Reprinted from

MACHLETT CATHODE PRESS

Vol. 22, No. 1, 1965

The Voice of America — A Generation of Growth

by

EDWARD F. BURGENI

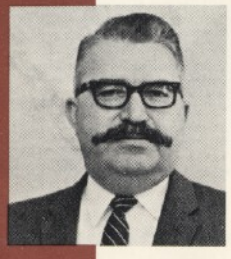
Edward F. Burgeni, associated with the "broadcasting" side of broadcasting in 1938, served as news editor and English language broadcaster for international stations prior to joining the Office of War Information in 1943. With the Dept. of State in 1945 and USIA in 1953, he has been Chief of both Domestic and Overseas Transmitter Divisions for the VOA. Prior to his present post as Manager of the VOA's important Munich operation, he was Domestic Area Operations Officer.

In collaboration with

GEORGE JACOBS

George Jacobs, who received his BEE Degree from Pratt Institute and his MSEE from the Univ. of Maryland, served as a Communications and Radar Officer during World War II. Joining the Engineering Staff of the VOA in 1949 he was a Radio Propagation Engineer and later was promoted to Chief of the Frequency Division, the post he now holds. He is responsible for directing telecommunication affairs, engineering and research in the field of radio propagation and frequency spectrum management.

and

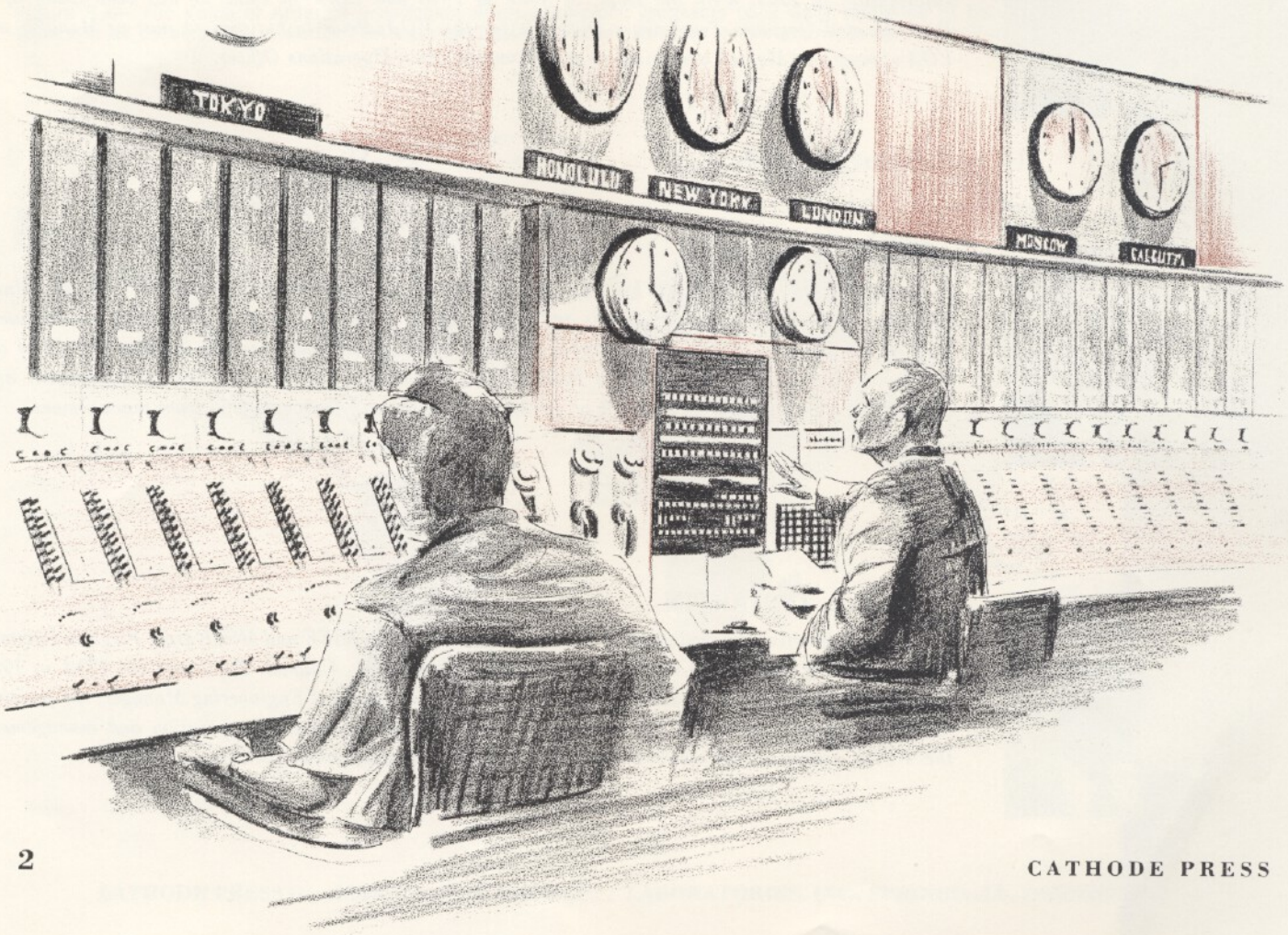


EDGAR T. MARTIN

Edgar T. Martin who, in addition to other degrees, holds a BSEE and MSEE from Virginia Polytechnic Institute, served with the U.S. Army Signal Corps, rising to Lt. Colonel. He joined the VOA in 1952 as Chief of the Frequency Division. In 1954 Mr. Martin was appointed Engineering Manager, the position he now holds, being responsible for research, planning, design, construction, operation and management of the VOA's immense and extensive broadcasting and communication facilities.

The Voice of America

By
EDWARD F. BURGENI, Area Operations Officer
in collaboration with
GEORGE JACOBS, Chief, Frequency Division
and
EDGAR T. MARTIN, Engineering Manager
Broadcasting Service, U. S. Information Agency
Washington 25, D. C.



Editor's Note:

In publishing this article on the growth, and present stature of the Voice of America, CATHODE PRESS continues a tradition of long standing, one which began in 1952, Vol. 9, No. 3, with the publication of Foy D. Kohler's "This is the Voice of America". (Mr. Kohler then was Chief IBS; he is now the United States Ambassador to Russia.) This was followed, Vol. 9, No. 4, by "The Voice of America" — a description of the development of Voice's transmitting facilities — by George Herrick and Raymond Kaplan. Vol. 10, No. 1 carried an article on the 4 Mw peak power AM transmitter, employed by the VOA in Europe, and finally, in Vol. 19, No. 1, 1962, there appeared an article on the new, and immense, Voice installation in Greenville, N.C., entitled, "Vapor Cooling: Its First Major American Installation in the New 250 kW Voice of America Transmitter"; a subsequent issue of CATHODE PRESS will carry a complete description of this facility. Limited copies of the above mentioned issues are still available. It is with a pleasure born of a long friendship that we present here the work of Messrs. Burgeni, Jacobs and Martin of the United States Information Agency.

— A Generation of Growth

Thirty-six years is hardly a lifetime, and yet it more than encompasses the full life history of what we know today as one of the most extensive technical systems in the world for communicating ideas through the use of electromagnetic radiation — the Voice of America.

Back in 1928 our economic world was in the full flush of a boom following the depressions caused by World War I. Radio, the airplane and the motor car, together with assembly line production techniques were the progressive hallmarks of our advancing industrial civilization.

The art of electronic communication had become commonplace, but relatively little was really known about the behavior of long distance transmissions via the high frequency bands of the radio spectrum. Even less was known of the power to influence men's minds by ideas transmitted through the means of radio.

However in the United States, several experimental licenses were granted for facilities to operate on high frequencies. A few pioneering broadcasters in this country as well as others elsewhere extended their interest to the shortwaves.

The large American electrical manufacturing companies engaged in shortwave broadcasting primarily to develop and publicize their products and thus create a market for devices of their own manufacture. This scheduled use of the shortwaves gave promise of expanded foreign trade for the manufacturer. Similarly the growing networks — NBC and CBS — having found success in the domestic field had visions of a world market for the sale of advertising time used to promote and sell the new and useful products of our age, and they too erected and operated shortwave transmitters.

By 1936, partly because of the public interest in the Olympic Games staged that summer in Berlin and the growing awareness of the rise of fascism and related political unrest in the world, shortwave broadcasting began its first early expansion. Ownership of an all-band receiving set became a status symbol of the times.

The next three years, 1936 to 1939, were crucial in the history of international broadcasting. The birth of the German Third Reich and the creation of the Hitler-Mussolini Axis brought forth an intense interest in improved communications for world wide direct coverage of news events as they occurred. Memorable were the rantings of the Bavarian housepainter who screamed and shouted his demands and threats across the miles. Through the medium of radio broadcasts, he and his minions were able to create fear, arouse internal conflicts among the populations of neighboring countries, and to weaken resistance to his aggressive intent.

Following the outbreak of hostilities in Europe in 1939 and the increase in international unrest in succeeding years and culminating in the attack on Pearl Harbor in December of 1941, the significant importance of a means for getting people to know what was happening and to attempt to influence their attitudes was fully recognized.

We in America had observed the success which Herr Goebbels and his Italian counterpart had achieved through the use of approximately fifty transmitters broadcasting intensively from Germany and Italy to the rest of Europe and particularly to France and the low countries. This highly organized official voice of German policy played a significant role in undermining the will to resist of the Czechs, the Poles and ultimately the Belgians, Dutch, French, Danes, and Norwegians. This propaganda machine, so effective in the initial stages of World War II, gave the word "propaganda" its present evil connotation.

It was here that what we now know as the Voice of America began.

In 1942 the entire shortwave broadcasting facilities of the United States consisted of twelve shortwave broadcast transmitters in scheduled operation. NBC had two 50 kw transmitters at Boundbrook, New Jersey. CBS had two 50 kw and one 10 kw at Brentwood, Long Island. Crosley had a 50 kw at Cincinnati, Ohio. Westinghouse had another at Boston. GE had two 50 kws at Schenectady and one more on the west coast at Belmont, California and WRUL operated a 50 and a 20 kw transmitter under the sponsorship of an educational foundation from Scituate, Massachusetts.

In addition the common carriers A T & T, Press Wireless, RCA, and MacKay had a limited number of low powered transmitters normally used in conjunction with their point to point traffic which were capable of being used for voice communication.

In the period prior to December 1941 (Pearl Harbor) and immediately following, the individual private broadcasters listed above were all actively engaged in broadcasting in a variety of languages to selected target areas. Program content was news, sports, cultural features, entertainment, religious programs and educational subjects. When the United States became engaged in the hostilities, the stations all immediately limited their program content to subjects permitted under the directives of the Office of Censorship. Broadly stated this limitation forbade broadcast of material inimical to the best interests of the United States or anything which might give aid or comfort to the enemy. Indeed, it was during this brief time, that the several skilled and dedicated individuals who found themselves engaged in what later became known as psychological warfare sought to help "win the war" by the persuasiveness of the ideas which they were able to present to both friendly and enemy foreign listeners.

The only thing wrong with this approach was that outside of the United States, the world knew only of official radio. The voice that spoke from the loud speaker in nearly all countries but ours was always the voice of government. The uncertainty, the confusion and the questions that arose in listeners' minds as to what the United States' abilities and intentions really were may be imagined when they heard one version of the news or an editorial reaction expressed by someone speaking for one network and something presented perhaps somewhat differently by another commentator from another network.

It was here that the National interest first took hold and the private broadcasters began to pool some of their most effective efforts into network operation. CBS, NBC, GE and Crosley began to share technical facilities and talent, each carrying the others' best offerings to the benefit of all concerned. The Office of War Information, created to help provide orderly insight to the American people about the extent and progress of our National war effort, soon branched into the foreign information activity and furnished, first, script material for the use of the shortwave network and, later, actual programs for broadcast over the several or combined facilities.

By November 1942 and in time for the first important American combat operations of World War II — the invasion of North Africa — the Overseas Division of the Office of War Information was established, and through it the Government contracted for and obtained the use of the international broadcasting capability of all of the private licensees.

Here began the second phase of the Voice of America, its growth and expansion to meet the needs of a world in peril.

Not only was centralized "official" programming a practical necessity for our war effort, but the means to ensure that the programming could be heard was equally a priority matter.

Additional facilities were needed: more powerful transmitters to provide stronger signals in more places on the earth; increased effective radiated power through the design and construction of more efficient antenna systems; relay stations located closer to ultimate target areas to provide that extra margin of signal and intelligibility that would get the message to the listener. These were what were needed and built and put into operation.

First, additional facilities were built at existing domestic locations; four more 50 kw transmitters at Boundbrook bringing the total to six; another at Brentwood, Long Island; a new 100 kw (the first really high power unit) at Schenectady; another 50 kw at Cincinnati; a 100 kw at Belmont, California. During this same period a new plant with one 50 kw and one 100 kw transmitter was built near San Francisco; another with two 50's was built at Wayne, New Jersey; six more very high powered units (rated output 110 kw each) were installed near Cincinnati. In 1945-1946 six more transmitters, consisting of a total of two 200's, and four 50's were installed at two locations on the west coast, one half the units at Dixon, California and the others at Delano, California. Three more 50 kw transmitters were installed at Scituate, Massachusetts and the original 20 kw unit was upped in power to 80 kw. By 1952 four additional 100 kw units were added to the west coast plants.

Now the Voice of America was more clearly heard with

42 transmitters broadcasting from the United States in 46 languages with an output of about 50 program hours daily or approximately 125 separate programs — each 15 minutes to an hour in length. This output was more than 365,000 words, or the equivalent, if printed and bound, of five novel length books written and broadcast daily.

Hand in hand with the growth of facilities at home came a corresponding and related expansion of facilities capability abroad.

The changing political scene, with the overthrow of the Axis aggressors and the emerging power and expansion of Soviet Communist influence in the World, created new obligations and pressures on the Information Agency. The need for a truly global network capable of meeting our national needs in this rapidly changing World was recognized by the Agency and plans were approved as presented to the Congress.

Development of the Global System

In developing a global radio network, three major technical problems had to be resolved. The first of these was to overcome the deterioration of the signal that occurs in broadcasting from the United States through the northern auroral zone to East Europe and Asia. Figure 1 shows how the shielding effect of the auroral zone prevents direct broadcasting from the United States to many areas of the world on the consistent basis needed to attract and hold an audience.

The second problem was that of overcoming the vast distances between the United States and other major areas of the world with a signal strong enough to be heard competitively in those areas.

The third major problem was to overcome Communist jamming which, beginning in 1948, sought to prevent clear reception of USIA broadcasts in the languages of the USSR, the Soviet satellites, and more recently China and Cuba.

Operational experience gained during the war years clearly indicated that effective world-wide broadcasting required a carefully developed integrated network or system of facilities, especially designed to deliver a strong technically competitive broadcast to a listener in any selected area of the world on either the short-, medium- or long-wave broadcasting band — whichever is popular in the specific area and can be picked up by most of the available receivers.

Long-range forward planning is essential in the development of such a system. It cannot be developed piecemeal, but must take into account all the interrelated elements of

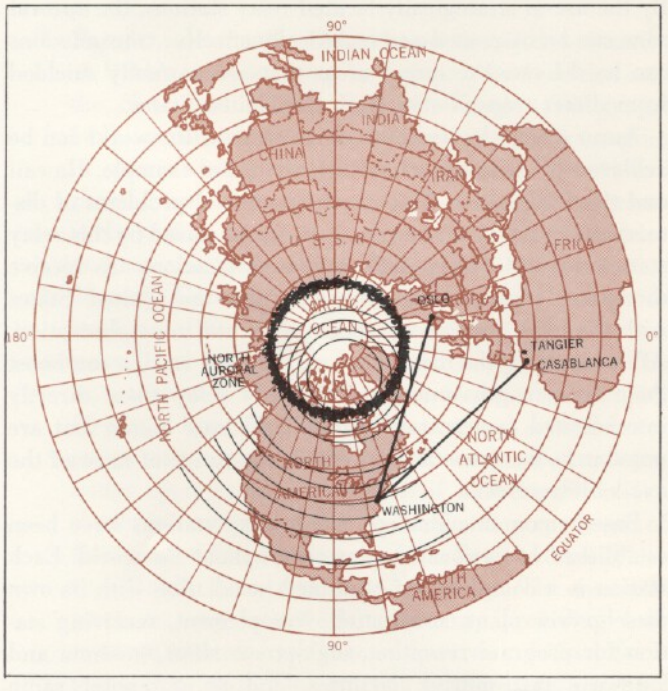


Figure 1 — Shows auroral zone through which VOA transmissions from the U.S. is heavily distorted or absorbed. Note short-wave transmission from New York to Tangier, Morocco Relay Station does not pass through auroral zones.

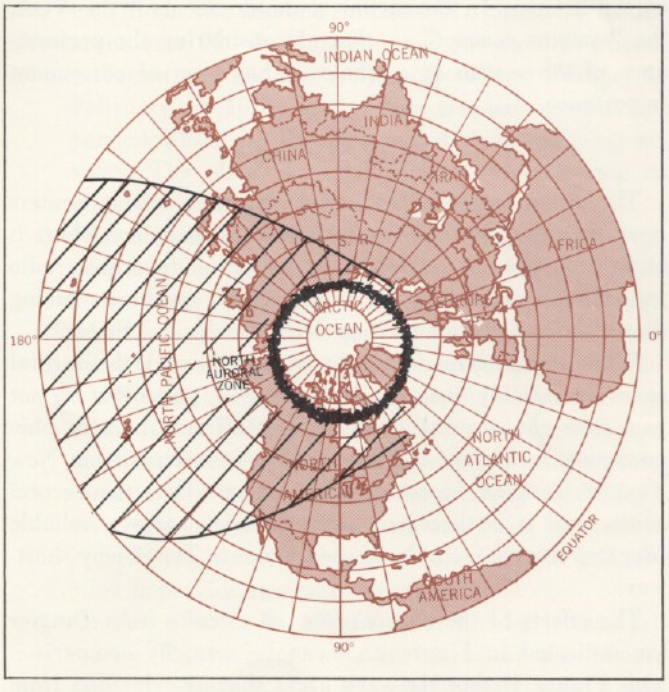


Figure 2 — Shows effects of auroral zone on transmission from Tangier, Morocco. Note that areas shielded from the U.S. in Figure 1 can be reached without difficulty from the VOA Relay Station at Tangier.

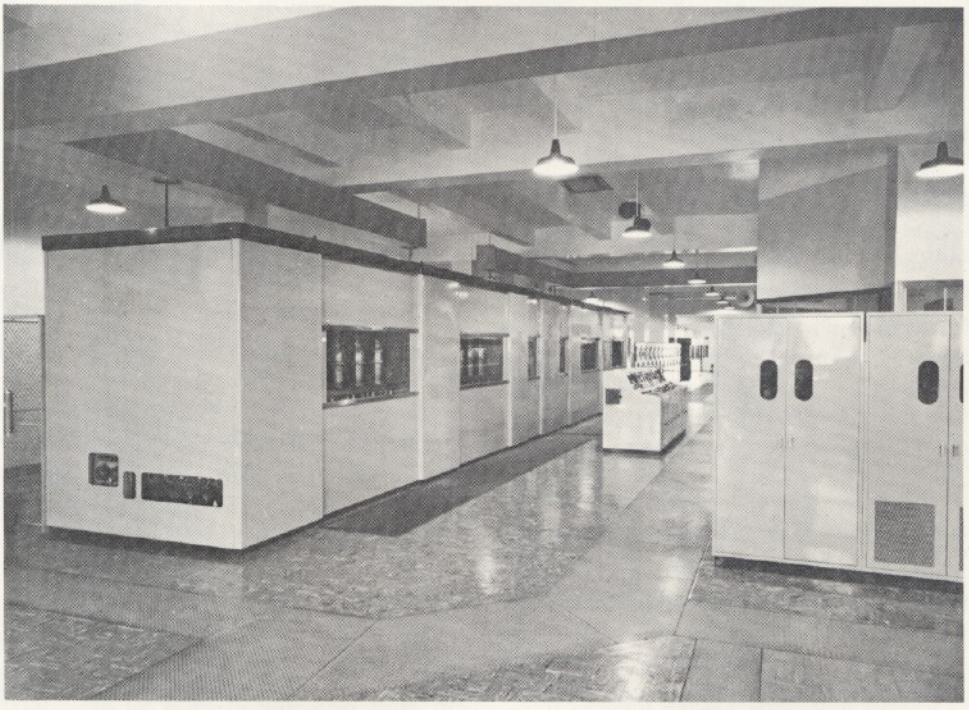


Figure 3 — Part of transmitter room of the VOA Philippines Relay Station showing Machlett ML-5682's in Continental 1 Mw medium-wave transmitter which broadcasts to Asia on 1140 kc.

the system. In the case of international broadcasting, the system begins at the microphone and ends in the receiver of the listener. In the technical development of the VOA, the "systems concept" — that of considering the performance of the system as a whole — has been of paramount importance.

Relay Stations

The development of the VOA facilities system centers upon the use of overseas relay stations, at locations where it is possible to take maximum advantage of favorable radio propagation conditions, to overcome the problems facing direct shortwave broadcasting from the United States.

While the transmission paths passing through the auroral zones are heavily distorted and absorbed, paths that do not pass near the auroral zones are not affected by this phenomenon. In Figure 1, for example, the circuit from New York to Tangier, Morocco, does not pass near the auroral zones, and it is therefore possible to maintain a reliable program service from the United States to Tangier by shortwave.

The effects of the auroral zone on circuits from Tangier are indicated in Figure 2. It can be seen, by comparison with Figure 1, that the very areas that are shielded from the United States can be reached without difficulty from Tangier. Therefore, programs transmitted to Tangier can be simultaneously relayed from Tangier directly into European or Near and Middle Eastern target areas— areas that cannot be reached effectively directly from the United States. By the use of strategically located relay stations, the auroral zone can be by-passed and technically effective transmissions can be delivered to target areas that are normally shielded from direct transmission from the United States.

Auroral zone by-passes to other areas of the world can be achieved by locating relay stations in, for example, Hawaii and the Philippines. Both the fundamental problems of distance and auroral zone absorption can be solved by this relay station concept. Relay stations in such locations can receive shortwave transmissions directly from the United States with the least possible effects from auroral zone absorption. After receiving the transmissions, the relay station can boost them in strength and simultaneously relay them directly into selected target areas on the broadcast bands that are popular in the areas and lie within the range of most of the available receivers.

Based upon this concept, VOA relay stations have been established at various locations throughout the world. Each station is a complete self-contained installation with its own diesel-power plant, small studio complement, receiving station for program reception, high-power short, medium and longwave transmitting facilities, and point-to-point radio teletype communications facilities.

The relay stations are integrated into a single system so that they can be fed programs directly from the United

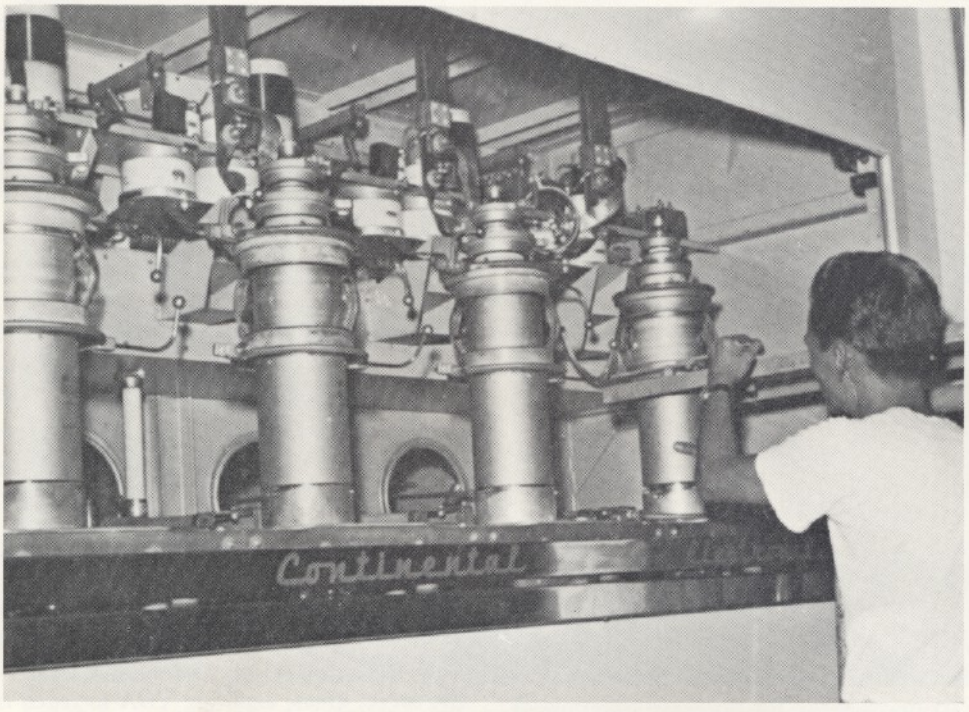


Figure 4 — Technician at Philippines Relay Station checks Machlett ML-5682 tubes in power amplifier of one megawatt transmitter.

States, or from another relay station.

The overseas relay system of the VOA consists of the following:

1. *Tangier, Morocco:* This station is used primarily as VOA's main gateway to Europe, North Africa and the Near and Middle East. At Tangier, the major facilities consist of ten shortwave transmitters ranging in power from 35 to 100 kilowatts. Twenty-five rhombic antennas are available for beaming programs to the various target areas. Figures 3 and 4 are interior and exterior views of the Philippine Relay Station.
2. *Munich, Germany:* This location is close enough to the Central European target areas so that the medium wave band can be used, as well as shortwave. The station consists of four shortwave transmitters ranging in power from 75 to 100 kilowatts, and several lower power transmitters. A 300 kilowatt medium-wave transmitter operates on a frequency of 1196 kc. Seventeen shortwave antennas are available for coverage of Europe, the Eurasian areas of the Soviet Union, Near and Middle East, and parts of Africa. The medium-wave antenna is a 4 element array providing four separate patterns each beamed towards a desired European target area. This antenna system is designed for sky-wave radiation out to about 500 miles from Munich. During the post war years and when Soviet jamming was at its height, the Agency built and established a very high powered (megawatt) long wave transmitter at Munich which operated from 1953-1964 on 173 kc. The antenna consisted of a single top loaded tower over 900 ft. high designed for omnidirectional radiation to provide coverage of Central Europe. In February of 1964, use of this transmitter was suspended when the Russians ended their jamming activity. The plant is currently in reserve in case its mighty signal suddenly becomes needed again.
3. *Thessaloniki, Greece:* This relay station was engineered to take advantage of its proximity to the Balkan target areas. The station consists of four 35 kilowatt shortwave transmitters, and a 50 kilowatt medium-wave transmitter operating on a frequency of 791 kc. Twelve shortwave antennas are available for coverage of the Balkans, the western Soviet Union, East Europe, the Near and Middle East. The medium-wave antenna consists of a 2 element directional array providing a reversible cardioid pattern with one beam centered to provide sky-wave coverage of the Balkans and the other to provide coverage of Greece.
4. *Rhodes, Greece:* VOA's station at Rhodes is used primarily for covering adjacent areas of the eastern Mediterranean. A 150 kilowatt medium-wave transmitter beams broadcasts to this area, primarily in the Arabic language, for approximately nine hours a day on a frequency of 1259 kc. Two 50 kilowatt shortwave

transmitters reinforce the medium-wave coverage. The medium-wave antenna consists of a three-tower array, producing a coverage pattern in the eastern Mediterranean similar in shape to a cardioid. Six shortwave antennas are available for beaming shortwave transmissions into the intended coverage area. From late 1951 and until May, 1964, VOA transmitting facilities at Rhodes were housed aboard a docked vessel, the U.S. Coast Guard's Courier. Since May, 1964, new land-based facilities have replaced those previously housed aboard the Courier.

5. *Philippines:* VOA maintains transmitting facilities near Manila and San Fernando on the Island of Luzon. These facilities consist of nine shortwave transmitters ranging in power from 35 to 100 kilowatts, a 50 kilowatt medium-wave transmitter operating on 920 kc, and a 1,000 kilowatt medium-wave transmitter operating on 1140 kc. There of the shortwave transmitters are transportable, and have been installed recently to provide increased VOA coverage of Southeast Asia. Twenty-five rhombic antennas are available for beaming shortwave broadcasts over an arc extending from Korea to India. The 50 kilowatt medium-wave transmitter uses a six-tower array for sky-wave coverage of the Philippines and adjacent areas of Southeast Asia, while the megawatt transmitter uses a four-tower array which produces three separate beams directed towards Southeast Asia and parts of China. This antenna system increases the effective power of sky-wave radiation to 3,500 kilowatts in certain directions.
6. *Okinawa:* VOA's Okinawa installation completes the Far Eastern coverage by beaming short- and medium-wave broadcasts to northern and central Asiatic areas. This station consists of three shortwave transmitters ranging in power from 35 to 100 kilowatts, and a 1,000 kilowatt medium-wave transmitter operating on 1178 kc. Six rhombic antennas direct shortwave transmissions to Siberia, the Far East, China and Central Asia. The medium-wave antenna consists of a six element array producing two beams directed towards China, Manchuria, Korea and Soviet Far East. In addition, two low-powered shortwave transmitters are used to augment the coverage.
7. *Colombo, Ceylon:* This installation, operated for VOA by Radio Ceylon in accordance with an agreement between the Governments of the U. S. and Ceylon, is intended primarily for coverage of India and Pakistan. The station consists of three 35 kilowatt shortwave transmitters. A large number of curtain arrays are available for beaming broadcasts to India, Pakistan, and adjacent areas.
8. *Woofferton, England:* Six 250 kilowatt and two 50 kw shortwave transmitters, operated for VOA by the British Broadcasting Corporation, on a contractual basis, beam Voice broadcasts to Europe, Africa and the Near and Middle East. Thirty-five high-gain curtain antennas are available for directing these transmissions to their target areas.
9. *Honolulu, Hawaii:* This station, located in the nation's newest state, serves as an auroral by-pass to the Far East and Southeast Asia. It consists of two 100 kilowatt shortwave transmitters and seven rhombic transmitting antennas.
10. *Monrovia, Liberia:* VOA's installation near Monrovia consists of six 250 kilowatt and two 50 kilowatt shortwave transmitters intended for coverage of the entire African continent. Twenty-nine high-gain transmitting antennas are available to beam VOA broadcasts over a wide arc from the Mediterranean to the South Indian Ocean. This installation came into full operation during 1964.

Modernization Needs Stimulate New Facilities

The overseas system of the VOA, consisting of fifty-nine high-power transmitters, effectively by-passes the auroral zone and bridges the vast distances between the U.S. and the target areas, enabling VOA to reach listeners with competitively strong signals in the broadcast bands most popular in the areas.

Still the network was not complete. Changing economic and domestic political factors had their effects. As a result of necessary economies in 1953, the Agency cut back some of its stateside facilities, eliminating the most obsolete and least efficient (high cost per KWH on the Air) elements. During this period the domestic system was reduced by 12 transmitters and operations were carried on by the remaining thirty.

Meanwhile the Soviet jamming effort, begun by them in 1948, continued and intensified. At the same time, the Russians and their satellites together with the United Arab Republic and the Chinese greatly increased their shortwave operations with the latter two passing both the BBC and the VOA to take over 2nd or 3rd place (Russia was and is first) in total number of program hours broadcast daily.

Many newly emerging countries and developing nations began, or increased their shortwave broadcasting, too. For these countries, shortwave radio provides an effective, simple and relatively inexpensive means of mass communication. Even the Soviet Union depends to a great extent on shortwave radio for keeping its people in the hinterlands informed.

The increased availability of transistorized radio receivers at steadily lowering costs also played an important part in the upsurge in the popularity of shortwave broadcasting. With receivers independent of power lines and capable of being operated for months on a few cheap batteries, radio could and did penetrate into rural and under-developed areas, opening up vast new audiences, both for the Voice

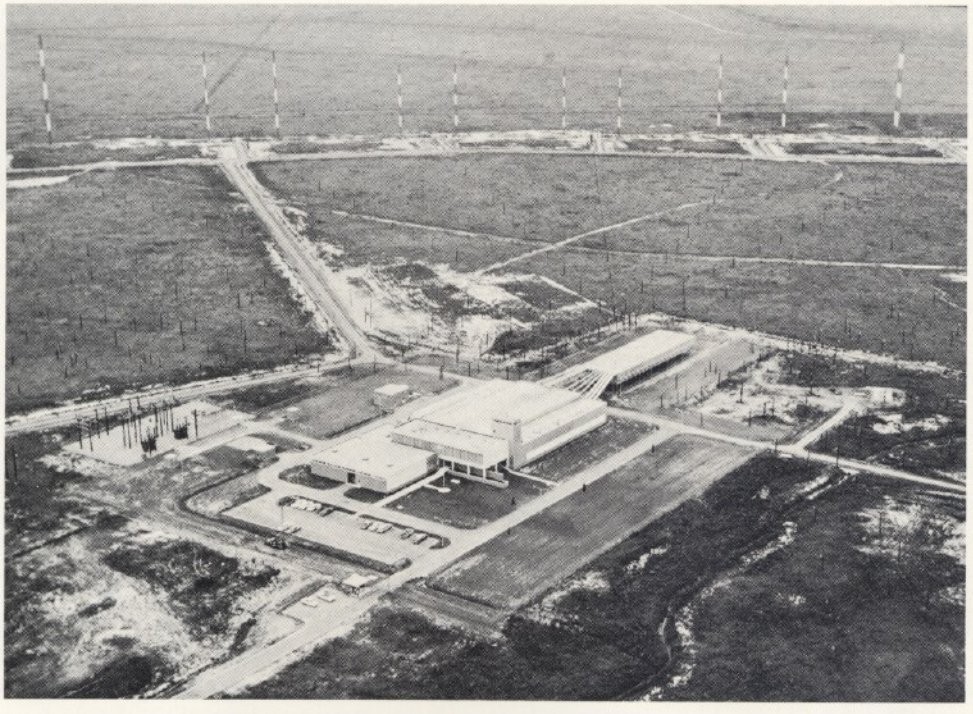


Figure 5 — Aerial view of Greenville, N.C. complex which consists of 18 broadcast and 4 communications transmitters, and 64 antenna systems.

of America and its competitors.

VOA reviewed and reprojected its long-range facilities planning program to meet the growing world competition in shortwave broadcasting. Basically, this plan called for eliminating coverage deficiencies which existed, and for boosting signal strengths in the more important target areas where competition was greatest.

The Greenville Complex

To compete in the now crowded spectrum, higher power and improved antenna systems were required. Plans were developed and construction begun on what has since become known as the Greenville Relay Station near Greenville, North Carolina. This huge complex consisting of 18 broadcast and 4 communications transmitters at two separate locations, a program receiving and distribution center at a third location and 64 elaborate antenna systems is believed to be the largest most powerful radio facility in the world today. Its 22 transmitters consisting of six-500 kw, six-250 kw, six-50 kw and four-5 to 15 kw SSB and communications units radiate a total energy output in excess of 4,800,000 watts. It serves as the primary East Coast feeder for all the European Mediterranean and African relay stations. In addition, it provides direct coverage for African area listeners as well as those in Latin America.

Inauguration of scheduled operations from Greenville in early 1963 made possible a further reduction in the use of the obsolete stateside units at Schenectady, Brentwood and Wayne which had served so faithfully through the war years and beyond.

At the time of writing, plans are going forward for 2 additional major relay stations — one to bolster our signals from the Eastern Mediterranean area and another in the Far East. These projects, now only in the initial phase of development will soon move into the construction phase with air dates set for 1967 or 1968.

Further modernization is under way at the older stateside plants as well. Three of the Bethany, Ohio transmitters will be replaced by modern 250 kw. units. These will strengthen the station in its mission to support the Greenville coverage. The two west coast plants will each be augmented by three-250 kw transmitters and two-50 kw units with completion scheduled for late 1965.

One additional facility placed in operation within 11 days after the site was picked is the medium wave element of the VOA Transportable Station. It, like its shortwave counterparts, is self contained and van mounted. At the time of the Cuban crisis in October, 1962, the transmitter was on the test floor at its manufacturing plant in Texas. A VOA engi-

neering task force was dispatched, some members going to Texas to oversee completion of the transmitter — others to the Florida Keys to locate and negotiate arrangements for a suitable site. By early November the station was on the air with a directional antenna system that enabled it to be clearly audible throughout Cuba.

This then is the Voice of America transmitter system — a vast and complex but highly integrated network of over a hundred modern powerful transmitters, located at 17 stations throughout the world. This system has been designed and operated to the highest standards of the radio transmitting art.

We have described how development of the VOA network overcame the first two problems affecting our ability to deliver useful signals to target area listeners. Relay stations provided the essential by-pass of the auroral zone and high powered close in relay points made our signals strong and competitive. There remained the problem of jamming.

Jamming

Communist jamming of VOA Russian-language broadcasts was first observed in February, 1948. It is believed that the Communists used more than 2,000 radio transmitters to jam Russian, European-satellite and Chinese-language transmissions of the VOA and other broadcasters.

Jamming consists mainly of irritating noises which sound like buzz saws, sirens, white noise, etc., placed on the same frequency as the VOA transmissions for the purpose of making reception of the program difficult, if not impossible. Although intentional interference of radio transmissions violates international radio agreements, these transgressions continue.

The VOA early realized that the most effective way to combat or nullify the effectiveness of jamming was to adopt a dynamic, versatile approach requiring a wide range of latitude in engineering, operating and programming techniques. Such an approach was necessary because there is no single "magic" solution to this problem — a technique that is successful today may be blotted out by increased jamming efforts tomorrow.

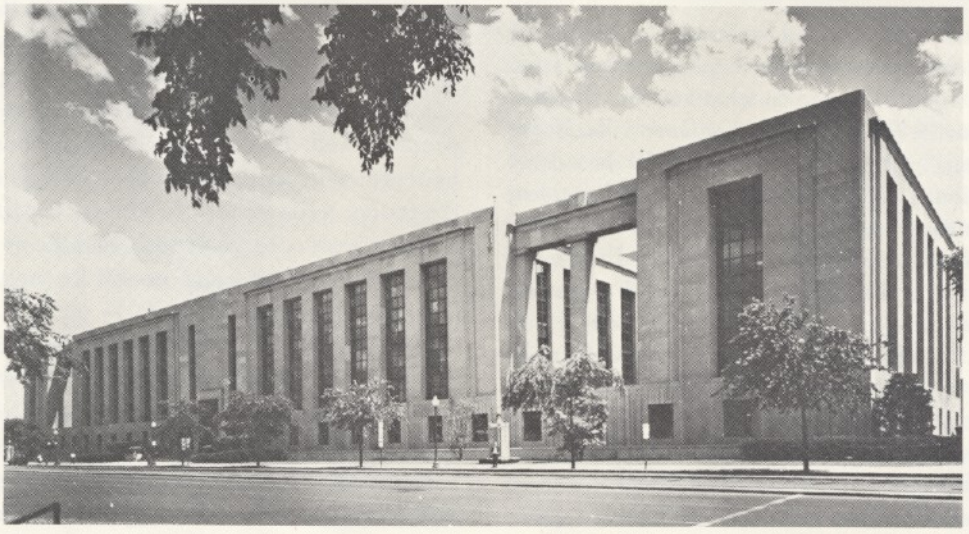
Concurrent with the development of the system itself, certain techniques have been devised in the form of electronic devices such as heterodyne filters, speech clippers, exalted carrier-type receivers, etc., the use of high-power transmitters and high-gain antennas, the advantageous use of favorable propagation conditions when these exist, the transmission of the same program simultaneously from various relay stations located at different geographical locations, broadcasting on an around-the-clock basis, increasing the number of broadcasts in the English language, which is not jammed, as well as continuous study of the problem. These have permitted various degrees of, and in some cases complete, penetration of the jamming barrage.

Recently for reasons best known to themselves, the Russians and some of the satellites (Rumania, Hungary, Czechoslovakia and Poland) discontinued jamming. Whether this was a move to reduce tension of the cold war or whether they found it no longer practical to pour out vast energy in a vain attempt to keep their people from hearing free uncensored ideas is a matter for conjecture. Of significant importance is the fact that we have now entered a new phase in the life of the Voice of America. A period in which VOA broadcasts can be heard louder and clearer than ever before.

Washington Headquarters

For the most part, VOA programs originate from its Washington, D. C. headquarters plant. The Washington facilities, located at 330 Independence Avenue, S. W., include nineteen studios, equipment to make forty different disc or tape recordings simultaneously, ten tape-editing booths, a

Figure 6 — Headquarters and studios for Voice of America are located in the Department of Health, Education and Welfare Building, 330 Independence Ave., Washington, D.C.



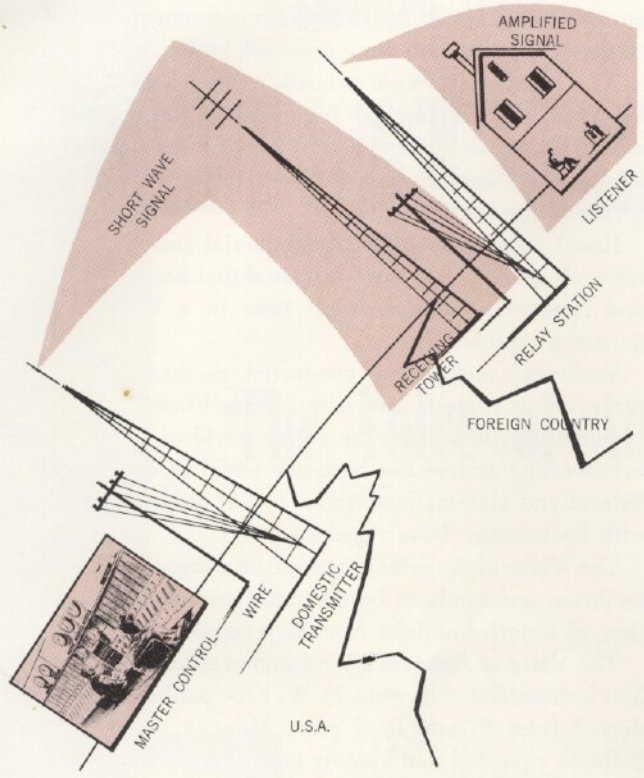


Figure 7 — Shows pictorially how VOA broadcasts originating in the Washington studios are transmitted to foreign listeners.

recording control center, the Master Control, engineering offices, editorial offices, music and transcription libraries, and various other service units which are required to keep VOA in operation twenty-four hours a day.

VOA's Master Control is one of the largest and most flexible in the world. It feeds programs originating in VOA studios, through special telephone circuits, to the shortwave transmitters in the United States. The Control Console (see Page 2) is capable of selecting program material from one hundred sources and of handling twenty-six programs simultaneously.

This rounds out the systems concept of the VOA worldwide international broadcasting network. VOA broadcasts originating in studios located in Washington, D. C., are fed through appropriate control equipment and landline circuits to any of the feeder transmitters located at the seven plants in the Continental United States. These programs are then broadcast over the high-power shortwave "feeder" transmitters, employing high-gain directional-antenna systems, to any one of the high-power transmitters located at the overseas relay points throughout the world. The circuits to the relay stations by-pass the auroral zone of exceptionally heavy rf absorption. The relay stations, located at optimum distances from the selected target areas boost the level of the signals received from the "feeder" transmitters and simultaneously relay the broadcasts directly into the target areas on either short, or medium-wave broadcasting bands, whichever are popular for broadcasting in the target areas. Often during periods of favorable propagation conditions, secondary target-area coverage is also obtained directly from the transmitters located in the continental U.S.A.

Figure 7 shows pictorially how VOA broadcasts originating in the Washington studios are transmitted to overseas listeners. Figure 8 shows the areas of the world that VOA broadcasts now reach.

Science and Research

Research has played an important part in the development of the VOA broadcast system. The VOA has established, during the development of this system, a research program at various colleges and universities, other Government departments and agencies, and commercial research organizations having experience along the lines most important to the technical development of the VOA. In general, this research program has explored the broad field of electronics, communications, and radio propagation. VOA's research program played a very significant role in the early development of ionospheric scatter communications, advancement of the state of knowledge concerning auroral and other anomalous types of radio propagation, and development of high-power transmitters, high-speed self-calibrating modulation monitors, peak audio clippers and other devices which have benefitted both the VOA and the communication field in general.

VOA is keenly aware of the necessity for keeping abreast of technical improvements in broadcasting and communications. To focus attention on scientific research and development, VOA often calls upon specialists from the academic world, industry, and Government to serve both as an informal forum for review of technical plans and as a source of technical ideas and information. Through this arrangement, VOA has available to it for consultative purposes, some of America's engineering and scientific leaders in the field of communication.

VOA is actively participating in Governmental long-range planning for space communications. It has urged that international radio and television broadcasting be considered as a high-priority goal for this country's space communications program.

VOA also participates actively in the Inter-departmental Radio Advisory Committee (IRAC) and other Government and international groups concerned with telecommunications planning.

Engineering Personnel

The Office of the Engineering Manager, VOA's engineering headquarters in Washington, is made up of approximately two hundred engineering, communication specialists, technicians and supporting clerical personnel. Of this number, more than one-fourth hold degrees in the various fields of engineering or associated sciences, or are registered pro-

fessional engineers. Overseas, VOA employs approximately 750 communication specialists and technicians, 100 of whom are American.

Effectiveness

The question may certainly be asked whether all these technical facilities are effective — can the VOA actually be heard well throughout the world. To determine how well the VOA can be heard, monitoring stations have been set up in key areas throughout the world to act as "ears" for the VOA. At each of seven monitoring stations, manned by trained technicians, all VOA language broadcasts to the particular areas are monitored under reception conditions that are typical for the average listener in the area. Reception information amassed at these monitoring stations during 1963, amounted to well over a million individual monitoring observations. Over 90% of the VOA programs monitored were reported as being received satisfactorily.

The Agency's Research and Reference Service conducted a series of transistor radio contests during 1963 to determine the size, composition, and geographical distribution of VOA's audience for specific language broadcasts.

To participate in the contest in which portable transistor radios were awarded to winners, listeners were asked to send to the Voice of America the following information: name and address, age, sex, occupation and the date and program on which they heard the contest announcement. (Announcements were made daily for a one-week period.)

As a result of a recent transistor radio contest conducted for VOA English language broadcasts, a total of more than 85,000 cards and letters were received from listeners in one hundred and sixty-seven countries and territories from every corner of the world.

Based on such contests, and material from several other research sources, it is now estimated that between seventeen and twenty-six million people tune in a VOA broadcast during a typical day!

Technical monitoring conducted on-the-spot, scientific surveys and contests and letters from listeners all provide convincing evidence that the VOA's world-wide international broadcasting system has been successful in overcoming the natural and man-made obstacles and is getting through well with its message from America.

The Voice of America, broadcasting through its technical facilities, seeks only to be the radio mirror, without distortion, of America and the American people.

The Voice of America's Washington studios are located at 330 Independence Avenue, S. W. Free public tours are conducted from 9 a.m. to 5 p.m., Monday through Friday, holidays excepted and visitors are cordially invited.

Figure 8 — The Voice of America broadcasts around-the-clock programs to a daily audience of between 17 and 26 million listeners in all corners of the world. VOA's transmission coverage includes areas shown in tinted sections of the map below.

CATHODE PRESS is published by THE MACHLETT LABORATORIES, INC., SPRINGDALE, CONNECTICUT