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The Influence of Terrain, Seasons, and Weather on Operations in Russia.

The Russian terrain, by and large, is distinguished by the following characteristics:

1. The terrain north of the Caucasus and west of the Urals is not mountainous but flat.

2. There are no rock formations with the exception of those in the Russo-Finnish border territory between the area north of Leningrad and Petsamo.

3. It includes vast swamp regions and a multitude of small, local swamps.

4. It has very large, contiguous woodlands (Central and Northern Russia).

5. It comprises immense, contiguous areas without forests or even trees (Ukraine and Southern Russia).

6. The soil is composed of loess and clay in Central and Northern Russia, and the so-called black soil in the Ukraine and Southern Russia.

7. Sandy plains are scattered among the loess and clay formations.

8. Salt steppes extend between the lower course of the Volga and the Don, along the Caspian Sea, and north of the Caucasus.

9. The rivers are gently falling lowland rivers which frequently



have marshy banks and are therefore accessible only with difficulty. For considerable distances they are deeply embedded and have steep embankments.

10. There are only very few hard-surfaced roads. Most of the traffic is conducted over dirt roads.

The decisive factor determining the feasibility of operations (march and combat) is the weather of the season and its effect upon the condition of the terrain. During the so-called muddy periods, the movement of motorized and horse-drawn vehicles on any but hard-surfaced roads is practically impossible. These periods range from the second half of April to the end of May or the beginning of June (in Southern Russia the muddy period sets in approximately two weeks earlier than in Central and Northern Russia), and from about the middle of October to the beginning of the cold season (the second half of November in Central and Northern Russia). Throughout this time the dirt roads and the terrain become mires, and the rivers and brooks are in flood. But not even all of the hard-surfaced roads are absolutely safe during the time of the spring thaws. In the spring of 1942, after the ground had begun to thaw, I myself saw how the top layer (road surface) of the hard-surfaced main highway between Smolensk, Roslawl, and Moscow became soft and soggy in numerous places which extended for dozens of kilometers. Moreover, there were deep gaps of from one to two meters width across the entire surface of the road. Even this highway could be kept open for vehicular traffic only by means of superimposed corduroy roads.

In the fall of 1941, while in command of the 52d Infantry Division,



I marched my division over a distance of 80 kilometers during the muddy period toward the end of October. The march, which was necessitated by the military situation, led over an improved dirt road. The division did not carry along any excess baggage. In lieu of motor vehicles, it was equipped with the light horse-carts used by the native population. Each gun was pulled by two teams of horses.

After four days of marching, soldiers and horses were close to exhaustion.

During the muddy period the difficulties of supply are greatly increased, and supply operations must be reduced to an absolute minimum. They are, of course, dependent upon the railroads and hard-surfaced roads. Transshipment of supplies to troops located away from the main arteries of traffic causes great difficulty and can be handled only in a limited volume. Light horse-carts and soldiers formed into carrier details are the only feasible means of transport. Moreover, such operations lead to considerable losses among the horses. Toward the end of summer and during winter, we adopted the following procedures. Wherever the situation had led to position warfare, we established so-called mud-period supply dumps in the combat area, which held ammunition and rations for from four to six weeks. We were thus able to suspend supply shipments during the muddy period. In the spring of 1942, the 52<sup>nd</sup> Infantry Division, which I commanded, was located in the vicinity of Juchnow (halfway between Smolensk and Moscow). While there, the division ran short of oats for its horses. There was no other alternative but to have a fresh supply of oats dropped by planes. Even while we were engaged in a war of movement, we were compelled to make



timely provisions for the period during which the mud would force operations to be suspended. This is much more difficult than in the case of static fronts.

It is therefore impossible to conduct operations during the muddy period. The best seasons for military operations are summer and early fall (June to the middle of October), and the frost period from the middle of November to the beginning of severe winter weather (toward the middle or end of December). Later on, the intense cold and, even more so, the large masses of snow would be a major handicap. Even the frost period is not well suited to combat because soon after its onset the frozen ground does not permit the digging of field fortifications. The soil must then be loosened with small explosive charges. During the most severe winter period the soil becomes frozen down to one and one-quarter meters below the surface.

An important factor during the summer and early fall, the periods most favorable for operations, often is the effect of rain on the condition of the terrain and the dirt roads. During midsummer, rainfalls are negligible. At best they last several hours, but hardly ever a whole day. Precipitation increases in the early fall. Several hours of rain soften the dirt roads enough to impede motor traffic along the low-lying stretches of the road enough to impede motor traffic along the low-lying stretches of the road to a considerable extent. A rainfall lasting from twelve to twenty-five hours softens the roads to such an extent that motor vehicles are able to move only with very great difficulty. For a period of from twenty-four to forty-eight hours even track-laying vehicles are unable to



move cross-country over clay and black soil. When the abortive thrust against Suchinitschi was launched toward the end of July 1942, my division - the 52d Infantry, which at that time was attached to a Panzer Corps - participated in the operation. We were located about 100 kilometers northwest of Orel. The soil contained a lot of clay. During one stage of the fighting it rained for twelve hours. As a result, the 4th Panzer Division of the corps, comprising tanks and motorized artillery, was immobilized for almost 24 hours. The horse-drawn artillery of my division, however, was able to move, though only with difficulty.

Movement on sandy soil is less affected by rainfall than movement on other types of soil. As a matter of fact, rain has sometimes a beneficial effect. There are sandy regions in which the wind accumulates dune-like sand drifts, especially atop crests of wavy terrain. The effect of one-meter-high drifts, of fine sand covering a long stretch of road is similar to that of snowdrifts. However, it is practically impossible to dig out the roads because the sand caves in at once. Furthermore, it is impossible to keep the sand from trickling off a standard shovel. Only once during the course of 1,500 kilometers of marching through Central Russia with my division did I encounter an obstacle of this nature. In that instance we suffered a six-hour delay and our horses became badly exhausted. Trucks could only pass this stretch of road by driving over boards and by pulling each other out. Motor vehicles with little road clearance had to be dug out time and again, and had to be pulled for several meters. The major part of the division was



able to take a detour.

Swamps and woods affect movements and combat operations in Russia the same as in other countries. Worth mentioning is only the fact that woodlands in most instances consist of vast virgin forests, and that, <sup>even</sup> unimproved roads are very scarce in those areas. The woods in the extreme North of Western Russia, along the Finnish border, are largely impenetrable and entirely unsuited for military operations. They either grow on swampland, or they rise above rocky ground with trees growing among boulders which are sometimes as high as a one-story house. Nevertheless, the woods are very dense. While I was in command of the 20th Mountain Army, which fought in Northern Finland (Lapland), it was split into two groups by such a forest which was 400 kilometers wide and deep. This immense area was held by only one Finnish Waldjaeger (Light Mountain Infantry) Battalion. The swamp areas, too, are frequently very widespread. The fact that the woods and swamps extend over such large areas is of tactical as well as strategic importance.

The Ukrainian steppes, so far as I know them, are nothing but well-cultivated, arable land, composed of black soil. Vast areas of this land are completely devoid of woods. Even individual trees are very rare. Rainfall has a stronger and more lasting effect than in Northern and Central Russia because the mire becomes even deeper. It is important to note that wood for the improvement of roads (corduroy roads) must be procured from far-off places, whereas it can be obtained locally in most other parts of Russia. Applied to Southern Russia, the frequently used term "steppe" is misleading. The lack of woods, and the fact that in



former times vast areas had not been placed under cultivation, may be responsible for this misnomer. It is only correct insofar as it is applied to the salt steppes between the lower course of the Volga and the Don north of the Caucasus, and along the shores of the Caspian Sea. These areas are not known to me from personal experience, for which reason I shall not discuss them.

A characteristic feature of all Russian terrain, except in wooded, swampy, and sandy areas, are long stretches of land serrated with ravines, most of which are narrow and often fifty meters deep. Their length often extends to several kilometers. Their banks are very steep in most instances. Such ravines are mainly found in flat country, where rain and melting snow cannot drain as rapidly as in wavy terrain. The water erodes the soil, and the rifts so created gradually become ravines. South of Kaluga, I saw an area of fifty square kilometers serrated by numerous ravines, most of which ran parallel to each other. There also are many ravines of this type in the plain south of Orel. These, however, are spaced far apart. Individual ravines are rather common. However, where they exist in great numbers they constitute a serious obstacle to tank operations. Nowhere but in Russia is aerial reconnaissance so important for the tactical as well as the strategic commitment of tanks.

The Caucasus is not known to me from personal experience.

The above-mentioned terrain features must be taken into account in the planning of operations. Operations are particularly dependent upon the favorable seasons which I have mentioned. For that reason,



large-scale surprise operations during other seasons are impossible. The Russian winter offensive cannot be cited as an example to contradict the above statement inasmuch as the German army at that time was very limited in its fighting capacity. Since the beginning of the war it had received hardly any replacements. (The 52d Infantry Division, for instance, had lost almost 2,000 combat troops by the middle of December 1941, and received only 250 replacements.) Numerous units had been dissolved. Existing units had not enough men to hold the sectors assigned to them. The armies were already separated by large gaps. Immediately after the beginning of the Russian winter offensive, the lack of winter equipment caused additional large losses. The success of the Russians was primarily due to their ability to advance along the gaps and the poorly covered sectors, and the fact that German units were maneuvered out of position and had to realign their forces in order to avert the constant threat of being cut off. Because of the snow it was impossible for the German forces to regroup, as changing conditions would have required. Thus, there was no other alternative but to retreat. Except on the roads which had been kept free from snow, the Russians moved up only little artillery, which, incidentally, they were unable to supply with sufficient ammunition.

The organizational setup must also be adapted to the peculiarities of terrain and climate. The question as to whether ground forces composed solely of tank and motorized elements without infantry support can wage a successful campaign in Russia is of primary importance and should be made the subject of a special study. On the basis of a superficial appraisal



I would answer in the negative. In any organizational setup, primary importance must be attached to suitable combat and transport vehicles. We employed dozens of different types. They did the job, although there were difficulties and disadvantageous features. On the other hand, there were certain types among them which were most suitable for operations.

Nothing is certain in war. Although plans may call for a lightning campaign, as was the case with the German Army High Command in 1941, the vastness of the country, and the fact that no one can ever determine Russian strength and potential power with complete accuracy, require that also plans for a winter campaign be drawn up. Thus, in planning operations, careful preparations for winter warfare must be included. The fact that the German army found itself badly handicapped by the lack of preparations for the winter of 1941 could be compensated somewhat by the experiences which many of the veteran troop commanders had gained during the Russian campaign of World War I.

If the lower Danube should enter into operational plans, it is to be noted that the bridging equipment employed by all European armies is useless from Belgrade to the Black Sea, because prevailing winds cause waves several meters high. Even the American bridging equipment, which I saw during bridging operations across the Inn and Danube at Passau and Regensburg, respectively, is not suited for this purpose. The engineers of the former Austro-Hungarian Army developed a suitable bridge which rested on Danube barges. This bridge proved completely satisfactory and was used during World War I as well as in 1941.

For operations in the Caucasus, part of the troops must be organized and equipped for mountain warfare.



Terrain conditions in the countries of Eastern Europe bordering on Russia (Poland, Rumania between the Carpathians and the Danube), and also Central Hungary and Northern Bulgaria, are similar to those in Russia, even though they are not quite as pronounced.

Summary: Whereas operations (i.e., march and combat) in Central Western, and Southern Europe can be conducted during all seasons - with the exception of winter operations in the Pyrenees, Alps, Carpathians, and the Balkan mountains - they are determined by specific seasonal conditions in Russia. The underlying causes are the change in the condition of the ground, brought about by the spring thaws and continuous autumn rains, and the difficulties of coping with the large masses of winter snow. The retarding element of terrain conditions is particularly effective because hard-surfaced roads are largely non-existent, and dirt roads are subject to the same changes in the spring and fall as the ground. Even during the seasons best suited for operations, a short rainfall has adverse effects upon the condition of the dirt roads and the terrain in general. This latter condition, within the larger scope of terrain and climate, is one of the three primary factors influencing campaign logistics such as the mobility of vehicles and weapons, and the need for specific clothing and equipment. The other two factors are the almost complete lack of hard-surfaced roads and the hardships of life during the transitional periods and during the winter. However, a discussion of these problems falls under a different subject heading.

(Signed) Dr. Rendulic

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