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PROVISIONAL INTELLIGENCE REPORT

THE RUBBER INDUSTRY
IN THE SINO-SOVIET BLOC



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THE RUBBER INDUSTRY IN THE SINO-SOVIET BLOC

CIA/RR PR-155

(ORR Project 22.860)

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FOREWORD

The purpose of this report is to present the latest information available on the rubber industry of the Sino-Soviet Bloc. Previous reports have presented information on the rubber position of the USSR and of the European Satellites. This information has been brought up to date in this report. Because of its increasing importance in the economy of the Sino-Soviet Bloc, the rubber industry of Communist China is discussed.

No data are available on capital investments, manufacturing costs, wholesale prices, or labor inputs for either synthetic rubber or finished rubber products in the Sino-Soviet Bloc. Hence this report is confined to the production and consumption phases of the industry.

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THE RUBBER INDUSTRY IN THE SINO-SOVIET BLOC*

Summary

During the period following World War II the rubber industry in the Sino-Soviet Bloc has expanded at a rate somewhat greater than that of most other Bloc industries. Although the productive capacity of the rubber industry in the Bloc now meets the essential requirements of the Bloc-wide economy, it is not great enough to provide quantities and varieties of consumer goods comparable to those available to the people of Western Europe. The per capita consumption of rubber in the Bloc in 1955 was only a fraction of that in most countries of the West.

The rubber industries of the various countries of the Sino-Soviet Bloc, like those of other countries, are dependent on supplies of natural, synthetic, and reclaimed rubber. The total Bloc supply of these kinds of rubber in 1955 was about 545,000 metric tons.** Of this total, natural rubber -- all of which was imported from non-Bloc countries -- accounted for about 127,000 tons, synthetic rubber for about 314,000 tons, and reclaimed rubber for about 104,000 tons.

Of total Bloc production of synthetic rubber in 1955, the USSR produced the greater part, about 240,000 tons. East Germany accounted for about 71,000 tons, Poland produced 2,000 tons, Czechoslovakia produced about 600 tons, and the other European Satellites and Communist China produced negligible amounts, if any. The USSR was also the major producer of reclaimed rubber in 1955, accounting for about 76,000 tons of the 104,000-ton total. The other Bloc countries, except Albania and Communist China, produced amounts ranging from 300 tons in Bulgaria to 10,500 tons in Czechoslovakia.

* The estimates and conclusions contained in this report represent the best judgment of ORR as of 1 October 1956.

** Tonnages throughout this report are given in metric tons unless otherwise indicated.

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Perhaps the best measure of the development of the rubber industry in any industrialized nation is the production of motor vehicle tires, including tires for aircraft and military vehicles. Between 1950 and 1955, production of tires in the Sino-Soviet Bloc increased 53.6 percent. Total 1955 production of motor vehicle tires in the Bloc was about 17 million units. The USSR produced about 11.6 million; Czechoslovakia, about 2 million; East Germany, about 1.2 million; Communist China, about 600,000; Poland, about 425,000; Rumania and Hungary, about 195,000 each; and Bulgaria, about 87,000. US production of motor vehicle tires in 1955 was about 112 million units. Any comparative evaluation of production of tires in countries of the Bloc, based on US production, is qualified by differences in the patterns of production. In the US, tires for passenger cars account for a much greater portion of total production of tires than in any of the Bloc countries.

Except for imports of natural rubber from non-Bloc countries, Sino-Soviet Bloc trade in rubber and rubber products is confined largely to intra-Bloc shipments. In 1955, Communist China imported the largest amount of natural rubber, about 40,000 long tons of the 127,185-ton total, mainly from Indochina and Burma. The USSR imported 24,400 long tons; Poland, 23,500 long tons; Czechoslovakia, 23,300 long tons; and the other European Satellites imported the remainder.

Perhaps the most significant aspects of the intra-Bloc trade in rubber and rubber products are probable reshipments of natural rubber from Communist China to the USSR and shipments of synthetic rubber from East Germany to other countries of the Bloc. In 1955, East German exports of synthetic rubber -- controlled by the USSR through the mechanism of the Council of Mutual Economic Assistance (CEMA) -- amounted to 55 percent of total East German production.

It is probable that strategic reserves of rubber are maintained only in the USSR. At the end of 1952 the Soviet reserve amounted to about 300,000 tons of natural rubber. From mid-1953 to mid-1955 the USSR purchased no natural rubber in the world markets, and it is probable that to avoid deterioration of the stored rubber, reserves were consumed by the industry. On the basis of that assumption, it is estimated that at the end of 1955 Soviet reserves of natural rubber were between 50,000 and 100,000 tons.

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The diversity of application of rubber and rubber products in an industrial economy makes impossible the determination of a detailed pattern of consumption of rubber in the Sino-Soviet Bloc. A general pattern can be established for the USSR, however, on the basis of consumption of rubber in transportation goods and in nontransportation goods. Of the total Soviet supply of rubber in 1955, about 232,400 tons, 67 percent was consumed in the manufacture of transportation goods -- tires, tubes, repair materials, and the like. The manufacture of nontransportation goods -- rubber footwear, hose, belting, sanitary goods, and the like -- consumed 33 percent of the total. It is probable that the pattern of consumption of rubber in the USSR is generally applicable to the Bloc as a whole, except, of course, to Communist China, in which the major rubber product is footwear. The comparable 1955 US pattern of rubber consumption was about 63 percent of the total supply consumed by transportation goods and 37 percent consumed by nontransportation goods.

The rubber industry of the Sino-Soviet Bloc currently has the capability of meeting the essential peacetime requirements of the economy of the Bloc. In a wartime economy the industry's 1955 productive capacity would sustain Bloc military activity for about 2 years. At the end of that period the loss of imports of natural rubber without a commensurate increase in production of synthetic rubber would seriously hamper Bloc military effort. Sino-Soviet Bloc plans indicate the clear intent of avoiding this eventuality. The Soviet Sixth Five Year Plan (1956-60) calls for more than a 100-percent increase in the production of synthetic rubber, 525,000 tons in 1960, and a 100-percent increase in the production of motor vehicle tires, 23 million units in 1960. East German plans call for the production of 85,000 tons of synthetic rubber in 1960, a 20-percent increase over 1955 production, and the production of 2.5 million motor vehicle tires in 1960, 1/^{*} a 100-percent increase over 1955 production. Both Hungary and Communist China plan to construct new facilities for the rubber industry, and the USSR undoubtedly will be an active buyer of natural rubber in world markets during the 1956-60 period.

The rubber industry of the Sino-Soviet Bloc does not appear to be significantly vulnerable, either in its supply of raw materials

* For serially numbered source references, see Appendix C.

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or in the concentration of its productive facilities. Neither is the industry a reliable indicator of the possible military intentions of the Bloc.

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I. Introduction.

Rubber is an essential component of a great many industrial and consumer products, and most modern media of transportation are completely dependent on adequate supplies of rubber. Transportation difficulties of the German armies during World War I clearly demonstrated the strategic importance of rubber. Following the war, however, only Germany and the USSR made serious efforts to develop a synthetic substitute for rubber. ^{2/} By 1939 these two countries alone had well-established synthetic rubber industries. With the dislocation of production and transportation of natural rubber during World War II, supplies of rubber became of vital importance to all combatants. ^{3/} It was during this period that synthetic rubber was first produced on a large scale in the US. ^{4/} Synthetic rubber was a major factor in the ultimate victory of the Western Powers.

Since 1945 the world demand for rubber has increased much more rapidly than available supplies of natural rubber, and the synthetic rubber industry has continued to thrive. Technological improvements have produced rubber which is made to specifications, and the growth of the industry is likely to continue. The economic importance of synthetic rubber will increase as new applications are developed and standards of living rise in all countries. At the same time, improved methods of growing natural rubber and new uses for natural rubber will intensify competition with synthetic rubber, and the rubber industry probably will present a shifting pattern for many years.

In the USSR the growth of the synthetic rubber industry has followed pre-World War II planning. The primary concern of the USSR is to be independent of Western sources for its essential strategic raw materials. Because natural rubber grows outside the present Communist-held areas, production of synthetic rubber has expanded rapidly. Planned production for 1955 was 364 percent of prewar production. ^{5/} As transportation facilities and living standards increase, future expansion probably will follow a similar pattern.

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Except for the 1941-48 period, when the rubber industry of the USSR constituted a separate ministry, the industry has always been a part of the Ministry of the Chemical Industry. 6/ Within the Ministry the following three main administrations are responsible for production of rubber and rubber products 7/: the Main Administration of the Rubber Industry (Glavkauchuk), the Main Administration of the Tire Industry (Glavshinprom), and the Main Administration of Industrial Rubber Products and Footwear (Glavrezinprom). The sale and distribution of these products are handled by the Main Administration for the Sale of Rubber Products, which is a part of the Main Administration for the Sale of Chemical Products (Glavkhimsbyt).

Although Soviet scientists are extremely capable and devote much time to research on synthetic rubber, there seems to have been little technical advancement in manufacture since 1946. In the USSR the basic raw material, butadiene, has been made from alcohol produced by fermenting such foodstuffs as grain and potatoes. 8/ By contrast, the Germans have made synthetic rubber from butadiene derived from calcium carbide and from styrene made from benzol, a byproduct of coal tar. In 1947 the Communists confiscated the equipment of the German plant at Schkopau and moved it to the USSR. This equipment was put into production with the help of German technical personnel. 9/ It is probable that much of the expansion of the industry called for by the Sixth Five Year Plan (1956-60) will be based on the expansion of production of synthetic alcohol from petroleum and on the expansion of production of carbide. Thus the growth of the industry will follow the 1946 dictum of Stalin to the effect that nonfood sources should be exploited as raw materials.

Expansion of production of Sovprene, a Soviet oilproof rubber, has been curtailed because the USSR has been able to import other types of oil-resistant rubber from East Germany. 10/ With the planned expansion in production of carbide, it would be possible to expand production of Sovprene should it become urgent for the USSR to increase present supplies.

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II. Supply.

A. Production.

1. USSR.

a. General.

Production of synthetic rubber in the USSR was begun in the early 1930's and by 1939 had become well established. Although no reliable information is available on production during World War II, the Fourth Five Year Plan (1946-50) showed the postwar importance of the industry in the minds of the Soviet planners. Production of synthetic rubber in 1950 was to be twice that in 1940, whereas the industry as a whole was expected to expand only 48 percent. Production of motor vehicle tires was to be trebled, production of rubber footwear was to increase one-third, and the announced goal for reclaimed rubber was 56,000 tons. The gains accomplished were impressive, but it is probable that the announced plans were not fulfilled. 11/ The Fifth Five Year Plan (1951-55) continued to emphasize the importance of the industry; production of synthetic rubber was scheduled to increase 82 percent by 1955, while the planned increase for all industry was 70 percent. No plans were announced for increases in production of tires and footwear. The annual announcements concerning plan fulfillments which have appeared since 1951 indicate that the actual increase in production of synthetic rubber between 1950 and 1955 was about 68 percent. Increases in production of tires during the last 4 years of the Plan were to total 39 percent. In 1954 and 1955, announced increases in production of rubber footwear amounted to 17.5 percent, but the increase in 1955 above 1950 is estimated to have been somewhat less.

Although industrial production as a whole exceeded the planned goals, it would appear that production of synthetic rubber was one of the areas in which plans were not fulfilled. 12/

b. Natural Rubber.

In support of Soviet efforts to become independent of foreign sources of strategic raw materials, the USSR experimented with domestic cultivation of rubber bearing plants in the 1930's. Plans for growing such plants as kok-saghyz, tau-saghyz, and guayule on

a large scale were interrupted by World War II. ^{13/} The Fourth Five Year Plan called for 270,000 hectares (more than 650,000 acres*) to be planted to these crops by 1950. This acreage would have produced over 7,000 tons of rubber. ^{14/} No announcements were made concerning the realization of this goal, and it is believed that results were disappointing. In any event, the Fifth Five Year Plan made no mention of domestic production of natural rubber.

Several factors indicate that, about 1952, Soviet planners abandoned the plan to cultivate natural rubber. First, the land requirements to meet the minimum needs of the USSR for natural rubber would amount to several million hectares; at the same time there was urgent need for arable land to implement the new agrarian policy of the USSR. Second, manpower needed for cultivation and processing was disproportionate to the amount of rubber produced. It has been estimated that the cost to produce the raw materials containing 1 ton of rubber solids amounted to the equivalent of 120,000 to 140,000 rubles. ^{15/} This amount did not include the cost of extracting the rubber. By contrast the 1952 average price of natural rubber in Singapore was US \$691.75** per ton, ^{16/} 2,767 rubles at the official rate of exchange.*** Third, during 1952, other crops were mentioned ^{17/} in the Soviet press as being expanded on lands freed by the abandonment of the rubber program. Fourth, no mention of production of natural rubber has appeared in the Soviet press since 1951.

c. Synthetic Rubber.

A famous Russian chemist, Lebedov, was the inventor of synthetic rubber. ^{18/} His discoveries led to the establishment of the industry in the USSR at a time when the Soviet planners were eager to become independent of foreign sources of strategic raw materials. The Second Five Year Plan (1933-37) called for the building of plants which could produce "several tens of thousands of tons of rubber" per year. Production in 1939 has been estimated at 64,100 tons, ^{19/} all made from alcohol obtained by the fermentation of foodstuffs. The end

* One hectare equals 2.471 acres.

** All trade values are given in terms of US dollars.

*** The official rate of exchange was 4 rubles = US \$1.

product was a general-purpose material which could be substituted for natural rubber in most products. Meanwhile, the manufacture of an oil-resistant synthetic rubber had been developed in the US. Soviet attempts to duplicate this material were unsuccessful until the technology of the US manufacturer was made available to the USSR through Lend-Lease during World War II. The USSR built a plant at Yerevan to make Sovprene 20/ (similar to US neoprene) and has continued to make this special-purpose rubber in quantities sufficient to meet its needs.

The Fourth Five Year Plan called for the development of nonfood sources for making synthetic rubber, and a plant to use petroleum gases was built in the Baku oil region. The Germans had based their process on calcium carbide obtained from coke and limestone, but most of the US industry used petroleum gases as a raw material. After World War II, much of the equipment at the large East German plant located in Schkopau was confiscated and moved to sites in the USSR. German scientists and technicians were used to get these new plants into operation. Details on the individual plants and on rubber technology are given in a previous report. 21/

The estimated production of synthetic rubber in the USSR, by plant, in 1946-55 is shown in Table 1.* Sites other than those listed in Table 1 have been reported, but their present status is uncertain, and they have not been included as producers. A large plant has been under construction for several years near Irkutsk, 22/ as a part of the industrial complex being built in that area to utilize local coal. Current information indicates that this plant is not yet in production.

d. Reclaimed Rubber.

Reclaimed rubber is made by the destructive processing, either chemically or mechanically, of old or discarded rubber products. It is used both to increase the supply of natural rubber and in formulations to impart desired characteristics to finished products. An accurate estimate of production is impossible to obtain, because production is largely dependent on the political and economic situations in the rubber-growing areas and on the quantity of old rubber products available for processing. Furthermore, most of the production of reclaimed rubber is from facilities located in plants

* Table 1 follows on p. 10.

Table 1

Estimated Production of Synthetic Rubber in the USSR, by Plant a/
1946-55

Plant Location	Economic Region	Plant	Thousand Metric Tons											
			1946	1947	1948	1949	1950	1951	1952	1953	1954	1955		
Kazan'	VI	SK-4	15	15	20	30	30	30	30	30	30	30	30	30
Krasnoyarsk	IX	SK-9	0	0	0	0	0	5	5	8	15	15	15	20
Sungait	V	SK-7	0	0	0	0	0	7	7	10	15	15	20	20
Tambov	VIII	SK-5	0	0	0	0	0	0	0	0	5	5	7	15
Temir-Fau	Xa	SK-2	0	0	0	0	0	5	5	10	12	12	15	15
Voronezh	VIII	SK-2 Kirov	N.A.	N.A.	10	22	22	38	40	44	49	49	55	55
Yaroslavl'	VIII	SK-1	22	25	30	30	30	30	30	30	30	30	30	30
Yefremov	VIII	SK-3	N.A.	5	15	20	20	25	30	30	30	30	30	30
Yerevan	V	SK-1	2	5	15	20	20	20	25	25	25	25	25	25
Total			40	50	90	122	143	172	187	211 b/	213 c/	240 d/		

- a. Estimates for 1946-52 are taken from source 23/. For a discussion of individual plant capacities, see Appendix A, Methodology.
- b. Total production in 1953 was announced as 113 percent of that in 1952. 24/
- c. Total production in 1954 was announced as 101 percent of that in 1953. 25/
- d. Total production in 1955 was announced as 112 percent of that in 1954. 26/

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that use it for making consumer goods. Reclaimed rubber is considered as a raw material, and for this reason no reports are published on its production.

It has been estimated that the rubber-reclaiming capacity of the USSR in 1945 was 30,000 tons. ^{27/} In addition to the data available on the individual producers, ^{28/} a reliable indication of the demand for reclaimed rubber in the USSR can be drawn from the consumption of new rubber. In the US the consumption of reclaimed rubber ranges from 20 to 30 percent of the new rubber consumed, depending on a number of economic factors such as the availability and price of reclaimed, natural, and synthetic rubber and on the types and potential uses of the rubber products. The USSR is thoroughly familiar with the literature on US practice in the use of reclaimed rubber, and it is probable that the Soviet demand for reclaimed rubber will be within the same general parameter as the US demand.

The estimated requirements for reclaimed rubber in the USSR in 1946-55 are shown in Table 2.

Table 2

Estimated Requirements for Reclaimed Rubber in the USSR
1946-55

Thousand Metric Tons			
<u>Year</u>	<u>Requirements a/</u>	<u>Year</u>	<u>Requirements a/</u>
1946	21	1951	50
1947	23	1952	55
1948	30	1953	61
1949	37	1954	68
1950	45	1955	76

a. Estimates for 1946-53 are taken from source ^{29/}. Estimates for 1954-55 are based on the assumption that expansion of requirements for reclaimed rubber would have been proportional to expansion of requirements for new rubber.

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e. Transportation Goods.

There are at least 10 plants in the USSR producing tires for motor vehicles and/or aircraft. 30/ It has been concluded that three plants listed in an earlier report -- those at Kazan', Lopasnya, and Ul'yanovsk -- probably do not produce tires. No information has been received on these plants since 1951 nor have any tires traceable to them been reported. It appears probable that these plants make "camelback" (the trade name for retreading material) and are engaged in retreading or repairing tires. One plant has been added to the earlier list, a plant identified at Fosforitnaya (59°38' N - 52°27' E). 31/ This plant is reported to make tractor tires, primarily, and production is small.

During the past decade the USSR not only has expanded production of motor vehicle tires by installing additional equipment in older plants but also has built at least two new plants. 32/ Other plants have been mentioned in the Soviet press, but there is no evidence from either reports or markings data that these additional plants are in production. The press reports indicate that future expansion of the tire industry will include production capacity in both central and eastern Siberia.

The estimated production of motor vehicle tires in the USSR, by plant, in 1946-55 is shown in Table 3.*

f. Carbon Black.

Carbon black is a special form of essentially pure carbon which, when added to rubber, greatly increases resistance to abrasion and flexing. Carbon black is an essential component of most rubber products, particularly transportation goods. In general, natural rubber requires the admixture of about 25 percent by weight of carbon black to obtain products of high quality, and synthetic rubber needs from 40 to 50 percent to achieve comparable quality.

Carbon black is made by burning an organic substance in a controlled supply of air and collecting the resultant "soot," or carbon. The original process burned natural gas and collected the carbon

* Table 3 follows on p. 13.

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Table 3

Estimated Production of Motor Vehicle Tires in the USSR, by Plant a/
1946-55

Thousand Units

Plant Location	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Kirov	90	150	300	600	950	950	950	950	1,000	1,000
Leningrad	300	400	600	650	700	700	720	750	850	900
Fosforitnaya	0	0	0	10	10	10	10	10	20	75
Moscow	230	490	900	1,275	1,515	1,550	1,550	1,650	1,800	2,000
Omsk	250	300	450	700	1,000	1,000	1,000	1,000	1,200	1,400
Sverdlovsk	75	90	180	250	300	340	350	400	500	800
Voronezh	0	0	0	0	0	0	50	400	1,000	1,200
Yaroslavl ¹	2,000	2,400	2,700	3,100	3,600	3,600	3,600	3,600	3,600	3,600
Yerevan	30	41	75	115	170	170	170	200	275	600
Total	<u>2,975</u>	<u>3,871</u>	<u>5,205</u>	<u>6,700</u>	<u>8,245</u>	<u>8,320</u>	<u>8,400</u>	<u>8,990</u>	<u>10,245</u>	<u>11,575</u>

a. Estimates for 1946-50 are taken from source 33/. Estimates for later years are based on more recent information and announced annual increases, as follows: there was no announced increase for 1951 above 1950 (it was assumed to be 1 percent or less); production in 1952 was 101 percent of that in 1951; production in 1953 was 107 percent of that in 1952; production in 1954 was 114 percent of that in 1953; and production in 1955 was 110 percent of that in 1954.

deposited on iron "channels," the product being known as "channel black." An improved method burns petroleum fractions in a furnace to make what are known as "furnace blacks." This process gives higher yields per pound of raw material and is subject to the close control which makes possible the production of grades designed for specific applications. The latest development in the manufacture of carbon black is the production of "high-abrasion" furnace blacks specially suited for tire treads. As far as is known, the USSR has not been able to produce carbon black of this type. The USSR has ample supplies of both natural gas and petroleum, but the Soviet industry uses old processes which US industry has improved greatly during recent years. The quality of Soviet tires indicates that similar improvements have not been attained by the USSR.

Before World War II the USSR was self-sufficient in the production of carbon black, having built several channel plants in the Baku oil region. 34/ In the postwar period the production of these plants was insufficient to meet the requirements of the expanded rubber industry. The resulting deficiency was met by imports from the US, which produces 90 percent of the world's production. 35/ In 1950 the US placed an embargo on exports of carbon black to the Sino-Soviet Bloc, a move which caused the USSR to expand production rapidly, primarily in the gas and petroleum producing areas. 36/ As a consequence, the USSR today has adequate supplies of carbon black to meet the needs of its rubber industry.

Facilities for the production of carbon black in the USSR in 1955 are shown in Table 4.*

g. Tire Cord.

During World War II the USSR received as a part of Lend-Lease aid a complete, modern, US-built motor vehicle tire plant. Thus Soviet technicians were fully informed on the importance of high-tensile tire cord as an essential component of heavy-duty tires. For this reason, the Fourth Five Year Plan called for a special main administration within the Soviet textile industry, known as Glavcord, to control the production of all tire cord. Much technical information was published on the theory of tire construction and the causes of tire failures. 37/

* Table 4 follows on p. 15.

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Table 4

Facilities for the Production of Carbon Black in the USSR a/
1955

			Metric Tons per Year
<u>Location</u>	<u>Capacity</u>	<u>Raw Materials</u>	<u>Type of Carbon Black Produced</u>
Region I			
Ukhta (Krutaya)	12,000	Natural gas	Channel and furnace
Uritsk	4,000	Natural gas	Channel
Region III			
Glezendorf	7,000	Natural gas	Channel and furnace
Region IV			
Armavir	5,000	Petroleum	Furnace
Mozdok	1,500	Natural gas	Channel
Malgobek	1,500	Natural gas	Channel
Krasnodar	6,000	Petroleum	Furnace
Maykop	7,000	Natural gas	Channel
Novocherkassk	15,000	Natural gas	Channel
Region V			
Lok-Batan	3,000	Natural gas	Channel
Bina	6,000	Natural gas and petroleum	Channel and furnace
Baku	1,500	Natural gas	Channel
Karadag	3,000	Natural gas and petroleum	Channel and furnace

a. This table is derived from detailed plant studies which are fully documented and are available in CIA files.

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Table 4

Facilities for the Production of Carbon Black in the USSR
1955
(Continued)

			Metric Tons per Year
<u>Location</u>	<u>Capacity</u>	<u>Raw Materials</u>	<u>Type of Carbon Black Produced</u>
Region VI			
Kuybyshev	6,000	Natural gas	Channel and furnace
Saratov	6,000	Natural gas	Channel and furnace
Region VII			
Ivanovo	8,000	Petroleum	Furnace
Yaroslavl'	10,000	Petroleum	Furnace
Region IX			
Omsk	9,000	Petroleum	Furnace
Region XI			
Irkutsk	1,000	Acetylene	Acetylene

The industry apparently has followed developments in the US; articles have appeared in Soviet publications regarding the use of nylon and similar polyamid fibers which the USSR makes under the names of "perlon" and "capron." 38/

There are nine known Soviet tire cord plants which operate under the supervision of Glavcord. 39/ In addition, three plants are known to make perlon fiber which is used in tire cord. Production data are lacking on individual plants, but it has been estimated that production of perlon fiber in 1951 and 1952 was about 5,000 tons per year. 40/ This amount would constitute only a small percentage of the total Soviet requirements for tire cord. It is probable that perlon cord would be used primarily by the USSR in tires for jet aircraft and for motor vehicles subject to extreme road conditions. In the US, nylon cord is

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standard for all aircraft tires and is being adopted for premium heavy-duty tires of all types. A recent survey showed that in 1955 the use of nylon cord in the US increased 100 percent above that in 1954. 41/

On the basis of the motor vehicle park in the USSR and the high usage of trucks compared with passenger cars, it is estimated that truck tires constitute about 90 percent of total Soviet production of motor vehicle tires. 42/ On the basis of average weights, it is estimated that about 5 kilograms (kg) of tire cord would be required to make an average tire. The estimated production of tires in the USSR would levy tire cord requirements in 1953-55 as follows:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	44,950
1954	51,225
1955	57,587

h. Beadwire.

Modern motor vehicle tires have a "bead" at either edge which serves to hold the inflated tire on the rim. These beads must have flexibility and great strength with a minimum of "stretch," or extensibility. Tire beads are made from high-carbon steel, the wire being drawn and either woven or twisted at the steel mill. The beadwire is shipped to the tire plants on spools, and the individual beads are cut and then fabricated by welding. Because of the extreme precautions necessary to guard against corrosion, it is not considered feasible to stockpile or store beadwire or the fabricated beads for extended periods. The average weight of steel in the finished beads varies from 2.5 to 5 percent of the weight of the finished tire, the higher percentage being needed for heavy-duty tires. 43/

Construction of motor vehicle tires in the Sino-Soviet Bloc follows standard practice in Western countries. Soviet-made tires have been carefully analyzed and have been found to contain beadwire similar to that used in the US, the chief difference being that the USSR uses tin or zinc plating instead of copper or bronze. 44/ It is probable that the USSR will be forced to adopt US practice for the construction of tubeless tires because neither tin nor zinc plating produces the adhesion needed in the newer type of tires.

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Estimated requirements for high-tensile wire in the USSR are equal to 5 percent of the estimated total weight of all tires produced. This 5-percent figure is used because of the high percentage of heavy-duty and truck tires made in the USSR. ^{45/} It is probable that in the European Satellites there is more nearly a balance between the number of truck tires and the number of passenger-car tires produced. For this reason, Satellite requirements are estimated to be 3.75 percent of the estimated total weight of all tires produced. In the USSR the requirements of the tire industry for steel wire will represent less than 2 percent of the estimated national production of steel wire, and production of vehicle tires cannot be considered to be a major consumer of steel. Estimated consumption of beadwire in the USSR in 1953-55 is as follows:

<u>Year</u>	<u>Consumption (Metric Tons)</u>
1953	13,485
1954	15,365
1955	17,362

1. Nontransportation Goods.

There are thousands of finished products made from rubber, and it is impossible to estimate production in even such broad categories as hose, belting, and mechanical goods. Although production data on rubber products are not given in Soviet publications, one rubber product in the nontransportation field is usually mentioned in the Five Year Plans and in the annual fulfillment announcements -- rubber footwear. This category includes rubber-soled sandals as well as such usual items as boots, athletic shoes, and overshoes. For this reason, the statement appearing in a Soviet chemical magazine in January 1954, to the effect that the industry must produce 91 million pairs of boots and galoshes in 1954 in order to meet its established norm, ^{46/} does not include other items which appear in Soviet statistics as "rubber footwear."

Annual increases in production of rubber footwear have been announced every year since 1945, with the exception of 1953 and 1954. From these announcements and published prewar figures, it has been possible to develop estimates of production of rubber footwear. The Fourth Five Year Plan called for a sevenfold increase in 1950 above

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1945, but this goal was slightly underfulfilled. The failure was admitted in the official announcement covering the accomplishments during the Plan period. The estimated production of rubber footwear in the USSR in 1945-55 is shown in Table 5.

Table 5
Estimated Production of Rubber Footwear in the USSR
1945-55

<u>Year</u>	<u>Announced Production in Terms of Previous Year (Percent)</u>	<u>Estimated Production (Million Pairs)</u>
1945	N.A.	14
1946	197 <u>a/</u>	27
1947	168 <u>b/</u>	45
1948	137 <u>c/</u>	62
1949	128 <u>c/</u>	80
1950	118 <u>c/</u>	94
1951	111 <u>d/</u>	105
1952	N.A.	105
1953	N.A.	102
1954	103 <u>e/</u>	105 <u>f/</u>
1955	N.A.	105

a. 47/
b. 48/
c. 49/
d. 50/
e. 51/
f. 52/

j. Sixth Five Year Plan (1956-60).

The Sixth Five Year Plan (1956-60) of the USSR makes several references to the expansion which is to take place in the rubber industry. During the 5-year period it is planned to increase the production of synthetic alcohol approximately 10 times and that of synthetic rubber, 2.2 times. The production capacity for motor vehicle tires is to be doubled during the same period.

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The Sixth Five Year Plan of the USSR specifically provides that new production facilities will be built in various economic regions to meet local needs for rubber products. If these plans are fulfilled, much of the planned expansion, particularly in the tire plants, will take place in south-central and eastern Siberia, where such facilities are now lacking.

2. Albania.

a. General.

Because Albania is not primarily an industrial country, its production of rubber products is limited to nontransportation goods such as footwear, gloves, and other consumer goods. The local demand for motor vehicle tires is met by imports from other countries of the Sino-Soviet Bloc. The only rubber plant in Albania is located at Durres (41°20' N - 19°25' E) and is variously reported to have from 70 to 130 employees. ^{53/} In addition to making consumer goods, the plant at Durres is said to recap worn motor vehicle tires. ^{54/} No statistics are published on the quantities of various products made, but occasional notices appear in the Albanian press indicating that the plant has fulfilled its production plan.

b. Nonrubber Components.

Because the rubber industry of Albania is limited to producing nontransportation goods, the only nonrubber component of importance is carbon black, which is used in footwear and some other consumer goods. All of the raw materials needed by the rubber industry, except the small amount of fabric used in footwear, must be imported.

3. Bulgaria.

a. General.

The manufacture of rubber products is considered to be one of the principal industries of Bulgaria and was scheduled to undergo a 90-percent expansion between 1952 and 1957. ^{55/} For administrative

* For a discussion of the estimated volume of these imports, see C, p. 67, below.

purposes, rubber plants are under the Ministry of Light and Food Industries and are controlled by the Director of the Leather and Rubber Industries. 56/

b. Natural Rubber.

As early as 1942, Bulgaria was reported to be experimenting with the production of natural rubber from shrubs. 57/ Since the USSR obtained control of the country, these experiments have been extended to include the cultivation of kok-saghyz. As late as March 1954, it was announced that further plantings of rubber bearing plants would continue during the year. 58/ No announcements have been made about the success or failure of the project, which probably has been dropped. As noted in Table 23,* Bulgaria continues to import its requirements for natural rubber from the West and from other countries of the Sino-Soviet Bloc.

c. Synthetic Rubber.

Bulgaria does not make synthetic rubber. It is dependent on imports from the USSR and possibly from East Germany to meet its needs.

d. Reclaimed Rubber.

As previously reported, production of reclaimed rubber in Bulgaria was started in 1950, 59/ principally in the only motor vehicle tire plant (see e, below) in the country. This production is used in the plant, and no statistics are published on production. It was reported that 90 to 120 tons of reclaimed rubber were consumed in the tire plant in 1950. 60/ The estimate of production of reclaimed rubber in Bulgaria in 1950-55, as shown in the following tabulation, is based on the growth of the tire industry:

<u>Year</u>	<u>Production (Metric Tons)</u>
1950	90
1951	100
1952	150
1953	200
1954	250
1955	300

* P. 68, below.

e. Transportation Goods.

The manufacture of motor vehicle tires in Bulgaria is entirely state controlled. The only plant in Bulgaria is the Georgi Dimitrov State Rubber Factory in Sofia, which employs about 1,500 workers. ^{61/} The plant was privately owned until 1948, when it was seized from the owner. It had made footwear and consumer goods in addition to tires. After 1951, however, production was limited principally to truck tires. In 1954, new buildings were added, ^{62/} and new machines from the USSR and East Germany were to be installed, ^{63/} thus increasing the capacity of the plant 50 percent. ^{64/} The rate of production in 1954 was reported to be about 75,000 tires per year, ^{65/} and it was claimed that this rate increased by about 1,000 per month in 1955. ^{66/} The estimated production of motor vehicle tires in Bulgaria in 1946-55 is shown in Table 6.

Table 6

Estimated Production of Motor Vehicle Tires
in Bulgaria ^{a/}
1946-55

Thousand Units			
Year	Production	Year	Production
1946	5.0	1951	55.0
1947	8.0	1952	60.0
1948	12.5	1953	65.8
1949	26.9	1954	75.0
1950	42.7	1955	87.0

a. ^{67/}. All figures are rounded to the nearest hundred.

f. Carbon Black.

Bulgaria does not produce any carbon black and so must meet its requirements through imports from other countries of the Sino-Soviet Bloc. The volume of this business is discussed below.*

* See C, p. 67, below, and III, p. 73, below.

g. Tire Cord.

The textile industry of Bulgaria is primarily concerned with the manufacture of cotton fabrics. As late as 1954 there were no artificial fibers produced or used in Bulgaria. ^{68/} There have been no reports of synthetic fiber cord being imported by Bulgaria. Based on these negative data, it is assumed that all tire cord made or used in Bulgaria is cotton. Using the standard of 5 kg of cord per tire, estimated requirements for tire cord in Bulgaria in 1953-55 are as follows:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	329
1954	375
1955	435

h. Beadwire.

Bulgaria has no wire-producing facilities and is dependent on imports for its requirements. The estimated consumption of beadwire in 1953-55 in Bulgaria is as follows*:

<u>Year</u>	<u>Consumption (Metric Tons)</u>
1953	74
1954	84
1955	98

i. Nontransportation Goods.

Approximately eight rubber plants in Bulgaria, the majority of which are located in Sofia, make a wide variety of consumer goods, including footwear, rainwear, sanitary goods, belting, hose, and similar products.** ^{69/} No statistics have been published on the total annual production of individual products. It is reported, however, that the principal footwear plant, located at Sveto Vrachene (42°42' N - 23°25' E), produced rubber footwear at a rate of 3 million pairs per year in 1954. ^{70/}

* Based on the same ratio used for the USSR.

** Details on these plants are meager. It is probable, however, that fewer than 5,000 workers are employed in all of them.

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4. Czechoslovakia.

a. General.

The rubber industry of Czechoslovakia is controlled and administered by the Ministry of Chemical Production. The industry is highly developed and not only is capable of meeting domestic requirements but also exports its products to other European Satellites. It was reported that production in the industry increased 126 percent during the First Five Year Plan (1949-53), 71/ and the Minister of the Chemical Industry claimed that production increased 176 percent between 1948 and 1955, 72/ compared with the 145-percent increase for all the chemical industries. The planned expansion in the first year of the Second Five Year Plan (1956-60) calls for an increase of 10 percent in the rubber industry, 73/ which is only slightly higher than the planned expansion of 9.7 percent for the chemical industry. Very little data have been received on individual plants since 1952; so estimates can be derived only from previous reports and a few claims of expanded operations.

b. Natural Rubber.

In 1949 the Soviet Minister of Agriculture ordered the cultivation of kok-saghyz in Czechoslovakia 74/ and efforts were made to expand this crop during the succeeding years. In 1951, production of 150 tons was expected. 75/ No publicity has been given to the program since 1951, and in view of the small yield, compared with an estimated annual consumption of about 20,000 tons of natural rubber, it is probable that the program has been abandoned.

c. Synthetic Rubber.

It was reported that a plant producing an oil-resistant rubber known as "svitpren" (neoprene) was put into operation in Czechoslovakia during World War II. This plant reportedly produced about 3,000 tons in 1942. The plant was, however, destroyed during the war and has not been rebuilt, 76/ but production of synthetic rubber apparently has continued in Czechoslovakia on an experimental basis. Scientific publications indicate that small amounts of svitpren are made at Gottwaldov (formerly Zlin) to meet domestic requirements for oil-resistant rubber. 77/ Recent press notices indicated that a general-purpose synthetic rubber for use in tires and related products is not being made. On 2 August 1955

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an article in the Bratislava press stated that Czechoslovak officials are planning the construction of the first synthetic rubber plant. 78/ The estimated production of synthetic rubber in Czechoslovakia in 1946-55 is shown in Table 7.

Table 7
Estimated Production of Synthetic Rubber
in Czechoslovakia
1946-55

		Metric Tons	
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	N.A.	1951	450
1947	40	1952	500
1948	300	1953	550 <u>a/</u>
1949	350	1954	575
1950	400	1955	600 <u>b/</u>

a. 79/
b. 80/

d. Reclaimed Rubber.

Production of reclaimed rubber is well-established in Czechoslovakia. Three plants are reported to be in production, but no figures are available on their individual capacities. 81/ Government operational plans for the 4th quarter of 1949 indicated a production of 6,140 tons of reclaimed rubber and a requirement of 9,000 tons. Consumption of new rubber in the same year was estimated to be 38,570 tons, which would be roughly 4 tons of new rubber to 1 ton of reclaimed rubber. 82/ (In the US the ratio is about 6 to 1 in the transportation sector of the industry and 3.6 to 1 in the nontransportation sector. 83/) It is believed that the reclaimed rubber industry in Czechoslovakia will continue to expand at a rate sufficient to maintain production in approximately this ratio. The estimated production of reclaimed rubber in Czechoslovakia in 1946-55 is shown in the following tabulation:

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<u>Year</u>	<u>Production (Metric Tons)</u>	<u>Year</u>	<u>Production (Metric Tons)</u>
1946	4,500	1951	7,000
1947	5,000	1952	8,000
1948	5,500	1953	9,000
1949	6,000	1954	9,750
1950	6,500	1955	10,500

e. Transportation Goods.

As shown in Table 10,* Czechoslovakia is the major producer of motor vehicle tires among the European Satellites, its production accounting for more than one-half of the motor vehicle tires made in the Sino-Soviet Bloc outside the USSR. Before World War II the French Michelin firm had a branch plant in Prague, and the Bata interests had a large plant in Gottwaldov. The plant in Gottwaldov continues to be by far the largest tire plant in the country. All rubber plants in Czechoslovakia have been nationalized.

The First Five Year Plan of Czechoslovakia called for a 64-percent increase in production of motor vehicle tires in 1953 compared with that in 1949, an average increase of 10 percent per year. The Czechoslovak State Statistical Office reported an increase during the period of 126 percent for the rubber industry as a whole but did not specify whether this increase was reported in monetary value or in units of production. Tires were not mentioned in the report. ^{84/} During the same period, total industrial production "more than doubled." No plans for production of tires were mentioned in the annual plans for 1954 or 1955, and no goals have been announced for the current Five Year Plan. Production of truck tires in 1954 was announced as "greater than planned," and production of footwear, as 107 percent of that in 1953. ^{85/} No press announcements have appeared that would indicate the major expansion of any of the tire plants. It therefore seems reasonable to assume that production of tires since 1953 has not been expanded at a rate greater than 10 percent per year. The estimated production of motor vehicle tires in Czechoslovakia in 1946-55 is shown in Table 8.**

Table 8 is based on data previously published ^{86/} and represents a conservative estimate based on a restudy of several hundred documents pertaining to the individual tire plants in Czechoslovakia. A recent report by the Council of Mutual Economic Assistance (CEMA) on the

* P. 34, below.

** Table 8 follows on p. 27.

Table 8

Estimated Production of Motor Vehicle Tires
in Czechoslovakia a/
1946-55

<u>Thousand Units</u>			
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	310	1951	1,570
1947	712	1952	1,660
1948	953	1953	1,750
1949	1,150	1954	1,875
1950	1,390	1955	2,000

a. Estimates on the production by individual plants is shown in Table 10, p. 34, below.

planned production of tires between 1957 and 1960 indicates a much smaller production of tires in Czechoslovakia. According to this document, 87/ production of "automobile tires" during this period will be as follows:

<u>Year</u>	<u>Production (Thousands)</u>
1957	1,100
1958	1,205
1959	1,280
1960	1,375

The report specifies "automobile tires," but normal statistical methods report "motor vehicle tires," which include equipment for all types of motor-driven vehicles. The estimates of production in the other European Satellites are consistent with CIA estimates. The figures given for Czechoslovakia, however, are considerably below those given in many other documents. The weight of the evidence now available substantiates the figures in Table 8.

During 1954 and 1955, quantity rather than quality seems to have been stressed in the motor vehicle tire industry of Czechoslovakia. In 1954, West Germany reported that the tires made in Czechoslovakia with which imported "Skoda" motor vehicles were fitted were "entirely worn out" after 5,000 kilometers (km) (about 3,000 miles). 88/ More

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recently, 6,000 "Barum" tires (made at Gottwaldov) were imported by Bolivia. The Bolivian government bought them from the importer and supplied them to the participants in a national automobile race. The results were disastrous because the tires failed before the race was half completed. The Bolivians have demanded a refund of the dollar price of the tires. 89/ Czechoslovak authorities apparently have taken a serious view of this complaint and have sent a mission to La Paz to investigate. 90/ It has also been reported that Czechoslovakia sold 100,000 tires to Communist China in 1955 and that China protested that the tires developed longitudinal cracks in the treads before they were put into service. 91/

Early in 1955 the formation of a cooperative between the Czechoslovak and Polish rubber manufacturers was announced. Its objective was to improve both the quality of the products and the methods of manufacture. All tire producers in Czechoslovakia and Poland were included in this organization. 92/

f. Carbon Black.

Czechoslovakia has only one plant which produces carbon black. This plant is located at Moravska Ostrava (49°50' N - 18°15' E) and is known as Urxovy Zavody. The plant makes carbon black by burning anthracene, a byproduct of coal tar. It was reported to have 1,200 workers in 1950 and was operating at a rate of 2,500 tons per year in 1952. 93/* Because Czechoslovakia requires approximately 20,000 tons of carbon black per year, it obviously is heavily dependent on imports to meet its needs.

g. Tire Cord.

Czechoslovakia manufactures tire cord of cotton, rayon, and perlon. Rayon cord is exported to other countries of the Sino-Soviet Bloc in addition to being used for heavy-duty tires made in Czechoslovakia. Cotton cord is produced at the Svit National Enterprise at Otrokovice. 95/ Rayon cord is produced in the recently built rayon plant at Senica, Slovakia. 96/ No information has been published on production at either of these plants, although Svit was reported to have produced about 1,300 tons of cotton cord in 1950. 97/

* The First Five Year Plan of Czechoslovakia called for a production schedule for carbon black in the leather and rubber industry of 8,086 tons in 1949, 8,618 tons in 1950, 8,947 tons in 1951, 10,461 tons in 1952, and 11,184 tons in 1953. 94/ There is no evidence that these goals were met.

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Rayon cord was formerly imported from the West, but when restrictions were placed on its export by the Western European countries in 1949, Czechoslovakia began to produce rayon cord. The domestic product is reported to be inferior to the imported material. 98/

Czechoslovakia is also reported to be making some tire cord out of perlon, a type of nylon. Nothing is known, however, of the relative amounts of cotton, rayon, and perlon that are used in tire cord. On the basis of an average of 5 kg of cord per tire, Czechoslovakia's requirements for tire cord in 1953-55 are estimated as follows:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	8,750
1954	9,375
1955	10,000

h. Beadwire.

Czechoslovakia has a large steel industry and is a major producer of wire. In 1953 it was reported that Czechoslovakia not only produced its own beadwire but also exported large quantities to East Germany. 99/ Domestic requirements for beadwire in Czechoslovakia in 1953-55 are estimated as follows:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	1,969
1954	2,109
1955	2,250

1. Nontransportation Goods.

Czechoslovakia has long been a manufacturer of all types of rubber products, including footwear, belting, hose, and industrial and sanitary items. No data have been published on the volume or value of these products. In 1954 the Czechoslovak press stated that the people had bought 69.3 million pairs of rubber shoes during the period of the First Five Year Plan. 100/ Also, the State Planning Office announced in 1954 that production of rubber work shoes in 1953 was 120 percent of that in 1952 101/ and that production in 1952 was 111 percent of that in 1951. Based on the average annual purchases during the First Five Year Plan and the announced annual increases in production which have taken place, production of rubber shoes is estimated to be about

20 million to 25 million pairs per year. There is no method of estimating the volume or value of other rubber products made.

5. East Germany.

a. General.

One of the most serious shortages experienced by the Germans in World War I was that of rubber. Consequently, Germany was a pioneer in the development of a satisfactory synthetic substitute. Before World War II, production of synthetic rubber had increased more than 20,000 tons per year, and this amount was expanded rapidly during the war. The principal producer was the I.G. Farben plant at Schkopau (51°24' N - 11°59' E), located in what is now East Germany. Heavy air raids in 1944 reduced production to a minimum, but it was increased as soon as the fighting ceased. 102/ The Soviet dismantling of industrial facilities in 1947-48 again reduced plant capacity. When the USSR gained political control of the country, rehabilitation of the chemical and rubber plants received high priority, and production at Schkopau has progressively increased since 1949, as shown in Table 9.* The Second Five Year Plan (1956-60) of East Germany calls for the expansion of production to 85,000 tons per year by 1960. 103/

Before 1945 the German rubber plants were located principally in the area which is now West Germany. With the partition of the country the USSR was faced with the task of building up capacity to make motor vehicle tires, belting, hose, footwear, and other rubber articles. 104/ For most rubber products, capacity appears to be adequate to meet the minimum domestic requirements. In the field of motor vehicle tires, however, a serious shortage still exists.**

Because the plant at Schkopau was one of the most important chemical plants in East Germany, it was among the first to be organized into a state-owned company (Sowjetische Aktiengesellschaft -- SAG) immediately after the USSR gained control of the country. On 1 January 1954 it was returned to East German control to be organized as a people-owned enterprise (Volkseigener Betrieb -- VEB). 105/ Operation of the plant is officially controlled by the Ministry for Heavy Industry, which also supervises the production of motor vehicle tires. 106/ The synthetic rubber produced is distributed by two agencies: the DIA Chemie (Deutscher Innen- und Aussenhandel Chemie -- German Domestic and Foreign

* P. 31, below.

** See III, p. 73, below.

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Trade for Chemicals), which handles priority export shipments, and the DHZ (State Administration for Material Supply), which allocates synthetic rubber to domestic consumers. Planning the distribution between domestic demand and export is done at the ministerial level and is the result of negotiations among the Ministry for Heavy Industry, domestic consumers, and the Soviet authorities.

b. Natural Rubber.

East Germany is the only European Satellite which has shown no interest in the domestic production of natural rubber. As far as is known, no attempts have been made to grow any of the rubber-bearing shrubs or vines. As a result, the country is wholly dependent on imports to meet its requirements.

c. Synthetic Rubber.

As previously mentioned, East Germany is the chief producer of synthetic rubber in the Sino-Soviet Bloc. The only producing plant, located at Schkopau, uses a process developed by the Germans, based on the conversion of acetylene 107/ (obtained from calcium carbide) to butadiene. The latter is mixed with styrene derived from a coal-tar product, and the mixture is polymerized. Thus the basic raw materials of the process are calcium carbide and coal tar. In addition to these, other organic chemicals may be used to make an oil-resistant synthetic rubber. It is significant that manufacture of the German products is based on the use of heavy chemicals as raw materials, in contrast to the Soviet process which is primarily dependent on alcohol derived from foodstuffs, such as grain and potatoes. The estimated production of synthetic rubber in East Germany in 1946-55 and 1960 is shown in Table 9.

Table 9

Estimated Production of Synthetic Rubber
in East Germany
1946-55 and 1960

Metric Tons			
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	23,997 <u>a/</u>	1952	56,300
1947	28,460	1953	62,131 <u>b/</u>
1948	30,700	1954	67,707 <u>c/</u>
1949	26,500	1955	70,685 <u>d/</u>
1950	39,008	1960	85,000 <u>e/</u>
1951	48,853		

a. 108/
b. 109/
c. 110/

d. 111/
e. 112/

d. Reclaimed Rubber.

No statistical information has been published since 1952 on either production or plans for production of reclaimed rubber in East Germany. Because of the severe shortage of motor vehicle tires in East Germany, 113/ it is believed that production of reclaimed rubber has not kept pace with other sectors of the rubber industry -- old tires are the principal raw material for making reclaimed rubber, and even old tires are scarce in East Germany. The manufacture of reclaimed rubber is carried out as a part of the production operations in fabricating plants, so reclaimed rubber is a "captive" product. Consequently, it does not appear in East German statistics as an end product. Estimates of production are therefore based on previously published information, the growth of the rubber industry as a whole, and the probable availability of raw materials. The estimated production of reclaimed rubber in East Germany in 1946-55 is shown in the following tabulation*:

<u>Year</u>	<u>Production</u> <u>(Metric Tons)</u>	<u>Year</u>	<u>Production</u> <u>(Metric Tons)</u>
1946	1,500	1951	3,770
1947	2,000	1952	4,200
1948	2,500	1953	5,000
1949	3,000	1954	5,500
1950	3,300	1955	6,500

e. Transportation Goods.

There are 5 plants making motor vehicle tires in East Germany, only 2 of which were in production in 1946. 116/ Because more than 90 percent of the rubber fabricating capacity before World War II was located in what is now West Germany, production of tires was seriously inadequate in East Germany, not only to meet consumer demand but also to supply tires for the Soviet occupying forces. In an effort to relieve this shortage, new equipment was added to existing tire plants as well as to other

* For further information, see Appendix A, Methodology. Estimates for 1946-53 are taken from source 114/. Estimates for 1954 are based on a nominal increase above those for 1953. Late in 1954 the authorities in East Berlin put on a scrap rubber drive to get more old tires for reclaiming. 115/ It is assumed that this effort would result in an increase in available raw material and a resulting increase in production in 1955.

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rubber fabricating plants. In spite of the rapid expansion which has taken place, the supply situation is still serious. In official market analyses, mention is made of vehicles being "idle due to shortage of tires." 117/ It was estimated in November 1954 that in spite of increased production in 1955, there would be a shortage of 1 million tires at the end of that year. 118/ The Second Five Year Plan (1956-60) of East Germany calls for a capital expenditure of 130 million East German marks (DME) for the expansion of the tire industry, 119/ with a production goal of 2.2 million to 2.8 million tires by 1960. 120/

The estimated production of motor vehicle tires in the European Satellites, by country and by plant, in 1946-55 is shown in Table 10.*

f. Carbon Black.

East Germany produces little or no natural gas and so has developed other materials as sources of carbon black for its rubber industry. The principal basic material is acetylene gas generated from calcium carbide, which, when burned in a controlled supply of air, yields a form of carbon called acetylene black, which can be used to reinforce rubber. Although acetylene black does not produce rubber compounds with the high resistance to abrasion which is achieved with gas blacks such as are made in the USSR and Rumania, it nevertheless can be used for most rubber products. Acetylene black also can be used to make a rubber compound which is electrically conductive, a product which has several strategic uses. For this reason, East Germany exports to other countries of the Sino-Soviet Bloc some acetylene black in exchange for a conventional type of black needed for tire treads. In addition to acetylene black, East Germany makes a small amount of carbon black by burning anthracene, a byproduct of coal tar which has limited industrial use. The resultant product is similar to channel black made from natural gas. Production from this source is small.

After the USSR and Rumania, East Germany is the largest producer of carbon black in the Sino-Soviet Bloc. Production is concentrated in three plants. The estimated production of carbon black in East Germany, by plant, in 1950-55 is shown in Table 11.**

* Table 10 follows on p. 34.

** Table 11 follows on p. 36. (Text continued on p. 37.)

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Table 10

Estimated Production of Motor Vehicle Tires in the European Satellites
by Country and by Plant a/*
1946-55

Location	Plant	Thousand Units									
		1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Bulgaria	Georgi Dimitrov	5.0	8.0	12.5	26.9	42.7	55.0	60.0	65.8	75.0 b/	87.0 c/
Czechoslovakia											
Bratislava/Petrzalka	Matador	10.0	30.0	20.0	720.0	800.0	850.0	870.0	900.0	945.0	1,000.0
Gottwaldov	Svit/Rudy Rizen	210.0	416.0	603.0	210.0	300.0	340.0	360.0	390.0	405.0	425.0
Nachod	Rubena	50.0	150.0	180.0							
Prague	Slovakian National Revolution	40.0	116.0	150.0	220.0	280.0	360.0	400.0	410.0	450.0	475.0
Puchov	Matador				10.0	10.0	20.0	30.0	50.0	75.0	100.0
Total		310.0	712.0	953.0	1,150.0	1,390.0	1,570.0	1,660.0	1,750.0	1,875.0	2,000.0
East Germany											
Berlin/Schmoeckwitz	Mueller	1.5	3.0	10.2	25.0	64.0	91.0	118.5	120.0	150.0	165.0
Heidenau	VEB Reifenwerk	0	0	4.0	15.0	49.0	55.0	50.0	30.0	30.0	30.0
Ketchendorf	VEB Deka	22.0	32.0	72.0	147.0	200.0	345.0	400.0	530.0	600.0	658.2
Klein Wittenberg	VEB Elbe							0.8	6.0	18.0	20.0
Riesa	VEB Riessa		4.0	17.8	30.0	81.0	120.0	203.0	230.0	341.7	352.0
Total		23.5	39.0	104.0	217.0	394.0	611.0	772.3	916.0 d/	1,139.7 e/	1,225.2 f/

* Footnotes for Table 10 follow on p. 35.

Table 10
Estimated Production of Motor Vehicle Tires in the European Satellites
by Country and by Plant a/
1946-55
(Continued)

Location	Plant	Thousand Units										
		1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	
Hungary												
Budapest	Magyar	30.0	48.0	55.0	72.0	105.5	120.0	160.0	175.0	180.0	195.0	b/
Poland												
Bedicea Poznan	Stomil Stomil	26.0	78.0	141.0	172.0	215.0	250.0	310.0	360.0	420.0	425.0	
Total		26.0	78.0	141.0	172.0	215.0	250.0	310.0	360.0	420.0	425.0	
Rumania												
Balcoi Brasov	Banloc Cauciuc Brasov	20.0	35.0	62.0	85.0	90.0	95.0	105.0	125.0	135.0	150.0	
Total		20.0	40.0	68.0	95.0	105.0	110.0	125.0	150.0	170.0	195.0	d/
Grand total		414.5	925.0	1,333.5	1,732.9	2,252.2	2,716.0	3,087.3	3,415.8	3,859.7	4,054.6	

a. Figures are rounded to the nearest hundred. Estimates for 1946-52 are taken from source 121/.

b. 122/

c. 123/

d. 124/

e. 125/

f. 126/

g. 127/

h. 128/

i. 129/

j. 130/

Table 11

Estimated Production of Carbon Black in East Germany, by Plant
1950-55

Plant	Location	Year						Metric Tons
		1950	1951	1952	1953	1954	1955 Plan	
Blankenburg Hydrocarbon	Blankenburg	400 a/	400	400	400	400	350	
Oranienburg Russwerk	Oranienburg	600	900	1,200	2,400 b/	2,400	2,500 c/	
Stickstoffwerk Piesteritz	Piesteritz	14,195 d/	14,100	14,000	12,500	15,600	16,035 e/	
Total		<u>15,195</u>	<u>15,400</u>	<u>15,600</u>	<u>15,300</u>	<u>18,400</u>	<u>18,885</u>	

a. 131/
b. 132/
c. 133/
d. 134/
e. 135/

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g. Tire Cord.

East Germany produces large quantities of both rayon and perlon but has no domestic production of cotton. Consequently, all tires produced in East Germany are made with synthetic fiber cord. Analysis of yearly plans shows that ample supplies of rayon and caprolactum, the raw material for perlon, are available. Actual production of rayon tire cord in 1954 was 4,398 tons, and planned production of perlon cord for the same year was 542 tons. 136/ Planned production for 1955 was 332 tons of perlon cord and 4,630 tons of rayon cord. 137/

Analyses indicate that tires for passenger cars comprise about 50 percent of the total production of motor vehicle tires in East Germany. In estimating consumption of tire cord in East Germany, it therefore can be assumed that the average tire will need 4 kg of cord, based on an average of 3 kg of cord for a passenger-car tire and 5 kg for a truck tire. The estimated consumption of tire cord in East Germany in 1953-55 is shown in the following tabulation:

<u>Year</u>	<u>Consumption (Metric Tons)</u>
1953	3,440
1954	4,560
1955	4,600

h. Beadwire.

East Germany produces about 50 percent of its requirements for beadwire and is dependent on imports for the remaining 50 percent. 138/ Available information indicates that there is an over-all shortage of steel wire in East Germany. 139/ Based on the number of tires produced, an estimate of the steel requirements of the rubber industry in East Germany in 1953-55 is shown in the following tabulation:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	990
1954	1,280
1955	1,460

i. Nontransportation Goods.

East Germany produces a wide variety of nontransportation consumer goods, such as footwear, conveyor belts, rubberized fabrics, and rainwear. Except for footwear, few statistics are available on the volume of these products. Production of conveyor belts was reported to be 1.5 million square meters in 1954, with a planned production of 2.4 million square meters in 1960. 140/ Most of these conveyor belts are exported to other countries of the Sino-Soviet Bloc.

Production of footwear has increased gradually since 1946, but production is apparently considerably below demand. Statistics are not entirely satisfactory since "footwear, boots, overshoes, and overboots" appear with disconcerting duplication. The estimated production of footwear in East Germany in 1946-55 is shown in Table 12.

Table 12

Estimated Production of Footwear in East Germany
1946-55

Thousand Pairs			
Year	Production	Year	Production
1946	N.A.	1951	1,200 (planned) <u>d/</u>
1947	N.A.	1952	1,000 (planned) <u>e/</u>
1948	1,469.6 <u>a/</u>	1953	1,200 (planned) <u>f/</u>
1949	850 (planned) <u>b/</u>	1954	2,400 <u>g/</u>
1950	737.94 <u>c/</u>	1955	2,484 <u>h/</u>
a. <u>141/</u>	d. <u>144/</u>	g. <u>147/</u>	
b. <u>142/</u>	e. <u>145/</u>	h. <u>148/</u>	
c. <u>143/</u>	f. <u>146/</u>		

The demand for rubber boots and shoes in East Germany has been estimated to be 9 million pairs per year. 149/ It seems probable that production is limited somewhat by both a shortage of equipment and a lack of rubber.

6. Hungary.

a. General.

Before World War II, production of rubber products in Hungary represented only about 1.2 percent of its industrial production. 150/ Since the USSR gained control of Hungary, the rubber industry has been expanded at about the same rate as other industries. The plants were in private hands before the war, but they were nationalized in December 1949 and placed under the control of the Main Administration for the Rubber Industry. The First Five Year Plan of Hungary (1950-54) called for expansion of the industry by 154 percent between 1949 and 1954. Actual production in 1954 was announced by the Minister of the Chemical Industry as 300 percent of that in 1949. 151/ A press statement mentions an increase of 188.3 percent. 152/

b. Natural Rubber.

Hungary is dependent on imports for its supplies of natural rubber. In 1938, imports were valued at \$560,000, 153/ and in 1947 the value was \$646,000. 154/ In an effort to reduce this burden of foreign exchange, Hungarian planners proposed to grow kok-saghyz, using seed supplies under the Soviet-Hungarian trade agreement of 1 August 1949. Much publicity was given to the program in 1951, with promises of large financial returns to be realized from growing kok-saghyz. The First Five Year Plan called for 5,000 acres to be under cultivation by 1954. Nothing has been published on the results obtained from this grandiose scheme, and it is doubtful if there is any significant production today.

c. Synthetic Rubber.

During World War II the Germans started the construction of a synthetic rubber plant in Hungary, which was to be the largest of its kind outside of Germany. The plant never got into production, and the Hungarians have since converted the plant to other uses. As a part of the development of a petrochemical industry, the USSR planned to produce synthetic rubber which used natural gas as a raw material. A joint Hungarian-Rumanian company backed by the USSR was formed for this purpose, and construction was reported to have started on a plant located at Szeged (46°15' N - 20°09' E), close to the Hungarian-Rumanian border. Planned production for 1956 was said

to be 23,000 tons. 155/ It is believed that construction of this plant is lagging because parts of it are only now reported to be under construction. A later report states that production will start during the Second Five Year Plan of Hungary (1956-60). 156/

d. Reclaimed Rubber.

Only one plant reclaims rubber in Hungary, and because it consumes this material in its own operations, no production statistics are available. Because of the severe shortage of tires that exists in Hungary 157/ and the consequent use of tires until they are completely worn out, it is doubtful if the necessary raw material is available for an extensive rubber-reclaiming industry. The estimated production of reclaimed rubber in Hungary in 1946-55 is shown in Table 13.

Table 13

Estimated Production of Reclaimed Rubber
in Hungary a/
1946-55

Metric Tons			
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	500	1951	3,000
1947	900	1952	N.A.
1948	1,900	1953	5,200
1949	2,200	1954	5,500
1950	N.A.	1955	5,800

a. Estimates for 1946-53 are taken from source 158/. Those for 1954 and 1955 are based on an expansion of total rubber consumption in Hungary.

e. Transportation Goods.

There is only one manufacturer of motor vehicle tires in Hungary, the Elsoe Magyar Ruggyantarugyar Rubber Plant located in Budapest (47°30' N - 19°05' E). ^{159/} It was established before World War II as a Hungarian subsidiary of the Dunlop Rubber Company of England and was considered to be one of the finest tire plants in Europe. The plant was seized by the USSR and is operated as a state-owned enterprise. The importance which is attached to this was indicated by the report that in 1949 the rubber industry of Hungary would require 30,000 tons of coal as fuel, of which 90 percent would be assigned to this plant. ^{160/} The plant also makes a wide variety of other consumer goods and was reported to have 4,000 employees in April 1955. ^{161/} The estimated production of motor vehicle tires in Hungary in 1946-55 is shown in Table 14.

Table 14

Estimated Production of Motor Vehicle Tires
in Hungary ^{a/}
1946-55

Thousand Units

<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	30	1951	120
1947	48	1952	160
1948	55	1953	175
1949	72	1954 (Plan)	180
1950	105	1955	195 ^{b/}

a. ^{162/}
b. ^{163/}

f. Carbon Black.

Since the end of World War II, Hungary has produced a small amount of carbon black in conjunction with its natural gas and petroleum industries. ^{164/} A small channel-type plant was built at

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Lispezentadorjan (46°32' N - 16°42' E), which was reported to have a small capacity and to be very inefficient. 165/ A modern plant was scheduled to be built in 1952 near the city of Nagykanizsa (46°27' N - 16°59' E), which was planned to satisfy the domestic demand for carbon black and provide some black for export. 166/ No published reports have been received which would indicate the completion of this plant or any exports of carbon black by Hungary. For these reasons, it seems probable that Hungary is still dependent on imports for its major requirements for carbon black. Production at the Lispezentadorjan plant, from descriptions of the facilities, is estimated to be 1,000 tons per year, compared with an estimated demand of 2,000 to 3,000 tons per year.

g. Tire Cord.

Although both rayon and cotton cord are consumed in Hungary, the domestic production of rayon is of such poor quality as to preclude its use in tires. 167/ For this reason, rayon cord is imported. In the third quarter of 1951, Hungary purchased 30 tons of rayon cord from one firm in Milan. 168/ It was reported that early in 1954 Hungary was purchasing approximately 100 tons of rayon cord per month from the Enka Company of the UK. 169/ No shipments of perlon or nylon cord into Hungary have been reported, nor is there any known domestic production of these materials. Hungary's requirements for tire cord in 1953-55, based on its estimated production of tires, is shown in the following tabulation:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	875
1954	900
1955	975

h. Beadwire.

Hungary has a domestic production of steel wire adequate to meet the requirements of its rubber industry. 170/ Unlike the USSR, Hungary uses a copper-coated wire for making tire beads. Consumption of beadwire in Hungary in 1953-55 is shown in the following tabulation:

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<u>Year</u>	<u>Consumption (Metric Tons)</u>
1953	200
1954	205
1955	220

i. Nontransportation Goods.

Motor vehicle tires are estimated to account for approximately one-half of the rubber consumption in Hungary, other products being footwear and rubber soles, industrial goods, and sanitary articles. Only fragmentary information is available on the production of individual items. Estimating production of rubber footwear is difficult because Hungarian statistics include leather sandals with rubber soles in the category of "rubber footwear." One report in 1950 stated that production of rubber shoes in 1949 was 360,000 pairs, compared with 250,000 pairs in 1948. 171/ Statements by government officials indicate that the total production of all types of rubber footwear in 1949 was about 1.36 million pairs. The First Five Year Plan called for an increase of 81 percent in 1954 above the level in 1949, and a major expansion of the footwear industry was undertaken during 1952 and 1953. This expansion resulted in a sharp increase in the production of all types of footwear. Government statistics during the First Five Year Plan have not differentiated between rubber and leather footwear; hence the figures in Table 15,* showing the estimated production of rubber footwear in Hungary in 1948-55, have been developed from the announced production of all types of footwear, assuming the same proportion of rubber shoes that prevailed in 1949. Production of rubber footwear in 1955 was reported to be 5.9 percent above that in 1954. 172/

The First Five Year Plan also called for an increase in production of 3,600 tons of industrial rubber goods in 1954 above that in 1949. 173/

7. Poland.

a. General.

Before World War II, Poland had a relatively large rubber industry with about 20 plants employing over 15,000 workers who

* Table 15 follows on p. 44.

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Table 15

Estimated Production of Rubber Footwear
in Hungary
1948-55

Million Pairs			
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1948	1.25	1952	7.0
1949	1.36	1953	6.6
1950	2.5	1954	7.9
1951	6.0	1955	8.2

manufactured a wide variety of products. ^{174/} By 1945 these plants were operating at only about 30 percent of capacity because of the shortage of raw materials. The postwar Three Year Plan (1947-49) of Poland called for the restoration of the industry to 133 percent of the prewar level by 1949, and great expansion was planned for the Six Year Plan (1950-55) of Poland. Production of tires was to increase fourfold, and production of footwear was to reach 10 million pairs by 1955. No specific announcements have been published on the accomplishment of these objectives. As of April 1956 the current Five Year Plan, (1956-60) had not been published in detail, but it is known to include further expansion of the rubber fabricating industry as well as the completion of a synthetic rubber plant by 1960. Meanwhile, the industry continues to operate with imported raw materials and is able to meet domestic requirements for rubber products.

b. Natural Rubber.

Poland has made some postwar attempts to grow kok-saghyz, but no publicity has been given to the project since mid-1951. ^{175/} A processing plant was included in the Six Year Plan, but it is doubtful if this plant was built; no mention has been made of it in the Polish press. It seems probable that the plan to grow kok-saghyz has been abandoned.

c. Synthetic Rubber.

Just before World War II the IG Farben Company built a plant at Debica (50°03' N - 21°25' E) to produce synthetic rubber. This plant was not in operation at the end of the war, and the equipment was shipped to the USSR. Plans for the reestablishment of the plant were presented in the Six Year Plan 176/ with a projected production of 9,000 tons in 1953 and a goal of 13,000 tons in 1955. 177/ Although several announcements have appeared concerning the success of the rubber products industry of Poland, no publicity has been given to the production of synthetic rubber. It is therefore believed that accomplishments to date have been far below the announced goals.

In 1951 the Polish government announced the projected building of another synthetic rubber plant, at Oswiecim (55°02' N - 19°14' E), as a part of a large chemical combine which included extensive facilities for making calcium carbide, a raw material necessary for the German process of manufacturing rubber. 178/ According to intelligence reports, machinery for the plant was imported from East Germany early in 1955, 179/ although the Polish press stated that two-thirds of the equipment was imported from the USSR and that the remaining one-third was to be made in Poland. 180/ The plant is planned to be in operation by 1958. 181/

Another small plant, located at Saarau (50°57' N - 16°30' E), was built just before World War II to make "thiokol" rubber, a special type of rubber which is oil-resistant but of slight value for general-purpose use. This plant reportedly had an initial capacity of 700 tons per year. 182/ It was taken over by the government in 1946 and has operated intermittently since that time. Production apparently is limited by the difficulty of obtaining the special raw materials needed for the operation of the plant. The plant was not in production in September 1955. 183/

Although a previous report 184/ included estimates of production, subsequent evidence seems to indicate that production of synthetic rubber in Poland is still limited to experimental or pilot-plant quantities, with total production being less than 2,000 tons per year. The most recent document received indicates that there will be no commercial production before 1958, when it is expected that 6,000 tons will be produced. 185/ This figure is expected to rise to 24,000 by 1960. This information was given at a meeting held in Berlin, 18-25 May 1956, attended by the Soviet members of CEMA, and is believed to be based on reality rather than on propaganda.

d. Reclaimed Rubber.

The Three Year Plan of Poland included the erection of a plant for reclaiming rubber, which would have a capacity of 1,500 tons per year. It is doubtful if this capacity was realized.

Since World War II a second plant for reclaiming rubber has been built at Kolo (51°26' N - 19°49' E), but it was reportedly completely destroyed by fire in 1954 and had not been rebuilt a year later. ^{186/} In addition to these 2 plants, at least 2 of the fabricating plants located at Krakow (50°05' N - 19°55' E) and Lodz (51°45' N - 19°28' E) reclaim old rubber, using the reclaimed rubber in their finished products. ^{187/} The estimated production of reclaimed rubber in Poland in 1946-55 is shown in Table 16.

Table 16

Estimated Production of Reclaimed Rubber
in Poland ^{a/}
1946-55

		Metric Tons	
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	500	1951	3,000
1947	500	1952	4,500
1948	500	1953	4,500
1949	1,000	1954	5,000
1950	2,800	1955	5,000

a. ^{188/}. The range of error is plus or minus 25 percent.

e. Transportation Goods.

Two of the 3 plants producing motor vehicle tires in Poland were established with the aid of US capital. The Stomil plant, located at Poznan (52°25' N - 16°58' E), started making tires in 1929. ^{189/} It was seized by the Germans in World War II and has been expanded several

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times since 1945. In 1948 the plant was scheduled to produce 4,768 tons of products of all types, and in 1952 it reported the production of 11,000 tons of tires. 190/ The plant was reported to have produced 8,500 tires in December 1954, which would be equivalent to about 100,000 tires per year. 191/ The Stomil Tire Plant No. 2, located at Debica, also built with US assistance, began production in 1939. It was designed to make 1,200 tires per day but never reached this production. 192/ It was completely demolished during World War II, was rebuilt with machinery from Germany after 1945, and began production again in 1949. 193/ As a part of the expansion to be carried out under the Six Year Plan, the plant is being greatly enlarged with machinery from East Germany. 194/ Upon completion in 1958, the Stomil Tire Plant No. 2 is planned to be "the largest rubber plant in Europe." 195/

The third motor vehicle tire plant, located at Plock (52°33' N - 19°42' E), has been under construction for several years and was to be completed in 1955. 196/ No information has been published to indicate that production had started or what volume was being produced. The estimated production of motor vehicle tires in Poland in 1946-55 is shown in Table 17.*

f. Carbon Black.

Two Polish plants produce carbon black from natural gas. These plants were built under the supervision of the USSR after World War II and were reported in 1950 to be producing a total of about 6,000 tons per year. 197/ Another carbon black plant, located at Gleiwitz (50°17' N - 18°40' E), was built by the Germans before World War II. This plant produced carbon black by burning coal-tar products -- anthracene and naphthalene -- and had a rated capacity of 1,500 tons per month. It was dismantled after the war, and the equipment was removed to the USSR. 198/ Later the plant was partially restored and was reported to have started production in May 1950. Reported capacity is about 3,000 tons per year. 199/ Because Poland's requirements are considerably below the indicated annual production of 9,000 tons, it is able to export carbon black to other European Satellites.

* Table 17 follows on p. 48.

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Table 17

Estimated Production of Motor Vehicle Tires
in Poland ^{a/}
1946-55

Thousand Units

<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	26	1951	250
1947	78	1952	310
1948	141	1953	360
1949	172	1954	420
1950	215	1955	425 ^{b/}

a. As no official announcements have appeared concerning the accomplishment of the Six Year Plan goal for production of tires, estimates are necessarily based on plant studies and probable rates of increase. The range of error is plus or minus 10 percent. Estimates for 1946-54 are taken from source 200/.

b. 201/

g. Tire Cord.

Poland has facilities for producing cotton, rayon, and perlon (called "steelon" in Poland) tire cord. In 1947 it was reported that cotton cord was being used in conjunction with rayon breaker strips, 202/ a practice followed in the US when rayon was priced too high to permit its exclusive use in motor vehicle tires. By 1951 it was reported that rayon cord was being used extensively for tires. 203/ The Debica tire plant was reported to be planning the production of tubeless tires in 1957 and by 1958 to be making tires with steelon cord. 204/ Based on Poland's estimated production of tires, consumption of tire cord in 1953-55 is shown in the following tabulation:

~~S E C R E T~~

~~S-E-C-R-E-T~~

<u>Year</u>	<u>Consumption (Metric Tons)</u>
1953	1,800
1954	2,100
1955	2,310

h. Beadwire.

Poland's requirements for beadwire represent less than 1 percent of its production of steel wire. In 1950 it was reported that approximately 55,000 tons of wire less than 8 millimeters in diameter were produced at the Kosciuszko Iron and Steel Works in Chorzow. 205/ The estimated consumption of steel in production of beadwire in Poland in 1953-55 is shown in the following tabulation:

<u>Year</u>	<u>Consumption (Metric Tons)</u>
1953	405
1954	472
1955	520

i. Nontransportation Goods.

Before World War II the rubber industry of Poland, which employed about 15,000 workers, was characterized by an emphasis on production of footwear, which was said to account for 64 percent of the production of the industry, in contrast to only 16 percent for motor vehicle tires. In the worldwide industry, footwear amounts to only 8.9 percent and tires, 71.2 percent. Industrial, sanitary, and other consumer goods constituted less than 20 percent of production in Poland. In the postwar period, as Poland has become more highly industrialized, the rubber industry has had to realign its production to meet the shift in demand. By March 1955, tires had risen to 28.2 percent of the industry's production, and footwear had decreased to 23 percent. 206/ The current Five Year Plan calls for further increases in production of tires and technical goods and less production of footwear.

In effecting this change the Polish planners have had to make the most efficient use of the small supply of experienced personnel and to establish training schools for additional workers. They have also received technical assistance from Soviet experts in an effort to improve production methods and the quality of product. 207/ They plan to increase greatly the use of synthetic rubber, which in 1955 accounted for only 35 percent of the new rubber used in Poland. 208/

For nontransportation goods the only specific figures available are those for rubber footwear. The Six Year Plan called for the production of 16.4 million pairs of rubber shoes in 1955. This goal was said to be 163.9 percent above production in 1949. In 1955 it was reported that the goal for production of footwear would be exceeded by 30.8 percent. 209/ An early report stated that production in 1949 was 149 percent above that in 1948. The estimated production of footwear in Poland in 1946-55 is shown in Table 18.

Table 18

Estimated Production of Footwear in Poland
1946-55

<u>Million Pairs</u>			
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	N.A.	1951	9.7
1947	N.A.	1952	13.8
1948	4.2	1953	16.4
1949	6.2	1954	18.3
1950	8.0	1955	21.4

8. Rumania.

a. General.

Before World War II the rubber industry of Rumania was very small. Except for carbon black, the necessary raw materials were imported. It was estimated that in 1933, rubber constituted one-third

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of the value of all imports into Rumania. 210/ Production was confined largely to footwear, raincoats, and other consumer goods. The first plant for making motor vehicle tires was established in 1938 with the help of a US manufacturer. 211/ During the war, Germany organized another company to make tires, thereby increasing its war supplies. Since the USSR assumed economic control of Rumania, efforts have been made to expand the rubber industry to meet domestic requirements, which were the basis for the planned expansion during the First Five Year Plan of Rumania (1951-55). The Plan called for 3 billion lei, the equivalent of \$20 million at the time the Plan was formulated, to be invested in the industry during 1951, 1952, and 1953. 212/

The production of synthetic rubber is the responsibility of the Ministry of the Chemical Industry. The manufacture of rubber products is controlled by the Rubber Center of the General Directorate of Leather and Rubber, a part of the Ministry of Light Industry. 213/ Worn rubber products, such as old tires, are collected by the Directorate of Collection and Acquisition for conversion into reclaimed rubber. 214/ The Ministry of Industry and Commerce controls the distribution and sale of tires, which are strictly rationed. 215/ The purchase of the necessary raw materials, which are imported, is handled by Chinimport, and the import of finished rubber products is handled by Technoimport.

b. Natural Rubber.

In an effort to reduce import requirements for natural rubber, Rumania has undertaken the production of rubber from kok-saghyz. Under the terms of the Soviet-Rumanian Trade Agreement of 20 February 1947, the USSR was to supply Rumania with 20 kg of kok-saghyz seed 216/ from which 1,700 to 1,800 tons of rubber were reported produced in 1949. 217/ This production seems highly improbable, because the amount of seed specified would be sufficient to plant only about 10 hectares, which in turn would produce a maximum of 3 tons of rubber. 218/ There have been no later reports of production, and although the industry may still be in operation on an experimental basis, it is doubtful if it is making a significant contribution to Rumania's rubber supply. It is probable that the program of kok-saghyz cultivation has been abandoned because of its slight potentialities.

c. Synthetic Rubber.

Rumania has been interested in producing synthetic rubber as a part of its plans for the development of a petrochemical industry. Although numerous references have appeared concerning production of synthetic rubber, it seems likely that such production is only on an experimental scale. The most reliable report describes a plant in Margina (45°52' N - 22°17' E), which produced 32.8 tons of synthetic rubber in November 1952 and planned to produce 75 tons in December 1952. 219/ Another plant is reported to be located in Ploesti, but no details of its capacity are available. 220/ On the other hand, a press report of July 1955 stated that "more attention must be given to the scientific problems connected with the production of synthetic rubber," 221/ a statement which would indicate that the industry is not in commercial production. No mention of synthetic rubber was made in the First Five Year Plan, but the Second Five Year Plan of Rumania (1956-60) calls for the establishment of a synthetic rubber industry to increase production at a rate of 5,000 tons per year, with production reaching 25,000 tons by 1960. 222/ On the basis of the available information, it is believed that production of synthetic rubber in Rumania is still on an experimental basis and probably is less than 1,000 tons per year.

d. Reclaimed Rubber.

Rumania has been interested for some time in the production of reclaimed rubber. As previously mentioned, the collection of worn rubber products is the responsibility of a government agency, and the motor vehicle tire plant at Baicoi (45°03' N - 25°47' E) has been reclaiming rubber as a part of its operations. The First Five Year Plan provided 900 million lei (equivalent to about \$6 million in 1950) for the erection of a rubber combine at Jilava (44°19' N - 26°06' E), south of Bucharest, which would reclaim rubber and produce footwear, belting, hose, and other technical articles. The reclaiming equipment (reportedly outdated machinery) was to come from the USSR, and the plant was to be completed in 1953. 223/ The reported capacity of 10,000 tons per month is obviously an error, because Rumania's requirements for reclaimed rubber would be less than 2 percent of this amount and because it would not have raw materials available to produce such an amount. A radio report of 12 December 1955 reported that this plant was "nearing completion." 224/ On the basis of the consumption of new rubber in Rumania, it is estimated that the production of reclaimed rubber would not exceed 150 tons per month, even when the new plant is in operation.

e. Transportation Goods.

Rumania has two plants producing motor vehicle tires. The first plant, built in 1938 with the aid of US capital, is located in Baicoi. 225/ It was called the Banloc Rubber Factory until 1955, when the name was changed to the Victory Chemical Plant. 226/ Its reported capacity is 500 tires per day, but because of a shortage of raw materials, production is probably much less than this figure. The other plant is the Rubber Products Factory located at Orasu/Stalin (45°38' N - 25°34' E), which was built by the Germans in 1944 to produce tires for military vehicles. In 1950 the capacity of this plant was reported to be 275 to 300 tires per day, 227/ but actual production probably is somewhat less than this figure.

The estimated production of motor vehicle tires in Rumania in 1946-55 is shown in Table 19.

Table 19

Estimated Production of Motor Vehicle Tires
in Rumania a/
1946-55

Thousand Units			
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	20	1951	110
1947	40	1952	125
1948	68	1953	150 <u>b/</u>
1949	95	1954	170
1950	105	1955	195

a. Estimates for 1946-52 and 1954-55 are taken from source 228/.

b. 229/

f. Carbon Black.

Rumania has long been a producer of carbon black, its production being closely associated with the petroleum and natural gas industries. Production in 1938 was less than 1,000 tons, and carbon black was used largely as pigment for paints, inks, and the like. 230/ Rumania

had 4 small channel-type plants located in the natural gas region, but because production decreased sharply in 1944 and 1945, 2 of these plants are believed to have been damaged during World War II. It is believed, however, that these plants were rebuilt. By 1947, four plants were reported to be in operation. These plants had a total annual capacity of about 2,000 tons. 231/ Between 1943 and 1952 the USSR instigated the construction of seven modern furnace-type plants to use the large reserves of natural gas. Equipment for these plants, located at Prostea-Mare (46°07' N - 24°18' E), was reported to have been sent to Rumania by the USSR. 232/ Each plant is estimated to have an annual capacity of 1,000 tons. Another facility for making carbon black, which went into production in 1952, has been reported at Satu-Mare (47°18' N - 22°53' E) 233/ and is believed to produce about 6,000 tons per year.* There have been no specific references to increased capacity in the carbon black industry of Rumania during the past 2 years; hence it is believed that production has been stabilized at about 38,000 tons per year. Because carbon black plants normally operate at maximum capacity and on a continuous basis, any appreciable increase in production can be accomplished only by the construction of additional facilities.

g. Tire Cord.

Rumania produces its domestic requirements for cotton tire cord and in 1950 was reported to be experimenting with the production of rayon cord. 235/ These attempts apparently were not entirely successful. In 1952 an official of Romanoexport was attempting to purchase as much as 200 tons of rayon tire cord per year. 236/ There have been no recent reports of production of rayon cord in Rumania. Rumania's requirements for tire cord in 1953-55, based on its estimated tire production, are shown in the following tabulation:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	750
1954	850
1955	975

* Production in 1949 was reported to have been 22,086 tons. 234/

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h. Beadwire.

Rumania is a major producer of steel wire. Its two steel producing plants have a combined annual production of more than 130,000 tons, and both plants have facilities for drawing high-carbon steel wire. ^{237/} As can be seen from the following estimates, consumption of steel wire by the rubber industry for beadwire constitutes a fraction of 1 percent of domestic production. The consumption of steel wire for beadwire in Rumania in 1953-55 is shown in the following tabulation:

<u>Year.</u>	<u>Consumption</u> <u>(Metric Tons)</u>
1953	169
1954	190
1955	220

i. Nontransportation Goods.

In addition to the 2 tire plants mentioned, Rumania has 4 plants which produce industrial goods and 1 plant which produces sanitary and surgical items. ^{238/} Also the largest shoe factory in Rumania was to be supplied under the First Five Year Plan with 200 million lei (\$ 1.33 million) for equipment to make rubber soles. ^{239/} There is little information available on actual production of footwear. The Rumanian Chemical Works Rubber Factory in Bucharest was scheduled to produce 350,000 pairs of rubber shoes in 1949, ^{240/} and the First Five Year Plan called for national production of 2.7 million pairs in 1955. This figure was raised to 4 million on 22 August 1953. ^{241/} There have been no announcements as to the success of the industry in meeting either of these goals.

9. Communist China.

a. General.

Before the Japanese invasion of China in the late 1930's, the Chinese rubber industry was primarily engaged in the production of footwear and of tires for bicycles, jinrickshas, and carts. Raw materials, except cotton fabric, were imported. Numerous small factories, each with a few employees using primitive methods, were responsible for most of the production. A few larger plants, most of which were located in the Shanghai area, used more modern methods.

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The demand for sanitary goods, motor vehicle tires, and hose was small, and investment in the machinery needed to make these items was not warranted. For this reason, such rubber products were imported.

With the Japanese invasion the pattern of the rubber industry of China changed. The invaders built a large modern plant and equipped other plants with Japanese machinery to supply their military needs. 242/ These plants were organized as branches of Japanese rubber companies. Some of the small handcraft plants were allowed to continue operations on a restricted basis. No detailed information on the industry during the Japanese occupation is available, but it is known that small supplies of rubber and of other raw materials confined production to an austerity basis.

After World War II, production of rubber was one of three activities in light industry which enjoyed relative prosperity. (The other two were textiles and flour milling.) The small plants were retained by their owners, whereas the large plants formerly operated by the Japanese were taken over by the Chinese Nationalists. Limited availability of foreign exchange hampered the import of raw materials and curtailed production. Nevertheless, by 1948 it was estimated that the rubber industry of Communist China had the following annual capacity 243/:

Item	Production
Motor vehicle tires (thousand units)	220
Motor vehicle tubes (thousand units)	220
Bicycle, jinricksha, and cart tires (million units)	4.05
Bicycle, jinricksha, and cart tubes (million units)	4.45
Shoes (million pairs)	90 to 100

When the Chinese Communists came into power in 1949, the rubber industry practically ceased operations because of a temporary shortage of raw materials, 244/ the result of the confusion in Peiping and the more pressing problems of the new rulers. By 1950, some order began to appear, and restoration of the industry was begun. The plants were placed under the Ministry of Light Industry. Direct supervision is maintained through regional bureaus which control all of the industrial facilities in their respective administrative district. Manufacture of rubber products appears to have been one of the activities selected by the Chinese Communists to be

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nationalized. Because the Chinese Communists controlled imports of raw materials, they were able gradually to eliminate the smaller and less efficient manufacturers. Larger plants were seized for taxes or reorganized into joint state-private enterprises. By the end of 1955, private enterprise had almost ceased to exist in the principal centers of rubber production. 245/

The rubber industry of Communist China is plagued with serious problems which it is attempting to correct. One of these problems concerns the quality of product. Many reports are received indicating an average service life for motor vehicle tires of 3,000 to 4,000 km, 246/ and footwear lasts less than 2 months. At an annual technical committee meeting held in Peiping during 27 November - 4 December 1954, a resolution was passed to increase the life of tires to 25,000 to 30,000 km, to extend the life of rubber shoes by 30 days, 247/ and to reduce the price of rubber shoes by 25 percent. In 1953, shoes were priced at \$18 to \$24 per dozen pairs, wholesale. At the same time, truck tires were advertised at the equivalent of about \$158, and a bicycle tire and inner tube cost about \$70. By contrast, workers in the principal rubber plant in Tientsin were paid from \$12.80 to \$25.60 per month, the latter being barely a subsistence level for unmarried workers. 248/

b. Natural Rubber.

For years the Chinese have attempted to raise rubber trees on Hainan Island. A small amount of rubber was being produced before World War II. The plantations, however, suffered considerable damage during the Japanese occupation. Reports vary in detail as to the situation in 1950, when the Chinese Communists gained control of the area. There probably were about 600 plantations, each of which produced an average of about 1 ton of rubber per year. 249/ The Chinese Communists announced an ambitious program for planting about 6 million additional trees, which would ultimately yield about 15,000 tons of rubber. 250/ Some of these trees were to be planted on the Luichow Peninsula. Technicians were sent to the area, and workers were recruited from the cities to clear the land and plant the seedlings imported from Burma and India. 251/ Workers were reported to receive the equivalent of \$14 to \$17 per month, with \$6.50 deducted for 2 meals per day. 252/ After 2 years of effort, apparently it was realized that the project was doomed to failure. The soil on the mainland was poor, and the drafted labor used proved inadequate for the job. Returnees in 1954 and 1955 reported that most of the trees had died and that the

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workers were diverted to other tasks. 253/ The most recent announcements by the Chinese Communists have listed several projects for the development of Hainan Island, but no mention has been made of growing rubber. A fundamental reason for the failure of the program probably is the fact that the area is too far north; the practical growing area for rubber is considered to be within 10 degrees of the equator.

It is estimated that production on Hainan Island is still less than 1,000 tons per year, with little prospect that this figure will increase materially above 1,500 before 1960.

c. Synthetic Rubber.

The only attempt to produce synthetic rubber in China was made by the Japanese-owned Manchurian Synthetic Rubber Company in 1942-44, but production never exceeded experimental quantities. 254/ The equipment from the plant, located in Kirin, was shipped north by the Chinese Communists, and the facilities have not been restored. 255/ The Chinese Communists have shown an interest in building a plant and may, with the help of Soviet technicians, realize this ambition, but it is doubtful if the plant could be built and in operation before 1960. At present, requirements for synthetic rubber must be met by imports.

d. Reclaimed Rubber.

For many years, China has imported large numbers of old tires for processing into reclaimed rubber. The processing was carried out in a few large plants making consumer goods, and statistics on production have never been published. Since 1951 the Chinese Communists have built two plants specifically designed to reclaim rubber. 256/ One plant built in Shanghai was scheduled to go into production in January 1955 with a capacity of processing 100,000 old tires per year (equivalent to about 750 tons of reclaimed rubber). 257/ Another plant built in Mukden (Shen-yang) was reported to have 90 percent of its machinery installed in December 1954 and was scheduled to start operating in 1955. No information was given on its capacity. 258/ In view of the fragmentary information available, it is impossible to make a reasonable estimate of the total production of reclaimed rubber in Communist China.

e. Transportation Goods.

As previously mentioned, the Japanese established the manufacture of motor vehicle tires in China. Almost the entire production was of the 32-by-6.00-inch size to fit military vehicles. When the Chinese Nationalists took over the government, they started the production of other sizes, and later the Chinese Communists began production of aircraft and large bus tires, and today many sizes are in production.

When the Chinese Communists gained control of Northeast China in 1948, the major tire producer was the former Japanese Bridgestone Rubber Factory* in Tsingtao, and this plant continues to be the largest producer. Other tire plants were located in Shanghai, Tientsin, and Mukden. The announced goals of the First Five Year Plan of Communist China (1953-57) included the construction of 4 tire plants and an increase in production from 417,000 tires in 1952 to 760,000 tires in 1957. 259/ It is probable that two of these new plants 260/ are located at Peiping and Mu-tan-chiang. In addition, it was announced in 1954 that 2 tire plants had been undergoing expansion, 1 in Northeast China and 1 in East China, and it was expected that production would be doubled in these plants. 261/ These expansions are believed to have taken place in Tientsin and Mukden. Equipment for this added capacity is reported to be coming from Czechoslovakia, East Germany, and the USSR. 262/

Annual announcements of production increases 263/ are sufficient to give a fairly accurate estimate of the total production of tires in Communist China. The estimated production of motor vehicle tires in Communist China in 1946-55 is shown in Table 20.**

The estimated production of motor vehicle tires in Communist China, by plant, in 1948-55 is shown in Table 21.***

f. Carbon Black.

Communist China's domestic production of lamp black, which is made by burning tung oil and similar materials, is not suitable for making tires, but it can be used in some nontransportation goods.

* See Table 21, p. 61, below.

** Table 20 follows on p. 60.

*** Table 21 follows on p. 61.

Table 20
Estimated Production of Motor Vehicle Tires
in Communist China
1946-55

Thousand Units			
<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1946	N.A.	1951	225
1947	N.A.	1952	417 a/
1948	59	1953	488 b/
1949	25	1954	702.5 c/
1950	62	1955	597 d/

a. 264/
b. 265/
c. 266/
d. 267/

Supplies of carbon black, therefore, are essential for tire plants in China. Because the US produces more than 90 percent of the Western supply, China imported carbon black of a quality needed for tires from the US until 1950, when restrictions were placed on this trade by the US. A thriving business in smuggling 268/ through Hong Kong and Macao then developed because the internal price of US-made carbon black rose to about \$1,700 per ton, more than \$0.77 per pound, compared with a US price of about \$0.16 per pound. Smuggled supplies were inadequate to meet requirements; hence the principal source was the countries of the Soviet Bloc. Soviet carbon black has been reported to be valued at about \$853 per ton. 269/ In 1950 the authorities also began a program to produce carbon black from domestic sources.

Large amounts of gas escape into the air from the coal mines at Fushun, Liaotung Province. A plant was constructed at Fushun to collect the gas and burn it to produce carbon black. The plant is controlled by the Fushun Mining Administration and is reportedly producing about 3,000 tons of carbon black per year. 270/ Another source which was exploited was the gas field at Lung-Ch'ang, Szechwan Province, which was controlled by the Petroleum Administration General Bureau.

Table 21
Estimated Production of Motor Vehicle Tires in Communist China, by Plant
1948-55

City and Plant	State Control Date	Number of Employees	Estimated Production (Thousand Units)												
			1948	1949	1950	1951	1952	1953	1954	1955					
Shanghai															
Ta Chung Hua	21 December 1954	938 (in 1950)	27.0	5.0	25.0	50.0	67.0	75.0	93.0	95.0					
Chung-nan	1 January 1954	N.A.					5.0	10.0	10.0	20.0					
Cheng Tai Hsin Chi	1 January 1954	300 (in 1952)				30.0	50.0	50.0	50.0	50.0					
Tientsin (T'ien-ching)															
Rubber Plant No. 2	December 1950	900 (in 1952)					5.0	10.0	20.0	20.0					
T'ien-ching Rubber Distribution Works	N.A.	N.A.	1.2												
Carton (Kuang-chou)	N.A.	N.A.													
Kuang-chou Rubber Manufacturing Works ^{u/}	N.A.	N.A.													
Peiping															
Chung-ya Chin Kun-yeh	State-built 1951-53	1,500 (in 1952)					30.0	60.0	80.0	80.0					
Makden (Shen-yang)	December 1950	6,000 (in 1950)	5.8	10.0	12.0	35.0	60.0	75.0	75.0	70.0					
Northeast Rubber Goods Plant (Factories No. 1 and No. 7)	December 1950	1,000 (in 1951)	25.0	10.0	25.0	110.0	200.0	200.0	215.0	200.0					
Tsingtao Rubber Goods Plant No. 1	December 1950	1,000 (in 1951)	25.0	10.0	25.0	110.0	200.0	200.0	215.0	200.0					
Mu-tan-chiang	N.A.	N.A.													
State-Operated Rubber Plant No. 1	N.A.	N.A.													
Total			59.0	25.0	62.0	225.0	417.0 ^{v/}	480.0	577.0 ^{g/}	597.0 ^{g/}					

a. This plant has been reported to be producing tires, but no details are available.

b. 271/

c. 272/

d. Excluded from 1954 figures.

A channel black plant was constructed in 1953 to make carbon black from 3 producing gas wells, and production was estimated to be about 650 tons in 1954. 273/ Construction of buildings and drilling of new wells have been reported to be continuing, with an ultimate production goal of about 4,500 tons of carbon black by 1960. 274/ The carbon black plant was said to have had 500 employees in 1954 and 900 in 1955 and was expected to employ 2,000 when completed. 275/ Soviet technicians supervised the drilling and construction of the plant.

g. Tire Cord.

Requirements for tire cord in Communist China seem to be met entirely by the cotton textile industry. This assumption is confirmed by the analysis of a MIG tire which was captured during the Korean War. This tire was made in a Chinese Communist factory using a Soviet tire mold and was made entirely of natural rubber with cotton cord. 276/ Because jet aircraft tires must withstand extreme service conditions, the use of cotton cord would indicate that no better material was available.

Under a 1955 trade agreement, Communist China is to obtain 55,000 bales of Egyptian cotton from Egypt. 277/ It is probable that some of this long-staple cotton will be used to make tire cord and textiles for the rubber industry.

The Tsingtao tire plant reportedly produces its own tire cord from thread obtained from the Tsingtao textile mills. 278/ Also, the new rubber plant in Tientsin built by the Chinese Communists in 1951-52 was reported to get its fabric requirements from textile mills located in Tientsin. 279/ There is no further information indicating which textile mills are producing tire cord. It has been reported that Communist China intends to build a rayon and textile mill in Mu-tan-chiang, 280/ which would be able to produce the textiles needed by the rubber industry; Mu-tan-chiang is also the location of one of the new tire plants discussed above. The estimated requirements for tire cord in Communist China in 1953-55, based on tire production, are shown in the following tabulation:

<u>Year</u>	<u>Requirements (Metric Tons)</u>
1953	2,400
1954	2,885
1955	3,250

h. Nontransportation Goods.

Footwear is the principal nontransportation item produced by the rubber industry of Communist China. Because the process historically has been a handcraft operation, no exact figures can be given for production before the Communist regime. In 1948, footwear capacity was estimated to be 4 million pairs per month in the Shanghai area alone, and this capacity was supposed to represent about 50 percent of the total for the country. ^{281/} Because of the small supply of raw materials, actual production of footwear is believed to have been considerably below capacity. The Chinese Communists have made the following moves to organize the industry to increase its efficiency ^{282/}: (1) the gradual elimination of the small, handcraft shops; (2) the concentration of equipment in larger plants; (3) the adoption of standard methods of manufacture to eliminate waste of raw materials; and (4) attempts to improve the quality of product by adopting quality standards and interchanging technical information at conferences of the principal leaders of the industry.

In 1950 the rubber industry of Communist China was reported to have 543 plants employing approximately 34,000 workers. ^{283/} A majority of these plants were making footwear. ^{284/} It is impossible to estimate accurately the number of plants or workers in the industry today because of the changes being made by the Chinese Communists. Nor is it possible to make an accurate estimate of the production of footwear in the individual plants known to be still operating. From the annual reports made by the Chinese Communist State Planning Commission, however, reasonably accurate figures can be given for the annual production of footwear since 1948. The estimated production of footwear in Communist China in 1949-57 is shown in Table 22.*

B. Stockpiles.

Very little information is published on the stockpiling of rubber in the Sino-Soviet Bloc. When considering the Soviet stockpile as a possible source of supply, it is necessary to make certain basic assumptions because the final estimates can be reached only by indirection. It is reasonable to assume the following:

1. Only natural rubber is stockpiled. It is the judgment of US experts that synthetic rubber should not be stored for more than 2 years, whereas natural rubber can be kept for periods of 10 years

* Table 22 follows on p. 64.

Table 22

Estimated Production of Footwear
in Communist China
1949-57

Thousand Pairs			
Year	Production	Year	Production
1949	50,000 <u>a/</u>	1954	76,692 <u>e/</u>
1950	45,100 <u>b/</u>	1955	88,196 <u>f/</u>
1951	67,600	1956	100,000 (estimated)
1952	61,690 <u>c/</u>	1957	108,300 (planned) <u>g/</u>
1953	69,092 <u>d/</u>		

a.	<u>285/</u>
b.	<u>286/</u>
c.	<u>287/</u>
d.	<u>288/</u>
e.	<u>289/</u>
f.	<u>290/</u>
g.	<u>291/</u>

or more, depending on the original quality of the rubber and conditions of storage, such as temperature and humidity. Standard practice in the US is to store only the highest grades available and to rotate the stockpile by withdrawals within reasonable periods to assure having a high-quality material in reserve at all times.

2. Stockpiling, in the sense of maintaining a strategic reserve, is done only in the USSR. Because the control of natural rubber imports and its intra-Bloc movement is a function of Raznoimport, 292/ it seems reasonable to assume that any strategic or military reserves are held within the geographic limits of the USSR.

3. Available information indicates that rubber compounding and application in the Sino-Soviet Bloc are similar to standard US practice. The Soviet consumption pattern of natural rubber compared with that of synthetic rubber probably is similar to that in the US.

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A leading authority on rubber has estimated that of the total rubber requirements in the US, 25 percent can best be met with natural rubber, regardless of its price. About 33 percent of the requirements need synthetic rubber for best performance, and the remaining 42 percent can be met with either natural or synthetic rubber, depending on price and availability. These proportions do not represent actual consumption statistics in the US; natural rubber actually accounts for approximately 40 percent of the consumption of new rubber. It is probable, however, that the estimates given would be approximately correct for the Sino-Soviet Bloc.

It is reported, for instance, that East German plants making truck tires for the USSR are required to use all natural rubber for the tires and 90 percent natural rubber and 10 percent Buna rubber for the inner tubes. ^{293/} (US practice is to use from 60 to 100 percent natural rubber for the tires and 100 percent butyl rubber for the inner tubes.) It seems reasonable to assume that this practice is followed in Soviet tire plants. There remains, however, the question of how much natural rubber the USSR actually consumes and how much it is able to set aside as a strategic reserve, or stockpile.

According to an earlier study; ^{294/} imports of natural rubber by the USSR through December 1951 would have permitted the stockpiling of 205,600 tons of natural rubber. Later data show that in 1952 the apparent available supply of natural and synthetic rubber was 49,000 tons more than estimated in the earlier study. This increase would mean that instead of the estimated 42,500 tons available for stockpiling in 1952, the actual amount was 91,500 tons, which would increase the estimated stockpile as of 31 December 1952 to more than 297,000 tons.

In 1953, Soviet imports of natural rubber decreased sharply, to 41,800 tons, lower than in any year since 1947.* In 1954 the USSR imported almost no natural rubber through normal trade channels. ^{295/} In 1955 it was announced that the USSR was again in the market to purchase rubber. Imports, however, did not start until about July, and the amount obtained was about 25,000 tons during the remainder of the year, less than one-half of the estimated Soviet minimum requirement. In contrast, the European Satellites continued to import natural rubber in amounts approximating their estimated normal needs. It seems unlikely that during 1953-55 the USSR obtained significant amounts of natural rubber from the Satellites. On the other hand,

* See Table 23, p. 68, below.

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Communist China during 1953-55 undoubtedly imported more natural rubber than was needed or could be processed. It was reported that under the Soviet-Chinese Payments and Credits Agreement concluded early in 1953, China was obligated to resell to the USSR 45 percent of the rubber obtained from Ceylon (under the rubber-rice barter agreement) and 40 percent of that which was obtained elsewhere. 296/ If this report is correct, China would supply the USSR with natural rubber during the 3 years as follows: about 25,000 tons in 1953, about 30,000 tons in 1954, and about 20,000 tons in 1955. If these amounts are added to Soviet purchases through normal trade channels, the imports of natural rubber by the USSR in 1953-55 would have been approximately as follows 297/:

<u>Year</u>	<u>Imports (Metric Tons)</u>
1953	67,000
1954	30,000
1955	45,000

On the basis of a 25-percent requirement for natural rubber, the USSR needed 208,000 tons of natural rubber, 56,000 tons more than was available from outside sources in 1953-55.

Because earlier estimates indicate that stockpiling in the USSR started about 1948, it seems likely that the deficit which existed in 1953-55 was met by removal of rubber from the stockpile. From a timing point of view -- that is, the necessity to rotate some of the stockpile -- this assumption seems reasonable. In addition, it would appear logical from the change which has taken place in the political climate in Communist China between 1949 and 1953. Geographically, the Chinese Communists are not far from a potential annual supply of 75,000 to 90,000 tons of rubber from southern Indochina. Thus the urgency to maintain a 4- to 5-year supply in the stockpile is considerably less than it was in 1948. Also, under the Soviet-Chinese agreement, the USSR will receive an average of about 25,000 tons of natural rubber per year 298/ through 1957. Because a large stockpile of natural rubber represents large amounts of hard currency, there is an additional economic reason for the USSR to keep strategic reserves at a minimum. Exactly what figure the Soviet planners have agreed on is not known, but the factors discussed above suggest that 200,000 tons would be considered adequate for any emergency. In a US Air Force report, 299/ it was estimated that in the event of a war the

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Sino-Soviet Bloc would experience a deficit of 89,000 tons of rubber during the first year of fighting. Thus a stockpile of 200,000 tons would be more than adequate for 2 years.

In conclusion, it is probable that in 1953-55 the USSR has been reducing its strategic reserve of natural rubber almost 20,000 tons per year. Soviet purchases since July 1955 ^{300/} have been of the highest quality rubber, which is a further indication that acquisitions are being used to replace material being withdrawn from the stockpile.

In any event, it is significant that the Soviet policy of purchasing natural rubber through world trade channels and in amounts at least adequate to meet current requirements was changed early in 1953 as shown in Table 23.* The importance of this shift in policy cannot be assessed without more information. Purchases by the Sino-Soviet Bloc during the next few years may indicate whether the reasons were economic or political. Also, information on similar shifts in the stockpiling of other materials may make possible some firm conclusions on the subject.

C. Trade.

1. Natural Rubber.

Because domestic production of natural rubber is almost nonexistent, the Sino-Soviet Bloc must depend on imports from the West to meet its requirements. Estimated imports of natural rubber by the Sino-Soviet Bloc, by country, in 1946-55 are shown in Table 23.* The figures in Table 23 are based on the published statistics of the International Rubber Study Group (IRSG) in London, which maintains a statistical service covering the world movements of rubber. Information on the Bloc has been estimated on the basis of reported shipments from the principal rubber centers and is the most accurate available. No statistics are published by the IRSG on estimated shipments to East Germany.

Statistics on natural rubber imported by Communist China present a problem. Exports of rubber to China by members of the UN are proscribed because rubber is considered to be a strategic material. When this prohibition was enacted in 1951, Ceylon was not a member of the UN; consequently, China began importing its requirements from

* Table 23 follows on p. 68.

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Table 23
Estimated Imports of Natural Rubber by the Sino-Soviet Bloc, by Country ^{a/}
1946-55

Average Singapore Price (US \$ per Long Ton)	Year	Part b/										Long Tons	Total USSR and European Satellites	Communist China c/ (Estimated Receipts)	Communist China c/ (Covert Receipts -- Minimum)	Total Sino-Soviet Bloc
		Bulgaria	Czechoslovakia	Germany	Hungary	Poland	Romania	USSR	USSR	USSR	USSR					
177.75	1946	300	779	N.A.	256	1,450	100	9,500	35,000	11,985	54,794	27,500	3,500 d/ 1,240 e/ 8,440 f/	184,375		
200.80	1947	150	23,356	900	3,000	3,600	1,000	100,000	100,000	132,008	156,875	70,000		188,254		
181.93	1948	925	27,500	1,700	8,500	12,000	1,250	105,000	82,500	118,254	169,251	73,250		195,361		
741.73	1950	175	22,500	504	6,500	5,500	575	63,000	63,000	96,001	172,611	23,750		169,148		
1,162.51	1951	275	11,000	9,376	250	11,500	600	123,000	41,850	105,648	50,367	62,250		119,857		
658.69	1952	575	20,000	1,448	4,750	20,000	2,750	23,000	21,500	41,425	86,955	31,750		127,185		
462.39	1953	750	17,000	892	23,000	15,000	200	425	200	50,367						
461.44	1954	300	22,300	9,095	11,250	15,000	200	425	200	50,367						
685.00 f/	1955	700	23,300	9,095	5,100	23,500	900	24,400		86,955						

a. Unless otherwise indicated, estimates are taken from source 301/
b. No official estimates are made by the IFRG on East Germany. FIGures given are based on reexports from London and Amsterdam. East Germany also receives reexports from the USSR, which appear as Soviet imports.
c. China before Communist domination is not included.
d. Shipped from Burma. 302/
e. Shipped from Indonesia. 303/
f. Approximate.
g. 850 tons from Singapore, 304/ 7,200 tons from Indonesia, 305/ and 390 tons from Burma. 305/

Ceylon. Total imports in 1952, as shown in Table 23, were from Ceylon. Late in the same year the 2 countries signed a 5-year trade agreement whereby China received 50,000 tons of rubber per year in exchange for 270,000 tons of rice. 307/ Consequently, the published statistics for the past 4 years represent shipments from Ceylon to China. Actually, additional quantities have been exported from Indonesia and Burma. The quantities shown in Table 23 reflect all known imports for 1953, 1954, and 1955. China continues attempts to circumvent the control of rubber shipments by offering premium prices, particularly to Indonesia and Burma, 308/ where political advantage might be gained from such deals, even though China's requirements are less than its imports from Ceylon. 309/

Because imports of natural rubber must be purchased with hard currency, they represent an important drain on supplies of sterling in the Sino-Soviet Bloc. In 1952 the market value of rubber imports by the USSR represented an estimated 10 percent of all imports from the West. Later years, in which imports were smaller, show a decreasing value of these acquisitions. The present trend appears to be for the European Satellites to obtain rubber in exchange for manufactured products through trade agreements, thus reducing requirements for foreign exchange.

2. Synthetic Rubber.

The Sino-Soviet Bloc does not import synthetic rubber; on the contrary, a small amount, supposedly from East Germany, was exported through Switzerland to the US in 1955. About 500 tons of synthetic rubber were imported at New York at a declared value of 15.3 cents per pound. This is about 10 cents per pound less than the prevailing price in the US.

3. Rubber Products.

Small amounts of motor vehicle tires are exported annually from Italy to the European Satellites. Statistics on the volume of this trade, however, are insufficient to be a reliable indicator of its value. 310/ These imports are not believed to constitute an important source of supply for the Satellites.

4. Plans.

There is no mention in the Soviet Sixth Five Year Plan (1956-60) of projected trade in rubber or rubber products. Information

is available, however, on the planned movements of these materials to and from East Germany during 1955 and 1956. In 1955, planned exports of synthetic rubber from East Germany were 39,140 tons, valued at about 82 million rubles. 311/ This amount represented about 55 percent of the planned production of 70,936 tons. 312/ In 1956, East Germany is expected to export 38,500 tons, 313/ slightly more than one-half of planned production. Imports of motor vehicle tires were expected to be 65,500 tires in 1955, valued at 9,725,000 rubles, 314/ compared with 16,000 tires to be imported in 1956. 315/ Planned imports of natural rubber and rubber products during 1955 were valued at 50 million rubles, about 15.33 percent of planned imports of chemicals. In 1955, exports of synthetic rubber and fabricated rubber products were listed as having a value of almost 100 million rubles, 11.68 percent of all exports of chemicals. 316/

At a meeting of CEMA, held in East Berlin from 18 to 25 May 1956, 317/ detailed plans were made for the exchange of many chemicals and rubber products within the Soviet Bloc during 1957-60. Shipments of synthetic rubber and motor vehicle tires between the various participating countries were forecast. Planned shipments of synthetic rubber and motor vehicle tires within the Soviet Bloc in 1957-60 are shown in Table 24.* The approximate values of these exchanges have been derived from the values given above for East German trade in 1955.

A study of the figures in Table 24 shows that East Germany is to be the primary source of synthetic rubber for the European Satellites in 1957-60 because exports from the USSR are almost counterbalanced by imports. The USSR and Czechoslovakia, however, are expected to supply motor vehicle tires to the rest of the Bloc. From the incomplete data available on the trade in these products during the Fifth Five Year Plan period, it would appear that these projected movements conform to the general trade pattern which has prevailed in recent years.

* Table 24 follows on p. 71.

Table 24
Planned Shipments of Synthetic Rubber and Motor Vehicle Tires
Within the Soviet Bloc
1957-60

Product and Country (Thousand tons)	1957		1958		1959		1960	
	Amount (Thousand Rubles)	Value (Thousand Rubles)	Amount (Thousand Rubles)	Value (Thousand Rubles)	Amount (Thousand Rubles)	Value (Thousand Rubles)	Amount (Thousand Rubles)	Value (Thousand Rubles)
Synthetic rubber								
East Germany								
To Bulgaria	0.5	1,048	0.5	1,048	0.5	1,048	0.5	1,048
To Hungary	2.4	5,029	2.7	5,658	3.1	6,496	6.4	13,411
To Poland	7.0	14,668	7.8	16,345	1.0	2,096	2.0	4,191
To Rumania	0.8	1,676	0.6	1,257	0.8	1,676	1.4	2,934
To USSR	25.0	52,388	25.0	52,388	25.0	52,388	25.0	52,388
To Czechoslovakia	1.0	2,096	3.0	6,286	7.5	15,716	7.0	14,668
Total	36.7	76,905	39.6	82,982	37.9	79,420	42.3	88,640
USSR								
To Albania	0.2	419	0.3	629	0.3	629	0.3	629
To Bulgaria	2.9	6,077	3.3	6,915	3.6	7,544	4.2	8,801
To Hungary	1.3	2,724	1.5	3,143	1.7	3,562	2.0	4,191
To East Germany	0.1	210	0.1	210	0.1	210	0.1	210
To Poland	4.5	9,430	4.5	9,430	5.7	11,944	5.0	10,478
To Rumania	5.3	11,106	5.4	11,316	5.7	11,944	6.0	12,573
To Czechoslovakia	12.3	25,775	14.3	29,966	15.2	31,852	15.5	32,480
Total	26.6	55,741	29.4	61,609	32.3	67,685	33.1	69,362

Table 24

Planned Shipments of Synthetic Rubber and Motor Vehicle Tires
Within the Soviet Bloc
1957-60
(Continued)

Product and Country (Thousand units)	1957		1958		1959		1960	
	Amount (Thousand Rubles)	Value	Amount (Thousand Rubles)	Value	Amount (Thousand Rubles)	Value	Amount (Thousand Rubles)	Value
Motor vehicle tires								
USSR								
To Albania	14.2	2,108	16.3	2,420	18.6	2,762	20.0	2,969
To Bulgaria	2.5	371	1.5	223	1.6	238	1.2	178
To Hungary	0.3	45	0.3	45	0.4	59	0.4	59
To East Germany	42.0	6,236	36.0	5,345	26.0	3,860	26.0	3,860
To Poland	146.1	21,691	12.3	1,826	96.4	14,312	52.0	7,720
To Rumania	68.2	10,126	190.3	28,254	190.9	28,343	192.5	28,580
To Czechoslovakia	0.5	74	0.5	74	0.5	74	0.5	74
Total	273.8	40,651	257.2	38,187	334.4	49,648	292.6	43,440
Czechoslovakia								
To Albania	5.0	742	5.0	742	5.0	742	5.1	757
To Bulgaria	2.0	297	1.5	223	2.0	297	2.0	297
To Hungary	0.7	104	0.9	134	1.0	148	1.0	148
To East Germany	3.0	445	3.0	445	3.0	445	3.0	445
To Poland	23.9	3,548	24.7	3,667	17.6	2,613	17.0	2,524
To Rumania	1.0	148	1.5	223	2.0	297	1.5	223
To USSR	1.0	148	1.0	148	1.0	148	1.0	148
Total	36.6	5,432	37.6	5,582	31.6	4,690	30.6	4,542

III. Consumption Patterns.

As explained in previous reports, 318/ consumption of rubber falls into two major categories -- that used in transportation goods and that used in nontransportation goods. The uses of rubber in nontransportation goods are many, so the potential demand in this field is almost unlimited. The demand for rubber in most industrialized countries, however, can be judged by the amount consumed in transportation goods because this category usually accounts for 50 to 75 percent of the total consumption.

In addition to the number of motor vehicles in a country, there are many factors which influence the demand for motor vehicle tires, such as the condition of the roads, the average ton-miles traveled per vehicle, and the quality of the tires. Furthermore, there is a large intra-Sino-Soviet Bloc trade in tires on which information is incomplete. Production of tires in individual countries, moreover, is not necessarily proportional to the domestic motor park. For these reasons, the estimated production of tires in the Sino-Soviet Bloc is a much firmer basis for estimating rubber demand than the number of motor vehicles produced or in use. In Albania, where no motor vehicle tires are produced, a small amount of rubber is used for bicycle tires and tire repair materials, which are classified as transportation goods. 319/ This amount is assumed to be about 15 to 20 percent of the consumption of rubber in Albania. Because Albania is not economically developed, the amounts involved are small.

A. USSR.

The consumption of rubber in the USSR can be estimated from the production of motor vehicle tires.* Briefly, it consists of calculating the amount of rubber required to make the estimated number of tires and inner tubes produced, with an addition of 10 percent for bicycle tires and tire repair materials. On the basis of this methodology, it is believed that transportation goods represent about two-thirds of the total demand for rubber. 321/ This proportion closely approximates the average prevailing in the West, but it will tend to decrease as the use of rubber in consumer goods expands. As long as

* Details of the methodology used are presented in source 320/.

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the Soviet economy is state controlled and emphasis remains on heavy industry, the amount of rubber used in nontransportation goods probably will remain about one-half of that used in transportation goods.

The estimated consumption of rubber in the USSR in 1946-55 and 1960 is shown in Table 25.*

B. Albania.

The consumption of rubber in the European Satellites has been thoroughly analyzed in a previous report. ^{322/} In Albania there is one rubber plant, located in Durrës, which makes bicycle tires, tire repair materials, footwear, and consumer goods. The estimated consumption of rubber in Albania in 1946-55 is shown in Table 26.**

C. Bulgaria.

The Second Five Year Plan (1953-57) of Bulgaria established a goal of increasing the production of rubber products ^{323/} by 90 percent during the period. Production of motor vehicle tires increased rapidly during the postwar years, transportation goods consuming an increasing proportion of the rubber supply. In 1953 it was announced that the Georgi Dimitrov Tire Plant was making bus tires, ^{324/} and in 1954, large tires for heavy trucks were in production. ^{325/} The manufacture of the larger sizes would increase the amount of rubber used in tires. The estimated consumption of rubber in Bulgaria in 1946-55 is shown in Table 27.***

D. Czechoslovakia.

Czechoslovakia is the major producer of motor vehicle tires in the European Satellites. In addition, Czechoslovakia produces large quantities of industrial and consumer goods made from rubber. On the basis of reported national estimates of total volume of goods and trade and related data, it is estimated that transportation goods currently

* Table 25 follows on p. 75.

** Table 26 follows on p. 76.

*** Table 27 follows on p. 77.

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Table 25

Estimated Consumption of Rubber in the USSR a/
1946-55 and 1960

Year	Estimated Production of Tires (Thousand Units)	Estimated Consumption of Rubber (Thousand Metric Tons)		Total
		Transportation Goods	Nontransportation Goods	
1946	2,975	59.6	29.8	89.4
1947	3,871	77.8	38.9	116.7
1948	5,205	104.5	52.2	156.7
1949	6,700	134.5	67.2	201.7
1950	8,245	165.5	82.8	248.3
1951	8,320	167.0	83.5	250.5
1952	8,400	168.6	84.3	252.9
1953	8,990	180.5	90.2	270.7
1954	10,245	205.7	102.8	308.5
1955	11,575	232.4	116.2	348.6
1960 (Plan)	23,000 b/	460.0 b/	230.0 b/	690.0 b/

a. 326/
b. Approximate.

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Table 26

Estimated Consumption of Rubber in Albania a/
1946-55

<u>Metric Tons</u>			
<u>Year</u>	<u>Consumption</u>	<u>Year</u>	<u>Consumption</u>
1946	20	1951	160
1947	30	1952	180
1948	60	1953	200
1949	100	1954	260
1950	125	1955	375

a. Estimates for 1946-53 are taken from source 327/. Estimates for 1954 and 1955 are based on the published goal of the First Five Year Plan, that is, 1955 production to be 300 percent of that in 1950.

consume only about 47 percent 328/ of the national rubber demand.* The estimated consumption of rubber in Czechoslovakia in 1946-55 is shown in Table 28.**

E. East Germany.

Many reports on the rubber industry of East Germany are available; so it is possible to present a fairly accurate picture of rubber consumption in that country. Although the production of motor vehicle tires has increased sharply during recent years, there is still a severe tire shortage, a condition which probably will continue until manufacturing capacity is considerably expanded. 330/ More than one-half of the tires made are large sizes for trucks and buses. In addition, East Germany is an important producer of industrial rubber goods such as conveyor belts, transmission belting, and rubber hose, some

* For further details, see source 329/.

** Table 28 follows on p. 78.

Table 27

Estimated Consumption of Rubber in Bulgaria
1946-55

Metric Tons

Year	Motor Vehicle Tires and Inner Tubes a/	Repair Materials b/	Transportation Goods	Nontransportation Goods c/	Total
1946	45 d/	10	55	445	500
1947	72 d/	15	87	573	660
1948	113 d/	23	136	748	884
1949	244 d/	49	293	807	1,100
1950	475 d/	76	551	1,036	1,587
1951	625 e/	100	725	1,200	1,925
1952	681 e/	180	861	1,113	1,974
1953	741 f/	200	941	1,407	2,348
1954	1,020 f/	230	1,050	1,617	2,667
1955	1,184 f/	250	1,434	1,858	3,292

- a. 331/
- b. 332/
- c. 333/
- d. Based on an average weight of 20 pounds per tire and inner tube.
- e. Based on an average weight of 25 pounds per tire and inner tube.
- f. Based on an average weight of 30 pounds per tire and inner tube.
- g. Calculated on the basis of an average annual increase of 14.9 percent, the announced goal for the Second Five Year Plan. Completion of the planned production for 1954 and the first 9 months of 1955 has been announced.

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Table 28

Estimated Consumption of Rubber in Czechoslovakia a/
1946-55

Year	Metric Tons		
	<u>Transportation Goods</u>	<u>Nontransportation Goods</u>	<u>Total</u>
1946	5,069	7,931	13,000
1947	11,063	12,937	24,000
1948	14,769	19,831	34,600
1949	19,000	26,000	45,000
1950	22,520	27,480	50,000
1951	25,570	29,430	55,000
1952	27,095	30,905	58,000
1953	28,620	31,380	60,000
1954	30,650	34,550	65,200
1955	32,700	36,800	69,500

a. Estimates for 1946-53 are taken from source 334/.
Estimates for 1954 and 1955 were calculated from the
estimated production of tires.

of which are exported to other European Satellites. Consequently, transportation goods require less than 50 percent of the consumption of new rubber in East Germany. The estimated consumption of rubber in East Germany in 1946-55 is shown in Table 29.*

F. Hungary.

Although the rubber industry of Hungary has been expanded since World War II, it still represents only about 5 percent of the total rubber industry in the European Satellites. The Second Five Year Plan (1956-60) of Hungary provides for further expansion of the industry with the objective of Hungary becoming self-sufficient in rubber

* Table 29 follows on p. 79.

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products. 335/ Transportation goods consume approximately one-half of the total demand for rubber in Hungary. The estimated consumption of rubber in Hungary in 1946-55 is shown in Table 30.*

Table 29

Estimated Rubber Consumption in East Germany a/
1946-55

Year	Metric Tons		
	Transportation Goods	Nontransportation Goods	Total
1946	441	12,559	13,000
1947	688	16,312	17,000
1948	1,504	19,831	21,335
1949	3,061	16,939	20,000
1950	5,850	20,650	26,500
1951	9,417	20,183	29,600
1952	12,100	22,400	34,500
1953	14,640 <u>b/</u>	25,360 <u>c/</u>	40,000 <u>d/</u>
1954	18,235	15,865 <u>c/</u>	34,100 <u>e/</u>
1955	18,441	20,716 <u>c/</u>	39,157 <u>f/</u>

a. This table was compiled from data presented in source 336/ and from information based on actual consumption figures and plans for 1953 through 1955.

b. Adjusted on the basis of actual production of tires in 1953.

c. Difference between total rubber consumption and amount used to make transportation goods.

d. Planned total rubber consumption for 1953.

e. Planned total rubber consumption for 1954.

f. Planned total rubber consumption for 1955.

G. Poland.

Before World War II, Poland had a large rubber industry. Although it suffered severely during the war the industry had regained its position by 1948. Since that time it has continued to expand with the industrial development of the country. A wide variety of rubber

* Table 30 follows on p. 80.

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Table 30

Estimated Consumption of Rubber in Hungary a/
1946-55

Year	Metric Tons		
	Transportation Goods	Nontransportation Goods	Total
1946	545	430	975
1947	795	805	1,600
1948	1,000	1,500	2,500
1949	1,315	1,985	3,300
1950	1,885	2,470	4,355
1951	2,355	3,000	5,355
1952	3,000	3,200	6,200
1953	3,450	3,550	7,000
1954	3,550	3,700	7,250
1955	3,850	3,950	7,800

a. Estimates for 1946-53 are taken from source 337/.
Estimates for 1954 and 1955 are based on later information.

products are made, not only for domestic consumption but also for export. Domestic demand for motor vehicle tires is approximately 300,000 tires per year; production is estimated to have been 425,000 tires in 1955. 338/ Nontransportation goods are the major consumers of rubber, requiring about 60 percent of total consumption. The estimated consumption of rubber in Poland in 1946-55 is shown in Table 31.*

H. Rumania.

The demand for rubber in Rumania is not large, as Rumanian industrial expansion began after World War II. The Second Five Year Plan (1956-60) of Rumania calls for extensive additions to various industries, which will be reflected in an increased demand for rubber products. Rubber products have been imported either from other European

* Table 31 follows on p. 81.

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Table 31

Estimated Consumption of Rubber in Poland a/
1946-55

Year	Metric Tons		
	<u>Transportation</u> <u>Goods</u>	<u>Nontransportation</u> <u>Goods</u>	<u>Total</u>
1946	580	1,570	2,150
1947	1,585	4,315	5,900
1948	2,766	5,354	8,120
1949	3,389	5,526	8,915
1950	4,125	6,375	10,500
1951	4,900	7,100	12,000
1952	6,100	8,900	15,000
1953	7,950	12,050	20,000
1954	9,275	13,725	23,000
1955	9,350	14,650	24,000

a. 339/

Satellites or from the USSR, but Rumania should be self-sufficient in domestic production by 1960.* The estimated consumption of rubber in Rumania in 1946-55 is shown in Table 32.**

I. Communist China.

As it is in other countries, the rubber industry of Communist China is geared to the needs of the country. Its products, in order of importance from the point of view of rubber consumption, are as follows: footwear; motor vehicle tires; small tires for bicycles, jinrickshas, and carts; and industrial and consumer goods.

Production of footwear in 1955 was estimated to be 90 million pairs.*** Rubber requirements for this number of shoes will naturally depend on the type of footwear being made. Most of the Chinese

* Further details are given in source 340/.

** Table 32 follows on p. 82.

*** See II, A, 9, h, p. 63, above.

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Table 32
Estimated Consumption of Rubber in Rumania a/
1946-55

Year	Metric Tons		
	Transportation Goods	Nontransportation Goods	Total
1946	153	230	388
1947	480	220	700
1948	720	780	1,500
1949	1,182	818	2,000
1950	1,323	877	2,200
1951	1,400	1,200	2,600
1952	1,550	1,250	2,800
1953	1,890 <u>b/</u>	1,600	3,490
1954	2,150 <u>b/</u>	1,850	4,000
1955	2,450 <u>b/</u>	2,050	4,500 <u>c/</u>

a. Unless otherwise indicated, estimates for 1946-52 are taken from source 341/.

b. Based on the estimated annual production of tires.

c. Based on the reported total increase in value of rubber products in 1950-55. 342/

Communists are accustomed to wearing sandals or a soft heelless shoe, so the rubber shoes produced are predominantly of the "sneaker" type. In addition, many miners' boots are manufactured. Sneakers require as little as one-eighth of new rubber (about 1/4 pound), whereas the boots may require several kilograms. On the basis of experience of the largest US manufacturer of rubber footwear, it is estimated that the average amount of rubber needed for all footwear would be about 1/4 kg (1/2 pound) per pair. To make 90 million pairs would require 22,500 tons of new rubber, more than 55 percent of the total demand.

Most of the production of motor vehicle tires in Communist China 343/ is of the sizes 32 inches by 6 inches 10 ply or 34 inches by 7 inches 8 ply, both of which require approximately 12.6 kg (about 27.5 pounds) of rubber for a tire and a tube. Other sizes include large tires for buses and small tires for passenger cars.

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Because these sizes are relatively few in number, it is believed that the weight given above represents a conservative average. On the basis of an estimated production of 650,000 tires in 1955, consumption of rubber in motor vehicle tires in China would be slightly more than 8,000 tons.

Communist China annually uses many tires for a wide variety of vehicles such as bicycles, tricycles, jinrickshas, push-carts, and wagons. Most of these tires have inner tubes which would require new rubber in their construction. The casings made in at least one plant were 50 percent new rubber and 50 percent reclaimed rubber. ^{344/} Considering the various sizes of tires produced, a conservative estimate of the average requirement would be at least 1 kg of new rubber for each new tire and inner tube. The annual production of small tires is difficult to estimate, but it was reported in 1948 that manufacturing capacity was 4.05 million tires and 4.45 million inner tubes. ^{345/} Because the Chinese Communists are emphasizing production of motor vehicle tires, it is doubtful, considering the small supply of raw materials, that more than 4 million small tires and inner tubes were made in 1955, which would require 4,000 tons of rubber.

Other items manufactured in Communist China are hose, belting, printing rolls, and industrial goods. A few consumer goods, such as hot-water bottles, gloves, and rubberized fabric for rainwear, are produced. The amount of rubber used in these products will be based on availability of raw materials. On the basis of planned production of tires and footwear and on individual plant studies, it is believed that the total rubber consumption in Communist China in 1955 was approximately 40,000 tons. The following tabulation is a breakdown of this figure:

<u>Product</u>	<u>Consumption (Metric Tons)</u>	<u>Consumption (Percent)</u>
Footwear (90 million pairs)	22,500	56.25
Motor vehicle tires (650,000)	8,000	20.00
Small tires (4 million)	4,000	10.00
Industrial and consumer goods	5,500	13.75
Total	<u>40,000</u>	<u>100.00</u>

A recent estimate of the consumption of rubber in Communist China in 1955 is 49,000 tons. ^{346/}

IV. Material Balances of Rubber in the Sino-Soviet Bloc.

A. General.

Estimated material balances of rubber in the Sino-Soviet Bloc in 1946-55 are shown in Table 33.* Arbitrary conclusions cannot be derived from these data, but certain obvious trends are indicated.

B. USSR.

The USSR was obviously short of rubber for 2 years after World War II. By 1948 the USSR had started to build up supplies and for several years continued a policy of stockpiling rubber. The reversal of this policy, which took place in 1953, has been discussed.**

C. European Satellites.

Rubber supplies in the European Satellites approximate consumption in those countries. Any surpluses which appear probably go into state reserves, which may be drawn on to meet temporary shortages. As they probably never exceed a 6-month requirement, they would not constitute stockpiles from a strategic point of view.

D. Communist China.

Communist China's operations in the rubber market are not clear. Purchases during 1950 and 1951 were obviously much in excess of domestic needs. Although the reasons for making these purchases are not known, the following reasons may apply:

1. To anticipate the control on the shipment of rubber to Communist China which was imposed late in 1951 by the UN,
2. To convert foreign credits into useful raw materials before the COCOM immobilized these accounts, or
3. To provide acceptable exports to the USSR in exchange for the military aid received for use in Korea.

Communist China's agreement with Ceylon assured China of more than adequate supplies of rubber during the life of the contract. Nevertheless, Communist China apparently continues efforts to obtain

* Table 33 follows on p. 86.

** See II, B, p. 63, above.

Table 33

Estimated Material Balances of Rubber in the Sino-Soviet Bloc a/
1946-55

Year	USSR			European Satellites			Communist China			Total Difference
	Supply	Demand	Difference	Supply	Demand	Difference	Supply	Demand	Difference	
1946	70.5	89.4	- 18.9	33.5	30	3.5	28.1	17.0	11.1	- 15.4
1947	108.4	116.7	- 8.3	55.7	49.9	5.8	70.6	21.0	49.6	- 2.5
1948	220.8	156.7	64.1	73.9	68.4	5.5	74.0	23.0	51.0	69.6
1949	265.5	201.7	63.8	92.0	80.4	11.6	28.1	17.0	11.1	86.5
1950	272.8	248.3	24.5	91.8	95.3	- 3.5	70.6	21.0	49.6	70.6
1951	288.3	250.5	37.8	101.3	106.6	- 5.3	74.0	23.0	51.0	83.4
1952	367.7	252.9	114.8	129.1	118.7	10.4	24.4	25.0	- 0.6	124.6
1953	311.8	270.7	41.1	154.5	133.0	21.5	64.3	29.0	35.3	97.9
1954	282.9	308.5	- 25.6	157.5	136.3	21.2	70.4	38.0	32.4	28.0
1955	332.4	348.6	- 16.2	169.8	148.6	21.2	41.1	40.0	1.1	6.1

a. For methodology, see Appendix A. The margin of error is plus or minus 10 percent.

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rubber from the underdeveloped countries of Southeast Asia. These efforts undoubtedly are politically motivated; in at least one recent transaction, it is suspected that the rubber purchased and paid for by Communist China went directly to the European Satellites. 347/ This situation is discussed more fully below.*

* See VI, C, p. 94, below.

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V. Inputs.

A. General.

The manufacturing phases of the rubber industry may be divided into two broad categories: (1) chemical, which includes the production of synthetic rubber, rubber chemicals, and reclaimed rubber; and (2) mechanical, which involves the fabrication of rubber products.

In the chemical phase the processes are varied, and some are extremely complicated. As an illustration, the following list shows the basic chemicals required to make "Buna S" type of rubber 348/:

Acetic acid	Manganese acetate
Alcohol, ethyl	Nitric acid, fuming
Alum	Oxalic acid
Alumina, activated	Phenyl a-naphthylamine
Aluminum chloride, anhydrous	Phenyl b-naphthylamine
Ammonia, anhydrous	Potassium persulfate
Antioxident, BLE	Potassium tantalum fluoride
Bardol	Salt
Benzene	Silica gel
Casein	Sodium bicarbonate
Caustic soda	Sodium carbonate, anhydrous
"Chlorex"	SONJ - 1707 catalyst
Chromium acetate	Sulfonated pine oil
Commercial acetone	Sulfur
Ethylene	Sulfuric acid, 95 percent
Furfural	Sulfuric acid, 98 percent
Hydrogen chloride	Titanium dioxide
Hydroquinone	Triethanolamine
Lauryl mercaptan	Zinc sulfate

When it is considered that Buna S is only one of many types of synthetic rubber, it is evident that a detailed list of material inputs, if it were obtainable, would be of little practical value and beyond the scope of this report. Alcohol requirements for making synthetic rubber by the Soviet process have been discussed in a previous report. 349/ A recent statement in a Soviet book, which called attention to the economic 350/ advantages of petroleum as a source of alcohol, stated that for the manufacture of 1 passenger-car tire, 50 liters of alcohol normally are used. Fifty liters of alcohol equal 200 kg (about 450 pounds) of grain, or 500 kg (about 1,100 pounds) of

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potatoes. In making Sovprene, the Soviet equivalent for oil-resistant neoprene, the principal ingredients are acetylene from calcium carbide and hydrogen chloride. According to the US originators of the process, 2,750 kg of calcium carbide and 414 kg of hydrogen chloride are required per ton of product.

According to captured documents, during World War II, Germany required the following inputs to make 1 ton of Buna rubber:

<u>Input</u>	<u>Amount</u>
Process water	230 to 250 cubic meters
Steam	3.3 to 3.5 tons
Electricity	145 to 165 kilowatt-hours (kwh)
Nitrogen	13 to 16 cubic meters
Air	7.5 to 8.5 cubic meters
Treated water	1.8 to 2.0 cubic meters

No information is available on capital investment, manufacturing costs, or labor requirements in making synthetic rubber in the USSR.

In the mechanical phase a wide variety of materials in addition to rubber is required to make finished end products. For example, the standard formula for a tire-tread mix will contain from 10 to 15 ingredients in addition to rubber. Even the quality and percentage of rubber used will vary with the nature of the product to be made. For this reason, it is not possible to estimate the inputs for the rubber industry in terms of specific quantities of different materials. Only one reference to utilities requirements has been found which is applicable to the Sino-Soviet Bloc. A recent Soviet text 351/ stated that a motor vehicle tire plant requires 20,000 to 25,000 kwh of electrical energy per 1,000 tires produced. On that basis, the tire industry of the USSR would consume about 250 million kwh of electricity per year.

B. Capital Investment.

No statistics have been noted on capital investment in the rubber industry of the Sino-Soviet Bloc since World War II. In the earlier days of the USSR, periodic announcements were made concerning investments, which permit comparison between the rubber and chemical industries during that period. In the mid-1920's, before the development of synthetic rubber, the rubber industry received about 10 percent

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of the capital which went into the Soviet chemical industry. For instance, the 1926-27 figure for chemicals was 60.1 million rubles 352/ compared with 6.3 million rubles for rubber. 353/ In the early 1930's the USSR initiated a major program for the construction of four plants to make synthetic rubber. Consequently, the proportion of capital invested in rubber compared with that invested in chemicals rose to a peak of 14 percent in 1933. 354/ By 1936, however, this proportion had dropped to about 7 percent (101 million rubles for rubber 355/ compared with 1,535 million rubles for chemicals). 356/

No comparable statistics have been found covering the period since 1940, so it is not possible to give an accurate estimate of the amount invested in the industry to date, nor of its present value. On the other hand, it is believed possible to make a general estimate of investments during the Sixth Five Year Plan, based on the planned physical expansion during that period. The following factors may be significant:

1. Production of synthetic rubber is scheduled for the greatest expansion of any product in the rubber and chemical industries -- 220 percent of production in 1955 compared with 204 percent for mineral fertilizers and less than 200 percent for other chemical products mentioned in the Sixth Five Year Plan.
2. Production of tires is to be doubled during the same period; it is specified that seven major enterprises will be built and put into operation for making tires and technical articles.
3. No percentage figure is given for the over-all expansion of the chemical industry. Industrial production, however, is scheduled to increase only 65 percent. It is evident, therefore, that the planners are emphasizing expansion in the rubber industry during 1955-60.

In view of the above factors and of the available prewar information, it is probable that expansion in the rubber industry will receive capital investments in the range of 10 to 15 percent of those devoted to the chemical industry. In a recent report 357/ the investments in the chemical industry were estimated to be 50 billion to 60 billion rubles during the Sixth Five Year Plan period. It therefore seems probable that the expansion scheduled to take place in the rubber industry will require 5 billion to 7.5 billion rubles.

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VI. Capabilities, Vulnerabilities, and Intentions.

A. Capabilities.

The Sino-Soviet Bloc is capable of meeting its strategic requirements for rubber products. In certain fields, however, Soviet technology appears to be considerably behind that of the US. For instance, in every country of the Bloc, with the exception of Communist China, there have been press announcements to the effect that tubeless tires were in production or being planned. Because the Bloc has no supplies of butyl rubber, which is essential for the production of tubeless tires, it is probable that this development will fail from an economic point of view. There have been several recent reports of failures of Soviet truck tires after only a few thousand miles of service. The corresponding tires made in the US would normally give 50,000 miles of service. A similar deficiency in Czechoslovak-made tires has been reported, which would indicate probable inferiority in manufacturing methods.

It was recently announced that the Voronezh Synthetic Rubber Plant had begun production of oil-extended rubber. This development, if it is in process, could have a considerable effect on the production of synthetic rubber in the Sino-Soviet Bloc. Experience in the US indicates that production can be increased at least 20 percent, with no decrease in quality, by the use of oil extension. Soviet scientists have been aware of this important improvement, but until recently there has been no indication that they had succeeded in applying it to their manufacturing processes.

On the other hand, it is improbable that the Sino-Soviet Bloc will attempt in the foreseeable future to manufacture butyl rubber on a commercial scale. Manufacture of this material, which was developed in the US, requires temperatures of 140 degrees below zero, and the process is extremely difficult. Large amounts of special solvents obtained from petroleum are required, and the information obtained to date indicates that the Bloc does not have either the equipment or the materials available to produce butyl rubber.

B. Vulnerabilities.

From a geographic point of view, the manufacture of synthetic rubber by the Sino-Soviet Bloc is well dispersed. The largest plant is that at Schkopau in East Germany and has a capacity of more than 70,000 tons, about 22 percent of the total Bloc capacity. Second in

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size is the plant at Voronezh, which is estimated to have a capacity of slightly more than 50,000 tons, about 16 percent of the total Bloc capacity. Raw materials -- other than synthetic rubber -- required by the Bloc rubber industry appear to be in adequate supply, although the USSR does import quantities of Egyptian long-staple cotton for making tire cord. In an emergency, domestic supplies of cotton could be substituted without a serious impairment of quality. As has been shown, strategic reserves of natural rubber probably are more than would be needed to meet an emergency. It is probable, however, that the USSR is heavily dependent on East Germany for supplies of certain special types of rubber and for rubber chemicals. If these supplies were denied the USSR, a serious dislocation in the industry might result.

C. Intentions.

Because the rubber industry in the Sino-Soviet Bloc is operating at approximately rated capacity, it is unlikely that a shift in the strategic intentions of the USSR would be indicated by a pronounced change in the operations of the industry. A sudden activity in the manufacture of specific war items, such as gas masks, might well foreshadow aggressive intentions, but such a shift would be difficult to detect.

The principal bulk item used by the military forces is, of course, tires. Because Soviet truck sizes are standardized for either military or nonmilitary use, a sudden shift to wartime conditions would not involve radical changes in the operations of tire plants. A recent report 358/ estimated that the Sino-Soviet Bloc demand for tires during the first year of hostilities would be as follows:

	<u>Units</u>
Military	6,197,000
Nonmilitary	8,255,000
Miscellaneous	940,000
Total	<u>15,392,000</u>

This number of tires would require about 292,000 tons of rubber, which is within the capacity and resources of the tire industry in the Sino-Soviet Bloc. For these reasons, it is unlikely that Soviet intentions can be judged by the operations of the rubber industry.

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APPENDIX A

METHODOLOGY

The methodology used in this report follows in general that used in previous reports published on the rubber industry in the Sino-Soviet Bloc. In preparing the tables showing the production of individual plants, it was necessary to assume that where information to the contrary was lacking, the expanded total production of the product in question had taken place at about the same rate in each plant. It is assumed that methods found to increase efficiency or production in one plant would quickly be adopted by plants of a similar type. Rubber plants in the USSR are controlled by one central authority and tend to be standardized to a greater extent than those in the US, where design and operations are privately controlled. Fabricating plants usually operate one shift per day; hence their production can be increased by working longer hours. On the other hand, plants making synthetic rubber and carbon black operate 24 hours per day. Thus, although minor increases in production can be effected by improvements in operation, substantial increases can be attained only by the addition of more equipment.

Another limiting factor in production of rubber may be the availability of raw materials -- for example, in the case of the synthetic rubber plant at Yerevan which makes Sovprene rubber from acetylene produced from calcium carbide. A recent study has determined that the amount of calcium carbide available for the production of Sovprene would limit production to 25,000 tons per year. Because it is known that the USSR has recently been trying to buy neoprene, which is the US equivalent of Sovprene, it seems probable that production at Yerevan has not been expanded.

The figures for the production of reclaimed rubber in most countries of the Sino-Soviet Bloc are usually estimates because this material is normally made in plants turning out finished products in which reclaimed rubber is used as a component. Thus production is consumed in the plant, and no quantitative figures are available. East Germany has several plants devoted to making reclaimed rubber, which is shipped to rubber fabricating plants. Information on these plants was the basis for the figures given on p. 32, above.

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New material about the rubber industry of Communist China is based on plant studies, economic reports on the industry before 1949, and press reports published since the Communists came to power. Little specific information is available on the status of individual plants in China since 1949; hence the finished data are the product of many bits of information. The Chinese Communist authorities are following a policy of increasing efficiency in the industry, a policy which has resulted in closing some less efficient plants and moving their equipment. Information on these moves is fragmentary, and the exact number of plants now in existence is uncertain. In the case of nonrubber tire components, statistics were developed from unpublished reports on these subjects.

The methodology used to determine demand* is based on the production of motor vehicle tires, because Western statistics divide rubber consumption into that used in transportation goods and that used in nontransportation goods. There usually is a general relationship between the two categories. The great variety of nontransportation goods produced and the fact that the number made in each country is generally dependent on the social and economic development of that particular area make it impossible to estimate consumption patterns with any degree of accuracy. For transportation goods, attempts were made to correlate the motor vehicle park and estimates of consumption of motor fuel with production of tires in each of the Sino-Soviet Bloc countries in an effort to refine the estimate of demand for rubber in transportation goods. The imponderables of road conditions, the average ton-kilometers of travel, and the quality of tires defeated any attempt to correlate data from the countries being studied with statistics from Western countries.

In preparing the data for material balances,** it was realized that there is extensive intra-Bloc trade in natural and synthetic rubber as well as in rubber products. Because statistics on this trade are incomplete, it was believed that a more accurate picture of the rubber situation in the Sino-Soviet Bloc would be presented by the method used. Except for a small quantity of synthetic rubber which appeared on the New York market in 1955 and was suspected of coming from East Germany, there have been no reports of the Bloc exporting rubber. A few tires have been shipped by Czechoslovakia to the Middle East, and, conversely, Italy has shipped some tires to Bulgaria. Because these

* See III, p. 73, above.

** See IV, p. 85, above.

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shipments have been relatively small and were believed to counter-balance each other, they have been ignored as being less than the probable accuracy of the final estimates.

The figures for supply* were made up of known imports of natural rubber plus domestic production of natural, synthetic, and reclaimed rubber. Estimates of demand were developed from figures for production of tires and other available data, following the methods discussed in previous reports. To check the accuracy of the results, the data on imports of natural rubber over a period of several years have been examined and compared with the estimated over-all figures for demand. These calculations appear to confirm the figures shown in Table 23.**

In preparing the figures for stockpiles,*** previous estimates had to be revised because more accurate data had become available on production of tires in the USSR in 1952 and in 1953. The net result was that almost 50,000 tons less rubber probably were consumed in those 2 years than had previously been estimated. This amount was assumed to be available for stockpiling in addition to the amounts previously estimated, making the total maximum stockpile about 300,000 tons at the end of 1952. As was stated, there is strong evidence that a policy of reducing this reserve is now in effect.

* See II, p. 7, above.

** P. 68, above.

*** See II, B, p. 63, above.

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APPENDIX B

GAPS IN INTELLIGENCE

Very little specific information is available on the current operations at the synthetic rubber plants in the USSR. New plants reportedly have been erected or are in production at Ryshkovo (51°42' N - 36°12' E) and Chkalov (51°45' N - 45°06' E), but, aside from press notices, no data have been received on either plant. A plant reportedly was under construction at Usol'ye (52°45' N - 103°48' E) in southern Siberia in 1953. No information has been received on this plant since 1954, when it was still under construction.

Estimates of production of tire plants in the USSR are based on the assumption that expansion has taken place in all of the plants, except that at Yaroslavl', at about the same rate.

Information on the production of both synthetic rubber and tires in the European Satellites, except for East Germany, is far from complete. It would be helpful to know what progress is being made on the petrochemical complex (scheduled to make synthetic rubber) being built by Hungary and Rumania because, when in operation, this complex will be a major industrial development for these countries.

A major gap in intelligence exists in knowledge of the cost of constructing various facilities in the rubber industry. Although figures may be obtained based on US experience, conditions in the Sino-Soviet Bloc may alter the costs considerably. For instance, the extreme weather conditions at Usol'ye might increase construction costs by as much as 50 percent. Concomitant with this question is that of manufacturing costs. Although there are some figures on the retail selling price of some sizes of tires, these figures are for only a few sizes and may or may not reflect plant costs.

Information on the rubber industry of China is fairly good through 1948. Since the Communists came to power, however, the reports have been few in number and often contradictory. Although official imports of natural rubber are reported, many shipments are consigned to other

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ports but are suspected of ending up in Communist China. Also there is a considerable amount of rubber smuggled out of Indonesia, part of which probably finds its way into China. All US sources seem alert to report such smuggling, but the devices used by the Chinese Communists to circumvent the rubber embargo make detection extremely difficult. As to the industry within China, a campaign has been undertaken to eliminate waste, not only of materials but also of manpower and equipment. Small plants have been closed, and usable equipment has been moved to larger and more modern plants. Very few data, except such information as that derived from press notices of quotas met, have been published on these modern plants. Current information on China is the weakest of any obtained from the Sino-Soviet Bloc.

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APPENDIX C

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

<u>Source of Information</u>	<u>Information</u>
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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