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RAILROAD GAUGE DIFFERENTIAL AND THE TRANSLOADING FACILITIES OF THE WESTERN SOVIET FRONTIER

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RAILROAD GAUGE DIFFERENTIAL AND THE TRANSLOADING FACILITIES OF THE WESTERN SOVIET FRONTIER

Summary

Uninterrupted through traffic by rail is not possible between the USSR and Central Europe, because Soviet railroads are 3½ inches wider in gauge than the standard European railroads. Traffic, therefore, must be transferred at the western Soviet frontier from tracks of one system to tracks of the other. Thirty-five special transloading stations for handling such cargo transfers are known to exist along the western Soviet frontier. The two principal methods used to accomplish such transfers are the following: first, unloading cars of one gauge and transferring the cargo to other cars of a different gauge and, second, adapting the running gear of rolling stock so that loaded cars can pass from tracks of one gauge to tracks of another without disturbing the load.

Although transloading is wasteful of manpower, time, and equipment, it has not proved a serious obstacle to intra-Bloc rail traffic. Existing facilities are now handling approximately 110,000 metric tons daily in each direction across the border, and maximum capacity is somewhat higher than present traffic levels. The Soviet Bloc, moreover, is capable of expanding facilities to meet any foreseeable increase in traffic capacity of the transfrontier railroad lines.

I. Introduction.

1. Importance of the Complex.

Land communication between the USSR and Central Europe depends almost entirely on railroads, but the gauge differential of the lines crossing the western Soviet frontier is a characteristic disadvantage almost unique in international railroading. Soviet rails are 5 feet apart, 3½ inches farther apart than standard-gauge European tracks, thus preventing Soviet broad-gauge locomotives and rolling stock from passing freely into the Satellite countries, where railroads are standard-gauge. Although the difference in gauge is of some defensive value to the USSR, it is a disadvantage in military movements against the West and in the normal traffic of the civilian economy. The defensive value is postulated on the assumption that the USSR will withdraw all locomotives in event of a retreat, forcing an invader to convert the Soviet railroads to standard gauge in order to use them. (Such conversion proved onerous to the German Army, which was unable to use the Soviet railroads for some time in 1941.) On the other hand, converting Eastern European rail lines to broad gauge would be infinitely more difficult for the Soviet Army than converting broad gauge to standard would be for an invader. It might not be necessary, however, for a westward-moving Soviet army to convert Satellite or Western European railroads to broad gauge, because the USSR already controls about 15,000 locomotives and 400,000 freight cars in the Satellite countries. 1/*

The difference in gauge, moreover, sharply reduces the strategic advantage to the USSR inherent in the steadily increasing density of the rail net from the Urals toward the west, which is the result of the requirements of the civilian economy. The increased density would otherwise constitute a strong military advantage for the USSR, particularly in offensive actions toward the West, because the facility of supply for an army corps on a fighting front depends directly on the density of the rail net in its rear area. A sparse net necessitates a deep rear area, which complicates supply and reduces the effectiveness of the entire corps.**

Three solutions to the gauge-differential problem are open to the USSR:

a. To convert the Satellite railroads to Soviet broad gauge;
b. To fit rolling stock with axles which readily can be adjusted to either gauge; and
c. To transload freight at change-of-gauge points from cars of one gauge to cars of the other.

All three of these devices are used, and some in combination, but the major tonnage of freight which crosses the Soviet frontier is transloaded. The disadvantages of transloading have military as well as economic significance. The cost in capital investment for transloading stations and the manpower allocated to the stations are burdens on the economy, and the time lost in transloading impedes civilian and military traffic alike. The vulnerability of the transloading stations themselves to air attack could have far-reaching consequences. A railroad system usually derives strategic elasticity from the density of its network because traffic can be rerouted from a line which may be blocked to other lines which are clear. This flexibility is limited along the Soviet frontier, however, because there is no transborder traffic on some lines which cross the frontier, and transloading stations have not been built. Through traffic therefore must be funneled through certain points of concentration.

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* Footnote references in arabic numerals refer to sources listed in Appendix B.
** The USSR network has a density of about 14 kilometers of track per 1,000 square kilometers of territory in the Kuban and Caucasus, 45 kilometers per 1,000 square kilometers between the Dnieper and the Don, and about 70 kilometers per 1,000 square kilometers along the western frontier. 2/

These targets do not offer a short cut to paralyzing Soviet Bloc rail traffic completely, because the simplicity of transloading stations allows them to be readily built, repaired, and rebuilt. They are, however, uniquely vulnerable to traffic interruptions and delays and to frequent reductions in east-west rail traffic capacity.

2. Historical Development.

The change-of-gauge problem is not new. Russia has carried on railroad traffic with Central Europe since 1865, when a treaty concluded with Prussia established direct transportation of passengers and freight between the East Prussian Railways and the Petersburg-Warsaw Railway Directorate. Between 1865 and World War I, railroad communication was established with Germany, Austria-Hungary, the Free City of Danzig, France, Belgium, and Sweden. After World War I, international traffic agreements established direct railroad communication between the Soviet Union and Estonia (1920), Latvia (1921), Germany via Latvia and Estonia (1923), Finland (1925), Poland (1926), Germany via Poland (1927), Austria through Poland and Czechoslovakia (1928), and Turkey (1928). Communication with the Near East was established in 1928 and with Rumania in 1935. Reloading of cars was needed for all traffic on all of these routes except to Estonia, Latvia, Finland, and Turkey. The economic policy of the USSR following World War I restricted rail traffic with the west to a fraction of its former level. Of the eight major routes via Poland, two were closed, and four were kept open solely for local traffic. The only two kept open for main-line traffic were equipped with axle-changing plants at the frontier.

Traffic was disrupted by World War II, and the treaties became void. New treaties were worked out after World War II reestablishing communications with Poland (23 November 1945), Czechoslovakia (26 November 1946), Rumania (1 July 1947 -- provisionally as of 10 September 1945), Hungary 1 December 1947 -- provisionally as of 31 August 1945), and with Finland (19 December 1947 -- provisionally as of 19 August 1945). The treaty with Poland provided for reloading of cars at the frontier, but it also permitted the transfer of loaded cars across the frontier by exchanging wheel-and-axle sets of one gauge for those of the other. 3/ In addition, the treaty provided for direct transport of passengers, baggage, and freight under one set of papers covering the entire route from the station of departure in one country to the station of destination in the other. The treaty also allowed transit transport across Poland for Soviet-German traffic.

Similar treaties were signed by the USSR with Czechoslovakia, Hungary, Rumania, and Finland. Each of these treaties specified the border-crossing points where cars were to be reloaded. These border points have two stations each, one in the USSR near the frontier and another across the frontier in the treaty country. All traffic was to be transloaded at the station in the country of its destination. Fifteen stations were listed in Poland for transloading freight, and five of these also were to serve passenger traffic. One station was listed for Czechoslovakia, one for Hungary, and six for Rumania. Although transloading is not necessary between the USSR and Finland, because Finnish railroads also operate on the 5-foot gauge, transloading was provided for at four border-crossing points between the two countries, and transloading sometimes occurs. Because the entire length of the present Soviet frontier is many miles west of its prewar position, all of the transloading stations established had to be newly built. A few transloading stations not covered by the original treaties have been added to the system. On the other hand, some stations have never been activated, others have remained comparatively unimportant, and some have been abandoned.

3. General Description of the Complex.

As the Satellite economies quickened under the impetus of the several Five Year Plans, east-west rail traffic increased, and by 1949 all of the major transloading points were handling far more freight than the 1945 transloading capacity. These yards had been expanded gradually since the war to the point where, for many of them, yard expansion was apparently no longer the most profitable manner of increasing over-all capacity. Additional transloading stations had to be built, and, because the stations had to be located on the major rail lines, which run east and west, rather than along the Soviet frontier, transloading-in-depth came into being. This required a dual-gauge line (parallel standard- and broad-gauge tracks) between the eastern- and westernmost transloading stations.

Insterburg, Brest, Przemysl, and the complex based on Chop are the most extensive installations. Brest has developed since 1945 from a simple change-of-gauge point with perhaps only one transloading station into the center of a complex of at least six transloading stations located along 25 miles of dual-gauge track which extends 16 miles into the USSR and 9 miles into Poland. These stations are, from west to east, as follows: Malaszewicze, Terespol, Brest-West, Brest-Central, Brest-South, Brest-East, possibly Brzozowka, and Zabinka. The Insterburg complex includes Insterburg, Neu Insterburg, Birkenfeld, possibly Klein Gnie, and Gerdauen. The Przemysl complex includes Zurawica, Przemysl, Medyka, Nizankowice, and possibly Lwow. The Carpathian complex includes Chop, possibly Uzhorod, and Mukacevo in Soviet Ruthenia, Cerna in Czechoslovakia, and Zahony in Hungary. A typical example of a smaller complex is Galatz in Rumania, where three transloading stations have been reported to exist, at Galatz-Brates, Galatz-Larga, and Reni in the USSR, with the possibility of other installations at Galatz-New Port and at Reni-Transborderea.

A list of the transloading stations known to be operating in 1950 is given below:

Transloading Stations in Operation on the Western Soviet Frontier 1950

USSR	POLAND
Heiligenbeil	Braniewo
Insterburg Complex	
Gerdauen) Birkenfeld) Neu Insterburg)	Korsze
Lososna	Kuznica
Berestovitsa	Krinki
Brest-Litovsk Complex	
Brest-Main) Brest-East) Brest-West) Zabinka)	(Terespol (Malaszewicze
Yagodin	Dorohusk
Rawa Ruska	Hrebenne
Przemysl Complex	
Medyka	Przemysl
Nizankowice	Zurawica
Carpathian Complex	
Chop) Mukacovo)	(CZECHOSLOVAKIA ((Cerna Nad Tisou ((HUNGARY ((Zahony

USSR	RUMANIA
Vadul	Dornesti
Ungeni	Iasi-Socola
Reni	(Galatz-Brates (Galatz-Larga

4. Organization.

The transloading stations apparently are not organised as a special branch of Soviet Bloc transportation as is, for example, the Soviet Danube Navigation Company but are administered by the separate railroad administrations under which all railroad operations in their respective areas are controlled. Thus the Malaszewicze and Terespol stations are administered by the Warsaw Railway Directorate, 1 of the 10 administrative regions of the Polish State Railways, whereas the Brest and Zabinka stations are administered by the Brest-Litovsk Railway System of the USSR Ministry of Railways. Transloading as such does not appear to have separate administration outside the authority of the local station masters, who are in turn subject to direction from the Traffic and Transport Sectors of their Regional Railway Directorate headquarters. Nor are transloading yards separated physically from local station yards. They are fenced in with and are under the same police surveillance as the local station yards.

Maintenance is not an administrative problem except at stations along the Soviet-Polish border where East German equipment must be serviced. At other stations, equipment can be serviced at system-of-origin facilities just over the frontier. What appears to be an overlap of authority occurs in the maintenance establishment at Brest, for example. There are two locomotive depots with repair facilities at the East Station yards, one for Soviet equipment and one for standard-gauge equipment. There is evidence 5/ that the standard-gauge depot belongs not to the Polish Railways but to the East German rail system, which operates German locomotives across Poland and into Brest-East Station in the USSR.

Little is known of traffic administration in any of the stations. Most of the material on this subject is supplied from prisoner-of-war (POW) interrogations and pertains chiefly to Polish transfer stations. Material on Czechoslovak, Hungarian, and Rumanian stations is very limited and often too old to be useful. Nevertheless, it is anticipated that review of Wringer and other POW reports will confirm the opinion that administration of traffic at Chop (where traffic is complicated by the fact that two different foreign systems, the Hungarian and the Czech State Railways, feed into this Soviet station) also is locally controlled and is little more of a problem than elsewhere.

5. Description of Freight Transfer Operations.

Two basic methods of transferring freight are used in the major transloading stations. In the first, called transloading, freight is physically removed from one freight car and reloaded into another car of different gauge. In the second method the wheels and axles of the car are adjusted to fit the gauge, and the car moves into the other system without disturbing the freight. Several ways of working both systems have been developed. The known methods are outlined below, but unreported methods may exist.

a. Transloading Methods.

(1) Cars of different gauges are parked in parallel rows on opposite sides of long platforms which are flush with the floor level of the cars. Freight of manageable proportion is removed by hand from one car to the platform, where it is reloaded into the other cars.

(2) Cars of bulk commodities such as coal, ores, or grain are shifted onto elevated sidings, 1 or 2 yards higher than the level of the track of the receiving cars. The material is shoveled by hand from the cars into wooden chutes which deliver it directly into the receiving cars.

(3) At a few stations some bulk materials are transloaded by car tipping. A device like a drawbridge elevates the car, lifting one end high in the air, which causes the ore or grain, for example, to slide rapidly into the receiving car. 6/

(4) Mobile equipment is transloaded between adjacent flat cars by spanning the gap with portable gangplanks. No platform is necessary. Since approximately 10 percent of eastbound reparations traffic 7/ and much more of westbound military traffic is made up of motor vehicles, this system permits important volumes of traffic to be transloaded without using fixed installations or equipment of any sort. The use of portable ramps, furthermore, permits vehicles to be off-loaded at any place in a yard and reloaded when convenient.

(5) In smaller yards, coal and ores have been manually transloaded with the use of canvas, stretcher-like containers borne between two men. It is not certain that this inefficient method is still in use.

(6) Small items, including scrap metal, are tossed by hand from one car to another. In 1945 and 1946, much valuable machinery was damaged by such rough transloading. This inefficient method has largely been abolished as yards have become specialized for various commodities.

(7) Fixed and movable cranes are used to handle heavy equipment. Cranes with grab-buckets also are used in reloading coal and ores where car-to-car loading is not practiced. At some points where large coal dumps are maintained along the tracks, trains are loaded by mobile cranes. (Brest and Przemysl have special areas for transloading coal.)

(8) No information has been disclosed on the transloading of livestock, and it is unlikely that appreciable numbers of live animals are shipped.

b. Axle Adaptation Methods.

(1) General.

There has been a tendency among US intelligence agencies to discredit the practicality of adapting the gauge of rolling stock by adjusting the axles, but it is now confirmed that a considerable part of Soviet east-west traffic has crossed the change-of-gauge points in adjustable-axle cars, and it is clear that this has been the case for many years. In the interwar period, Germany, Poland, the USSR, and the Baltic countries employed approximately 70,000 units of adaptable rolling stock in east-west traffic. Of these, 31,000 belonged to the USSR, 18,000 to Poland, and 13,000 to Germany. 8/ Czechoslovakia acquired 8,000 to 9,000 new adjustable cars between 1945 and 1948. 9/ Germany was paramount in developing adjustable axles; but since the war, dual-gauge rolling stock has been produced in Poland, Czechoslovakia, Hungary, Rumania, and the USSR as well as in East Germany.

Several types of adjustable cars have been developed, none of which has proved to be really successful. The simplicity of rolling stock design, particularly of the two-axle cars, is based on the rigidity of wheel-and-axle sets. No satisfactory method has been found for building a sufficiently rigid wheel-and-axle set which can be lengthened and shortened at will. The chief difficulty is that play develops between the wheel and axle, causing vibration, pounding, and excessive wear to all parts. Changing the length of the axle on cars which were built for only one gauge sets up stresses in load-bearing members for which they were not designed and in some cases brings the cars out of balance. Another difficulty is that the brake mechanism must be rehung to keep the brake shoes in alignment with the wheel rims when the axle is lengthened. In some cases it is not possible to align the brake linkage,

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and only half of the brake shoe can be brought to bear on the rim when axles are set for standard-gauge service. These disadvantages are not serious, but they complicate operations and cause delays.

It is doubted that the development of adjustable-axle locomotives for frequent transfer across the frontier has been undertaken. Satellite locomotives built for the USSR move to the frontier on standard-gauge axles. They apparently cannot do so under their own steam, however, because they are reported to make the journey "cold," with driving rods disconnected.

(2) Gauge Conversion Equipment.

The following four different types of gauge conversion equipment have been identified to date:

(a) The removable-wedge axle, on which splines are cut into both the axle and the wheel. Wedges which lock the wheel against both rotation and lateral displacement are fixed firmly into the splines. The wedges are fitted on the outside of the wheel for standard-gauge and on the inside for broad-gauge service. 10/

(b) The ring-and-key axle is similar in design and function to the removable-wedge axle described above. The axle and wheel are splined to take a key which locks the wheel against rotation. Each end of the axle is circumscribed with two concave channels into which a complementary convex ring will fit. The ring secures the wheel against lateral movement and is fixed into the outer channel for broad-gauge and the inner channel for standard-gauge service. 11/

(c) A telescopic axle has been reported, but confirmation is lacking, and no description has been received.

(d) An automatic camber-change hub which would permit cars to pass slowly from one gauge to another without adjustment or stopping was developed by the Germans. The spindles on the ends of the axles are bent slightly downward, so that on standard-gauge tracks the wheels run on a camber which toes-in the wheels 7/8 of an inch at the rim. As the car moves over the adjusting track section, a trip automatically rotates the axle one-half revolution, inclining the spindles upward and changing the wheel camber to a toed-out position. This gives the necessary increase in gauge at track level.

It is believed that this device was abandoned as being impractical.

(3) Axle-adapting Procedures.

There are also several different methods employed to effect the adjusting of axles. The exchange of bogies or trucks may be the simplest and most efficient method of adapting all rolling stock and is the only method of modifying four-axle (double-truck) cars. A simple operation removes a key from the king pin of the bogey, and the car is hoisted off its bogies with cranes and set down again on bogies of the other gauge. The brake linkage is no problem, because it is built into the bogey. The number of four-axle cars in service in the Satellites, however, is still a small fraction of total inventories. The exchange of bogies on four-axle cars has been reported at Galatz and may be done at Brest, Przemysl, Chop, Cerna, and Zahony as well, if not at other smaller stations.

(a) At Cerna in Czechoslovakia, cars are moved onto a section of dual-gauge track and parked over a pit. A mechanical -- possibly hydraulic -- lift elevates the wheels above the rails, and after wedges and brake linkage are loosened, the wheels are forced outward on the axles. The lift then moves the whole car 1-3/4 inches sideways and lowers it onto the broad-gauge rails. The earlier practice of forcing the slowly moving wheels out on the axles by a guard rail has been abandoned. There are two pits, one for eastbound and one for westbound traffic.

(b) At Zahony in Hungary, cars are parked over a pit where four men loosen the wedges and two men fix braces to the "movable rail," which is forced outward by two hydraulic cylinders. (The braces transmit a thrust to the top of the wheel equal to the thrust at the bottom, thus preventing the springing of the wheel or the axle.) The car is then moved to a second pit, where wedges and brake linkage are secured. 12/

(c) At Galatz in Rumania, loaded cars are lifted about 18 inches off the tracks by large cranes mounted on flat cars. Wheels are forced outward on the axles by screw jacks placed against the axle and connected to the wheel rims by chains and hooks. At this station there are 10 to 12 cranes, each able to lift one loaded car. 13/

II. Volume of Traffic under Various Circumstances.

1. Past Traffic Levels.

a. Prewar.

Reliable statistics reveal that railroad traffic between the USSR and Central Europe fluctuated widely in the decade before World War II. Traffic with Germany and Czechoslovakia across Poland varied between a high of 1,645,000 metric tons in 1931 and a low of 219,000 tons in 1934. In the last reported year, 1937, this traffic totaled 522,000 tons. In addition, traffic destined for Poland itself is estimated to have been about 175,000 tons, making total traffic across the Polish frontier approximately 700,000 tons, or a daily average of approximately only three trains. Prewar tonnage was only a small fraction of present traffic because the Satellites, which now trade almost exclusively within the Soviet Bloc, carried on most of their prewar commerce with Western Europe. These figures have little bearing on this study, however, because none of the present transloading stations was in service before World War II. 14/

b. World War II Period.

The history of wartime transloading has not been explored, chiefly because of the dearth of material, and it is unlikely that reliable material on Soviet transloading during the closing days of the war will soon be available. It is clear, however, that wartime traffic through the transloading stations now under review did not exist, except possibly for a very brief period.

c. Postwar.

Although reporting on postwar traffic has been poor, particularly before 1949, total traffic across the western Soviet frontier is tentatively estimated at 100 trains and 110,000 metric tons a day each way. This figure was derived from reports of traffic on some of the lines, the number of trains transloaded at some stations, the number of cars or the number of tons transloaded at other stations. The daily capacities reported for two coal and ore transfer installations were used, as well as the time required to effect the change of axles reported for two other installations. These figures were adjusted according to the date of information. Three secondary yards, for which no information was available, were arbitrarily allotted traffic levels commensurate with their importance as compared with other stations whose traffic levels were known. Where several figures exist, the mean was taken as the current traffic level. The margin of error is estimated to be about 20 percent.

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2. Projected Traffic Requirements.

a. Peacetime Economy.

The volume of traffic can be expected to rise at least 5 percent per year for 5 years, a rate of increase well within the capabilities of the railroads and the transloading stations to match.

b. Military Traffic.

Traffic to support stand-by forces in the western Satellites would put no strain on the transloading system. Existing facilities are delivering approximately 110,000 metric tons a day in each direction across the border. This would supply 60 divisions with 500 tons a day each and leave 80,000 tons a day to support the civilian economies. Only severe sabotage or bomb damage would create situations in which military requirements might not be met.

III. Capacities.

1. Basic Data on Facilities and Installations.

The full extent, condition, and capacity of facilities and installations at all transloading stations is not known. With minor exceptions, however, the approximate number of tracks, cranes, platforms, and warehouses can be estimated, and special areas, such as the coal-loading depot, can be located and described. The quantity and condition of transloading equipment is quite well-known for a few of the major installations and fairly well-known for many of the secondary stations. Maintenance of transloading equipment is not a serious problem. Except for a very few hydraulic installations, cranes are the chief items requiring maintenance, and the locomotive shops adjacent to nearly every yard are able to provide the necessary periodic checks and overhauls.

The efficiency of operations has improved greatly in the 5-year period since most of the stations were established. Careless or willful destruction of machinery cargoes in manual transloading has been reported only rarely since 1946. The increased use of mechanical lifting equipment and the development of special techniques for certain commodities have greatly increased the tons-per man and tons-per-day transloading capacity of all but the most unimportant stations.

Transloading is no longer hampered by seasonal factors to the same extent that it once was. The construction of warehouses beside platforms has reduced losses in goods and time because of bad weather. Figures permitting the comparison of transloading capacity for winter and summer, or for fine weather and foul, are not available.

2. Estimates of Present Capacity.

The aggregate capacity of all transloading stations on the western Soviet frontier has been estimated at about 185,000 metric tons a day in each direction. This figure is only approximate, as sufficiently firm data to permit an accurate estimate are not yet available.

Based on the estimate for aggregate current traffic of 110,000 metric tons of freight a day in each direction given in II 1c, above, the aggregate capacity was estimated by using the highest credible reported traffic levels for each station, rather than the mean levels, and by making some allowances for the expansion of facilities which undoubtedly has gone on since June 1950. The estimated level of traffic given in II 1c, above, has an estimated margin of error of 20 percent, and the estimated present capacity, partially based on this figure, has an estimated margin of error of 30 percent.

3. Potential Capacity.

a. Diversion of Traffic to Other Media.

The possibilities of diverting traffic to other transport media are small. Improved highway transport and the possible increase of east-west inland shipping may cause greater tonnages to move by other media, but concurrent over-all increases in transportation requirements will cause rail traffic to increase, preventing any reduction in actual tonnage transloaded.

b. New Yard Construction.

The possibilities for expanding transloading capacity by new construction are so great that potential future capacity will be difficult to compute. It may be assumed, however, that existing facilities, plus feasible expansion of transloading-in-depth, will be able to cope with any increases in traffic that the tributary lines can accommodate.

c. Expansion of Present Facilities.

Existing facilities appear to be continually, though only gradually, expanding. Information on this activity, however, has rarely been less than 6 months out of date, and the current position is not clear, but most of the stations may be expected to receive appropriations for expansion every year. Expansion of transloading stations requires such a negligible fraction of the total Soviet Bloc productive capacity that supply sources will be no problem. The Satellite countries can supply all of the cement and cranes required. German reparations alone could meet these needs. It is likely that more rails will come from the USSR than from the Satellites, where the replacement of rails in local networks generally is lagging behind schedule, a result in part of the unsatisfactory production of rails in several Satellite countries. Maintenance is not a large factor in transloading capacity, and its improvement cannot be expected to yield significant capacity increases.

The efficiency of operations already has been greatly increased, and future increases will have little effect on transloading capacity unless mechanization is greatly increased. It is undoubtedly within the capacity of the Soviet Bloc to increase greatly the amount of machinery employed in transloading, but plenitude of labor and the shortage of mechanical equipment make it likely that increases in mechanization will be slow.

IV. Materials and Manpower Requirements.

The entire complex of transloading stations does not require capital outlays extensive enough to create a noticeable strain on the economy of the Soviet Union. Cranes, rails, cement, and manpower are the chief requirements.

1. Principal Materials.

Large stations have from six to a dozen cranes. Maximum requirements for the entire system of transloading stations probably do not exceed 175 units. Most of these cranes are now installed, and maximum annual requirements for replacement and for expansion of installations should not exceed 20 percent, or 35 cranes. Most of these are manufactured in East Germany.

Rails are believed to be no more of a problem than cranes. Although rails are in extremely short supply throughout the entire Soviet Bloc, rails for marshalling yards are not a critical item. The average transloading station may have 2,500 metric tons of rails already laid, and replacement will be almost nil. Annual expansion may be at the rate of 5 percent for the entire complex, which would require 3,600 tons of rails per year. This is not a requirement against the productive capacity of the USSR, however, because the quantity of rails, too worn for main-line service but adequate for station yard installations, that are dismantled and replaced every year in the Soviet Union far exceeds 3,600 tons.

Concrete has been used to build one or two transloading platforms in many of the larger stations. The total investment may equal 6,000 cubic yards of concrete in each of 20 platforms. Thus a total of approximately 120,000 cubic yards of concrete, or 30,000 yards of cement, have been used for that purpose. Station expansion may require 12,000 cubic yards of cement yearly, which is certainly not a strain on the Soviet economy.

2. Manpower.

Indirect manpower requirements of other industries which produce transloading equipment can be regarded as negligible.

Direct manpower requirements in the transloading complex run from 600 to 2,000 persons a station. Although this may represent a total labor force of from 12,000 to 45,000 workers, even the maximum estimate would be only 1.5 percent of the total railroad manpower force of the Soviet Union, 15/ or an infinitesimal fraction of the total labor supply of the Soviet Bloc. Roughly 1,000 men of the total transloading labor force are required to operate cranes and lifts.

Distribution of skills, training, and technical personnel are not problems, because transloading is done almost exclusively by unskilled labor. The crane operators and hydraulic lift personnel require a minimum of technical competence, which can be acquired on the job.

V. Capabilities, Vulnerabilities, and Intentions.

1. Capabilities.

The difference in gauge and the system of transloading stations do not constitute a limiting factor to any foreseeable Soviet courses of action. The existing system is capable of meeting all current requirements for transferring freight across the western Soviet frontier with only occasional and temporary delays because of seasonal or extraordinary increases in traffic, which are not frequent enough to warrant increased facilities. Moreover, transloading capacity can be expanded to meet any foreseeable increase in the traffic capacity of the transfrontier railroad lines. This includes the ability to install surplus capacity in preparation for air attack, but such "overinvestment" is not yet foreseen.

2. Vulnerabilities.

Air attack could achieve a few extraordinary disruptions to rail communications, but until Western air forces had neutralized Soviet air defenses, damage would be neither sufficiently critical nor sustained to impair the Soviet military potential in the West. Even with complete control of the air, continuing interdiction would be very difficult to maintain because of the exigencies of weather and other deterrents. A badly damaged yard, moreover, can be relaid in a relatively short time, and transloading-in-depth further complicates air attack. Any permanent, decisive reduction of transloading capacities could be attained only by large-scale and repeated attacks made possible by complete air supremacy.

3. Intentions.

Intelligence reports on transloading stations may not provide reliable indicators of war intentions, as the two types of activities at transloading stations which might possibly be indicators go on spasmodically in normal peacetime. These are (a) the extension of yard capacity, which is a continuing result of the expanding economic requirements, and (b) the occasional assembly of large numbers of flat cars, which necessarily must precede the movement of armored divisions. Stocks of military stores, vehicles, and troops in quantities sufficient for mounting an invasion already exist west of the transloading belt, and existing transloading capacity already is adequate to maintain a full-scale military attack against the West.

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APPENDIX A

GAPS IN INTELLIGENCE ON TRANSLOADING STATIONS

Although a large body of material pertaining to transloading stations is available within CIA, there are some critical gaps in the information.

Reliable figures on the total volume of traffic currently crossing the western Soviet frontier do not exist. Copious material on the facilities at several of the stations is available, but complete and detailed information on all facilities of any one station does not exist, and little information of any sort exists for several secondary stations. There are a few minor stations for which no information on facilities was available at the time of the preparation of this report. Moreover, there is no one component of a transloading station, as, for example, loading platforms, on which information exists for all stations.

As a result of the gaps in intelligence, no accurate table of all transloading facilities on the western Soviet frontier has been prepared, and the total volume of traffic now being transloaded can be estimated only from incomplete evidence. Similarly, the potential transloading capacity for the entire western frontier can be estimated only in the light of current traffic estimates, which are not entirely firm.

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