# Maps for Ordinary Consumers versus Maps for the Military: Double Standards of Map Accuracy in Soviet Cartography, 1917-1991

**Alexey V. Postnikov**

**ABSTRACT:** Soviet cartography shared several important characteristics with the Russian cartography from which it emerged. Geographical expeditions were extremely important for filling out the contents of both Russian and Soviet state topographic maps. Cartography had been centralized in many ways in Russian times, but the centralization became absolute under the Soviet system. At the same time cartography came under centralized control of the government in the State Cartographic Service, and the publication and use of large-scale maps were subject to governmental restrictions. The 1:100,000 map of the USSR was compiled in 1954, and was not designed to provide ordinary consumers with topographic information. Any maps for ordinary users, their scales notwithstanding, were based on the 1:2,500,000 map of the country. In the 1970s, the map was deliberately impaired by a cartographic projection that resulted in random distortions of the map's contents.

**KEYWORDS:** Cartography, topography, geography, geomorphology, surveys, security, accuracy, archives, Russia, USSR, air surveys, geodesy, geographical descriptions

## Introduction

During the Soviet era, only a few official historical overviews of the State Geodetic Service were published to commemorate the anniversaries of the agency; and the later they were produced, the less objective they were. With time, certain figures simply disappeared from the histories, and the roles of others were reduced as many historical facts became politically unpalatable. Nevertheless, some of those documents, together with genuine archival materials, were available for an outline of the State Cartographic Service's development. The most thorough book of this kind was 50 Years of Soviet Geodesy and Cartography (50 let sovetskoi...1967).

The main sources for this essay were archival materials, mostly those at the Fond [Collection] No. 8223 (Chief Administration of Geodesy and Cartography or GUGK) of the Russian State Archives of the Economy (RGAE) under the Federal Archival Service of Russia. The Fond suffered two important losses. In 1941, when the GUGK had to leave Moscow in a hurry, some of its files were destroyed (RGAE, Fond 8223, opis'1, p. 5). The next calamity with the Fond occurred in 1991, when social turmoil in the country forced the GUGK to withdraw all the personal files of its higher officials from the archives. Later, those files disappeared without a trace. The losses were mitigated somewhat by using the family archives of S.G. Sudakov, the former Chief of the Department for Surveys and Topographic Maps at the GUGK.

Despite the danger of being too close to the situation—I had been associated with GUGK for many years—I draw in this essay on my own knowledge of the facts and information supplied to me by senior colleagues, with the understanding that this information may be modified as more perspective on the period is gained. Another important source, the archives of the Soviet Military Topographic Service, could not be used, either, because they are still closed to public. Instead, I depended on staff recollections recorded in the files of the Chief Administration of Geodesy and Cartography.

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## The Legacy of Pre-Revolutionary Russian Cartography and Changes in the Political and Socio-Economic System after 1917

From its early days, Russian cartography had been under the highly centralized control of the government. Drastic restrictions were imposed on compiling, publishing, and using large-scale maps.

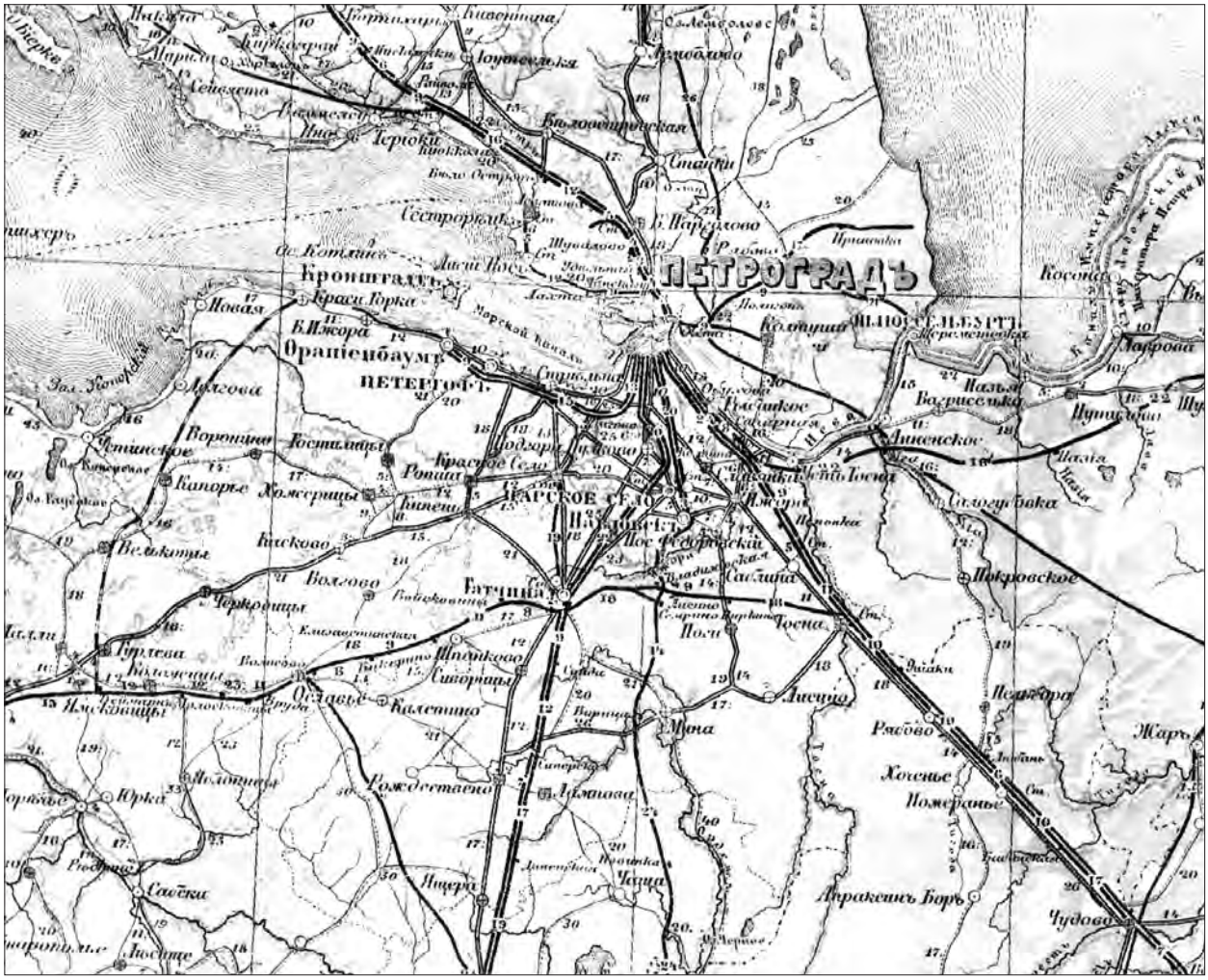


**Figure 1**. *Military communication and strategic map of Russia*, 1: 840,000 (1919). Detail of the vicinity of Petrograd.

When compared with other developed countries, the mapping policy of the Russian state had yet another peculiarity. While frontier and colonial cartography was actively developing, the coverage of Russia's own territories in Europe and Asia was relatively poor. Maps at a scale of 1:126,000 covered less than half of European Russia. The most thorough surveys at 1:42,000 and larger were conducted for the territory that was designated the "Western Boundary Expanse," and for Crimea, Novorossia, Moscow and the Saint-Petersburg region, Western Caucasus, and a few small areas in Siberia and central Asia. The pre-revolutionary maps of these areas were reprinted and used until the early 1930s.

The Higher Geodetic Administration was founded in 1919 and renamed several times in subsequent years:

1926-1928: Geodetic Committee
1928-1930: Chief Geodetic Committee
1930-1932: Chief Geodetic Administration
1933-1935: Chief Geological–Hydrological–Geodetic Administration
1935-1938: Chief Administration of State Survey and Cartography (GUGSK)
1938-1991: Chief Administration of Geodesy and Cartography (GUGK)

From the very beginning, the activities of the Higher Geodetic Administration were interrelated with those of the Military Topographical Service. The geodetic and cartographic activities of both agencies were coordinated by the Permanent Counsel Board of the Military Topographical Branch of the Red Army's General Headquarters, which was established by a decree on May 30, 1925 by the All-Soviet Council of the People's Commissars and the Military Revolutionary Soviet (RGAE, Fond 8223, opis' 1, # 1099, sheet 25). On April 21, 1940, special guidelines were approved to coordinate topographical, geodetic, and cartographic activities conducted by the GUGK and the Ministry of Defense and Navy (RGAE, Fond 8223, opis' 1, # 774). These guidelines


**Figure 2.** *Military communication and strategic map of Russia,* 1: 840,000 (1919). Detail of Western Belorussia.

empowered the GUGK to map all the territories of the USSR, except for areas within ten kilometers of naval bases, military installations of the Coast Guard, state borders, and "The Special Regions" under the jurisdiction of the Ministry of Defense. The latter could only be surveyed by military topographers and Navy hydrographers. First-order triangulation, first- and second-order leveling, and first-order astronomical observations became the responsibility of the civil geodetic service, with the Ministry of Defense controlling all the GUGK's activities that had military importance. All military and civil surveys and mapping had to conform to the general rules and programs developed by the GUGK and coordinated with the Ministry of Defense (RGAE, Fond 8223, opis' 1, # 774. Sheets 1-2). Subsequently developed instructions and accuracy standards were intended to provide uniform topographic materials and maps. In 1951, a special meeting of high officials from the civil and military topographical agencies finally codified these standards and instructions (RGAE, Fond 8223, opis' 1, # 1623).

The Higher Geodetic Administration did not start active work until as late as 1922-1923. The agency's evolution reflected the power struggles between the different Bolshevik factions and leaders of the period. In 1922 there was even an attempt to disband the young agency altogether (Komedchikov 2000b, pp. 5-8). The attempt failed and the special Scientific-Technical Council of the Higher Geodetic Administration under Professor F.N. Krasovsky (1878-1948) generated new theoretical and methodological foundations for topography and geodesy in the country. At first, due to the Civil War and other needs of the Bolsheviks, the Higher Geodetic Administration could not really organize any new surveys on the Russian territory and compile the necessary topographical maps. As a result, Soviet cartographers had to depend on pre-revolutionary materials. They continued to reprint the most important military topographical maps (with scales of 1, 2, 5 and 10 versts (1 vertsta = 1066.8 meters) to one inch) and military communication maps, using old plates (Figures 1-3).


**Figure 3.** *Military communication and strategic map of Russia,* 1: 840,000 (1919). Detail of Western Georgia.

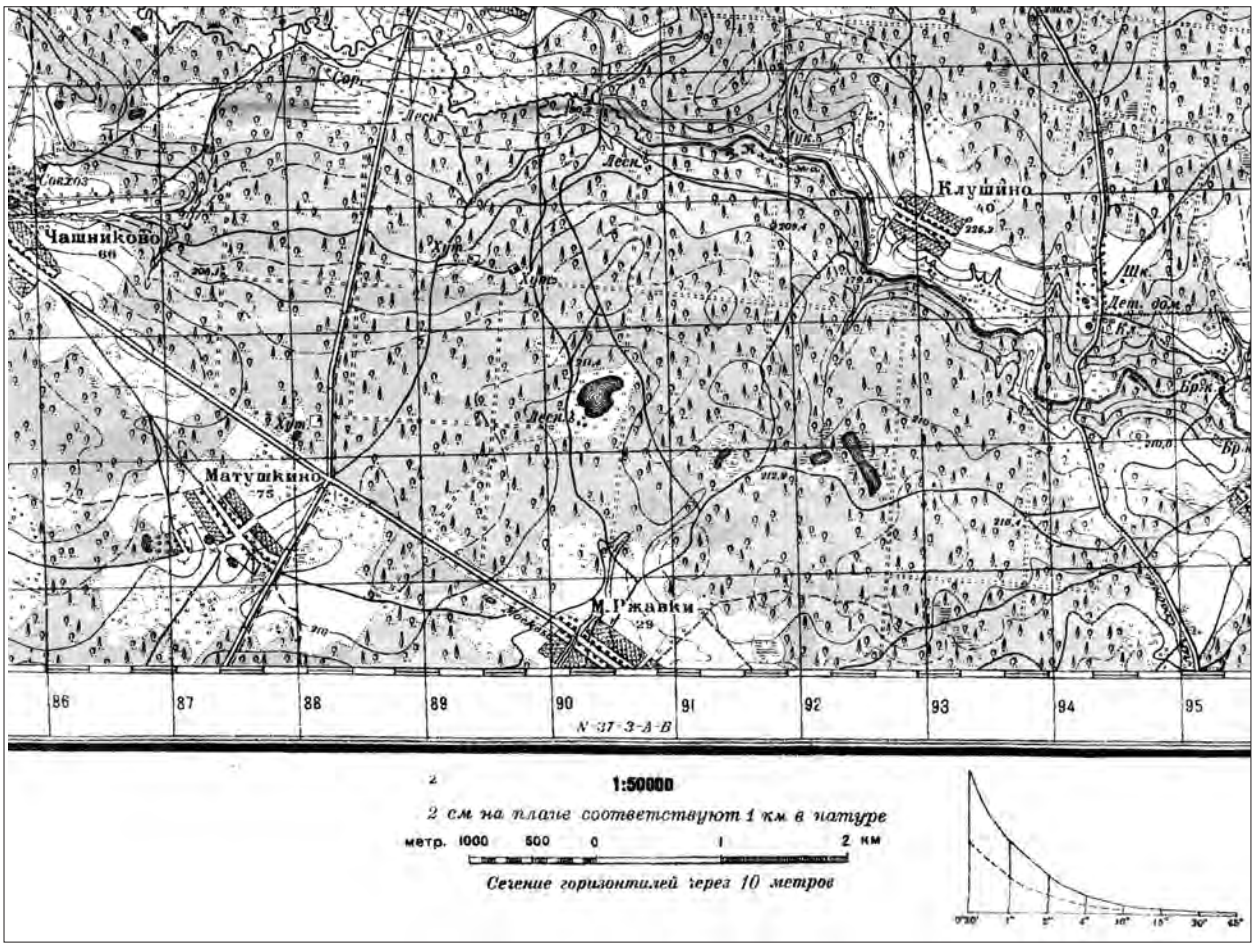


**Figure 4.** *The topographical Map of the Moscow Province* (1925-1926), 1:50,000. Detail of the region to the north of Moscow.

After the official change to the metric system, the Higher Geodetic Administration began to compile new topographical maps in this system using old sources and changing the maps' symbols. The 1: 42,000 Topographical Map of the Moscow Province, which used a printed military topographical map, was one of the first maps to be compiled in this way during 1925-1926 (Figure 4).

In the nineteenth century, printed maps with scales larger than 1:420,000 covered only a minor part of the European Russian territory. To make matters worse, the results of some of the surveys of the time were not published. The administrators at the Soviet cartographic service decided to finish these works and publish them using the new symbols and the metric system. The so-called General Mende's Surveys were the most imposing unfinished Russian cartographic project of the nineteenth century. The surveys, which began in 1848 under the supervision of Lieutenant General A.I. Mende (1800-1868), were the first example of the coordinated efforts by the country's main topographical and geodetic services to create a "universal" topographical map meeting the needs of a broad range of users. The majority of the maps and detailed geographical descriptions drawn up as part of that program remain at the Russian State Archives in manuscript form (Postnikov 1989, pp. 150-155). By 1926, Soviet cartographers published some 790 sheets of topographical maps at 1:100,000, using Mende's manuscript materials and a few new surveys (RGAE, Fond 8223, opis' 1, # 1099, sheet 28). In 1929-1930, to facilitate the introduction of new technology in geodesy, air survey, and cartography, the Soviet state geodetic survey initiated active contacts with the United States Coast and Geodetic Survey and with such private American firms as Brock and Weymont Incorporated Engineers (RGAE, Fond 8223, opis' 1, # 78, Sheets 19-20).

During the New Economic Plan (1921 to early 1930s), some of the Higher Geodetic Administration surveys and mapping projects were paid for as commercial works by the organizations and industries that ordered them. Concurrently, the State's

control over the surveying and mapping activities of different ministries and departments outside the Higher Geodetic Administration's sphere of influence began to loosen. As Stalin's totalitarian regime strengthened, however, this situation could no longer be tolerated. As a result, in 1931-1933, a series of governmental decrees put all mapping activities and relevant control functions under the Soviet State's supervision (RGAE, Fond 8223, opis' 1, # 83, Sheets 1-4). In 1935, all these functions, together with civil geodesy and mapmaking within the responsibility of the Chief Administration of State Survey and Cartography, came under the direct supervision of NKVD (the Soviet security police) (RGAE, Fond 8223, opis' 1 # 678). At that time the chief of the NKVD was G.G. Yagoda. After he was executed as an "enemy of the people" in 1936, his successor, "the Terrible Dwarf" N. Yezhov (1895-1939), administered the most severe stage of Stalin's purges from 1936 to 1938. The State Cartographic Service became a real military institution in terms of regulations and discipline.

By the late 1930s, it became obvious that the topographic study of the country was far from fulfilling the demands of the developing economy. As was customary at the time, the situation was explained in terms of class struggle and sabotage. The report on the 1938 General Plan for Mapping the Territory by the Moscow Regional Branch of Geodetic Service and Cartography, under the NKVD, stated that "subversion in cartography had led to a situation in which one of the most populated and industrially developed parts of the Soviet Union was not covered by a modern map with the scale of 1:500,000 or larger" (RGAE, Fond 8223, opis' 1, # 546, sheet 21). There were two categories of large-scale mapping envisaged under the 1938 plan. The regions of the first category included not only European Russia, but also the parts of the Soviet Union under the exclusive control of the Main Administration of Prisoners' Camps (GULAG). Depending on the significance of a given region, the mapping was to be performed at 1:10,000, 1:50,000, 1:100,000, 1:200,000, and 1:500,000 (RGAE, Fond 8223, opis' 1 # 546, sheets 5 verso, 52-53]. By 1941 only a few regions had been surveyed in accordance with the project. Once again the Soviet leaders blamed the "enemies of the people" for all the postponements and inadequacies of their plan's fulfillment [RGAE, Fond 8223, opis' 1, # 1099, sheet 38].

About 1938, the Soviet Union strongly denounced Hitler's Germany in its official propaganda. In reality, however, Stalin was making a great effort to cooperate with the Nazis and to adopt some of their administrative approaches and strict disciplinary practices. Previously inaccessible official correspondence and other documentary history of the State Cartographic Service under the NKVD provides us with an example of Stalin's double-face political dealings.

The NKVD supervisors introduced the new regulations for the State Cartographic Service, as shown in the previously undescribed file with the official correspondence and drafts of those regulations. The very first document in the file—a translation of the "Law on the State Cartographic and Topographic Surveys" signed by Hitler on July 3, 1934—demonstrates the Soviet leadership's secret admiration for the Nazi legislation (RGAE, Fond 8223, opis' 1 # 202, sheet 3; Komkov 1949, pp. 11-12). However, long before the Soviet State Geodetic Service was placed under NKVD supervision, the Service's regulations bore an uncanny resemblance to the Nazi regulations decreed in Hitler's 1934 Law. The Soviet government and the NKVD made sure the adopted regulations were even more severe than the Nazi blueprint. For instance, the official regulations issued by the NKVD for the Chief Administration of the State Surveys and Cartography (GUGSK) specified that "all persons found guilty of publishing maps failing to conform to the standards created by the Chief Administration of the State Surveys and Cartography of the NKVD, or of compiling maps without the said Administration's permission, would be prosecuted as criminals" [emphasis in document] (RGAE, Fond 8223, opis' 1 # 588, sheets 1, 2). Another example refers to professional titles. The Soviet State Cartographic Service did not have any specific criteria for professional titles, until the NKVD copied and implemented a decree that created a special Qualifications Evaluating Commission within the GUGSK responsible for awarding the scientific degrees of Candidate and Doctor of Sciences in geodesy and cartography.

A number of prominent Soviet scientists, including Professors M.D. Solov'ev, F.N. Krasovsky, A.S. Chebotarev, M.K. Ventsel, A.A. Mikhaylov, and B.V. Fefilov, served on the Commission. NKVD officer V.D. Tatarnikov was appointed Chairman of the Commission to represent the Security Service's interests in the Commission's activities (RGAE, Fond 8223, opis' 1 # 531, sheet 260. A member of the Commission, P. A. Kobozev (1878-1941) helped Tatarnikov in his ignoble pursuits. According to an official letter signed by Professor Mazmishvili, rector of the Moscow Institute of Engineers of Geodesy and Cartography (MIIGAiK's), "P.A. Kobozev, a member of the Bolshevik Party from 1898, in all his activities . . . was constantly struggling with the traitors of the people, and recently, on the bas[is] of his materials,

a number of persons were exposed, who happened to be enemies of the people . . ." (RGAE, Fond 8223, opis' 1, # 913, sheet 258).

Stalin's purges were especially severe in the late 1930s. During the 1939 celebration of the Twentieth Anniversary of the Higher Geodesic Administration, Chairman Tatarnikov was entrusted with the introductory report. According to this report, the main achievement of the Geodetic Service was that, "It could crush the enemies of the people, spies, saboteurs, fascist bastards from the Trotskiy-Bukharin's clique and scorch their snakes' nests that they had created even within the administration of the Geodetic Service. All the staff at the Topographical-Geodetic Service is mobilized and actively involved in liquidating the consequences of the subversion" (RGAE, Fond 8223, opis' 1 # 599, sheets 4-5).

In December 1938, when L.P. Beria replaced Yezhov as head of the NKVD, the Chief Administration of the State Survey and Cartography became an independent agency within the Cabinet (RGAE, Fond 8223, opis'1 # 588). This change notwithstanding, the agency's military style and behavior persisted, affecting the activities of industrial enterprises and scientific research institutes that had to use maps. For instance, in 1935 the GUGSK strictly prohibited the Academy of Sciences' Institute of Soils to organize the Institute's own Map Bureau to store soil maps (RGAE, Fond 8223, opis' 1 # 202, sheet 59). In his diary, Soviet scientist Academician V.I. Vernadsky (1863-1945) commented on the strange and abnormal situation created by the severe rules of the State Geodetic Service on map usage:

> May 11, 1941. A curious feature of our times is the unexpected and incomprehensible organized ignorance. This pathological phenomenon influences our lives greatly. Two circumstances are most conspicuous here. The first is a ban on synoptic [weather] maps. [It] led to the distortions in the work of the previously highly developed Main Physical Observatory. Not only are the maps no longer printed, but even [the mentions] of cyclones and anti-cyclones have disappeared … . The second circumstance has to do with geographical maps. Everything is distorted [on them]. Here, the censorship exceeded everything [that we had encountered] lately . . . (Vernadsky 1995; Mochalov et al. 1999, pp. 150-63).

Nevertheless, Soviet cartographers continued to work and achieved some real successes. Detailed and up-to-date atlases such as the *Atlas of the Industry of the USSR* (1928-31), *Atlas of the Moscow Oblast* (1933), *Atlas of the Leningrad Oblast and Karelian ASSR* (1934), and the USSR volume of the *Large Soviet Atlas of the World* were produced and their value acknowledged at the International Exhibition in Paris in 1937, where the *Large Soviet Atlas of the World* was awarded the Grand Prix.

Ironically, the relative sophistication and scientific correctness of the pre-war Soviet maps would later serve as a pretext for enforcing severe censorship and strict limitations on the distribution of maps published for sale. Attempting to explain away the crushing defeats suffered by the Red Army during the first months of WW II, Stalin's propaganda blamed the defeats on the public availability of detailed Soviet maps to the enemy. According to persistent rumors circulated at the time, new Soviet maps and atlases had apparently been purchased *en masse* by foreign embassies on the eve of the war. The Germans, in particular, were said to have cleaned out the entire stocks of these materials. Then, as Stalin's policy-makers implied, they used them when bombing the Soviet industry, transportation systems, communications, and agricultural enterprises.

These accusations had harsh consequences for some of the implicated maps and atlases, not to mention a few cartographers responsible for their compilation and distribution. For instance, large-scale maps of Moscow and the Moscow *oblast* (province) were banned from free circulation, removed from libraries' map rooms, and, in many cases, even burned. Detailed thematic maps, regional atlases, and even the second volume of the *Large Soviet Atlas of the World* became difficult to find. In the case of thematic maps there was another important consequence: Data on industrial productivity and some types of production were excluded from these maps for the next half century. The symbols used for industries merely showed which plants and factories there were in a given town, and their sizes, which before had indicated the size of the industrial output (RGAE, Fond 8223, opis'1 #129, sheet 1), reflected the size of the town's population, not its industries.

As for the Soviet topographic maps, they relinquished their secrets in the first few days of Germany's assault on the Soviet Union. On June 28, 1941, the Germans occupied Minsk, the site of one of the main, and still functioning, cartographic agencies, where hundreds of thousands of topographic maps had been stored for shipment by special trains to the Red Army. The Germans seized all these newly printed maps, as well as the agency's equipment, cartographic raw materials, and original plates. Shortly thereafter the German Military Cartographic Unit (Krigs Karten- und Vermessungsamt) under Major Waldenschpul began printing Soviet topographical maps from the confiscated original plates, adding the necessary German legends. The plant's equipment

and materials "moved" with the front. They were shipped to Kaunas (Lithuania) in November 1943, and less than a year later, they were transferred to Königsberg, where they were finally captured by the Russians and returned to in Minsk. The Nazis also seized the Kharkov cartographic plant in the Ukraine, which was used during the war to print both Russian and German topographical maps (RGAE, Fond 8223, opis' 1 # 1035, sheets 3, 120).

## Soviet Postwar Large-scale Cartography and its Double Standards for Map Accuracy

After World War II, security regulations for topographic maps did not change. The 1948 special instructions for using and storing topographic maps required that they "must be kept in the way accepted for secret and office-use documents . . . Persons who, as a result of poor storage or negligent use, lose or misuse a map qualified as <<secret>> or <<only for office use>> will be subject to criminal prosecution" (RGAE, Fond 8223, opis' 1 #1227, sheets 16-19). Even professional topographers who received topographic maps for their field surveys had to sign an undertaking to use the maps in accordance with the rules. If the materials were lost, the responsible surveyor could be sentenced to up to eight years in prison.

The war had taught the Soviet leadership a lesson where basic large-scale cartography is concerned. Learning from that lesson, Stalin decreed that the first priority for the Military and Civil State Topographic Services after the war was a survey of the entire territory of the Soviet Union for a 1:100,000 topographic map. This grandiose project was completed in 1954. The map was based on air surveys performed in the remote regions of Siberia and the Russian Far East, using relatively sparse points of astronomic geodetic control. The network of those control points was adjusted by photo-triangulation. That method minimized work in the field but could not exclude it entirely. During each field session, topographers had to conduct extended traverses in the wilderness of the Siberian *taiga* and mountains in order to provide control points for air photography. As of 1951, all field parties included a Deputy Superintendent on Political Matters whose job was to conduct political and security surveillance of the surveys for the Communist Party and the Security Services (RGAE, Fond 8223, opis' 1 # 1711, sheets 1 -2).

Surveyors and cartographers experienced the full force of Stalin's cruelty. Many surveying parties suffered terribly from lack of transportation, food, and other necessities of camp life, and while no exact figures are available, the death toll due to exposure to cold, famine, and predators was considerable. Working as a surveyor and geographical editor in Southern Yakutiya in the 1960s, I found many traces of the tragic fates of my predecessors. During a forced one-month break in surveying due to forest fires in the valley of the Buom River (Aldano-Uchur Mountains, August 1963) I found a *labaz* (a field storage platform constructed on top of three trees cut at some four meters' height) destroyed by bears. On the trunk of one of the trees, the following sad story was written:

> All my reindeer had perished. The Yakut deer herd died. There is no more ammunition. The food stores became bears' prey. I am left with a very sick junior surveyor on my hands. I have no transportation or means of subsistence. I shall try to force my way to the River Gynym, and then to the Aldan. November 20, 1948, Senior Surveyor N.

November in Yakutiya is bitter winter, with temperatures never rising above minus 20 degrees Celsius. Considering, moreover, that Gynym River is at least 200 kilometers from the camp where I saw the inscription, it is highly unlikely that the courageous surveyor and his ailing helper had reached the scarcely populated valley of the Gynym River alive. All my later efforts to find out anything about the fate of that survey party have been in vain. Even now, all archival files on the casualties during the surveys for the 1:100,000 National Topographic Map Project are closed to researchers. Information on this important, national mapping project is hard to find, perhaps because toward the end of the project (March 1953), the Chief Administration of Geodesy and Cartography was again placed under the Soviet Security Service's supervision, functioning as a department of the Ministry of Internal Affairs of the USSR until March 9, 1960.

The National Topographic Map Project had nothing to do with providing ordinary consumers with quality large-scale maps. A map at the scale of 1:100,000 fell into the category of secret materials and could not be used even as a source for any general-purpose map. Large-scale maps for ordinary consumers had to be compiled using the 1:2,500,000 map of the Soviet Union, with relevant parts enlarged to the needed scale. In this way tourist maps and maps of the administrative units (such as regional and *oblast* maps), usually compiled at 1:600,000, showed only the most general data for the main towns, villages, and roads. Even special road maps and atlases for

tourists contained no information as to whether the roads were paved with macadam, or whether they were stone or dirt roads. With no coordinates shown, the roads served to delineate national, provincial, regional or local administrative jurisdictions. As a result, the maps performed poorly as orientation aids for tourists and other consumers.

In the 1970s even the basic 1:2,500,000 map was deliberately impaired in a very tricky way. Higher authorities of the Main Administration of Geodesy and Cartography of the Council of Ministers of the USSR ordered its Central Research Institute to perform the task. Professor G.A. Ginzburg, the leading specialist in mathematical cartography at the Institute, constructed a special cartographic projection, the application of which led to implementing random distortions in coordinates, distances, and directions on the map. Ginzburg was awarded the State Prize for this achievement.

Limitations on Soviet cartography were relaxed only after the perestroika. In 1989 the Military Topographical Service of the General Staff and the GUGK began to publish maps for sale to ordinary consumers and for use in business, industry, and agriculture. The maps had scales of 1:200,000 and smaller and were based on topographic maps stripped of military and other information deemed confidential (Liuty and Komedchikov 1999, p. 21).

## Geographic Awareness in Soviet Cartography

In pre-Revolutionary Russian topography, geographical expeditions were the order of the day, requiring intensive professional training of topographers in geography and geomorphology. As early as 1802 the Map Depot and Quartermaster Corps of the Russian Army used a manuscript that was a major step forward in solving the problems of mapping typical features of the Earth's surface. This document was "written by Colonel Baron Kalemberch in the Service of the Russian Emperor and translated from French by Major Carbonier d'Areit of the Quartermaster General's Department of His Imperial Majesty's Court" (Rossiyskiy gosudarstvennyy…, Fond 93 (P.K. Sukhtelen), opis' 1, # 683, sheets 1-31). A large portion of the manuscript was devoted to different aspects of geomorphology (using the modern term). It demonstrated the need to know the origin and development of features on the Earth's surface in order to map them properly.

Geographical awareness among the Russian topographers was further enhanced through the mapping efforts in Siberia, which developed considerably as a result of a new administrative system designed by Count M.M. Speransky (1792-1839), the Governor General of Siberia as of 1819. Speransky established a special Siberian Commission to develop a program for organizing the administration and economy of Siberia and studying its natural resources and possible uses. Engineer Batenkov (1793-1863), the manager of the office of the Siberian Commission, who later became a prominent Decembrist, compiled a Draft Plan for Exploring Siberian Territories (Russian State Library, Fond 20 (Baten'kov), Kart.12, # 12). The Plan outlined a research program for the geographical, cartographic, and geodesic study of Siberia to explore and expoit its natural resources. Alexander I's most influential courtiers, A.A. Arakcheyev, A.N. Golitsyn, D.A. Guryev, V.P. Kochubey, Kampenhausen, and Speransky, signed the Plan's executive summary.

The Plan became the primary procedural guideline for all subsequent efforts by the Military Topographical Depot (MTD) and Corps of Military Topographers in the little explored corners of the Russian Empire. Its accomplishments in the fields of topography and geodesy were eventually summarized by A.P. Bolotov (1803-53) in his "Course on Advanced and Basic Geodesy." The course stressed that "topographic maps should not only depict noteworthy features, preserving their relative size, appearance, and location, but also describe the very nature *of the terrain* [my emphasis], on which these features are located" (Bolotov 1837, p. 2).

Russian cartographers in the first half of the nineteenth century placed major emphasis on the geographical verisimilitude and accuracy of topographic maps. As a matter of fact, geographical accuracy became an integral part of the Russain cartographic tradition. A treatise written in 1854 by O.F. Stefan, Superintendent of the General Staff, provides a clear sense of the legacy of the ideas advanced by the Russian military topographers at the dawn of the nineteenth century. Stefan emphasized the need to use geomorphology to ensure the geographical reliability of the cartographic representations of the landscape.

These geographical traditions in cartography developed actively in the Soviet times. Mapping practices and geographical studies have been inseparable, and this circumstance enriched both cartography and geographic science. One of the first assignments of the Soviet state geodetic service's newly founded Research Institute of Geodesy and Cartography [TsNIIGAiK] was to perform a five-year

(1928-1933) systematic investigation of the "Creation of Methods for Geographical-Cartographic Surveys . . . " (RGAE, Fond 8223, opis' 1, # 78, sheets 36-37). The TsNIIGAiK's director, professor F.N. Krasovsky, supported the project with all his authority, pointing out that:

> Sometimes Topography is being replaced by Geometry, and those landscape features that definitely have to be shown during a survey are absent on the topographical plan . . . To proceed from the survey materials to the topographic map, and, more importantly, basic geographical map, one should understand the region in the geographical sense during the survey itself (Krasovskii 1932).

On March 4, 1934, while discussing the difficult situation with large-scale mapping, the Scientific Board (headed by Professor M.A. Tsvetkov) of the Russian Cartographic Trust, or the All-Union Cartographic Trust, reached the conclusion that one should urgently organize special geographical explorations to serve the objectives of large-scale mapping. At the time, the Scientific Board continued to develop and update the method of using nineteenth-century topographical materials for compiling new maps. Geographical investigations played a key role in those methods (RGAE, Fond 8223, opis' 1, # 167, sheets 37, 148).

In the same year, celebrating the fifteenth anniversary of the Soviet Geodetic Service, Professor A.A. Borzov (1874-1939), the famous geographer and geomorphologist of Moscow State University, stressed in his presentation that geographers have a special reason to praise the Service. In his words, "nowhere in the world such close ties between geography and cartography exist as in this country." Nobody at the meeting pointed out that the ties had been traditional for Russian cartography. Professor M.A. Tsvetkov, an outstanding geographer and cartographer of Moscow State University and MIIGAiK, even wrote that "Tsarist Russia had nothing like a civil cartography or professional training program for civil topographers" (RGAE, Fond 8223, opis' 1, # 137, sheets 5, 8-9). Given that before the revolution Tsvetkov had been a professor of the Konstantin's Land Estate Measuring [Geodetic] Institute (which became MIIGAiK in Soviet times) and the editor-in-chief of the famous *Atlas of the Asian Russia* [*Atlas Aziatskoy chasti Rossii...*(1914)], a major Russian achievement in civil cartography and geography, this statement is difficult to comprehend. But as a Russian intellectual with "a past," he was under a permanent threat and could not probably have written otherwise. The stand he took would not save him, though, as he was later sentenced to five years in prison (1939-44) and to ten years of subsequent exile as an "enemy of the people."

In 1935-37 special geographical expeditions were organized by the TsNIIGAiK to serve the objectives of large-scale mapping. The researchers formulated their main observations as follows:

> The generalization of a map's content is not a mechanical task but, rather, an analytic pursuit of the successful result, informed by the right scientific understanding of the geographical landscape type. To solve this problem, a cartographer should choose the number of features to be mapped depending on the geographical landscape type. While drawing those features, he must take into the consideration a geomorphological structure of the land's surface (RGAE, Fond 8223, opis' 1, # 243, sheets 1-3; 53-55).

The recommendations of the TsNIIGAiK's expeditions were approved by the Institute's Scientific Council, which included such prominent Soviet geographers, cartographers, and geodesists as Professor Y.M. Shokal'sky (1856-1940), Member of the Academy of Sciences of the USSR; Professor F.N. Krasovsky (1878-1948) and Professor N.G. Kell' (1883-1965), Corresponding Members of the Academy of Sciences of the USSR; Rear Admiral Professor V.V. Kavraiskii (1884-1954); Professor M.A. Tsvetkov (1875-1960); and the famous Soviet Arctic explorer, Professor R.L. Samoilovich (1881-1940). The chairman of the Council was A. E. Fersman (1883-1945), outstanding Soviet geologist and Member of the Academy of Sciences of the USSR (RGAE, Fond 8223, opis' 1, # 241, sheet 55, 65).

The results of the expeditions were analyzed in the *Proceedings of the TsNIIGAiK* (Filonenko 1938). In 1938 the GUGSK approved special "Basic Guidelines on Geographical Works for Compiling Maps with the Scales of 1:100,000 and 1:200,000 and for the Explorations of the Permanent Polar Expedition" (RGAE, Fond 8223, opis' 1, # 677). The guidelines' compiler I.P. Zarutskaia (1908-90) later served as the editor-in-chief of the 1: 2,500,000 map of the USSR and became an outstanding Professor of Cartography at Moscow State University's Geography Department. Her professional career was typical of the careers of the "Old Guard" cartography professors, both at the Moscow State University and at the MIIGAiK. All of them had "graduated" from the difficult and demanding "Field School" of the State Topographic Surveys and Mapping, and the most outstanding among them formed the Soviet scientific school of geographical cartography. Professor

K.A. Salishchev (1905-88), after having surveyed Arctic Siberia, developed the geographical aspects of cartography first at the MIIGAiK and then at Moscow State University. The Chief Editor of the Topographic-Geodetic Service of the GUGK, N.S. Podobedov (1908-91), who was responsible for the geographic content of the 1:100,000 State Topographic Map (1946-54), would become the Chair of Field Cartography and the Geography Department at the MIIGAiK.

Zarutskaia's guidelines stressed the introduction of "geographical editing and proofreading to ensure geographic accuracy in depicting the geographic specificity of a terrain." Zarutskaia was convinced that the geographical study of a territory would elucidate the laws of the relief structure's formation and the territorial distribution of its features. The knowledge of such laws would help to simplify the interpretation of air photographs and cut down on the number of traverses necessary for obtaining vertical control points. The geographical expeditions would thus lead to a reduction of the volume of field work.

As regards methods, the guidelines determined that "the geographer's personal observations [underlined by Zarutskaia] on the traverses should be the main way of obtaining geographical data, the observation's results being represented in the notes, drawings, and sketches in the field log of geographical observations." Aside from the observations on the traverses, special places had to be chosen in the different typical landscapes. Geographers were supposed to stay at those places for some time in order to conduct an in-depth exploration of the natural features and their images in air photography. After completing the observation and data collection, they were to compile thematic maps on geology, geomorphology, soils, vegetation, and other themes, depending on the region's geographical character. Steps were also to be taken to ensure that geographers obtained data by interviewing the region's inhabitants. Such inquiries usually referred to seasonal phenomena, such as the times of river ice breakup, floods (and their extent), and freezing of rivers (RGAE, Fond 8223, opis' 1, # 677, sheets 1, 2, 8-19).

In addition to the guidelines, Zarutskaia compiled the "Main Principles for Geographical Explorations for the Permanent Polar Air Surveying Expedition of 1939 (in the region of the Lena delta)" (RGAE, Fond 8223, opis' 1, # 677, sheets 38-41). The principles specified that general visual studies were to be conducted from an aircraft flying at 3,000-3,500 meters altitude, while special air visual survey trips were to be flown at 500 meters altitude so as to distinguish the most typical and least geographically clear features.

The Moscow Air Survey Enterprise's (MAP's) field geographical explorations were continued in 1940-1942 as a prominent part of the Noril'sk Polar Expedition. The expedition's teams traversed some 4,000 kilometers by foot without any transportation and conducted detailed explorations on 40 model points with different landscape characteristics to find out the exemplary features of different natural phenomena portrayed on air photos. The last wartime geographical expedition was organized to determine the boundary between the Northern and Middle Ural Mountains. Collection of native geographical names was of great significance in all those expeditions. The geographers traveled with a small team of natives, including an interpreter. All toponyms had to be written in Russian as well as in the native languages. Then, they would be discussed and approved by the members of a regional tribal council (RGAE, Fond 8223, opis' 1, # 1100, sheets 78-75, 62-66).

The intensive experimental and theoretical work conducted by the TsNIIGAiK and the field units of the GUGK on the cartographic application of geographical expeditions led to changes in higher education curricula for cartographers. On April 5, 1936, Decree No. 637 of the Soviet Government considerably strengthened the training program in geographical subjects for the specialty of geodesist-cartographer. The decree proclaimed that thorough training in physical geography, social geography, and regional geography should be the main focus of a cartographer's education. By force of this ruling, the curricula had to include the following courses in the field of geography: dynamic geology, oceanography, hydrology, meteorology, edaphology, botanical geography, zoogeography, geochemistry, geomorphology, application of physical geography to cartography, geomorphological mapping, methods of field geographical-cartographic investigations, methodology of social geography, general and economic statistics, elements of demography, ethnology, social geography of the capitalistic world, geography of the international division of labor, methodology of regional geography, social geographical mapping, and history of geography (RGAE, Fond 8223, opis' 1, # 414, sheets 9-20). This curriculum changed and developed with time. At the Moscow State University, geographical subjects with their mapping applications continue to be the core of cartographers' training. At the MIIGAiK, cartography continued to be taught and now its significance is an accepted fact, especially thanks to studies of the

Earth's resources using remote sensing.

The "pure geographers" were commonly engaged in surveying and mapping. It was especially true during World War II, when all Soviet geographers were directed to serve the needs of the military (Sovetskie geografy. . . (1985), by compiling and using various maps. Not surprisingly, after the war they emerged with a deep appreciation and understanding of maps. Figure 5 illustrates a detail from a historically very interesting Soviet map of the World War II period. A strictly secret map of Berlin at 1:25,000 compiled for Stalin on April 29, 1945, this map played a key role in planning the last assault on the German capital.

During the war, the Commission for Geographical-Geological Services of the Red Army was established at the Academy of Sciences to supply the armed forces with military geographic descriptions and comprehensive military geographic maps. A special mapping group under the direction of I.P. Gerasimov was established within the commission. The group was based at the Institute of Geography of the Academy of Sciences of the USSR and developed a number of new methods for comprehensive and landscape mapping applicable to wartime needs under the direction of Gerasimov, Ye. M. Lavrenko, and A.S. Kes' (Komedchikov 2000a, p. 21).

With time, the relative importance of geography and geographical training in military cartography began to weaken. The development of remote sensing, photogrammetric instruments, geographical information systems, and automated cartographic systems facilitated that change. Military surveyors

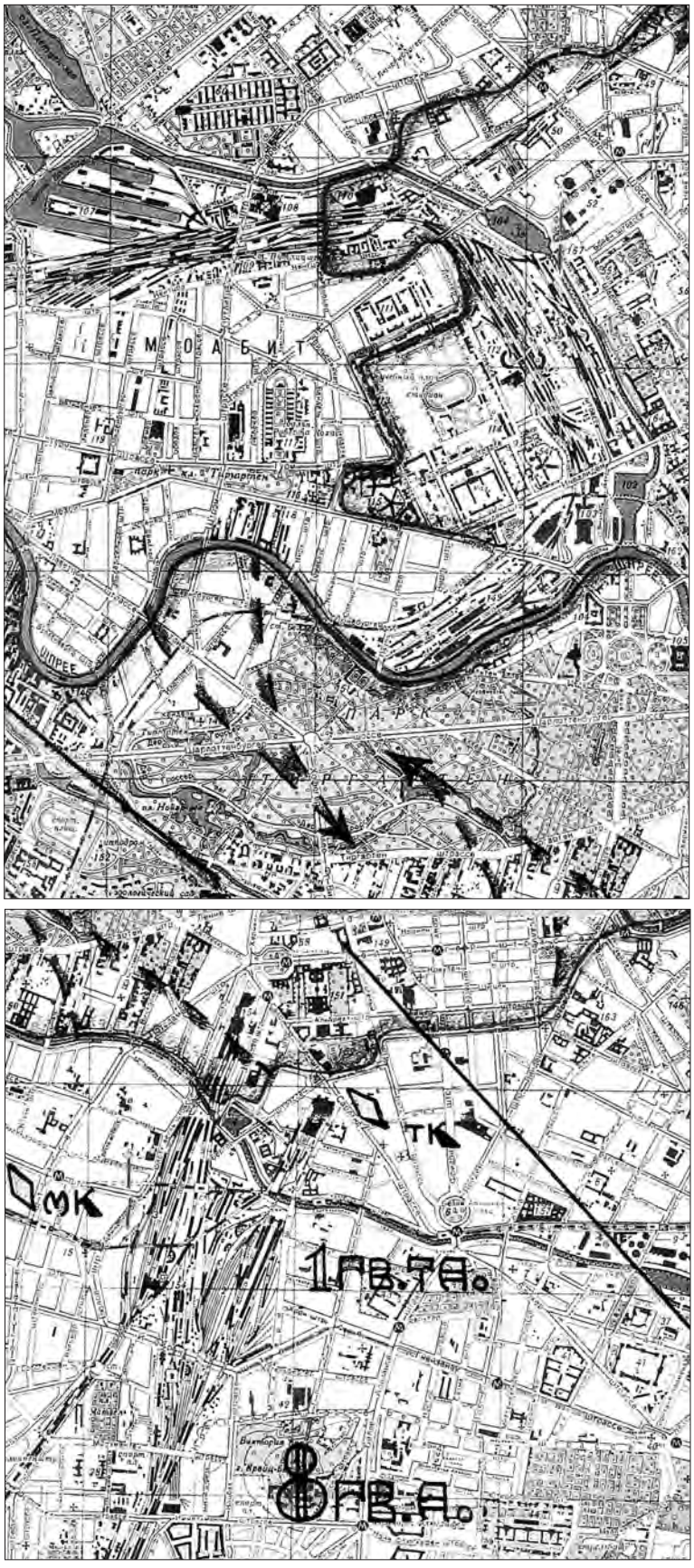

**Figure 5.** Soviet map of the World War II period. Two details from a strictly confidential plan of the city of Berlin at 1:25,000, compiled for Josef Stalin on April 29, 1945. It was used to plan the final assault on the German capital. [Source: Agoniya Tret'ego Reikha: Vozmezdie *(Agony of the Third Empire: Vengeance) 2000*].

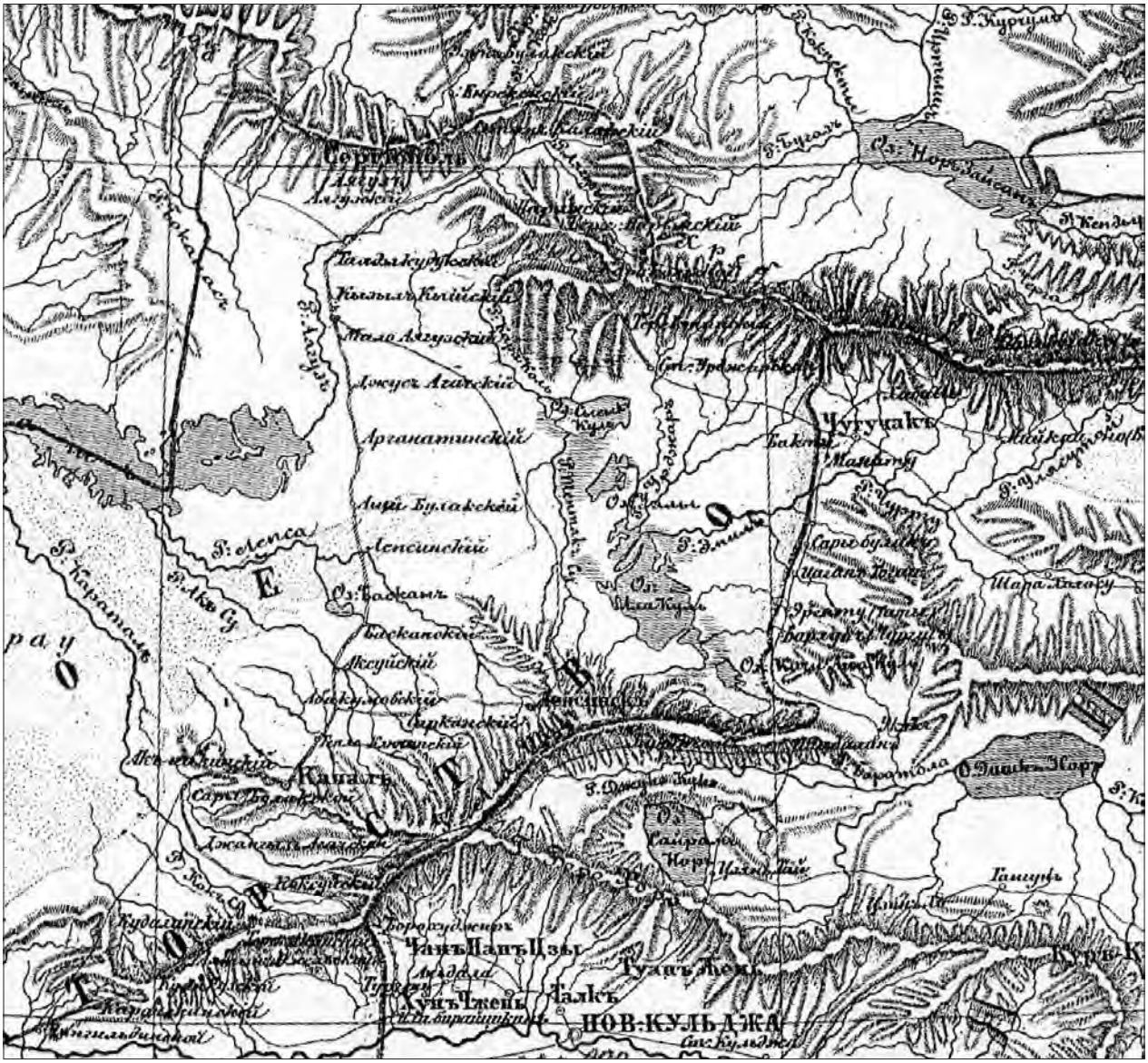


**Figure 6**. A small-scale map showing the positions of Chinese boundary forts constructed after 1759. [Source: Galkin 1869].

and cartographers depended more than their civil colleagues on purely instrumental methods. That led to a kind of "geographical nihilism" in the Soviet Military Topographical Service and its educational institutions. As a result, courses on geography were excluded from the curriculum of military topography colleges. Only military cartographers who graduated from the higher-level Military Engineers Academy received an education in GIS and military geography.

This development created a strange situation. Although, in theory, topographical maps compiled by civil and military cartographers should be similar in their geographical content, they were, in fact, different. During my studies of historical and modern maps in preparation for the discussions with the Chinese on the Sino-Russian boundary dispute, I encountered some examples of the lack of geographic awareness on the maps of the Military Topography Administration (VTU). Our assignment was to trace the line of the Sino-Russian boundary on the contemporary landscape. The boundary changed in some places over its more than hundred-year history. As a result, the officially agreed upon line does not necessarily correspond to the line that is being guarded. In some places, the proper delineation was lost due to the disappearance or destruction of the boundary marks (pillars, poles) or landmarks that had been mentioned in the official Sino-Russian boundary

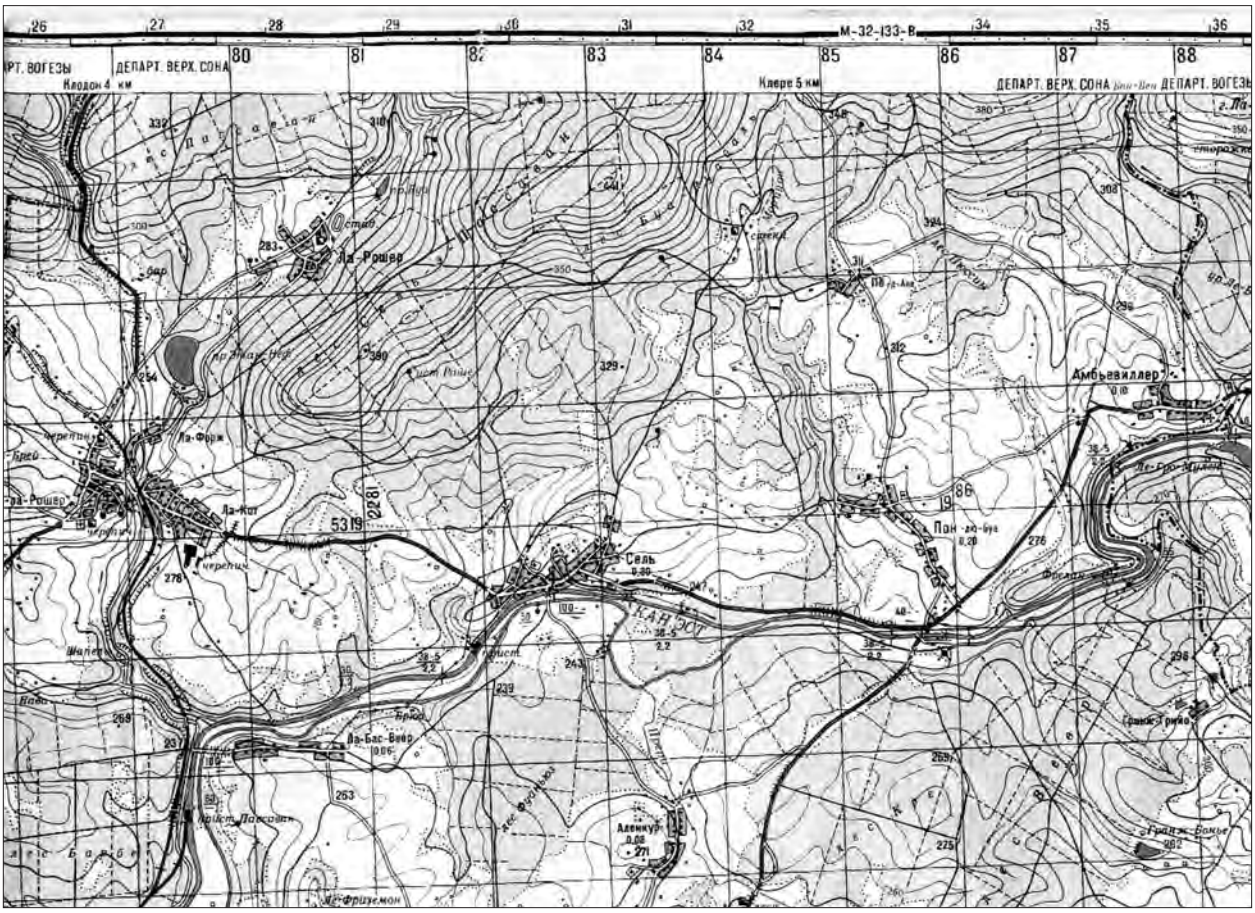


**Figure 7**. A recent Soviet topographical map (1989) at 1:50,000. Detail of a region in France.

treaties. One of the longest of the lost portions of the boundary line is in the Kazakh semi-desert region to the east of Alakol' Lake near the foothills of the Saur and Tarbogatay Mountains. There the boundary line had been delimited in accordance with the Protocol signed by the Russian and Chinese representatives on September 25, 1864, in the Chinese town of Chuguchak. The line approved by the Protocol was drawn up based on the relief and the positions of Chinese boundary forts constructed shortly after 1759, namely, "the forts of Kumurtchi, Kara-bulak, Boktu, Vey-tantsy (in Russian, Koktuma), Manitu, Sary-bulak, Chagan-togoy, Ergetu, Barluk, and Modo-Barluk" (Formirovanie sovetsko-kitaiskoi granitsy...1974, 68: 262-265) (Figure 6). This represents the distance of more than 40 kilometers. No Chinese forts have survived there. The Russians demolished all of them in the late nineteenth century.

Strictly speaking, nobody could say anything definite about the boundary line in this region before the correct positions of the forts could be found on the present-day landscape. Our objective, eventually successful, was to find those positions. The success was achieved mainly thanks to the very high geographical precision of the Russian topographical maps that had been surveyed and compiled during the period of the boundary's delimitation. I found two sources that were especially useful for this work. The first source was "The Survey of the Stretch of the Sino-Russian Boundary from the Northern Outskirts of Alatau Mountains down to the Tarbogatay Ridge," at 1:84,000, compiled in spring 1862 by military topographer Nifant'ev under the supervision of Russian Boundary Commissar Colonel Ivan Babkov (RGVIA, Fond 386, opis' 1, # 6014). The second source was "The Report Map of the Topographical Survey of a Part of the Sino-Russian Boundary..." by Lieutenant Strel'nikov, Lieutenant of the Military Topographers' Corps Nifant'ev, and Topographers of the Second Grade Razmazin, Antipin, Loshakov and Larionov, who completed this map in 1862 under the supervision of Separate Siberian Corps Colonel of the General Headquarters Babkov. This map was at a scale of 1:210,000 (RGVIA, Fond VUA, # 25602). A study of genuine archival documents on how the maps were surveyed and

compiled indicated that although these maps were made using a reconnaissance geodetic control (astronomical observations and a triangulation in a local system of coordinates), their geometric correctness and especially "geographical precision" were extremely dependable. We had a very good chance to prove this in the field.

The Military Topographical Administration (the VTU of the Soviet Army) provided us with a specially published recent map of the area at a scale of 1:50,000. This map, of the type shown in Figure 7, was compiled using remote sensing data and the most sophisticated automated stereophotogrammetric plotter. So, we had in the field both the sheets of this modern map and the original copies of the historical materials. Virtually from the first steps of our reconnaissance we found that the old materials were much richer in landscape features than the new map. The region is almost a desert, and it lacks well defined outlines. This fact was highly evident on the modern map, which showed only sand and relief contours. The old materials meticulously showed even such minute details of the desert as small dry river beds, areas of polygonal clay surfaces, salt marshes, and permanent dunes.

At the place where the former Chinese fort Sary-Bulak stood, we encountered one especially representative example of the old map's superiority in geographical precision. The fort had been constructed near a small creek ("Sary-Bulak" means "yellow or muddy creek" in Kazakh) in the foothills of the Saur Mountains. Additional contours of the "Report Map of the Topographical Survey of the Part of the Sino-Russian Boundary" showed a mountain slope covered by many small mounds in the vicinity of the fort. Evidently, those mounds had developed as a landslide formed on an inclined underground bed of waterlogged pebbles. As that was a very rare natural phenomenon in the region, this landscape feature was quite unusual. We found the mounds in the landscape, but we could not detect them on the modern 1:50,000 topographical map. Although the modern map was four times larger in scale than the map compiled in 1862, it only showed an even slope at that spot.

Thanks to such tiny but nevertheless important natural features on the old Russian maps, military topographers from our party could pinpoint the probable positions for each of the ten Chinese boundary forts on the present-day landscape. A small team of archeologists from the Russian Academy of Sciences was invited to verify our results. We did not tell them what they were supposed to find in the places that we had marked with special poles. But the archeologists did find remains of ground works of some buildings in the vicinity of each pole. They confirmed in their official reports that those buildings had been constructed in the Chinese tradition of defense forts dating to the second half of the eighteenth century. Their conclusion helped us to prove to diplomats that we had, in fact, found "the lost boundary line" delineated by the official Sino-Russian Treaty. Our success underscored the importance of historical cartographic studies and strengthened belief in the high quality of Russian topographical maps made in the nineteenth century.

## Conclusion

This essay is intended only as a skeletal history of Soviet large-scale cartography in its three essential lines of developments, which are dealt with in the corresponding sections of this paper. The first section shows that the Soviet field surveys and mapping inherited pre-revolutionary practices and priorities, despite all the changes in the administrative character of the official cartography during Soviet times. After the Revolution, the supervision of the large-scale cartography by the centralized state continued and strengthened, culminating in the rule of the KGB and special legislation similar to and partly based on the Hitler's Law on the State Cartographic and Topographic Surveys. In the second part of the paper it was shown that such development had an important consequence for ordinary consumers of maps (as opposed to the military). Their "large-scale" maps were in fact enlarged sections of the 1:2,500,000 map of the Soviet Union with a specially distorted projection. In the third part of the study we showed that while the old traditions of geographical precision of Russian large-scale mapping survived and developed in civil cartography during the Soviet era, they significantly declined in the topographical maps compiled by the military topographical service in the last decades of the twentieth century.

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