

UNITED



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OFFICIAL RECORDS OF THE SECOND SESSION  
OF THE GENERAL ASSEMBLY

SUPPLEMENT No. 9

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REPORT OF THE  
ADVISORY COMMITTEE  
ON UNITED NATIONS  
TELECOMMUNICATIONS

LAKE SUCCESS  
NEW YORK

1947

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## INTRODUCTION

## 1. AUTHORITY FOR UNITED NATIONS TO OWN AND OPERATE ITS COMMUNICATIONS FACILITIES

At the first session in London, on 13 February 1946, the General Assembly approved the recommendations of the Technical Advisory Committee on Information, and transmitted them to the Secretary-General for his information and consideration. This Committee had recommended, amongst other things:

"The United Nations should also have its own radio broadcasting station or stations at headquarters with the necessary wave-lengths, both for communication with members and with branch offices, and for the organization of United Nations programmes. The station might also be used as a centre for national broadcasting systems which desire to co-operate in the international field. The scope of the radio broadcasting activities of the United Nations should be determined after consultation with national radio broadcasting organizations."

Pursuant to the above authority, the Secretary-General on 1 September 1946 appointed a committee of three radio experts, and issued the committee the following terms of reference.

## ADVISORY COMMITTEE ON UNITED NATIONS TELECOMMUNICATIONS

## I

The above Committee was formerly known as the Panel of Radio Experts and was summoned by the Department of Public Information to assist in its task. It will henceforth be known as the Advisory Committee on United Nations Telecommunications. Its working membership will comprise Brigadier-General Frank E. Stoner (United States), Chairman; Mr. S. Kagan (France), Member and Mr. G. F. Van Dissel (Netherlands), Member.

## II

The above Advisory Committee has been assigned three distinct but related functions:

(a) To prepare a plan for efficient world-wide broadcast coverage under United Nations auspices of the General Assembly proceedings beginning on 23 October 1946, and to give its engineering advice in the working out of this plan on behalf of the Department of Public Information.

(b) To investigate and make recommendations concerning United Nations broadcasting and telecommunications arrangements during the period between the close of the General Assembly and the establishment of permanent United Nations telecommunications facilities.

(c) To investigate the technical problems arising in connection with the proposal to give the United Nations independent radio communication with the Governments and peoples of all Member States, and to prepare recommendations in the form of a plan supported by the necessary technical data. These recommendations shall be completed by 10 November 1946, on which date it is suggested that five communications experts<sup>1</sup>

designated by China, Egypt, Uruguay, the United Kingdom and the U.S.S.R. shall be asked to meet with the Advisory Committee and examine the plan in order to permit greater participation in its preparation. The recommendations could then, at the discretion of the Secretary-General, be submitted to the General Assembly.

## III

The Advisory Committee will be expected to give careful consideration to all technical and financial aspects of the problems involved, in order that the General Assembly may have in convenient form the opinion of competent technicians regarding the possibilities and limitations which lie before the planners in this field. More specifically, the Advisory Committee is asked:

(a) To advise as to the frequencies best suited to United Nations requirements, and to suggest means for securing same.

(b) To consult with the Transit and Communications Division of the Department of Economic Affairs with a view to recommending means by which the United Nations can protect its interests as an operating service in the international telecommunications field.

(c) To draft a proposal for the establishment of one signal communications service at United Nations Headquarters and such other points as needed for handling United Nations broadcasts and the receipt and transmission of United Nations written record traffic.

(d) To make recommendations concerning the planning of a world-wide broadcasting schedule, having regard to such considerations as the wide geographical distribution of listeners, seasonal and other changes in atmospheric conditions, problems of timing and the technical experience of existing radio systems.

(e) To advise as to how the United Nations can best ensure a rapid flow throughout the world of information concerning its activities by integrating United Nations facilities with those under commercial or government control.

(f) To investigate the possibility of the United Nations radio service entering the fields of frequency modulation and television and the immediate steps, if any, which should be taken to safeguard its interests in this respect.

(g) To consult with all specialized agencies associated with United Nations with a view to the preparation and utilization of a common system of world-wide telecommunications.

(h) To consult with the Military Staff Committee and other appropriate bodies concerning the technical problems which may arise in connexion with the use of United Nations telecommunications facilities in time of emergency.

(i) To prepare an estimate of the cost of the United Nations involved in the plans mentioned above.

## IV

In order to complete the above tasks, the Committee is authorized to engage a limited number of technical consultants who will be asked to give detailed assistance in connection with specific

<sup>1</sup>Detail on Membership — see Annex C.

problems investigated. Such services will include draughtsmanship required to illustrate certain portions of the Advisory Committee's recommendations.

(Approved and Signed by the Secretary-General, 14 October 1946)

## 2. ANALYSIS OF THE COMMITTEE'S DIRECTIVE

The first objective — to prepare a plan for efficient world-wide broadcast coverage, under United Nations auspices, of the General Assembly proceedings beginning on 23 October 1946 — has been accomplished. The plan was approved by Assistant Secretary-General Benjamin A. Cohen, of the Department of Public Information, on 10 October 1946, and is now in effect. It consists, in general, of utilizing part of the United States State Department and Canadian Broadcasting Corporation, networks for broadcasts to Europe, the Middle East, Africa, Latin America, the Far East, India, Australia and New Zealand. It affords only limited coverage to these major areas, and the plan was adopted as a matter of expediency and because of the limited funds available in the 1946 budget.

The second objective was to investigate and make recommendations concerning United Nations broadcasting and telecommunications arrangements during the period between the close of the General Assembly and the establishment of permanent United Nations telecommunications facilities. These recommendations will be included in a supplemental report to the Secretary-General, after decision is made by the General Assembly on the permanent facilities plan described herein. This decision is essential before intelligent planning can be started; as the services to be included under lease arrangement and by other means may run for several years, and requirements will vary according to the permanent plan facilities and funds approved by the General Assembly.

The technical plan to give the United Nations its own permanent and independent radio communications facilities, so that it can communicate with the Governments and peoples of all Member States, is discussed in Chapter III of this report and summarized with the resulting recommendations to the General Assembly in Chapter VI.

## 3. GENERAL DESCRIPTION OF THE PROPOSED TECHNICAL PLAN

In the last international frequency allocation agreed at Cairo in 1938, roughly six per cent of the frequency spectrum between four (4) and twenty (20) megacycles was assigned to broadcasting. The remaining frequencies — ninety-four per cent — were assigned to the fixed, mobile and amateur services. It will be difficult to get additional frequencies assigned to international broadcasting at the next international telecommunications conference. The present allocation is inadequate, and many stations are operating inside and outside of the band in derogation of the Cairo regulations. Our plan calls for the taking over by the United Nations of the frequencies formerly assigned to the League of Nations. It will require a detailed engineering study to determine

which of these frequencies can be used at the proposed United Nations radio stations without causing interference to the existing radio stations of Member Nations.

A conservative estimate of the need for United Nations is twelve frequencies in the broadcasting band. In the light of present conditions, this requirement indicates that a co-ordinated plan for the high-frequency broadcasting of the world may be expected to provide for sharing of the frequencies approximately fifty per cent of the available time, taking intelligent advantage of time differences and improved directional antennae, and/or for the extension of the international broadcasting bands to provide for the requirements of United Nations.

Direct international broadcasting normally requires the use of high frequencies (short-wave), although in closely settled regions medium-wave (standard broadcasting) may reach adjacent countries.

Programmes produced in one country may be supplied by wire or radio point-to-point transmission for re-broadcasting over standard frequency stations in other countries.

A third main possibility is the export of recordings and script material for use by stations in other countries. These programmes may or may not have been performed publicly, in whole or in part, in the country or point of origin.

In the plan for use of international broadcasting and press distribution for the United Nations General Assembly, use on a world-wide basis of all these methods in combination has been included. It will be regional in structure and operation, combining United Nations news service with international broadcasting, thereby affording the greatest economy in plant facilities, operating costs, and frequencies.

The plan initially calls for headquarters station; a European station, originating and relay; and a Pacific area relay station. A Latin American originating and relay station is included for installation, as the organization expands and the requirements are more precisely known. These short-wave broadcasting centres will be at locations selected on a geographical and technical basis in Member Nations' territories. Each centre will have transmitters, receivers, directional antennae for transmission and reception, and terminal broadcasting equipment, and will provide for area coverage; the sum of all centres will give maximum world-wide coverage. Each United Nations radio centre will be connected by wire lines, low-powered radio or micro-wave channels to permit re-broadcasting on standard local existing networks, thereby obtaining the maximum listening audience by the fullest utilization of the existing national governmental or private networks in the area served.

## 4. NEW TECHNIQUES INCLUDED IN THE PLAN

The war revealed in a spectacular way the vital significance of communications. Armies of the Allied nations, separated by oceans and continents, were connected together and controlled by integrated national systems — national systems



through combined procedures and methods operated efficiently as a single integrated system. Messages jumped from cable to radio to land line and between national networks with speed and accuracy. Leaders were able to communicate orally around the world. Written messages were sent from hemisphere to hemisphere in seconds. Soldiers were separated from their homeland only by the distance to the nearest telephone.

Dissemination of mass material by electrical means was essential to the defeat of the common enemy. The maintenance of a firm peace requires comparable, if not better, world-wide service to defeat the enemy of mankind — ignorance, from which spring fear, misunderstanding, selfishness and mistrust. Over a thousand million dollars were spent on research, development, procurement, installation, and operation of international communication facilities by the Allied Governments for the prosecution of the war. This plan calls for the expenditure of \$6,000,000, which is less than a hundred and fortieth of the amount spent during the war — small insurance for protection of the peace.

The principal developments and methods of the war are embodied in the technical plan. A few of the new techniques included are as follows:

Use of radio receivers which augment the carrier and thereby reduce the effect of selective fading in reception of direct international radio broadcasting. This will involve using the new receiver at network points and not for replacing radio receivers used by the public.

Extension of the use of single side-band transmission will conserve frequency space and improve the quality of reception. Since either of the side-bands will convey the desired voice, emission of both is used only when two transmissions are to be made. Transmitters are available in which a radio-telephone modulation produces only one side-band, the other being almost completely suppressed, thereby reducing the band width occupied to nearly half. A small amount of additional equipment permits two or more separate radio-telephone channels on the same transmitter, thereby permitting more effective use of the facilities. The main advantage is a radio-telephone circuit on one side-band for exchange of programmes originating in Europe and at the headquarters site, and six or more teletype circuits each operating at sixty words per minute on the other side-band for handling written record material.

Violent fading is usually encountered in the high-frequency range. Greatly improved reception will be obtained by combining the signals intercepted by two or more properly spaced antennae. This system will be used for receiving the one-way broadcasts of voice and written record releases at the major field offices.

Since the loudest passages of speech or music must not exceed the modulation capability of the transmitter, the softer passages are often so weak that they are lost under noise level at the receiver. Amplifiers are available which compress the volume range transmitted, thereby strengthening the weaker passages and improving their reception. However, a special receiver having complementary

characteristics will be employed to expand the volume range to its original value.

To overcome natural obstacles introduced by the auroral zones and radio propagation vagaries, provision has been made for the routing of transmission via alternate paths through relays when the primary routes are inoperative.

These new techniques are in addition to the use of highly directional transmitting and receiving antennae, available to relay, and not to direct international radio broadcasting.

##### 5. FULLEST UTILIZATION OF NATIONAL COMMERCIAL COMMUNICATION FACILITIES FOR HANDLING OFFICIAL UNITED NATIONS MESSAGES

The United Nations facilities will not be employed for handling any official business to Member Nations, and will refrain from entering the point-to-point general service field in competition with Member Nations' commercial systems. It is neither possible nor desirable for the United Nations to establish a world-wide point-to-point system for handling its own official message business.

The volume of official United Nations message traffic to and from Member countries will be great. It will gradually increase as the departments of the Secretariat and the specialized agencies expand to their permanent strength and organization. It is estimated that this volume of official material plus the inter-office or internal administrative circulars, orders, bulletins and documents, will exceed a million words daily. All American commercial radio companies have branch offices at the Headquarters site of the United Nations and, through existing agreements between these companies and the commercial and governmental systems of the Member Nations, service is available for the handling of all official written record business to and from the Member Nations, and for the handling of private press releases of the individual press associations of the world.

One special case is, however, to be noted. An important portion of the Secretariat and specialized agencies will be located in Europe, very probably in Geneva and Paris. The resulting flow of inter-office administrative business and information documents for European release justifies the installation of the main European relay in the vicinity of Geneva. The same facilities will be used for handling programme transmission to and from Europe. The plan provides to this end a duplex multi-channel system.

The U.S. Telecommunications Co-ordinating Committee met in Washington, D.C., on 19 June 1946 for the purpose of discussing Article 7 of the convention between the United Nations and the Government of the United States regarding arrangements for the permanent headquarters, and in particular the United Nations communications facilities at the headquarters site. Mr. S. Kagan, Mr. G. F. Van Dissel and Mr. Marc Schreiber represented the United Nations under authority of the Secretary-General. The draft agreed upon at this meeting was as follows:

"The United Nations may establish and operate in the headquarters district its own short-wave radio broadcast facilities (sending and receiving

stations), which in the case of emergency or when the Secretary-General considers that special circumstances justify doing so, may be used for radio-telegraph, radio teletype, telephone, telephoto and similar services. The United Nations shall make arrangements for the operation of such services with the International Telecommunications Union, the appropriate agencies of the United States Government and the appropriate agencies of other affected Governments with regard to wavelengths and other similar matters.

"Arrangements will also be made to enable the United Nations to establish in the headquarters district a standard and frequency modulation broadcasting station of the type normally licensed in the United States to serve a community of comparable size to the zone."

The Advisory Committee on United Nations Telecommunications, after careful study of all the communications requirements of the United Nations, considers the above agreement inadequate for covering the point-to-point service proposed in the plan. It is therefore recommended that a supplemental agreement with the United States Government for this point-to-point service be initiated by the Secretary-General, upon approval of the general plan by the Assembly.

#### 6. GENERAL OPERATIONAL REQUIREMENTS

The uses which can be made of the facilities planned are manifold. It is assumed that all the specialized agencies will use the United Nations network facilities for mass communications, in an effort to effect the widest dissemination of material rapidly and economically. Broadcasts of United Nations press material and releases will be handled expeditiously by superimposing a radio-printer on active voice broadcast channels, permitting the "transmission" of voice and printed record at a hundred words a minute simultaneously without harm to the quality of the voice transmissions. All field offices will be able to receive both voice and press releases for rapid dissemination in their own area. This type of service will create, for the newspapers and broadcasting stations of the world, a reservoir of superior material always available and timely.

From a limited preliminary survey of the specialized agencies and the departments of the Secretariat, it is estimated that over one million words of programme press material and inter-office documents will be distributed daily to the twelve to twenty field offices, for further distribution simultaneously and quickly to all the press associations, newspapers, and national radio networks of the world.

Provisions should be made to establish all operating policies and to determine the division of usage among the United Nations departments and the specialized agencies.

The organization plan calls for the establishment of a small communications operating and engineering staff to provide for the implementation of this plan and the operation of the approved broadcasting facilities. This engineering staff, in addition to its regular duties, would furnish communications engineering advice on call to all

Member Nations on their domestic communications problems, with the end in view that United Nations assistance will lead to standardization throughout the world of procedures and methods, making possible a speedier flow of information by a flexible and automatic exchange of information between networks.

In times of emergency or crisis the Secretary-General shall issue the directives for the operation and control of the network.

#### 7. RELATION OF UNITED NATIONS FEEDER NETWORK TO EXISTING WORLD-WIDE NETWORKS

The communications network proposed in this plan for United Nations is small in comparison with the major high-frequency networks of the world. It is planned to serve as a feeder to all national and international networks from its one primary and two or three secondary stations. It should service all the networks of the world. Its modest size should not cause the dislodgement of any high-frequency station operating in the national or international public interest.

Encouragement and assistance will be afforded in every way possible for the international exchange of programmes between existing networks and stations of the various nations. It is understood that all Member Nations will be allowed to use the United Nations network when controversial questions are before the General Assembly or the Councils.

#### 8. INITIATION OF PLAN AND LONG-RANGE EXPANSION

The Committee estimates that it will take at least two years to procure and install all the communications facilities included in this plan, provided the total appropriation is made available immediately. It is essential that the United Nations go on the air with its own facilities at the earliest possible date; even to the extent of obtaining and installing used transmitters, capable of very limited coverage; such equipment to be replaced as new equipment is made available. It is the unanimous opinion of the Committee and of leading communications experts consulted that the United Nations obtain and temporarily install, at rented locations, some of the transmitters and associated equipment listed for the headquarters site, during the calendar year 1947.

The basic facilities listed in this plan for the one primary and two or three secondary stations will give the maximum world-wide coverage with the minimum expenditure of funds and interference to international communications. The system is designed to allow great flexibility so that expansion to a world belt-line is readily obtainable, as the requirements demand and funds are made available.

This world belt-line would include additional relay stations in the Far East, Middle East, and at any point between which could be linked to the proposed stations of the plan in forming a multi-channel path around the earth in the Equatorial and North Temperate Zones; surfaces of the earth less affected by polar disturbances to transmissions. Such a world belt-line would give the United Nations complete world-wide coverage for its

material as all the nations of the earth would have a high-powered station of the network in their own general area.

## CHAPTER II

### FACTS BEARING ON THE CASE

#### 1. TECHNICAL DEFINITIONS

**Radio Broadcasting.** Radio transmissions intended to be received by the general public.

**National Radio Broadcasting.** Radio Broadcasting intended to be received primarily in territory of the country in which the originating station is located.

**Interior Radio Broadcasting.** National radio broadcasting intended to be received primarily within the boundaries of the country in which the originating station is located (as distinguished from colonial broadcasting).

**International Radio Broadcasting.** Radio broadcasting from one country intended for reception in one or more other countries.

**Direct International Radio Broadcasting.** International radio broadcasting in which the general public receives the radio emissions directly from the originating station in another country without relay.

**Relay International Radio Broadcasting.** International radio broadcasting in which the material is transmitted by point-to-point radio from the originating station to a broadcasting station in another country.

**Wire Network International Radio Broadcasting.** International radio broadcasting in which the material (intelligence or programme) is transmitted by wire from the originating station to a broadcasting station in another country.

**High-Frequency (short-wave) Radio Broadcasting.** Radio broadcasting on frequencies between 3,000 and 30,000 kilocycles. (In this range, the frequencies from about 6,000 to 20,000 kilocycles are most useful for long distance.)

**Multiple Address Telegrams.** Omnidirectional messages sent out by means of Morse, teletype or facsimile to several destinations simultaneously. The addressees are informed by code telegram of the time and frequency of the transmission and acknowledge receipt or request repetition by code symbol using the services of commercial carriers.

**Duplex Service.** Service between two points, fixed or not, permitting traffic flow in both directions.

**Point-to-point Service.** Circuit between two fixed points, generally using highly directional aerials at transmitting and receiving ends to secure highest signal intensity.

#### 2. SERVICES REQUIRED BY UNITED NATIONS

In order to obtain a definite knowledge of the services to be rendered by the United Nations Telecommunications System, the Secretary-General constituted an inter-departmental committee. This committee held two sessions, 6 and 13 September 1946, at which all Departments of the Secretariat were represented with the exception of the Legal Department.

The required services appear as follows:

**Operational Services.** Broadcasting to listeners throughout the world directly or indirectly, through relaying or through rebroadcasting over local networks of the Member Nations. Transmitting of multiple address inter-office business to multiple destinations one way broadcast by means of morse signals, teleprinter or facsimile. The United Nations will thus be able to distribute:

1. Documents;
2. Official communications such as: general information, statistical reports, medical intelligence bulletins, agricultural reports, etc.

**Special Services.** This kind of service is not of general interest to the public and is exclusively directed to one point of destination. In technical terms this type of service is designated as inter-office service. The United Nations requires limited two way service for the following purposes:

(a) Special services of a permanent character: Telecommunications between Headquarters and the major permanent field offices. These telecommunications may comprise radiotelephone, radio-telegraph, teleprinter or facsimile.

(b) Special services of a temporary character: Such as telecommunications from Headquarters to centres of international activities, conferences, meetings, commissions, etc.

(c) Special services in times of Emergencies: Such as direct communications between United Nations Headquarters and Member Countries.

In times of emergency the United Nations Telecommunications facilities will be operated under special rules to be set up by the Secretary-General.

Finally all Member Nations will benefit in times of calamities such as floods, earthquakes, hurricanes or other disasters by having the United Nations Telecommunications network placed at their disposal.

#### 3. THE FREQUENCY SPECTRUM AND INTERNATIONAL RADIO REGULATIONS

There is but one radio spectrum for all the nations to use and the international co-operation which has made possible the effective, efficient use of this spectrum is significant and stands out as a monumental landmark attesting to the kind of international relationship which can be achieved when common problems bring the nations together in a co-operative undertaking.

Formerly, the term wavelength was used to indicate the length of the electro-magnetic radio waves employed by any particular station. Today it is customary to speak not of the wavelength but of the frequency of the wave. The product of the wavelength and the frequency is the velocity of the wave which is the same as the velocity of light (300,000 km per second). In general, when two or more stations use the same frequency in the same area, there is a likelihood of interference. Therefore, it has become customary for stations in the same area to operate on different frequencies in order to avoid interference. Frequencies between 3,000 and 30,000 kilocycles have been designated as high frequencies, to distinguish them from lower frequencies and from even higher frequencies. High frequencies are of especial importance

in international radio regulation since, by their use, it is possible to transmit signals over great distances, exceeding half the distance around the world, even with a low power transmitter. This characteristic of the high frequencies makes it imperative that an international frequency assignment plan be adhered to by all nations in order that harmful interference may be avoided.

The first important international agreements on radio communications resulted from a meeting held in Berlin in 1906 when radio — or wireless, as it was called — was only a few years old and was utilized almost solely for communication with ships at sea. Safety considerations and the requirement for a universal standard operating procedure which would be independent of language were the motivating factors responsible for the calling of this conference. Thirty nations participated and formulated the basis of a treaty and accompanying regulations with respect to communications between ships and shore stations.

In 1906, broadcasting was not a recognized radio service, nor was radio employed on aircraft. As time went on, broadcasting began to be developed; it was found that communication between fixed points by means of radio was a practical method of communicating over routes where no wire facilities were available or practicable; amateur radio operators became so numerous that they were recognized as a distinct service; and, in time, radio proved to be a valuable adjunct in connection with the safe operation of aircraft. Each of these main uses of radio and numerous special uses resulted in the defining of individual classes of stations as radio services and today the major services which are recognized are broadcasting, fixed, mobile, amateur and navigational aid services. Experience has indicated that, in general, broadcasting stations should employ bands of frequencies exclusively set aside by international agreement for broadcasting purposes and that, similarly, exclusive bands of frequencies for each of the other main services likewise should be available if efficient, orderly international communication is to take place. This is to say that mobile services will, in general, cause interference to broadcasting reception, and vice versa, unless each service employs different bands of frequencies. In some parts of the radio spectrum above and below the high frequency portion, agreement on precise bands of frequencies may be regional in character but in those instances where the service itself is world-wide, as in the case of the distress frequency of 500 kilocycles which has been used by mobile stations for many years for the sending of S.O.S. (distress) messages, international agreement among all the nations is essential.

The international technical body which has formulated the telecommunications treaties governing the use of radio frequencies is known as the International Telecommunications Union (ITU), which maintains a permanent Secretariat in Berne, known as the Berne Bureau.

#### 4. HIGH FREQUENCY BROADCASTING AND ANALYSIS

Originally, medium frequency stations whose signals could be received over comparatively short

distances were the only outlet for public news, information and entertainment. These first broadcasting stations operated in a domestic sense, serving a community in a fairly local zone surrounding the particular broadcasting station. As new techniques were developed and more was learned of the propagation of radio waves, it became possible for broadcasting stations to employ more power and to serve larger reception areas. When the high frequency spectrum was proved to be useful for long distance communication, broadcasting stations whose signals could be heard over great distances began to operate in bands set aside for this purpose in the high frequency spectrum. The number of frequencies available for this purpose between 6,000 and 20,000 kilocycles is ninety-five under Radio Regulations agreed upon at the last International Telecommunications Conference held in Cairo (1938). In order to appreciate why there must be a limitation on the number of high frequencies available for each of the radio services it is necessary to recognize that natural phenomena affecting radio wave propagation define the upper and lower frequency limits of the portion of the radio spectrum known as "short-wave" or "high frequency." A number of essential services must each receive blocks of frequencies in this high frequency region. When these basic facts are given due consideration it becomes clear that no one service can use more than a fraction of the high frequency spectrum without making it impossible for some other service to operate. At the present time all these broadcasting frequencies are employed by one or more nations and in addition, some nations have found it necessary to utilize frequencies for broadcasting purposes outside the bands internationally allocated. This is a deplorable situation, since it strikes at the very root of the concept which has formed the basis for the successful international co-operative use of the radio spectrum. The alleviation of this situation is a matter requiring urgent consideration, and it is expected to be one of the major topics which will be taken up by the ITU at the World Conference next summer.

International radio broadcasting is not always identical with high-frequency radio broadcasting (sometimes called short-wave broadcasting). Some international radio broadcasting is in fact done on low frequencies; e.g., Radio Luxembourg on 232 kilocycles is operated for the purpose of broadcasting to other countries. Nevertheless the questions under consideration here have to do primarily with broadcasting over long distances, for which the high frequencies must necessarily be used. International radio broadcasting therefore is one kind of high-frequency radio broadcasting.

The high frequencies are used extensively for national as well as for international radio broadcasting. They are in fact used for both classes of national radio broadcasting, viz., interior radio broadcasting and colonial radio broadcasting. Examples in interior radio broadcasting are their use in tropical countries where the high level of atmospheric static makes the lower frequencies less useful, and their use in very large countries. Examples in colonial radio broadcasting are broadcasting

from a mother country to overseas possessions of that country.

It follows that the high frequencies available for broadcasting must be divided among all three classes of use, interior radio broadcasting, colonial radio broadcasting and international radio broadcasting.

ANALYSIS

An examination of the reasons for the congestion in the present broadcasting bands, and the operation of some stations outside these bands is necessary to an understanding of the problems with which the world is confronted.

The General Radio Regulations of the ITU, Cairo Revision (1938), allocated bands of frequencies for high-frequency (short-wave) broadcasting. It should be noted that these frequencies are not allocated specifically for international broadcasting, but may be used for any broadcast service. The maximum usable frequency for international broadcasting varies with the eleven years sunspot cycle, being higher during periods of high sunspot activity. For the purposes of this report the year 1944 was chosen as representative of propagation conditions during a relatively low sunspot year. The frequencies above 18,000 kilocycles are not generally useful during periods of low sunspot activity, so for the purpose of this discussion, the ninety-five frequencies, resulting from a ten kilocycle channelling system which is the separation between frequencies considered essential for good quality reception, are distributed as follows:

Band	Frequencies
6,000 kc.....	20
9,000 kc.....	20
11,000 kc.....	20
15,000 kc.....	25
17,000 kc.....	10
TOTAL 95	

In addition, Cairo allocated ten frequencies in the 7,000 kilocycle band for use in regions other than the Americas and allocated a number of frequencies below 5,000 kilocycles for broadcasting in tropical regions provided interference would not result to established services in these bands.

An analysis which has just been completed by the Federal Communications Commission of the United States of America indicated that approximately one hundred countries and territories now use the frequency range between 6,000 and 20,000 kilocycles for some form of broadcasting service. Adding the ten frequencies in the band 7200-7300 kilocycles which is available for broadcasting in regions outside the Americas to the ninety-five frequencies listed above makes a total of 105 frequencies on a ten kilocycle channelling system. This is to say that no two stations are assigned at closer frequency intervals than ten kilocycles. Actually there are now in use more than 105 discrete (mutually non-interfering) frequencies in the broadcasting bands between 6,000 and 20,000 kilocycles, since it is at present a common practice to assign frequencies anywhere in the bands, at a detriment to quality reception. Of the total of 604 active discrete frequencies, only 249 active frequencies are within the limits of the broadcasting

bands allocated by the International Radio Regulations at Cairo in 1938. In other words 355 discrete frequencies are in use outside the Cairo broadcasting bands in this range.

As might be expected, numerous reports of serious interference caused by these out-of-band broadcasting stations are constantly received by the various nations, and the efficiency of the radio service rendered by stations other than broadcasting is greatly impaired. A fact which further aggravates this situation is that these out-of-band broadcasting stations frequently employ extremely high powered transmitters, and in many cases directive antennae. This increases the degree of interference to the services other than broadcasting.

Transmission conditions in the high-frequency range vary with the time of day, season and the eleven-year sunspot cycle. Because of these variations, a single frequency would not be useful to any country for more than a few hours a day. In order to make the maximum use of the frequencies available, an international arrangement is indicated to provide for the ultimate sharing of all the frequencies by all of the countries in order to make each frequency useful for as many hours each day as possible. Thus no country would have exclusive use of any frequency.

The analysis given in this report of the frequency situation in the short-wave frequency band shows that there is a considerable congestion of broadcasting stations inside as well as outside of the allocated bands.

All the data which have been available to the Advisory Committee indicate that there is a strong international tendency toward complete revision of existing international rules and regulations with a view to reinforcing them by authoritative action.

Technical means for improving the present state of affairs and measures for evolving more satisfactory rules than those at present in force are being investigated by various nations. They may be shortly summarized as follows:

- (a) Enlargement of the allocated bands;
- (b) Time-sharing of the frequencies;
- (c) Limitation of the number existing stations;
- (d) Exclusive use of directive aerials, minimum power, and other factors to avoid interference.

All these means have their own advantages and disadvantages. In view of the importance of the problem, the Advisory Committee feels that the probable solution will be to incorporate all of these measures in one integrated action. The Committee is further of the opinion that a sharing of frequencies in international broadcasting, as well as limitation of the number of stations, will be the principal elements in any solution adopted. It is understood that the next International Telecommunications Conference will have the task of working out these new rules and the system of authoritative action. This conference is planned to take place in the last half of 1947 and, in view of the magnitude of its task, will probably last several months.

## 5. LEAGUE OF NATIONS FACILITIES AND FREQUENCIES

The analysis given above shows that it will be very difficult, if not impossible, to find within the authorized high frequency bands the necessary wave-lengths to operate the United Nations Telecommunications network, as outlined in chapter III of this report.

Fortunately, the United Nations, continuing the high mission of the League of Nations, can lay claim to the wave-lengths formerly allocated to the League of Nations for the use of the facilities known under the name: "Radio Nations." The historical facts are as follows:

The League of Nations, in order to permit the operation of its radio station in peace-time, as well as in periods of emergency, had reserved a certain number of wave-lengths, sufficient as well for its short-wave services as for its medium and long-wave facilities, the latter only to be used in times of emergency.

As the Assembly of the League of Nations decided, after a long negotiation with the Federal Government of Switzerland, to entrust the exploitation of its facilities to the Swiss Company, Radio-Suisse — more than fifty per cent of the stock interest was held by the Federal Government of Switzerland — the position of the League of Nations towards the existing international organizations in the field of Telecommunications, such as the International Telecommunications Union, was more or less involved. Not being a Government, and not exploiting radio facilities of its own, it was unable to obtain membership in that Union, or even to secure for itself a special position in the Union, based on its international character.

It was, under these circumstances, unable to have the necessary wave-lengths for its facilities filed under its own title, and thus was obliged to entrust this task of filing to the operating Company: Radio-Suisse, which acted as the custodian of the League. In the frequency lists, published by the ITU, these wave-lengths appeared therefore under the name of Radio-Suisse, with a special indicator in the end column: "League of Nations." This was done with the definite understanding that these wave-lengths were exclusively reserved for the League's facilities, and for no other purpose. To complete this outline, it has to be mentioned here that Radio-Suisse, officially a private Company but Government-controlled, had no concession for broadcasting, neither for a national nor for an international service. The international short-wave service Radio-Suisse handled for the League of Nations was completely organized, controlled, and transmitted under the responsibility of the League, Radio-Suisse lending only its technical services for which it was duly compensated.

The solution, chosen by the Assembly of the League of Nations in 1929, to entrust the operating of its facilities to a private Company proved progressively unsatisfactory.

In the year 1939 Radio Nations, the League radio station, ceased practically to function as a direct consequence of World War II. The Swiss Federal Government denounced the Agreement of 21 May 1930 (C.191.M.91.1930 VIII) concluded

between the Swiss Federal Council and the Secretary-General of the League of Nations, concerning the establishment and operation of Radio Nations. This denouncement was made in accordance with articles 25 and 26 of that Agreement and automatically involved the cancellation of the convention concluded between the Secretary-General and Radio-Suisse in accordance with Article 25. Negotiations between the League and the Swiss authorities concerning the price to be paid for the station started in February 1942. These negotiations resulted in the transfer of the station to the Swiss authorities for the total sum of 265,530 Swiss francs. During these negotiations, it seems from the records that no mention was made by either of the two parties of the wavelengths reserved for the League of Nations, notwithstanding their great intrinsic value.

The following edition of the frequency list of the ITU showed, however, many of the League's wave-lengths registered under the name of Radio-Suisse, without any further reference to the League of Nations. In order to obtain a complete picture in this matter, the United Nations requested and obtained from the ITU an analysis of the frequencies formerly reserved for the League of Nations. This analysis shows clearly that the Swiss authorities appropriated some of these wave-lengths for their own use; the rest they abandoned.

During the past years, the Swiss have built up a considerable point-to-point telegraph service based on the acquired station Radio-Nations. The United Nations may wish to take into account whether these existing requirements should not be given consideration in some form.

The United Nations Telecommunications Advisory Committee questions, however, the right of the Swiss Government to hold or to abandon these frequencies, and the legality of the transfer of these frequencies from the League of Nations to Radio-Suisse.

The above analysis shows the difficulties to be faced by the United Nations in trying to acquire frequencies within the existing short-wave broadcasting bands. It is, therefore, essential that the frequencies which belonged to the League of Nations should be put at the disposal of the United Nations and this solution is fully justifiable in the present circumstances.

In the course of his negotiations with the Swiss Government, the Secretary-General has already referred to this matter and, before the opening of the Five-Power Telecommunications Conference in Moscow, the following telegram was dispatched by him to the Chairman of the Conference:

"I have the honour to submit the following matter for the consideration of the Five-Power Telecommunications Conference. At the first part of the first session of the General Assembly of the United Nations a number of delegations stressed the importance of the United Nations having appropriate facilities for telecommunications as well as broadcasting and the following provision was inserted in the draft of a convention to be concluded between the United Nations and the United States of America 'Section 7'. The United Nations may establish in the zone any type of



installation which it deems necessary for the purpose of its work and in particular may establish its own radio telephoto sending and receiving stations including broadcasting, teletype and telephoto services. The United Nations shall make arrangements with the International Telecommunications Union with regard to wavelengths and other similar matters." (Journal of the General Assembly, First Session, Number 34, London, Thursday 7 March 1946, pp 695).

"During the negotiations which took place with the United States authorities the following text was accepted which represents the state of the negotiations up to date. "Section 7. The United Nations may establish and operate in the Headquarters District its own shortwave radio broadcasting facilities (sending and receiving stations) which in case of emergency or when the Secretary-General considers that special circumstances justify doing so may be used for radio telegraph teletype telephone and similar services. The United Nations shall make arrangements for the operation of such services with the International Telecommunications Union and the appropriate agencies of the United States government and the appropriate agencies of other affected governments with regard to wavelengths and other similar matters.

"Arrangements will also be made to enable the United Nations to establish in the Headquarters District a standard or frequency modulation broadcasting station of a type normally licensed in the 'United Nations' to cover a community of a size comparable to the zone."

"In order to comply with the views expressed by the General Assembly I have requested a group of experts to formulate plans for the telecommunications facilities to be owned and operated by the United Nations at its headquarters and such other locations as may result from a decision of the General Assembly on this matter. The preparation of a general plan has not yet been completed. I would however very much appreciate it if the Five-Power Telecommunications Conference could give consideration to the following points which will arise when the United Nations enters the field of international telecommunications in the near future.

"Primo frequency requirements of the United Nations facilities with particular reference to the frequency band 4000 to 25000 kilocycles.

"Secundo modifications of the statutory regulations of the International Telecommunications Union or such other succeeding organization as may come into being to enable the United Nations to operate in full independence its telecommunications facilities.

"Tertio the modification of regulations under paragraph two above should be guaranteed in the general agreement to be concluded by the United Nations and the International Telecommunications Union in accordance with Articles 57 and 63 of the Charter. Pending however the conclusion of this agreement the right for the United Nations should be ensured to be repre-

sented at the forthcoming Worldwide Telecommunications Conference and preliminary meetings thereto in order to be able both to follow the development of the general question of the future relationship of the International Telecommunications Union with the United Nations and to take care successfully of the above mentioned particular interest of the United Nations in connection with the establishment and operation of its facilities in the field of international telecommunications. Should the consideration of these points call for any further information representatives of the United Nations Secretariat could immediately be sent to Moscow at your request. Will appreciate acknowledgment of this message. End of message."

The past experience of the League of Nations shows that the interests of the United Nations as an organization operating Telecommunications facilities will only be fully protected after an appropriate status is found for it in relation to the International Telecommunications Union. This question can only be considered at the next International Telecommunications Conference to be held in Washington in 1947. In order to secure the fullest support from the Member States of the United Nations, it is urgently recommended that the Resolution, the text of which appears in chapter VI, be adopted by the Assembly of the United Nations.

## 6. CONCLUSIONS

The congestion in the field of high-frequency broadcasting outlined in the preceding paragraphs makes it imperative that the requirements of any new facilities, such as those described in chapter III, be put in operation with this strictest minimum number of frequencies. This consideration alone prescribes the necessity for sharing the projected communications facilities between the United Nations and all Specialized Agencies. The plan has been drawn up accordingly.

## CHAPTER III

### THE TECHNICAL PLAN

Although combined operation of broadcast and written record facilities in single plants is contemplated because of obvious economies effected thereby, it is convenient to treat these two services separately in a discussion of the problems involved and the proposed facility utilization.

#### *Broadcasting*

The objective with respect to broadcast service is to provide the most extensive world coverage for the United Nations programmes which is feasible. Related to the problem are considerations of auroral effects on propagation over certain paths, listener habits in the target area, the number of different languages which must be served, and frequency requirements as related to the time of day, season of the year and position in the sun spot activity cycle. For the purpose of this discussion it is assumed that the required frequencies will be available. (It is also assumed that the United Nations General Headquarters will be in the general vicinity of New York City and that

the Main European Field Office will be in or reasonably near to Geneva.)

On these figures herein which show proposed shortwave antenna beams or coverage, there has been plotted a solid circular ring showing the lower limit of moderate ionospheric storms around this area. Radio transmission through these areas is likely to be erratic and in general the further the path penetrates into the auroral zone the less reliable the service will be. This condition sets up certain restrictions with regard to how much direct service can be provided from a location on the East Coast of the United States. It is possible to serve reliably, for sustained periods, only those areas lying between an azimuthal bearing from New York of  $40^{\circ}$  true eastward to  $330^{\circ}$  true. This excludes parts of Eastern Europe, Asia, and certain islands of the Pacific, including the Philippines. The condition is shown in Figure 1. This indicates the necessity for relay stations, one of which is proposed for the Main European Field Office. From this location Eastern Europe and a good portion of Western Asia, including most of India, can be served, with some possibility of service into the western parts of China.

A second relay point located on the west coast of the United States, or somewhat farther out in the Pacific, is definitely indicated for adequate service to Japan, the Philippines, the Dutch East Indies, China, etc. Figure 1 shows that the antennae planned for South American service could be reversed so as to beam a signal to the Far East area but the reliability of such transmission directly through the Auroral Zone cannot be expected to justify such operation. Therefore, this proposal includes a suggested facility for a second broadcast relay station for this service.

Figures 6 and 6.1 show the relative advantages of a United States West Coast location and a location in Hawaii, or some other island in the general area. The exact location can be given special study but the principal point here is to include such a facility in the plan. Negotiations with regard to the location of the site, with the Governments concerned, will be started upon approval of the general plan by the Assembly.

With regard to listener habits in the target area, it may, in general, be assumed that the important hours are somewhere between 1800 and midnight, local time. Therefore, the service plan is based on giving the most intensive coverage possible during those hours, with supplementary service during noon and breakfast periods only where transmitter availability, as determined by the night programming requirements, permits.

Language requirements make it necessary that each programme "thread" over a certain transmitter to a given area use, in alternating periods, the various languages spoken in that area. When the number of languages is large, the time which can be devoted to each in a single evening of broadcasting becomes shorter and, for adequate service in each, the number of programme "threads" and, hence, the number of transmitters in service to that area must be increased.

## Plan of Operation

*Note:* It should be understood that the plan of operation outlined herein is intended to present the general idea of facility utilization and is not suggested as an actual operating plan insofar as exact time schedules are concerned. No attempt has been made to distinguish between the importance of service to one area as compared with another, or even accurately to relate to the plan the exact local time used in any certain country. These are problems for the operating and policy staffs when the operation begins. However, the operating schedule as related to average local time in the area, is prepared to show utilization of facilities by the transfer of transmitters from European to South American service (e.g. fig. 2). Further study may also indicate that the actual beam directions for the antennae could be altered to some advantage.

Figure 1 shows the various directions in which it is planned to beam transmissions from the United Nations General Headquarters transmitting station and the approximate beam widths considered desirable. Several of these directions will require more than one antenna and the antennae proposed are shown in Figure 8.

A typical operating schedule for the transmitters at this point is shown in Figure 2. It will be seen that, during the evening or night period from about 6:00 p.m. to midnight local time, all of the five transmitters are used to Europe and Africa, i.e., one for South and Central Africa, and one for North Africa, which also serves Portugal, Spain, and, if desired, Italy. The other three are available for division among the numerous European languages as desired.

One of the 100-kilowatt transmitters (C) is used essentially for relay feed transmissions outside of those hours when it is important for European programming. Thus, during these odd hours the European Field Office station can be continuously recording programmes to be re-broadcast later at important periods for areas served by this station. Thus the problem of relay feeds at specific hours can be somewhat relieved. It is also to be noted that certain of these odd hours correspond to important listening time in certain of the target areas served by the European relay station (for example, 1300 to 1600 GMT is 1800 to 2100 in India) so that, during a part of the time at least, direct instantaneous relay may be used, Figure 4.

The voice channel of the suppressed carrier, single side band circuit, to the European station will also be available as a relay feed. This should make it unnecessary to assign two broadcast transmitters to this service even though more than one programme thread is continuously used there.

As the important listening time in the Eastern hemisphere closes, the transmitters at the Headquarters station are transferred to South and Central American service and later to New Zealand, Australia, and eventually Eastern Asia. Thus, the percentage of idle time for the transmitters is kept low, as is also shown in Figure 2. This represents merely a "typical" schedule and doubtless the transmitters would be utilized even more fully as the requirements are further investigated.



An examination of the beam directions shown in Figure 1 and the antenna list shown in Figure 8 will indicate that no conflict exists in antenna usage. It should be noted that the schedule in Figure 2 shows broadcasts at only *optimum* listening times and yet practically full utilization of the transmitters proposed is required. Undoubtedly other important broadcasting will be found desirable at marginal times or perhaps to areas not considered in this schedule, such as Ireland, so that every hour that each transmitter can be operated, still permitting adequate maintenance, is expected to be required.

Figure 3 shows the various directions in which it is planned to beam transmissions from the Main European Field Office relay station and the approximate beam widths considered desirable. A typical operating schedule for the transmitters at this station is shown in Figure 4.

Thus, it is apparent that the European relay station complements rather than duplicates the transmission from United Nations Headquarters.

#### *Long or Medium Wave Broadcasting*

In accordance with the objective of providing the most extensive broadcast coverage, it is proposed that the important European area should be served by a United Nations-owned 1000-kilowatt transmitter, operating on the low or medium frequency band (180 to 300 kc/s or 535 to 1605 kc/s). The expected day and night coverage of such a transmitter, based on operation in the long-wave band, is shown in Figures 5 and 5.1. The final recommendation as to the frequency of this facility must await further engineering study as to propagation and noise conditions in this area, in addition to consideration of available frequencies. If the final decision is made to use long-wave operation at the European relay, then a suitable frequency must be allocated.

Alternatively programmed in the various European languages, this transmitter will perform a highly important service by bringing United Nations programmes to a large audience on a wavelength to which they are most accustomed to listen, and where the quality of reception on the home receiver may be expected to be better than by short-wave.

#### *Relay Station for Eastern Asia and Pacific Areas*

Figures 6 and 6.1 show antenna beams for two possible locations for the Pacific area relay station. Figure 7 shows a typical schedule of operation for this station. This schedule shows programming starting at early evening time in Japan and shifting to other areas approximately in the order of their positions in the time zones. It will be noted that only eleven hours of transmitting time are shown which cover a six to midnight time lapse over a five-hour time zone spread. However, considering the number of different areas and languages (some of which are listed in Figure 7), the importance of this service cannot be doubted even if the transmitter is used only a few hours per day. The dashed-in blocks show the morning periods from about 7:00 to 9:00 a.m. local time for several areas. If these or perhaps the noon hour were programmed, it would more fully utilize the transmitter. This, however, would require a transmitter

at General Headquarters for relay feed during these hours, and none is provided for. These morning periods can probably be filled by pre-recording programmes at a time when a transmitter is available at General Headquarters. If a California location is used, a wire could be leased to programme this transmitter at an expense of about \$14,000 per year. Another possibility is a local programming staff with printed word copy supplied by United Nations General Headquarters as a basis. These are operational problems and further study is required to make recommendations regarding the best location and operating procedure. The important point is that a Pacific relay facility must be included in the plan.

It is understood, as previously stated, that the broadcasting system proposed herein will form a nucleus to be augmented by the use of national networks for short, medium, and long wave broadcasting and perhaps by the use later of frequency modulation broadcasting. Thus, a separate part of the programme from that considered herein involves negotiations with the operators of these facilities in the various countries and the planning necessary to co-ordinate these operations as a part of the overall service.

#### *Operation of the Receiving Station*

Certain items of equipment are included in the receiving stations for General Headquarters and for the European Field Office which are for use only in the broadcasting activity. These are the "Exalted Carrier" Dual Diversity Receivers. This is a type of receiver, recently developed, which greatly reduces the distortion effects of selective fading and, hence, is highly desirable for the reception of short-wave voice or music transmissions over long-distance paths, especially if the signal thus received is to be re-broadcast. Three of these receivers are proposed for each of the mentioned receiving stations. In Europe they would be used principally for picking up the transmissions from the General Headquarters station for re-broadcasting. They would also be used for receiving scheduled transmissions from other stations which may, by negotiation, serve as programme source for certain broadcasts over to United Nations stations.

In the General Headquarters station these receivers are to be used principally for the reception of programmes originated in various countries which by arrangement are to serve as a part of the programming for the United Nations stations.

There are shown in this proposal twenty simple diversity receivers equipped for frequency shift teletype reception. In addition to their use for reception of written record traffic, these are to be used by the branch offices for receiving U.N. programmes and feeding them by wire line or other means to the domestic stations in the area which by negotiation previously mentioned are to augment the service. The voice channel of the single side-band transmitters will also serve this purpose for Europe and later South America.

#### *Studio Operations*

The master control at the General Headquarters provides for feeding the U.N. transmitters

plus simultaneous feeds to the common carriers, U. S. Networks, etc. A total of twelve separate programmes may be fed at one time.

In short-wave broadcasting a great deal of source material is invariably derived from recordings made of current broadcasts originating in many parts of the world. With these programmes on discs the actual programme can be developed by "dubbing" processes. In many cases it is desirable to record a programme and broadcast it from the transcription rather than directly. Therefore, twelve recording lathes is considered a minimum requirement at General Headquarters. As previously mentioned, the recorders at the European Field Office will be invaluable for recording transmissions to be broadcast at a later time.

Twelve studios are considered an absolute minimum and would not be enough were it not for the fact that for a great portion of the time these will be used mainly as "line feeds" to a given transmitter or transmitters and most of the programmes broadcast will be recorded or will be pick-ups from various parts of the world for rebroadcast. As programme plans develop, it may be necessary to provide additional production studios.

The reference recorders are proposed so that a continuous record of every programme broadcast can be made and filed to be held as long as considered desirable.

The monitor system makes it possible for any of the executives or programme personnel, whose offices are so equipped, to dial in to particular programmes in which they are interested. It also provides a means of making available in the various offices special pick-ups of important overseas or domestic programmes. It may also be used for auditions. Without it, additional personnel would be required for scheduling equipment and studios or other locations for such monitoring.

#### *Written Record Traffic*

The objective with regard to written record traffic is to take care of the bulk of heavy inter-office communication between the United Nations European branch office and General Headquarters. The problem here is somewhat different from broadcasting in that the receiving station is under our control and can be equipped with the best of equipment, directional antennae, etc. However, the circuits will be disturbed by auroral effects and ionospheric storms.

Out of United Nations General Headquarters it is proposed to operate initially one "main trunk" to Europe with the possibility of adding a second "main trunk" circuit to South America when the situation demands, each to provide six two-way radio printer channels and, in addition, a two-way voice channel which can be used for radio programming and also for pre-scheduled important two-way telephone conversations.

Normally these circuits would utilize 2-kilowatt, suppressed carrier, single side-band transmitters but, to handle those periods when the circuit becomes hard to work, a 50-kilowatt amplifier is provided for each end of each circuit. These amplifiers are so designed that they may be used to supplement the broadcast service whenever they are

not required for inter-office and document traffic service.

Figure 13 shows the basic circuits which would be provided for United Nations inter-office written record traffic between General Headquarters and the two potential field offices which would serve as distribution centers in their areas. Figure 14 is a block diagram showing the operation of the circuits.

A six-channel radio printer circuit at sixty words per minute has an ultimate daily capacity of about 500,000 words in each direction. Allowing for outages due to time out for frequency changes, maintenance, periods of bad propagation which result in reduction of the number of operable channels, time used for service messages, and idle periods resulting from uneven traffic flow, it is reasonable to assume 250,000 words as the practical average daily capacity. This may be increased slightly by operation at seventy-five words per minute.

The proposed plan, therefore, provides for 250,000 words per day each way between United Nations General Headquarters and the Main European Field Office and when required 250,000 words per day each way between United Nations General Headquarters and the Main Latin American or Western Hemisphere Field Office. In other words, the traffic possible in each direction on each circuit would fill about thirty pages of a standard size (8-column) newspaper.

The message centre at United Nations General Headquarters would normally serve as clearing point for all traffic. It would also be possible, if found desirable, to handle programme material between Latin America and Europe direct to relieve General Headquarters of a part of the relaying load.

Since this is a teletype operation, single or multiple received copies or stencils of all material can be made depending on the type of paper rolls used in the machines.

It is contemplated that written record inter-office traffic to other field offices of the United Nations would be distributed by the two Main Field Offices via commercial carriers. Thus, these two offices would act as branch clearing points for all other offices in their area. The General Headquarters Office would file official business messages to United Nations branch offices via commercial carriers.

The traffic which this system is capable of handling (1,000,000 words per day, i.e., 250,000 words each way on two circuits) if paid for at a rate of five cents per word would cost over \$15,000,000 per year. Whereas, if carried on the United Nations network, the cost were figured at one cent per word, the proposed installation would amortize itself in a few years, provided the load equals the working capacity.

On certain days of disturbed ionospheric conditions, the capacity of these circuits will be reduced. (This was allowed for in the overall coverage capacity figures above.) On some occasions, conditions may be bad enough to make radio printer operation impossible. At such times

it is often possible to continue service on a reduced basis by International Morse Code. Therefore, tape perforators, transmitting heads, and tape recorders are provided for this emergency operation.

The message centers are to be equipped with radio printer connection to the commercial carrier offices for handling United Nations inter-office traffic which must be routed that way and for handling all traffic from United Nations offices to addresses other than United Nations main branch offices.

#### *Frequency Shift Operation*

All of the broadcast transmitters operated by the United Nations at General Headquarters and at the European relay station are to be equipped for simultaneous, frequency shift keying. This can be accomplished without degrading the quality of the broadcast transmissions. Special receivers are required for demodulation of the keyed signal for printer or International Morse Code operation.

Such receivers are proposed for United Nations General Headquarters where frequency keyed signals from the European relay station can be used as a cue circuit for acknowledgments, and also at the European, Asiatic, and Latin American Field Offices, and at twenty additional locations to be determined. All of these will receive frequency shift-printer signals from General Headquarters. The European and Pacific area relay broadcast stations will also be keyed in this manner, usually by direct simultaneous relaying of the signal keyed on one of the United Nations General Headquarters stations.

Such signals will only be available when a broadcast station is beamed to the area. However, it will be noted from the typical broadcast schedule that service to Europe is provided for all but four hours daily. There is about nine hours service to East and West South America, and from four to eight hours to other areas plus the coverage by the relay stations.

It is believed that this service will be extremely valuable for handling general bulletins to all branch offices. These would be normally transmitted on a "blind" broadcasts basis but on important bulletins acknowledgment could be requested to assure reception. The acknowledgment would be handled directly by commercial carrier or through one of the two Main Field Office Message Centres, according to routines established.

The International Morse equipment can also be applied to this method of transmission when circuit conditions are bad and the equipment listed contemplates this emergency service.

It will be noted that the system proposed for the handling of United Nations inter-office written record traffic does not contemplate the installation of facilities for all of this traffic from all branch offices but, instead, provides two high-capacity circuits from General Headquarters to certain important Field Offices which are thereby established as clearing offices for their area. It thus absorbs the expense of heavy long-distance overseas traffic by funneling a portion of this through

clearing centres via short-distance commercial routes. It is not anticipated that the traffic flow from smaller branch offices would justify the installation of United Nations-owned equipment at all these points. As the system develops, one or more additional heavy traffic circuits from General Headquarters to other clearing points may become desirable and can be added.

#### *Combined Operation*

It will be noted that all transmitting facilities for a given location are to be installed in a single plant. For technical reasons, it is not feasible to install receiving equipment in the transmitting plant but these are also grouped in a single station.

This grouping of facilities makes for economy of operating in several ways. The operation can be carried out with a smaller staff of personnel, antennae can be utilized for various types of service and economy in initial cost is thereby effected. As previously mentioned, the transmitters have been planned for flexibility of usage so that fullest utilization may be attained.

In point-to-point handling of inter-office business with both terminals "controlled," it is possible to shift frequencies on short notice, as ionospheric conditions change, so that the circuit can be kept working a great portion of the time even under undesirable and changing conditions. However, in broadcasting established schedules must be maintained so that the listener will know where to tune the receiver. Broadcasting is "blind" so that there is no way of receiving instantaneous reception reports even if it were feasible to change frequencies during schedules. For this reason, dual or even triple frequency coverage of the same area with the same program is the ideal of good short-wave broadcasting. Although this proposal does not even contemplate dual frequency coverage except for some periods to South America where transmitters are available, the flexibility provided by the possibility of transferring amplifiers for single side band operation over to broadcast service may permit this procedure on certain important programme periods. In any case, it is believed the proposal presents an absolute minimum of transmitting facilities required for meeting the objective.

#### CHAPTER IV

### THE ORGANIZATIONAL AND BUDGETARY PLAN

All experience in civilian as well as in military administration leads to the conclusion that the Telecommunications organization of the United Nations — its nervous system — should be conceived as a single centralized unit. In times of emergency, the Secretary-General must be — on a moment's notice — in a position to use these facilities for preserving peace.

It is estimated that after the facilities, as outlined in Chapter III, are installed and in full operation the annual cost for technical personnel will be approximately \$500,000.

The current expenditures comprise beyond the personnel an annual technical maintenance expenditure estimated broadly at five per cent of the capital investment (see Annex A). This percentage amounts annually to approximately \$300,000. The technical annual operational budget is thus estimated to total:

Personnel	\$530,000
Material	300,000
	<u>\$830,000</u>

The operational budget would reach this sum at the earliest four years after the Assembly decided to implement the technical plan, Chapter III. During the constructional period the operational budgetary requirements are estimated as follows:

	Personnel	Material	Total
1947	\$ 75,000	\$ None	\$ 75,000
1948	200,000	25,000	225,000
1949	350,000	100,000	450,000
1950	500,000	250,000	750,000

Similarly the total capital investment of approximately \$6,000,000, which is shown in detail in Annex A, would be spread over a period of three years estimated as follows:

	Funds Obligated	Funds Disbursed
1947	\$3,000,000	\$1,000,000
1948	2,000,000	3,000,000
1949	1,000,000	2,000,000

The cost figures in Annex A do not include any provision for buildings and land as no decision has been made yet concerning the headquarters site.

The cost figures in this Report are estimates based on past experience in the procurement of similar equipment and materials. Wherever possible tentative quotations were obtained from suppliers. It is proposed that all contracts for procurement and for performance of the construction and installation be awarded after taking sealed bids from a number of recognized suppliers or contractors, of all Member Nations, in each of the various fields involved.

## CHAPTER V

### FULFILMENT OF TERMS OF REFERENCE

The Committee making a final check of its terms of reference reports as follows:

#### GENERAL TERMS OF REFERENCE

(a) Measures to be taken for broadcasting the proceedings of the General Assembly meeting in 1946.

#### Action taken

Arrangements made with Office of International Information and Cultural Affairs, United States Department of State, and the Canadian Broadcasting Corporation to provide limited coverage to Europe, Middle East, Africa, Latin America, Far East, India, Australia, New Zealand.

(b) Measures to be taken in the interim period between the current Assembly and the establishment of permanent United Nations facilities.

#### Action taken

Until the General Assembly decides on the permanent facilities, it was not found possible to make any recommendations. A supplementary report will be made in due course.

(c) Preparation of a technical plan for the United Nations radio facilities.

#### Action taken

The technical plan is contained in this Report.

#### SPECIFIC TERMS OF REFERENCE

(a) Frequencies best suited to United Nations requirements and means of securing them.

#### Action taken

No attempt was made to indicate spot frequencies pending the successful outcome of current negotiations between the Secretary-General and the Swiss authorities to recover the old League of Nations frequencies and the completion of studies as to the possibilities of obtaining frequencies from other sources.

(b) Protection of United Nations interests as an operating service in the international field.

#### Action taken

Transit and Communications Division consulted as instructed. Five Power Preliminary Telecommunications Conference in Moscow informed of the planned facilities for the United Nations with a view to obtaining status for the United Nations in the International Telecommunications Union, at the next World Conference.

(c) Establishment of a United Nations Signal Communications Service.

#### Action taken

An organization is proposed in an enclosure to the letter of transmittal. See also Figure 14.

(d) To design a world-wide broadcast schedule.

#### Action taken

Included in the plan.

(e) To advise on integration of United Nations facilities with those under commercial or Government control.

#### Action taken

With full regard to the strictest economy the whole conception of the plan provides for: (I) to insure a rapid flow of information throughout the world; and (II) to integrate United Nations facilities wherever possible with the national and commercial networks of the world.

(f) Frequency modulation broadcasting and television as applied to the proposed United Nations radio service.

#### Action taken

This would be a local activity of the United Nations Headquarters. Application has been made to the Federal Communications Commission for allotment of a suitable frequency for this operation. As regards television, no action has been taken pending decision on the frequency bands at the next International Conference.

(g) Consultation with Specialized Agencies looking towards a common system of telecommunications.

### *Action taken*

Consultation has taken place with the following specialized agencies, subsidiary organizations, etc.: United Nations Educational, Scientific and Cultural Organization; International Bank of Reconstruction; International Labour Office; Food and Agricultural Organization; World Health Organization; United Nations Relief and Rehabilitation Administration. The results are mentioned in the Report in Annex B.

(h) Consultation with Military Staff Committee as regards use of United Nations facilities in emergency.

### *Action taken*

Done by General Frank E. Stoner whose exposition was noted in the records the Military Staff Committee.

(i) Estimated Cost.

### *Action taken*

An estimate of the cost of the equipment required is included as Annex A.

## CHAPTER VI

# CONCLUSIONS AND RECOMMENDATIONS

To make this plan a reality, after endorsement by the General Assembly of the United Nations, two things are required:

## FREQUENCIES AND FUNDS

The Advisory Committee on United Nations Telecommunications submits therefor the following recommendations to be acted upon by the Assembly:

### *A. Frequencies*

In order to recover the frequencies formerly registered for the League of Nations (Chapter II pages 24 ff) and, further, in order to protect the future position of the United Nations as an Agency operating international telecommunications facilities, the following draft of a Resolution is submitted:

"During the first part of the First Session the General Assembly resolved that: "The United Nations should have its own radio broadcasting station or stations at headquarters with the necessary wave-lengths, both for communication with Members and with branch offices, and for the origination of United Nations programmes." (J.O. No. 34, 7 March 1946, page 673).

In view of the present shortage of frequencies in the short-wave broadcasting bands it is urgent that the United Nations should receive the use of the frequencies which had been previously allocated for the requirements of the League of Nations. Therefore, the General Assembly:

1. Instructs the Secretary-General to take the necessary steps with a view to recovering for the United Nations the frequencies which had been previously registered with the International

Telecommunications Union by Radio Suisse for utilization by the League of Nations Radio station;

2. Recommends that the Members should facilitate the participation of the United Nations in the activities of the International Telecommunications Union in order to fully secure its rights as an organization operating international telecommunications facilities."

### *B. Funds*

As regards funds the following draft of a Resolution is submitted:

"The General Assembly approves the Report of the Secretary-General concerning the acquisition of telecommunications facilities, and instructs the Secretary-General to proceed with the implementation of the plan as submitted."

## ACKNOWLEDGMENTS

The Advisory Committee on United Nations Telecommunications wishes to express its acknowledgment to the organizations and individuals for the co-operation received.

1. In assuring the coverage of the second part of the first session of the General Assembly starting 23 October 1946, in Flushing:

United States Department of State (OIC)  
Canadian Broadcasting Corporation  
World-Wide Broadcasting Foundation  
American Telephone and Telegraph Company  
Colonel Martin Luchinger, Indiana Bell Telephone Company

2. In the preparation of the present report: United States Federal Communications Commission

Weldon and Carr, Consulting Radio Engineers, Washington, D.C.

However, the Committee assumes full responsibility for the text and in particular for every recommendation made in this report.

## ANNEX A

### Cost of Proposed Facilities

(for all items the figures shown represent estimated cost, including cost of installation)

#### I. FACILITIES AT UNITED NATIONS GENERAL HEADQUARTERS: \$2,994,000.00

##### *A. Transmitting plant*

- |     |   |           |
|-----|---|-----------|
| 1.  | 3-2 kw, 5 to 22 mc, suppressed carrier, single side band transmitters (one spare)   | \$130,000 |
| 2.  | 4-50 kw, 5 to 22 mc, radio frequency channels, the final amplifier of which may be operated either as Class B linear amplifier for increasing the power of the single side band transmitters above or as Class C plate-modulated amplifier for broadcast service. | 180,000   |
| 3.  | 2-audio amplifier, modulator and rectifier systems for the above 50 kw radio frequency transmitters.  | 270,000   |
| 3.1 | 2 rectifier and power supply systems for item 2.  | 30,000    |

(Items 1, 2, and 3.1 above normally provide two broadcasts and two single side band, suppressed carrier, transmitting facilities. However, during periods when low power operation of the single side band facilities are used, the two 50 kilowatt radio frequency channels will provide for telegraph operation or be employed as standby units for the other two channels in broadcast operation.)

- |    |   |           |
|----|---|-----------|
| 4. | 2-100 kw, 6 to 20 mc, broadcast transmitters.             | \$450,000 |
| 5. | 1-200 kw, 6 to 22 mc, broadcast transmitter.              | 400,000   |
| 6. | 10 frequency shift keying limiting amplifiers and         |           |
| 7. | 25 frequency shift keying oscillator units with crystals. | 21,000    |

*Note:* One limiting amplifier (item 6) is normally to be associated with each transmitter though interchangeable. The oscillator units (item 7) can be fed to any of the ten limiting amplifiers and therefore serve as constant frequency sources for all of the transmitters and may be used either with or without frequency shift keying, as the service requirements demand.

- |     |   |                    |
|-----|---|--------------------|
| 8.  | 1 radio frequency patch panel for the output of the oscillator units and  |                    |
| 9.  | 1 keying circuit switch and relay panel for the oscillator units and  |                    |
| 10. | 1-10-channel audio input console.   | 6,000              |
| 11. | 10 audio equipment bays with limiting amplifiers pre-emphasis network and monitoring facilities for each of ten channels.   | 15,000             |
| 12. | Test equipment bays including frequency monitors, modulation monitors, distortion measuring equipment and audio oscillator. | 13,000             |
| 13. | Antennae per the detailed listing shown in Figure 8.  | 550,000            |
| 14. | 1 set of maintenance tools.   |                    |
| 15. | A universal antenna transmission line switching system.   | 45,000             |
| 16. | Substation for power supply.  | 12,000             |
| 17. | Emergency power supply (500 kw Diesel Unit).  | 75,000             |
| 18. | Communication link between United Nations Headquarters area and transmitter plant (approximately 50 miles distance).        | 50,000             |
| 19. | Communication link between United Nations Headquarters transmitting and receiving plants.                                   | 10,000             |
|     | <b>TOTAL</b>  | <b>\$2,257,000</b> |

#### B. Receiving station

- |    |   |           |
|----|---|-----------|
| 1. | 2 Suppressed carrier, single side band receivers. | \$ 70,000 |
|----|---|-----------|

- |     |   |                  |
|-----|---|------------------|
| 2.  | 3 Exalted carrier, dual diversity receivers or equivalent.                  | \$ 75,000        |
| 3.  | 2 Frequency shift dual diversity receivers.                                 | 3,000            |
| 4.  | Antennae per the detailed listing shown in Figure 11.                       | 128,000          |
| 5.  | Antenna matching and switching panel and                                    |                  |
| 6.  | Audio output line amplifier and switching bay and                           |                  |
| 7.  | Telegraph output line switching system and                                  |                  |
| 8.  | Test equipment for maintenance and  |                  |
| 9.  | 1 Set of maintenance tools.   | 6,000            |
| 10. | Emergency Power Supply.   | 10,000           |
| 11. | Communication link between United Nations Headquarters and Receiving Plant. | 50,000           |
|     | <b>TOTAL</b>  | <b>\$342,000</b> |

#### C. Master Control Studies

- |    |  |          |
|----|--|----------|
| 1. | Twelve Channel Master Control console and associated equipment bays capable of feeding twelve outgoing programme circuits with pre-selection and instantaneous, and/or individual channel switching to any twelve (or less) of twenty-four incoming programme circuits. This contemplates twelve General Headquarters studios and twelve Remote lines from the Receiving station, domestic networks, common carriers, and other pick-up points. Also test equipment bay. | \$35,000 |
| 2. | Recording room master control capable of switching any of the twenty-four pick-up points to any one of twelve recorders.   | 30,000   |
| 3. | 12 Instantaneous records for high fidelity transcription work.   | 15,000   |
| 4. | 12 tape or disc type continuous reference recorders.   | 25,000   |
| 5. | 6 Studios each with control booth and equipped as follows: <ul style="list-style-type: none"> <li>(a) 1-2 channel console with 6 channel mixer.</li> <li>(b) 2 High fidelity microphones.</li> <li>(c) 1 Talk back microphone.</li> <li>(d) 1 High fidelity monitor speaker.</li> <li>(e) 1 Talk back speaker.</li> <li>(f) 4 Transcription playback tables.</li> </ul>  | 30,000   |
| 6. | 6 studios equipped as in item 5 except with only two transcription playback tables   | 22,000   |
| 7. | "Stroger" type dial selection monitor system with 100 monitoring positions each equipped with dial   |          |

type selector, amplifier and loud speaker. (Monitoring positions to be located in various offices of executives, programme directors, writers, etc., to be used for checking any outgoing programme, for listening to special overseas or network pick-ups arranged for at the United Nations Receiving station, through common carriers, etc.

8. Small maintenance shop with tools.	\$ 35,000
	<u>3,000</u>
<b>TOTAL</b>	<b><u>\$195,000</u></b>

#### D. Message centre

1. 12 Receiving only page printers, each with reperforators and each equipped for multi-copy sprocket feed operation.	\$ 31,000
2. 12 Keyboard printers with transmitting head and relay. (Above are for operation of the six channel teletype circuits on each of the single side band transmitters.)	32,000
3. 8 Send and receive radio printers for connexion with common carriers.	17,000
4. 2 Keyboard printers with transmitting head and relay for carrier shift keying of broadcast transmitters.	5,000
5. 1 Receiving only radio page printer for que back on certain frequency shift transmissions.	1,000
6. 6 Perforators for international morse transmission.	5,000
7. 6 International morse transmitting heads.	5,000
8. 6 International morse tape recorders with tape pullers.	5,000
9. 1 Incoming line switch panel and	
10. 1 Outgoing line switching and keying relay panel.	3,000
11. 2 Voice frequency telegraph equipment.	96,000
<b>TOTAL</b>	<b><u>\$200,000</u></b>

#### II. FACILITIES AT UNITED NATIONS MAIN EUROPEAN FIELD OFFICE: \$1,886,500.00

##### A. Transmitting plant

1. 1-2 kw suppressed carrier single side band transmitter.	\$ 43,000
2. 1-50 kw, 5 to 22 mc, broadcast transmitter.	175,000
3. 1-100 kw, 5 to 22 mc, broadcast transmitter.	225,000

Note: The final amplifier in each of the above two units is to be so designed that it may serve alternately as a Class B Linear amplifier for the single side band transmitter.

4. 1-1000 kw, long-wave broadcast transmitter	\$650,000
5. 3 Frequency shift keying limiting amplifiers and	
6. 8 Frequency shift keying oscillator units with crystals. (See note under I-A-7 above.)	6,000
7. 1 Radio frequency patch panel for oscillators.	
8. 1 Keying circuit switch and relay panel for oscillators.	
9. 1-5 channel audio input console.	
10. 5 Audio equipment bays with limiting amplifiers, pre-emphatic networks, and monitoring facilities for each of five channels.	12,000
11. Test equipment bays including frequency monitors, modulation monitors, distortion measuring equipment, and audio oscillator.	9,000
12. 1 Non-directional long wave antenna and ground system.	35,000
13. Directional short wave antenna as listed in Figure 9.	200,000
14. A universal antenna transmission line switching system and	
15. 1 set of maintenance tools.	7,000
16. Substation for power supply.	18,000
17. Emergency power supply (200 kw Diesel unit).	40,000
<b>TOTAL</b>	<b><u>\$1,420,000</u></b>

##### B. Receiving Station

1. 2 Suppressed carrier, single side band receivers (1 spare).	\$ 70,000
2. 3 Exalted carrier, dual diversity receivers or equivalent.	75,000
3. 2 Frequency shift dual diversity receivers.	
4. Maintenance test equipment.	5,000
5. Antennae per detailed listing in Figure 12.	95,000
6. Antenna matching and switching panel.	
7. Audio output line amplifier and switching bay.	
8. Telegraph output line switching system.	
9. 1 set of maintenance tools.	4,000
10. Emergency Power Supply.	10,000
<b>TOTAL</b>	<b><u>\$259,000</u></b>

##### C. Master control and studios

Note: It is assumed that the broadcasting in the main European field office will be principally a relay operation. Therefore, only three small announcing studios are provided. Any local organizations requiring larger studios could be carried in by wire line from leased domestic



studios in the area. It may be most feasible to make the master control and studio layout a part of the receiving station rather than a separate installation. The figure for building alteration and acoustical treatment would hold for either case. (See discussion of the use of recording equipment in Appendix.)

1.	1-6 channel master control console and associated equipment bays capable of feeding 6 outgoing programme circuits with preselection and instantaneous, simultaneous and/or individual channel switching to any 6 (or less) of 10 incoming programme circuits. This contemplates 3 studios and 7 remote lines from receiving station, common carriers, domestic networks, and other pick-up points.	\$ 15,000
2.	Recording room master control capable of switching any of the ten incoming programme circuits to any of six recorders.	9,000
3.	6 Instantaneous recorders for high-fidelity transcription work.	8,000
4.	6 Tape or disc type continuous reference recorders.	13,000
5.	3 Studios each with control booth and equipment as follows:	
	(a) 1 Two channel console with six channel mixer.	
	(b) 2 High fidelity microphones.	
	(c) 1 Talk back microphone.	
	(d) 1 High fidelity monitor speaker.	
	(e) 1 Talk back speaker.	
	(f) 3 Transcription play back tables.	14,000
6.	Small shop with maintenance tools.	3,500
7.	Building alterations and acoustical treatment.	40,000
	<b>TOTAL</b>	<b>\$102,500</b>

#### D. Message Centre

1.	6 Receiving only radio page printers with reperforators and each equipped for multi-copy sprocket feed operation.	\$ 16,000
2.	6 Keyboard printers with transmitting head and relay.	16,000
3.	4 Send-receive radio printers for connexion with common carriers.	8,000
4.	1 Keyboard printer with transmitting head and relay for carrier shift keying of broadcast transmitter.	

5.	2 Receiving only radio page printers for frequency shift reception.	
6.	3 Perforators for international morse code transmission.	
7.	3 International morse transmitting heads.	
8.	6 International morse type recorders with tape pullers.	
9.	1 Incoming line switching panel.	
10.	1 Outgoing line switching and keying relay panel.	\$17,000
11.	1 Voice Frequency telegraph equipment.	48,000

*Note:* The incoming and outgoing switching panels will include facilities for direct instantaneous carrier shift keying of the European transmitters from incoming signals of the General Headquarters transmitters.

**TOTAL \$105,000**

### III. FACILITIES FOR BROADCAST RELAY STATION TO SERVE EASTERN ASIA AND PACIFIC AREAS: \$526,000.00

#### A. Transmitting plant

1.	1-200 kw, 6 to 22 mc, broadcast transmitter.	\$400,000
2.	1 Frequency shift keying limiting amplifier.	
3.	3 Frequency shift keying oscillator units with crystals.	2,000
4.	1 Audio input equipment bay with limiting amplifier, pre-emphasis network, and monitoring facilities.	
5.	1 Test equipment bay including frequency monitor and modulation monitor.	
6.	1 Set of maintenance tools.	6,000
7.	Antennae per the detailed listing in Figure 10.	
8.	1 Transmission line transfer switch.	5,000
9.	Substation for power supply.	5,000
10.	Emergency Power Supply (200 kw Diesel Unit).	40,000
	<b>TOTAL</b>	<b>\$458,000</b>

#### B. Receiving station and studio

1.	1 Exalted carrier dual diversity receiver or equivalent.	\$25,000
2.	1 Frequency shift dual diversity receiver.	2,000
3.	2 Rhombic receiving antennae.	
4.	1 Antenna matching and switching panel.	16,000
5.	1 Two channel studio console.	
6.	2 High fidelity microphones.	
7.	4 Instantaneous high fidelity recorders.	



8. 4 Transcription play back tables.
9. 4 Equipment bays with recording amplifiers, patch panel, monitors, etc.
10. 1 High fidelity monitor speaker.
11. Test equipment: Audio oscillator, signal generator, analyzer.
12. One set of maintenance tools. \$15,000
13. Emergency Power Supply. 10,000

TOTAL \$68,000

#### IV. FACILITIES AT UNITED NATIONS LATIN AMERICAN FIELD OFFICE: \$335,000.00

*Note:* It is understood that this facility may be installed at any important field office; a Latin American office has been assumed most feasible for the purpose of presenting this budget.

##### A. Transmitting plant

1. 1-2 kw, 5 to 22 mc, suppressed carrier, single side band transmitter. \$ 43,000
  2. 1-50 kw amplifier for the above suppressed carrier transmitter. 30,000
  3. 1 Rhombic antenna beamed to United Nations General Headquarters receiving station. 16,000
  4. 1 Rhombic antenna beamed to United Nations main European Field Office receiving station. 16,000
  5. Emergency Power Supply (200 kw Diesel Unit). 40,000
- TOTAL \$145,000

##### B. Receiving Station

1. 1 Suppressed carrier, single side band receiver. \$ 35,000
  2. 1 Exalted carrier, dual diversity broadcast receiver or equivalent. 25,000  
(To be used to feed United Nations programmes to local stations for re-broadcasting.)
  3. 1 Frequency shift, dual diversity receiver. 2,000
  4. 2 Receiving rhombic antennae, bearing on United Nations General Headquarters transmitting station.
  5. Antenna matching and switching panel. 16,000
  6. Emergency Power Supply 10,000
- TOTAL \$88,000

##### C. Message Centre

\$102,000

This message centre, located in the United Nations field office building, is to be a duplicate of the Main European Field Office Message Centre with the exception that item 4 shall be omitted.

*Note:* It is not planned for the time being to purchase land or construct transmitting or receiving plant buildings at this location. The possibility is being considered to install the equipment in existing commercial plants and to have it operated on a contract basis by such commercial companies.

TOTAL \$102,000

#### V. FACILITIES FOR USE IN VARIOUS BRANCH OFFICES:

- A. 20 Frequency shift, dual diversity receivers, capable of both programme and printer-telegraph reception simultaneously. \$ 30,000
  - B. 20 Line amplifiers for the audio channels of these receivers. 6,000
  - C. 20 Dual antenna kits for use with above receivers. 20,000
  - D. 20 Receiving only radio page printers. 26,000
  - E. 20 tape recorders with tape pullers for international morse code reception. 18,000
- TOTAL \$100,000

#### VI. MISCELLANEOUS GENERAL EXPENSES:

- A. 4 Telephone "privacy" devices. \$60,000  
(These are for use in connexion with the single side band voice channels for telephone conferences by United Nations officials between General Headquarters and the two field offices where single side band equipment is planned.)
  - B. 4 Ultra high frequency multi-channel studio-to-transmitter and receiving station-to-studio link transmitters and receiving for use at United Nations General Headquarters and at Main European Field Office. (Including antennae and antenna supports.) 10,000
- TOTAL \$70,000

#### *Note:*

1. The above estimates do not include any provision for buildings and land, as no decision has been made yet concerning the headquarters site.

2. The cost figures in this report are estimates based on past experience in the procurement of similar equipment and materials. Wherever possible, tentative quotations were obtained from suppliers. It is proposed that all contracts for procurement and for performance of the construction and installation be awarded after taking sealed bids from a number of recognized suppliers or contractors, of all Member Nations, in each of the various fields involved.

**ANNEX B**

**Replies from Specialized Agencies of the  
United Nations**

Paris

9 November 1946

Brigadier-General Frank Stoner,

Following is copy of cable sent to Cohen today. Congratulations on excellent plan of Stoner Committee as outlined to me by Lambert for United Nations shortwave radio network giving world coverage also plan of interim broadcasting facilities. UNESCO warmly endorses Stoner proposals on assumption: (first) that joint board of United Nations and specialized agencies will supervise facilities and plan programmes; (second) that UNESCO be recognized as specially interested in educational, scientific and cultural programmes and as specifically responsible for formal educational work; (third) that UNESCO personnel share in day-to-day operations and production in New York and other centres. On this basis of co-operation we confidently look forward to important development of joint use of radio to promote our common and individual objectives.

HUXLEY

International Bank for  
Reconstruction and Development  
Washington, D.C.  
25 October 1946

Dear General Stoner,

I have received your letter of 21 October 1946, suggesting that representatives of the Bank and the Telecommunications Advisory Committee of the United Nations meet to discuss the requirements of the Bank in this field.

We will, of course, be pleased to arrange such a meeting, but I should like to express to you my view that it is unlikely that the Bank would find it necessary or desirable to avail itself of world-wide broadcast facilities.

Aside from the release to the press from time to time of current information, the Bank will probably limit its information programme to the task of furnishing appropriate information to investment groups in those countries in which it seeks to market its securities. This type of information does not lend itself to radio broadcast nor does it require the broad coverage of a radio network system.

For these reasons, I suggest that the Bank's interest in the plans of your Committee is less direct than that of other agencies. Under the circumstances, you may decide that discussions would not prove particularly fruitful. If you do desire discussions, however, I shall be glad to designate a representative to explain more fully the role and program of the Bank.

Sincerely yours,

(Signed) EUGENE MEYER  
President

Brig.-Gen. Frank E. Stoner,  
Chairman,  
Telecommunications Advisory Committee,  
United Nations,  
Lake Success, N.Y.

International Labour Office  
Bureau international du Travail  
Montreal 25,  
Canada  
25 October 1946

Dear General Stoner,

Thank you for your letter of 22 October. The International Labour Office will be glad to appoint a representative to discuss with you our requirements in regard to the matters being considered by the Telecommunications Advisory Committee, and I shall get in touch with you on the subject as soon as the Director-General has decided who will represent the Office for this purpose.

Sincerely yours,

(Signed) C. W. JENKS  
Legal Adviser

Brig.-Gen. Frank E. Stoner,  
Chairman,  
Telecommunications Advisory Committee,  
United Nations,  
Lake Success, N.Y.

World Health Organization  
Interim Commission  
2 East 103rd Street  
New York, N.Y.  
24 October 1946

Brig.-Gen. Frank E. Stoner,  
Chairman,  
Telecommunications Advisory Committee,  
United Nations,  
Lake Success, N.Y.

Dear General Stoner,

Following our telephone conversation this morning, I am enclosing a copy of a note made by Mr. Deutschman of our staff, on our communications needs in the future.

No decision has yet been taken as to the headquarters of the Organization or of the Interim Commission during the first part of 1947. The decision about the Interim Commission will have to be made between the 4th and 10th of November in Geneva; after that time we shall be able to give you more definite information. I hope that in the meantime the information we have will be of use to you.

Sincerely yours,

(Signed) BROCK CHISHOLM  
Executive Secretary

22 October 1946

While it is difficult to estimate the overall requirements of WHO in Radio facilities and Radio time I can, however, list our needs as follows:

A. *Telecommunications*  
Official Communications with  
(a) Governments

This would include communications and announcements under the International Sanitary Conventions and emergency communications such as in the case of outbreak of important epidemics, etc.

(b) Regional Bureau

Routine weekly or daily communications addressed to all regional bureaus of WHO. Time about five minutes per day.

B. Radio

(a) Epidemiological bulletins

These bulletins addressed to national health administrations over a complete network of stations or by beams in code or in clear would require about five minutes per day.

(b) Official announcements to national health administrations would be made occasionally or in connection with the work of the Health Assembly.

(c) Broadcasts about the activities of WHO

These broadcasts addressed to the general public should be arranged for within the terms of agreement with the Department of Public Information United Nations. I assume that such broadcasts made in five or six languages would require forty minutes per week.

*Remark.* In a telephone conversation with General Stoner, the World Health Organization declared that they could not yet give a final statement concerning the use of the United Nations facilities but that their estimate for the moment was forty minutes daily.

United Nations  
Relief and Rehabilitation Administration  
25 October 1946

Brig.-Gen. Frank E. Stoner,  
Chairman,  
Telecommunications Advisory Committee,  
United Nations,  
Lake Success, N.Y.

Dear General Stoner:

In response to your letter of October 21, I should like to advise you that the United Nations Relief and Rehabilitation Administration will not be concerned with any matters which will be before the United Nations Telecommunications Advisory Committee. UNRRA is not an agency of the type we believe to be contemplated under the terms of reference of your committee, since it is a temporary rather than a specialized agency.

It is not contemplated that UNRRA will continue its activities past the middle of 1947, and many of its operations will cease before that time. Accordingly, it is not felt that it will be necessary for representatives of UNRRA to discuss requirements in the telecommunications field.

If, nevertheless, you feel that any purpose would be served by meeting with a representative of UNRRA, we shall be happy to meet with you.

Sincerely yours,  
(Signed) ALFRED E. DAVIDSON  
General Counsel

No answer was received from the  
Food and Agricultural Organization

On 13 November 1946 Brig.-Gen. Frank E. Stoner for the fine presentation, stating that they see a brief of the proposed Communications Plan for the United Nations.

The Military Staff Committee thanked General Stoner for the fine presentation, stating that it took cognizance of the proposed plan and noted it in the record of the Military Staff Committee.

ANNEX C

Membership of the Committee

*Original Committee*

Brigadier-General FRANK E. STONER (U.S.A.),  
Chairman, Assistant Chief Signal Officer, U.S.  
Army, Former Wartime Chief of U.S. Army  
Communications Service.

MR. S. KAGAN (France), former Chief Signal Officer, HQ, Free French Forces; formerly Chief French Mission of Telecommunications.

MR. G. F. VAN DISSEL (Netherlands), Chief of Communications Dept., Netherlands Purchasing Commission; Former Member of Transit and Communications Section, League of Nations (in charge of direction League of Nations wireless section).

*Augmented Committee*

The augmented committee consisted of the members named above, plus the following nominees of the Governments named:

MR. WEN YUAN PAN (China), formerly Technical Adviser, China Defense Supplies, Inc., Washington, D.C., and Universal Trading Corp., New York City; Communications Expert to Internat. Civil Aviation Conference, 1944.

COL. HASSAN BEY RAGAB (Egypt), at present Military Attaché, Egyptian Embassy, Washington, D.C.; formerly Commanding Officer, Egyptian Army Telecommunications Maintenance System.

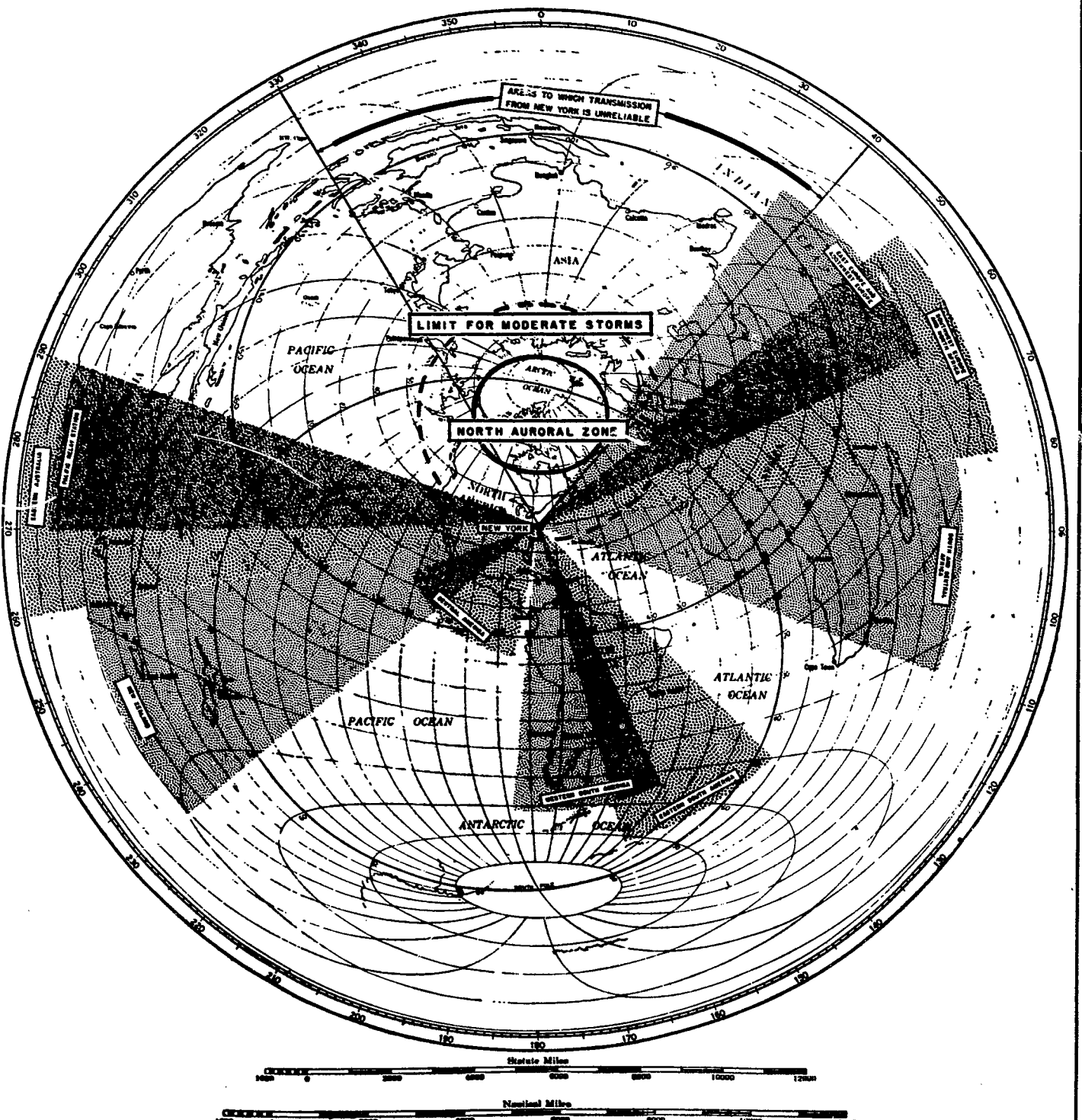
MR. SERGEI P. GAVRILITSA (U.S.S.R.), at present radio engineer in charge of communications, Soviet Delegation to United Nations; formerly broadcast engineer, Moscow Radio, Main Office.

BRIG. JOHN GORDON DEEDS (U.K.), Telecommunications Attaché, British Embassy, Washington, D.C.; formerly Deputy Director of Signals (Telecommunications), War Office, London.

MR. ROBERTO FONTAINA, President of SADREP, Commercial Broadcasting Network of Uruguay; Alternate Delegate of Uruguay to United Nations Assembly.

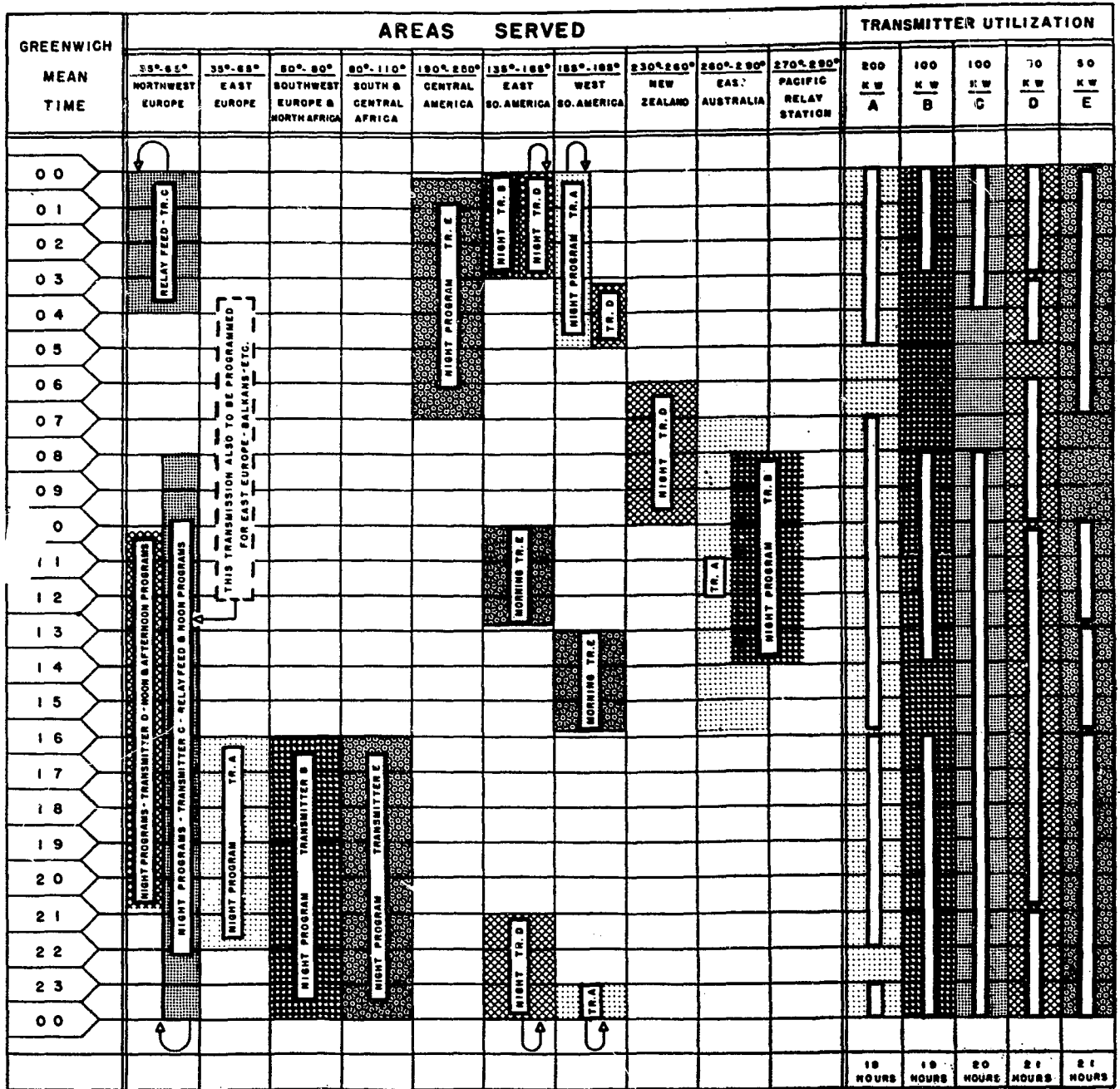
**BROADCAST ANTENNA BEAM DIRECTIONS**  
**UNITED NATIONS GENERAL HEADQUARTERS TRANSMITTING PLANT**

**CHART OF THE WORLD**  
 Showing Great Circle Distances and Azimuths



**WELDON & CARR**  
**CONSULTING RADIO ENGINEERS**  
**WASHINGTON DC**  
**461016A**

# TYPICAL OPERATING SCHEDULE FOR UNITED NATIONS GENERAL HEADQUARTERS TRANSMITTERS



**NOTE:**

TRANSMITTER UTILIZATION - INDICATES THE TOTAL NUMBER OF HOURS AND THE TIME OF DAY EACH OF THE FIVE TRANSMITTERS IS IN OPERATION.  
AREAS SERVED - SHOWS THE BROADCASTING TIME FOR EACH OF THE INDICATED AREAS AND THE PARTICULAR TRANSMITTER REQUIRED FOR THAT SERVICE.

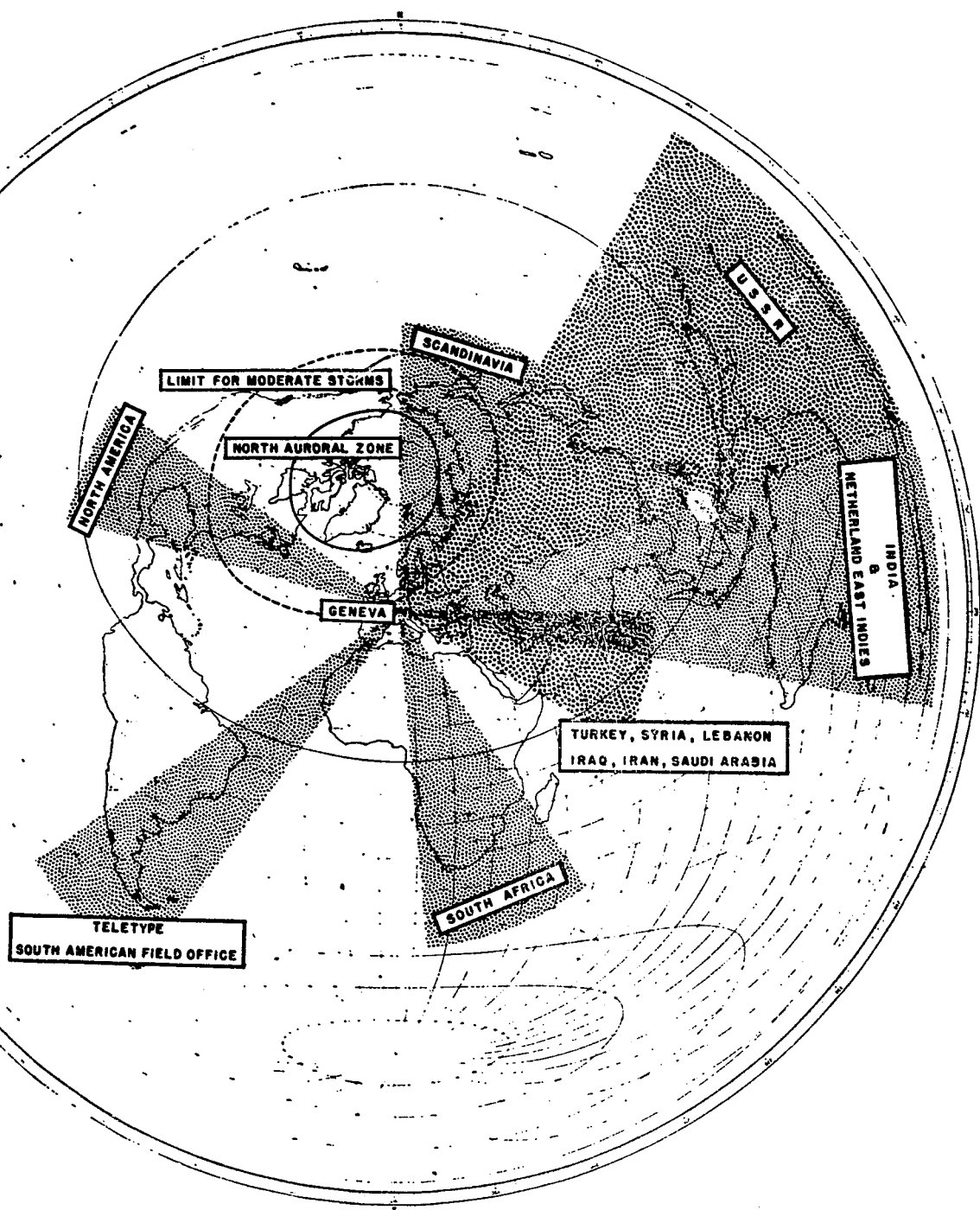
WELDON & CARR  
CONSULTING RADIO ENGINEERS  
WASHINGTON DC  
481028

**BROADCAST ANTENNA BEAM DIRECTIONS**

**UNITED NATIONS MAIN EUROPEAN FIELD OFFICE  
TRANSMITTING PLANT**

**CHART OF THE WORLD**

SHOWING GREAT CIRCLE DISTANCES  
AND AZIMUTHS FROM GENEVA



# TYPICAL OPERATING SCHEDULE FOR UNITED NATIONS MAIN EUROPEAN FIELD OFFICE SHORT WAVE TRANSMITTERS

GREENWICH MEAN TIME	AREAS SERVED SHOWING TRUE BEARINGS						TRANSMITTER UTILIZATION	
	30°-70° USSR	70°-100° INDIA AND NETHERLANDS EAST INDIES	90°-120° NEAR EAST	145°-175° CENTRAL AND SO. AFRICA	0°-30° SCANDINAVIA	225°-305° NORTH AMERICA	100 KW A	50 KW B
00								
01						TRANSMITTER A		
02						TRANSMITTER A		
03						TRANSMITTER A		
04						TRANSMITTER A		
05						TRANSMITTER A		
06								
07								
08								
09								
10								
11								
12								
13		TRANSMITTER A						
14		TRANSMITTER A						
15								
16			TRANSMITTER B					
17	TRANSMITTER A		TRANSMITTER B					
18	TRANSMITTER A		TRANSMITTER B					
19	TRANSMITTER A							
20				TRANSMITTER B				
21				TRANSMITTER B				
22				TRANSMITTER B	TRANSMITTER A			
23					TRANSMITTER A			
00							17 HOURS	8 HOURS

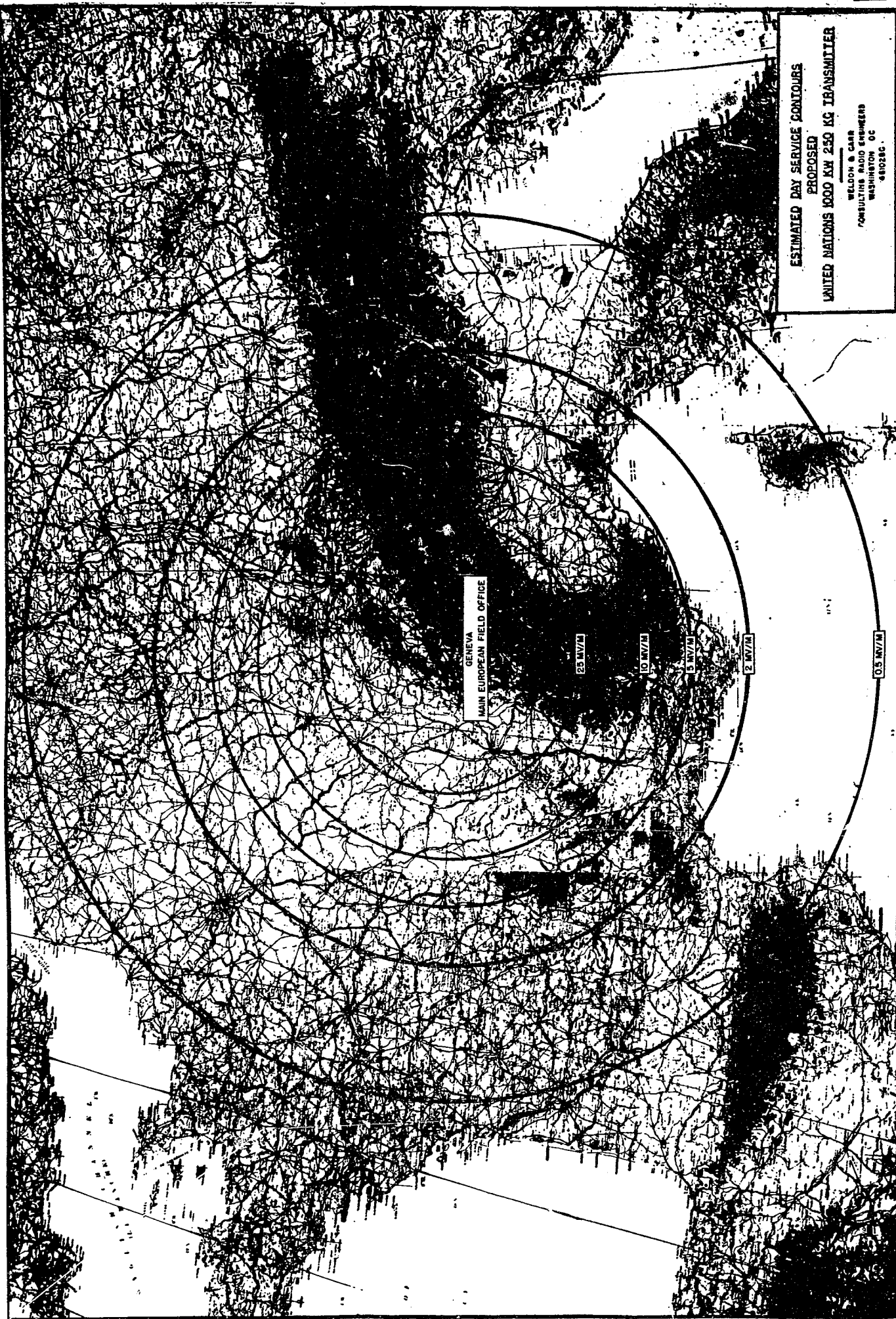
**NOTE**

TRANSMITTER UTILIZATION-INDICATES THE TOTAL NUMBER OF HOURS AND THE TIME OF THE DAY EACH OF THE TWO TRANSMITTERS IS IN OPERATION.  
AREAS SERVED-SHOWS THE BROADCASTING TIME FOR EACH OF THE INDICATED AREAS AND THE PARTICULAR TRANSMITTER REQUIRED FOR THAT SERVICE

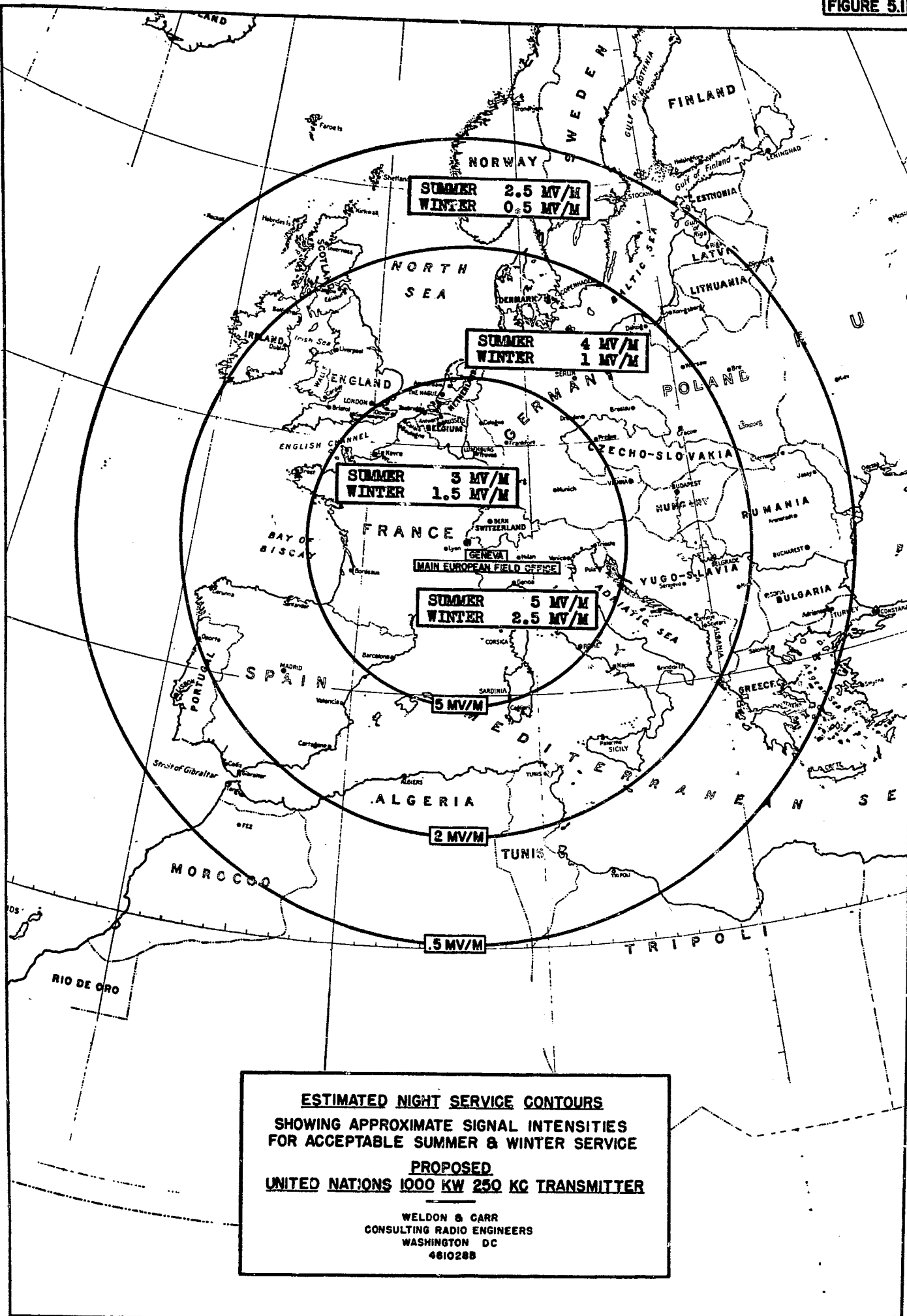
THE 50 KW TRANSMITTER SERVES THE NEAR EAST AND SOUTH AFRICA FOR EIGHT HOURS DAILY, THE REMAINING CAPACITY IS RESERVED FOR RELAYING PROGRAMS ORIGINATING IN EUROPE TO UNITED NATIONS HEADQUARTERS OR ELSEWHERE.



ESTIMATED DAY SERVICE CONTOURS  
PROPOSED  
UNITED NATIONS 1000 KW 250 KC IB TRANSMITTER  
WELDON & GARR  
CONSULTING RADIO ENGINEERS  
WASHINGTON, DC  
481028C

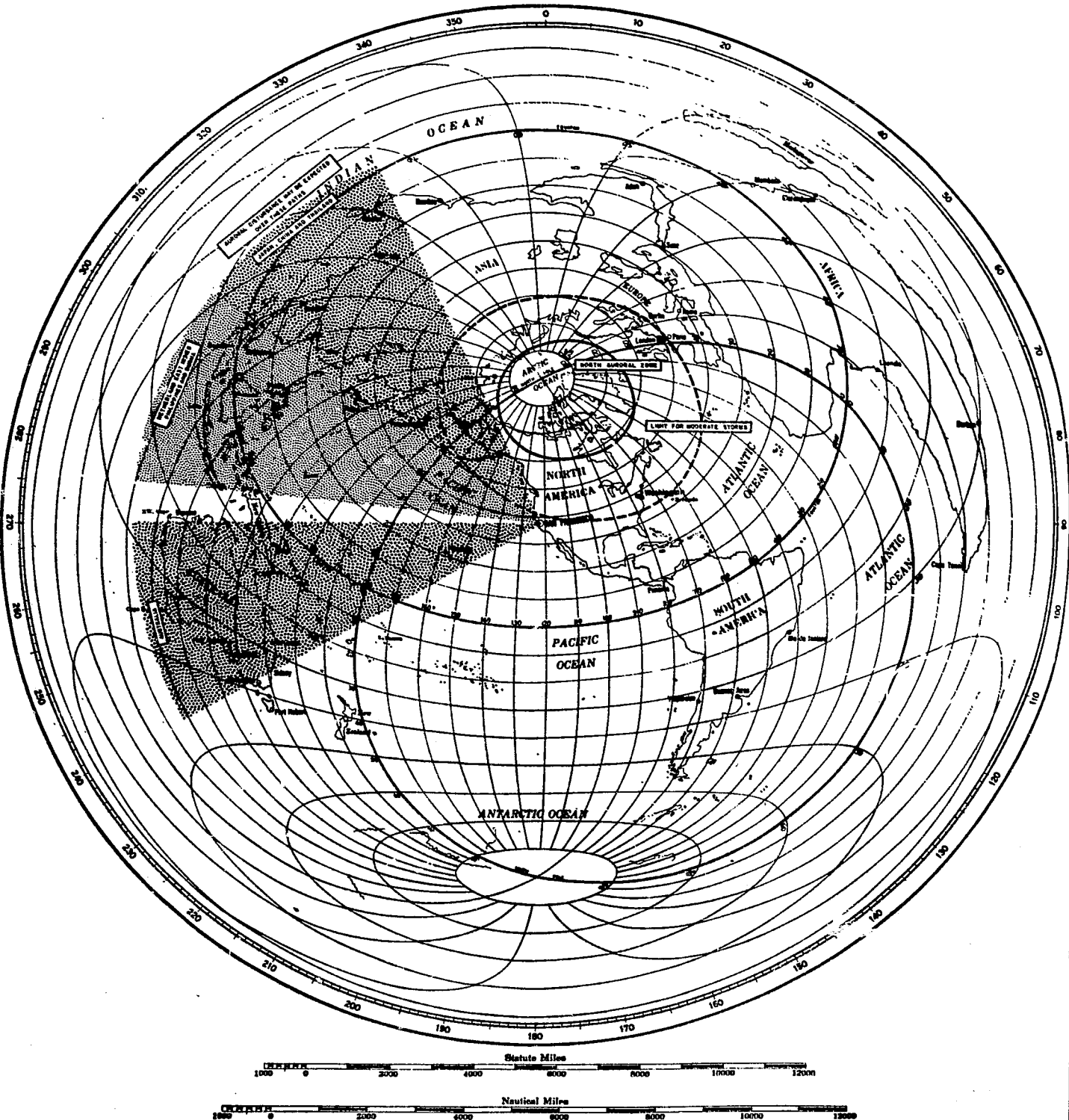




**FIGURE 5.1**

**BROADCAST ANTENNA BEAM DIRECTIONS**  
**FOR FIRST POSSIBLE LOCATION OF UNITED NATIONS**  
**PACIFIC AREA RELAY STATION**

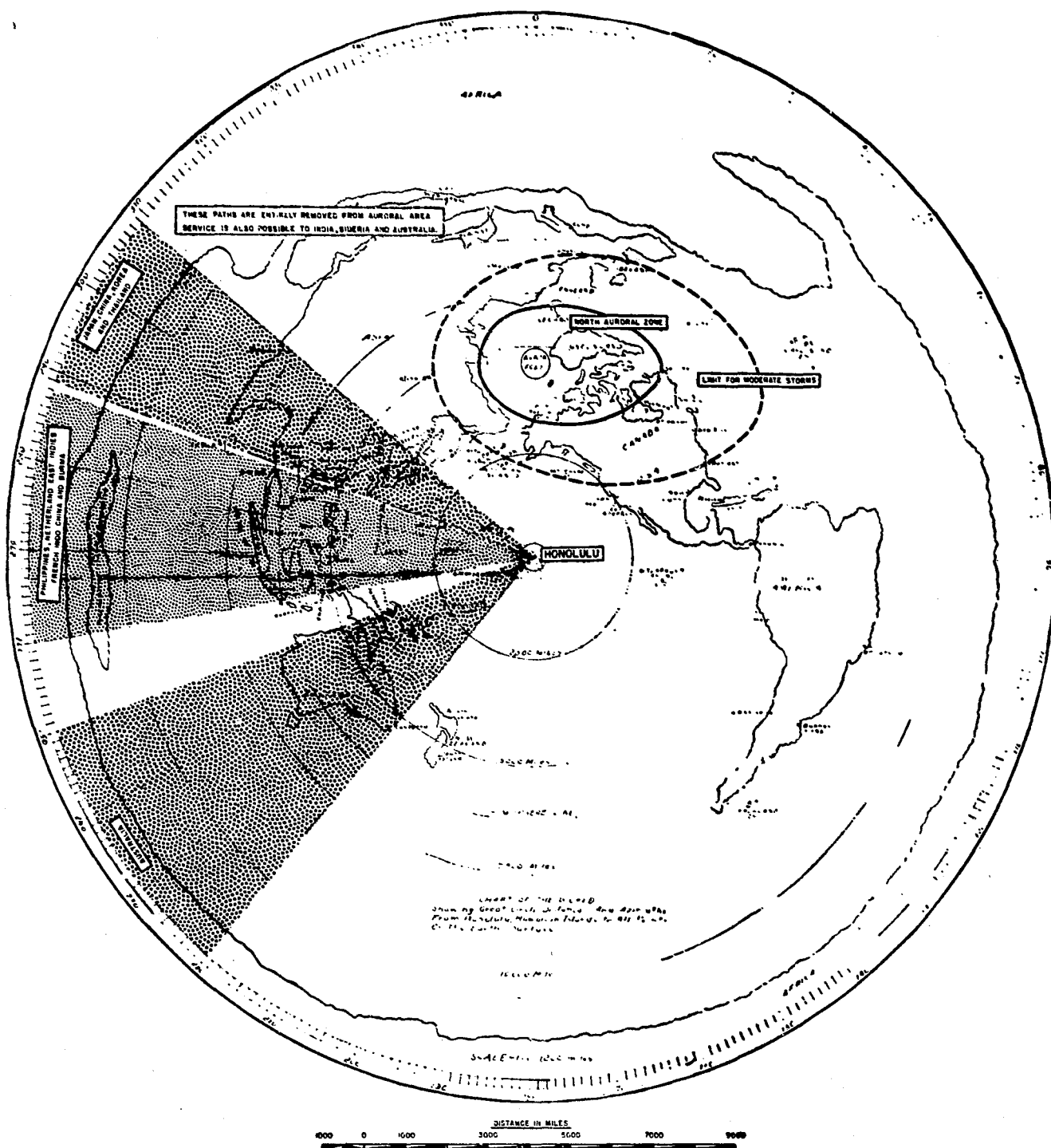
**CHART OF THE WORLD**  
 Showing Great Circle Distances and Azimuths  
 from San Francisco, Cal. to all Points on the Earth's Surface



**WELDON & CARR**  
**CONSULTING RADIO ENGINEERS**  
**WASHINGTON DC**  
**461016C**

**BROADCAST ANTENNA BEAM DIRECTIONS  
FOR SECOND POSSIBLE LOCATION FOR UNITED NATIONS  
PACIFIC AREA RELAY STATION**

**CHART OF THE WORLD  
SHOWING GREAT CIRCLE DISTANCES AND AZIMUTHS  
FROM HONOLULU HAWAIIAN ISLANDS TO ALL POINTS  
ON THE EARTH'S SURFACE**



**WELDON & CARR**  
**CONSULTING RADIO ENGINEERS**  
**WASHINGTON DC**  
**46101GR**

# TYPICAL OPERATING SCHEDULE FOR UNITED NATIONS PACIFIC AREA RELAY STATION

GREENWICH MEAN TIME	AREAS SERVED							TRANSMITTER UTILIZATION (1 - 200KW)
	ANTENNA BEAM NO. 1			ANTENNA BEAM NO. 2				
	JAPAN	CHINA	THAILAND	PHILIPPINES	NETHERLANDS EAST INDIES	FRENCH INDO- CHINA	BURMA	
00								
01								
02								
03								
04								
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15								
16								
17								
18								
19								
20								
21								
22								
23								
00								

11 HOURS

11 HOURS

## NOTES

- 1 TRANSMITTER UTILIZATION - INDICATES THE TOTAL NUMBER OF HOURS AND THE TIME OF DAY TRANSMITTER IS IN OPERATION
- 2 AREAS SERVED - SHOWS THE BROADCASTING TIME FOR EACH OF THE AREAS AND THE ANTENNA BEAM REQUIRED FOR THAT SERVICE
- 3 THE MARKINGS SHOW EVENING HOURS OF AREAS SERVED  
DASHED LINES SHOW ADDITIONAL POSSIBLE SERVICE DURING MORNING HOURS TO THESE AREAS

WELDON & CARR  
CONSULTING RADIO ENGINEERS  
WASHINGTON DC  
461029

# **TENTATIVE LIST OF ANTENNAE** **UNITED NATIONS GENERAL HEADQUARTERS TRANSMITTING PLANT**

<i>Beam Direction</i>	<i>Antenna No.</i>	<i>Description</i>	
EAST AND NORTHWEST EUROPE	1	6 and 9 mc. dual frequency curtain	All to be supported on three towers.
EAST AND NORTHWEST EUROPE	2	9 and 11 mc. dual frequency curtain	
EAST AND NORTHWEST EUROPE	3	11 and 15 mc. dual frequency curtain	
EAST AND NORTHWEST EUROPE	4	11 and 15 mc. dual frequency curtain	
EAST AND NORTHWEST EUROPE	5	15 and 17 mc. dual frequency curtain	
SOUTHWEST EUROPE AND NORTH AFRICA	6	9 and 11 mc. dual frequency curtain	All to be supported on three towers.
SOUTHWEST EUROPE AND NORTH AFRICA	7	15 and 17 mc. dual frequency curtain	
CENTRAL AND SOUTH AFRICA	8	9 and 11 mc. dual frequency curtain	
CENTRAL AND SOUTH AFRICA	9	15 and 17 mc. dual frequency curtain	
EAST SOUTH AMERICA	10	9 and 11 mc. dual frequency curtain	All to be supported on three towers.
EAST SOUTH AMERICA	11	15 and 17 mc. dual frequency curtain	
WEST SOUTH AMERICA	12	9 and 11 mc. dual frequency curtain	
WEST SOUTH AMERICA	13	15 and 17 mc. dual frequency curtain	

**FIGURE 8**  
**Sheet 1 of 2**

MEXICO AND CENTRAL AMERICA	14	Broadbeam curtain for 6 mc.
EAST AND NORTHWEST EUROPE	15	Rhombic antenna with 6 to 11 mc. range
EAST AND NORTHWEST EUROPE	16	Rhombic antenna with 9 to 15 mc. range
EAST AND NORTHWEST EUROPE	17	Rhombic antenna with 11 to 17 mc. range
EAST SOUTH AMERICA	18	Rhombic antenna with 6 to 11 mc. range
EAST SOUTH AMERICA	19	Rhombic antenna with 9 to 15 mc. range
WEST SOUTH AMERICA	20	Rhombic antenna with 9 to 15 mc. range
PACIFIC AREA RELAY TRANSMITTER	21	6 and 9 mc. dual frequency curtain
PACIFIC AREA RELAY TRANSMITTER	22	11 and 15 mc. dual frequency curtain
PACIFIC AREA RELAY TRANSMITTER	23	17 and 22 mc. dual frequency curtain

All to be supported on three towers.

*Note:* The following antennae are to be reversible: Nos. 6 and 7 (for service to New Zealand); Nos. 8 and 9 (for service to Australia).

The above tentatively summarizes antenna requirements without specifying operating frequencies pending their allocation to the United Nations.

# TENTATIVE LIST OF SHORT WAVE ANTENNAE

## UNITED NATIONS MAIN EUROPEAN FIELD OFFICE TRANSMITTING PLANT

<i>Beam Direction</i>	<i>Antenna No.</i>	<i>Description</i>
USSR	1	6 and 9 mc. dual frequency curtain
INDIA AND NETHERLANDS EAST INDIES	2	6 and 9 mc. dual frequency curtain
INDIA AND NETHERLANDS EAST INDIES	3	11 and 15 mc. dual frequency curtain
NEAR EAST	4	9 and 11 mc. dual frequency curtain
AFRICA	5	11 and 15 mc. dual frequency curtain
SOUTH AMERICA	6	Rhombic antenna designed for optimum frequency range of 9 to 15 mc.
NORTH AMERICA	7	11 and 15 mc. dual frequency curtain
NORTH AMERICA	8	Rhombic antenna with 6 to 11 mc. range
NORTH AMERICA	9	Rhombic antenna with 11 to 18 mc. range
SCANDINAVIA	10	6 to 9 mc. dual frequency curtain

*Note:* The above tentatively summarizes antenna requirements without specifying operating frequencies pending their allocation to the United Nations.

FIGURE 9

**LIST OF ANTENNAE**  
**UNITED NATIONS PACIFIC AREA RELAY TRANSMITTER**

<i>Beam Direction</i>	<i>Antenna No.</i>	<i>Description</i>
JAPAN, CHINA, AND THAILAND	1	9 and 11 mc. dual frequency curtain
JAPAN, CHINA, AND THAILAND	2	15 and 17 mc. dual frequency curtain
PHILIPPINES, NETHERLANDS EAST INDIES, FRENCH INDO-CHINA, AND BURMA	3	9 and 11 mc. dual frequency curtain
PHILIPPINES, NETHERLANDS EAST INDIES, FRENCH INDO-CHINA, AND BURMA	4	15 and 17 mc. dual frequency curtain

All to be supported on three towers.

*Note:* The exact location of this relay station will influence the choice of design frequencies for the antennae and the above is merely suggested as a typical installation.

*Note:* The above tentatively summarizes antenna requirements without specifying operating frequencies pending their allocation to the United Nations.

**FIGURE 10**



**TENTATIVE LIST OF ANTENNAE**  
**UNITED NATIONS GENERAL HEADQUARTERS RECEIVING STATION**

<i>Beam Direction</i>	<i>Number of Pairs of Rhombic Antennas</i>	<i>Frequency Range</i>
UN EUROPE	2	5 to 11 and 11 to 20 mc.
UN SOUTH AMERICA	2	5 to 11 and 11 to 20 mc.
NORTH AFRICA	1	5 to 20 mc.
SOUTH AND CENTRAL AFRICA	1	5 to 20 mc.
MEXICO	1	5 to 20 mc.
PACIFIC AREA	1	5 to 20 mc.

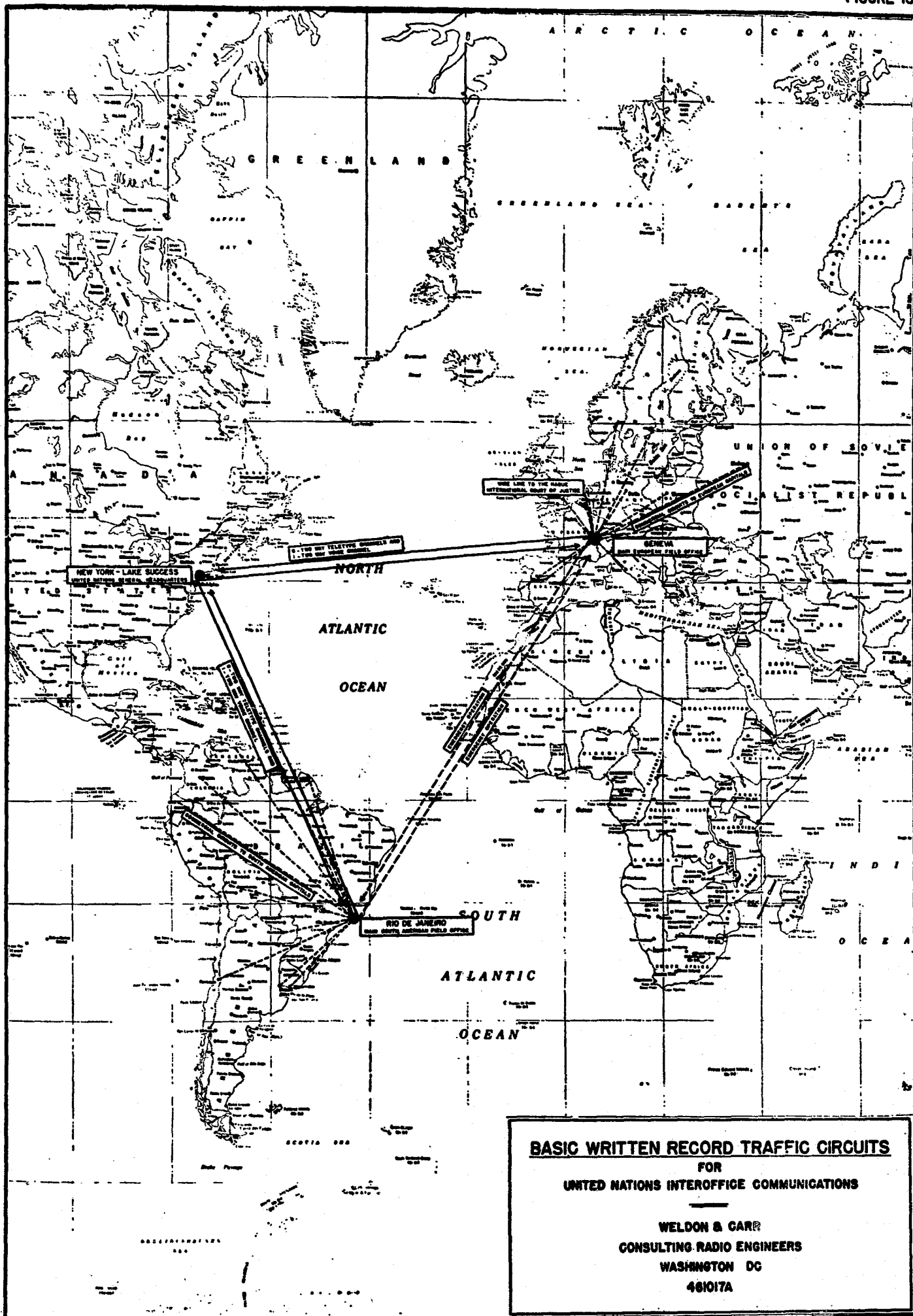
One non-directional dipole for local pick-up

**TENTATIVE LIST OF ANTENNAE**  
**UNITED NATIONS MAIN EUROPEAN FIELD OFFICE RECEIVING STATION**

<i>Beam Direction</i>	<i>Number of Pairs of Rhombic Antennas</i>	<i>Frequency Range</i>
UN NEW YORK	2	5 to 11 and 11 to 20 mc.
UN SOUTH AMERICA	1	5 to 20 mc.
USSR	1	5 to 20 mc.
INDIA AND NETHERLANDS EAST INDIES	1	5 to 20 mc.
AFRICA	1	5 to 20 mc.
SCANDINAVIA, ENGLAND, AND NORTH EUROPE	1	5 to 20 mc.

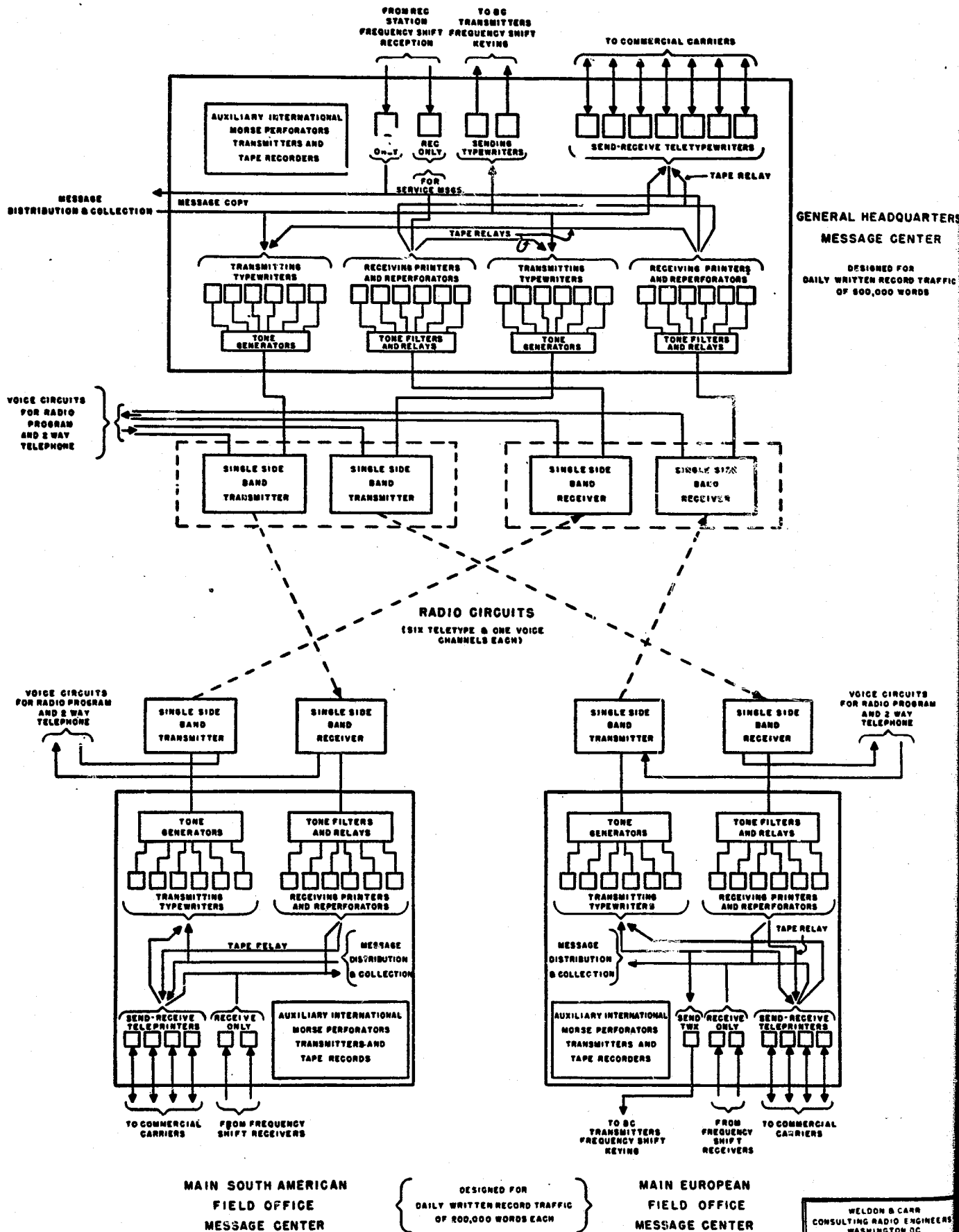
One non-directional dipole for local pick-up

**FIGURE 12**



# TELETYPE CIRCUIT OPERATION

## GENERAL HEADQUARTERS TO TWO FIELD OFFICES





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