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STUDENT RESEARCH REPORT

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THE BAIKAL-AMUR RAILROAD MAINLINE
ECONOMIC AND MILITARY SIGNIFICANCE

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FOREWORD

This research project represents fulfillment of a student requirement for successful completion of the overseas phase of training of the Department of the Army's Foreign Area Officer Program (Russian).

Only unclassified sources are used in producing the research paper. The opinions, value judgments and conclusions expressed are those of the author and in no way reflect official policy of the United States Government; Department of Defense; Department of the Army; Office of the Assistant Chief of Staff of Intelligence; or the United states Army Institute for Advanced Russian and East European Studies.

Interested readers are invited to send their comments to the Commander of the Institute.

ROLAND LAJOIE
LTC, MI
Commander

SUMMARY

The Baikal-Amur Railroad Mainline, which is currently under construction and scheduled for completion in 1983, will run north of Lake Baikal parallel to the Trans-Siberian Railroad eastward to Komsomol'sk-on-Amur. Here it will connect via a new bridge over the Amur River to an existing rail line and continue on to the Pacific Ocean, thereby forming a second, shorter rail link between the Pacific and the western part of the Soviet Union. In this paper, the author presents a brief description of this new railroad and the area it will serve and attempts to assess the military and economic factors which motivated its construction.

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HISTORY

The entire transportation network of the Baikal region today relies on the Trans-Siberian Railroad, which was built in 1891-1904. Over the past 30 years, the volume of cargo shipped via this railroad has increased 600 percent on the average and 800 to 1000 percent on some sections.[1] The new Baikal-Amur railroad, scheduled for completion in 1983, will not only take the burden off the old railroad but will also make possible a sharp rise in exports, imports and transit shipments.

The idea of building a railroad through Siberia not to the south but to the north of Lake Baikal was originally formulated in 1888 in "Works of the Russian Technical Society's Commission on Railroads Throughout Siberia." It was clear that the northern route was almost 500 kilometers shorter. The severe climate and lack of experience in dealing with permafrost conditions, however, made it necessary to build the railroad (Trans-Siberian) south of Lake Baikal.

Nevertheless, between 1911 and 1914 the Ministry of Railroads drew up a preliminary technical and economic substantiation for the construction of the Angara-Lena railroad (the western section of the Baikal-Amur Mainline Railroad) (BAM). This documentation was based on findings from an expedition by the engineer and writer N.G. Garin-Mikhailovskii, who found two possible railroad outlets to navigable portions of the Lena River; the first--from Irkutsk to Kachug, Verkhnelensk, and Zhigalovo; the second--from Taishet to Bratsk and Ust'-Kut. Forty years later, in 1954, the railroad was built according to the second variant.

Thus, the necessary preliminary documentation determining the final route of the western section of the future BAM was already in existence before World War I. The intervention of the war and the Revolution delayed any further work until 1934, when design and exploratory work was begun for the construction of a railroad from Taishet to Sovetskaia Gavan' on the Pacific coast. The planned route covered 4,500 kilometers.

Before World War II, auxiliary routes had been built from the small station at Bam on the Trans-Siberian Railroad to the village of Tynda and from Izvestkovskaia to Urgal. At the same time, construction was underway on the 700 kilometer stretch from Taishet through Bratsk to Ust'-Kut, as well as from Volochaevka to Komsomol'sk-on-Amur, where the 450 kilometer section to Sovetskaia Gavan' was begun.

During the war the Izvestkovaia-Urgal and Bam-Tynda sections were disassembled and the rails sent to the Volga region to be used in shipping war materiel. The Izvestkovaia-Urgal section was rebuilt after the war, and the Komsomol'sk-on-Amur-Sovetskaia Gavan' line was completed.

In 1974 the Soviet Union began anew the project of building a railroad north of Lake Baikal. The construction of BAM is consistent with a basic Soviet strategic concept dating back to Lenin which calls for the dispersement of industry and means of communication. The current trend to revive these concepts can be traced back to at least 1955. A decree by the Plenum of the CPSU Central Committee in July of that year called for "strict adherence to Party directives concerning more rapid development of industry in the eastern areas of the country and not limiting the concentration of industrial enterprises to just a few large cities."

Following this decree, beginning in 1956, the Soviet economic and military press began to announce that the displacement of industry in the depth of the country's territory must be accomplished regardless of considerations of economic cost effectiveness. It was announced that this regionalization of economics must answer a dual requirement of military strategy; the best possible use of industrial units for the needs of war and successful protection of economic objects from enemy attack.[2]

Marshal Sokolovskii in his book on strategy stated that:

> The most careful strategic considerations are taken into account by the organs of the economic leadership in formulating plans for the geographic distribution of

> industry, regions of agricultural production, and the building of the means of communications. [3]

The experience of WWI demonstrated the need to expand the rail network in the Far East. Towards the end of the war, during the Manchurian operation against the Japanese, the Soviets spoke of the difficulty of regrouping and supplying of troops over the Trans-Siberian Railroad.

> The transfer of troops from west to the Far East, a distance of 9,000-11,000 kilometers, was accompanied with tremendous difficulties. During the period of May-July alone in 1945, 136,000 railway cars arrived in the Far East and Transbaikal. A huge regrouping of forces stationed in the Transbaikal and in the Far East occurred simultaneously with the redeployment of troops from the west. [4]

With the completion of BAM in 1983, the Soviets will roughly double their capacity to supply and deploy troops in Siberia and the Far East.

While current soviet military doctrine points to the rising role of pipelines, truck transport, and aircraft in supplying military operations, they still give high marks to the railroads in the overall supply system.

> Transportation occupies an important place in supplying the army with military equipment, ammunition, weapons, food supplies and also in the direct support of military operations. The leading role in the over-all volume of shipments belongs to railway transportation. [5]

Thus, the continuing importance of railroads in supplying military operations, and the existence of the Soviet military-strategic concepts of dispersal of industry and the means of communications represent longstanding concepts which play an important role in motivating the construction of BAM.

While it is possible to trace historical military motivations for strengthening the transportation network in the Far East, present-day economic considerations obviously play a role as well. Both topics will be discussed further in subsequent sections of the paper.

GENERAL DESCRIPTION

The Baikal-Amur Railroad will cross especially difficult terrain. It will pass through seven mountain ranges, including the Baikal, North Muia, and Udokan ranges. In its path are many rivers, the largest of which are the Lena, Kirenga,Vitim, Oleksa, Selemdzha, Bureia, and Amrun' rivers. The builders must construct 142 large bridges. [6] Construction of the new bridge over the Lena, which opens the railroad's western gates,was completed in September 1975, [7] as was the bridge over the Amur near Komsomol'sk, which allows trains crossing to continue unimpeded to the Pacific Ocean. [8]

The Baikal region has extremely unfavorable and climatic conditions. Over 50 percent of the planned route of the railroad traverses regions of permafrost. The western section of the line is in a zone of seismic activity ranging from 7-9 on the Richter scale, and the eastern section shows a range of six to seven. In the last 200 years have been 800 earthquakes in the Baikal region. The route also passes through areas subject to avalanches and rockslides, while others are covered by extensive swamps and bogs. Temperatures drop to minus 50 degrees Celsius in winter and rise to plus 36 degrees Celsius in summer, causing hardships for workers and equipment alike. [9]

Earthwork on the roadbed will exceed 200 million cubic meters. Over 3,200 structures must be built over obstacles of all kinds, one for every kilometer of the route. Approximately 200 stations and sidings will be built along the route and at 64 of these locations, permanent settlements with the requisite services will be built to accommodate railway workers. [10] It will take 500,000 workers 10 years to complete the nearly 2,000 miles of railway at a cost of 15 billion dollars, including associated construction in its service area (feeder roads, stations, towns, etc.). [11] By way of comparison, the 800-mile long Alaskan Pipeline, which crosses three mountain ranges, runs beneath some 350 rivers and streams, passes through permafrost zones and areas of intense earthquake activity, cost 7.7 billion dollars. [12]

BAM has been declared a national youth project. Volunteers from every republic and oblast' are working on the project. L.I. Brezhnev, in a speech at the 17th Komsomol Congress in April of 1974 said of this project:

> This construction is of tremendous importance. The Baikal-Amur railroad will cut through primeval taiga and pass through places where tremendous wealth lies, which must be put to the service of the Motherland. A new large industrial area will be created there and new cities and settlements will be built. We are firmly convinced that the Komsomols and other young people will make a worthy contribution to this great construction project.

At this congress the Young Communist League pledge to sponsor the construction of the BAM and the railroad was declared an All-Union Komsomol Shock Preoject. [13]

A number of benefits are granted to the construction organizations and to persons wishing to work on BAM. As an exception, 10 percent in excess of the estimated costs will be available foe unforeseen work and expenses on all installations of BAM and of the Bam-Tynda-Berkatit spur, and 15 percent for temporary structures. In view of the harsh working conditions in the area of the BAM project and of the Bam-Tynda-Berkatit spur, a wage increment increase of 70 percent is given to workers engaged in all types of jobs for the duration of this project.

Workers on BAM and its perpendicular spur receive several other entitlements. They receive all the substantial benefits granted to workers in areas equivalent to the Far North, and family members receive lump sum payments in the amount established for the Far North. The USSR Construction Bank is authorized to make loans to BAM construction workers of up to 500 rubles per worker, to be repaid within three years. Local municipal authorities are authorized to reserve housing of the skilled workers (Grade 4 and higher) and their families in their permanent place of residence while they are away working on the BAM project. [14]

There is a growing need for manpower in the BAM zone--160,000 workers by 1980, 350,000 by 1990. Data from the Russian Republic State Planning Committee's Central Economics Research Institute indicate that the state spends 11,000 rubles to establish a single person in the BAM zone, but experience in other developing indicates that only one-third of those who come to work

in such areas remain. Thousands of people come to the BAM zone for romantic adventure, from a sense of duty, out of a desire to change jobs, or in pursuit of the ruble. But the fact remains that it is difficult to retain workers because of the harsh climate and inadequate housing and services. Volunteers may be willing to put up with difficulties on a temporary basis, but they are not willing to accept the same difficulties as a permanent condition of life.

A recent survey of BAM construction workers, conducted during the period of August 1975 to August 1976 yielded the following information: Males comprise 70 percent of the construction workers. More than 60 percent of family men lived during the period of the survey without their families. The uniting of families depends on creating the necessary conditions for their accommodation (e.g. adequate housing, schools, and services). This would permit stabilization of personnel, since family men comprise 60 percent of the construction workers, and they are the most active group migrationally. More than 56 percent of family men are emigrants from regions of Siberia and the Far East. The main condition for the introduction of female labor is the development of the social infrastructure. Personnel on BAM are selected mainly on their professional suitability; more than 80 percent of those working have a construction specialty. The social portrait of the average BAM worker is as follows: male, 31 years of age, eighth-grade education, from the city, construction profession, paid on Grade 3 or 4 pay scale, (average to above average base pay) and works on modern construction equipment.[16]

Such a major project as BAM requires considerable organization. The management of construction and the orderly flow of materials is supervised in the Ministry of Transport Construction by the Main Administration of the Construction of the Baikal-Amur Mainline (Glavbamstroi). In the Ministry of Railroad, supervision is carried out by the Administration of Equipment Supply (Transkomplekt) and a corresponding administration within the Main Administration of Capital Construction, and at Tynda Station, the capital of BAM, by the BAM Construction Directorate. Uninterrupted financing of the project is handled through local branches of the USSR Construction Bank.[17]

ROUTE DESCRIPTION

The BAM route between Lena Station and Komsomol'sk-on-Amur, which was selected decades earlier, was confirmed by recent investigations to be the best route. (See Appendix A).

Beginning in Irkutk Oblast' from Lena Station, the route of the new main line quickly shifts to the right bank of the Lena River and for nearly 300 kilometers continues southeast through valleys of the Niia and Kirenga rivers and their tributaries. After surmounting the Baikal range via a tunnel, the railroad enters the Buriat Autonomous Republic and descends to the northern tip of Lake Baikal towards the center of the Northern Baikal region, the village of Nizhneangarsk. From here the route stretches along the wide valley of the Upper Angara at the end of which it approaches the high steep North Muia Range, which divides the Baikal Basin (Enisei River) and the Vitim-Lena Rivers. Passing through a 15-kilometer tunnel, the line continues along the Muia Valley and then into the territory of Chita Oblast'.

Further to the east, using the Siul'ban river valley (right tributary of the Vitim River), the route rises to the highly elevated Charsk Basin, passing by the raion center of Chara village. Then, having climbed a spur of the Stanovoi Range, it continues on to the junction of the Chichin and Amur Oblasts with the Yakut Autonomous Republic and along the Khan' River Valley to reach the Olekma River. Continuing along the Olekma River for nearly 100 kilometers, the main line, after crossing this river, stretches along a deep, narrow valley of its right tributary--the Niiukzhe River, and for approximately 1650 kilometers passes along the Lena-Amur watershed and quickly approaches the raion center of the village of Tynda, a future huge railway center.

In this area the Baikal-Amur and Trans-Siberian railroads approach each other at their closest points, and for this reason a connecting line 176 kilometers in lenghth was constructed from the existing station at BAM to the future rail center of Tynda. After the completion of the construction of this line it will be possible to significantly accelerate the pace of construction of BAM simultaneously to the east and west from Tynda. In addition, the connecting line will be the initial section of the future Yakut main line, to be constructed to Berkatit station in the 10th Five Year Plan period (1976-1980).

From Tynda Station the Baikal-Amur Main Line goes in a southeast direction alomost parallel to the Trans Siberian Railroad, first along the Giliui River, and then along the hilly, swampy Zeisko-Bureinskii plain. As a result of the construction of a hydroelectric station dam on the Zeia River above the town of the same name, a reservoir was created which the main line bypasses to the north, crossing the Zeia River near the village of Bomnak. Continuing for one hundred kilometers after crossing the Selemdzha River, the main line enters the Khabarovsk Krai and near the village of Chegdomyn approaches the existing railroad branch laid from Izvestkovaia Station.

After construction of the Baikal-Amur Main Line, the Urgal railway center will come into being. To the east, the route surmonts the Bureinskii Range by means of a tunnel, and changing direction sharply from southeast, continues along the Amrum'river valley to Berezovka Station-- the terminal of the active lumber transporting site, connected to the Komsomol'sk Center. This site will be reconstructed and will become part of the Baikal-Amur Main Line. After crossing the new Amur River bridge near Komsomol'sk, the route will continue on to Sovetskaia Gavan' and a sea ferry to Sakhalin. [18]

In view of the projected growth of freight turnover, the right-of-way and bridge supports on the Ust'-Kut-Tynda section of the railway are constructed for double-tracking and the remaining sections will be double-tracked in the future as the need arises. [19]

It has been proposed that the two major tunnels being cut through the North Muia and Baikal ranges be cut to accommodate double tracks. These two tunnels, along with four small shoreline tunnels between Severobaikalsk and Nizhneangarsk, comprise the most complex segment of the BAM route. The 15-kilometer North Muia tunnel is also the most labor-intensive project on the entire route and it is this sector which will determine when through traffic along the entire route can be opened. The costs for double-tracking are estimated to be 25 percent more than that of single-track tunnels but they are considered to be easier to build and operate. [20]

PLANNED ECONOMIC DEVELOPMENT

The construction of the Baikal-Amur Mainline will play a key role in the development of Siberia and the Far East. Extraction of natural resources will be achieved by forming at least 10 large territorial complexes at various locations in the BAM zone.

The first such complex, looking at the west to east, is the Upper Lena Territoral Production Complex, which will include the very rich timber resources of the Lena and Kirenga basins. Very little exploration of the earth's interior has been done there so far, but deposits of petroleum, gas, polymetals, sodium chloride, talc, and fluorspar have already been discovered. Great hydroelectric sources remain untapped. If scientists' forecasts about raw material reserves are confirmed, it is expected that the chemical industry will also be developed in this region.

The North Baikal Center, which is located within Lake Baikal's water protection zone, may be given special development. The new railroad is creating favorable conditions for the extensive development of a region of large -scale tourism and recreation. The traditional branches of fishing, hunting, and trapping will be very important. The Kholodnia polymetals deposit can become a mining industry base. The region is a promising source of other useful minerals as well.

The Muia Center, which contains the Molodezhnyi chrysotile asbestos deposit, the only one of its kind in terms of fiber quality, will be developed. This deposit is located only 30 kilometers from the BAM route. Not far away is the Orekitkanskii molybdenum deposit, which has favorable mining-engineering conditions: the ore there can be extracted by the inexpensive opencut method. The hydroelectric and water resources in this region can be very important. The Mokskaia Hydroelectric Station, which is planned for the Vitim River, will not only provide electricity, but will also aid agricultural reclamation in the Muia Basin and improve navigation on the Vitim.

The development of the Udokan Industrial Center is tied to its well-known copper and other ore deposits. The area's harsh natural conditions will make necessary the use of the most progressive ore-dressing techniques and the introduction of highly productive equipment adapted for work in low-temperature conditions. Udokan

ore concentrates will probably have to be processed in more southerly regions with better natural and economic conditions.

The creation of the Chul'man-Aldan (South Yakut) Territorial Production Complex is envisaged. This future center has mineral and raw material resources for a number of industrial branches. The most important precondition for this complex is the location of coking coal and iron ore within a compact area. During the first stage, the Neriungri Opencut Coal Mine, Coal-Cleaning Mill, and State Regional Power Station will be built, as well as auxiliary production facilities, spur tracks and a housing and communal-services complex. Construction of a taiga mining-and-concentrating combine to produce iron ore pellets and concentrated iron ore will also begin. During the second stage, it is planned to expand the extraction of coal and the development of new iron ore deposits. [21]

One variant for the development of the South Yakutia Territorial Production Complex calls for a full-cycle metallurgical combine to be located here. This is not the only possible site for a Far East metallurgical combine. Detailed technical and economic calculations and substantiating documents have yet to be provided.

The construction of the Bam-Tynda-Berkatit rail line , also known as the "Little BAM", opens up wide possibilities for the rapid development of the timber and lumber industry there as well.

The Tynda Center will have a special appearance, too. From the very beginning, top-priority work has been underway here on the creation of a large-capacity interregional construction industry base, designed to ensure the construction of the entire western section of BAM. It is expected that in the 11th Five-Year Plan period (1981-1985) this complex will become one of the most important transportation and distribution centers, construction bases, and repair centers in the entire Near North zone. As in neighboring areas, the timber industry will also be developed here.

The outlines of the rapidly growing Zeia Territorial Production Complex, which is going up in the vicinity of the newly constructed power station are already visible. This station will provide electric pow-

er for the whole southern zone of the Far East. The dam on the Zeia River also helps solve another important national-economic problem; it will avert the destructive consequences of flooding in the area and facilitate the extensive use of productive bottomlands. This circumstance can be fully appreciated only when one considers the limited quantity of land suitable for agriculture in the entire BAM zone. Gold mining, machine building, the construction industry, and timber cutting and processing will be developed here also.

The specific character of the Urgal Territorial Production Complex will be tied at first to the transfer of West Siberian petroleum from railroad cars to a pipeline which will feed the industrial centers of the Far East and the Pacific Coast. The creation within this complex of the planned Bureia Hydroelectric Station will ensure the electrification of the eastern section of BAM and will improve the electric-power supply in adjoining regions. In the long run, the complex's fuel base can be augmented by exploiting the Urgal coal deposits and by constructing a thermal power station. It is apparent even now that it would be feasible to develop the machinery industry here, including the production of roadbuilding machinery, and enterprises to repair machinery and equipment for the mining and timber industries, as well as transportation vehicles. Enterprises for the complete-cycle processing of timber are also planned.

The Komsomol'sk Territorial Production Complex will be developed in the eastern part of the BAM zone. There is a possibility that a new metallurgical combine based on South Yakutia's coal and iron ore and the nearby deposits of the Udsko-Selemdzha Iron Ore Basin will be constructed. The advantages of this variant are linked to the convenient location of the principal consumers of the metal and its more favorable economic and geographical conditions. Evidently, the machine-building complex will also receive further development, for it seems sensible to locate plants here that will produce equipment for the utilization of timber-cutting wastes, for the repair of locomotives, etc. The timber and lumber industry and various branches of the chemical industry will also be developed. The country's growing requirement and the discovery of new deposits are causing an accelerated growth rate in the tin mining industry.

The unique Sovetskaia Gavan' Territorial Production Complex is being formed at the far eastern end of BAM; it will be a major transportation junction and a principal material and technical supply base for a large part of the Far East. The first stage of the Vanino-Kholmsk oceangoing ferry has already gone into operation, and reconstruction of the seaport is expanding. Ship repair and the processing of ocean products will be developed on a large scale.[22]

PROVIDING ELECTRICAL ENERGY FOR THE BAM AREA

The projected electrical energy consumption for the BAM area is estimated at tens of billions of kilowatt hours per year.

The proposed plans for the area place the BAM within a ring of electrical power stations and electrical transmission lines. A huge hydroelectric power station is projected for the upper reaches of the Vitim River near the future railway. Still other hydroelectric power stations will appear on the Maakan and Bureia Rivers. Construction of the Neriungri State Regional electric power station has begun in southern Yakutia.

Until these projects begin operation, the electric energy supply for BAM will come from long-distance power transmission lines. They will stretch from Ust'-Ilim and Zeia hydroelectric power stations.

A long-distance power transmission line is already being constructed in the direction of the Lena River. Working blueprints for the first sections of the line from Ust'-Kut to Nizhneangarsk and from Tynda to Skovorodino (located on the Trans-Siberian Railroad) have been issued. The supports for the largest high voltage line in the Far East are being laid on the left bank of the Zeia River. More than 400 kilometers of power transmission lines will stretch from Komsomol'sk-on-Amur to Sovetskaia Gavan'. Its wires will pass over the supports of the new Amur River railroad bridge.

In the next few years, nearly 6,000 kilometers of high voltage electrical transmission lines will be laid across taiga, mountains, and swamps. A new electrical energy system will be constructed in the Baikal-Amur Main Line zone which be closely tied to the existing system in Siberia and the Far East.

Due to the overall limited energy supply at present, the BAM railroad will use internal combustion instead of electric engines during the initial period of operation. Electric locomotives will be used along the western section, which can draw on the reserves of the Bratsk Hydroelectric Power Station and the entire series of hydroelectric stations along the Angara River. Electrification of the Taishet-Ust'-Kut section, which has already been built, is now underway.[23]

AIR TRANSPORTATION

The BAM area is currently heavily dependent on air transportation, since often this is the only way to deliver personnel and supplies to remote areas. Helicopters which serve the western section of the BAM are based at the Ust'-Kut airport. The airport has not been able to achieve 24-hour operations, and the airstrip is often shut down for long periods after heavy rains because landing strips are unimproved and concrete landing pads have not been built for the helicopters.[24]

Air connections between the BAM bases and between the bases and large cities are often unreliable. Many of the landing fields for fixed-wing aircraft are unimproved and become inoperable after even a light rain. As an example, passengers who depart Ulan-Ude for Nizhneangarsk on an An-24 airplane must transfer at an intermediate air strip to an An-2, the only type of airplane which can land at Nizhneangarsk. When connecting flights are missed, it is often necessary to wait overnight in the primitive airport terminal. Frequently it takes four days to fly from Ust'Kut to Tynda, providing tickets and seats are available. It is quite often difficult to get to Tynda, BAM's capital, by air even from Moscow. [25]

Considering the geographical location of the BAM route and the enormous sweep of the construction, the problem of transport supply to the "building project of the century" becomes understandable. In this regard aviation plays a key role in the BAM region.

Initially, aircraft were used to transport surveyors and construction workers. As air traffic increased, the movement of people involved in BAM construction in the main routes of Khabarovsk-Middle Urgal-Komsomol'sk were studied for the purpose of establishing the optimal number of flights on these lines. Passenger flights to Middle Urgal are now made by the An-24, Yak-40, and Il-14 aircraft.

In 1974, when surveying projects were just getting underway, crews in An-2 aircraft first made survey flights, and then aerial photographing flights. These were later joined by Mi-4 helicopters which supplied necessities to construction workers. In 1975 the accrued flying time for all types of airplanes and helicopters servicing the BAM was more than 11,000 hours.

Since the beginning of 1975, when persons indirectly involved in the building of the main line entered

the field along with surveyors, operations have developed on a broad front. The sphere of aviation services has expanded; transporting people to construction sections, supplying them with provisions, instruments, building materials, fuel, shelter, heavy equipment for building bridges, including assembly operations on the final stage of the bridge across the Amur River in the area of Komsomol'sk. The aviation contribution has increased by the addition of the Mi-6 and Mi-8 helicopters. They transport prefabricated cottages, supplies, and mail to the construction brigades in addition to medical and cultural services. Nearly 8,000 tons of different types of cargo and more than 12,000 construction workers were transported to the building sites of BAM in 1975. [26]

COMMUNICATIONS

Communications in the BAM zone have been described as inadequate. This is not surprising, considering that most areas are remote and sparsely populated. The USSR Ministry of Communications, in order to improve communications, will establish direct telephone communications between Tynda and Moscow, Novosibirsk, Irkutsk, Chita, Khabarovsk, and Blagoveshchensk.

In most communities along the BAM, mail is transported from the central post offices by helicopter. More vehicles have been allocated to postal enterprises to facilitate mail delivery.

The Ministry of Communications is planning additional measures to improve services for organizations and people along the railroad. Inter-city telephone and telegraph service and television broadcasting will be greatly improved by the construction of a radio relay line along the railroad and by the new satellite communications system. [27]

THE MILITARY-STRATEGIC SIGNIFICANCE OF BAM

The Trans-Siberian Railroad is clearly vulnerable in the event of serious hostilities between the Soviet Union and China, since it runs approximately 150 miles from the Chinese border for quite long stretches. It represents the only existing rail communication between Vladivostok and the sea with the western USSR, and severing of the railroad would make resupply extremely difficult. The new Baikal-Amur Main Line will run approximately 100 to 300 miles further north of the Trans-Siberian line, so that it will be separated from the Chinese border by additional hundreds of miles of forests, marshes, and mountain ranges, thereby making it much more defendable.

China confronted Soviet military planners with the problem of defending a 9,700-mile common border against a very large and experienced land army, as well as a growing arsenal of nuclear weapons. When Chinese troops attacked a Soviet border patrol in 1969, the Soviet Union was forced to effect a drastic reorientation of its military priorities, Soviet forces now had to be divided, and the Far East became a front even more difficult to defend, in terms of logistics and manpower and materiel requirements, than the Soviet Union's European frontiers. [28]

By 1973 the Soviet Union had deployed about 44 divisions (including two in Mongolia) along the Sino-Soviet border, whereas up until 1969 there were only 21 divisions in this area, which includes the forces in the Central Asian, Siberian, Transbaikal, and Far East Military Districts. The number of divisions has remained relatively constant to the present day. Along with these troops, the Soviet Union deployed a large array of supporting artillery, air power, nuclear warhead storage, and missiles. [29]

The massive military build-up on the Chinese border then forced the Soviet Union to increase its logistic capability to supply it, a need which is fulfilled by the Baikal-Amur Mainline. Furthermore, the Trans-Siberian railroad is aging and is already overloaded. This factor further increases the importance of BAM as a main supply line for the Soviet military forces in the Far East.

It has already been shown that the technical documentation for determining at least the western section of the BAM route was completed prior to World War I, and exploratory work was begun for the remainder of the route to Sovetskaia Gavan' in 1934. Although the interruption of World War II prevented further construction during that period, it was feasible that construction could have started as early as the 1950's, providing the necessary impetus had been present. It seems to be no accident then, that the decision to begin construction of the BAM quickly followed on the heels of the Soviet build-up along the Sino-Soviet border which began in 1969 and leveled off in 1972. Although the Soviet press repeatedly points to the BAM as the key to developing the economic potential of the area it will serve, the open press never cites the obvious logistical and strategic importance of the line in relation to the increased military presence in the Far East vis-a-vis the Peoples' Republic of China (PRC).

BAM represents the requisite transportation infrastructure for the further development of the economy of the sparsely populated areas of Eastern Siberia and the Far East. The rise in population which will result due to the industrial development of the area will of itself meets a major political goal of Soviet policy which also has military-strategic significance. A population increase in the Far East, especially along the Sino-Soviet border, tends to bolster territorial claims to the area which are disputed by China, despite the fact that this area has been considered Russian sovereign territory since the late 17th and early 18th centuries.

Specific efforts on the part of the Soviets to populate this area can be traced to a May 1973 decree of the USSR Council of Ministers entitled "On New Benefits Granted to Citizens Resettling in the Country's Collective and State Farms." This decree offered the highest fringe benefits and monetary awards, as well as special vacation periods and opportunities to purchase automobiles and motorcycles for those who moved to the area along the border with the PRC. [30]

One of the most obvious indicators of BAM's military-strategic significance vis-a-vis China is Japan's reluctance to directly participate in this construction project in order to avoid straining Sino-Japanese relations.

In March 1973, the Soviet Union issued an invitation to Prime Minister Tanaka to visit Moscow and the visit took place in October of the same year. During this visit the Soviets tried to interest the Japanese in its proposal for joint economic development of Siberia as well as its plan to construct the new BAM 2,000-mile railway to convey coal, oil, and other goods to the Pacific coast of the USSR. The undertakings at that time produced little in the way of concrete accomplishments for the Soviets, and as a result of these negotiations the Japanese became embroiled in the rivalry between the Soviet Union and China, although they did strive to maintain a balance in their relations with the two countries. [31]

In the reaction to the Japanese refusal to participate in the construction of BAM the Kremlin made no reference to a third party influencing the failure to conclude an agreement, but it merely published a somewhat testy statement indicating the failure to come to agreeable terms with the Japanese was based on business considerations alone. According to the Soviets,

> Enemies of Soviet-Japanese business cooperation broke off Japan's assistance in the construction of this railroad, assuming that the Soviet Union would not be able to cope with this giant task and would go hat in hand to Japanese business, which would dictate the terms of its own participation. [32]

The Soviet Union still can offer strong inducements to acquire Japanese economic assistance in such projects as BAM. It can offer to cooperate economically with Japan by trading Soviet raw materials, especially oil, for Japanese industrial goods and investment in Siberian development. There are, however, some serious obstacles to Soviet sucess. Japanese political leaders, anxious to preserve an even balance between China and the USSR, do not wish to anger Peking by assisting the Soviet Union build up its power in the very region where that power, enhanced by greater regional self-sufficiency and closer integration with the Soviet transportation net in the western part of the USSR, would most directly threaten Chinese territory. [33] Hence the cautious slowness with which the Japanese have responded to Soviet proposals for cooperation in Siberian development.

Another major Soviet construction project related to developing the transportation infrastructure in the Far East is currently underway. Although not a grandiose in scale as the BAM, it nevertheless also has military-strategic significance in relation to China, and to Japan as well. The Soviets are building a bridge between Siberia and the island of Sakhalin across a narrow sound linking the Sea of Okhotsk in the north with the Sea of Japan in the south. After the construction of this bridge, which is expected to be completed by late 1980, Moscow would be in a position to transport all supplies by train from Siberia to Sakhalin. The construction of this bridge, as well as other developments, indicate that the Soviet Union is expanding its strategic base in the Far East. Vladivostok is presently the focal point in this area, however, it is by no means an ideal bastion. It lies too close to the Chinese border, almost touching it, and is geographically not centrally located, being on the extreme southern tip of the Soviet Far East. According to the latest conception, it appears as though the logistical and operational base is to be transferred to Sakhalin. Vladivostok would, of course remain as a strongpoint, but not as a first-rate strategic center.

According to Professor Mokota Mamoi of the Japanese National Defense Academy, who prepared an outline of the new Soviet plan for the Far East, the base of Soviet power would then extend in a wide loop over the entire area of Sakhalin along the Siberian border to Kamchatka.[34]

The extensive employment of railway troops in the construction of BAM also tends to emphasize the military importance of this project, even though these troops are routinely used on civil projects as well. These troops represent a trained construction force whose military discipline make them ideally suited for harsh climatic and geological conditions encountered in the area of the BAM construction. They take an active part in many aspects of construction. These troops have constructed dozens of bridges, prepared railway roadbeds, laid conduits, prepared hundreds of kilometers of automobile roads, and laid railway tracks.[35]

One reporter, who toured the western and central sections of BAM only and described the work of civilian construction crews there, stated additionally that "the eastern part is being rammed through by soldiers of the

Soviet Army." [36] If his information is accurate, it would appear then that the construction of a major section of the railroad is primarly the responsibility of the railway troops.

Direct discussion of the military-strategic aspect of the BAM in Soviet open sources is extremely scarce or perhaps non-existent. However, the very presence of an article on the construction of the Baikal-Amur Main Line in the publication Soviet Military Review at least indirectly affirms the military significance of this new railroad main line. The article appears under the heading of development of transport during the Soviet Tenth Five-Year-Plan (1976-1980). The article speaks of the uniqueness of the railway and states that a sizable part of the line will start functioning during the current five-year-plan. [37]

Chinese notice of the construction of BAM or comment on its military-strategic significance is also difficult to detect. During the mid-1970's, the Chinese press comments in this area were limited to condemnations of the "agressive policies" of the Soviet Union, especially the policy of "social-imperialism," and loudly deplored the "massive deployment of Soviet troops in the Far East and along the Sino-Soviet border," [38] as well as the "Brezhnev clique" which has "altered the pattern of industrial disposition in order to prepare industries for wartime production..." [39]

While it is obvious that military-strategic factors motivated the construction of BAM, it must be pointed out that these factors alone probably would not justify the construction of the railroad because of the tremendous cost of the project. The exploitation of energy, fuel, and rich natural resources, as well as other benefits to be derived from the construction of BAM, will allow the Soviet Union to not only pay for the project, but realize a large return on its investment. An evaluation of the economic factors follows.

ECONOMIC SIGNIFICANCE

BAM was begun in 1974 and is scheduled for completion in 1983. It is hailed by the Soviet Union as the "Construction Project of the Century." This new rail - road will have exceptionally important economic significance once completed. The construction of this rail line will strengthen the transportation ties of the Transbaikal region and Far East with the remaining areas of the country and create favorable conditions for exploiting rich natural resources. This new rail route will create a new exit to the ports of the Pacific Ocean and shorten by several hundred kilometers the freight shipping distance and reduce travel time across Siberia by two days in comparison with the existing Trans-Siberian Railroad.

Many industrial productions centers are planned for the zone through which the BAM route passes. The exceptionally rich Udokan copper deposits are located here. Huge reserves of coking coal and high-quality iron ore deposits are located to the north near the cities of Chul'man and Aldan. Rich timber resources, suitable for pulp and paper manufacturing, valuable deposits of asbestos, and polymetals are also located here. The Bam-Tynda-Berkatit railroad is being built perpendicular to and simultaneously with BAM in order to service large coal and iron ore deposits in Southern Yakutia. The area is also rich in hydroelectric resources. The Zeia Hydroelectric Power Station, the first to be constructed in the area, began generating electric power in 1975.[40]

The construction of BAM will give strong impetus to the economic improvement of the eastern regions of the country. Premier Kosygin stated:

> With the construction of the Baikal-Amur Main Line, the rich mineral resources of Siberia and the Far East--iron ore, coal, natural gas, copper, lead, tin, as well as rich timber resources--will be infused into the national economy. The powerful energy resources of Siberian rivers will be exploited on an even greater scale to produce inexpensive electric energy.[41]

When BAM goes into operation, it will significantly improve the conditions for supplying many developing areas of Siberia and the Far East, including the Yakut Autonomous Republic, Magadan and Amur Oblast's, as well as the Primorskoi (Maritime) and Khabarovsk Krais, and the Sakhalin and Kamchatka Oblast's. Presently, the in-

dustrial and construction shipments, food supplies and consumer goods are delivered to these areas for the most part via water routes (during the short navigation period) and with the help of air transport. The construction of this railroad will provide reliable and uninterrupted communications to these remote areas with all industrial and cultural centers of the country. [42]

The BAM zone is a staging area for the further economic development of the Far North. The construction of the Taishet-Lena railroad has meant that the role for the Northern Sea Route and the Sea of Okhotsk ports in supplying Yakutia has diminished. At present 80 percent of all freight traffic goes by way of Osetrovo (near Ust'-Kut), while about 20 percent goes through the Bol'shoi station. Hence, the Baikal-Amur Main Line has already become the main route for the supply of the Far North. When the problem of the economic development of the BAM zone is solved, it will be possible to move the Far North's supply bases to there from Irkutsk, Ulan Ude, and Khabarovsk.

The new main line will have a tremendous influence on the development of the external trade ties of the Soviet Union and also those European countries which use Soviet railroads for transit freight shipments, with countries of the Pacific Ocean Basin. Within a few years, specialized oil tanker, lumber, coal, and containerized routes will be in operation along BAM. Several existing railroad sections and port stations are scheduled for modification to accomodate these routes, and Vostochnyi Port is under construction. [43]

Vostochnyi Port is located near Nakhodka on Wrangel Bay. This port was chosen for expansion and modernization because it is sufficiently ice-free, has an enormous, deep natural harbor, a clear 12.5-kilometer coastal strip and railroads and roads nearby. A coal-handling complex worth 27 million rubles is currently also under construction here. [44]

One of the main goals for the construction of the BAM is the creation of favorable economic conditions for the transportation of crude oil from the Tiumen' fields of Western Siberia to the seaports of the Pacific Ocean. [45] In fact, in terms of freight turnover on the Baikal-Amur Main Line, the first place in importance

(70-75 per cent) will be occupied by the delivered via pipeline to Taishet, and will be transported further on trains along the BAM route to Urgal. From here the oil will again be pumped through pipelines to refineries in the Far East and to ocean ports.

Such a delivery system for crude oil in the specific conditions of the BAM zone turned out to be more economical in comparison with transportation via oil pipeline. This was determined, on the one hand, by the high cost of constructing a main line oil pipeline in the area under consideration, which approaches the cost of building a one-track railway, and on the other hand, by the advantages of a railway as a more universal means of transport.

Second place in terms of freight turn-over will belong to lumber freight (10-18 per cent). In terms of local freight turn-over, next in importance are various construction materials, metals, oil products, coal, machines and equipment, and consumer goods. Berkatit Station will have the largest local freight turn-over in the BAM region (shipping of coal). [46]

Forming a second direct exit to ports of the Pacific Ocean basin and providing a shortening of freight hauling distance, the Baikal-Amur Main Line will have a significant advantage in comparison with the Trans-Siberian Railroad in establishing communications with the Komsomol'sk-Magadan' Oblast', with all areas of the country west of Taishet, and with Southern Yakutia. In communications with the ports of South Sakhalin, Kamchatka, and Chukotka, the shipping distance via railway and sea routes combined from Taishet via BAM through Sovetskaia Gavan' in comparison with shipments via the Trans-Siberian Railroad is shortened by 1000 kilometers and more, including a reduction of more than 450 kilometers on the rail portion alone.

The western section of BAM (Lena-Tynda) in addition will shorten shipping distance by almost 160 kilometers between Taishet and the southern regions of the Amur Oblast', Khabarovsk and Primorskoi Krais. Therefore, significant additional freight can pass along the western sections for the Far East when necessary.

Tynda Center will become the largest point for through-shipments of freight. Large shipments of Southern Yakutia coal, lumber, oil, and other cargo continuing on to the east will pass through here.[47]

Soviet determination to develop its Siberian and Far Eastern territories is reflected within the framework of recent five-year plans. BAM represents a major construction project through which this goal is being implemented.

The Ninth Five-Year Plan (for 1971-1975), building on the achievements of the previous periods, has reaffirmed the Soviet determination to carry on the development of Siberia and the Far East, with particular emphasis on exploitation of energy resources. Highest priority among programs for the eastern regions is given to development of the oil and gas fields of West Siberia and related industrial facilities. As for East Siberia, the emphasis is on development of ferrous and nonferrous metallurgy, forestry, pulp-and-paper manufacturing, and electric power generation, with particular stress on the creation of industrial complexes in the southern portion of the region. For the Far East, the emphasis is on development of the necessary infrastructure (manpower, housing, water supply, telecommunications, roads, and other transportation facilities) for electric power generation, mining, timber processing, pulp-and-paper manufacturing, and fishing, in addition to construction of oil refineries and improvement of harbor facilities.[48]

> In examining the Soviet development effort in Siberia and the Far East, one can discern several major motivations. First, the USSR seems determined to develop giant, continuous economic complexes stretching from European Russian to the Urals and on into Siberia. Second, the Soviet Union desires to assure its industry the needed fuels and raw materials by exploiting the resources of Siberia on a broader scale. Furthermore, the export of Siberian and Far Eastern resources promises to earn the Soviet Union significant amounts of foreign currency or reciprocal imports of advanced machinery and consumer goods.[49]

CONCLUSION

With the completion of BAM in 1983, the Soviet Union will realize a project whose idea back to the late 19th century. The Soviets are making a colossal investment in terms of manpower, equipment, and capital investment over a 10-year period to construct BAM. This construction is motivated by both military and economic factors. Soviet military doctrine which calls for the dispersement of industry and means of communications appears to be one of these factors. One of the main motivations for the construction of BAM is that it will be less vulnerable to a potential Chinese attack because it will be separated by several hundred miles of rough terrain from the disputed Sino-Soviet border, while the Trans-Siberian Railroad runs close to the border for long stretches, almost touching it in some places. In addition to being more easily defendable, the BAM doubles the ability of the Soviets to logistically support their huge military build-up along the Chinese border.

The new railroad will not only strengthen transportation ties of the Transbaikal region and Far East with the western part of the country, but it is the key to developing rich Siberian fuel, energy, and raw material resources which would otherwise remain unexploitable. These resources will be used not only for internal industrial consumption, but will increase foreign trade with countries of the Pacific basin, especially Japan, thereby bringing in much-needed foreign currency and manufactured goods.

The building of BAM represents a significant improvement in the transportation infrastructure of the Far East, and the 60-odd permanent settlements being built along the railroad, as well as the industrial centers being built in the BAM zone, will form the basis for a vast resettlement program aimed at populating the sparesely populated eastern areas of the Soviet Union, especially those areas adjacent to the Chinese border.

In attempting to asses the relative importance of the military and economic considerations which motivated the construction of BAM, it appears to the author that neither is decisively more important than the other, but rather it suffices to say that both are equally important, since they both in large measure serve the vital interests of the Soviet Union.

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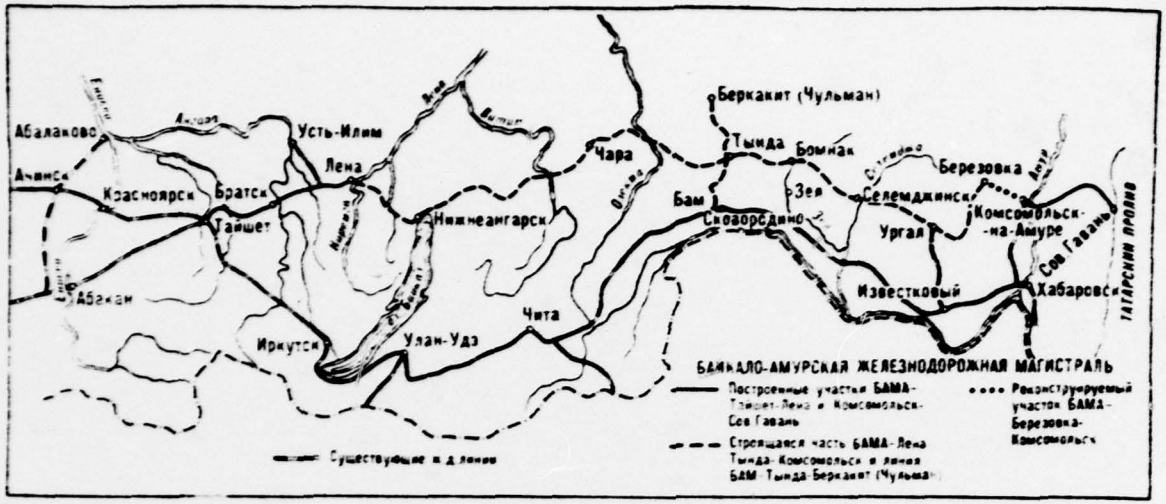
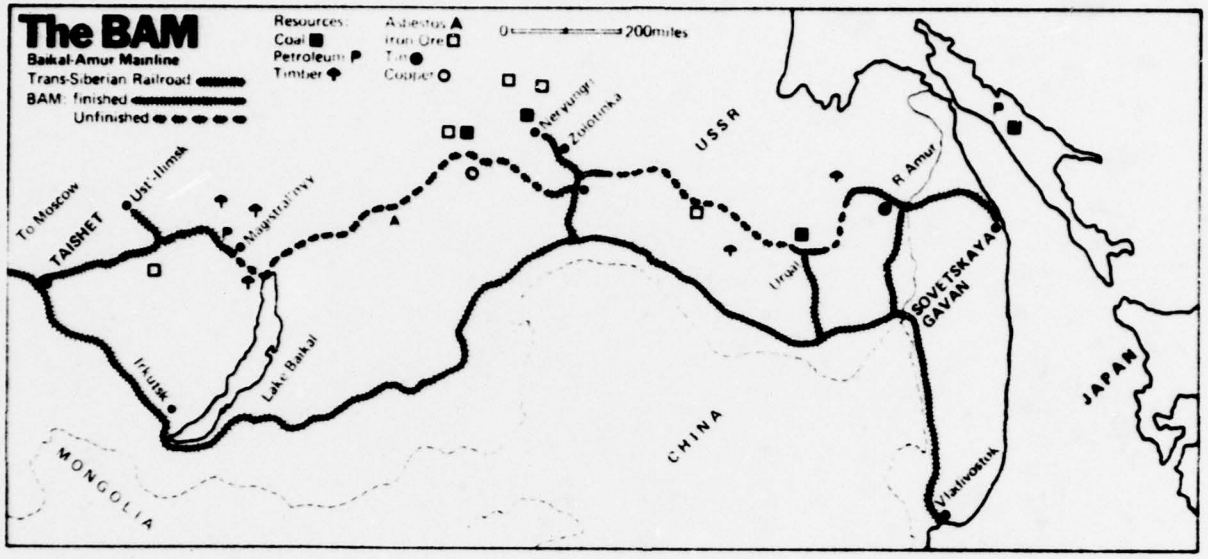


Map 1. The Baikal-Amur Railroad Mainline

Legend: ═══ Existing railroads
——— Completed BAM segments (Taishet-Lena and Komsomol'sk-Sovetskaia Gavan')
- - - BAM segment under construction(Lena-Tynda-Komsomol'sk and Bam-Tynda-Berkatit(Chul'man)
. . . BAM segment to be rebuilt (Berezovka-Komsomol'sk)

Source: Zheleznodorozhnyi Transport (Railway Transport) No. 10,1974, p.39.

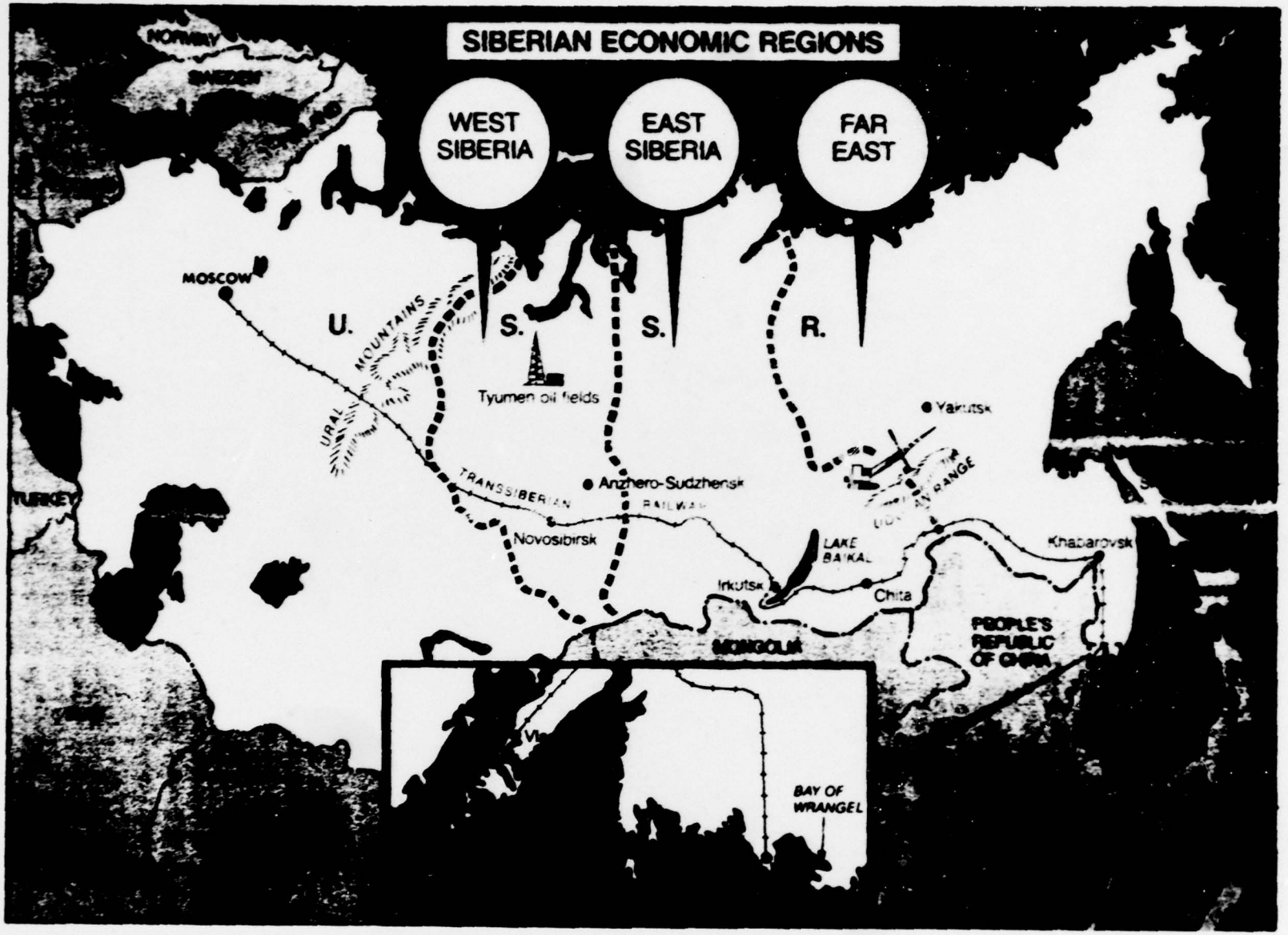
APPENDIX A.



Map 2.

Source: Smithsonian, Washington, D.C., February 1978, p. 38.

APPENDIX B.



Siberia—stretching from the Urals to the Pacific—encompasses many Soviet administrative and territorial divisions, but for purposes of economic planning, it is divided into three huge regions. The inset shows major ice-free ports of the USSR on the Sea of Japan.

Map 4.

Source: Problems of Communism, May-June 1972, p.3.