activities expand further in the area.

B. Extension of Agriculture

Recent agricultural expansion has had a more pronounced effect on railroad construction in the Urals-Baikal region than anywhere else in the USSR. This region, in addition to its rapid industrial development, includes most of the area covered by the New Lands program that was launched in March 1954 and that called for the cultivation of some 35.5 million hectares of virgin and idle lands in the semiarid steppe and wooded steppe regions of the Southern Urals, Western Siberia, and Northern Kazakhstan. The movement of

the labor, farm equipment, supplies, and construction materials required for a project of such magnitude, however, was hampered by the lack of adequate transportation facilities. During the initial stages of the program, access to the New Lands was limited to the east-west Trans-Siberian and South-Siberian trunklines and to a few secondary lines crossing the area from north to south.

To meet the transportation requirements in the New Lands, the USSR initiated large-scale railroad construction programs in Northern Kazakhstan, in the Altayskiy Kray, and in the districts of Kurganskaya Oblast', Omskaya Oblast', and Novosibirskaya Oblast'. Construction has been started on about 2,132 kilometers of new narrow-gauge and broad-gauge lines that will serve as feeders to the Trans-Siberian and South-Siberian trunklines, which roughly bound the New Lands area on the north and on the south, respectively. Approximately 1,390 kilometers of new line were originally scheduled as narrow gauge. This emphasis on narrow-gauge lines reflected the need for quick and cheap transportation during the initial stages of the New Lands program. By mid-1955, however, it became apparent that the volume of traffic would be greater than anticipated, and many new lines originally planned as narrow gauge were converted to broad gauge.

The backbone of the new railroad network is the Central-Siberian trunkline, which, when completed, will extend from Kustanay on the Tobol River to Barnaul on the Ob' (No. 21). The original plans called for a series of broad-gauge and narrow-gauge lines, but they are now being converted into a single-track broad-gauge trunkline. In addition the eastern portion will provide an important bypass for the Trans-Siberian trunkline. Its main function is to serve the agricultural needs of the New Lands. Much of the western half of the trunkline, extending from Kustanay to Irtyshskove (on the Irtysh River), has been completed. Only the sections from Peski to Volodarskoye and from Kzyl-Tu to Irtyshskoye are still in early stages of construction. More than two-thirds of the eastern half of the trunkline, extending from Irtyshskoye to Barnaul, is either under construction (the Irtyshskoye-Karasuk sector) or has been completed (the Karasuk--Kamen'-na-Obi sector). An important branch line leads northward from Irtyshskoye and follows the left bank of the Irtysh River to Kulomzino, on the Trans-Siberian trunkline near Omsk (No. 22). When completed, the Kulomzino-Irtyshskoye-Barnaul trunkline will carry much of the coal traffic now routed from the Kuzbass to the Urals via Stalinsk and Novosibirsk, thereby reducing dependence on the heavily utilized Trans-Siberian trunkline.

As a result of these developments, a number of small and obscure settlements located along the Central-Siberian trunkline are becoming important transportation centers. The village of Peski, located

approximately 220 kilometers east of Kustanay, is already an important grain transshipment point and storage center. Together with Raz'yezd (siding) Zernovoy, it forms the junction between the Central-Siberian trunkline and branch lines leading northwest to Kurgan (No. 23) and southeast to Athasar and the new state farms (sovkhozes) of Pobeda and Krasnoznamenskiy (No. 24). Farther east, the old rayon centers of Karasuk and Kamen'-na-Obi are also assuming greater economic importance as a result of the new railroad. Karasuk is being developed into an important railroad junction, serving both the new Central-Siberian trunkline and the already existing Tatarskaya-Kulunda-Semipalatinsk line. Transloading and terminal facilities at Karasuk handle a large volume of construction materials, including rails from Stalinsk, railroad spikes from Magnitogorsk, and lumber from the Khakasskaya AO. A second railroad station, Karasuk II, is being built to handle the increasing traffic. Kamen'-na-Obi, on the other hand, is rapidly becoming important as a rail-to-river transloading center.

Several other branch and feeder lines have been built to facilitate the export of grain from the New Lands. Of these the Tuz-Kala--Uspenka (No. 25), Bulayevo-Sovkhoz imeni Malenkova (No. 26), Kovyl'naya-Uritskoye (No. 27), and Shil'da-Sovkhoz Ozernyy lines (No. 28) (listed from east to west) are of considerable local importance.

The Tuz-Kala--Uspenka line, completed in 1957, is a 32-kilometer, broad-gauge extension of the Maraldy-Tavolzhan* line which branches off the South-Siberian trunkline east of the Irtysh River. Although the main function of the extension is serving new state farms in the surrounding area, it also transports salt extracted from the saline deposits of Maloye Tavolzhanskoye Ozero.

The narrow-gauge Bulayevo-Sovkhoz imeni Malenkova line was completed and opened for traffic in August 1955. It serves chiefly as a feeder line connecting the large Malenkov state farm with the Trans-Siberian trunkline to the north. It also provides an outlet for grain produced on new state farms in Bulayevskiy Rayon of Severo-Kazakhstanskaya Oblast' and in Chkalovskiy Rayon of Kokchetavskaya Oblast'.

The recently completed narrow-gauge line from Kovyl'naya to Uritskoye (midway between Kustanay and Peski) crosses the heart of the New Lands from north to south, thus providing a link between the South-Siberian and Central-Siberian trunklines. The main function of the line is to

* Tuz-Kala and Tavolzhan refer to the same locality. The former appears to be merely the name for the railroad station and the terminal facilities at Tavolzhan. It probably also includes a recently constructed railroad-workers settlement near the railroad station.

facilitate grain shipments from newly cultivated lands in Ruzayevskiy Rayon of Kokchetavskaya Oblast' and in Uritskiy and Semiozernyy Rayons of Kustanayskaya Oblast'.

The 170-kilometer-long Shil'da-Sovkhoz Ozernyy line branches off the Chelyabinsk-Orsk railroad. The first part of the line, covering a distance of 75 kilometers and connecting Shil'da with the previously isolated settlement of Adamovka was completed by the end of August 1955. The second section, leading from Adamovka to the large state farm Sovkhoz Ozernyy, was only recently commissioned for freight and passenger traffic.

C. Construction of New Hydroelectric Projects

The postwar construction of giant hydroelectric complexes in the USSR has also played an important part in the development of Soviet railroads since 1950. In the European USSR, for example, the Tsimlyansk, Kuybyshev, and Kakhovka power stations, dams, and reservoirs, required the construction of some 300 kilometers of rail lines to connect the construction sites with the adjacent railroad network. The necessity for rail supply lines derives from the fact that railroads provide the only mode of overland transport capable of (1) handling the millions of tons of construction materials on a year-round basis and (2) transporting equipment and machinery of unusually large dimensions and weights. These requirements virtually rule out long-distance transport by river, which is seasonal, or by trucks.

The large hydroelectric projects have frequently resulted in the creation of new through railroad lines. Originally, such lines were no more than supply routes for construction sites. When the dam was completed, however, the lines serving opposite banks of the river were generally interconnected across the dam. In this manner, newly constructed dams on major Soviet rivers have in many cases eliminated the need for projected railroad bridges and for costly rail-ferry services. The hydroelectric projects listed below are examples of construction that have altered the railroad pattern in the USSR.

Kakhovka Dam and Reservoir. This recently completed power project on the Dnepr River, some 60 kilometers northwest of Kherson, required the construction of two railroad supply lines: (1) the Snigirëvka-Kakhovka line from the northwest (No. 29), and (2) the Novofederovka-Kakhovka line from the east (No. 30). The connection of these two approach lines by means of a rail crossing over the Dnepr dam has created an important regional trunkline (208 kilometers long) that connects the Donbass region with the Moldavian SSR and with the Khersonskaya, Nikolayevskaya, and Odesskaya Oblasts of the Ukrainian SSR.

Dneprodzerzhinskiy Hydroelectric Center. To facilitate construction of this large power complex on the Dnepr River, the USSR is planning to build railroad supply lines both from Novomoskovsk on the Kharkov-Dnepropetrovsk trunkline and from Verkhnedneprovsk on the Krivoy Rog-Dnepropetrovsk trunkline. The connecting of these lines across the future dam will create a new 70-kilometer-long bypass route (No. 31) capable of diverting Kharkov-Krivoy Rog rail traffic from the heavily congested lines now serving the Dnepropetrovsk industrial complex.

Kuybyshev Hydroelectric Station and Reservoir. Railroad supply lines approach both the northern and southern ends of the huge Kuybyshev Dam, located on the Volga River at the settlement of Zhigulevsk. Lines serving the northern end of the dam originate at Kuybyshev and at Kinel'. The two meet at the village of Sok and form a single approach to the dam. The line from Kuybyshev is already in operation, but that from Kinel' is still under construction. The southern end of the dam is connected by rail with Syzran', located 80 kilometers west of the complex. A connection of the two approaches by way of the dam would create a 220-kilometer-long alternate route between Kinel' and Syzran', which would bypass Kuybyshev and relieve greatly the current heavy traffic on the Trans-Siberian trunkline between these two points (No. 32).

Stalingrad Hydroelectric Complex. A rail crossing over the recently completed Stalingrad dam, which has been announced by the Soviets, will provide through rail service between Stalingrad and the Caspian port of Astrakhan' (No. 33). It will also eliminate the costly and time-consuming ferry service now operating between the present rail terminals of Prichal'naya, north of Stalingrad, and Post Paromnaya, on the left bank of the Volga River.

Saratov Hydroelectric Station and Reservoir. This huge complex is currently under construction at the Volga River port of Balakovo, some 130 kilometers upstream from Saratov proper. To facilitate construction operations, a 120-kilometer-long supply line has been built from the settlement of Pugachëv to the eastern end of the dam. Plans also call for a westerly rail approach to the dam from the river port of Vol'sk. The connection of the two approach lines over the dam would create a new east-west route to serve the lower and central Volga region (No. 34). In combination with the projected line from Pugachëv to Buzuluk and Sterlitamsk, the new route would also provide an important link in the direct rail service between Saratov and Magnitogorsk (No. 35).

Cheboksary Dam and Power Station. Plans have been made for the construction of this hydroelectric power complex on the Volga River, but work has not yet been started and the complex probably will not be in operation until after 1965. To serve this complex, plans call for a rail connection with existing lines in the area and a supply line leading

southwestward from the Kazan'-Zelenodol'sk-Golovinskiy railroad to the construction site (No. 36).

Siberian Hydroelectric Projects. Hydroelectric projects planned or under construction east of the Urals have less effect on railroad development than those in European USSR. A single supply line generally terminates at each of the construction sites. Because most of the power projects are situated in remote areas, away from the main traffic lanes of Siberia, there is no incentive to create bypasses and alternate rail routes using the dams for railroad crossings.

III. Improvement in Operations

This part of the report treats the development of those railroad facilities that are most closely related to railroad expansion and contribute most directly to an increase in the volume and speed of traffic carried: (a) modernization of signaling facilities, (b) expansion of railroad station and yard facilities, (c) electrification, and (d) dieselization. For more detailed information on the current status of trackage, traction, and gauge, reference should be made to the inclosed maps 27991 and 28674.

A. Modernization of Signaling Facilities

With the Fifth Five Year Plan, Soviet railroaders initiated a program for modernizing signaling facilities and methods throughout railroad systems of the USSR. The use of semaphores and manual signaling at intermediate points along heavily traveled double-track lines has already been reduced materially. Semaphores are being replaced with automatic color-light signals, spaced along the track at intervals of 2 to 2.5 kilometers. Most commonly used are the 3-aspect signals of searchlight type, but in suburban areas a 4-aspect multilens type is used. By the end of 1959, some 24,200 kilometers of main routes had been equipped with automatic color-light signaling, including the greater part of the Trans-Siberian trunkline, the heavily traveled Pechora Railroad, and a number of rail lines connecting Moscow with the Donbass. Along some of these routes, such as the Omsk railroad section of the Trans-Siberian line, many locomotives are equipped with automatic warning and braking devices that are keyed to automatic signals along the track. Along electrified lines, control of automatic color-light signals is achieved through the medium of alternating-current coded track circuits up to about 3,000 yards in length. By the end of 1960, Soviet plans call for the conversion to automatic signaling of some 26,000 kilometers of railroad, including parts of the Trans-Siberian trunkline, parts of the Turkestan-Siberian trunkline, and a number of key lines in the Moscow, Urals, and Donbass areas.

Manual signaling at intermediate switches along single-track lines with heavy traffic is gradually being replaced by centralized traffic controls. Only recently, some 1,000 signalmen were reported to have been released at 14 of the larger railroad stations and junctions of the Donets System.

The introduction of centralized traffic controls (C.T.C.) on a limited number of lines has done much to increase their capacity, efficiency, and safety of operation. In a C.T.C. system, all points and signals along a rail section 80 to 160 kilometers in length are centrally controlled and operated by traffic dispatchers. By having

full control of the movement of trains in their sectors, traffic dispatchers have been able to raise the capacity of single-track lines by 25 to 40 percent. Modern traffic-control installations are of the "all-relay" type, whereas older facilities employed manually operated uniselector switches. With the all-relay type of control, the preparation of complex routes may take no more than 10 seconds compared to upward of 12 minutes when done by hand. As of the end of 1959, C.T.C. is believed to be in operation on about 2,000 kilometers of track -- mainly between Moscow and the Urals, on the Northern Railroad System, and on some railroad lines in the Caucasus and Soviet Central Asia. Although further shifts to C.T.C. are underway, the apparent lack of technicians and shortages of equipment may well keep the USSR from meeting its 1960 goal of 8,000 kilometers of railroad under C.T.C. operation.

Methods of controlling grade crossings are also being automated, with considerable saving of manpower. Unattended grade crossings and the much-used system of crossing guards are being supplemented or replaced with flashing red-light signals and automatic barriers.

B. Expansion of Railroad Station and Yard Facilities

Much progress has been made in reconstructing and in increasing the capacity of war-damaged railroad stations, junctions, classification yards, and transloading facilities. Major efforts were focused on increasing freight-handling capacity and trackage of railroad stations and yards located along heavily used east-west rail arteries. Among these, priority was given to the following trunklines: Stalinsk-Omsk-Chelyabinsk, Omsk-Vagay-Sverdlovsk, Kurgan-Sverdlovsk, Karaganda-Akmolinsk-Petropavlovsk, Sverdlovsk-Kazan'-Moscow, Chelyabinsk-Orsk-Orenburg-Kinel', and Chelyabinsk-Kuybyshev-Ryazan'. Along railroads carrying heavy passenger traffic -- such as the trunklines connecting the Central Industrial Region with the Urals, Soviet Central Asia, and Siberia -- plans call for the renovation or complete reconstruction of passenger stations that are out of date. Cities earmarked for improved passenger-station facilities include the growing industrial centers of Nizhniy Tagil, Magnitogorsk, Ufa, Tuymazy, Chelyabinsk, Kurgan, Akmolinsk, Barnaul, Novokuznetsk, and Krasnoyarsk.

Significant strides in improving the operation and efficiency of Soviet railroads are also being made by developing a series of new railroad freight terminals. Such developments are currently taking place at Chelyabinsk, Kartaly, Petropavlovsk, Akmolinsk, Omsk, Tatarsk, Tayga, Novokuznetsk, Inskaya, and in the Barnaul-Chesnokovka complex. Other railroad terminals -- such as those at Proletarskaya, Lyangasovo, Dëma, Kuybyshev, Batraki, Ryazan', Yudino, and Arzamas -- are being reconditioned to serve as collection and dispatching points for freight

traffic moving from the Urals to the Volga Region and the Central Industrial Region. Improvements are also planned for the crowded rail terminals at Stalingrad and Saratov and within the Moscow area. Facilities at Stalingrad and Saratov are receiving added trackage to provide increased rail capacity. Plans for the Moscow rail complex include the establishment of a new eastern classification yard, which is to be located at Station Orekhovo.

C. Electrification

Soviet transportation planners recognize that electrification is one of the principal means of modernizing and increasing the efficiency of Soviet railroads. As a result of the electrification program of the past decade, the USSR became one of the world leaders in both the length of electrified line and in the amount of electrification underway. By the end of 1950 the USSR possessed 3,085 kilometers of electrified railroad. By January 1957 the figure had increased to 6,325 kilometers. Plans call for the completion of 7,405 additional kilometers of electrified track by December 1960, thus providing a total of 13,730 kilometers. By contrast, the United States currently has only some 4,000 kilometers of electrified lines. It should be noted, however, that in the United States the emphasis since World War II has been on converting from steam to diesel traction; furthermore the Soviet rate of electrification has been much slower than the US rate of conversion to diesel traction -- notwithstanding the fact that the average freight traffic density per route kilometer in the USSR was about three times that in the United States.

The accompanying map USSR: Railroads, 1960,* which summarizes available information on the current status of the Soviet electrification program, indicates that electrified lines now radiate from Moscow in all directions, connecting the Soviet capital with Kalinin, Klin, Yaroslavl', Vladimir, Ryazan', Pavelets, Kursk, Aprelevka, Mozhaysk, and Manikhino. Other concentrations of electrified lines in the European USSR are found in the Leningrad and Khar'kov-Donbass-Krivoy Rog areas, in the Kola Peninsula, and in the Caucasus. Of particular interest is the nearly completed electrification of the Kurak-Khar'kov stretch. Once in operation, it will give continuous electric traction from Moscow to Slavyansk in the Donbass. Completion of electrification work along the Slavyansk-Gorlovka-Chaplino line will also provide electric train service from Moscow to the industrial centers of Dnepropetrovsk, Krivoy Rog, and Zaporozh'ye. East of Moscow the electrification of railroads is concentrated in the Urals region north of Sverdlovsk, in the Kuzbass,

* Following p. 24.

and along the Trans-Siberian trunkline west of Lake Baikal. Apparently, the electrification of the Trans-Siberian trunkline, the country's main east-west transportation artery, carries top priority. The target date for electrifying the line from Moscow to the Far East is 1965. Plans call for electric train service between Moscow and Slyudyanka on Lake Baikal by the end of 1960. At present the Moscow-Ryazan', the Bazarnyy Syzgan'-Kuybyshev-Chelyabinsk-Makushino, the Isil'-Kul'--Omsk--Novosibirsk--Mariinsk, and the Zima-Irkutsk-Slyudyanka sections are operating under electric traction. The Chernorechenskaya-Klyukvennaya section has also been converted to electric traction, but diesels are still being used because of a shortage of electric locomotives.

Soviet electrification plans for the future are even more impressive. During the 10-year period from 1960 to 1970, electric traction is to reach some 45,000 kilometers, or 30 percent of the total operational trackage. Electrification projects include the following long-distance lines: Irkutsk-Vladivostok; Moscow-Khar'kov-Rostov-Mineral'nyy Vody; and Leningrad-Kotlas-Vorkuta.

Electrification has had a considerable impact on the efficiency and capacity of Soviet railroads. Increased speeds of freight and passenger trains along electrified stretches have been accompanied by improved and more frequent service. In some instances the length and weight of freight trains have nearly doubled as a result of electric traction, notably along the largely electrified route connecting Moscow with Syzran', Kuybyshev, Ufa, Chelyabinsk, Omsk, Novosibirsk, and Mariinsk.

The extension of electrification has been accompanied by a corresponding reduction in the demand for steam locomotives, and as early as 1956 their production was discontinued in the USSR. There is still no wholesale scrapping of steam locomotives and their maintenance facilities, but obsolete engines are gradually being retired or released for export.

D. Dieselization

The use of diesel traction in the USSR is restricted largely to Soviet Central Asia, the lower Volga Region, and the Northern Caucasus. Diesel locomotives were found to be especially well adapted to use in the dry desert areas, since they could cover long distances without requiring water or other servicing.

Diesel-powered trains were first introduced into the Soviet railroad system in 1932, on the Ashkhabad Railway in the Turkmen SSR. Between 1946 and 1955 the USSR increased the length of diesel-operated lines to 6,400 kilometers, mainly single-track lines with low to moderate traffic densities. By the end of 1960, some 18,000 to 20,000

kilometers of the railroad network are scheduled for dieselization. The program is restricted largely to lines in the desert areas of Soviet Central Asia, the Volga Region, and the Northern Caucasus that are not scheduled for electrification but require increased traffic capacity. Data available on diesel-operated lines as of 1 January 1959, as well as on plans for dieselization during the period 1959-65 are summarized on the accompanying map, USSR: Dieselization of Railroads.*

* Following p. 24.

IV. Evaluation of Progress

The expansion of the railroad network and improvement in operational efficiency are integral parts of the continuing Soviet economic program. As of 1950, railroads were operating at or near capacity and carried about 86 percent of goods transported between points within the country and provided over 90 percent of all transport east of the Urals. The railroad plant at the time was therefore inadequate to meet the anticipated increase in freight and passenger traffic and to service new areas of economic development. During the period between 1950 and 1960, great strides were made toward overcoming some of the more pressing inadequacies; nevertheless, the accomplishments fall short of the goals set by the Fifth and Sixth Five Year Plans.

A. Goals and Accomplishments

By the end of the Fifth Five Year Plan the over-all length of Soviet railroads in general use amounted to 205,900 kilometers. This included 120,700 kilometers of main line, 29,500 kilometers of second tracks, and 55,700 kilometers of yard tracks. In addition between 5,000 and 6,000 kilometers of narrow-gauge track had been built exclusively to serve industrial, agricultural, and lumbering operations. When compared with a total railroad trackage of 193,600 kilometers as of January 1950 -- consisting of 116,900 route-kilometers of main line, including narrow-gauge, 24,800 kilometers of second track, and approximately 51,900 kilometers of yard track -- the 1956 figures indicate impressive progress. Nevertheless, railroad construction on lines officially scheduled for completion during the Fifth Five Year Plan fell short of the estimated goal of 5,600 kilometers in spite of the fact that many of the lines earmarked for completion were already in their final stages of construction by the end of 1950. Official completions of lines scheduled for the 5-year period, including both new lines and carry-overs from the Fourth Five Year Plan, amounted to only about 3,200 kilometers* or 57 percent of the estimated goal. The total track laid, however, including construction on lines not scheduled for completion until a later date, brings the total to somewhat more than 4,000 kilometers.

Plans for the Sixth Five Year Plan (1956-60) called for the completion of about 6,500 additional kilometers of new line. Included in this schedule were about 4,288 kilometers of newly planned lines and 991 kilometers of carry-over work from the Fifth Five Year Plan, as well as 1,211 kilometers of carry-over work from the Fourth Five Year Plan.

* About 600 additional kilometers were transferred from other administrations to the Ministry of Transport, thus officially bringing to 3,800 kilometers the trackage added to that agency between 1951 and 1960.

In addition, some 6,000 to 7,000 kilometers of single-track trunklines were earmarked for double tracking. These goals were impressive, but it is now estimated that only 67 percent of the goal for the cancelled Sixth Five Year Plan will be met by 1960. Considerable difficulty in construction was encountered in 1956, and the rate of progress in more recent years (both in lines completed and under construction) indicates that probably no more than 4,300 kilometers of the original goals will be attained by the end of 1960.

Although falling short of the original goals set forth for both Five Year Plans, the construction program has still made progress sufficient to (1) permit an increase in traffic capacity along railroad lines that had already been operating at near capacity levels in 1950, (2) divert traffic in certain commodities from heavily utilized trunklines, and (3) meet some of the traffic demands in areas of recent economic expansion.

Because areas undergoing intensive development received top priority, railroad construction has been particularly evident in the Urals-Lake Baikal region. Several new east-west-oriented rail lines built and placed in operation have provided alternate routes to the heavily traveled Trans-Siberian trunkline and new traffic links between the Kuzbass, and New Lands area, and the Urals industrial region. Notable among these routes are the Barnaul-Stalinsk and Stalinsk-Abakan sections of the south-Siberian trunkline and the Tayshet-Lena line, which provides direct connection between the Lena and Angara River basins and the Trans-Siberian trunkline as well as completed sections of the Central-Siberian trunkline.

Farther south, the construction of the Mointy-Chu line in Kazakhstan provided an important north-south rail connection between the South-Siberian and Turkestan-Siberian trunklines, thus not only relieving the Turkestan-Siberian railroad of much of the burden of shipping coal from the Kuzbass to the Alma-Ata area but also shortening the haul from 2,100 kilometers to 1,000 kilometers. The international trunkline to China via Soviet Kazakhstan has also been completed as far as the international boundary. With the completion of the Chinese section, this trunkline will not only divert much of the Chinese traffic from the congested Trans-Siberian trunkline but also will reduce the rail distances between Moscow and Peking by about 1,100 kilometers.

In European USSR, in particular, much has been accomplished in providing supply lines to hydroelectric and other major construction projects; many serve, in addition, as important links in the railroad network and permit traffic to bypass areas of heavy traffic density.

Concurrently with the construction of new rail lines, the USSR emphasized the improvement of operating efficiency to increase the overall carrying capacity of Soviet railroads. Electrification and dieselization of traction have increased the capacity by permitting greater speed and the use of longer trains. Modernization of signalling facilities have further contributed to speed of operation, and improved loading facilities and railroad-yard operation have made possible more rapid handling of freight. Greater efficiency in operation has already eased congestion at Moscow, Kuybyshev, Kiev, Novosibirsk, Sverdlovsk, and other key railroad centers in the country.

B. Continuing Inadequacies

Although the improvement and expansion of existing rail facilities have increased the freight and passenger traffic capacities of Soviet railroads, the ever-growing transportation demands of the Soviet economy have kept pace with these increases. Consequently, rail lines are generally operating at high capacity in 1960, much as they were in 1950. An analysis of the 1960 network also reveals a number of railroad inadequacies that have not been solved. Most of them were under consideration for the Fifth and Sixth Five Year Plans, but remedial measures were not started. For example, the much-discussed Astrakhan'-Gur'yev link across the northern end of the Caspian Sea would facilitate and reduce the cost of rail shipments from the Ukraine and the Lower Volga to Kazakhstan and Central Asia. The lack of a direct rail link from the Moscow area to the Turkmen SSR, the Uzbek SSR, and the western part of Kazakh SSR has necessitated slow and inefficient rail movement via a circuitous route through Orenburg and Tashkent. A new trunkline from Saratov to Chardzhou via Aleksandrov Gay and Kungrad would shorten rail traffic between Moscow and Ashkhabad by approximately 1,000 kilometers. Use of the much-heralded Central-Siberian trunkline as an alternate route for rail traffic between the Urals and Kuznets industrial region is also denied because of the failure to complete bridges across the Irtysh and Ob' Rivers and a key section of the route -- the Kamen'-na-Obi--Barnaul section -- which is still in an early stage of construction. Finally, progress has been extremely slow in achieving the much-discussed objective of a direct rail connection between the Kotlas--Vorkuta trunkline and rail lines serving the Sverdlovsk industrial region in the Urals.

V. Comparative Trends in United States and Soviet Railroad Systems

The United States was far ahead of the USSR in both the size and operational efficiency of its railroad network at the end of 1959. The US network of main-line railroads (354,000 route kilometers) is almost three times as large as the entire Soviet rail network (estimated at 122,300 route kilometers). In modernization of railroad facilities and traction the United States leads the USSR. US terminal facilities are extensive and well mechanized, and automatic block signals are used along some 48 percent of the total route mileage. In the USSR, less than half of the 85 existing hump yards are modernized, and automatic block signals are installed on only about 6 percent of the main-line rail network. In the United States, dieselization is virtually complete. Soviet railroads, on the other hand, are largely steam operated, diesel and electric traction still accounting for only about 11 percent of the total mileage.

Closer comparison of the two railroad systems, however, reveals that the Soviets are reducing the over-all lead of the United States and have already exceeded it in traffic output because of the growing importance of other modes of transportation in the United States. The Soviet rail network, although only one-third as large as that of the United States, already handles more freight and passengers per year than all US railroads. In 1957, for example, when US railroads carried a total of 941 billion ton-kilometers of freight, the Soviet rail system hauled 1,213 billion ton-kilometers. This disparity increased further in 1958, when the number of ton-kilometers dropped to 839 billion in the United States but increased to 1,302 billion in the USSR. The average density of freight traffic in 1958 in terms of ton-kilometers per kilometer of rail line was 10.7 million in the USSR compared with about 2.4 million in the United States. At the same time, passenger traffic in the USSR was approximately three times greater than in the United States. In 1956, Soviet railroads carried a total of 1,658 million passengers. Of this total, however, 80 percent was urban traffic -- mostly workers commuting to their jobs.

To handle the heavy freight and passenger traffic, the USSR will continue to operate its railroads at near capacity. Railroads still carry about 85 percent of the total volume of all inland and domestic coastal freight. Although roads, inland waterways, and coastal maritime transport are currently being improved, the rail share of the traffic load probably will not be reduced appreciably until after 1970. The present Soviet program of modernization should result in steadily increasing traffic capacity as well as operational efficiency.

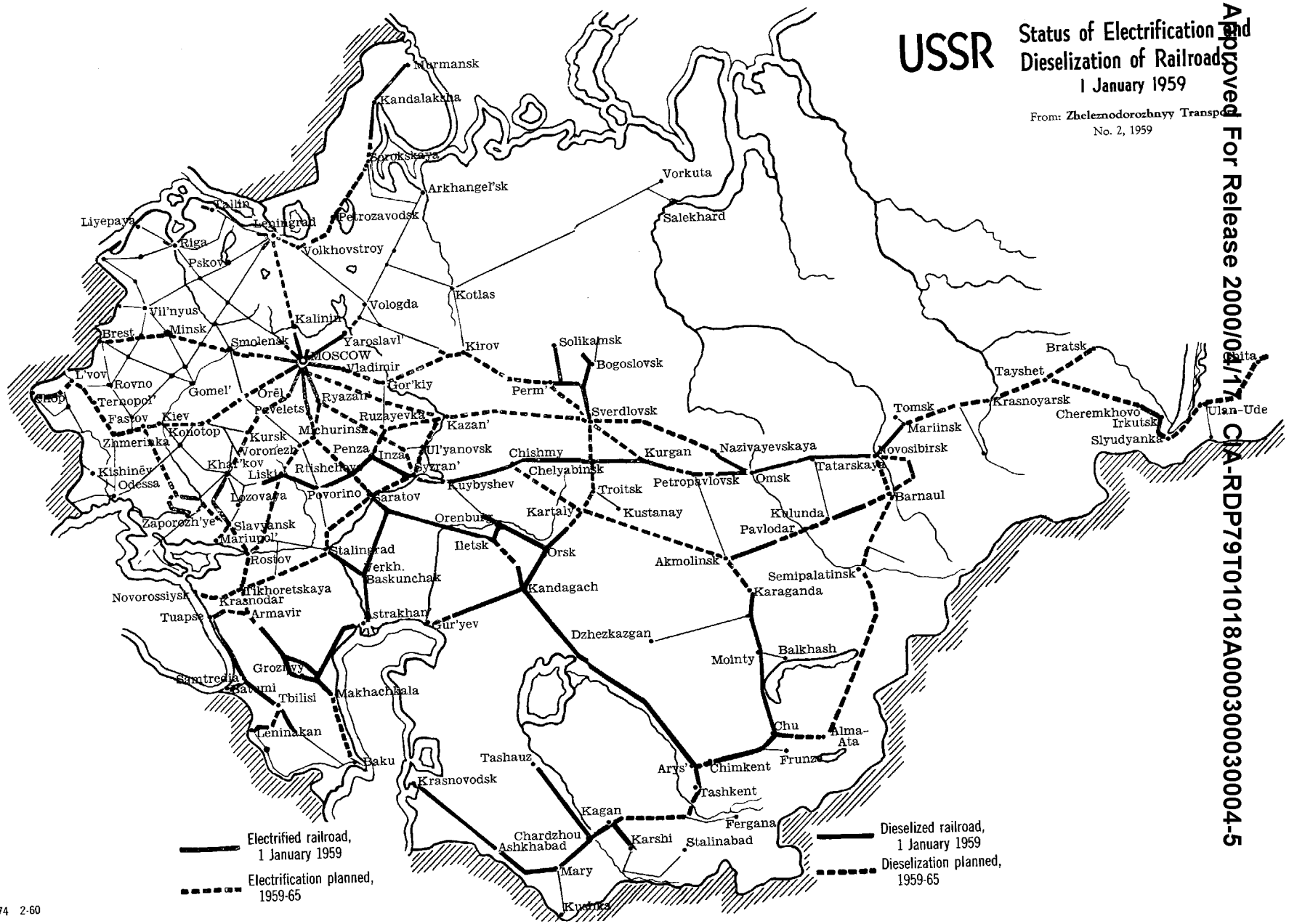
In contrast, the volume of railroad traffic in the United States is declining somewhat. The 354,000 kilometers of main line operated in the United States in 1959 represent a decrease of 51,500 route kilometers

from the 405,600 operated in 1900. Currently, US railroads operate considerably below full capacity. They carry somewhat less than 40 percent of the total volume of inland and coastal freight traffic. The decline is even more apparent in passenger traffic. The downward trend of US railroading is caused largely by the greater availability of trucks, buses, trailers, passenger automobiles, and pipelines and by the shift of traffic to the highly developed highway system.

The USSR also exceeds the United States in the total number of locomotives available, but those in the United States are chiefly modern diesels. At the end of 1958 the United States had 27,575 such locomotives available compared to an estimated 2,777 in the Soviet Union. In the number of electric and steam engines, the USSR leads. The United States had 556 electric and 1,350 steam engines, whereas the USSR had 2,022 and 31,680, respectively. By the end of 1959, the United States had practically no steam locomotives in use. In the USSR the number of steam locomotives had been reduced to 28,448, and the number of electric locomotives had increased to 2,500.

Continued intense utilization of its railroads provides the Soviet Union with initial strategic advantages at the onset of hostilities, when the movement of troops, weapons, and supplies of all sorts would depend almost entirely on the immediate access to operational equipment and an efficient and extensive rail network -- in border areas as well as in the interior regions of the country. On the other hand the Soviet rail system currently has little or no slack to take on the increased load of supporting prolonged large-scale military operations without curtailing the flow of nonmilitary traffic.

Of greater importance is the potential the Soviet rail network provides for supporting a guided-missile deployment system throughout the USSR. Without special arrangements, most of the rail network can presently transport cylindrical objects up to 12 or 13 feet in diameter and about 80 feet in length or objects of a somewhat smaller diameter and greater length. From a military point of view, the United States rail network still possesses most of the tremendous logistic capability it had during World War II, when railroads doubled their freight volume and more than tripled their passenger volume without any appreciable increase in the railroad plant. In the United States, however, the continued decline in rail operations is currently reducing the logistic capability, whereas that of the USSR is increasing.



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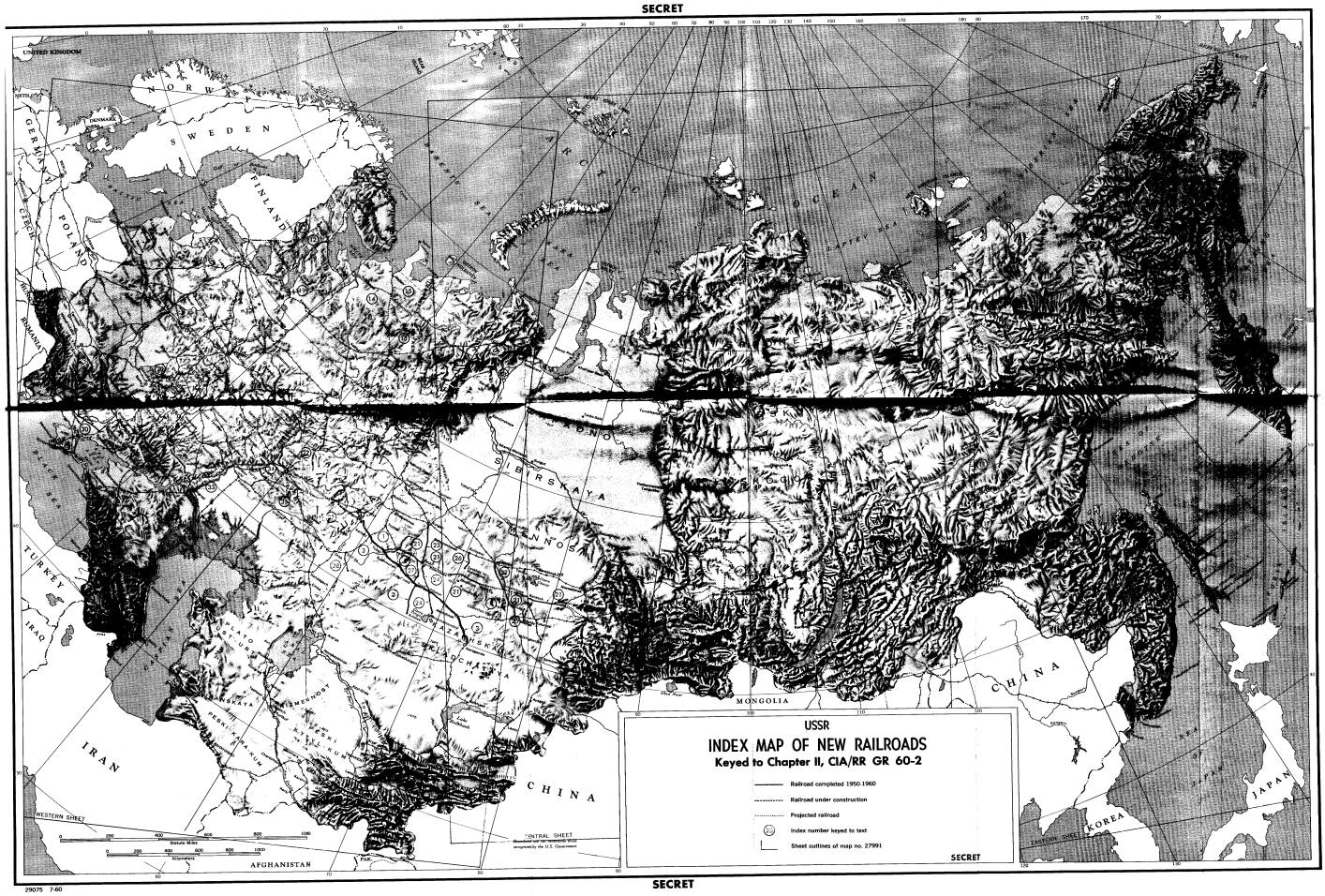

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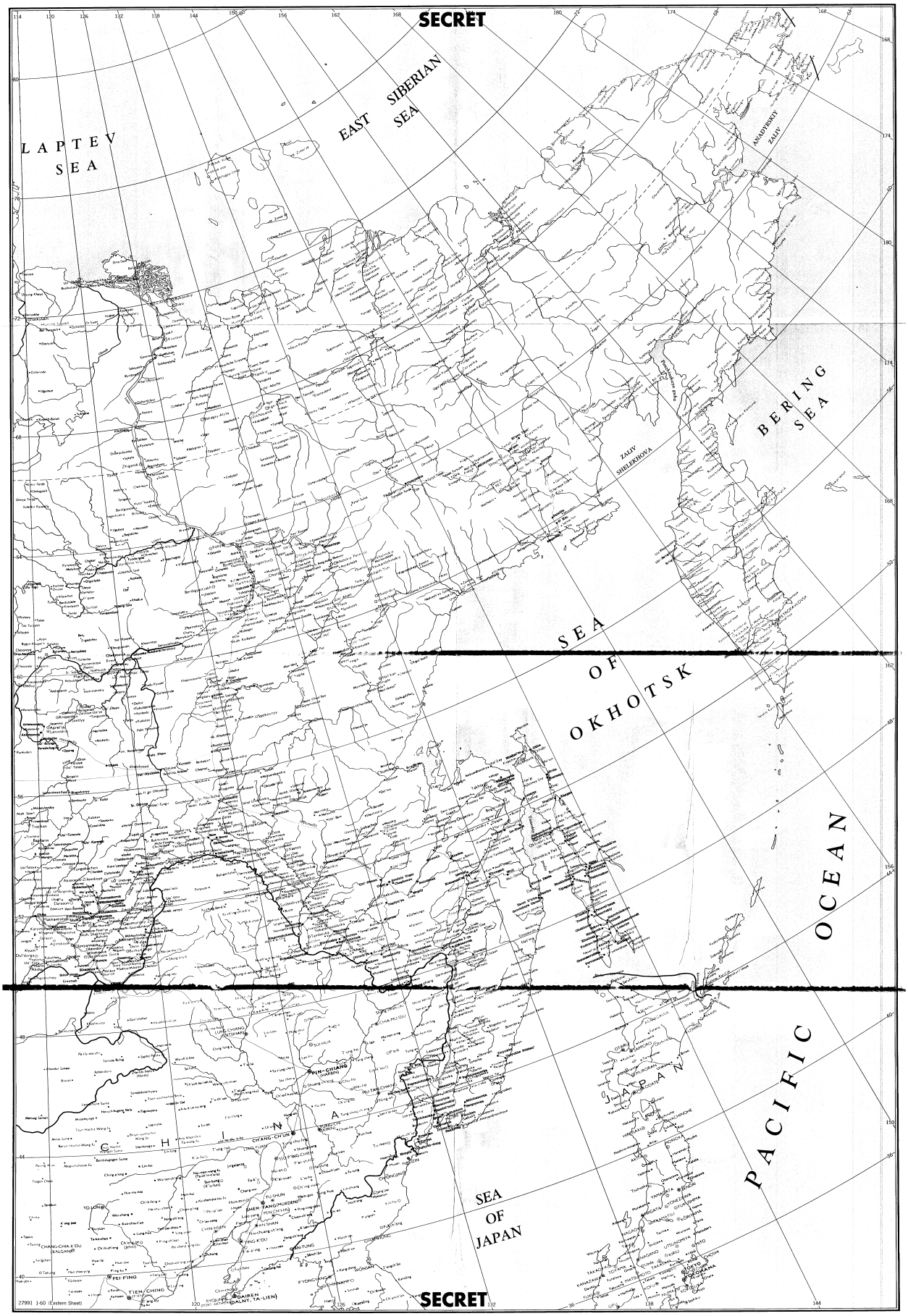

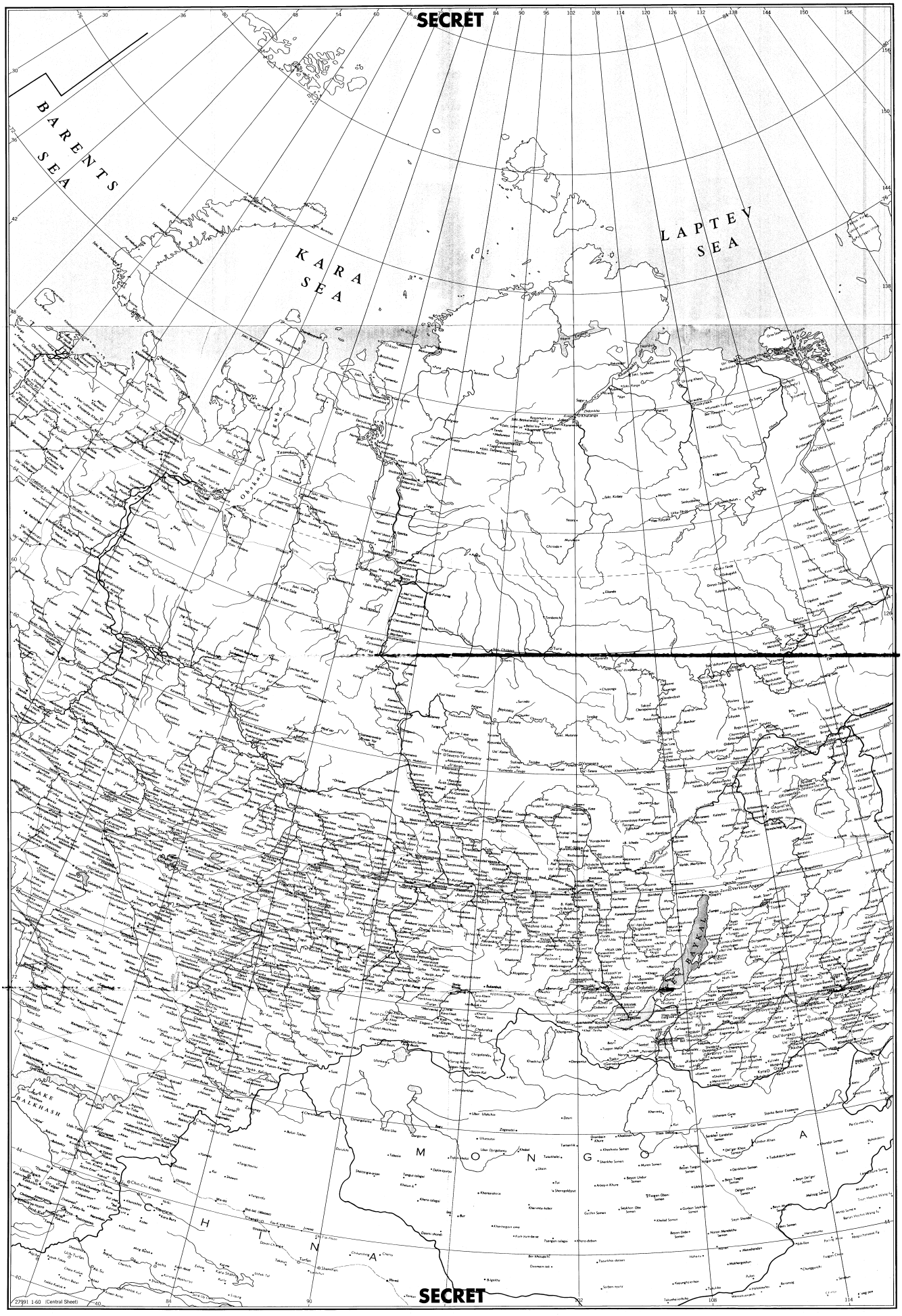

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USSR: RAILROADS, 1960

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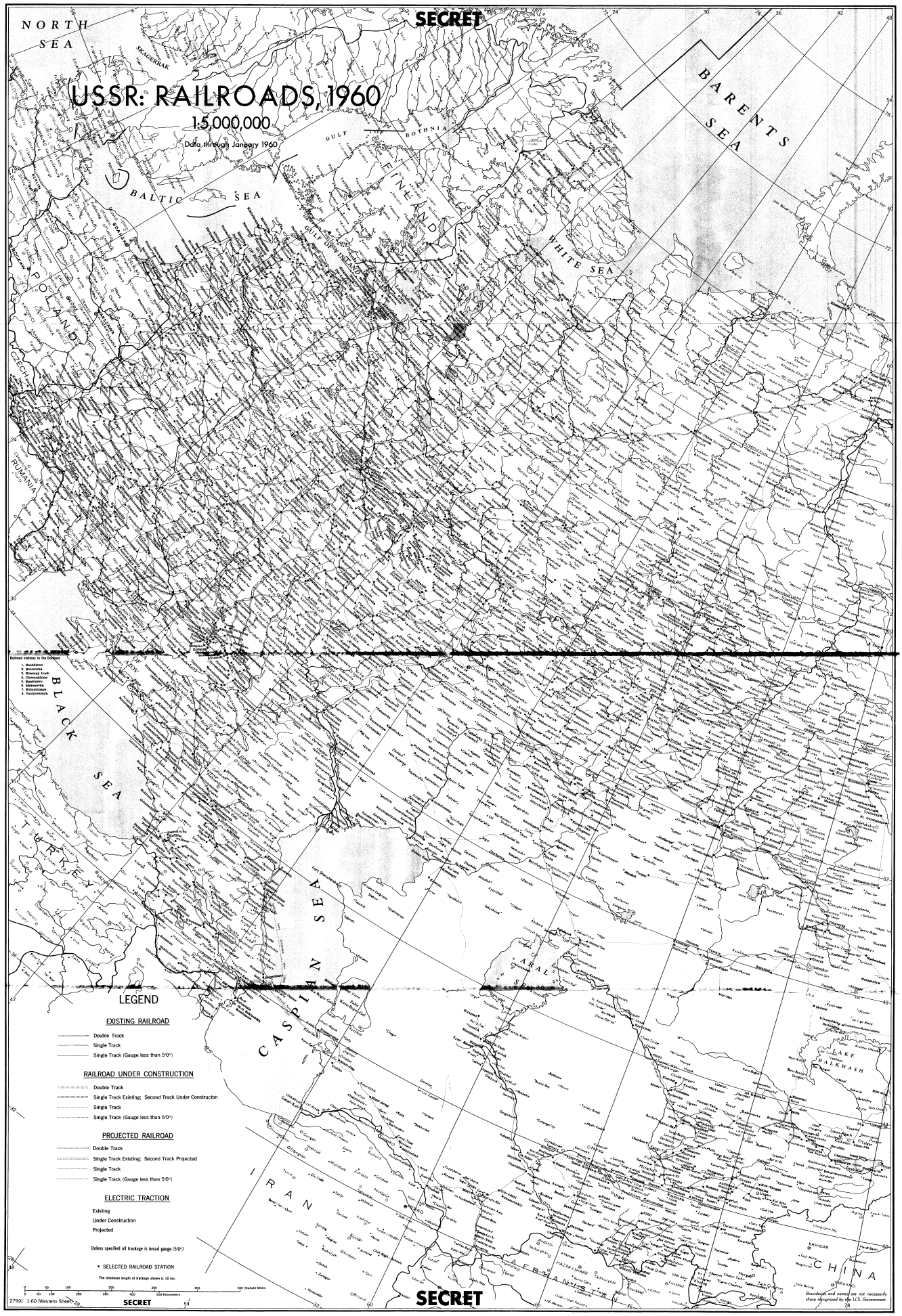
Data through January 1960



LEGEND

EXISTING RAILROAD

- Double Track
- Single Track
- Single Track (Gauge less than 5'0")

RAILROAD UNDER CONSTRUCTION

- Double Track
- Single Track Existing; Second Track Under Construction
- Single Track
- Single Track (Gauge less than 5'0")

PROJECTED RAILROAD

- Double Track
- Single Track Existing; Second Track Projected
- Single Track
- Single Track (Gauge less than 5'0")

ELECTRIC TRACTION

- Existing
- Under Construction
- Projected

Unless specified all trackage is broad gauge (5'0")

• SELECTED RAILROAD STATION

The minimum length of trackage shown is 10 km.

0 50 100 200 300 400 500 Statute Miles
0 50 100 200 300 400 500 Kilometers

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Boundaries and names are not necessarily those recognized by the U.S. Government.