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No 87

ECONOMIC INTELLIGENCE REPORT

CAPITAL INVESTMENT IN POST AND TELECOMMUNICATIONS IN THE USSR 1951-65

CIA/RR ER 60-5
February 1960

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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FOREWORD

The purpose of this report is to compile, analyze, and evaluate capital investment* in those post and telecommunications facilities and services in the USSR that are operated and controlled by the Ministry of Communications. Other ministries operate functional post and telecommunications systems such as those serving the armed forces, shipping, railroads, and industry. Investment in these functional and independent post and telecommunications systems is not covered in this report. Although the facilities and services covered 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 these facilities and services, as do all other ministries. In addition, it is believed that the armed forces make direct investment contributions to the Ministry of Communications for the construction of facilities that are to be used to a large extent by the military. No information is available, however, on the magnitude of these investment contributions, and no attempt has been made in this report to quantify them.

Estimates of investment in telecommunications are presented in two forms: as annual aggregates of total investment and as annual investments by type of facility. In the absence of information, estimates of investment in postal services are presented only as annual aggregative figures.

Estimates of annual investment in telecommunications were derived by applying known and estimated cost data on telecommunications equipment and installations to known and estimated data on growth in telecommunications facilities. Available data both on growth of telecommunications facilities and on costs of telecommunications equipment and installations are spotty. On this basis, therefore, it is estimated that the investment data presented in this report have a probable margin of error of plus or minus 20 percent.

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* Not all investment in the USSR is capital investment. All references to investment in this report, however, refer to capital investment only.

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CAPITAL INVESTMENT IN POST AND TELECOMMUNICATIONS IN THE USSR*
1951-65

Summary and Conclusions

The public post and telecommunications sector** of the Soviet economy is operated and maintained by the Ministry of Communications (Ministerstvo Svyazi) of the USSR*** and by the ministries of communications of the republics. Investment in this sector is directed toward the development of facilities that will provide services primarily to meet the needs of government and only secondarily to meet the needs of private consumers. Primary responsibility for the planning of capital investment in this sector rests with the Ministry of Communications, acting in concert with the State Planning Committee (Gosplan). Before the industrial reorganization in 1957, subordinate units of the Ministry of Communications had little freedom of choice in proposing investment plans responsive to local needs. After the reorganization, subordinate units of the Ministry were given freedom to initiate investment plans based on firsthand knowledge of their needs. To the extent that this change is made to work, it could assist the local units to meet their communications needs. If this end is not accomplished, at least the change could serve to bring these needs into sharper focus at the higher echelons than was the case heretofore.

The level and pattern of investment in public post and telecommunications in the USSR for the period 1951-58 were greatly influenced by the rapid growth of economic and military activity in the country. Communications requirements generated by this growth imposed increased demands for service on the post and telecommunications system. As a partial response to these increased demands, investment for the development of post and telecommunications resources grew rapidly, but

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* The estimates and conclusions in this report represent the best judgment of this Office as of 15 January 1960. Technical terms are defined in Appendix B, Glossary of Technical Terms.

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

*** Hereafter referred to as the Ministry of Communications.

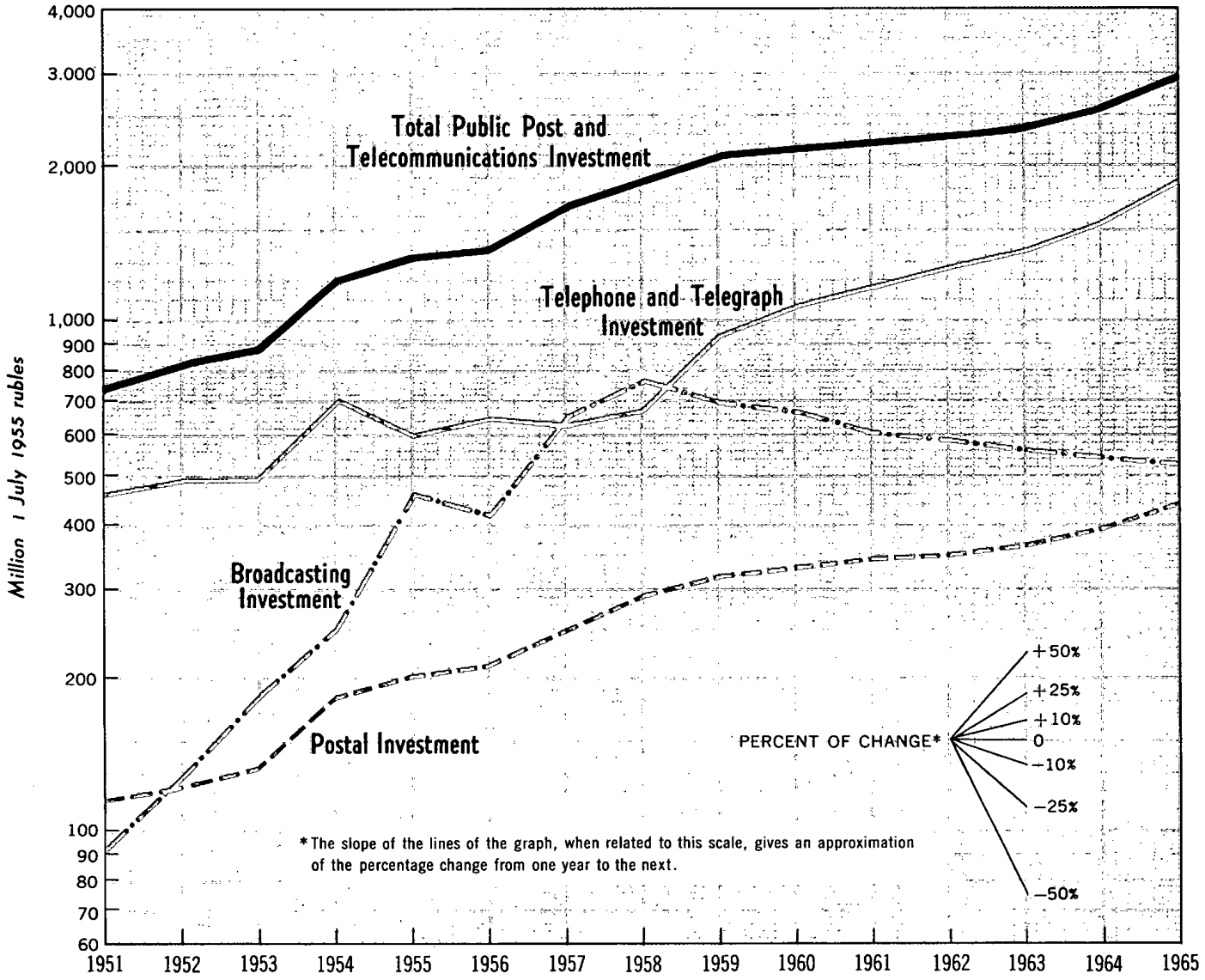
from a small base. Total investment for 1951-58 amounted to about 9.8 billion rubles.* Expansion of facilities resulting from this investment led to substantial increases in the volume of service rendered. Nevertheless, at the end of the period, supply of service, particularly for mainline interurban communications, was still lagging behind demand for service, and the post and telecommunications system was meeting only minimal requirements for service in terms of normal Western use patterns.

The Seven Year Plan (1959-65) for the post and telecommunications sector underscores the effort to be made to overcome this lag. Total investment is expected to be about 16.6 billion rubles for the 7 years, about 69 percent greater than the total for the previous 8 years. The average annual rate of growth** of investment, nevertheless, will be less for the period 1959-65 than for the previous 7 years, or 6 percent compared with 14 percent. The lower rate of growth for the period 1959-65, however, is heavily influenced by the progressive decrease in investment for broadcasting facilities, which will be approaching full coverage. The continued increase in funds planned for investment in mainline high-capacity telecommunications facilities, such as multiconductor and microwave radio relay lines, throughout the period will markedly reduce the lag in the supply of mainline communications service that existed at the end of 1958. The accompanying chart shows the estimated growth in investment for the sector as a whole and for the subsectors during 1951-65.

Besides indicating a substantial increase in the amount of investment in public post and telecommunications, the Seven Year Plan also indicates a major change in the pattern of such investment. For the period 1951-58, investment was aimed primarily at expanding the capacity of the post and telecommunications system by the application of relatively inexpensive equipment to existing facilities. For the period 1959-65, capacity will be expanded by investment which involves the construction and installation of new, modern, high-capacity telecommunications facilities. Major features of the Seven Year Plan include increasing the length of microwave radio relay lines 740 percent, increasing the length of cable (multiconductor and coaxial) lines 100 percent, increasing the length of interurban telephone channels 190 percent, increasing urban telephone exchange capacity 50 percent, expanding the television broadcasting base 167 percent,

* Unless otherwise indicated, ruble values in this report are expressed in terms of 1 July 1955 rubles and may be converted to US dollars at the rate of 6 rubles to US $1. 1/ [redacted] 50X1 5UX1

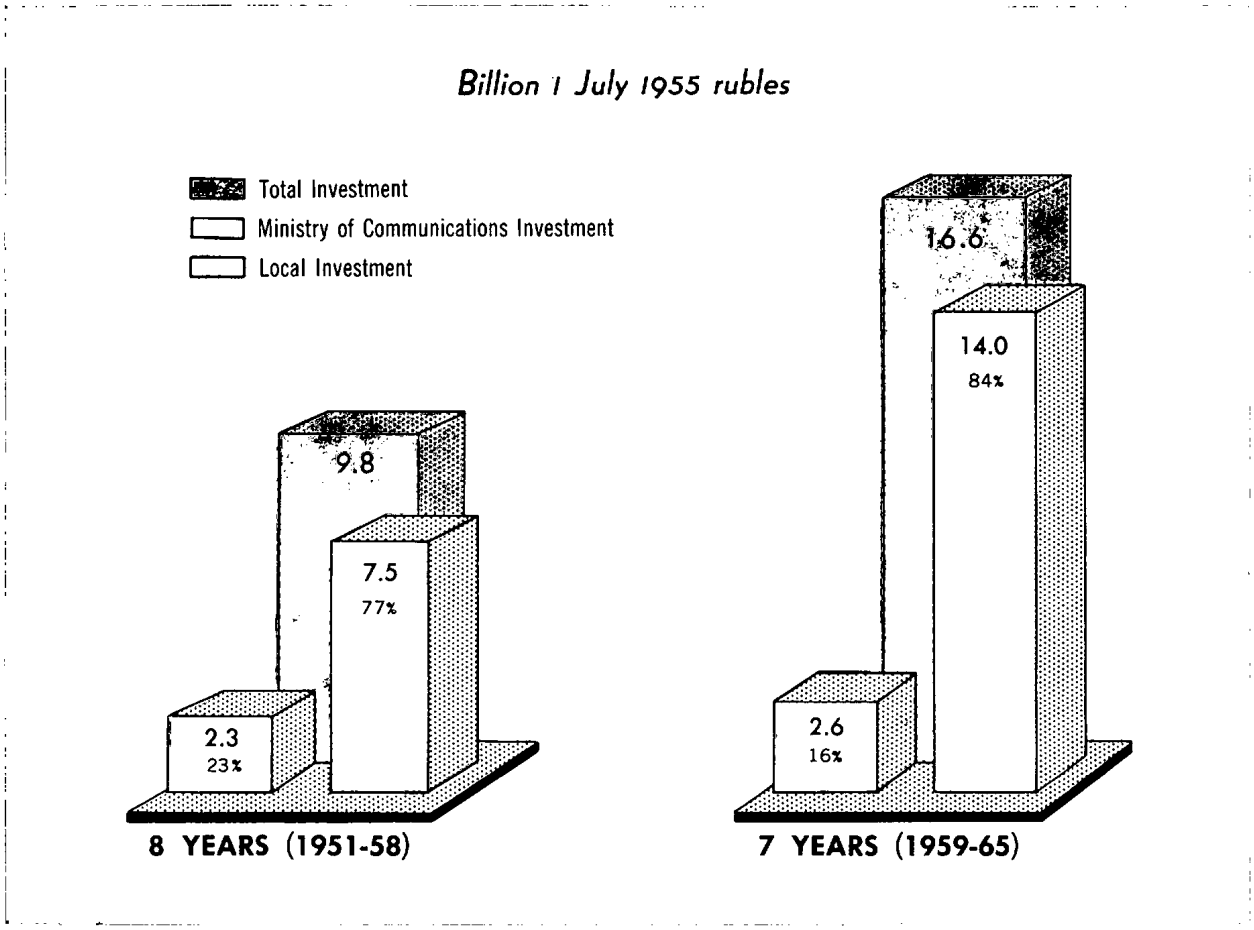
** Average annual rates of growth expressed in this report are for the period stated and are calculated at the compound interest rate, based on the absolute figure for the year immediately preceding the period stated.



and enlarging the radiobroadcasting transmission base 60 percent. Throughout the Seven Year Plan period, particular attention will be given to the construction and installation of facilities that will provide services to meet new requirements created by the recent industrial reorganization as well as by the over-all economic growth of the country. It is expected that for the most part the goals of the Seven Year Plan in the post and telecommunications sector will be met.

Total investment in public post and telecommunications in the USSR consists of centralized investment by the Ministry of Communications

and decentralized local investment. The chart below shows the comparison of the absolute and percentage contributions of each type of investment with the total for the periods 1951-58 and 1959-65.



Decentralized local investment will constitute a decreasing percentage of the total investment in public post and telecommunications during 1959-65 compared with 1951-58, but the absolute amount will increase. It is expected that decentralized local investment will continue to play a significant part in the development of the post and telecommunications system, especially in meeting the needs of the councils of national economy (sovety narodnogo khozyaystva -- sovnarkhozy) under the industrial reorganization of 1957.

During 1951-58 the Ministry of Communications was allocated about 0.65 percent of total state centralized investment. During 1959-65 the Ministry will be allocated about 0.70 percent of the total. In spite of this slight increase in the share of total state centralized investment going to post and telecommunications for the entire period

1959-65, there is no upward trend in annual allocations. The increase in centralized investment funds that are allocated to post and telecommunications development during the Seven Year Plan, therefore, does not indicate an increased priority for post and telecommunications but rather reflects the general increase in investment that is expected to occur in the USSR during the plan period. The relative improvement expected in the post and telecommunications sector of the economy during the course of the Seven Year Plan will be accomplished by a change in the pattern of investment rather than by a change in post and telecommunications investment priority.

It is estimated that, for the entire period 1951-65, the marginal capital-output ratio for the public post and telecommunications sector of the Soviet economy will be about 1.5 to 1. Although this ratio indicates a relatively high productivity of capital for the sector as a whole, it is heavily influenced by the very favorable capital-output ratios of the postal and broadcasting subsectors. Whereas the ratios of the postal and the broadcasting subsectors for the period will be about 0.7 to 1 and about 1.4 to 1, respectively, the ratio for the telephone and telegraph subsector will be about 2.2 to 1.

Investment in post and telecommunications during 1959-65 will be influenced strongly by intra-Bloc requirements for service. In 1957, under the leadership of the USSR, the Sino-Soviet Bloc established the Organization for Cooperation Among the Socialist Countries in the Fields of Post and Communications (OSS). The formation of this organization, as well as the formation in 1957 of a similar organization for railroads known as the Organization for Cooperation of Socialist Railroads (OSZhD), indicates an increased effort by the USSR to extend control over other economic and military activities of the Sino-Soviet Bloc as a whole through the secondary influence that service sectors exert over the economy. OSS is concerned mainly with standardizing, expanding, and integrating the post and telecommunications systems and services of the member nations. The major objectives of OSS include making the telecommunications systems of all Bloc countries partly automatic by 1965 and fully so by 1975, accelerating telegraph traffic between member countries, and establishing microwave radio relay facilities for use in a Soviet Bloc telecommunications (including television) network to be completed by 1965. It is not yet known what amount of investment resources will be allocated by the USSR for implementing its portion of the OSS program. Because the USSR was the prime mover in the formation of this body, however, it is believed that sufficient funds will be made available jointly to accommodate the program.

The plan for the development of public post and telecommunications resources in the USSR during 1959-65, although ambitious, is

attainable. An adequate supply of equipment and materials is required, however, for its attainment. The inadequacies of domestic production and of external procurement have been problems plaguing the post and telecommunications sector since World War II. If the necessary materials and equipment are forthcoming, this sector should be capable by the end of 1965 of making a much fuller contribution to the growth of the economy and to the strategic power of the country than it has been able to make in the past.

I. Introduction

The distribution of investment in the basic service sectors of an economy, such as transportation, electric power, water supply, and telecommunications, usually reflects the need for balanced growth of a modern industrial economy. The development of these sectors is generally geared to the development of the industrial sector of the economy. Depending on the planned directions of development within an economy, some service sectors will be more rapidly developed than others. The telecommunications sector provides a rapid means of controlling, directing, and coordinating diverse economic activities. The effectiveness with which these activities are integrated in time, space, and substance is influenced by the quantity and quality of the telecommunications resource base. To the extent that telecommunications resources meet the needs of an economy, they contribute to the acceleration of the rate of economic growth. Conversely, when these resources are incapable of providing services to meet such needs, acceleration of the rate of growth may be impeded.

Since the end of World War II, there is probably no government that has been more dedicated to rapid economic growth than the government of the USSR. The eventual goal of this Communist state -- world domination -- is predicated on the rapid development and expansion of its economy. It is strange, therefore, that Soviet planners have adhered to a policy of allocating relatively small amounts of investment funds for the development of the telecommunications sector.

Although reasons for this policy are not clear, it is believed to be dictated by the availability of resources for the over-all development of the economy. During the early postwar years the whole Soviet economy was rather chaotic in consequence of war destruction, obsolete equipment, and loss of trained manpower. The lack of material and capital resources for the simultaneous development of all economic sectors necessitated the establishment of investment priorities for sector development. These priorities

emphasized the long-range development of the producer goods sector of the economy rather than the service and consumer goods sectors. Investment priorities were established for the development of some parts of the service sector, however, in relationship to the urgency of the need for such services by the government. For the post and telecommunications sector, these urgent requirements stemmed from the needs for service of the Communist Party, the armed forces, the police, and the key economic organs of government. It is pertinent to inquire, therefore, whether or not the present post and telecommunications system meets the several requirements of the state.

Judgments derived from this inquiry naturally will vary according to the point of view from which they are made. From the point of view of the planning and decision-making authorities in Moscow, services rendered by the post and telecommunications system are adequate. Because capital and material resources were limited, decisions for the development of post and telecommunications were made on the basis of getting necessary communications at the lowest possible cost. From the point of view of the government, the post and telecommunications system is adequate even though it meets no more than the most urgent needs of government. Evidence indicates that in spite of numerous stresses and strains the system appears generally able to meet governmental requirements.*

From the point of view of the Ministry of Communications, the present level of development of post and telecommunications is less than adequate. Announcements by the Ministry repeatedly have emphasized the fact that existing facilities are inadequate to meet all economic and military requirements and that available funds are insufficient to build all the additional facilities judged to be needed. Consequently, the Ministry of Communications has been requesting for a number of years that the numerous functional telecommunications systems of the country be placed under its control. According to the Ministry, control of these facilities would allow it to meet more fully its prescribed responsibilities in providing service to all

* Even the planning and decision-making authorities in Moscow have been known to misjudge their economic needs. For example, the rail transport crisis that occurred in the USSR during 1931-34, now historically documented, was directly attributable to a shortsighted policy. This policy placed heavy reliance on driving existing equipment and personnel harder to meet the demand for rail freight transport service rather than on allocating sufficient investment funds and materials for the development of rail facilities in balance with the growth of the economy as a whole. About 2 years were required to overcome this crisis. 2/

other sectors of the economy. The Ministry has achieved some measure of success in acquiring control of the functional telecommunications systems of the country. In February 1958 it was reported that the Ministry of Communications had gained control of some mainline telecommunications facilities of ministries abolished by the industrial reorganization.

From the point of view of the sovnarkhozy, the post and telecommunications system is also inadequate. Effective management of a region requires direct telecommunications service within the region and with other regions. At the time of the industrial reorganization in 1957, local facilities were hampered by limited quantity, poor distribution, and low capacity and were not capable of providing satisfactory service. The Ministry of Communications has undertaken to improve and rearrange existing telecommunications facilities to meet these emerging needs. In spite of some gain the benefits derived from this action are considerably less than adequate.

The post and telecommunications system is inadequate to meet general public requirements, particularly for telecommunications, but in the USSR the necessity to provide service for the general public is a matter of secondary importance. Generally, the services that are rendered to the public coincide with the interests of the state. Wire-diffusion, radiobroadcasting, and television services, for example, have become increasingly available because these mass information media are used primarily for propagandistic purposes.

If the criterion of adequacy is the ability of the system to meet all service requirements of the economy, including those resulting from the industrial reorganization, then the system is unsatisfactory. The system is undoubtedly inadequate if it is judged on the basis of its ability to provide telecommunications service to the general public. The system is probably adequate, however, if the criterion used is its ability to meet only the urgent requirements of government, including those of the Communist Party, the armed forces, the police, and the key economic organs of government.

II. Capital Investment Process*

In the USSR, capital investment (kapital vlozheniya) is defined as the financial and material resources allocated by central, republic, and local budgets for construction of new plants and facilities and for reconstruction and expansion of existing plants and facilities. Since

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1938, capital repairs have not been considered to be capital investment and therefore are not taken into account in the capital investment plan. Resources for capital repairs are realized in part from amortization deductions, which are represented to be part of the unit cost of production, and from profits accruing to enterprises from their basic operations. This concept of capital investment applies to all sectors of the Soviet economy, including post and telecommunications. 4/

Capital investment in the post and telecommunications sector of the economy is divided into the following categories: (1) construction work, including special construction projects; (2) purchase of equipment for installation; (3) installation work; (4) purchase of productive and nonproductive properties; and (5) other miscellaneous capital investment expenditures. 5/

Capital investments are classified as being above limit (sverkhlimitnyy), below limit (nizhelimitnyy), or extra limit (vnelimitnyy). Investment for construction subordinate to the Ministry of Communications is classified as either above limit or below limit according to indexes established by the Council of Ministers of the USSR.* Generally, above-limit investments are those for the construction of operational facilities costing more than 10 million rubles and for the construction of administrative facilities, except housing, costing more than 5 million rubles. All other construction of Ministry subordination, including housing, is considered to be below limit. All above-limit investment of the Ministry of Communications must be approved by the Council of Ministers. This investment is included in the special title list of above-limit construction of Gosplan. The Ministry of Communications is authorized to approve all below-limit investments. 6/

Investment for construction subordinate to the republic ministries of communications is also classified as above limit or below limit. The classification, however, is made at the discretion of the republic councils of ministers in accordance with the powers granted them. Usually, construction costing 50 million rubles and more is classified as above limit, whereas that costing less than 50 million rubles is classified as below limit. The republic councils of ministers are authorized to approve all below-limit investment of republic subordination. All above-limit investment of the republic ministries, however, must be approved by the Council of Ministers. Such investment is also included in Gosplan's special title list of above-limit construction. 7/

* Hereafter referred to as the Council of Ministers.

Extra-limit capital investment, as the name implies, is that not limited by specific investment indexes. This type of investment is used by republic ministries primarily for extending telephone service to rural areas. Because such investment is financed outside the state budget, prior approval by the Council of Ministers is not required.

Capital investment is either planned or unplanned. Planned investment is that which is included in the annual investment plan approved by the Council of Ministers, and such investment is financed primarily by the state budget. Unplanned investment is that which is not included in the annual investment plan, and such investment is financed by sources other than the state budget. Unplanned post and telecommunications investment includes all extra-limit investment; investment financed by local budgets for construction of wire-diffusion facilities in cities and workers' settlements; investment made from special sources, such as the enterprise fund; and above-plan investment made with funds accruing from the provision of additional post and telecommunications services. 8/

Before 1 July 1957 the planning of capital investment for the development of the post and telecommunications sector of the Soviet economy was primarily the function of the Ministry of Communications, acting in concert with the central planning agencies* of the Council of Ministers. Each year, at a time designated by these agencies, the Ministry issued instructions to its subordinate enterprises and republic ministries on methods and targets to be used in drafting their capital investment plans. On the basis of these instructions, the republic ministries called for capital investment plans from their subordinate enterprises. On receipt of these plans the republic ministries revised, compiled, and submitted to the gosplans of their respective republics and to the Ministry of Communications drafts of capital investment plans. When these drafts had been reviewed and amended, the Ministry compiled one capital investment plan that was submitted to the Council of Ministers for approval. On receipt by this government body the plan was reviewed in the light of plans for the over-all development of the economy and the available resources in the planned budget. After making the necessary changes, the central planning agencies, acting for the Council of Ministers, returned to the Ministry of Communications the approved capital investment plan. The Ministry in turn forwarded to its subordinate enterprises and to the republic ministries the now approved capital investment plan. 9/

* Including the State Planning Commission (Gosplan), which was responsible for long-term planning, and the State Economic Commission (Gosekonomkomissiya), which was responsible for current planning.

Effective 1 July 1957 the economic-administrative structure of the USSR was reorganized in an attempt to improve the functioning of the economic system by shifting the responsibility and the authority for day-to-day decision-making from more central authorities to more local authorities. Fundamentally, the structure was altered by concentrating long-term and current planning in Gosplan, by changing the functions of or abolishing most central ministries, and by establishing sovnarkhozy to which were subordinated most industrial enterprises in the region. One of the more important features of the reorganization was the increased influence of Gosplan in planning and controlling the economic activities of republics, ministries, sovnarkhozy, and enterprises. 10/

In the reorganization of the Soviet economy, 105 (now 104) new economic regions were created, each controlled by a sovnarkhoz. This replacement of the previous pattern of functional (enterprise-ministerial) subordination by a regional subordination was intended to facilitate and to improve the decision-making processes that affected the over-all allocation and use of resources by giving local units more authority and responsibility over activity at the enterprise level.

Many central ministries were abolished by the industrial reorganization, but, as would be expected of a service sector of nationwide coverage, the Ministry of Communications was retained intact. The power that the Ministry has in the area of investment planning has also remained intact. Since 1954 the Ministry of Communications has been a union-republic ministry with counterpart republic ministries. In the 1954 reorganization the republic ministries and their subordinate enterprises were given a limited voice in planning capital investments. Decisions on important aspects of the investment plan, however, remained with the Ministry of Communications, which, acting with the central planning agencies of the Council of Ministers, established and approved general plan targets for post and telecommunications investment.

Coincident with the change in industrial organization were changes in the planning processes. Before the reorganization, rigid guidance for the preparation and tight prescriptions for the content of the plan proceeded down the economic structure from the Ministry in Moscow, through the republic ministries, to the subordinate units. By the time the information had reached the subordinate units, the substance of the plan had become so confined as to leave little freedom on the part of these units to propose plan items responsive to local needs. What freedom remained was subject to removal as the plan proceeded back up the structure to the Ministry in Moscow and thence to Gosplan. After the reorganization the preparation of the plan commenced with the subordinate units. In this arrangement,

subordinate units have the freedom to initiate plans based on first-hand knowledge of their needs. Such planning is, of course, subject to revision as the plan passes up the structure to the Ministry in Moscow and then to Gosplan. To the extent that this change is made to work, it could conceivably improve greatly the ability of subordinate units to meet over-all economic production goals. Even in cases where plan data are rejected or revised by higher echelons, they will bring to those more remote echelons knowledge of on-the-spot problems that before were not known or were ignored by the bureaucrats. 11/

III. Growth of Investment

The growth in Soviet economic and military activities greatly influenced the level and pattern of investment in public post and telecommunications for the period 1951-58. This growth placed increased demands for service on the post and telecommunications sector of the economy. The program for the development of the post and telecommunications system during the Fifth Five Year Plan (1951-55) was a partial response to these increased demands. During this period, some investment was directed at the construction of new facilities, but primary emphasis was placed on expanding the capacities of existing facilities through investment in relatively inexpensive equipment. Telephone carrier equipment was installed on existing wirelines, teletype apparatus replaced slow-speed Badout and manual Morse equipment, wire-diffusion facilities in the same area were consolidated, and the length of postal routes was increased by the use of air and motor transport. This program effected substantial increases in the total volume of service that the post and telecommunications system was able to render. Nevertheless, at the end of 1955, communications service was still lagging behind demand, and the post and telecommunications system was meeting only minimal requirements for service in terms of normal Western patterns of use. 12/

The Sixth Five Year Plan (1956-60) of the Ministry of Communications was ambitious and addressed itself to overcoming this lag. The plan emphasized the expansion of services through an intensive program for the construction of additional basic telecommunications facilities. Major features of the plan included the installation of not less than 10,000 kilometers (km) of microwave radio relay lines; the installation of 19,000 km of interurban cable trunklines, including 2,700 km of coaxial cable lines; the construction of 75 major television centers; and the installation of 250 frequency-modulation (FM) radiobroadcasting transmitters. Although this plan was discarded in late 1957, it guided post and telecommunications development during 1956-58. 13/

The industrial reorganization of 1 July 1957 imposed additional demands for telecommunications service because rapid, reliable

communications were necessary to tie together the diverse economic activities placed under the control of a sovnarkhoz. During 1957 and 1958 these additional demands were partly met by improving and rearranging existing facilities. Local resources primarily were used for this purpose, with little investment by the Ministry of Communications.

The new Seven Year Plan (1959-65) includes most of the objectives of the original Sixth Five Year Plan. Under the new plan, sizable amounts of investment funds will be allocated to the construction of additional modern, high-capacity telecommunications facilities. The level of investment planned for the construction of these additional facilities underscores the concerted effort that is to be made to meet current and future demands for service.

A. Investment in Public Post and Telecommunications, 1951-58

The estimated total investment in public post and telecommunications in the USSR during 1951-58 was about 9.8 billion rubles. During this period, investment grew rapidly but from a small base. The total annual investment, as shown in Table 1,* increased from about 737 million rubles in 1951 to about 1.9 billion rubles in 1958, an increase of about 155 percent.

The rate of growth in total investment in public post and telecommunications for the period 1951-58, shown in Figure 1,** varied from year to year. The moderate rate of growth shown for the period 1951-53 was followed by an extraordinarily high rate of growth in 1954. The increase in 1954 primarily reflected the investment needs associated with the expansion of point-to-point radio facilities necessary for extending telecommunications service to state farms and machine tractor stations established in that year in the virgin lands of Kazakh SSR and Bashkirskaya ASSR. Following the increase in 1954, there was a slackening in the rate of growth in investment, and during 1955 and 1956 the rate of growth was comparable to that for the period 1951-53. The rate of growth in investment during 1957 and 1958, however, again turned upward. This increase reflects the starting of major projects under the now discarded Sixth Five Year Plan.

Of the 9.8 billion rubles of investment in public post and telecommunications during 1951-58, investment by the Ministry of Communications approximated 7.5 billion rubles. The remaining 2.3 billion rubles were local investment. Investment by the Ministry, as***

* Table 1 follows on p. 14.
** Following p. 22.
*** Text continued on p. 22.

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/*
1951-58

Million 1 July 1955 Rubles

	1951	1952	1953	1954	1955	1956	1957	1958
Postal investment b/	110.6	121.6	130.7	178.9	196.1	207.6	247.6	281.9
Telecommunications investment c/	626.8	688.8	740.4	1,013.5	1,111.5	1,176.2	1,403.2	1,597.4
Telephone	103.7	140.5	130.7	180.3	137.1	139.3	139.3	139.3
Urban d/	59.9	76.9	46.2	93.7	72.5	70.7	70.7	70.7
Manual	8.9	8.9	2.7	10.5	9.2	4.6	4.6	4.6
Automatic	51.0	68.0	43.5	83.2	63.3	66.2	66.2	66.1
Rural e/	4.6	4.8	6.1	8.2	5.8	9.7	9.7	9.7
Manual	3.6	3.6	4.1	6.4	4.2	7.3	7.3	7.3
Automatic	0.9	1.1	2.0	1.8	1.6	2.5	2.5	2.5
Interurban f/	39.2	58.8	78.4	78.4	58.8	58.8	58.8	58.8
Telegraph	26.7	14.3	14.1	26.7	13.9	30.2	32.0	32.0
Regular g/	26.0	13.0	13.0	26.0	13.0	26.0	26.0	26.0
Subscriber h/	0.7	0.7	0.7	0.5	0.7	1.7	3.3	3.3
Facsimile i/	N.A.	0.6	0.4	0.2	0.2	2.4	2.7	2.7

* Footnotes for Table 1 follow on p. 17.

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/
1951-58
(Continued)

Million 1 July 1955 Rubles

	1951	1952	1953	1954	1955	1956	1957	1958
Common telecommunications facilities	328.2	328.2	335.6	483.6	434.1	464.2	440.0	477.8
Wirelines j/	292.3	289.4	292.3	309.7	309.7	367.6	330.0	367.5
Trunk and secondary	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0
Intrarayon	79.8	79.8	79.8	79.8	79.8	79.8	79.8	79.8
Multiconductor cable	72.5	69.6	72.5	89.9	89.9	107.3	110.2	110.2
Coaxial cable	N.A.	N.A.	N.A.	N.A.	N.A.	40.5	N.A.	37.5
Microwave k/	N.A.	N.A.	N.A.	N.A.	13.5	27.0	54.0	54.0
Point-to-point radio l/	35.8	38.8	43.3	173.9	110.9	69.6	56.0	56.3
Long range	6.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Intraoblast	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Intrarayon	14.6	15.7	16.4	16.8	16.8	17.5	19.7	19.7
Urozhay (harvest)	12.2	13.0	16.8	147.0	84.0	42.0	25.2	25.2
Tropospheric scatter	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.0	N.A.
Ionospheric scatter	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1.3

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/
1951-58
(Continued)

Million 1 July 1955 Rubles

	1951	1952	1953	1954	1955	1956	1957	1958
Broadcasting	89.9	127.5	181.7	244.6	448.1	412.2	626.9	748.7
Radiobroadcasting m/	1.2	3.8	3.8	10.0	12.5	13.8	12.5	12.5
Wire diffusion	88.7	95.8	177.9	211.6	246.6	209.4	208.4	187.2
Urban n/	34.3	30.8	71.9	74.4	68.5	61.2	67.7	66.3
Wire-diffusion centers	N.A.	N.A.	2.5	2.8	1.7	3.2	6.2	10.8
Wired loudspeakers	34.3	30.8	69.4	71.7	66.8	58.0	61.5	55.5
Rural o/	54.4	65.0	106.0	137.1	178.1	148.2	140.7	120.8
Wire-diffusion centers	17.0	17.9	13.3	14.0	12.1	7.7	6.5	11.3
Wired loudspeakers	37.4	47.1	92.8	123.2	166.0	140.6	134.2	109.5
Television p/	N.A.	28.0	N.A.	23.0	189.0	189.0	406.0	549.0
Centers	N.A.	18.0	N.A.	18.0	144.0	144.0	306.0	414.0
Relay stations	N.A.	10.0	N.A.	5.0	45.0	45.0	100.0	135.0

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/
1951-58
(Continued)

Million 1 July 1955 Rubles

	1951	1952	1953	1954	1955	1956	1957	1958
Housing g/	78.3	78.3	78.3	78.3	78.3	130.3	165.0	199.7
Total public post and telecommunications investment r/	737	810	871	1,192	1,308	1,384	1,651	1,879
Ministry of Communications investment r/	606 s/	675 t/	760 t/	900 u/	1,100 v/	1,000 u/	1,100 u/	1,400 w/
Local investment r/ x/	131	135	111	292	208	384	551	479

a. All data are rounded to the nearest hundred thousand rubles unless otherwise indicated. Totals were derived from unrounded data and may not agree with the sum of the rounded components.
b. Estimated on the assumption that telecommunications investment comprised 85 percent of the total investment and that the remaining 15 percent was postal investment.
c. Investment for each of the facilities was derived by applying known and estimated data on equipment costs and installation to known and estimated data on telecommunications facilities, as shown below for specific facilities.

50X1

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR
1951-58
(Continued)

d. The sum of investment in urban manual and automatic telephone facilities. Investment in urban manual telephone facilities was computed by multiplying the growth of urban manual telephone exchange capacity, from Table 4 (p. 48, below), by the average investment cost of 270 rubles per number. This figure for average investment cost includes both equipment and line installation costs, of which 30 percent was estimated to be equipment cost and 70 percent line installation cost. 15/ Investment in urban automatic telephone facilities was computed by multiplying the growth of urban automatic telephone exchange capacity, from Table 4, by the average investment cost of 945 rubles per number. The investment cost in one number served by an automatic telephone exchange was estimated to be 3.5 times that in one number served by a manual exchange. 16/

e. The sum of investment in rural manual and automatic telephone facilities. Investment in rural manual telephone facilities was computed by multiplying the growth of rural manual telephone exchange capacity, from Table 4, by the average investment cost of 180 rubles per number. This average investment cost includes costs of both equipment and line installation, of which 20 percent was estimated to be equipment cost and 80 percent line installation cost. 17/ Investment in rural automatic telephone facilities was computed by multiplying the growth of rural automatic telephone exchange capacity, from Table 4, by the average investment cost of 630 rubles per number. The investment cost in one number served by an automatic telephone exchange was estimated to be 3.5 times that in one number served by a manual exchange. 18/

f. Computed by multiplying the growth of length of interurban telephone channels, from Table 5 (p. 49, below), by the average investment cost of 196 rubles per channel kilometer. 19/

g. Computed by multiplying the growth of telegraph apparatus in use, from Table 6 (p. 50, below), by the average investment cost of 13,000 rubles per apparatus. 20/ This average investment cost includes both equipment and installation costs, of which 60 percent was estimated to be equipment cost and 40 percent installation cost.

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR
1951-58
(Continued)

h. Computed by multiplying the growth of subscribers, from Table 7 (p. 51, below), and the growth of subscriber telegraph exchanges, from Table 8 (p. 52, below), by the average investment cost of 4,000 rubles and 2,500 rubles, respectively. 21/

i. Computed by multiplying the growth of cities with facsimile service, from Table 9 (p. 53, below), by the average investment cost of 75,000 rubles per apparatus per city. It was assumed that there were two facsimile apparatus in each city.

j. The sum of investment in trunk and secondary, intrarayon, multiconductor, and coaxial cable lines. Investment in these facilities was computed by multiplying their growth, from Table 10 (p. 54, below), by the average investment cost of 14,000 rubles, 1,330 rubles, 29,000 rubles, and 67,500 rubles, respectively. These average investment cost figures include both equipment and installation costs. 22/

k. Computed by multiplying the growth of microwave radio relay lines, from Table 11 (p. 55, below), by the average investment cost of 27,000 rubles per kilometer. This figure for average investment cost includes both equipment and installation costs. 23/

l. The sum of investment in long-range, intraoblast, intrarayon, urozhay, tropospheric scatter, and ionospheric scatter point-to-point radio facilities. Investment in these facilities, except those for tropospheric and ionospheric scatter, was computed by multiplying their growth, from Table 12 (p. 56, below), by the average investment cost of 190,000 rubles, 25,000 rubles, 7,300 rubles, and 4,200 rubles, respectively. These figures for the average investment cost include both equipment and installation costs. 24/ Because of obscurities in the data reported, investment in tropospheric and ionospheric scatter facilities was estimated to be the minimum figure necessary to install the tropospheric scatter link between Frunze and Przheval'sk and the ionospheric scatter link between Leningrad and Murmansk.

m. Computed by multiplying the number of amplitude-modulated (AM) radiobroadcasting transmitters placed in operation, from Table 13 (p. 57, below), by the average investment cost of 1,250,000 rubles per transmitter. This figure for the average investment cost includes both equipment and installation costs, of which 40 percent was estimated to be equipment cost and 60 percent installation cost. 25/ The total investment in radiobroadcasting does not include investment in frequency-modulated (FM) radiobroadcasting facilities, because in the USSR most of these facilities are housed in the buildings of television centers. Because of

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR 1951-58 (Continued)

obscurities in the data reported, it was not feasible to allocate a portion of the total investment in major television centers to FM radiobroadcasting.

n. The sum of investment in urban wire-diffusion centers and urban wired loudspeakers. Investment in urban wire-diffusion centers was computed by multiplying the number of urban wire-diffusion centers installed, from Table 14 (p. 58, below), by the average investment cost of 13,135 rubles per center. 26/ Investment in urban wired loudspeakers was computed by multiplying the number of urban wired loudspeakers installed, from Table 15 (p. 59, below), by the average investment cost of 75 rubles per loudspeaker. 27/ These figures for the average investment cost include both equipment and installation costs.

o. The sum of investment in rural wire-diffusion centers and rural wired loudspeakers. Investment in rural wire-diffusion centers was computed by multiplying the number of rural wire-diffusion centers installed, from Table 14 (p. 58, below), by the average investment cost of 5,151 rubles. 28/ Investment in rural wired loudspeakers was computed by multiplying the number of rural wired loudspeakers installed, from Table 15 (p. 59, below), by the average investment cost of 75 rubles per loudspeaker. 29/ These figures for the average investment cost include both equipment and installation costs.

p. The sum of investment in television centers and television relay stations. Investment in television centers was computed by multiplying the number of television centers placed in operation, from Table 16 (p. 60, below), by the average investment cost of 18 million rubles. 30/ Investment in television relay stations was computed by multiplying the number of television relay stations placed in operation, from Table 16 (p. 60, below), by the average investment cost of 5 million rubles. These figures for the average investment cost include both equipment and installation costs. Because of obscurities in the data reported, investment in television centers includes investment in FM radiobroadcasting facilities.

q. Including state and local investment as well as investment in housing for postal workers. 31/ Data for 1958 were extrapolated, assuming the same absolute increase for 1957-58 as for 1956-57.

Table 1

Estimated Total Investment in Public Post and Telecommunications Facilities
in the USSR
1951-58
(Continued)

r. Rounded to the nearest million rubles.
s. 32/
t. Interpolated, using graphic analysis.
u. 33/
v. 34/
w. 35/
x. Computed by subtracting investment by the Ministry of Communications from the estimated total investment in public post and telecommunications facilities. The remainder was assumed to be local investment.

shown in Table 1, increased from about 606 million rubles in 1951 to about 1.4 billion rubles in 1958, an increase of about 131 percent. During this same period, local investment increased about 266 percent, from about 131 million rubles in 1951 to about 479 million rubles in 1958. The annual growth of investment by the Ministry of Communications, shown in Figure 1,* was more consistent than that of local investment and for the most part paralleled growth in the total investment in public post and telecommunications. In 1956, however, investment by the Ministry decreased, whereas the total investment increased. The decrease in investment by the Ministry is believed to have mirrored the uncertainties that existed at the start of the Sixth Five Year Plan.

Although investment by the Ministry of Communications during 1951-58 accounted for about 77 percent of the total investment in public post and telecommunications, this proportion varied considerably for individual years, as shown in Figure 2.* Investment by the Ministry during 1951-55 provided about 82 percent of the total investment, whereas during 1956-58 it provided only about 71 percent. This decline in the contribution of investment by the Ministry to the total investment in public post and telecommunications reflected a change in the general economic policy of the country. This policy gave increased emphasis to the role of local investment in the over-all development of the economy. In post and telecommunications, this increased local investment made possible the construction of new television, rural telephone, and housing facilities.

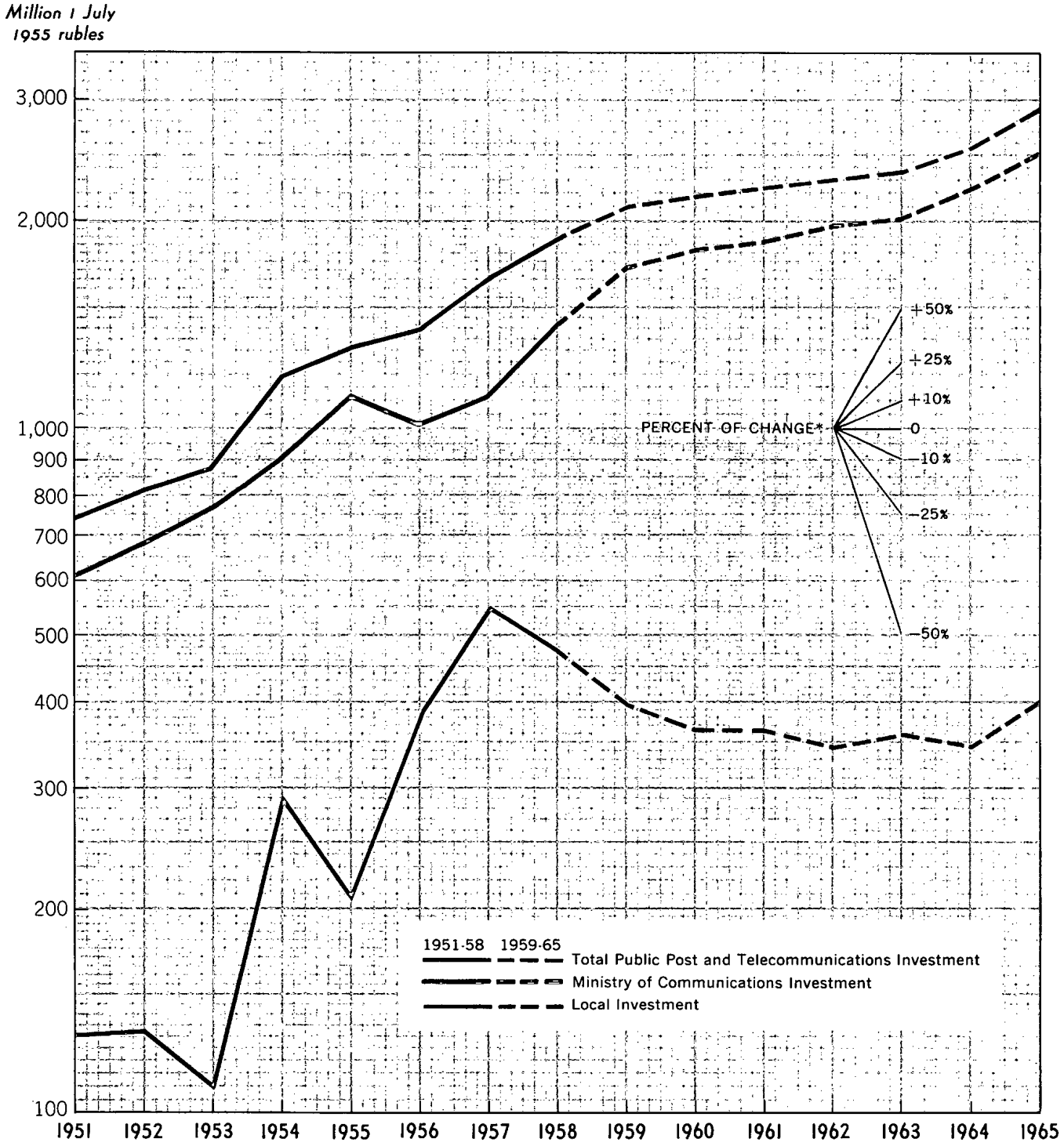
It is estimated that during 1951-58 investment in telecommunications accounted for about 85 percent and investment in postal services for about 15 percent of the total investment in public post and telecommunications. The percentage distribution of the total investment in telecommunications, shown in Figure 3,* varied throughout the period. The most significant of these variances occurred in investment in common telecommunications facilities and investment in broadcasting facilities. During 1951-55, investment in common telecommunications facilities, particularly wire and multiconductor cable lines, accounted for about 46 percent of the total investment in telecommunications, whereas investment in broadcasting facilities, especially wire-diffusion, accounted for only about 26 percent. During 1956-58 the percentage relationship of each type of investment to the total changed, with investment in broadcasting facilities accounting for about 43 percent and

* Following p. 22.

Figure 50X1

USSR

RATE OF GROWTH OF PUBLIC POST AND TELECOMMUNICATIONS INVESTMENT, 1951-65



* *The slope of the lines of the graph, when related to this scale, gives an approximation of the percentage change from one year to the next.*

50X1

28304 2-60

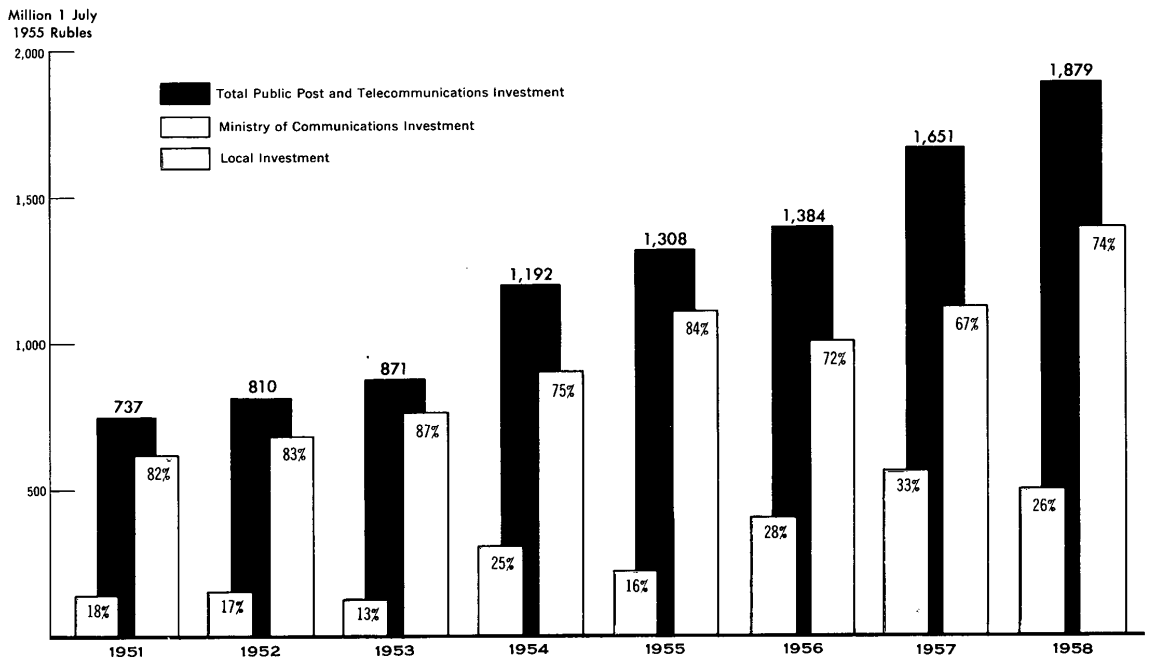
[redacted]

USSR

Figure 2

50X1

PERCENTAGE DISTRIBUTION OF TOTAL PUBLIC POST AND TELECOMMUNICATIONS INVESTMENT, 1951-58



28305 2-60

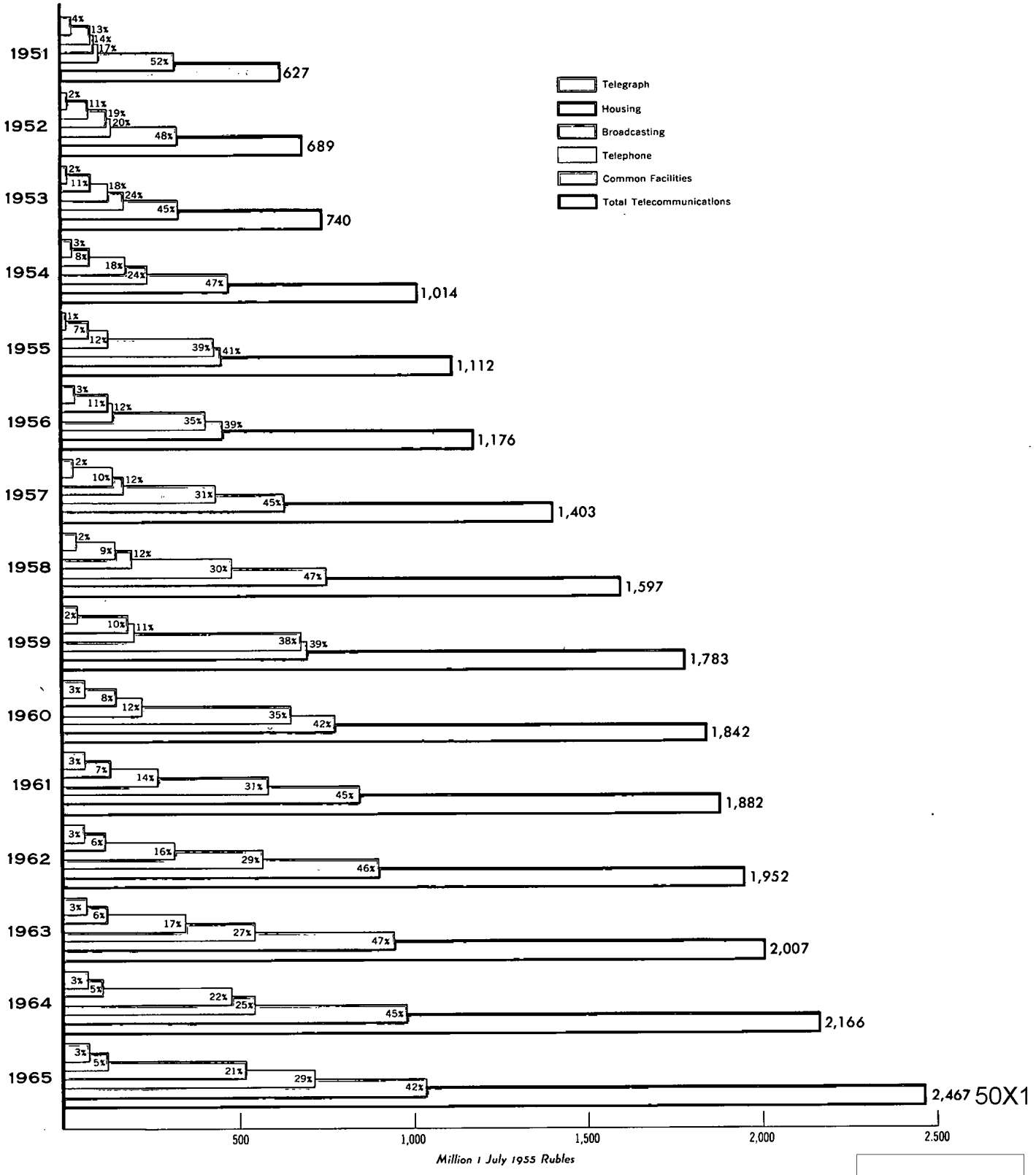
[redacted]

50X1

Figure 3

50X1

USSR
DISTRIBUTION OF TOTAL TELECOMMUNICATIONS INVESTMENT, 1951-65



50X1

28306 2-60

investment in common telecommunications facilities for only about 33 percent. The increase of investment in broadcasting as a percentage of the total investment in telecommunications primarily reflected the heavy emphasis placed on expanding the television broadcasting transmission base of the country during the period as well as on the continued development of wire-diffusion facilities. The decrease of investment in common telecommunications facilities as a percentage of the total investment in telecommunications resulted from decreased investment in point-to-point radio facilities. Investment in wire-line and microwave radio relay line facilities showed continued growth.

B. Investment in Public Post and Telecommunications, 1959-65

It is estimated that the total investment in public post and telecommunications in the USSR for 1959-65 will amount to about 16.6 billion rubles, or about 69 percent more than in the previous 8 years. The total annual investment, as shown in Table 2,* is expected to increase about 38 percent during the period, increasing from about 2.1 billion rubles in 1959 to about 2.9 billion rubles in 1965.

Although the absolute amount to be invested during 1959-65 will be substantially greater than that invested during 1951-58, the average annual rate of growth of investment, as shown in Figure 1,** will be less rapid. Whereas the total investment in public post and telecommunications for the previous 7 years grew at an average annual rate of about 14 percent, the rate of growth during 1959-65 will be only about 6 percent. The higher rate during 1951-58 reflects the low level of investment at the beginning of the period.

Of the 16.6 billion rubles to be invested during the Seven Year Plan period, investment by the Ministry of Communications will account for about 14 billion rubles and local investment for about 2.6 billion rubles. These estimates are based on announcements which state that investment by the Ministry during 1959-65 would be more than double that during 1952-58. It is anticipated that the annual investment by the Ministry of Communications, as shown in Table 2,* will increase from about 1.7 billion rubles in 1959 to about 2.5 billion rubles in 1965, an increase of about 47 percent. Although the absolute amount of total local investment during 1959-65 will be greater than that during 1951-58, the annual local investment during 1959-65 will increase only slightly, from about 397 million rubles in 1959 to about 402 million rubles in 1965. The annual investment by the Ministry during 1959-65, shown in Figure 1,** will be somewhat more consistent than the annual local investment.***

* Table 2 follows on p. 24.
** Following p. 22, above.
*** Text continued on p. 33.

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/*
1959-65

Million 1 July 1955 Rubles

	1959	1960	1961	1962	1963	1964	1965
Postal investment b/	314.6	325.0	332.2	344.4	354.2	382.1	435.4
Telecommunications investment c/	1,782.8	1,841.8	1,882.2	1,951.7	2,006.8	2,165.5	2,467.1
Telephone	188.5	229.0	260.7	306.5	338.1	470.5	726.1
Urban d/	78.2	97.9	109.4	133.7	144.4	178.2	213.8
Manual	3.5	2.4	1.6	1.4	0.8	0.5	0.3
Automatic	74.7	95.4	107.7	132.3	143.6	177.7	213.6
Rural e/	12.3	13.5	14.1	16.0	17.3	17.9	22.3
Manual	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Automatic	5.1	6.3	6.9	8.8	10.1	10.7	15.1
Interurban f/	98.0	117.6	137.2	156.8	176.4	274.4	490.0
Telegraph	39.3	48.1	56.9	62.4	66.5	70.8	73.5
Regular g/	26.0	26.0	26.0	26.0	26.0	26.0	26.0
Subscriber h/	12.1	20.9	29.7	35.4	39.8	44.2	47.0
Facsimile i/	1.2	1.2	1.2	1.0	0.8	0.6	0.4

* Footnotes for Table 2 follow on p. 27.

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/
1959-65
(Continued)

Million 1 July 1955 Rubles

	1959	1960	1961	1962	1963	1964	1965
Common telecommunications facilities	701.3	769.4	842.6	885.7	934.3	976.3	1,036.0
Wirelines j/	512.6	571.6	623.4	664.2	700.2	729.4	782.7
Trunk and secondary	197.4	224.0	252.0	280.0	294.0	294.0	308.0
Intrarayon	77.1	106.4	119.7	119.7	119.7	119.7	119.7
Multiconductor cable	210.0	215.0	230.0	245.0	270.0	300.0	340.0
Coaxial cable	28.1	26.2	21.8	19.5	16.5	15.8	15.0
Microwave k/	129.2	143.5	172.2	177.9	195.2	215.2	229.6
Point-to-point radio l/	59.5	54.2	46.9	43.5	39.0	31.6	23.7
Long range	5.7	4.6	3.4	2.5	2.3	1.5	1.0
Intraoblast	5.8	5.2	4.8	4.2	3.5	2.8	1.2
Intrarayon	21.2	17.5	16.1	13.1	11.7	8.0	4.4
Urozhay (harvest)	25.2	25.2	21.0	21.0	16.8	12.6	8.4
Tropospheric scatter	1.0	1.0	1.0	2.0	4.0	6.0	8.1
Ionospheric scatter	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/
1959-65
(Continued)

Million 1 July 1955 Rubles

	1959	1960	1961	1962	1963	1964	1965
Broadcasting	677.7	647.4	594.0	573.1	547.9	530.8	516.6
Radiobroadcasting m/	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Wire diffusion	193.2	162.9	134.0	113.1	93.4	76.3	62.1
Urban n/	46.0	28.9	16.2	12.6	7.2	3.6	2.7
Wire-diffusion centers	7.7	4.9	2.7	2.1	1.2	0.6	0.5
Wired loudspeakers	38.2	24.0	13.5	10.5	6.0	3.0	2.2
Rural o/	147.2	134.0	117.8	100.5	86.1	72.7	59.3
Wire-diffusion centers	31.7	29.0	25.5	21.7	18.6	15.7	12.8
Wired loudspeakers	115.5	105.0	92.2	78.8	67.5	57.0	46.5
Television p/	472.0	472.0	447.5	447.5	442.0	442.0	442.0
Centers	285.0	285.0	266.0	266.0	266.0	266.0	266.0
Relay stations	187.0	187.0	181.5	181.5	176.0	176.0	176.0

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR a/
1959-65
(Continued)

Million 1 July 1955 Rubles

	1959	1960	1961	1962	1963	1964	1965
Housing g/	176.0	148.0	128.0	124.0	120.0	117.0	115.0
Total public post and telecommunications investment r/	2,097	2,167	2,214	2,296	2,361	2,548	2,902
Ministry of Communications investment r/ s/ t/	1,700	1,800	1,850	1,950	2,000	2,200	2,500
Local investment r/ u/	397	367	364	346	361	348	402

a. All data are rounded to the nearest hundred thousand rubles unless otherwise indicated. Totals were derived from unrounded data and may not agree with the sum of the rounded components shown.
b. Estimated on the assumption that telecommunications investment comprised 85 percent of the total investment and that the remaining 15 percent was postal investment.

50X1
50X1

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR
1959-65
(Continued)

c. Investment for each of the facilities was derived by applying known and estimated data on equipment costs and installation to known and estimated data on telecommunications facilities, as shown for specific facilities. For the most part, the data used on equipment costs and installation were the same as those used for 1951-58. Some adjustments were made, however, to account for the higher cost of more modern facilities planned for installation during 1959-65. Most important of these were multiconductor cable, coaxial cable, and microwave radio relay.
d. The sum of investment in urban manual and automatic telephone facilities. Investment in urban manual telephone facilities was computed by multiplying the growth of urban manual telephone exchange capacity, from Table 4 (p. 48, below), by the average investment cost of 270 rubles per number. This figure for the investment cost includes both equipment and line installation costs, of which 30 percent was estimated to be equipment cost and 70 percent line installation cost. 37/ Investment in urban automatic telephone facilities was computed by multiplying the growth of urban automatic telephone exchange capacity, from Table 4, by the average investment cost of 945 rubles per number. The investment cost in one number served by an automatic telephone exchange was estimated to be 3.5 times that in one number served by a manual exchange. 38/
e. The sum of investment in rural manual and automatic telephone facilities. Investment in rural manual telephone facilities was computed by multiplying the growth of rural manual telephone exchange capacity, from Table 4, by the average investment cost of 180 rubles per number. This average investment cost includes costs of both equipment and line installation, of which 20 percent was estimated to be equipment cost and 80 percent line installation cost. 39/ Investment in rural automatic telephone facilities was computed by multiplying the growth of rural automatic telephone exchange capacity, from Table 4, by the average investment cost of 630 rubles per number. The investment cost in one number served by an automatic telephone exchange was estimated to be 3.5 times that in one number served by a manual exchange. 40/

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR
1959-65
(Continued)

f. Computed by multiplying the growth of length of interurban telephone channels, from Table 5 (p. 49, below), by the average investment cost of 196 rubles per channel kilometer. 41/
g. Computed by multiplying the growth of telegraph apparatus in use, from Table 6 (p. 50, below), by the average investment cost of 13,000 rubles per apparatus. 42/ This average investment cost includes both equipment and installation costs, of which 60 percent was estimated to be equipment cost and 40 percent installation cost.
h. Computed by multiplying the growth of subscribers, from Table 7 (p. 51, below), and the growth of subscriber telegraph exchanges, from Table 8 (p. 52, below), by the average investment cost of 4,000 rubles and 2,500 rubles, respectively. 43/
i. Computed by multiplying the growth of cities with facsimile service, from Table 9 (p. 53, below), by the average investment cost of 75,000 rubles per apparatus per city. It was assumed that there were two facsimile apparatuses in each city.
j. The sum of investment in trunk and secondary, intrarayon, multiconductor, and coaxial cable lines. Investment in these facilities was computed by multiplying their growth, from Table 10 (p. 54, below), by the average investment cost of 14,000 rubles, 1,330 rubles, 50,000 rubles, and 75,000 rubles, respectively. These average investment cost figures include both equipment and installation costs. 44/
k. Computed by multiplying the growth of microwave radio relay lines, from Table 11 (p. 55, below), by the average investment cost of 57,400 rubles per kilometer. This figure for the average investment cost includes both equipment and installation costs. 45/
l. The sum of investment in long-range, intraoblast, intrarayon, urozhay, tropospheric scatter, and ionospheric scatter point-to-point radio facilities. Investment in these facilities, except tropospheric and ionospheric scatter, was computed by multiplying their growth, from Table 12 (p. 56, below), by the average investment cost of 190,000 rubles, 25,000 rubles, 7,300 rubles,

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR 1959-65 (Continued)

and 4,200 rubles, respectively. These figures for average investment cost include both equipment and installation costs. 46/ Investment in tropospheric and ionospheric scatter facilities was estimated on the basis of the amount necessary to install the tropospheric scatter link between Frunze and Przheval'sk and the ionospheric scatter link between Leningrad and Murmansk, from Table 1 (p. 14, above).

m. Computed by multiplying the number of amplitude-modulated (AM) radiobroadcasting transmitters placed in operation, from Table 13 (p. 57, below), by the average investment cost of 1,250,000 rubles per transmitter. This figure for average investment cost includes both equipment and installation costs, of which 40 percent was estimated to be equipment cost and 60 percent installation cost. 47/ The total investment in radiobroadcasting does not include investment in frequency-modulated (FM) radiobroadcasting facilities, because in the USSR most of these facilities are housed in the buildings of television centers. Because of obscurities in the data reported, it was not feasible to allocate a portion of the total investment in major television centers to FM radiobroadcasting.

n. The sum of investment in urban wire-diffusion centers and urban wired loudspeakers. Investment in urban wire-diffusion centers was computed by multiplying the number of urban wire-diffusion centers installed, from Table 14 (p. 58, below), by the average investment cost of 18,000 rubles per center. 48/ Investment in urban wired loudspeakers was computed by multiplying the number of urban wired loudspeakers installed, from Table 15 (p. 59, below), by the average investment cost of 75 rubles per loudspeaker. 49/ These figures for the average investment cost include both equipment and installation costs.

o. The sum of investment in rural wire-diffusion centers and rural wired loudspeakers. Investment in rural wire-diffusion centers was computed by multiplying the number of rural wire-diffusion centers installed, from Table 14 (p. 58, below), by the average investment cost of

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR 1959-65 (Continued)

10,000 rubles. 50/ Investment in rural wired loudspeakers was computed by multiplying the number of rural wired loudspeakers installed, from Table 15 (p. 59, below), by the average investment cost of 75 rubles per loudspeaker. 51/ These figures for the average investment cost include both equipment and installation costs.

p. The sum of investment in television centers and television relay stations. Investment in television centers was computed by multiplying the number of television centers placed in operation, from Table 16 (p. 60, below), by the average investment cost of 19 million rubles. 52/ Investment in television relay stations was computed by multiplying the number of television relay stations placed in operation, from Table 16, by the average investment cost of 5.5 million rubles. These figures for the average investment cost include both equipment and installation costs. Because of obscurities in the data reported, investment in television centers includes investment in FM radiobroadcasting facilities.

q. Including state and local investment as well as investment in housing for postal workers. [redacted] which indicated that during 1959-65 the Ministry of Communications would invest 464 million rubles in housing construction. It was assumed that local sources would invest an equivalent sum. The combined figure (928 million rubles) was then extrapolated, using graphic analysis. Data for housing investment in 1951-58, from Table 1 (p. 14, above), served as the basis for this extrapolation. 50X1

r. Rounded to the nearest million rubles.

s. Total investment in the Ministry of Communications during 1959-65 was estimated to be about 14.0 billion rubles. [redacted] which indicated that investment in the Ministry of Communications during 1959-65 would be more than double that of the preceding 7 years. The total investment during 1952-58 was about 6.9 billion rubles. 50X1

Table 2

Estimated Total Investment in Public Post and Telecommunications Facilities in the USSR
1959-65
(Continued)

t. Extrapolated, using graphic analysis. Investment data for 1951-58, from Table 1 (p. 14, above), served as the basis for the extrapolation.
u. Computed by subtracting investment by the Ministry of Communications from the total investment in public post and telecommunications facilities. The remainder was assumed to be local investment.

Throughout the period, anticipated growth in investment by the Ministry will parallel anticipated growth in the total investment in public post and telecommunications.

The percentage relationship of investment of the Ministry of Communications and local investment to the total investment in public post and telecommunications for the years 1959-65 is shown in Figure 4.* During 1959-65 the proportion of Ministry investment to the total investment will be somewhat higher than that during 1951-58, averaging about 84 percent compared with the previous 77 percent. The proportion, however, will vary for individual years, ranging from about 81 percent in 1959 to about 86 percent in 1965. Although the over-all contribution of local investment to the total investment during 1959-65 will decrease in percentage terms compared with 1951-58, it will increase in absolute terms. Local investment will contribute significantly to the development of television, wire-diffusion, and housing facilities during the period.

It is estimated that during 1959-65 investment in telecommunications will comprise 85 percent of the total investment in public post and telecommunications and that investment in postal services will comprise the remaining 15 percent. This composition of the total investment is the same as that for 1951-58. With the exception of investment in common telecommunications facilities, the percentage distribution of the total investment in telecommunications will show marked changes throughout the period. The most significant of these changes, shown in Figure 3,** will be in investment in telephone and investment in broadcasting. In 1959, investment in telephone probably was only about 11 percent of the total investment in telecommunications whereas in 1965 it will have increased to about 29 percent. This growth reflects the increased emphasis that is expected to be placed on expanding and developing the urban and interurban telephone networks of the country. Investment in broadcasting for the period 1959-65 will decrease progressively, both in absolute terms and as a percent of the total investment in telecommunications: whereas such investment accounted for about 38 percent of such investment in 1959, it will account for only about 21 percent in 1965. This decline will result primarily from the decreased investment in wire-diffusion facilities. These facilities were relatively well developed at the start of the plan period, and lessened growth in this field is expected in the future.

The investment data cited above are based primarily on interpretations of information contained in the Seven Year Plan for expanding and developing the post and telecommunications sector of the

* Following p. 34.
** Following p. 22, above.

Soviet economy. The plan emphasizes the concerted effort to be made to meet current and future needs for service associated with the anticipated economic growth of the country. The major objectives of the plan are as follows:

1. Increasing the length of microwave radio relay lines 740 percent.

2. Increasing the length of multiconductor and coaxial cable lines 100 percent.

3. Increasing the length of interurban telephone channels 190 percent.

4. Increasing urban telephone exchange capacity 50 percent.

5. Replacing existing manual telephone exchanges in large cities with automatic telephone exchanges.

6. Increasing rural telephone exchange capacity 75 percent.

7. Expanding the television broadcasting transmission base 167 percent.

8. Expanding the radiobroadcasting transmission base 60 percent.

9. Increasing the installed capacity of the subscriber telegraph network 2,000 percent.

10. Expanding the phototelegraph network to provide service among republic, oblast, and large industrial centers.

11. Introducing tropospheric and ionospheric scatter facilities in areas where it is not feasible to construct wirelines or microwave radio relay lines.

12. Expanding postal volume through the increased use of mechanization techniques and through the construction of additional postal facilities.

Implementation of most of the stated objectives of the Seven Year Plan will require large outlays of capital funds throughout the plan period. This fact is partly reflected in Figure 5,* which

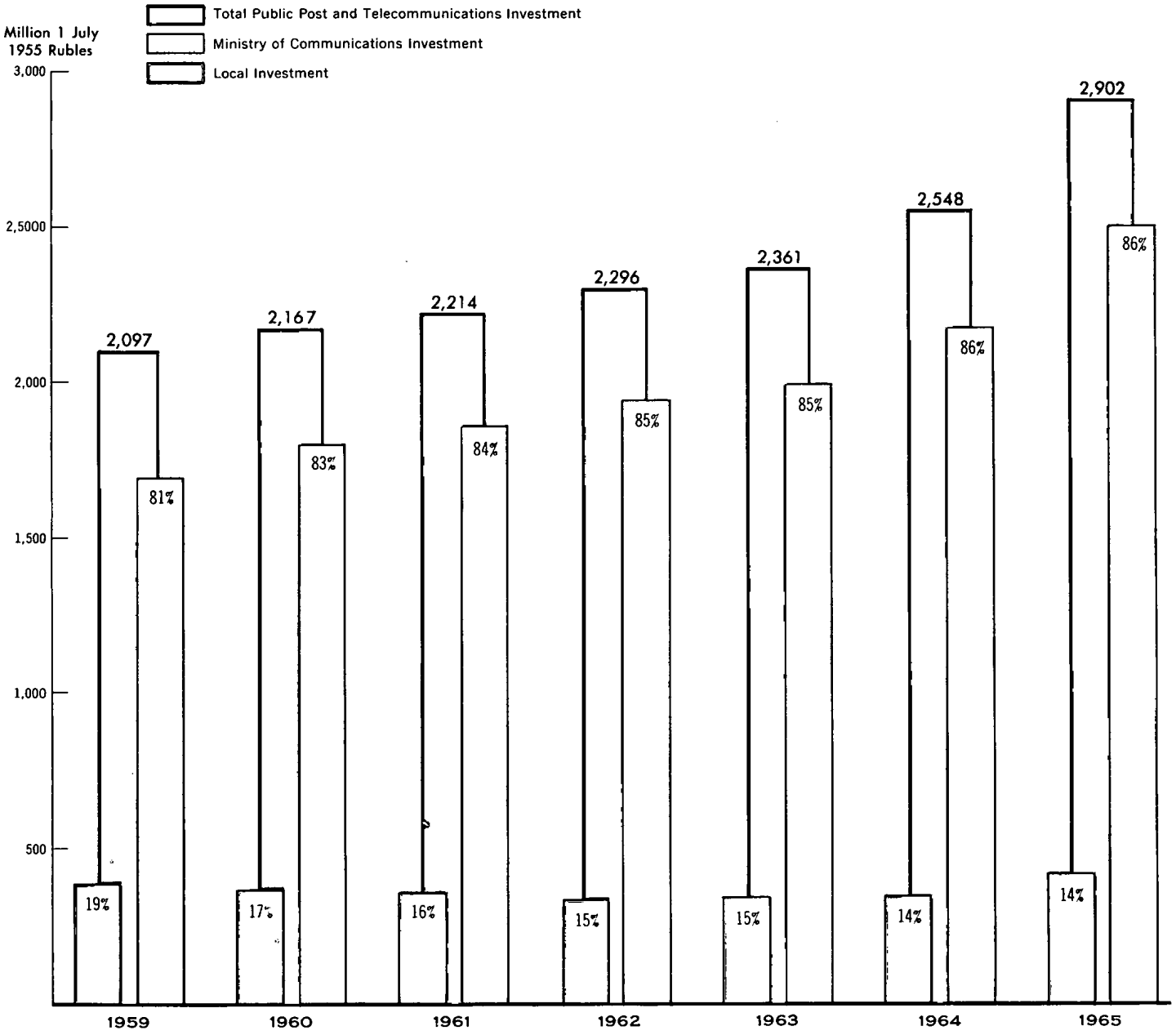
* Following p. 34.

50X1

Figure 1

USSR

PERCENTAGE DISTRIBUTION OF TOTAL PUBLIC POST AND TELECOMMUNICATIONS INVESTMENT, 1959-65



28307 2-60

50X1

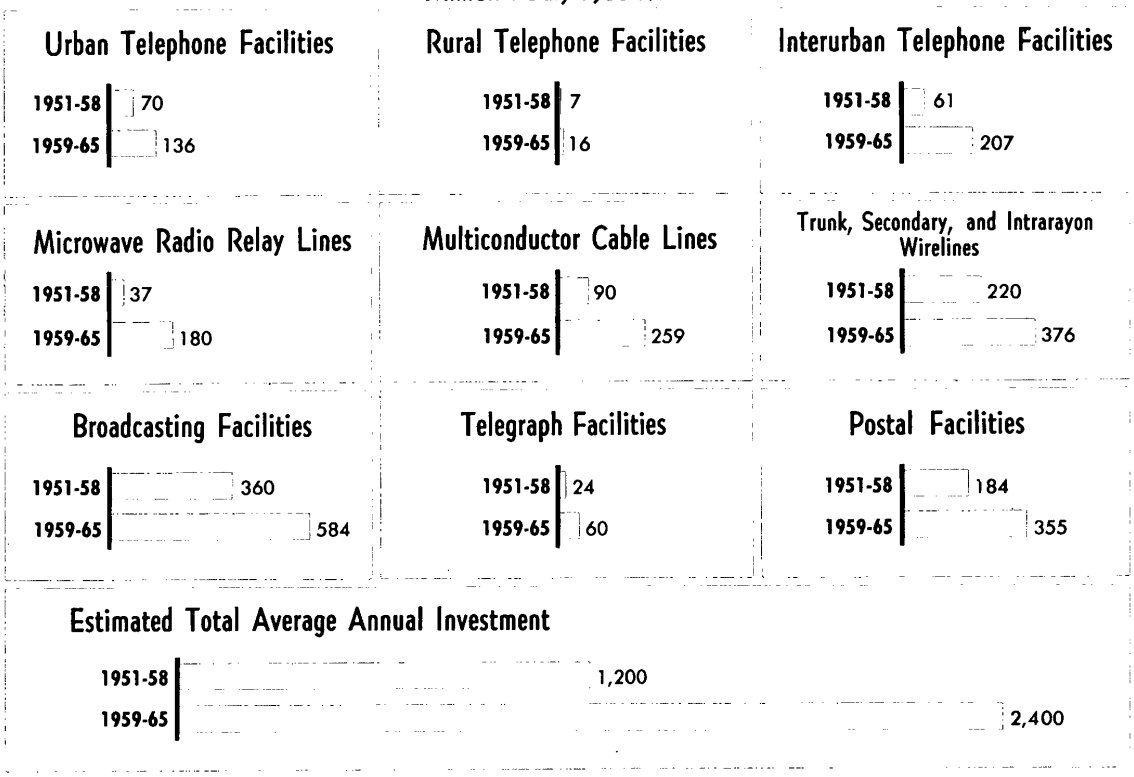
Figure 5

50X1

USSR

AVERAGE ANNUAL INVESTMENT IN PUBLIC POST AND TELECOMMUNICATIONS FOR 1951-58 AND 1959-65

Million 1 July 1955 Rubles



50X1

28308 2-60

indicates that the average annual investment during 1959-65 will be twice that during 1951-58. This increase in the average annual investment coupled with the fact that no appreciable change is expected to occur in the growth of the post and telecommunications labor force indicates that investment during 1959-65 will also be more capital-intensive than that during 1951-58.

Although the plan for the development of post and telecommunications resources during 1959-65 is ambitious, it is realistic. The plan addresses itself to eliminating one of the major deficiencies of the telecommunications system -- the lack of modern, high-capacity telecommunications facilities. If the plan is to be wholly fulfilled, however, substantial increases in the availability of modern telecommunications equipment will be necessary. In the past, communications ministries and enterprises have experienced difficulties in acquiring necessary equipment and materials. For example, it was reported that in 1958 the nonavailability of equipment was the main problem confronting Uzbek SSR in attempts to develop its post and telecommunications resources. If equipment becomes available to the Ministry of Communications in sufficient amounts, fulfillment of the Seven Year Plan is highly probable. Successful completion will result in a post and telecommunications system capable of making a fuller contribution to the growing economic and military activities of the country. 55/

C. Ministry of Communications Investment Related to Total State Centralized Investment, 1951-65

State centralized investment in post and telecommunications in the USSR is believed to have been inadequate during 1951-58. The total state centralized investment for the over-all development of the Soviet economy during this period was about 1,167 billion rubles. Of this amount, investment funds allocated to the Ministry of Communications were only about 7.5 billion rubles, or less than 1 percent of the total. Although the rate of growth of Ministry investment, shown in Figure 6,* was greater than that of total state centralized investment during 1951-58, the relatively small amount of investment funds allocated to the Ministry limited the development of facilities to a rate that was too low to keep pace with the rate of development of the economy as a whole. This limited growth in post and telecommunications facilities was the primary factor causing the supply of service to lag behind the demand for service.

The percentage relationship of investment of the Ministry of Communications to total state centralized investment since 1951 is summarized in Table 3.** The data vividly point up the low level

* Following p. 36.
** Table 3 follows on p. 37.

of centralized investment funds made available to the post and telecommunications sector compared with the economy as a whole. In 1958, for example, whereas the share of total state centralized investment allocated to post and telecommunications was only about 0.7 percent, available information indicates that the share allocated to transportation was about 10 percent. Allocations of the total state centralized investment to the industrial and agricultural sectors in that same year were about 64 percent and 15 percent, respectively. 56/

It is estimated that during the Seven Year Plan period investment of the Ministry of Communications will be about 14 billion rubles, whereas the total state centralized investment will be about 1,971 billion rubles. State centralized funds allocated to the Ministry during each year during 1959-65, as shown in Table 3, will remain less than 1 percent of the total.

The average annual rate of growth of Ministry investment during 1959-65, shown in Figure 6,* will be as rapid as that of total state centralized investment, 8.6 percent compared with 8.5 percent. The comparability of both rates of growth suggests that the existing gap between the available supply of service and the demand for service will not be narrowed. For the most part, however, the rate of growth of Ministry investment is heavily influenced by the decreasing rate of investment in broadcasting facilities that will develop during the period. The rate of growth of investment in mainline high-capacity facilities such as multiconductor cable and microwave radio relay lines (which are in short supply) will be substantially higher than the rate of growth for the economy as a whole, amounting to about 17.5 percent and about 23.0 percent, respectively. Under the circumstances the level of investment in these facilities will go a long way toward narrowing the gap between supply and demand for service.

D. Marginal Capital-Output Ratio, 1951-65

The marginal capital-output ratio** in the public post and telecommunications sector of the economy of the USSR is expected to be about 1.53 to 1 during 1951-65. This ratio indicates that additions to capital stock during the period will be highly productive. The use of this

* Following p. 36.

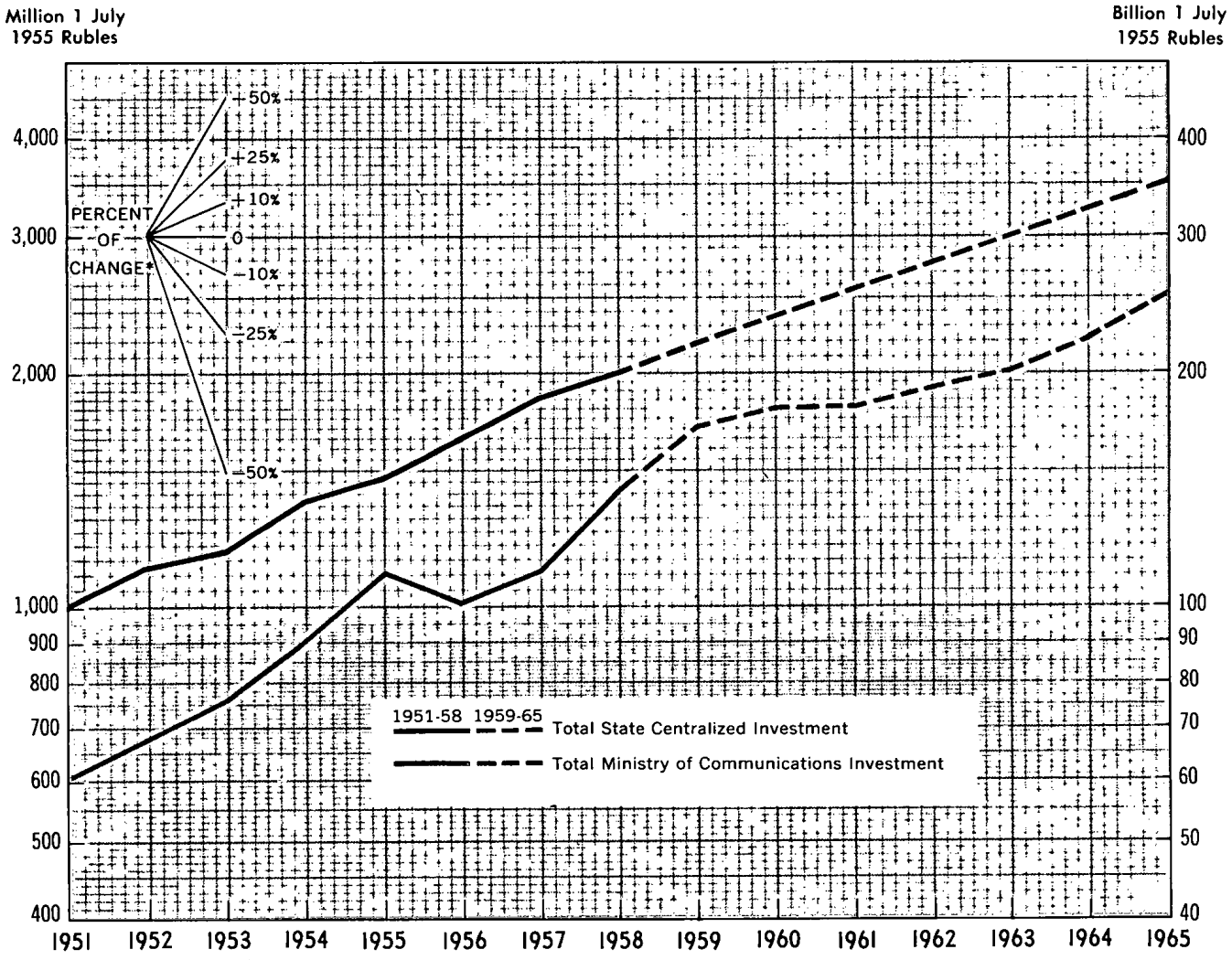
** Hereafter referred to as the capital-output ratio. The term is defined as the ratio between investment and the resulting increase in output, measured in terms of revenue. The capital-output ratios discussed in this report were computed by dividing the total investment in public post and telecommunications facilities, from Table 1 (p. 14, above) and from Table 2 (p. 24, above), by increases in revenue from public post and telecommunications services, from Table 17 (p. 61, below).

Figure 6

50X1

USSR

RATES OF GROWTH OF TOTAL STATE CENTRALIZED INVESTMENT AND MINISTRY OF COMMUNICATIONS INVESTMENT, 1951-65



* *The slope of the lines of the graph, when related to this scale, gives an approximation of the percentage change from one year to the next.*

28309 2-60

50X1

Table 3

Investment by the Ministry of Communications as a Percent of State Centralized Investment in the USSR a/
1951-65

Year	Investment by the Ministry of Communications b/ (Billion 1 July 1955 Rubles)	State Centralized Investment c/ (Billion 1 July 1955 Rubles -- New Unit Evaluation d/)	Investment by the Ministry of Communications as a Percent of State Centralized Investment
1951	0.606	101	0.60
1952	0.675	113	0.60
1953	0.760	118	0.64
1954	0.900	137	0.66
1955	1.10	147	0.75
1956	1.00	166	0.60
1957	1.10	185	0.60
1958	1.40	200	0.70
1959	1.70	219	0.78
1960	1.80	237	0.76
1961	1.85	257	0.72
1962	1.95	278	0.70
1963	2.00	301	0.66
1964	2.20	326	0.68
1965	2.50	353	0.71

a. All data are rounded to three significant digits except percentages, which are rounded to two significant digits.

Table 3

Investment by the Ministry of Communications as a Percent of State Centralized Investment in the USSR
1951-65
(Continued)

b. Data for 1951-58 are from Table 1 (p. 14, above), and data for 1959-65 are from Table 2 (p. 24, above).
c. 57/
d. Prices of 1 July 1955 adjusted for new regional prices and wage norms introduced in 1956. This adjustment increased capital investment costs for the whole economy slightly more than 4 percent. In contrast to column 2, data in column 1 were not of sufficient magnitude to justify application of the 4-percent correction that had been included in Soviet statistics.

ratio as an absolute measure of the productivity of capital for the post and telecommunications sector as a whole, however, is limited by several important factors, as follows:

1. The prices charged for public post and telecommunications services may be unusually high in relation to the investment costs of these services. In 1958, for example, the Ministry of Communications was to charge the Kiev Electric Powerplant 3.5 million rubles per year for the leasing of five telecommunications channels. The total cost for the construction of these facilities was only 1.2 million rubles, and the annual operating cost was only 45,000 rubles. If this example is typical of the pricing policies of the Ministry of Communications, then the highly favorable capital-output ratio for public post and telecommunications is not an accurate reflection of the physical productivity of capital but rather is a reflection of an inordinately high price charged for telecommunications service. 58/

2. The use of annual investment data rather than total capital assets for the computation of the over-all capital-output ratio may have affected the ratio significantly. A large base of relatively unproductive capital assets would obviously outweigh the influence of a more favorable ratio resulting from the recent additions of highly productive capital assets.

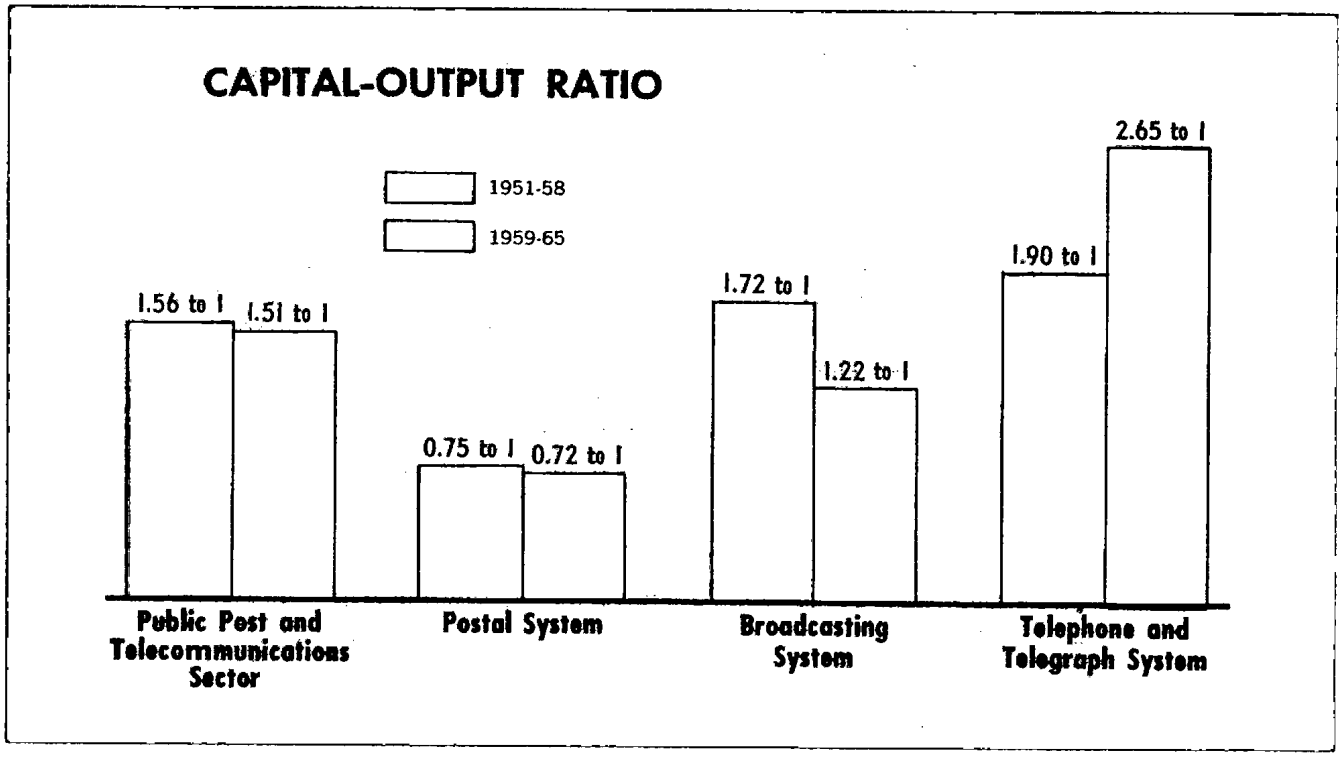
3. The computation of the capital-output ratio for the entire public post and telecommunications sector combines various investment-revenue relationships that are sufficiently dissimilar to make the average less meaningful.

A comparison of the capital-output ratios both for the public post and telecommunications sector as a whole and for its subsectors for the periods 1951-58 and 1959-65 is shown below.*

This comparison clearly shows that the postal, the broadcasting, and the telephone and telegraph subsectors actually are three distinct entities, the capital-output ratios of which bear little similarity either to one another or to the over-all capital-output ratio for the public post and telecommunications sector.

In the postal system the capital-output ratio reflects an extremely high return on new investment during both periods. This high return, however, probably is attributable more to increases in

* The data covered by the various capital-output ratios were adjusted to reflect a lag as observed from the data in Figure 7 (following p. 40) and to eliminate the effect of price changes for broadcasting services in 1952-53. Consequently, the capital-output ratios are only representative of the stated time periods.



the postal labor force than to increases in investment. This assumption is based on the belief that an expansion in postal volume, which in turn effects an expansion in postal revenue, generally is accomplished through relatively light inputs of capital coupled with heavy inputs of labor.

In the broadcasting system the capital-output ratio also reflects a high productivity of new investment. Much of the exceptional nature of this ratio, however, lies in the fact that, with the exception of investment in wire-diffusion service, broadcasting investment includes only the cost of transmitting facilities. Investment in wire-diffusion service includes the cost of both transmitting and receiving facilities. Thus the broadcasting system obtains revenue from all receiving facilities but only invests in receiving facilities in the wire-diffusion service.

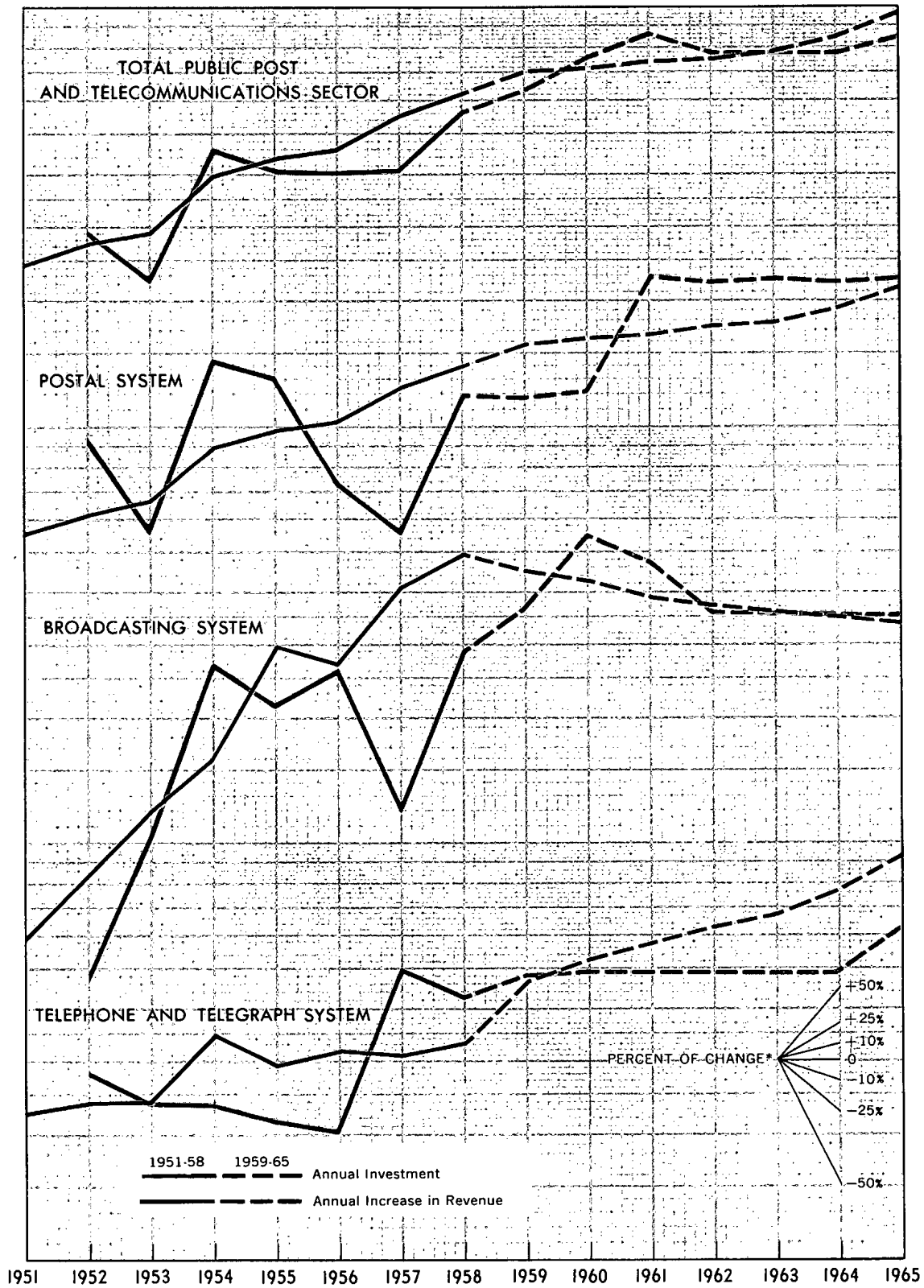
Another factor contributing to the favorable capital-output ratio in the broadcasting system is that in providing radiobroadcasting or television service to an area, usually only one transmitter*

* In television broadcasting a single broadcasting unit includes one transmitter for broadcasting the video portion of the signal and another transmitter for broadcasting the audio portion of the signal.

Figure 7 50X1

USSR

PUBLIC POST AND TELECOMMUNICATIONS INVESTMENT AND INCREASES IN PUBLIC POST AND TELECOMMUNICATIONS REVENUE, 1951-65



* *The slope of the lines of the graph, when related to this scale, gives an approximation of the percentage change from one year to the next.*

50X1

is necessary regardless of the number of radiobroadcast or television receivers in the area. In an expanding economy, therefore, the returns on investment in radiobroadcasting and television transmitting facilities continually increase throughout the life of these facilities. The more favorable capital-output ratio of the broadcasting system during 1959-65 compared with 1951-58 is attributed to this fact as well as to the fact that during 1959-65 investment in wire-diffusion service will decrease in relation to investment in other broadcasting services.

The capital-output ratio is less favorable for the telephone and telegraph system than it is for the postal and broadcasting systems -- 1.90 to 1 compared with 0.75 to 1 and 1.72 to 1, respectively, for 1951-58 and 2.65 to 1 compared with 0.72 to 1 and 1.22 to 1, respectively, for 1959-65. The capital-output ratio for the telephone and telegraph system, however, particularly during 1959-65, is comparable to the capital-output ratio for similar investment in the US during 1950-56, which was about 2.76 to 1 for telephone carriers.*

The less favorable capital-output ratio for the telephone and telegraph system during 1959-65 compared with 1951-58 is attributed to a shift in the pattern of investments. During most of the 1951-58 period, telephone and telegraph output was expanded by applying relatively inexpensive equipment to existing facilities. Telephone carrier equipment was installed on existing wirelines, and teletype apparatus replaced manual Morse equipment. By 1956 these methods for expanding output were rapidly being exhausted. Both the discarded Sixth Five Year Plan and the new Seven Year Plan emphasized the expansion of output through the construction of new, high-capacity facilities such as microwave radio relay and multi-conductor cable lines. Most of the investment for the construction of these facilities, which are heavy users of capital, will occur during 1959-65, but full service utilization will not occur until later. As a consequence, investment per unit of output will be greater during 1959-65 than in 1951-58.

A comparison of the annual investment in public post and telecommunications and the annual increases in the revenue from public post and telecommunications, shown in Figure 7,** illustrates some significant relationships. There is a lag of about 1 year between changes in investment and corresponding changes in revenue. This lag is most readily seen during 1955-65.

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* Computed from investment and revenue data for Class A telephone carriers [redacted] 50X1

** Following p. 40, above.

In the postal system, no consistent relationship exists between changes in postal investment and changes in postal revenue. This situation probably is attributable to the fact that investment in the postal system is reflected primarily in increased efficiency and lower operating costs and only secondarily in increased revenue. Increases in postal revenue are associated more with increases in the postal labor force than with increases in investment.

In the broadcasting system a relatively consistent relationship exists between changes in broadcasting investment and changes in broadcasting revenue, assuming a lag of about 1 or 2 years. The changes in revenue compared with the changes in investment vary. These fluctuations, however, are inherent in the nature of broadcasting investment. For example, sizable increases in radiobroadcasting and television revenue occur when these services are introduced into areas not already served. The expansion of these services in areas already served, however, will not produce comparable increases in revenue.

A relatively consistent relationship also exists between changes in telephone and telegraph investment and changes in telephone and telegraph revenue, assuming a lag of about 3 years. A lag of several years is not unusual for returns on investment in these facilities, because the capacities of newly installed telephone and telegraph facilities are seldom fully utilized during the early years of their operation.

The increased cost associated with the construction and installation of modern, high-capacity telecommunications facilities during 1959-65 will be partly offset by economies resulting from reductions in operating costs per unit of output. Reduced operating costs will result from decreased labor costs per unit of output and increased capacity for handling traffic per unit of time. 60/

IV. Influence of Intra-Bloc Agreements on Investment

The level and pattern of investment in post and telecommunications in the USSR is influenced not only by domestic requirements for service but also by international requirements. Most important of these international requirements is the desire of the USSR to establish a unified post and telecommunications system within the Sino-Soviet Bloc that would allow the USSR to exercise increased economic and political control over the other Bloc countries and contribute to the over-all military potential of the Bloc.

The first known step taken by the USSR for the establishment of a Bloc-wide, integrated telecommunications system occurred in 1950, when the USSR directed Rumania to construct a special telecommunications network for use in the event of general mobilization or emergency. This network was to be part of a special telecommunications network encompassing all countries of the Soviet Bloc, excluding Albania. On completion the Rumanian network was to connect with the telecommunications networks of the USSR, Bulgaria, and Hungary. Completion of the

network was originally scheduled for 1955, but the economic crisis in Rumania in 1953-54 delayed completion until 1960. 61/

In 1956 the USSR initiated another, more intensive move to overcome the lack of a unified post and telecommunications system within the Bloc. Beginning in that year, a series of at least 11 Soviet Bloc conferences related to this subject were held at the behest of the USSR. In consequence of these meetings, a new group known as the Organization for Cooperation Among Socialist Countries in the Fields of Post and Communications (OSS) was formed in late 1957. There are some indications that this new body is associated with, but not a part of, the Council for Mutual Economic Assistance (CEMA).

The OSS organization is mainly concerned with integrating and expanding the post and telecommunications systems and services of its member countries. The major objectives of the organization include making all Bloc telecommunications systems partly automatic by 1965 and fully so by 1975, accelerating telegraph traffic between member countries, and establishing microwave radio relay stations for use in an East Bloc television network to be completed by 1965. It is believed that each country will provide the funds to finance its share of the OSS program, with possibly some financial help from the USSR for the more underdeveloped Bloc countries. The importance attached to the OSS program is indicated by the report that the Hungarian economic plan of 1958 was altered to provide funds for implementation of the OSS obligations of Hungary. 62/

Because of the recent formation of OSS, it is believed that directives of the organization had only a limited effect on Soviet investment in post and telecommunications in 1958. The full effect of OSS, however, undoubtedly will be felt during the Seven Year Plan. It is not known what amount of investment resources allocated to public post and telecommunications during the Seven Year Plan will be used for implementation of the OSS program. The following plans for specific facilities, however, are believed to have been developed in response to OSS objectives 63/:

1. Installation of a cable from Moscow to Hanoi via Communist China and Outer Mongolia, planned for completion by 1962.

2. Establishment of a facility from Moscow to East Berlin via Kaliningrad, Warsaw, Lodz, and Frankfurt an der Oder, using existing underground cables between Warsaw and East Berlin and a microwave radio relay line to be constructed between Moscow and Warsaw, planned for completion by late 1960.

3. Construction of a microwave radio relay line from Moscow to East Berlin via Brno, Prague, and Dresden, for completion in 1962.

4. Installation of an underground, 4-tube coaxial cable line from Moscow to East Berlin via Kiev, L'vov, and Katowice, for completion by mid-1964. Two tubes will carry television signals and the other two will carry multiple-channel carrier systems. Eventually, this line will be extended to Peking.

When these facilities are completed, all of the capitals of the Sino-Soviet Bloc will be interconnected either by cable (multiconductor or coaxial) or by microwave radio relay lines. These facilities will provide a substantial increase over present capacities and will be a major step toward fulfillment of the long-run plans of OSS for the complete integration of all telecommunications systems of the Sino-Soviet Bloc.

V. Future Trends

The accelerated growth of key sectors of the Soviet economy that is planned for the period 1959-65 will result in increased demands for post and telecommunications service. Plans for the development of post and telecommunications during this period recognize this fact and indicate that an intensive effort will be made to construct and install high-capacity, basic telecommunications facilities in sufficient quantities to meet these demands. Implementation of plans for expansion of post and telecommunications will require that the Ministry of Communications be given more investment funds and equipment than in the past. If these increases are forthcoming, the Ministry may pursue the following courses of action:

1. Install about 20,000 km of microwave radio relay lines for transmission of interurban telephone and telegraph traffic and for transmission of network television.

2. Install about 30,000 km of multiconductor cable lines (including coaxial cable) for increasing interurban telephone and telegraph circuit capacity. Expansion of multiconductor cable facilities, however, will be contingent on the availability of equipment from either domestic production or importation from various Free World and Soviet Bloc countries. Indications are that domestic output is not currently meeting internal needs for such equipment. In early 1959 the USSR sought to import a large quantity of multiconductor cable from various NATO countries. This action was taken in spite of the fact that the type of multiconductor communications cable that was sought is under embargo.

3. Increase urban telephone exchange capacity by about 1 million lines, of which more than 90 percent will be automatic.

4. Increase rural telephone exchange capacity by about 380,000 lines, of which more than 25 percent will be automatic.

5. Expand the subscriber telegraph network by about 58,000 subscribers. The expansion of subscriber telegraph facilities is needed primarily to meet increased telegraphic service requirements resulting from the industrial reorganization.

6. Expand the facsimile network to provide service to at least 60 additional cities compared with 1957. By the end of 1965, facsimile service will be available at 125 major cities and industrial centers.

7. Expand the television broadcasting transmission base by construction of about 100 major television stations and about 230 television relay stations.

8. Expand the radiobroadcasting transmission base through the construction of AM, FM, and wire-diffusion radiobroadcasting facilities.

9. Expand the use of tropospheric and ionospheric scatter facilities. It is expected that this communications technique will be used extensively in the northern regions of the country and in other remote areas where it is not economically or technically feasible to construct wirelines or microwave radio relay lines.

10. Take all actions necessary for implementation of OSS directives.

11. Expand postal services through the construction of 18 main post offices, 27 railroad post offices, 30 mail transport offices, and several thousand branch communications offices. In addition, equipment will be introduced to speed the handling and delivery of mail. These actions probably will include installing semiautomatic letter-sorting machines in large post offices, doubling the number of motor vehicles carrying mail, and adding about 1,000 railroad mail cars.

The planned allocation of investment funds to the Ministry of Communications during 1959-65 appears to be sufficient for the implementation of post and telecommunications expansion plans. Increases in the supply of equipment and materials made available to the Ministry of Communications will be the prime factor on which successful completion of these plans will hinge. If these supplies become available in sufficient amounts, the completion of plans is highly probable. With such an increased physical plant, the post and telecommunications system will be able to meet new requirements for service generated both by the industrial reorganization and by the anticipated economic growth of the USSR. By so doing, the system will make a fuller contribution to the economic development of the country.

APPENDIX A

STATISTICAL TABLES

Table 4

Estimated Capacity of Telephone Exchanges Operated by the Ministry of Communications of the USSR a/
1950-65

Thousand Lines

Year	Urban			Rural		
	Manual	Automatic	Total	Manual	Automatic	Total
1950	778.0	563.0	1,341.0	233.2	0.3	233.5
1951	811.0	617.0	1,428.0	253.3	1.8	255.1
1952	844.0	689.0	1,533.0	273.2	3.6	276.8
1953	854.0	735.0	1,589.0	296.2	6.7	302.9
1954	893.0	823.0	1,716.0	331.7	9.6	341.3
1955	927.0	890.0	1,817.0	354.9	12.2	367.1
1956	944.0	960.0	1,904.0	395.2	16.1	411.3
1957	961.0	1,030.0	1,991.0	435.5	20.0	455.5
1958	978.0 b/	1,100.0 b/	2,078.0	475.8 b/	23.9 b/	499.7
1959	991.0 c/	1,179.0 d/	2,170.0	515.8 e/	32.0 d/	547.8 d/
1960	1,000.0 c/	1,280.0 d/	2,280.0	555.8 e/	42.0 d/	597.8 d/
1961	1,006.0 c/	1,394.0 d/	2,400.0	595.8 e/	53.0 d/	648.8 d/
1962	1,011.0 c/	1,534.0 d/	2,545.0	635.8 e/	67.0 d/	702.8 d/
1963	1,014.0 c/	1,686.0 d/	2,700.0	675.8 e/	83.0 d/	758.8 d/
1964	1,016.0 c/	1,874.0 d/	2,890.0	715.8 e/	100.0 d/	815.8 d/
1965	1,017.0 c/	2,100.0 f/	3,117.0	755.8 e/	123.9 f/	879.7 g/

[redacted] 50X1

b. Assuming the same absolute growth for 1957-58 as for 1956-57.
c. Computed by subtracting urban automatic exchange capacity from the total urban manual and automatic exchange capacity.
d. Interpolated, using graphic analysis.
e. Extrapolated by applying the absolute growth of 40,000 telephone numbers per year.
f. [redacted] which indicates that the capacity of automatic telephone exchanges will increase by 1.1 million lines during 1959-65. It was assumed that 1 million of these lines would be for urban use and the rest for rural use. 50X1
g. 66/

Table 5

Estimated Length of Interurban Telephone Channels Operated by the Ministry of Communications of the USSR 1950-65

Million Channel-Kilometers

Year	Length of Interurban Telephone Channels
1950	1.4 a/
1951	1.6 b/
1952	1.9 b/
1953	2.3 b/
1954	2.7 b/
1955	3.0 c/
1956	3.3 b/
1957	3.6 d/
1958	3.9 e/
1959	4.4 b/
1960	5.0 b/
1961	5.7 b/
1962	6.5 b/
1963	7.4 b/
1964	8.8 b/
1965	11.3 f/

a. 67/
b. Interpolated, using graphic analysis.
c. 68/
d. 69/
e. Assuming the same absolute growth for 1957-58 as for 1956-57.
f. 70/

Table 6

Estimated Number of Telegraph Apparatus in Use by the Ministry of Communications of the USSR a/
1950-65

Units

Year	Telegraph Apparatus
1950	26,000
1951	28,000
1952	29,000
1953	30,000
1954	32,000
1955	33,000
1956	35,000
1957	37,000
1958	39,000 b/
1959	41,000 b/
1960	43,000 b/
1961	45,000 b/
1962	47,000 b/
1963	49,000 b/
1964	51,000 b/
1965	53,000 b/

50X1

b. Extrapolated by applying the average absolute rate of growth shown during 1955-57.

Table 7

Estimated Number of Subscribers
to the Subscriber Telegraph Network
in the USSR
1950-65

Units

Year	Subscribers
1950	175 a/
1951	350 a/
1952	525 a/
1953	702 b/
1954	820 b/
1955	1,000 b/
1956	1,400 a/
1957	2,200 c/
1958	3,000 d/
1959	6,000 e/
1960	11,200 e/
1961	18,600 e/
1962	27,400 e/
1963	37,300 e/
1964	48,300 e/
1965	60,000 f/

a. Extrapolated, using graphic analysis.
b. 72/
c. 73/
d. Assuming the same absolute growth for 1957-58 as for 1956-57.
e. Interpolated, using graphic analysis.
f. 74/

Table 8

Estimated Number of Subscriber Telegraph Exchanges in the USSR
1950-65

Units

Year	Exchanges
1950	15 a/
1951	30 a/
1952	45 a/
1953	61 b/
1954	74 b/
1955	84 b/
1956	105 c/
1957	126 d/
1958	147 e/
1959	182 c/
1960	228 c/
1961	286 c/
1962	353 c/
1963	428 c/
1964	511 c/
1965	600 f/

a. Extrapolated, using graphic analysis.
b. 75/
c. Interpolated, using graphic analysis.
d. 76/
e. Assuming the same absolute growth for 1957-58 as for 1956-57.
f. Estimated on the basis of 100 subscribers per subscriber telegraph exchange.

Table 9

Estimated Number of Cities
Having Facsimile Service
in the USSR a/
1950-65

Year	Units Cities
1950	20
1951	20
1952	24
1953	27
1954	28
1955	29
1956	46 b/
1957	64 c/
1958	82 d/
1959	90 b/
1960	98 b/
1961	106 b/
1962	113 b/
1963	118 b/
1964	122 b/
1965	125 e/

[redacted] 50X1

b. Interpolated, using graphic analysis.

c. 78/

d. Assuming the same absolute growth for 1957-58 as for 1956-57.

e. [redacted] 50X1

[redacted] facsimile service will be made available to republic centers, oblast centers, and large industrial cities. 50X1

Table 10

Estimated Length of Wire and Cable Lines Operated by the Ministry of Communications of the USSR a/
1950-65

Thousand Kilometers

Year	Length of Wire Lines		Length of Cable Lines	
	Trunk and Secondary Lines	Intrarayon Lines	Multiconductor Cable Lines	Coaxial Cable Lines
1950	1,940	532	11.3	0
1951	1,950	592	13.8	0
1952	1,960	652	16.2	0
1953	1,970	712	18.7	0
1954	1,980	772	21.8	0
1955	1,990	832	24.9	0
1956	2,000	892	28.6	0.6
1957	2,010	952	32.4	0.6
1958	2,020 b/	1,012 b/	36.2 b/	1.2 c/
1959	2,034 d/	1,070 d/	40.4 e/	1.5 f/
1960	2,050 d/	1,150 d/	44.7 e/	1.9 d/
1961	2,068 d/	1,240 d/	49.3 e/	2.2 d/
1962	2,088 d/	1,330 d/	54.2 e/	2.4 d/
1963	2,109 d/	1,420 d/	59.6 e/	2.6 d/
1964	2,130 d/	1,510 d/	65.6 e/	2.9 d/
1965	2,152 d/	1,600 d/	72.4 g/	3.1 d/

50X1

b. Assuming the same absolute growth for 1957-58 as for 1956-57.
c. Including only 180 kilometers of the Moscow-Vladimir and 375 kilometers of the Moscow-Kiev coaxial cable lines. 81/
d. Extrapolated, using graphic analysis.
e. Interpolated, using graphic analysis.
f. Including 750 kilometers of the Moscow-Kiev coaxial cable line. 82/
g. 83/

Table 11

Estimated Length of Microwave Radio Relay Lines Operated by the Ministry of Communications of the USSR 1955-65

Kilometers

Year	Length of Microwave Radio Relay Lines
1955	500 a/
1956	1,500 a/
1957	3,500 a/
1958	5,500 b/
1959	7,750 c/
1960	10,250 c/
1961	13,250 c/
1962	16,350 c/
1963	19,750 c/
1964	23,500 c/
1965	27,500 d/

a. 84/
b. 85/
c. Interpolated, using graphic analysis.
d. 86/

Table 12

Estimated Number of Point-to-Point Radio Transmitters Under the Ministry of Communications of the USSR a/
1950-65

Units

Year	Long-Range Radio Telephone-Telegraph Transmitters b/	Intraoblast Radio Telephone-Telegraph Transmitters c/	Intrarayon Radio Telephone-Telegraph Transmitters	Urozhay (Harvest) Radio Telephone-Telegraph Transmitters
1950	220	300	11,600	25,000
1951	260	400	13,600	27,900
1952	300	500	15,750	31,000
1953	340	600	18,000	35,000
1954	380	700	20,300	70,000
1955	420	800	22,600	90,000
1956	460	900	25,000	100,000
1957	500	1,000	27,700	106,000
1958	540	1,100	30,400 d/	112,000 d/
1959	570 d/	1,330 e/	33,300 d/	118,000 d/
1960	594 d/	1,540 e/	35,700 d/	124,000 d/
1961	612 d/	1,730 e/	37,900 d/	129,000 d/
1962	625 d/	1,900 e/	39,700 d/	134,000 d/
1963	637 d/	2,040 e/	41,300 d/	138,000 d/
1964	645 d/	2,150 e/	42,400 d/	141,000 d/
1965	650 d/	2,200 f/	43,000 d/	143,000 d/

50X1

b. Data for 1950-58 were estimated on the basis of Soviet requirements for long-range radio telephone-telegraph transmitters.
c. Data for 1950-58 were estimated on the basis of Soviet requirements for intraoblast radio telephone-telegraph transmitters.
d. Extrapolated, using graphic analysis.
e. Interpolated, using graphic analysis.
f. 88/

Table 13

Estimated Number
of Amplitude-Modulated (AM) Radiobroadcasting Transmitters
in the USSR a/
1950-65

Units

Year	Radiobroadcasting Transmitters
1950	160
1951	161
1952	164
1953	167
1954	175
1955	185
1956	196
1957	206
1958	216 b/
1959	226 b/
1960	236 b/
1961	246 b/
1962	256 b/
1963	266 b/
1964	276 b/
1965	286 b/

50X1

b. Extrapolated by applying the absolute growth shown during 1956-57.

Table 14

Estimated Number of Wire-Diffusion Centers
in the USSR a/
1950-65

Units

Year	Wire-Diffusion Centers		
	Urban	Rural	Total
1950	9,567	9,352	18,919
1951	9,319	12,652	21,971
1952	9,223	16,129	25,352
1953	9,410	18,704	28,114
1954	9,620	21,416	31,036
1955	9,746	23,763	33,509
1956	9,991	25,252	35,243
1957	10,464	26,513	36,977
1958	11,289 b/	28,711 b/	40,000 c/
1959	11,717 d/	31,884 e/	43,601
1960	11,988 d/	34,783 e/	46,771
1961	12,140 d/	37,329 e/	49,469
1962	12,259 d/	39,503 e/	51,762
1963	12,327 d/	41,366 e/	53,693
1964	12,360 d/	42,940 e/	55,300
1965	12,386 d/	44,224 e/	56,610

50X1

b. Computed by applying the same percentage relationship of urban and rural growth to the total growth for 1957-58 as for 1956-57.
c. 91/
d. Computed by dividing the number of urban wired loudspeakers, from Table 15 (p. 59, below), by the number of urban wired loudspeakers per urban wire-diffusion center (1,182), as shown for 1958.
e. Computed by dividing the number of rural wired loudspeakers, from Table 15, by the number of rural wired loudspeakers per rural wire-diffusion center.

Table 15

Estimated Number of Wired Loudspeakers
in the USSR a/
1950-65

Thousand Units

Year	Wired Loudspeakers		
	Urban	Rural	Total
1950	7,367	2,318	9,685
1951	7,824	2,816	10,640
1952	8,234	3,444	11,678
1953	9,160	4,681	13,841
1954	10,116	6,323	16,439
1955	11,007	8,537	19,544
1956	11,780	10,411	22,191
1957	12,600 b/	12,200 b/	24,800
1958	13,340 c/	13,660 c/	27,000 d/
1959	13,850 e/	15,200 e/	29,050
1960	14,170 e/	16,600 e/	30,770
1961	14,350 e/	17,830 e/	32,180
1962	14,490 e/	18,880 e/	33,370
1963	14,570 e/	19,780 e/	34,350
1964	14,610 e/	20,540 e/	35,150
1965	14,640 f/	21,160 f/	35,800

50X1

b. 93/
c. Extrapolated, using graphic analysis.
d. 94/
e. Interpolated, using graphic analysis.
f. 95/

Table 16

Estimated Number of Television Centers and Television Relay Stations in the USSR a/
1950-65

Units

Year	Television Centers	Television Relay Stations
1950	2	2 b/
1951	2	2 b/
1952	3	4 b/
1953	3	4 b/
1954	4	5 b/
1955	12	14 b/
1956	20	23 b/
1957	37 c/	43 b/
1958	60 d/	70 d/
1959	75 e/	104 e/
1960	90 e/	138 e/
1961	104 e/	171 e/
1962	118 e/	204 e/
1963	132 e/	236 e/
1964	146 e/	268 e/
1965	160 f/	300 g/

50X1

b. Computed on the basis of the ratio of television centers to television relay stations shown for 1958.
c. 97/
d. 98/
e. Interpolated, using graphic analysis.
f. 99/
g. 100/

Table 17

Estimated Revenue of the Ministry of Communications
of the USSR, by Type of Service
1951-65

Million 1 July 1955 Rubles

Year	Postal	Telephone			Telegraph	Broadcasting	Total Revenue b/
		Urban and Rural	Interurban	Total			
1951	3,315	694	1,224	1,918	1,160	1,441	7,886
1952	3,550	739	1,304	2,043	1,257	1,558	8,454
1953	3,691	786	1,349	2,135	1,354	1,278	8,442
1954	4,059	854	1,428	2,282	1,396	1,335	9,016
1955	4,397	908	1,531	2,439	1,410	1,592	9,743
1956	4,580	959	1,621	2,580	1,431	1,902	10,454
1957	4,721	1,065	1,478	2,543	1,866	2,043	11,173
1958	5,025	1,257	1,546	2,803	1,949	2,391	12,168
1959	5,321	1,490	1,613	3,103	2,031	2,830	13,285
1960	5,630	1,728	1,682	3,410	2,113	3,489	14,642
1961	6,207	1,964	1,750	3,714	2,195	4,058	16,174
1962	6,767	2,199	1,818	4,017	2,278	4,486	17,548
1963	7,343	2,434	1,887	4,321	2,360	4,909	18,933
1964	7,903	2,669	1,954	4,623	2,442	5,335	20,303
1965	8,479	3,022	2,022	5,044	2,524	5,762	21,809

a. All data are rounded to the nearest million rubles. [redacted] 50X1

50X1

b. A breakdown of revenue data for all categories does not in all cases agree with the totals shown. These variations, however, are negligible.

APPENDIX B

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	
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. 36]

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 alternation 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 sinultaneously 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.

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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."

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.)

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

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.

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.

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 or a roll of tape, or by perforations on a roll of tape, or by 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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CIA-RDP79R01141A001600050001-7