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ECONOMIC INTELLIGENCE REPORT

**POST AND TELECOMMUNICATIONS SERVICES
IN CZECHOSLOVAKIA**

1950-57



CIA/RR 154
November 1958

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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(ORR Project 46.1963)

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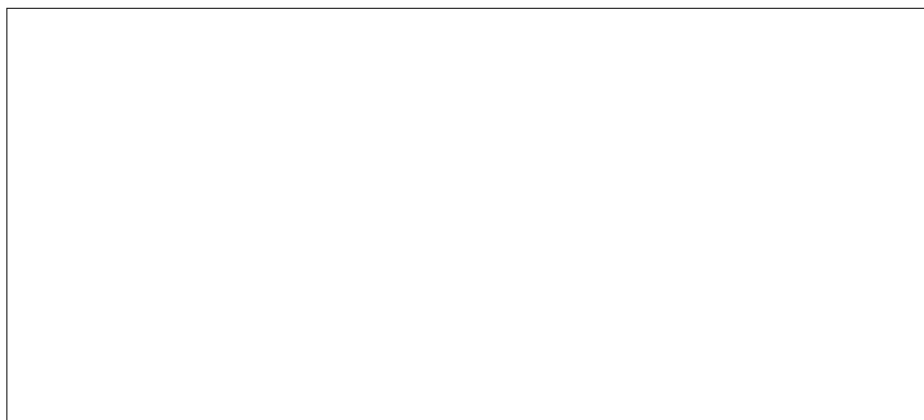
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FOREWORD

This report is concerned with those post and telecommunications facilities and services in Czechoslovakia operated and controlled by the Ministry of Communications. Other ministries operate functional telecommunications systems such as those serving the armed forces, shipping, railroads, and industry. These independent post and telecommunications systems are not covered in this report. It must be pointed out, however, that although the facilities and services covered here are confined to those under the jurisdiction of the Ministry of Communications, their use is not so restricted. The armed forces make abundant use of this system, as do all ministries.



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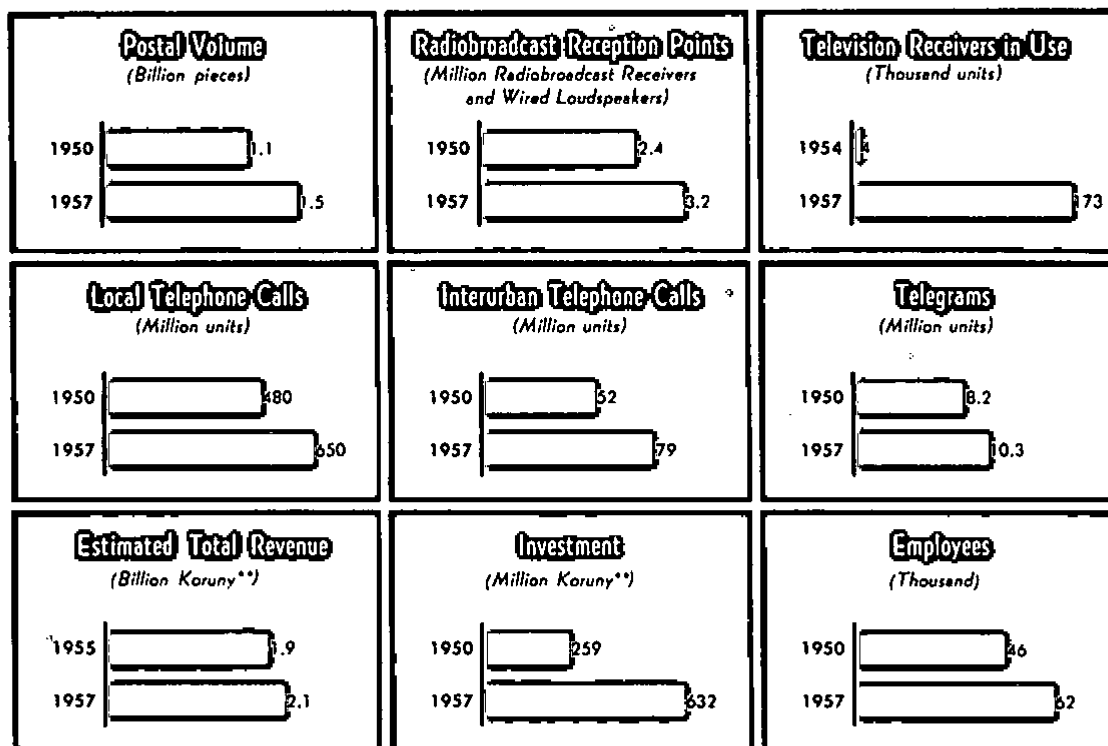
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POST AND TELECOMMUNICATIONS SERVICES IN CZECHOSLOVAKIA*
1950-57

Summary and Conclusions

Czechoslovakia emerged from World War II with a well-developed post and telecommunications system which had suffered a minimum of war damage. Since World War II and particularly since 1950, the system, under the operation and control of the Ministry of Communications, has been further expanded and improved so that it is currently capable of meeting both the domestic and the international needs of the country. A summary of the present status and recent development of the post and telecommunications system in Czechoslovakia follows:



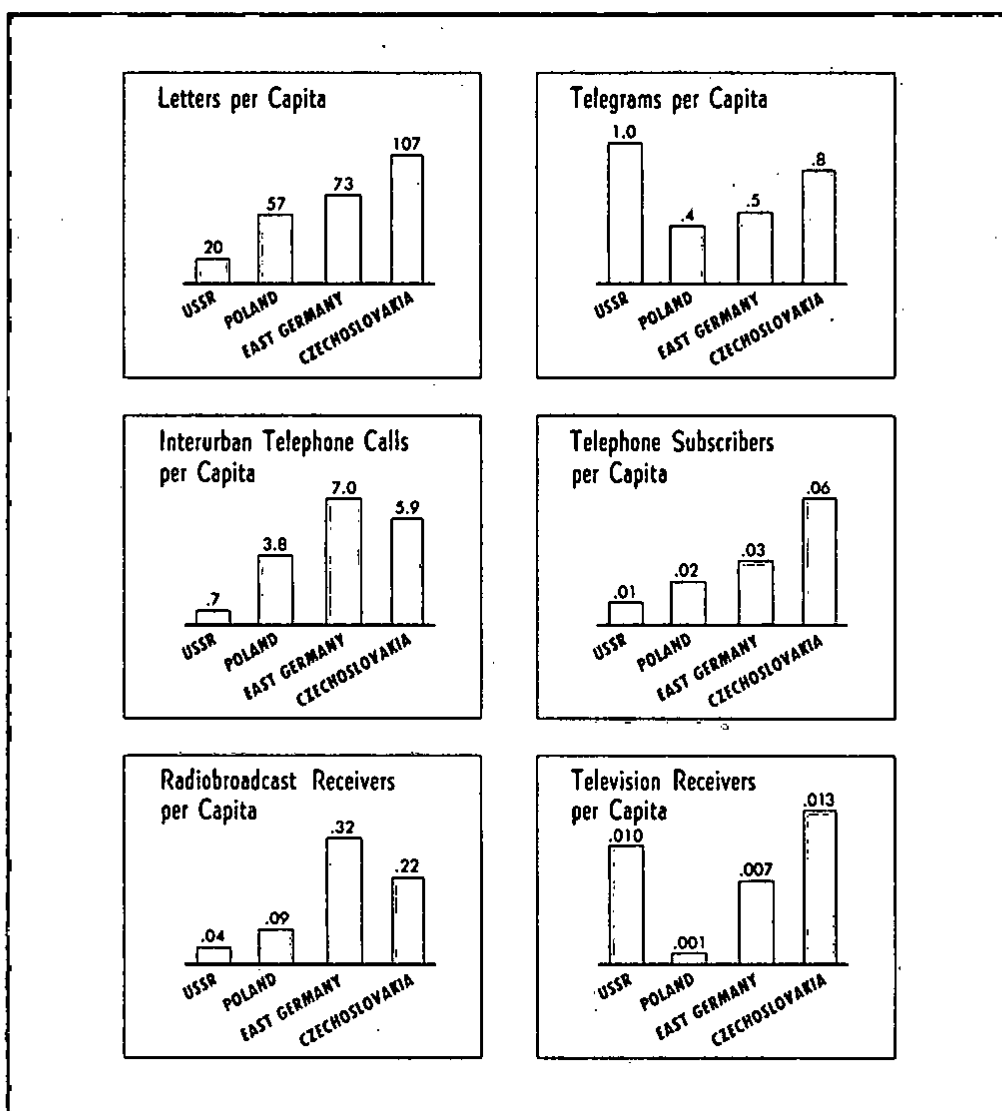
* The estimates and conclusions in this report represent the best judgment of this Office as of 1 August 1958. Technical terms are defined in Appendix A, Glossary of Technical Terms.

** Except where otherwise indicated, koruny values in this report are expressed in terms of 1955-57 koruny and may be converted to US dollars at the official rate of exchange of 7.2 koruny to US \$1. This exchange rate, however, does not necessarily reflect the true dollar value.

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Because a substantial post and telecommunications base existed at the end of World War II and because considerable progress has been made in expanding the system since that time, Czechoslovakia now has the most advanced public* post and telecommunications system in the Sino-Soviet Bloc, as shown below.



* The term public in this report refers to the facilities and services under the control of and operated by the Ministry of Communications. It does not refer to functional systems such as those serving the armed forces, the state police, or other ministries.

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The Czechoslovak post and telecommunications system is outstanding in the Sino-Soviet Bloc not only because of the volume of service performed but also because of its efficiency and reliability. Although there is ample room for improvement in the system, it is currently considered to be equivalent to those of most Western European countries.

Plans of the Ministry of Communications call for an expansion and improvement of the post and telecommunications system in Czechoslovakia and emphasize automation, particularly in the telephone and telegraph portions of the system. To a lesser extent, attention is to be devoted to expanding the volume of service by the extension of existing facilities. Judging by past performance, the Ministry of Communications is capable of meeting its plan goals and thus will be able to improve even further the quantity and quality of service available to the economy.

I. Introduction.

The purpose of this report is to discuss the status, operation, and development of the public post and telecommunications facilities and services provided by the Ministry of Communications in Czechoslovakia. Quantitative data are limited generally to the period 1948-57, but some qualitative references to the historical development of the system are included in the text.

II. Ministry of Communications.

The primary responsibilities of the Ministry of Communications of Czechoslovakia are to provide domestic and international telephone and telegraph services through integrated wireline and radio facilities; domestic and international broadcasting services utilizing radio, television, and wire-diffusion facilities; and domestic and international postal services. The Ministry, furthermore, is responsible for technical control and regulation of the functional telecommunications systems operated by other ministries and agencies. 1/*

A. Organization.

The Ministry of Communications of Czechoslovakia was originally named the Ministry of Post and Telegraph. This predecessor Ministry was established shortly after World War I to provide the country with postal and telecommunications services. 2/ Subsequently it delegated

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to the Czechoslovak Post, one of its subsidiaries, authority to direct and operate all public post and telecommunications services and facilities.

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Operational control of post and telecommunications services in Slovakia was delegated by the General Directorate to the Slovakia Regional Directorate. ^{4/}

On 8 April 1952 the Ministry of Post and Telegraph was renamed the Ministry of Communications. ^{5/} Its organizational structure, however, remained unchanged until some time in 1953. At that time, it is believed, the structure of the Ministry was reorganized, with emphasis being placed on a decentralization of ministerial activities along operational and administrative lines. The Czechoslovak Post with its General Directorate was abolished and was replaced by three deputy ministers with subordinate central administrations and central departments. ^{6/} The Slovak Regional Directorate likewise was abolished and was replaced by the Slovak Commission for Communications. All the deputy ministers as well as the Slovak Commission for Communications were made directly subordinate to the Minister of Communications. Since its reorganization in 1953 the organizational structure of the Ministry has remained basically unchanged, it being one of the few ministries not affected by the ministerial reorganizations that took place in Czechoslovakia during 1956. The present organizational structure of the Ministry of Communications is shown in Figure 1.**

The Minister of Communications in Czechoslovakia is Dr. Alois Neumann. ^{7/} Although not a member of the Communist Party, Dr. Neumann has substantial control over the activities of the Ministry. The Communist Party, however, maintains control of the Ministry to insure that its policies are carried out. This control is probably exercised through the deputy ministers, at least through Deputy Minister Laipert, who is known to be an active Communist Party member.

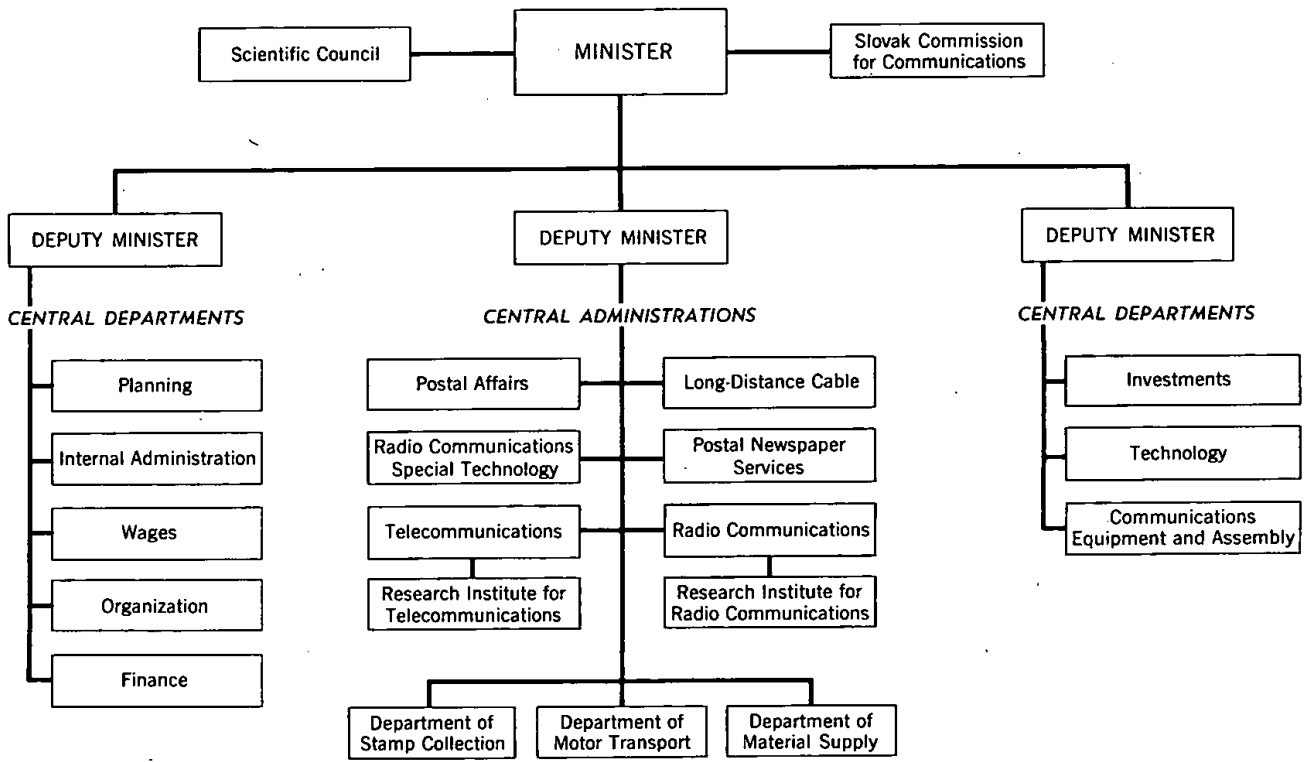
The Minister is assisted in controlling the operations of the Ministry by three deputy ministers -- Miroslav Laipert, Jarau Manak, and Frantisek Petrasek. ^{8/} Although the specific activities which each controls are not known, control of operational activities of the Ministry is vested in one deputy minister, and control of administrative and staff activities is vested in the other two. The deputy ministers

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** Following p. 4.

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CZECHOSLOVAKIA ORGANIZATION OF THE MINISTRY OF COMMUNICATIONS, 1957



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exercise control over their assigned duties through 6 central administrations and 8 central departments. In addition to their specific duties, it is believed that all three deputy ministers assist the Minister in coordinating the over-all activities of the Ministry.

Although the manner in which the six central administrations carry out their responsibilities is not known, it is believed that they exercise nationwide supervisory control of post and telecommunications services in Czechoslovakia. In addition, they are believed to direct and control, through district and regional offices, the operational aspects of post and telecommunications in Bohemia/Moravia. Direction and control of operational post and telecommunications activities in Slovakia appears to be the responsibility of the Slovak Commission for Communications.

The eight central departments control administrative and staff activities of the Ministry. The central departments of planning, internal administration, wages, organization, and finance are subordinate to one deputy minister, and the central departments of investments, technology, and communications equipment and assembly are subordinate to the other. In the performance of their duties the central departments support the operational activities of the central administrations.

Research and development within the Ministry of Communications is conducted by the Research Institute for Telecommunications, subordinate to the Central Administration for Telecommunications, and by the Research Institute for Radio Communications, subordinate to the Central Administration for Radio Communications. 9/ These institutes receive their direction from the Scientific Council of the Minister of Communications. The Scientific Council was established in 1954 and is the supreme authority of the Ministry in the sphere of research and development. 10/ Other government organizations operate their own institutes for the research and development of electronics and telecommunications equipment. 11/ These institutes maintain research and development programs in support of the Ministry of Communications as well as other government organizations.

Until recently, all broadcasting services in Czechoslovakia were amalgamated under the Czechoslovak Broadcast Corporation. This Corporation was subordinate to the Ministry of Education and Culture, which had ultimate authority in the administrative, budgeting, and programming policies of the Corporation. 12/ Broadcasting services in Slovakia operated independently from those in Bohemia/Moravia, but the Slovak system was also under the general control of the Corporation. 13/ Technical control over all broadcast operations was maintained by the Ministry of Communications.

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In December 1957 the Czechoslovak Broadcast Corporation was dissolved, and the Czechoslovak Committee for Radio and Television was created. 14/ The Committee, an independent organ of the government believed to be directly subordinate to the Council of Ministers, was made responsible for all broadcasting services in Czechoslovakia. The reorganization maintained the independence of broadcasting services in Slovakia from those in Bohemia/Moravia. Broadcasting services in Slovakia were made subordinate to a newly created Slovak Committee for Radio and Television, which was placed under the general control of the Czechoslovak Committee for Radio and Television. 15/ The reorganization did not affect the technical controls exercised by the Ministry of Communications over all broadcast operations. The present organization of the Czechoslovak broadcast system is believed to be as shown in Figure 2.*

Although the reorganization of the Czechoslovak broadcasting system did not alter the basic pattern of broadcasting services, it did establish a mechanism for a more efficient provision of service. As an independent agency of the government, the Czechoslovak Committee for Radio and Television has autonomy in establishing its administrative, budgeting, and programming policies. This freedom of action should eliminate frictional and jurisdictional disputes which resulted from the previous organizational structure of the broadcasting system.

The present organization of the Ministry of Communications in Czechoslovakia appears to be consistent with its basic responsibilities of providing public post and telecommunications services. The reorganization in 1953 was the initial step in an effort to decentralize many ministerial activities previously controlled in Prague. Since the reorganization, the Ministry has recognized that a further decentralization of its activities is a prerequisite for the expansion and improvement of its services. With this as a goal, it has initiated programs to simplify relationships among its individual components so that decisions can be resolved at the basic working levels. 16/ Furthermore, in 1958 the Ministry plans to organize regional economic post and telecommunications units which will have full responsibility for the administration and operation of post and telecommunications activities in their respective regions. 17/ It is believed that the ability of the Ministry of Communications to expand and improve service will be largely determined by the extent to which it achieves decentralization.

B. Revenue.

Total revenue of the Ministry of Communications of Czechoslovakia, as shown in Table 1,** is estimated to have increased from

* Following p. 6.

** Table 1 follows on p. 7.

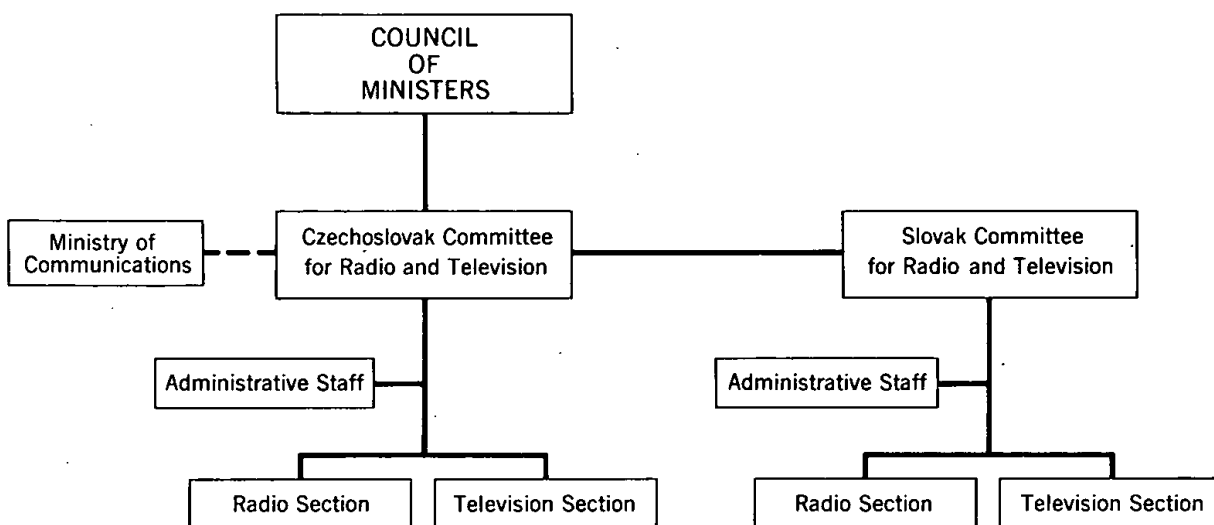
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Figure 2

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CZECHOSLOVAKIA ORGANIZATION OF THE BROADCASTING SYSTEM, 1957



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1.9 billion koruny in 1955 to 2.1 billion koruny in 1957, an increase of about 11 percent. Although these figures are based on fragmentary data, they nevertheless compare favorably with the post and telecommunications revenue of other Soviet Bloc countries during this period. 18/

Table 1

Estimated Total Revenue of the Ministry of Communications
of Czechoslovakia a/
1955-57

	Million Current Koruny		
	<u>1955</u>	<u>1956</u>	<u>1957</u>
Postal revenue <u>b/</u>	805	844	893
Telecommunications revenue <u>c/</u>	<u>1,068</u>	<u>1,120</u>	<u>1,184</u>
Telephone <u>d/</u>	839	873	915
Interurban and international <u>e/</u>	572	603	635
Local <u>f/</u>	239	249	260
Installation <u>g/</u>	28	21	20
Telegraph <u>h/</u>	56	58	60
Broadcast	173	189	209
Radiobroadcast <u>i/</u>	168	173	177
Television <u>j/</u>	3	10	22
Wire diffusion <u>k/</u>	2	6	10
Total post and telecommunications revenue	<u>1,870</u>	<u>1,960</u>	<u>2,080</u>

a. Totals are derived from unrounded data and may not agree with the sum of their rounded components. All totals are rounded to three significant digits.

b. Estimated on the basis of postal revenue in the USSR, which was approximately 43 percent of total revenue. 19/

c. The revenue for the various services was derived by applying known and estimated telecommunications price data to known and estimated telecommunications service volumes.

d. Because of obscurities in the data reported, total telephone revenue does not include a "base monthly rate" of 24 koruny for "private residence subscribers" which is charged under certain un-stated conditions.

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Table 1

Estimated Total Revenue of the Ministry of Communications
of Czechoslovakia
1955-57
(Continued)

- e. Derived from interurban and international telephone calls from both regular and leased telephone circuits. Revenue from regular circuits was computed by multiplying the number of calls for 1955-56 from source 20/ and for 1957 from Table 9 (p. 27, below) by the estimated average revenue of 6 koruny per call. Revenue from leased circuits was assumed to be 25 percent of total interurban and international telephone revenue.
- f. Computed by multiplying the number of local calls for 1955-56 from source 21/ and for 1957 from Table 8 (p. 26, below) by the estimated average revenue of 0.4 koruny per local call.
- g. Computed by multiplying the number of new telephone subscribers by an estimated installation fee of 500 koruny. 22/
- h. Derived from telegrams from both regular and leased telegraph circuits. Revenue from regular circuits was computed by multiplying the number of telegrams for 1955-56 and for 1957 from Table 10 (p. 31, below) by the estimated average revenue of 5.2 koruny per telegram. Revenue from leased circuits was assumed to be 10 percent of total telegraph revenue.
- i. Computed by multiplying the estimated midyear figure for radio-broadcast receiver subscribers for 1955-57 from Table 13 (p. 39, below) by the yearly subscriber tax of 60 koruny. 24/
- j. Computed by multiplying the estimated midyear figure for television receiver subscribers for 1955-57 from Table 15 (p. 44, below) by the yearly subscriber tax of 180 koruny. 25/
- k. Derived from wire-diffusion subscriber taxes and installation fees. Revenue from subscribers was computed by multiplying the estimated midyear figure for the number of subscribers for 1955-57 from Table 16 (p. 46, below) by the yearly subscriber tax of 60 koruny. Revenue from installation fees was computed by multiplying the estimated midyear figure for the number of new subscribers by the installation fee of 45 koruny per loudspeaker. 26/

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Of the total revenue received by the Ministry of Communications in 1957, telecommunications services accounted for about 57 percent and postal services for about 43 percent. Telephone revenue provided the major portion of telecommunications revenue, accounting for about 77 percent. The percentage contributions to total telecommunications revenue by broadcasting and telegraph services amounted to about 18 percent and 5 percent, respectively.

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Beginning some time in 1958, radiobroadcast, television, and wired loudspeaker subscription fees, heretofore collected by the Ministry of Communications, are to be collected by the Czechoslovak Committee for Radio and Television. 27/ This change will not adversely affect the revenue position of the Ministry of Communications, however, as the Ministry is expected to receive payment commensurate with the value of the services it provides.

The revenue of the Ministry of Communications is expected to increase in the future at a rate in excess of that achieved during 1955-57. This increase will result primarily from expansion of the volumes of telephone and broadcasting services. 28/

C. Investment.

The estimated annual investment in post and telecommunications in Czechoslovakia, as shown in Table 2,* increased 163 percent, from 240 million koruny in 1949 to 632 million koruny in 1957. This growth reflects the increasing emphasis being placed on the expansion of post and telecommunications facilities and services in Czechoslovakia.

In deriving investment for post and telecommunications, reference was made to aggregate data available for the transportation and the post and telecommunications sectors of the economy for 1949-53. During this period, investment in the post and telecommunications sector averaged about 13 percent of the total. 29/ Although there was a cutback in aggregate investment in these sectors during 1954-56, it is believed that this cutback was almost entirely confined to the transportation sector and that during this period investment in the post and telecommunications sector continued to grow at about the same rate as during 1949-53. It is estimated that this pattern of growth continued through 1957.

Investment in the post and telecommunications sector of the Czechoslovak economy is increasing to meet the major goals of the Second Five Year Plan (1956-60). These goals include expansion and improvement of telephone, television, and interurban telecommunications facilities and services. 30/ Telephone service is being expanded and improved through the increased use of automatic and semiautomatic exchange equipment. 31/ The expansion of television service is being achieved by the construction of additional television stations. Interurban telecommunications facilities, consisting primarily of microwave radio relay and coaxial cable lines, are being constructed to permit the expansion and improvement of interurban telephone service and the establishment of nationwide network television service. 32/ The

* Table 2 follows on p. 10.

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Table 2

Estimated Investment by the Ministry of Communications of Czechoslovakia a/
1949-57

	Million 1956 Koruny								
	1949	1950	1951	1952	1953	1954	1955	1956	1957
Telecommunications b/	178	192	246	289	323	359	395	431	468
Post c/	62	67	86	101	113	126	139	152	164
Total	240 d/	259 d/	332 d/	390 d/	436 d/	485 e/	534 e/	583 e/	632 e/

- a. All data are rounded to the nearest million.
- b. Assuming that investment in telecommunications was equal to 74 percent of investment for both post and telecommunications. 33/
- c. Difference between total investment and telecommunications investment.
- d. Communications equaled 13 percent of investment for both transportation and communications.

[Redacted]

- e. Extrapolated by applying the average absolute growth shown during 1949-53.

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majority of these facilities are to be completed during the last 3 years of the plan. As a consequence, investment during 1958-60 will be greater than that during 1956-57.

D. Manpower.

1. Labor Force.

The labor force of the Ministry of Communications of Czechoslovakia, as shown in Table 3,* increased from about 46,000 employees in 1950 to about 62,000 employees in 1957. This increase in personnel of about 35 percent generally reflects the gradual and steady expansion of post and telecommunications facilities and services which occurred during the period.

In 1956, however, there was an unusually large increase in the labor force. Although reasons for this increase are not known, it does not appear to have been justified by the expansion of post and telecommunications services and facilities which occurred during 1956. A further indication that growth in the labor force in 1956 was out of line with the volume of service performed is found in an announcement in December 1956 by the Ministry of Communications that a reduction in its labor force would be effected in the future through a decentralization of Ministry activities. 36/ There is no information available which indicates that the intended reduction in the labor force was implemented. It is assumed, therefore, that the labor force in 1957 was held at the same level as in 1956. Furthermore, it is believed that employment in the Ministry will not increase at an appreciable rate in the future, as the planned increase in automation should enable the future growth in volume of service to be accomplished without a large increase in the labor force.

The post and telecommunications sector of the Czechoslovak economy, as in the case of all the other economic sectors, has been hampered since World War II by a continuous shortage of employable males. 37/ To meet this problem, the Ministry of Communications has augmented its labor force by the recruitment of women. In 1955, 44 percent of all employees of the Ministry of Communications were women. This was higher than the percentage of women employed in the industrial sectors of the economy but was comparable to the percentage of women employed in other service sectors. 38/ The extensive use of female labor probably has not hampered the operation of the Ministry, as many jobs in the post and telecommunications sector can be performed equally well by men or women. In 1955, for example, 40 percent of all mail carriers in Czechoslovakia were women, yet their employment had no

* Table 3 follows on p. 12.

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Table 3

Estimated Average Number of Employees a/ of the Ministry of Communications
of Czechoslovakia
1950-57

	Thousand Units							
	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>
Employees	46 <u>b/</u>	47 <u>b/</u>	49 <u>b/</u>	52 <u>c/</u>	54 <u>c/</u>	57 <u>c/</u>	62 <u>c/</u>	62 <u>d/</u>

a. Excluding apprentices.

b. Derived by assuming the ratio of the workers employed in communications to be 16 percent of the total number of workers employed in transportation and communications. 39/

c. 40/

d. Assuming the same level of employment in 1957 as in 1956 because of the unusually large number of new employees in 1956 and of statements from the Ministry of Communications which implied a desire to reduce the number of employees in 1957.

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adverse effect upon mail delivery service. 41/ It is believed that other branches of the Ministry, within the limits of required skills, also have had favorable results in their employment of female labor.

The over-all quality, efficiency, and performance of the post and telecommunications labor force is considered to be good. 42/ The existing shortages of qualified engineering and technical personnel are not believed to be serious and have not impaired operations of the Ministry. The expanding volume of post and telecommunications services and the consistent fulfillment and overfulfillment of major plan goals by the Ministry give support to this belief.

2. Wages.

Wage rates for employees of the Ministry of Communications of Czechoslovakia are established in accordance with standard qualifications issued by the government. 43/ These standards are based upon levels of education and experience and require the taking of examinations. Employees qualifying are paid a predetermined basic wage and have the opportunity to supplement it by premiums, commissions, and other allowances established by the Ministry on the basis of performance. 44/ The Ministry does not use piecework as a basis of compensation. 45/

The average annual wage of employees of the Ministry of Communications is lower than the average annual wage of employees in other sectors of the economy. As shown in Table 4,* in 1957 the average annual wage of post and telecommunications employees was about 13,860 koruny, whereas the average annual wage for the economy as a whole was about 15,468 koruny. 46/ The gap between these wage levels is believed to be a result of the large proportion of relatively low-paid postal employees. Specific groups of highly skilled employees in the Ministry -- such as the technicians who install, operate, and maintain the complex telephone, telegraph, and broadcasting facilities of the Ministry -- receive substantially higher wages than postal employees, but their number is small relative to the number of postal employees, and thus their higher wage rates have little effect on the over-all wage level of the Ministry.

Wages paid to post and telecommunications employees increased about 16 percent from 1953 to 1957. Plans by the Ministry of Communications for expanding automation in post and telecommunications activities should increase labor productivity and lead to continued wage increases for post and telecommunications employees.

* Table 4 follows on p. 14.

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Table 4

Estimated Total Annual Wage Bill and Average Annual Wage
of Employees a/ of the Ministry of Communications
of Czechoslovakia
1953-57

	1953	1954	1955	1956	1957
Total annual wage bill (million current koruny) <u>b/</u>	624	665	719	821	859
Average annual wage (current koruny)	12,000 <u>c/</u>	12,324 <u>c/</u>	12,612 <u>c/</u>	13,236 <u>c/</u>	13,860 <u>d/</u>

a. Excluding apprentices.

b. Derived by multiplying the average annual wage by the estimated average annual number of employees.

c. Derived by multiplying average monthly wages by 12. 47/

d. Assuming the same absolute increase for 1956-57 as for 1955-56.

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3. Training.

Skilled and competent employees are necessary for the efficient operation of the post and telecommunications sector of the economy. Cognizant of this, the Ministry of Communications of Czechoslovakia has initiated employee training programs in both the basic and the technical training schools which it operates. In addition, the Ministry sponsors on-the-job and after-duty-hours training programs.

Training schools for regular employees are operated by the Ministry at Trencianske Teplice, Trutnov, Rozmberk, Kosice, Blansko, Varnsdorf, Brno, Opava, and Bratislava. 48/ The schools at Opava and Brno offer 2-year courses, whereas the other schools offer courses for shorter periods. 49/ The Ministry also operates telecommunications schools for apprentices. 50/ Apprentices attending these schools are trained under simulated working conditions in the use and operation of telecommunications equipment. 51/

The Ministry of Communications does not operate schools offering advanced training in post and telecommunications 52/ -- such training is provided by various universities and specialized schools operated by the Ministry of Education and Culture. In 1956 there were some 3,000 students majoring in the field of post and telecommunications at universities and specialized schools in Czechoslovakia. 53/

On-the-job and after-duty-hours training programs are integral parts of the Ministry's training effort. 54/ These programs help the employee to master the complex equipment, techniques, and methods used in the post and telecommunications sector. Instructors for these as well as other training programs operated by the Ministry are recruited from among the outstanding employees of various post and telecommunications enterprises. 55/

It is believed that the training efforts of the Ministry of Communications, supplemented by training available at universities and specialized schools, are sufficient to meet the minimum technological requirements necessary for the efficient operation and maintenance of the post and telecommunications system in Czechoslovakia. The planned expansion of this system and the accompanying introduction of more complex equipment, however, will require continuing increases in the level of technical skill and competence of Ministry employees. Some shortages of highly skilled technicians exist, 56/ but they have not seriously hindered the operations of the Ministry to date, and continued training efforts by the Ministry should result in their elimination in the future.

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4. Labor Productivity.

Labor productivity for individual post and telecommunications services in the Ministry of Communications of Czechoslovakia cannot be computed at this time, because of inadequate data on the labor force. An aggregate measure of labor productivity, in terms of average revenue per employee, however, has been derived and is shown as follows:

	<u>1955</u>	<u>1956</u>	<u>1957</u>
Average annual revenue per employee (current koruny)*	32,860	31,680	33,500
Index of labor productivity (1955 = 100)	100	96	102

The tabulation shows an over-all growth of 2 percent in labor productivity between 1955 and 1957 in spite of a substantial decline in labor productivity in 1956. The decline in 1956 was caused by an unusually large increase in the labor force during the year, which more than offset increases in total revenue.**

Labor productivity increased by about 6 percent in 1957, and future increases commensurate with this increase are expected to occur. These increases will result primarily from extensive automation planned for the telephone and telegraph networks of the Ministry of Communications.

E. Equipment.

Czechoslovakia has a well-developed industry for manufacturing electronics and telecommunications equipment. 57/ It is the third largest producer of telecommunications equipment in the Soviet Bloc, surpassed only by the USSR and East Germany, and its output of telecommunications equipment is sufficient to meet most of the needs of the Ministry of Communications. 58/ In addition, considerable equipment is available for other domestic users and for export. 59/

1. Production.

The electronics and telecommunications equipment industry of Czechoslovakia is mainly of German origin. 60/ Before World War II,

* See Tables 1 and 3, pp. 7 and 12, respectively, above, for data on total revenue and total labor force.

** See 1, p. 11, above.

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plants which were subsidiaries of German firms were the major producers of such equipment in the country. During the wartime occupation, Germany needed large quantities of these types of equipment and provided the manpower, investment funds, and raw materials necessary to expand output. A further expansion of output was effected in the postwar period. This expansion, however, although fairly rapid, was hampered by recurrent shortages of skilled manpower and raw materials and by a lack of modern manufacturing equipment.

At present the electronics and telecommunications equipment industry in Czechoslovakia is believed to consist of about 70 plants which produce a variety of products ranging from simple tubes to large radiobroadcasting and jamming transmitters. These plants are controlled by several ministries, including the Ministry of Precision Engineering, the Ministry of Heavy Industry, and the Ministry of National Defense. 61/ Below the ministerial level, control is effected through a complex of five nationalized corporations: Tesla, Bateria, Kablo, Skoda, and Prazska Akumulatorka.

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Currently, the electronics and telecommunications equipment industry produces sufficient quantities and varieties of telecommunications equipment to meet almost all the primary needs of the Ministry of Communications. Future plans of the industry, which include the development and production of more complex telecommunications equipment, should facilitate the planned expansion of the system. 63/

Czechoslovakia, East Germany, and Hungary, as member nations of the Warsaw Pact, agreed in 1955 to divide the responsibility for producing various types of telecommunications equipment. In 1956, as a direct result of Soviet efforts to standardize telecommunications systems within the Soviet Bloc, Czechoslovakia, East Germany, Hungary, and the USSR agreed to integrate and specialize their productive efforts. Under the terms of the agreement, Czechoslovakia was to specialize in television transmitters and receivers, East Germany in radiobroadcasting transmitters and receivers, Hungary in carrier frequency equipment, and the USSR in telephone equipment. 64/ It is not known to what extent these agreements have been carried out. It is believed, however, that for the immediate future they will have no serious effect upon the productive capability of the Czechoslovak electronics and telecommunications equipment industry to meet most of the equipment needs of the Ministry of Communications.

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2. Imports.

The Ministry of Communications of Czechoslovakia imports electronics and telecommunications equipment from various Free World and Soviet Bloc countries. These imports are needed to meet requirements for equipment not provided by domestic production. Imports are administered by the Ministry of Foreign Trade and are handled by a national foreign trade corporation.

Imports of equipment from Free World nations include television equipment from France, 65/ radiobroadcasting equipment from Great Britain, 66/ various types of measuring equipment from Sweden and Switzerland, 67/ and teleprinters from West Germany. 68/ Imports of equipment from Soviet Bloc nations include microwave radio relay equipment from East Germany 69/ and television receivers from the USSR. 70/

Czechoslovakia suffers from recurrent shortages of raw materials. 71/ To meet its production requirements, the electronics and telecommunications equipment industry must therefore import substantial quantities of raw materials. The USSR, Poland, and Hungary are the predominant suppliers of raw materials, particularly non-ferrous metals including copper, lead, zinc, and aluminum. 72/ Non-Soviet Bloc nations are additional suppliers of raw materials, but to a considerably lesser degree.

It is expected that Czechoslovakia will continue to import electronics and telecommunications equipment. A high level of imports of raw materials is also expected to continue. These imports will be required if planned increases in the production of electronics and telecommunications equipment are to be met, and the increases are necessary if planned goals for expanding the post and telecommunications system are to be achieved.

3. Exports.

On balance, Czechoslovakia is a net exporter of electronics and telecommunications equipment. These exports, administered by the Ministry of Foreign Trade and handled by a national foreign trade corporation, are made principally to countries of the Sino-Soviet Bloc and to various underdeveloped areas. Although such exports appear to be motivated primarily by economic considerations, it is evident that long-range political considerations also influence the export policy of Czechoslovakia, especially in trade with underdeveloped areas.

Czechoslovak exports contribute substantially to Sino-Soviet Bloc requirements for telecommunications equipment. Exports to the Bloc

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have included high-powered radiobroadcasting transmitters to Poland, Rumania, and Communist China; telephone equipment to the USSR; and radio receivers and wired loudspeakers to Albania. 73/

In the past few years, Czechoslovakia has succeeded in penetrating the markets for electronics and telecommunications equipment of many underdeveloped countries. The primary reason for success is the policy of offering competitively favorable terms of trade, including low prices and long-term credit. This policy has resulted in the export of fairly large quantities of radiobroadcasting and telephone equipment to various Middle Eastern countries, including Egypt, Syria, and Afghanistan, 74/ and of telecommunications equipment to Greece, Turkey, and India. 75/ Attempts by Czechoslovakia to penetrate Latin American markets culminated in 1957 in a very attractive offer to expand the telephone network of Uruguay. 76/ This offer, however, has been withdrawn because of internal financing problems in Czechoslovakia. 77/

The export policy of Czechoslovakia with regard to the penetration of markets for electronics and telecommunications equipment in underdeveloped countries is believed to be influenced both by political and economic considerations. Politically, the successful penetration of these markets could eventually lead to Communist access to telecommunications facilities in these areas. Economically, penetration of these areas would make them dependent upon Czechoslovakia for future shipments of spare parts and additional equipment. The offer to expand the Uruguayan telephone network, for example, would have given Czechoslovakia access to all telephone lines in Montevideo for 4 years, in addition to making Uruguay dependent upon Czechoslovakia for additional telephone equipment and needed spare parts. 78/

Future Czechoslovak exports of telecommunications equipment are expected to remain at a high level, primarily because of Sino-Soviet Bloc requirements for electronics and telecommunications equipment but also in part because of anticipated further efforts to penetrate markets of underdeveloped countries.

4. Technology.

Research and development programs in the Ministry of Communications of Czechoslovakia are conducted by the Research Institute for Telecommunications and the Research Institute for Radio Communications. The Research Institute for Telecommunications is responsible for the development of equipment which will aid in the maintenance and improvement of telephone and telegraph facilities. Development of equipment for the maintenance and improvement of broadcasting services is the responsibility of the Research Institute for Radio Communications. At

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the present time there is no research and development institute for postal technology.

Besides the research institutes maintained by the Ministry of Communications, both the military sector of the economy and the sector concerned with manufacturing electronics and telecommunications equipment maintain research institutes for the development of electronics and telecommunications equipment. Research programs for the development of military telecommunications equipment in Czechoslovakia are conducted by the Military Technical Institute, whereas various institutes of the nationalized corporations Tesla and Skoda conduct research programs for the development of equipment for the industry manufacturing electronics and telecommunications equipment. 79/

In the last decade, Czechoslovakia has made substantial progress in the research and development of electronics and telecommunications equipment. In the past, research programs were geared generally toward developing equipment originated by Free World nations, but present-day research programs emphasize original research. It is believed that the level of technology in Czechoslovakia in the field of electronics and telecommunications equipment is adequate to support an expanding and improving post and telecommunications sector.

III. Postal Services.

Postal service is available throughout Czechoslovakia. Service is provided by a nationwide network of main post offices, railroad post offices, and rural post offices. There is a main post office in each of the country's 270 political okreses (districts). Attached to these main post offices are 32 railroad post offices. 80/ In addition, rural post offices, which act as substations for main post offices, have been established throughout the country to insure that no inhabitant is more than 3 kilometers (km) from a post office. 81/ The number of post offices in Czechoslovakia is shown in Table 5.*

Total postal volume in Czechoslovakia is composed of letters, packages, money orders, and newspapers and periodicals. Of this total, newspapers and periodicals are believed to comprise the major portion, even though volume data are available only for letters and packages. The assumption that newspaper and periodical volume composes the largest share of the total is based on analogy with other Soviet Bloc countries. By the same analogy, money order volume is believed to be negligible.

Beginning in 1953, the responsibility for the distribution of domestic newspapers and periodicals was vested in a Postal Newspaper Department

* Table 5 follows on p. 21.

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Table 5

Estimated Number of Post Offices of the Ministry of Communications
of Czechoslovakia a/
1950-57

	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>
Post offices	3,546	3,558	3,569	3,621	3,710	3,819	3,998	4,177 <u>b/</u>

b. Assuming the same absolute increase for 1956-57 as for 1955-56.

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of the Central Administration for Postal Affairs of the Ministry of Communications. 83/ This responsibility was shifted to a Central Administration for Postal Newspaper Service in January 1957. 84/ The responsibility for other postal services still remains with the Central Administration for Postal Affairs. 85/ The distribution and forwarding of foreign newspapers and periodicals rests with the National Publishing House. 86/ Plans indicate, however, that the Ministry of Communications will assume this responsibility some time in the future. 87/

The total volume of letters and packages, as shown in Table 6,* has increased steadily since 1950, with the exception of a slight decline in 1953. The decline in 1953 is believed to have been caused by internal disorders and by the government reorganization that occurred during that year. It is assumed that other service volumes have followed a similar pattern since 1950.

The postal system also provides postal savings service; collects radiobroadcasting, wired loudspeaker, and television subscription fees; and handles government pensions. 88/ In the future, responsibility for the collection of broadcasting subscription fees is to be turned over to the Czechoslovak Committee for Radio and Television.

The postal system of Czechoslovakia does not employ modern postal techniques -- for example, most cancellation of mail is done by hand, and manually operated machines are employed in handling mail. The lack of modern equipment can be attributed in part to the lack of a developmental organization for postal technology. It was planned to assign three engineers in 1957 to survey this problem, but to date no results of their activities have been observed. 89/

Postal service in Czechoslovakia is efficient in spite of the lack of mechanization. Major industrial cities such as Prague, Brno, and Bratislava have three deliveries of mail per day. In addition, losses of mail have been slight -- for example, only 16.5 out of every million special delivery items handled during 1955 were lost. Parcel post losses in 1955 amounted to only 10.6 items out of every million. 90/

The Second Five Year Plan (1956-60) calls for a 20-percent increase in the number of post offices and for the introduction of postal mechanization. 91/ Through mechanization the Ministry of Communications hopes to improve domestic mail delivery so that a letter will reach its destination no later than 1 day after mailing. 92/ The planned increase in post offices and the introduction of mechanization should substantially improve postal service in Czechoslovakia.

* Table 6 follows on p. 23.

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Table 6

Estimated Volume of Letters and Packages Sent
in Czechoslovakia a/
1950-57

	Million Units							
	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>
Letters								
Ordinary	998	1,103	1,149	1,126	1,174	1,261	1,311	1,361 b/
Registered	38	41	44	45	53	59	64	69 b/
Packages c/	23	25	26	25	25	26	26	26 b/
Total volume	<u>1,059</u>	<u>1,169</u>	<u>1,219</u>	<u>1,196</u>	<u>1,252</u>	<u>1,346</u>	<u>1,401</u>	<u>1,456</u>

a. All data are rounded to the nearest million.

b. Assuming the same absolute increase for 1956-57 as for 1955-56.

c. Including letters containing valuables.

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IV. Telephone and Telegraph Services.

Telephone and telegraph services in Czechoslovakia are provided by the Ministry of Communications through the use of an extensive wireline network supplemented by microwave radio relay and point-to-point radio facilities. The telephone and telegraph system in Czechoslovakia is well developed and is considered superior to that of other Soviet Bloc countries. The system provides adequate service to meet the needs of government and industry. In addition, considerable service is available for use by private consumers. Of these services, telephone is the more extensive, as shown by the substantially greater volume of telephone calls made than telegrams sent. Future plans call for expanding and improving both telephone and telegraph services.

A. Telephone.

Czechoslovakia has a well-developed telephone system, ranking first among the countries of the Sino-Soviet Bloc. In terms of geographic coverage, telephone service (as shown on the map, Figure 3*) is available in all areas of Czechoslovakia. ^{94/} The density of telephone coverage, however, (as shown on the map, Figure 4**) varies rather markedly between krajs,*** with the heaviest concentration in the krajs of Bohemia/Moravia and in Bratislava kraj. ^{95/} The same general pattern of distribution for local, interurban, and international telephone calls also exists.

There was a considerable expansion in the telephone system in Czechoslovakia between 1948 and the end of 1957. During this period, as shown in Table 7,**** the number of telephone subscribers increased by about 92 percent, so that there are estimated to have been 743,000 telephone subscribers in the country by the end of 1957. During this same period, as shown in Tables 8 and 9,† the number of local telephone calls increased by about 55 percent to a total of 650 million in 1957, and the number of interurban and international calls increased by about 120 percent to a total of 79 million in 1957.

The local Czechoslovak telephone network is highly automatized. In 1948, about 60 percent of all telephone subscribers were connected to automatic telephone exchanges. The number of automatic exchange connections has grown steadily since then, as shown in Table 7, and††

* Inside back cover

** Following p. 24.

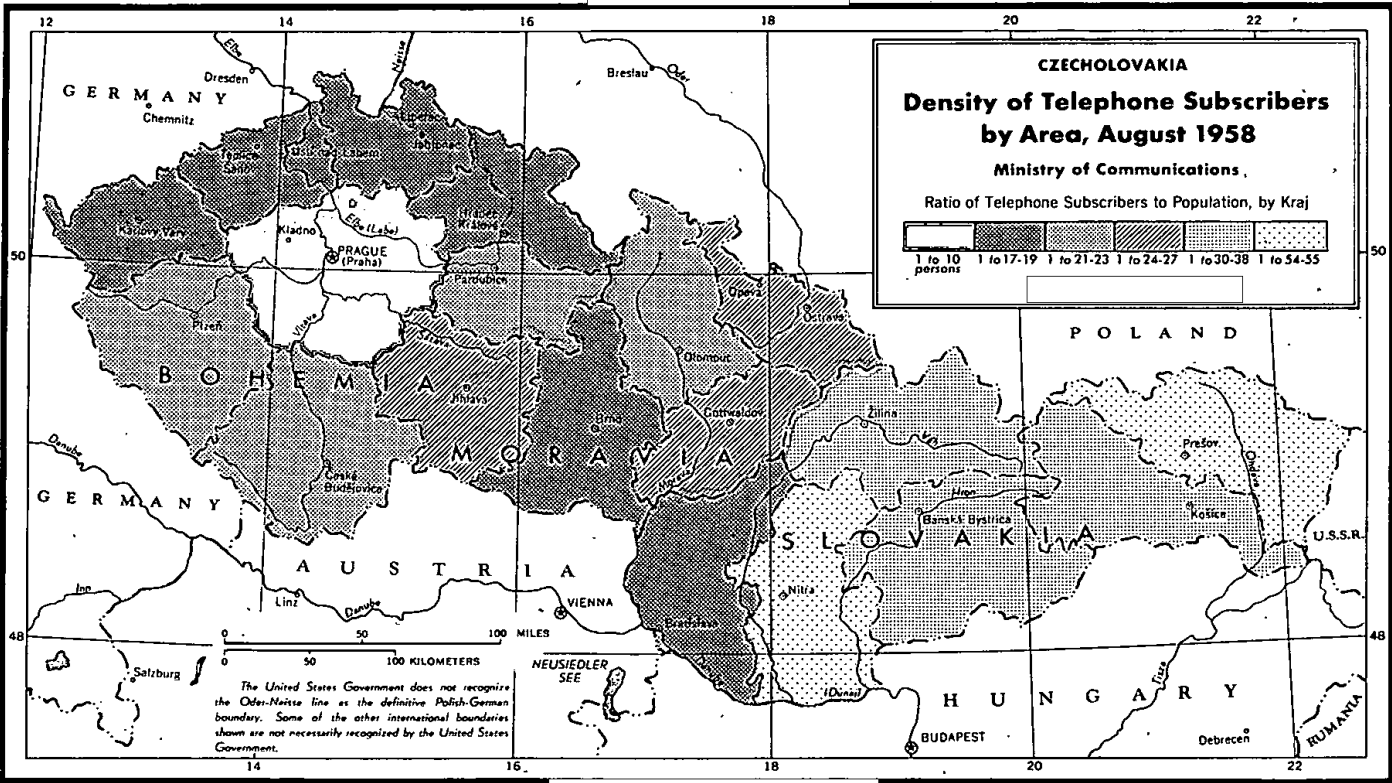
*** Krajs are major subdivisions of the provinces of Bohemia, Moravia, and Slovakia.

**** Table 7 follows on p. 25.

† Tables 8 and 9 follow on pp. 26 and 27, respectively, below.

†† Continued on p. 28.

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Figure 4

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Table 7
Estimated Number of Telephone Subscribers in Czechoslovakia
by Type of Line and by Type of Exchange a/
1948-57

Year	Thousand Units				
	Subscribers by Type of Line			Subscribers by Type of Exchange	
	Private	Party	Total	Automatic	Manual
1948	221	165	386	233	153
1949	233	187	420	250	170
1950	245	206	451	274	177
1951	255	223	478	315	163
1952	262	257	519	358	161
1953	269	286	555	407	148
1954	281	326	607	451	156
1955	297	365	662	509	153
1956	316	387	703	550	153
1957	334 b/	409 b/	743 c/	594 d/	149 e/

a. All data are rounded to three significant digits.

b. Assuming the same percentage relationship of main and secondary subscriber lines to total subscriber lines for 1957 as for 1956.

c. g/

d. Extrapolated, using graphic analysis.

e. The difference between the total number of telephone subscribers and the number of subscribers served by automatic exchanges.

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Table 8

Estimated Number of Local Telephone Calls Handled
by the Ministry of Communications of Czechoslovakia a/
1948-57

Million Units			
<u>Year</u>	<u>Bohemia/Moravia</u>	<u>Slovakia</u>	<u>Total</u>
1948	379	40.2	419
1949	385	47.3	433
1950	415	65.2	480
1951	431	71.0	502
1952	441	75.9	517
1953	459	71.2	530
1954	496	81.5	577
1955	512	86.3	598
1956	530	93.6	624
1957	552 b/	97.5 b/	650 c/

a. All data are rounded to three significant digits.

b. Assuming the same percentage relationship of local calls in Bohemia/Moravia and in Slovakia to total calls for 1957 as for 1956.

c. Assuming the same absolute increase for 1956-57 as for 1955-56.

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Table 9

Estimated Number of Interurban Telephone Calls
Handled over Facilities of the Ministry of Communications
of Czechoslovakia a/
1948-57

Million Units

<u>Year</u>	<u>Bohemia/Moravia</u>	<u>Slovakia</u>	<u>Total b/</u>
1948	30.4	5.7	36.1
1949	36.8	7.9	44.7
1950	42.0	9.5	51.5
1951	45.8	11.2	57.0
1952	47.2	12.3	59.5
1953	49.6	13.2	62.8
1954	53.7	14.5	68.2
1955	56.2	15.4	71.6
1956	59.0	16.5	75.5
1957	62.0 c/	17.4 c/	79.4 d/

a. All data are rounded to three significant digits.

b. Of this total, international calls represent less than 1 percent of the calls for all years. 100/

c. Assuming the same percentage relationship of calls in Bohemia/Moravia and in Slovakia to total calls for 1957 as for 1956.

d. Extrapolated by applying the absolute growth shown during 1955-56.

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it is estimated that by the end of 1957 80 percent of all telephone subscribers in Czechoslovakia were connected to automatic exchanges.

Automatic interurban and international telephone service is not available in Czechoslovakia. With the exception of semiautomatic interurban telephone facilities between Prague and Brno and between Prague and Bratislava, all domestic interurban telephone exchange facilities are manually operated. 101/ Similarly, all international telephone facilities, with the exception of the semiautomatic facilities between Prague and Warsaw, are manually operated. 102/

The expansion and automatization of the telephone system has been confined primarily to urban areas of the country. 103/ In 1953 it was reported that all obecs (rural administrative units subordinate to okreses) in the country had been supplied with telephone service. 104/ In spite of this implied progress in rural telephone coverage, in 1956 it was reported that 20 percent of the machine tractor stations, 25 percent of the state farms, and 65 percent of the cooperative farms had no telephone service. 105/ A considerable addition to telephone facilities in rural areas will be required before all areas of the country have adequate telephone service. An indication that this will not occur for some time is given in plans for the future expansion of telephone service. These plans give priority to the expansion of urban telephone service "in keeping with (over-all) planned economic development." 106/

Although the Czechoslovak telephone system is superior to that of other Soviet Bloc countries, it still has some serious shortcomings. The Ministry of Communications stated in 1956 that the telephone system in Czechoslovakia lagged behind the development of other sectors of the economy. This lag was considered harmful to the development of the national economy and detrimental to national defense. Furthermore, it was stated that the telephone system was not meeting the needs of private consumers. 107/ This latter criticism appears to be most applicable to telephone service in rural areas.

An indication of inefficiency in interurban telephone service is provided by delays involved in completing interurban calls. The following tabulation shows the percentage of interurban calls delayed in 1956 in one large unidentified interurban telephone exchange 108/:

<u>Percent of Calls Delayed</u>	<u>Delay in Minutes</u>
15	0 to 2
25	3 to 10
30	11 to 30
13	31 to 60
17	Above 60

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As indicated by the above data, 60 percent of interurban telephone calls placed were delayed more than 10 minutes, and more than 30 percent were delayed more than 30 minutes. The excessive delay encountered in completing an interurban call from this exchange reportedly was the primary factor causing cancellation of 10 percent of the interurban calls placed. Assuming that the interurban exchange under study is typical, the data indicate that the number of interurban calls made in Czechoslovakia could have been increased by nearly 8 million calls in 1957 by reducing the time required to complete a call.

The primary deficiency of the telephone system as a whole appears to be the lack of exchange facilities. A secondary deficiency arises from the fact that many of the automatic exchanges currently in use are antiquated and inefficient, resulting in poor service. 109/

Plans call for the addition of 200,000 telephone subscribers in Czechoslovakia by the end of 1960. 110/ These subscribers are to be connected to automatic exchanges, bringing the number of automatic connections to 84 percent of the total. 111/ Semiautomatic interurban telephone facilities also will become more widely available by the end of 1960. The fulfillment of these plans will result in a marked improvement in the availability, speed, and quality of telephone service in Czechoslovakia. Long-range plans by the Ministry of Communications reportedly envisage a "telephone paradise" in Czechoslovakia in 15 years. Under this plan the country is to be divided into districts, each of which will have fully automatic local telephone exchanges and semiautomatic or fully automatic interurban exchanges. 112/

B. Telegraph.

The telegraph network in Czechoslovakia provides regular telegraph, subscriber telegraph (TELEX*), and facsimile service. Facilities of this network, which are usually housed in post offices throughout the country, provide both domestic and international telegraph service. Traffic passed over this network is carried by wireline facilities used in common with the telephone system as well as wireline facilities used exclusively for telegraph purposes.

1. Regular Telegraph.

Regular telegraph facilities of the Ministry of Communications of Czechoslovakia are extensive. Service is available on a

* TELEX is a term applied to a system of subscriber telegraph used in European countries. As Czechoslovakia has a subscriber telegraph network interconnected with this European network, the term TELEX is used in this report to describe the Czechoslovak network.

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nationwide basis and is considered adequate to meet the needs of the country. Teletype apparatus is used predominantly, and semiautomatic or automatic exchange facilities are available at most telegraph stations. 113/ Approximately 60 percent of the telegraph traffic is transmitted over wirelines used in common with the telephone system and 40 percent over wirelines used exclusively for telegraph service. 114/

The volume of telegrams sent in Czechoslovakia, as shown in Table 10,* grew from 7.5 million in 1948 to 10.3 million in 1957, an increase of 37 percent. In terms of the geographic distribution of service volumes, Bohemia/Moravia has consistently accounted for about 73 percent of the total and Slovakia for about 27 percent.

The regular telegraph network in Czechoslovakia is one of the most advanced in the Sino-Soviet Bloc, a result of the widespread use of teletype apparatus and semiautomatic and automatic exchange facilities. 115/ As an example of speed of service, regular telegrams can be sent from Prague to all parts of Slovakia within 2 to 3 hours. 116/ It is reported that about 80 percent of all telegrams sent in Czechoslovakia are transmitted between terminal stations immediately, the remaining 20 percent being temporarily delayed. 117/

In the future, major emphasis will be placed on converting terminal facilities of local telegraph stations to semiautomatic and eventually automatic operations. 118/ When this conversion is completed, a fully automatic regular telegraph system in Czechoslovakia will result. 119/

The Ministry of Communications is considering combining regular telegraph and TELEX wireline and terminal facilities in order further to improve both services. The lack of telegraph circuit capacity and the lack of special terminal equipment appear to be the factors which prevent combining the facilities of these two services at the present time. 120/ These limiting factors are not considered serious, and it is anticipated that the two networks will be merged some time in the future. 121/

The regular telegraph network of the Ministry of Communications is expected to continue to meet the expanding needs of the economy. Plans call for the introduction of automation on a wide scale, and thus improvements in both speed and efficiency of regular telegraph service can be expected.

* Table 10 follows on p. 31.

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Table 10

Estimated Number of Telegrams Sent in Czechoslovakia a/
1948-57

Million Units			
<u>Year</u>	<u>Bohemia/Moravia</u>	<u>Slovakia</u>	<u>Total</u>
1948	5.5	2.0	7.5
1949	5.7	2.1	7.8
1950	5.9	2.3	8.2
1951	6.1	2.5	8.6
1952	6.3	2.5	8.8
1953	6.5	2.5	9.0
1954	6.9	2.5	9.4
1955	7.1	2.5	9.6
1956	7.4	2.6	10.0
1957	7.6 b/	2.7 b/	10.3 c/

a. All data are rounded to the nearest hundred thousand.

b. Assuming the same percentage relationship of telegrams sent in Bohemia/Moravia and in Slovakia to total telegrams for 1957 as for 1956.

c. Extrapolated by applying the average absolute growth shown during 1948-56.

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2. Subscriber Telegraph (TELEX).

In addition to the regular telegraph network, there is a well-developed TELEX network in Czechoslovakia which is operated and maintained by the Ministry of Communications and provides direct domestic telegraph service for enterprises located in most major cities and towns in the country. In addition, the network is integrated with Western European and Soviet Bloc TELEX networks. 123/

The domestic TELEX network in Czechoslovakia provided service in 1957 to about 1,000 subscribers located in about 250 cities and towns in Czechoslovakia. 124/ Approximately 78 percent of these subscribers were located in Bohemia/Moravia and 22 percent in Slovakia. 125/ Major facilities of the domestic and international TELEX network, as shown on the map, Figure 5,* consist of 13 automatic and 9 manual exchanges located in 20 cities. The main switching center for traffic in Bohemia/Moravia is in Prague. Bratislava serves as the main switching center for traffic in Slovakia. In Slovakia, all subscriber lines are connected to automatic exchanges, whereas in Bohemia/Moravia only about 53 percent of subscriber lines are so connected. 126/ The complete automation of exchanges in Slovakia probably results from the more recent introduction of TELEX into this area.

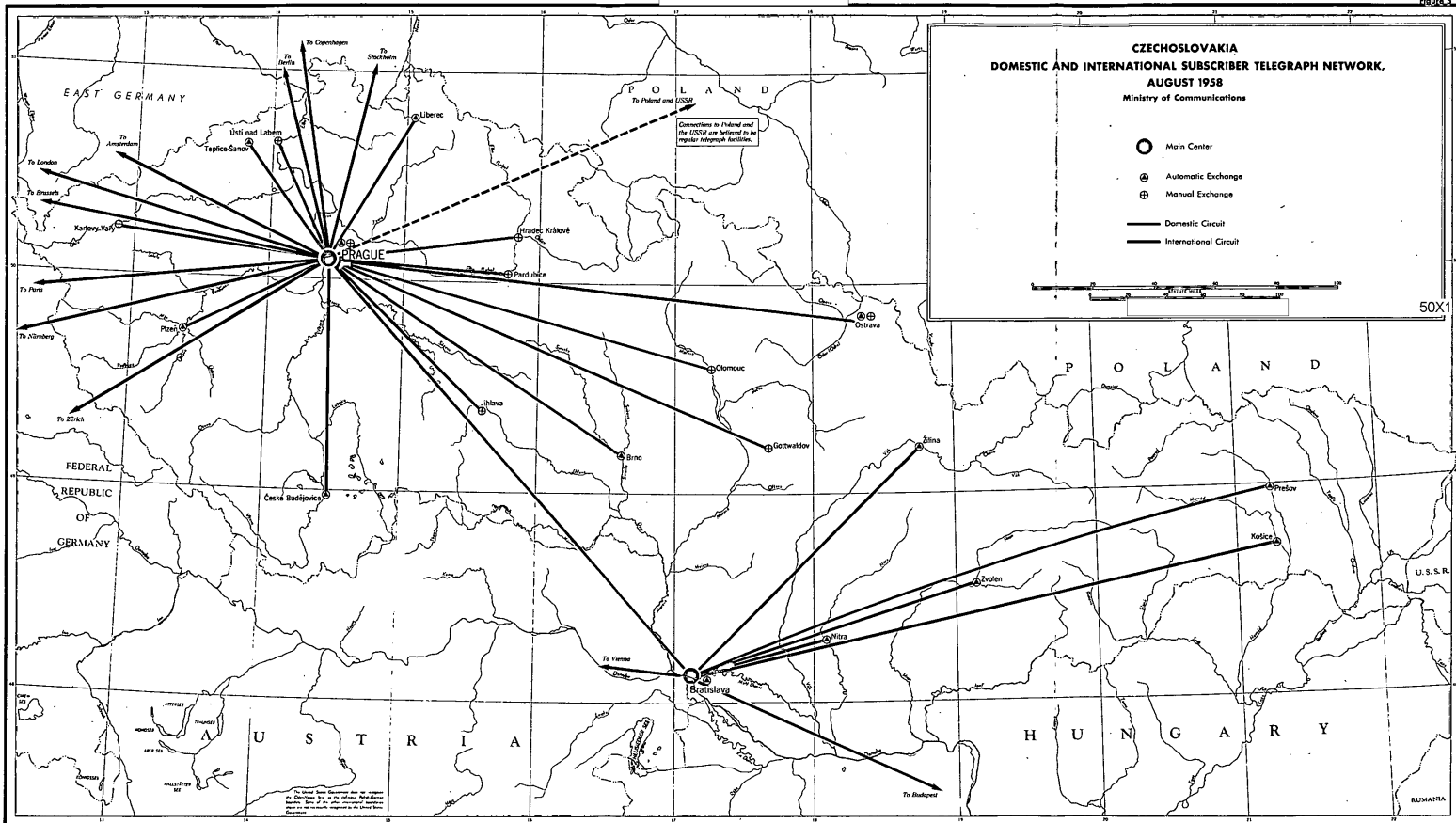
Plans scheduled for completion by the end of 1960 call for a 50-percent increase in the number of TELEX stations in Czechoslovakia and the automation of at least 6 stations in Bohemia/Moravia currently operating with manual exchange equipment. 127/ Implementation of these plans will enhance the efficiency, effectiveness, and speed of domestic TELEX service in Czechoslovakia.

3. Facsimile.

Although little information is available concerning facsimile services and facilities in Czechoslovakia, it is believed that domestic facsimile service is available between all major cities in the country and that international facsimile service is available to all major European countries. The basis for this assumption is the existence of the well-developed domestic and international telephone and telegraph system in Czechoslovakia which is capable of providing such service. It is known that international facsimile service is available from Czechoslovakia to Switzerland, the UK, and India. Plans of the Ministry of Communications call for an increase in facsimile service in the future, but the extent of this increase is not known. 128/

* Following p. 32.

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C. Common Telecommunications Facilities.

Common telecommunications facilities in Czechoslovakia consist of wireline, microwave radio relay, and point-to-point radio facilities. Of these facilities, wirelines are the most important in providing domestic and international telephone and telegraph service. Point-to-point radio facilities, used primarily as reserve facilities in domestic operation, provide some international telephone and telegraph service. Microwave radio relay facilities are predominantly employed in providing network television service.

1. Wirelines.

The wireline network of Czechoslovakia, operated and maintained by the Ministry of Communications, is the major medium employed in providing domestic and international telephone and telegraph service. It is also used to relay radiobroadcasting programs. Domestic wireline facilities extend to all urban areas and to most rural areas of Czechoslovakia. International wireline facilities extend to all countries bordering Czechoslovakia.

The interurban wireline network, as shown on the map, Figure 6,* consists of open wire and multiconductor cable. Most multiconductor cable lines are underground and provide the main connections between major cities in Czechoslovakia. Many of the multiconductor cable routes are paralleled by open wirelines. Open wirelines also are used to provide connections between main trunklines and to less populated areas.

Growth in multiconductor cable lines, as shown in Table 11,** has been relatively stable since 1950, averaging more than 600 km a year. There are estimated to have been 10,900 km of multiconductor cable lines in use by the end of 1957 in Czechoslovakia, 70 percent of which was concentrated in Bohemia/Moravia and 30 percent in Slovakia.

The size and capacity of main multiconductor cables in Czechoslovakia are comparable to those of most Western European countries, ranging from 28 quads to 78 quads, with an average of 52 quads on main interurban lines. 129/ The capacity of these lines is augmented by carrier frequency telephone equipment providing 3, 8, and 12 telephone channels. 130/

Circuit capacity of the wireline network in Czechoslovakia is adequate to meet official requirements and allow additional capacity

* Inside back cover.

** Table 11 follows on p. 34.

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Table 11

Estimated Length of Multiconductor Cable Lines of the Ministry of Communications
of Czechoslovakia a/
1950-57

	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>
Bohemia/Moravia (thousand kilometers)	4.0 <u>b/</u>	4.5 <u>c/</u>	4.9 <u>c/</u>	5.6 <u>c/</u>	6.1 <u>c/</u>	6.8 <u>c/</u>	7.2 <u>c/</u>	7.6 <u>d/</u>
Percent of total	72	72	70	68	69	70	70	70
Slovakia (thousand kilometers)	1.6 <u>b/</u>	1.7 <u>c/</u>	2.0 <u>c/</u>	2.5 <u>c/</u>	2.8 <u>c/</u>	2.9 <u>c/</u>	3.0 <u>c/</u>	3.3 <u>d/</u>
Percent of total	28	28	30	32	31	30	30	30
Total length of multiconductor cable lines (thousand kilometers)	<u>5.6 e/</u>	<u>6.3 c/</u>	<u>7.0 c/</u>	<u>8.2 c/</u>	<u>8.9 c/</u>	<u>9.7 c/</u>	<u>10.3 c/</u>	<u>10.9 d/</u>

a. All data are derived from unrounded figures and are rounded to the nearest hundred kilometers.

b. Extrapolated by applying the same percentage relationship of the length of cable lines of Bohemia/Moravia and of Slovakia to the total length of cable lines as that shown for 1951.

c. 131/

d. Assuming the same absolute increase for 1956-57 as for 1955-56.

e. Extrapolated by applying the same percentage relationship of the length of cable lines to the length of cable routes for 1950 as for 1951 (the length of cable routes in 1950 was 4,500 kilometers and in 1951, 5,000 kilometers 132/).

S-E-C-R-E-T

for use by private consumers. Future development of the wireline network is to include the continued expansion of multiconductor cable lines and the introduction of some coaxial cable lines. 133/ As the cost of installing and maintaining coaxial cable lines does not generally compare favorably with that of microwave radio relay, it is believed that future emphasis will be placed on the expansion of microwave radio relay facilities rather than of coaxial cable.

2. Microwave.

The microwave radio relay network in Czechoslovakia provides domestic and international television service and, in addition, some domestic telephone and telegraph service. The first lines of this network in the country became operational in December 1956 between Prague and Ostrava. 134/ The network, as shown on the map, Figure 7,* has grown rapidly since then. Prague, Hradec Kralove, Brno, Ostrava, and Bratislava are now interconnected by means of 2-way microwave circuits, and a 1-way microwave circuit exists between Ostrava and Presov. 135/ International microwave radio relay circuits connect Czechoslovakia with East Germany, Poland, and Austria. 136/

Microwave radio relay equipment used in Czechoslovakia has been imported from France, East Germany, and the USSR. 137/ By 1959, domestically produced microwave radio relay equipment is to be available. This equipment is to be employed initially on the Bratislava - Banska Bystrica microwave radio relay line. 138/

Although the microwave network is used primarily to relay television programs, some of the lines are also equipped to carry telephone and telegraph traffic. The Prague-Brno microwave radio relay line utilizes French terminal equipment providing 48 telephone channels. Other microwave lines are believed to be equipped with 24-telephone channel terminal equipment obtained from Swiss and UK companies. The use of microwave radio relay facilities to carry telephone and telegraph traffic, however, is still limited, and trouble is being encountered in the use of these facilities. 139/

Plans indicate a desire to expand the television network in Czechoslovakia and to increase the capacity of interurban telephone and telegraph facilities. Both microwave radio relay and coaxial cable have been mentioned as the mediums to be employed in effecting these plans. It is believed that microwave radio relay rather than coaxial cable will be selected for these purposes because of cost considerations and the planned domestic production of microwave equipment.

* Following p. 36.

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S-E-C-R-E-T

In addition to microwave facilities, there have been indications that very high frequency (VHF) radio relay facilities are used for domestic telephone traffic. ^{140/} It is believed, however, that the interest of the Ministry of Communications in developing a VHF network largely has disappeared since the development of the microwave radio relay network in Czechoslovakia.

3. Point-to-Point Radio.

Point-to-point radio facilities in Czechoslovakia are used primarily to provide international telephone and telegraph service. The map, Figure 8,* shows international circuits operating between Czechoslovakia and other parts of the world. ^{141/} Terminal facilities for high-frequency international circuits are located in Prague, with main transmitting facilities at Podedbrady and main receiving facilities at Tehov. Low-frequency terminal facilities are located at Liblice and Satalice. ^{142/} Twenty-four direct international point-to-point radio circuits were active during 1957 and the first half of 1958. The volume of traffic handled by international radio telegraph circuits is estimated to be about 600,000 telegrams annually. ^{143/} No traffic statistics for international telephone service are available.

Domestic point-to-point radio facilities of the Ministry of Communications in Czechoslovakia are limited and are used almost exclusively for reserve purposes. The wireline and microwave radio relay networks provide adequate capacity for domestic traffic. There are no indications that domestic or international point-to-point radio facilities will expand in the future.

V. Broadcasting Services.

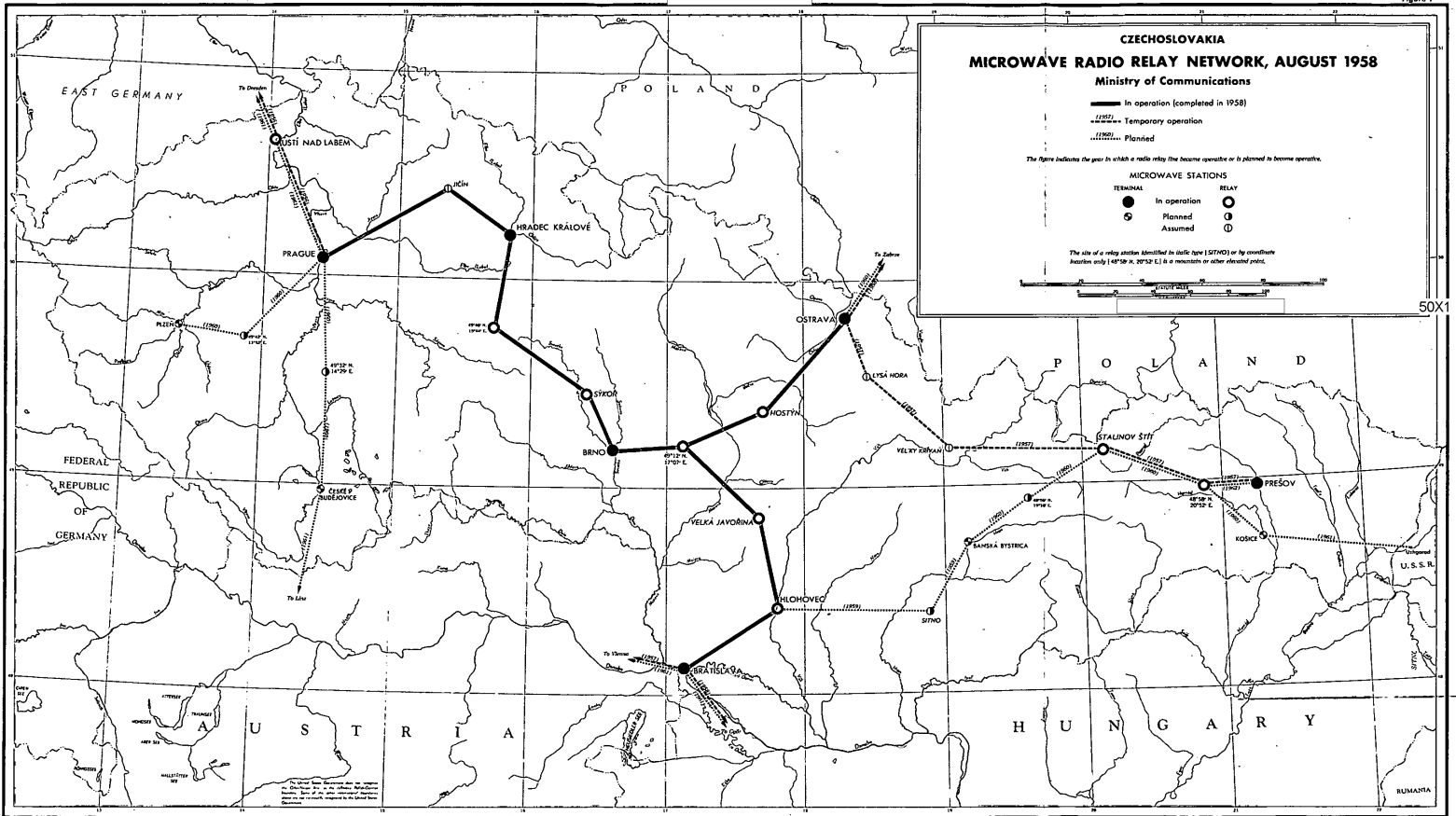
The Czechoslovak broadcasting system is composed of networks for domestic and international radiobroadcasting, television, and wire diffusion. The radiobroadcasting network is the most extensive, providing domestic service throughout Czechoslovakia and international service to Europe, North and South America, Australia, New Zealand, and the Arab countries. The television and wire-diffusion networks are still in the early stage of development but are being expanded rapidly.

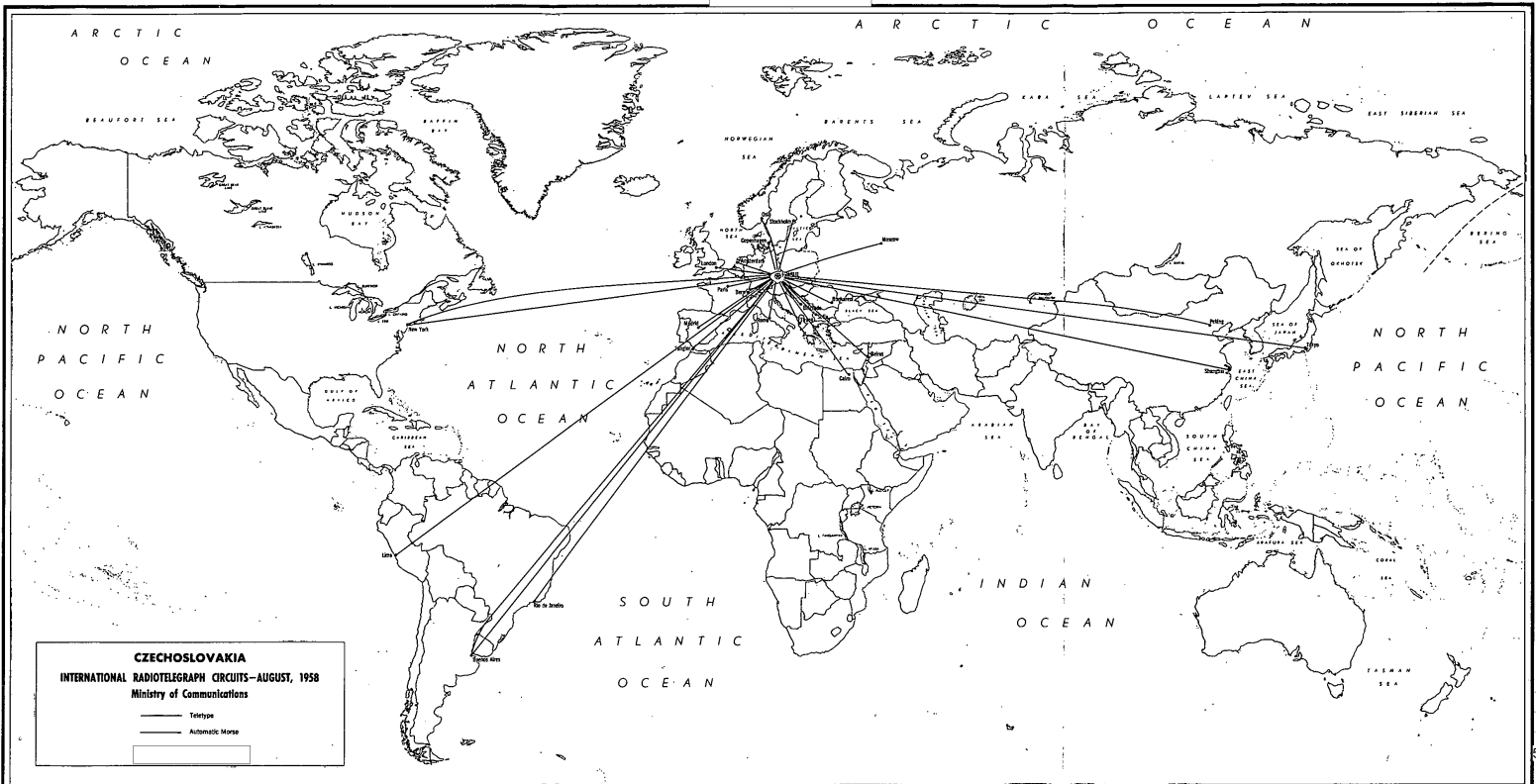
The reception base of the domestic broadcasting system in 1957 consisted of more than 3.3 million receivers, of which almost 3 million were radiobroadcast receivers, 173,000 were television receivers, and 180,000 were wired loudspeakers.

* Following p. 36.

S-E-C-R-E-T

Figure 7





S-E-C-R-E-T

Future plans for broadcasting in Czechoslovakia indicate that major emphasis will be placed on expanding the television and wire-diffusion networks. Both amplitude modulated (AM) and frequency modulated (FM) radiobroadcasting services are to be improved, and additional FM transmitters are to be introduced some time after 1960.

A. Radiobroadcasting.

The Czechoslovak radiobroadcasting network, which provides domestic and international service, has shown substantial growth since 1950. As shown in Table 12,* the number of domestic and international radiobroadcasting transmitters has grown from 21 in 1950 to 32 in 1957. The combined power of these transmitters increased during this period from 620 kilowatts (kw) to 1,385 kw. As a result of this growth, domestic radiobroadcasting in Czechoslovakia is well developed and, with the exception of some isolated areas, provides adequate coverage throughout the country. 144/ Domestic transmitting facilities consist of 26 AM transmitters and 1 FM transmitter. These transmitters, 7 of which have a power in excess of 100 kw, provide service to almost 3 million radiobroadcast receivers. As can be seen from Table 13** and the map, Figure 9,*** the greatest concentration of receivers and transmitters is in Bohemia/Moravia, a distribution which is similar to the pattern of other post and telecommunications facilities in Czechoslovakia.

As there are language differences within Czechoslovakia, domestic radiobroadcasting service is provided by two networks, the Czech radiobroadcasting network, serving Bohemia/Moravia, and the Slovak radiobroadcasting network, serving Slovakia. Each network has two Home Service programs which are broadcast in their respective areas. Czech Home Service programs, Prague I and Prague II, originate mainly from studios in Prague, and Slovak Home Service programs, Bratislava I and Bratislava II, originate mainly from studios in Bratislava. Although the Czech and Slovak networks are virtually independent, some Home Service programs are exchanged. 145/

In addition to Home Service programs, a number of programs are originated and broadcast regionally. Most regional transmitters are interconnected by means of wirelines with major studios and serve primarily as relay transmitters for Home Service programs. An exception is found in the Czech network, where transmitters at Gottwaldov, Hradec Kralove, Liberec, Olomouc, Pardubice, and Usti nad Labem originate and broadcast regional programs exclusively.**** 146/

* Table 12 follows on p. 38.

** Table 13 follows on p. 39.

*** Following p. 38.

**** Continued on p. 40.

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S-E-C-R-E-T

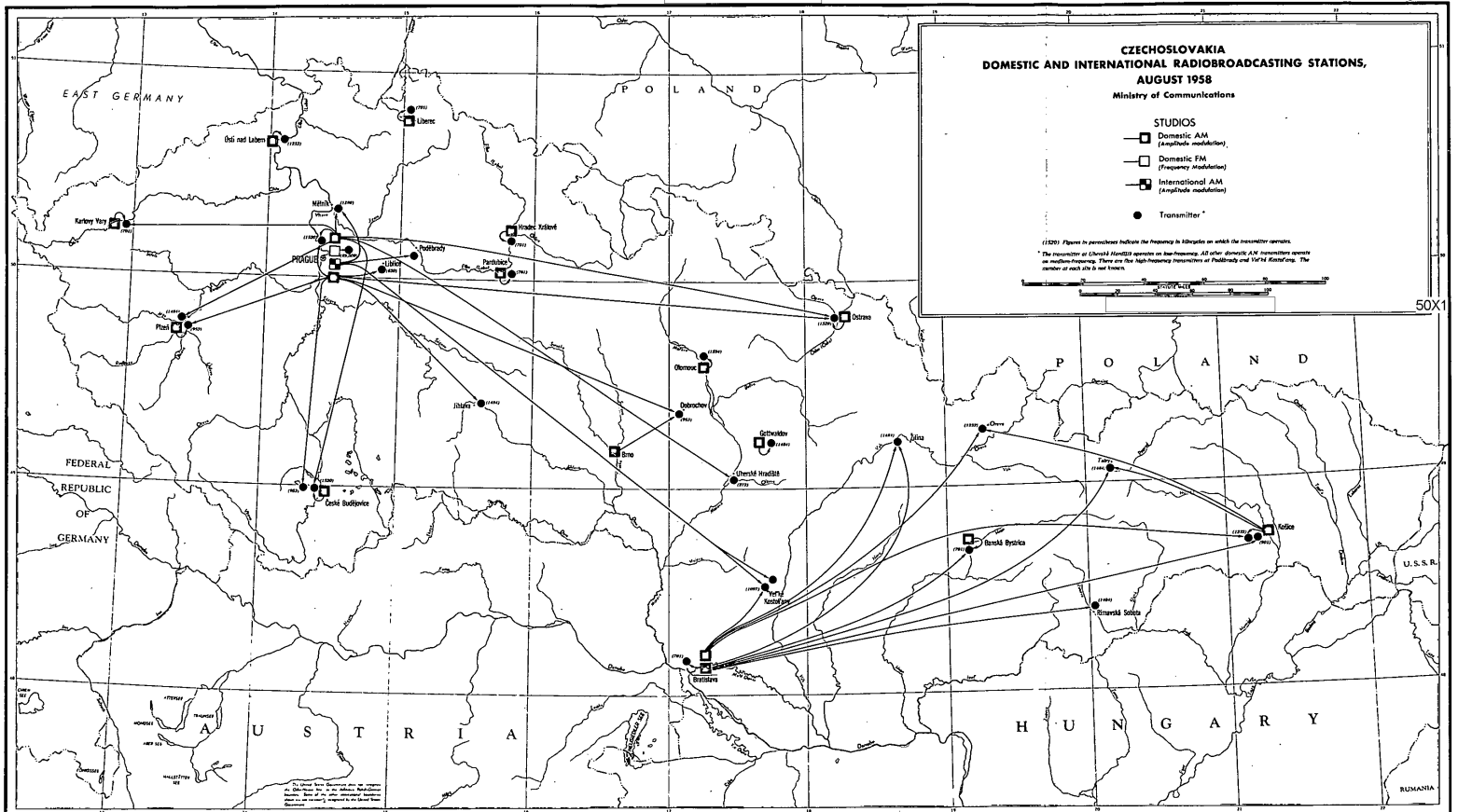
Table 12

Estimated Number and Power of Domestic and International Radiobroadcasting Transmitters
in Czechoslovakia
1950-57

<u>Year</u>	<u>Transmitters (Units)</u>	<u>Total Power of Transmitters (Kilowatts)</u>
1950	21 <u>a/</u>	620 <u>b/</u>
1951	18 <u>a/</u>	N.A.
1952	20 <u>a/</u>	985 <u>b/</u>
1953	21 <u>a/</u>	N.A.
1954	22 <u>a/</u>	N.A.
1955	31 <u>a/</u>	990 <u>b/</u>
1956	31 <u>a/</u>	N.A.
1957 <u>b/</u>	32	1,385

a. 147/
b. 148/

S-E-C-R-E-T



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Table 13

Estimated Number of Licensed Radiobroadcast Receivers
in Czechoslovakia a/
1948-57

Thousand Units			
<u>Year</u>	<u>Bohemia/Moravia</u>	<u>Slovakia</u>	<u>Total</u>
1948	1,880	232	2,110
1949	1,990	269	2,260
1950	2,100	319	2,420
1951	2,180	365	2,540
1952	2,240	399	2,640
1953	2,260	415	2,680
1954	2,300	442	2,740
1955	2,360	484	2,840
1956	2,390	525	2,920
1957	2,440 b/	535 b/	2,970 c/

a. All data are rounded to three significant digits. Totals are derived from unrounded data and may not agree with the sum of their rounded components.

b. Assuming the same percentage relationship of radiobroadcast receivers in Bohemia/Moravia and in Slovakia to total radiobroadcast receivers for 1957 as for 1956.

c. 150/

50X1

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The Czech radiobroadcasting network consists of 18 AM transmitters and 1 FM transmitter. With the exception of one low-frequency transmitter, all AM transmitters in the Czech network operate in the medium-frequency range. The most powerful transmitters in this network are located at Liblice, Melnik, Uherske Hradiste, and Brno/Dobrochov. The following tabulation shows the location, power, and frequency of transmitters in the Czech network 151:

<u>Location of Transmitters</u>	<u>Power (Kilowatts)</u>	<u>Frequency (Kilocycles)</u>
Brno/Dobrochov	100	953
Ceske Budejovice	5	1,520
Ceske Budejovice	N.A.	953
Gottwaldov	N.A.	1,484
Hradec Kralove	2	701
Jihlava	2	1,484
Karlovy Vary	15	701
Liberec	0.5	701
Liblice	120	638
Melnik	100	1,286
Uherske Hradiste	200	272
Olomouc	N.A.	1,594
Ostrava	20	1,520
Pardubice	N.A.	701
Plzen	15	953
Plzen	N.A.	1,484
Prague	2	1,520
Usti nad Labem	2	1,232
Prague (FM)	0.5	89,500

The Slovak radiobroadcasting network is composed of 9 AM transmitters, all of which broadcast in the medium-frequency range. The most powerful transmitters in the Slovak network are located at Velke Kostolany, Banska Bystrica, and Kosice. The following tabulation shows the location, power, and frequency of transmitters in the Slovak network 152:

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<u>Location of Transmitters</u>	<u>Power (Kilowatts)</u>	<u>Frequency (Kilocycles)</u>
Banska Bystrica	100	701
Bratislava	2	701
Bratislava (Velke Kostolany)	150	1,097
Kosice	2	701
Kosice	100	1,232
Orava	1.5	1,232
Rimavska Sobota	N.A.	1,484
Tatry	N.A.	1,484
Zilina	2	1,484

International radiobroadcasting service in Czechoslovakia consists of programs broadcast in 12 different languages to Europe, North and South America, the Arab countries, Australia, and New Zealand. Hours of international radiobroadcasting, by area and by language, are shown in Table 14.* Programs originate from studios in Prague and are transmitted from 5 full-time high-frequency transmitters and 2 part-time medium-frequency transmitters. The 5 high-frequency transmitters are located at Velke Kostolany and Podebrady, and the 2 medium-frequency transmitters are located at Velke Kostolany and Melnik. 153/

International radiobroadcasting service has shown an increase in average hours of transmission from 108 per week in 1950 to 177 per week in 1957. This increase of 63 percent was accomplished primarily through an expansion of transmitting facilities.

With the exception of construction work presently under way on a more powerful AM transmitter for Liblice, plans for domestic AM radiobroadcasting through 1960 make no provision for the construction of additional transmitters. Instead, antenna systems are to be improved to increase the coverage of existing transmitters. In 1959, adjustments are to be made on the antenna system of the Karlovy Vary, Ceske Budejovice, and Ostrava AM transmitters, and in 1960, improvements on the antenna system of the AM transmitter at Uherske Hradiste are to be completed. 154/ There are indications that international radiobroadcasting service will be extended to cover South Africa. 155/

Plans also provide for the installation of five FM transmitters some time after 1960. The locations of these transmitters have not been announced, but they are reportedly to be set up at locations housing television facilities. 156/

* Table 14 follows on p. 42.

S-E-C-R-E-T

Table 14

Estimated Total Weekly Output
of the Czechoslovak International Radiobroadcasting Service
to Foreign Audiences, by Area and by Language a/*
1950, 1955, and 1957

	<u>Average Number of Hours Per Week</u>		
<u>Area and Language</u>	<u>1950 b/</u>	<u>1955 b/</u>	<u>1957 c/</u>
To Europe			
Czech/Slovak	0	0	13.50
English	8.75	14.00	10.50
French	11.75	17.50	14.00
German	1.75	8.75	21.00
Greek	7.00	7.00	7.00
Italian	7.00	14.00	10.50
Macedonian	1.75	0	0
Norwegian	0	3.50	0
Russian	2.25	7.00	7.00
Serbo-Croatian	24.50	7.00	7.00
Slovenian	7.00	0	0
Spanish	15.75	14.00	10.50
Swedish	0	3.50	10.50
Total	<u>87.50</u>	<u>96.25</u>	<u>111.50</u>
To North and South America			
Czech/Slovak	14.00	14.00	20.00
English	7.00	14.00	14.00
Spanish	0	1.75	14.00
Total	<u>21.00</u>	<u>29.75</u>	<u>48.00</u>
To Australia and New Zealand			
English	0	0	7.00
Total	0	0	<u>7.00</u>

* Footnotes for Table 14 follow on p. 43.

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Table 14

Estimated Total Weekly Output
of the Czechoslovak International Radiobroadcasting Service
to Foreign Audiences, by Area and by Language a/
1950, 1955, and 1957
(Continued)

	Average Number of Hours Per Week		
	<u>1950 b/</u>	<u>1955 b/</u>	<u>1957 c/</u>
To the Arab Countries			
Arabic	0	3.50	10.50
Total	0	<u>3.50</u>	<u>10.50</u>
Grand total c/	<u>108.50</u>	<u>129.50</u>	<u>177.00</u>

a. All information is as of 1 October for the years given. Miscellaneous musical programs to various areas of the world are not included.

b. 157/

c. 158/

B. Television.

The first television station in Czechoslovakia was established in Prague in 1953. This major station was followed by major television stations in Ostrava in 1955 and Bratislava in 1956. 159/ In 1957, local television stations were established in the Karlovy Vary region of western Bohemia and in Presov in eastern Slovakia. 160/ These stations, shown on the map, Figure 10,* provided programs to about 173,000 television receivers in Czechoslovakia at the end of 1957. Table 15** shows the growth and geographic distribution of television receivers in Czechoslovakia since 1953.

Network television service was initiated in Czechoslovakia in 1956, when programs were exchanged between Prague and Ostrava. 161/ In late 1957, Bratislava was able to receive programs from Prague, relayed through Ostrava. 162/ Programs from Prague were also relayed

* Following p. 44.

** Table 15 follows on p. 44.

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through Ostrava to Presov in 1957. 163/ Microwave radio relay facilities were used to relay these programs. The local television station in the Karlovy Vary region receives programs originating in Prague by means of direct off-the-air pickup.

Table 15

Estimated Number of Licensed Television Receivers
in Czechoslovakia a/
1953-57

	Units		
<u>Year</u>	<u>Bohemia/Moravia</u>	<u>Slovakia</u>	<u>Total</u>
1953	0	0	0
1954	3,830	0	3,830
1955	32,100	11	32,100
1956	75,100	794	75,900
1957	171,000 <u>b/</u>	1,810 <u>b/</u>	173,000 <u>c/</u>

a. All data are rounded to three significant digits. Totals are derived from unrounded data and may not agree with the sum of their rounded components.

b. Assuming the same percentage relationship of television receivers in Bohemia/Moravia and in Slovakia to total receivers for 1957 as for 1956.

c. 165/

50X1
50X1

Although Czechoslovakia has no permanent international telecommunications circuits capable of carrying television programs, temporary microwave radio relay lines have been established for program exchanges among Czechoslovakia, East Germany, and Austria. The first of these exchanges took place in 1956, when Prague received "live" television programs from East Germany. 166/ At least twice in 1957, "live" programs were transmitted from Prague to East Berlin. 167/ Program exchanges between Czechoslovakia and the Eurovision network (the television network of Western Europe), through East Germany, and between Czechoslovakia and Austria also took place in 1957. 168/

Czechoslovakia has extensive plans, running through 1962, for the further expansion of television. Eight additional major television stations are to be established during this period, dates and locations of which are as follows:

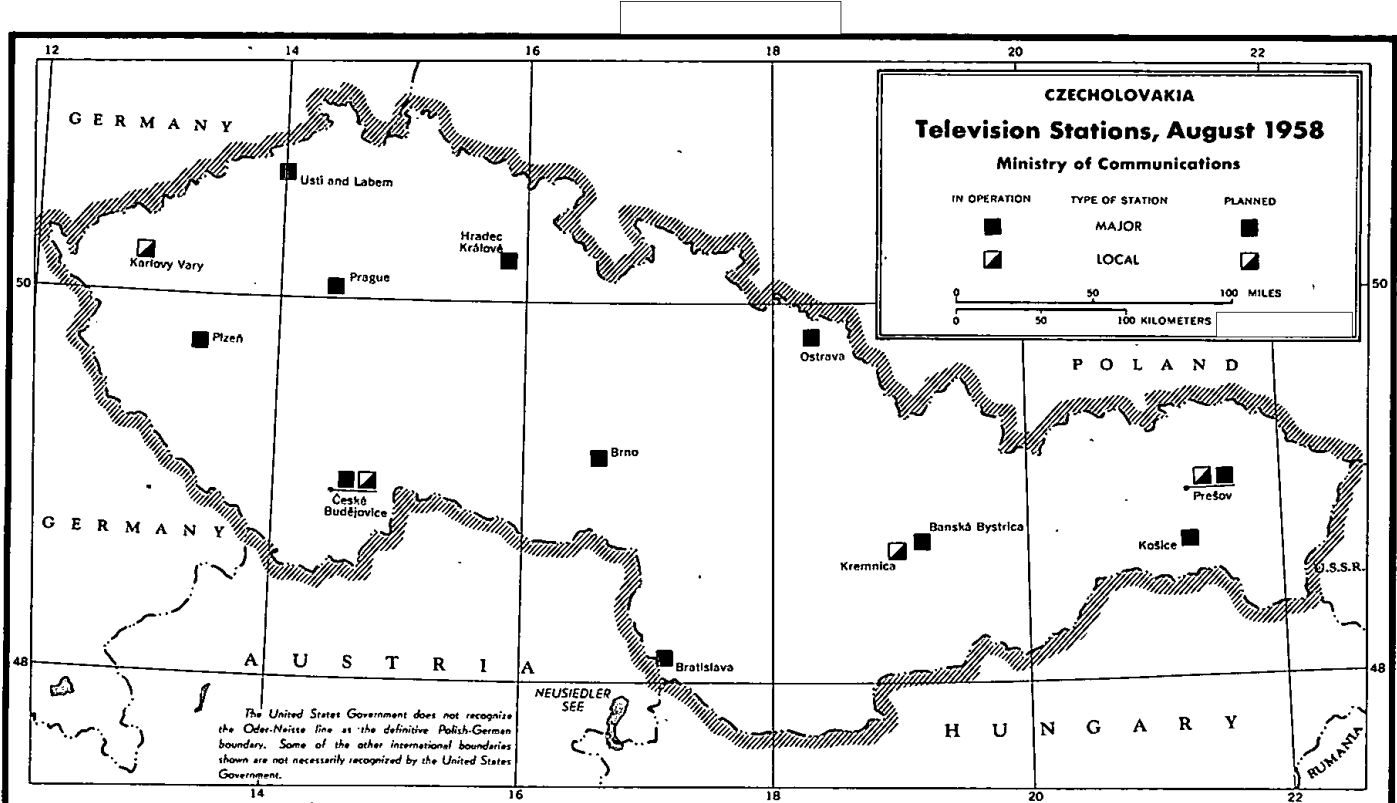


Figure 10

50X1

50X1

50X1

S-E-C-R-E-T

1958	Hradec Kralove Brno
1960	Plzen Ceske Budejovice Kosice
1961	Usti nad Labem Banska Bystrica
1962	Presov

These stations are to provide television coverage for 80 percent of the country and service to more than 750,000 television receivers. In addition, local television stations are planned in Kremnica (near Banska Bystrica) and Ceske Budejovice in 1958. These local stations will provide temporary television coverage until major stations planned for these areas become operational. 169/

In addition to the expansion of television transmission and reception facilities in Czechoslovakia, plans call for the expansion of network television. There are to be two national television networks, one in Bohemia/Moravia and the other in Slovakia. The main studio for the Bohemia/Moravia network is to be in Prague, and the main studio for the Slovakia network is to be in Bratislava. These main studios are to be interconnected in 1958.

The Bohemia/Moravia network is to be expanded to connect Prague with Hradec Kralove and Brno in 1958, Plzen and Ceske Budejovice in 1960, and Usti nad Labem in 1961. The Slovakia network is to be expanded to connect Bratislava with Banska Bystrica in 1959, Kosice in 1960, and Presov in 1962. 170/ Microwave radio relay facilities are to be employed in both of these networks.

International television service also will be expanded so that Czechoslovakia can exchange programs with all neighboring countries. 171/ Television service with the USSR will be through Kosice, with East Germany through Usti nad Labem, with Poland through Ostrava, with Austria through Bratislava, and with Hungary through Bratislava. 172/

Television plans for the end of 1960 call for the introduction of color television and the completion of the first sections of new television studios in Prague and Bratislava. Prague is to receive a more powerful television transmitter some time after 1960. 173/

S-E-C-R-E-T

C. Wire Diffusion.

Wire diffusion in Czechoslovakia was originally established in Unhost, Bohemia, near Prague, in 1953. 174/ By the end of 1957, as shown in Table 16, the wire-diffusion network had been expanded to include 180,000 licensed wired loudspeakers.

Table 16

Estimated Number of Licensed Wired Loudspeakers
in Czechoslovakia a/
1953-57

	Units		
<u>Year</u>	<u>Bohemia/Moravia</u>	<u>Slovakia</u>	<u>Total</u>
1953	N.A.	0	N.A.
1954	1,280	0	1,280
1955	27,300	7,630	34,900
1956	77,300	21,000	98,300
1957	141,000 <u>b/</u>	38,500 <u>b/</u>	180,000 <u>c/</u>

a. All data are rounded to three significant digits. Totals are derived from unrounded data and may not agree with the sum of their rounded components.

b. Assuming the same percentage relationship of wired loudspeakers in Bohemia/Moravia and in Slovakia to total wired loudspeakers for 1957 as for 1956.

c. 176/

50X1
50X1

The wire-diffusion network in Czechoslovakia is patterned after that of the USSR. Home service and regional radiobroadcasting programs are transmitted by means of telephone wirelines to wire-diffusion centers located in cities and villages. From these centers, programs are retransmitted by wire to individual wired loudspeakers. In addition to retransmitting radiobroadcasting programs, wire-diffusion centers also originate a limited number of programs of local interest. 177/

The primary impetus for the development of the wire-diffusion network in Czechoslovakia apparently has been the desire to restrict the number of reception points capable of receiving non-Soviet Bloc radiobroadcasts, thus insuring a captive audience for domestic propaganda.

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Plans for expanding the wire-diffusion network to 750,000 wired loudspeakers by the end of 1960 indicate that Czechoslovakia will continue to emphasize the development of wire diffusion throughout the country. 178/ To make this expansion more palatable to the general public, a great deal of publicity has been given in Czechoslovakia to the advantages of wire diffusion, stressing the clarity of reception and the relative cheapness of wired loudspeakers compared with radio-broadcast receivers. 179/ Whether this publicity is successful or not, continued growth in wire-diffusion facilities can be expected in Czechoslovakia.

VI. Future Trends.

The post and telecommunications system of Czechoslovakia has grown substantially in recent years and is currently capable of meeting most of the needs of the economy. Future plans provide for the continued growth of the system in order to further increase the availability, speed, and reliability of post and telecommunications services as well as to provide for anticipated future service requirements. This growth is to be achieved primarily through increased automation of existing post and telecommunications facilities and through introduction of more advanced post and telecommunications techniques. Although details of plans are not available, indications are that the Ministry of Communications will pursue the following courses of action:

1. Rapidly expand both the microwave radio relay facilities for transmission of network television and the interurban telephone and telegraph service.
2. Expand and automatize local and interurban telephone facilities.
3. Expand and automatize TELEX facilities.
4. Increase the automation of regular telegraph exchange facilities.
5. Increase the mechanization and improve the speed of service in the postal system.
6. Expand the television transmission and reception base.
7. Expand the wire-diffusion network.
8. Expand the FM radiobroadcasting transmission base after 1960.
9. Improve the coverage of domestic AM radiobroadcasting.

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S-E-C-R-E-T

Judging by the past performance of the Ministry of Communications in meeting plan goals and expanding post and telecommunications facilities and services, it is estimated that the Ministry will be successful in completing the foregoing courses of action. By so doing the Ministry will be able to register continued growth in the volume of post and telecommunications service and improvement in the quality of service for both governmental and private consumers.

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S-E-C-R-E-T

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

Amplitude modulation (AM): The process by which a selected carrier frequency is varied in magnitude (amplitude) by other frequencies that contain the information to be transmitted in telecommunications. (See Frequency modulation.)

Apparatus: Instruments, machines, appliances, and other assemblies used in providing a telecommunications facility.

Automatic (as an adjective): Of or pertaining to any process involved in producing telecommunications service which does not require direct, immediate human assistance.

Band (of frequencies): The entire range of frequencies between two numerically specified frequency limits. The magnitude of this range is a limiting factor on the amount of information that can be transmitted in telecommunications. With respect to frequencies of the radio spectrum as a whole, the International Telecommunication Union has for convenience divided the whole radio spectrum into eight major bands, as follows:

Frequency Bands		Corresponding Wave*
Range	Type	Band
30 kc** and below	Very low frequencies (VLF)	Myriametric waves
30 to 300 kc	Low frequencies (LF)	Kilometric waves
300 to 3,000 kc	Medium frequencies (MF)	Hectometric waves
3,000 to 30,000 kc	High frequencies (HF)	Decametric waves
30,000 kc to 300 mc***	Very high frequencies (VHF)	Metric waves
300 to 3,000 mc	Ultra high frequencies (UHF)	Decimetric waves****
3,000 to 30,000 mc	Super high frequencies (SHF)	Centimetric waves****
30,000 to 300,000 mc	Extremely high frequencies (EHF)	Millimetric waves****

* Waves are undulating disturbances: a sound wave is a disturbance in the air, which is an elastic medium, and an electric wave is a disturbance in any medium whatever. The number of waves per second is the frequency of a given wave. Because the speed of wave propagation is considered to be constant, the length of a given wave is in inverse relation to its frequency: the longer the wave length, the lower the frequency, and the shorter the wave length, footnotes continued on p. 50

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Cable: A bundle of sheathed, insulated wires and/or coaxial tubes, used as a telecommunications medium. It is sometimes referred to as "multiconductor cable."

Carrier (as an adjective): Of or pertaining to a technique for dividing a circuit, lane, supergroup, group, or channel into portions which can be used independently of and simultaneously with all other portions. Different frequencies or different pulses are selected for each portion to "carry" the information to be transmitted, after alteration by the information frequencies. The carrier itself need not be transmitted.

Channel: A portion, electrical or physical, of a telecommunications circuit, lane, supergroup, or group which can be used to transmit information independently of and simultaneously with all other portions. A channel may be used to provide two or more subchannels.

Circuit: A telecommunications connection between two or more distant points by a wire, cable, or radio medium facility used to carry information. The circuit is the fundamental telecommunications connection between distant points. By the application of appropriate techniques, a circuit may be arranged in many different combinations to meet the need for various kinds and quantities of telecommunications service. In its simplest form a circuit may carry only single telecommunications units in sequence. In its most complex form it may by apportionment carry simultaneously thousands of telephone channels and telegraph subchannels; a number of television programs; and other specialized kinds of service, such as high-fidelity broadcast programs, radar signals, and data-processing signals.

For the most complex application, a circuit is often arranged into lanes, each of which can carry, in 1 direction, 1 television program or 600 telephone channels. In turn, these 600 telephone channels are subdivided into 10 supergroups of 60 telephone channels each. Each supergroup is subdivided into 5 groups of 12 telephone channels each. One or more telephone channels may be further subdivided into three to twenty 60-word-per-minute teletype subchannels. Other specialized kinds of service may be accommodated by combining two or more telephone channels.

the higher the frequency. Wave length is usually measured in linear units of the metric system.

** Kilocycles per second, or 1,000 cycles per second.

*** Megacycles per second, or 1 million cycles per second.

**** It is becoming common usage to refer to waves (frequencies) in these three bands as "microwaves."

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Coaxial (as an adjective): Of or pertaining to a modern telecommunications cable medium technique using one or more tubes (sometimes called "pipes"). Each metal tube surrounds a conducting wire supported concentrically by insulators. The space in the tube usually contains nitrogen gas under pressure. Generally, coaxial cable is used for the transmission of information in complex form, such as radar, computer data, or television signals, and/or for the transmission of telephone channels and telegraph subchannels. A single tube usually carries information in only one direction at a time. The capacity of a tube depends in part upon the distance between repeater stations. In the standard facility, which may have from 2 to 8 tubes in the cable, a single tube carries a lane of 600 telephone channels or 1 television lane, for which the repeater station spacing is about 7 statute miles. In a new developmental coaxial cable facility, a single tube may carry 3 lanes of a total of 1,800 telephone channels or 3 television lanes, for which the repeater station spacing is expected to be about 3 statute miles.

Electronics: A general term used to identify that branch of electrical science and technology that treats of the behavior of electrons in vacuums, gases, or solids. Today, telecommunications makes extensive use of electronic technology.

Facility: An association of apparatus, material, and electrical energy required to furnish telecommunications service.

Facsimile (as an adjective): Of or pertaining to a telecommunications (telegraph) service in which photographs, drawings, handwriting, and printed matter are transmitted for graphically recorded reception. In one method (Type A), images are built up of lines or dots of constant intensity. In another method (Type B), images are built up of lines or dots of varying intensity, sometimes referred to as "telephoto" and "photoradio."

Feeder (as an adjective): Of or pertaining to telecommunications facilities of relatively low capacity which join facilities of relatively high capacity. (See Main.)

Frequency: The rate in cycles per second at which an electric current, voltage, wave, or field alternates in amplitude and/or direction. (See Band.)

Frequency modulation (FM): The process by which a selected carrier frequency is varied in frequency by other frequencies that contain the information to be transmitted in telecommunications. (See Amplitude modulation.)

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Functional (as an adjective): Of, pertaining to, or connected with special, unique, or particular telecommunications facilities managed and operated by a single agency, organization, company, department, committee, ministry, or other entity, in contrast to the facilities of a basic system.

Group: A number of channels (usually 12) or subchannels combined (multiplexed) electrically in building up the total capacity of a telecommunications circuit, lane, or supergroup.

Ionosphere: Those layers of the earth's atmosphere occupying the space about 210 statute miles in thickness extending from about 30 statute miles above the earth's surface to the outer reaches (exosphere) of the atmosphere. Reflection from these layers makes possible long-distance transmission of radio signals. The layers, however, are responsible for fading of signals, skip distance, and differences between daytime and nighttime radio reception. They are also used as a scattering reflector for ionosphere scatter-transmission techniques to transmit to distances of about 1,000 to 1,500 statute miles.

Joint facility: A telecommunications facility owned, controlled, or operated by two or more agencies, organizations, companies, departments, committees, ministries, or other entities.

Lane: A 1-way portion, electrical or physical, of a 2-way telecommunications circuit which can be used independently of and simultaneously with all other portions. The largest lane today can handle 600 telephone channels or 1 television program. In some applications the direction of a lane may be reversed.

Leased (as an adjective): Of or pertaining to the direct operation by a user of a telecommunications facility owned by another agency.

Line: A general term used to delineate a telecommunications circuit facility (wire, cable, or radio).

Main (as an adjective): Of or pertaining to telecommunications facilities at and between principal cities and centers which have relatively high capacity compared with feeder facilities. (See Feeder.)

Medium: Any substance or space that can be used practically to transmit a form of electrical energy for the purpose of providing telecommunications service.

Microwave radio relay (as an adjective): Of or pertaining to a radio medium technique in modern telecommunications employing radio

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frequencies higher than 300 mc. These frequencies do not normally afford practical direct transmission to great distances, principally because they do not bend well around the earth's surface and because they do not reflect well from the ionosphere. They are, however, capable of reliable transmission from horizon to horizon (line-of-sight) by the use of special antennas which concentrate the radio energy and give it desired direction. Great distances can, in consequence, be reached by this technique by the interposition of relay stations along the route of the line with a spacing interval of from 25 to 40 statute miles, depending upon terrain conditions. This technique can be employed practically to carry from a small number of telephone channels and telegraph subchannels to thousands of such channels and subchannels through 2 or more lanes and to carry 1 or more television and other specialized lanes and channels. (See Band.)

Mobile (as an adjective): Of or pertaining to a telecommunications facility which is intended to be operational while in motion or during halts at unspecified points. (See Portable.)

Modulation: The process of altering a carrier frequency or carrier pulses by other frequencies or pulses representing the information being transmitted.

Multiplex (as an adjective): Of or pertaining to the combining of information signals, modulated or unmodulated, of two or more lanes, supergroups, groups, channels, or subchannels for transmission over the same circuit.

Network: An interconnection, electrical or physical, of two or more circuits or portions thereof for the purpose of facilitating telecommunications service.

Point-to-point (as an adjective): Generally, of or pertaining to telecommunications service between fixed points, using the radio medium.

Portable (as an adjective): Of or pertaining to a telecommunications facility which can be readily moved from place to place but is not normally operational while in motion. (See Mobile.)

Private (as an adjective): Belonging to or concerning an individual person, organization, institution, or activity; not public or common.

Pulse: A spurt of electrical energy of extremely short duration (usually measured in millionths of a second), yet capable of being used in telecommunications to transmit information.

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Quad: In a multiconductor telecommunications cable, the physical association of a group of 4 conductors in any one of various arrangements for the purpose of providing 2-way multichannel operation.

Reception base: The aggregate telecommunications receiving facilities employed in providing a broadcast service.

Route: The geographical path followed by a wire, cable, or radio line.

Scatter (as an adjective): Of or pertaining to a radio medium technique in modern telecommunications by which energy in radio frequencies above 30 mc is deliberately scattered into one or the other of two reflecting portions of the atmosphere (troposphere and ionosphere) at a predetermined angle such that a usable portion of the energy arrives at the desired receiving location. This technique is especially applicable to regions in high latitudes (Arctic and Antarctic) where facilities of other media suffer from the rigors of weather and terrain and where the conventional long-distance radio media of the lower frequency bands (200 kc to 30 mc) are subject to serious disruptive propagational anomalies. (See Band.)

Subchannel: A portion, electrical or physical, of a telecommunications channel which can be used independently of and simultaneously with all other portions. An appreciable number of telephone channels can usually be subchanneled to carry from three to twenty 60-word-per-minute teletype subchannels on each telephone channel so employed.

Subscriber: Any customer who directly operates telecommunications apparatus in obtaining telecommunications service.

Supergroup: A number of groups (often five) combined (multiplexed) electrically in building up the total capacity of a telecommunications circuit or lane.

System: All of the facilities and networks managed by a single agency, organization, company, department, committee, ministry, or other entity in rendering either functional or basic telecommunications service.

Telecommunications: Transmission, reception, or exchange of information between distant points by electrical energy over a wire, cable, or radio medium facility to produce telephone, telegraph, facsimile, broadcast (aural and visual), and other similar services.

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Teletype (as an adjective): Of or pertaining to a technique for effecting telegraph service by the use of an apparatus similar to a typewriter in which information is transmitted by keyboard and received by type printer on a roll of paper, on a roll of tape, or by perforations on a roll of tape, or both. (Sometimes called a "teleprinter" or "teletypewriter.")

Transmission base: The aggregate telecommunications transmitting facilities employed in providing broadcast service.

Transistor: A modern device which is capable of performing in a solid (germanium or silicon) many of the functions performed by the conventional electronic tube in a gas or vacuum.

Troposphere: The layer of the earth's atmosphere occupying the space from the earth's surface to a height of about 6 statute miles. This layer is used as a scattering reflector for tropospheric scatter transmission techniques to distances of about 200 to 500 statute miles.

Wave guide (as an adjective): Of or pertaining to a telecommunications medium, now under development in several countries, which may be capable of transmitting extremely large amounts of conventional and complex information. It consists of a circular or rectangular hollow metallic tube in which electrical energy travels in the form of waves, much as do sound waves in a speaking tube.

Wire diffusion: Distribution of broadcast programs by a wire or cable medium to wired loudspeakers.

Wired loudspeaker: A telecommunications loudspeaker which receives from a distribution point one or more broadcast programs by a wire or cable medium.

Wireline: A general term used to identify a line consisting of either an aerial cable (and/or separate wires) or an underground cable, used as a telecommunications medium.

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APPENDIX B

METHODOLOGY

The statistical data in this report were developed in large part from information contained in the 1957 statistical yearbook for Czechoslovakia. [REDACTED]

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[REDACTED] The interrelationships that are known to exist between various statistical series, along with analogy with other Soviet Bloc countries, were used to check the validity of the data presented. The specific methodology used in the determination of each statistical series, together with appropriate source references, is contained in the table footnotes.

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Figure 3

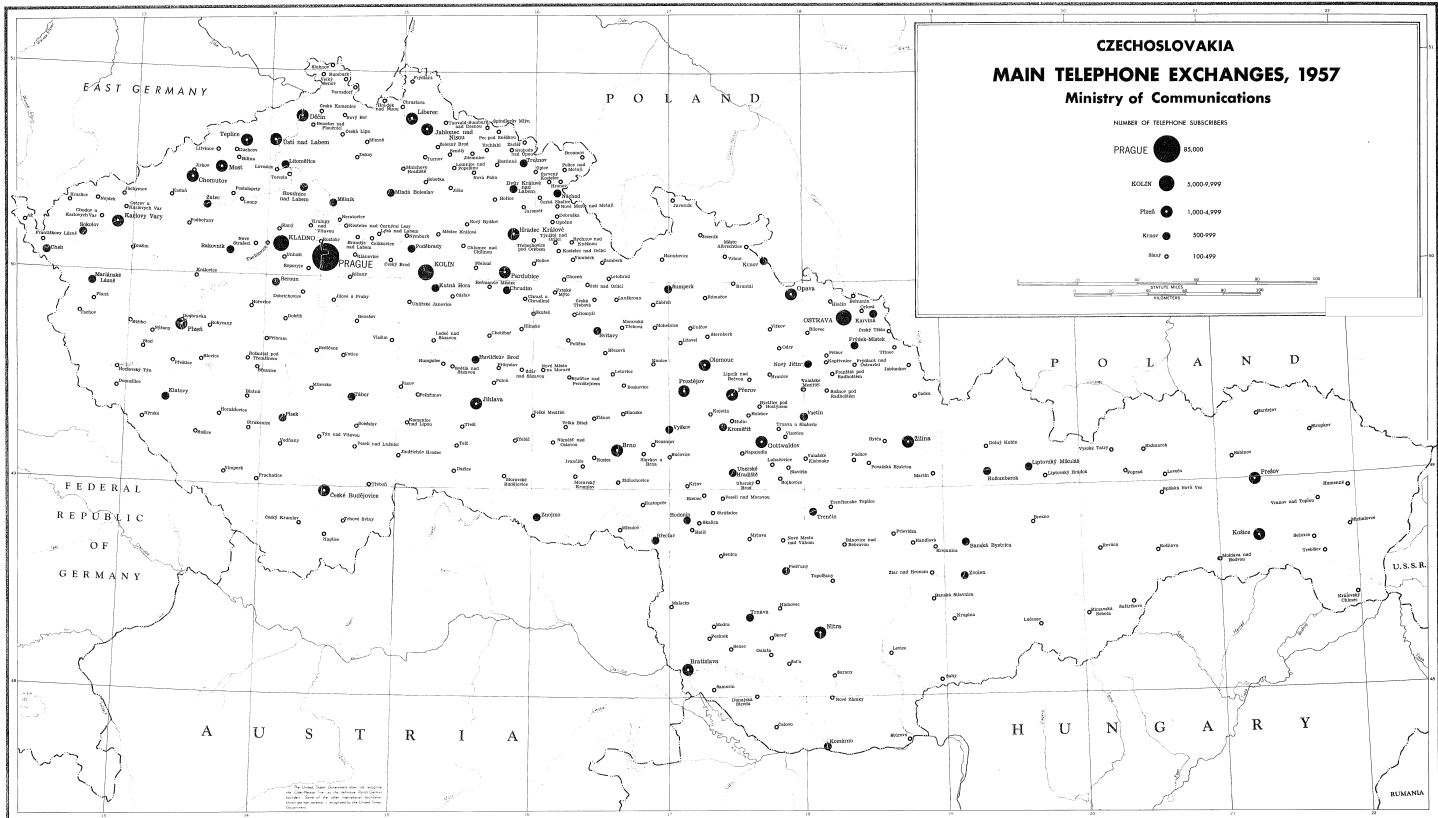
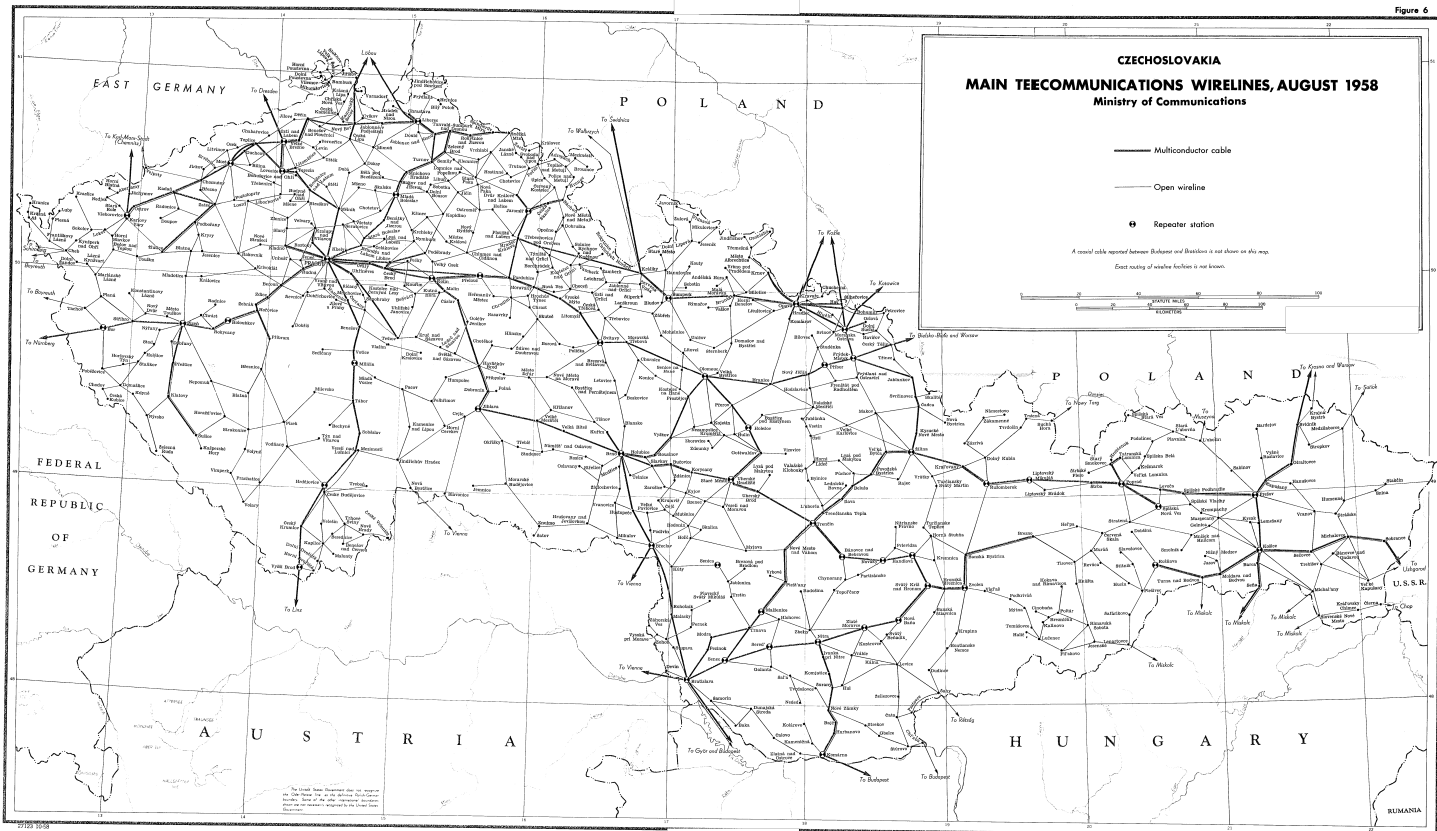


Figure 6



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