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COMMUNICATIONS CONTROL IN WAR  
by  
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May 4, 1933.

OUTLINE OF ADDRESS BY  
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ON  
COMMUNICATIONS CONTROL IN WAR

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Colonel McCain The details of the speaker's remarkable career may be found in "Who's Who in America", an extract of which is placed on the bulletin board for your information. So, in presenting him I shall make but a single observation. Take any man who, in his youth, is carried to a new country, who is unacquainted with its language and the customs and psychology of its people, who enters a field in which success requires technical genius and executive ability and who, in a few short years becomes president of his company, and that company the largest of its kind in the world -- gentlemen, I submit that that man must possess to a marked degree the very essence of the stuff that created America. Colonel David Sarnoff, Signal Corps Reserve, President of the Radio Corporation of America.

COMMUNICATIONS CONTROL IN WAR  
BY  
COLONEL DAVID SARNOFF, SIGNAL RESERVE.

Among the assignments specified for my tour of active duty in the War Department, it was stated that the Chief Signal Officer desired me to make "a study of American commercial communications systems for the purpose of providing a peace-time 'set-up' that would be advantageous to national defense." At the same time the Director of the Army Industrial College requested me to address the College on the subject of, "Communications Control in War". As these two subjects are interrelated, they may be dealt with in the same discussion, in sequence.

I

Extensive Bibliography  
now in Government's  
Files

An extensive bibliography exists in the Signal Corps and the Naval Communications offices on the communications situation in this and other countries. Special reference may be made in this connection to the paper by General Irving J. Carr, Chief Signal Officer of the Army, entitled, "The Influence of the Control of International Communications on the Conduct of War", published in the Signal Corps Bulletin of January-February, 1933. Reference is also made to the Committee report on Problem No. 14, under the subject of "Communications Control", submitted February 18, 1933, to the Army Industrial College by Lieutenant Colonel C. W. Beard, Major J. L. Guion, Captain W. C. Ellis and Lieutenant J. M. Worthington, and also Communications Control Problem No. 53, submitted to the Army Industrial College April 23, 1932, by Lieutenant Homer W. Jones,

Commander J. T. Alexander and Major L. B. Bender. Reference is also made to a comprehensive address delivered on April 20, 1933, by Captain S. C. Hooper, Director of Naval Communications, at the Naval War College, Newport, R. I., on the subject of "World Communications".

I wish to take this opportunity to pay tribute to the officers of the Army and Navy who have performed this very important work. I have gone over it carefully and formed a high opinion of it, not only because of the exhaustive nature of the investigation of our national and international communications, but also because of the thorough comprehension of our communication problems evidenced by the conclusions reached.

It has not yet been possible for me to correlate all of the information I have obtained in Washington on some of the questions of communications as they relate specifically to the national defense. I have an appreciation of the magnitude of this problem because of this tour of duty and the former assignments I have had with the Army and Navy. Out of an experience of more than twenty-five years in the communications business, during which time I have witnessed the development and upbuilding of our great American systems, it is natural that I should have formed some rather definite views about the present status and future development of our communications. I shall touch upon them in the course of this discussion.

Existing Manufacturing and  
Communication Facilities  
in the United States

With the principal findings in the documents that have been at my disposal, I am in full accord. There is reasonable agreement that existing facilities are,

in the main, adequate to meet the nation's requirements in peace as well as in war. Nevertheless it is true, as will be indicated later in this discussion, that there are still many points in this country not served by any telegraph service and that the newer system of radio depends upon its older rivals, the wire companies, for the necessary collection and delivery of traffic.

The major problems, therefore, are, first, how the nation's communications may be made economically sound in peace time, rendering the maximum service to the public, second, how they may be transformed promptly and efficiently from a peace time to a war time basis, and third, how they may be best coordinated and controlled during war. Obviously, if the nation is to rely in war on the use of facilities existing in peace, we must be certain that the peace-time situation is such as to provide quickly what will be needed during war. Time is an exceedingly important element when war comes.

Much thought has been given in the papers previously mentioned, to the advisability of rebuilding certain parts of our communications structure so that the whole will be stable, efficient and capable of withstanding unusual stress. After an analysis of these papers, one may obtain a much clearer view as to what steps are desirable, feasible and, perhaps, imperative in order that our communications may be placed on a sound national defense basis.

Our communications system must be economically strong in time of peace if it is to meet the greater needs of war.

Before proceeding to discuss the development of any new communications program, it is first necessary to examine frankly our present situation and the extent and direction of our communications growth.

## II

Communications Divided  
into Three General  
Groups

Our facilities for rapid communication, as distinguished from the slower means of the post, fall into three general groups. Although these are closely related in certain

aspects, they remain inherently different.

The first is voice communication. Such communication may be accomplished either over wires or by radio. Except through the employment of specialized equipment, it leaves no record. It is distinguished from other means of communication in that for a brief time, distant and disconnected terminals are temporarily joined, either automatically or manually, and those who desire to communicate are given control of the circuit, to use it at will and to disconnect it at the conclusion of their two-way conversation.

The second is record communication. This may employ, also, either wires or radio. The user of this method of communication need not be present when his message is transmitted, but relies on specialists conversant with a telegraphic code.

The third is one-way mass communication. This is accomplished through radio broadcasting, by which an entire nation may be reached with an important message instantly and simultaneously.

In the new era of electrical achievements, to which the modern research laboratory has made profound contributions, a fourth method of communication, distinctly individual from all others, is promised. This is sight communication, or television.

Voice Communication  
a Virtual Monopoly

Any comprehensive plan of communications control in time of war must give first consideration to the telephone, which is among the nation's most outstanding utilities. In the United States telephone service has been developed by private enterprise, to a high degree of efficiency. During the last five years it has been extended, with the aid of radio, to virtually all parts of the world. The remotest of any remote hamlet of the inland states may now call an individual on the opposite side of the globe with remarkable ease and converse as readily as though the two were seated in

adjacent apartments. In transoceanic conversations, such as between the United States and the Philippine Islands or the hinterlands of Europe, the user of the circuit cannot determine where the voice leaves the domestic wire lines and goes into the air channels on radio waves. Transfer of the voice from one medium to another is automatic while the conversation lasts.

Originally composed of many isolated units, our service of voice communication long since was organized into a virtual monopoly, to the very distinct advantage of the subscriber, the investor and the country at large. Because of the intimate and personal use of the services made available, the public soon refused to tolerate an expensive duplication of facilities which was obviously wasteful of capital and unsound economically, in addition to being of pronounced inconvenience to the user. In capital invested, terminal stations and wire network, and quality of telephone service, the system of the American Telephone and Telegraph Company stands preeminent. It is a complete unit, adequate to meet the needs of peace and the strain of war.

The advantages which have followed unified control in the field of voice communication are significant. Ample capital has been attracted for the full employment of American resourcefulness and inventive genius. Research and development have been pressed forward rapidly, and our telephone wire lines have been extended not only to every hamlet of the country, but also to isolated farms and cottages. Although one can never say that perfection has been reached, it seems that only the assurance of wise and sympathetic regulation remains necessary to give the American people the utmost in a voice communication service.

Competition has been  
Keystone in Record  
Communication

Passing from the voice transmission industry to that of record communication, the situation is vastly different. Here government policy has adhered to the principle of competition as the incentive for providing the people with an adequate telegraphic service, and although competitive effort and enterprise have exercised their full stimulating force, many economic barriers have remained.

At the head of the domestic service of record communication stands the great system of the Western Union with its 22,487 offices scattered throughout the country. This company represents a grouping of many smaller organizations that sprang up in different sections in the earlier days of the telegraph. Other smaller companies were formed during this period of consolidation into the Postal Telegraph Company, which now maintains approximately 2,800 offices. The Postal offices are located in the important cities of the country, and for that reason duplicate an equal number of Western Union offices.

To these two important systems must be added a number of other companies, which emphasize the competitive nature of record communication in the domestic field. The Mackay Radio & Telegraph Company operates a local radio telegraph system on the Pacific Coast, from Seattle to Los Angeles, with

transcontinental circuit from San Francisco to New York. Press Wireless, Inc., a newcomer in domestic communication, maintains radiotelegraph stations at New York, Chicago, San Francisco, Los Angeles and Honolulu. The Tropical Radio Telegraph Company, while primarily engaged in Central American communications, is licensed to communicate between New Orleans, Miami and New York. R. C. A. Communications, Inc., although not as yet an important factor in the domestic telegraph field, operates a service between both coasts.

The public records of the Federal Radio Commission show that numerous aviation, oil, and cinema companies have been licensed to carry on limited domestic record communication services by radio. The existence of duplicate and overlapping facilities in the case of this particular utility means a multiplicity of operating agencies and a lack of coordinated effort. Aside from the economic waste resulting from this large duplication of facilities in peace time, these conditions present a serious problem of coordination and control in times of war.

#### Effects of Unrestricted Competition

Although it is generally recognized that, since the development of voice communication, the telegraph has never received such universal use in the United States as the telephone, it is interesting to note the bearing of the competitive situation on this subject. To serve the public interest to the greatest advantage, the telegraph must extend beyond the urban communities and be accessible to less populous districts. With a population only one-half as large as that of the United States, Germany, with a unified service, has nearly twice as many telegraph offices. Similarly, with a population only one-third as large as that of the United States, France has one and a half as many telegraph offices.

Thus it may be perceived that despite the extent of our internal system of record communications, and despite the impressive number of feeder offices and the approximately 2,000,000 miles of telegraph wires that knit the country together, the concentration of competitive effort in the larger markets has deprived the villages and outlying districts of telegraphic facilities such as are possessed by similar small communities in European countries. The recent years of economic depression have witnessed, in fact, a reduction in the number of domestic telegraph offices. It is evident that under the system of open competition many small towns could not support telegraph offices on a full time basis. It is clear, however, that their establishment would impose no impossible strain on a unified organization.

In American cities, competition between the leading telegraph companies is now so keen that a substantial portion of effort and expense that should be devoted to service must be expended in soliciting and obtaining the message. Duplicate and competitive telegraph offices are located side by side. These require two managers, two groups of messengers, two sets of clerks and operators, two outfits of equipment, two systems of call boxes in nearby office buildings, and many miles of duplicating wire circuits. In virtually any important hotel there may be seen, usually adjacent to each other, the offices of our two telegraph systems, and it is apparent there is far from a sufficient amount of business to warrant this obvious duplication of effort.

In New York City alone, 300 telegraph offices carry Western Union signs and 150 others Postal Telegraph signs. As a consequence of such widespread duplication, of which the New York City situation is but a single example, the public must pay higher rates than would otherwise be necessary for its record communication services.

Benefits of Unification                      Material savings could be made by a program of unification in this field of public service. From the large economies which would result from the elimination of costly duplicate executive management, duplicate offices, duplicate maintenance, accounting, operating, clerical, messenger, and engineering departments, one could safely predict a substantial reduction in present telegraph rates by at least 20 per cent and probably even more.

If the economies mentioned should be effected, a program of service expansion then could be undertaken in order that thousands of small communities might enjoy a telegraph office in their home town for the first time. Such an expansion program would largely absorb the operating personnel transferred from closed duplicate offices in the cities. It would call for new construction work, including new pole lines penetrating the more remote sections of the country. The logical development of this program would mean that employees taken from telegraph companies' payrolls during the past three years would return to familiar jobs. Naturally, such expansion must be economically sound. It could not be undertaken overnight on an elaborate scale. Another important factor in unification would be its stabilizing value. When an industry is stabilized, employment in that industry is stabilized. Any surplus personnel remaining after the program came into effect, might be absorbed by the introduction of shorter working hours for all employees.

Intense Competition in International Field                      Dealing with another phase of record communication, attention is directed to the international field, where American organizations and services meet those of foreign nations.

In international record communication services we find not only competition and duplication between different American companies, but we also find them existing to an aggravated degree.

In point of mileage of submarine cables employed, the subsidiaries of the International Telegraph & Telephone Company occupy first place in our cable communications. Six of the twenty-one cables crossing the North Atlantic are owned and operated by its subsidiary, the Commercial Cable Company, which also owns and operates two cables to Cuba. The Commercial Pacific Cable Company operates the single submarine cable connecting the United States with Hawaii, Midway, Guam, Japan, China and the Philippines. The All-American Cable Company, another I. T. & T. subsidiary, owns and operates cables in the Latin-American field.

Western Union, operating the second largest American cable system, works ten cables across the North Atlantic, four of which are leased from British owners, and in addition, employs cables to the West Indies and Central America. The French Cable Company owns and operates three cables from New York to France and Great Britain. It is important to observe that practically all the North American cables which terminate in New York City are landed en route at either Nova Scotia or Newfoundland, and that consequently the strategic control of these important channels of communication is not in our hands. They cannot be relied upon fully in considering our plans for national defense.

New Freedom in Communications  
for United States

As we know, the United States was  
for a long time largely dependent on  
the cable facilities of foreign

nations. In order to gain communications freedom, radio came forward as a major factor in our overseas correspondence. Its development and rapid expansion have occurred almost entirely since the World War. R. C. A. Communications, Inc., has set up from our two major communication centers, New York and San Francisco, an extensive system of overseas radio circuits connecting with forty-one other nations and insular possessions. Menlo Park furnishes an auxiliary system of eleven additional circuits.

As a result of the speed, dependability and directness of its service, radio has added immeasurably to the facilities of world communication. It has accomplished its original purpose of liberating the United States from complete reliance on submarine cables that might be interrupted by a single stroke at the outset of hostilities. It has also given us a highly efficient marine service capable of maintaining contact with ships on any sea.

In addition to the RCA system, external communications are augmented by the overseas radio system of the Army and Navy, by the facilities of Press Wireless, Inc., devoting its efforts toward the greater distribution of American and foreign news, by the radio subsidiary of the International Telegraph & Telephone Company, the Mackay Radio Company, which operates trans-oceanic radio-telegraph circuits, by the Tropical Radiotelegraph Company with its comprehensive system between the Central American republics and the United States, and by a number of private radiotelegraph systems. Intensive and destructive competition prevails between various American companies, each seeking to obtain for itself as large a share as possible of the available international traffic. The intense rivalry which exists in the field of international communication is fully as unsound as that which exists in the domestic field. Under a unified system of external record communication, economies and rate reductions could likewise be effected.

Communications Policy  
of Other Nations

To comprehend the full significance of national policies in international communications, however, we must glance at the trend in foreign countries. Virtually every important foreign nation has unified its external

communications into a single system, either as a private monopoly under governmental auspices, or as a monopoly under governmental operation and control.

Great Britain                      Until 1929, the cable and radio communication companies of Great Britain were also numerous. They were engaged in what appeared to be a struggle to the death. The great communications systems that had been the pride of the British Empire seemed threatened with economic extinction. Recognizing the enormous waste in resources and effort under the regime of wholesale and bitter competition, the British Government itself stepped in and assisted in the creation of a radio and cable merger for all external record communications services. Into this merger, now known as the Imperial and International Communications, Ltd., went the world encircling Eastern Telegraph Company, the Eastern Extension Telegraph Company, The Western Telegraph Company, the British Pacific Cable Board, with its two cables connecting Canada and Australia, several other important British cable companies, and the British Marconi Wireless Telegraph Company. This gigantic consolidation included also substantial holdings in the Canadian Marconi Company, the Amalgamated Wireless Telegraph Company of Australia, an Indian Marconi Company and a South African Marconi Company, as well as substantial radio communication interests in Brazil, the Argentine, Chile, Peru and Colombia.

Thus constituted, the Imperial British system is by far the strongest and most comprehensive international communication organization operating in the world today. From London its vast web of cables binds together the British Empire, reaches into the West Indies, extends to all of South America, and touches all countries in the Mediterranean, as well as India, Africa, Australasia, Java, China, Japan and the Philippines. Its radio circuits connect not only the units of the British commonwealth of nations, but also the United States and the important countries of South America. Great Britain has given to the world a demonstration of complete coordination and effective governmental control of a nation's vital international communication system, supported in all of its foreign arrangements by the full power of the British Empire. Members of the Government sit in the councils of the Imperial Company. In peace time the Government promotes communications development. In wartime, it naturally can have the closest control.

France, Germany and Italy present international communication pictures much after the British pattern, although these countries never have possessed cable systems comparable in extent or importance with those of their cross-channel neighbor.

Germany                      During the war, the now German cable system was taken over by Great Britain, France and Japan, and except for a cable laid between Germany and the Azores, connecting with an American cable, Germany's post war communication development has been almost entirely in the field of radio. For many years Germany encouraged the private

Telefunken Company to develop and build radio stations throughout the world. Radio services were established with most other European nations and with countries of the New World and the Orient. A year ago, after carefully studying the effect of the British merger, the German government took over this complete system. Today, the German government operates a monopoly of internal communication of voice and record and of international radiotelegraph and radiotelephone services, thus presenting another significant example of unified control.

France                      France's principal cable undertaking comprises the three submarine cables to the United States, one of which formerly belonged to Germany. The Compagnie Telegraphic Sans Fil, the great French radio communication company, was granted permission twelve years ago to exploit international radio communication and to establish quickly a number of important circuits. Three years ago the French government required the French cable and radio companies to merge their interests, and today these complementary services present a unified and solid front to the world.

Italy and                      In Italy, the government several years ago merged the  
Other Nations                competing Italian cable and radio companies for the more effective exploitation of international communications. Austria and Switzerland have consolidated their foreign communication services. In Holland, Belgium, Denmark, Norway, Sweden, Poland, Russia, Turkey, Czechoslovakia, Hungary, Japan, China, Java, French Indo-China and certain other countries, a governmental monopoly in communication has been maintained. Efficient and economical service for their own nations, particularly in the development of foreign commerce, rather than expensive competition, is the policy that dominates the external communications of most foreign countries.

Foreign Nations                From the foregoing situation it may be seen that  
Possess Strategic              in transactions where the international communica-  
Advantage                      tions organizations of the United States meet foreign interests, we are compelled to deal with a single agency representative of the foreign government itself or supported and endorsed by governmental sanction. The foreign communications organization, on the other hand, may be selective in its dealings with competitive American interests. Inasmuch as nearly all international communications services must be operated in conjunction with a foreign monopoly, the practical result is that the foreign monopoly has a most effective control in any situation. Now rules and regulations may be made abroad at will, and the American company must comply with them or cease working. Competing American companies, anxious for opportunities in new territories, may accept these demands or conditions. The strategic advantage rests with the nation overseas. One or more American companies and consequently our American system of communication, suffer from any arrangement thus reluctantly but necessarily entered into.

Advantage of Japan  
as an Example

For example, in the case of Japan, where all communications, both domestic and international, are handled exclusively by the Japanese government, our American communications position is unimpaired until a time when two or more American companies offer additional circuits between Japan and the United States. At that moment the control of our transpacific communication would immediately pass to the Japanese. Competing American companies would have to accept the terms and conditions of service laid down by Japan or do no business.

These situations in the international field may appear to be largely of commercial significance, but it must be emphasized that they also have an acute bearing on our problems of national defense. It is impossible to have an international communications structure of the desired strength for peace or war, when foreign nations are in a position to dictate communications rates and conditions. It is impossible to have an economically strong American international communications structure with the waste, overlapping effort and intensive competition that now mark our situation in this field. It is impossible to prepare suitably our international communications for quick response in a national emergency when they are wholly lacking in coordination in times of peace. Instead of consisting of a number of scattered companies, they should form a part of a clean-cut segment that could be promptly fitted into our national defense plan developed by our military and naval authorities.

Mass Communication by  
Radio Broadcasting

In the foregoing I have discussed the position and resources of this nation in the fields of voice and record communications, and have indicated the trend among other nations toward the unification of external record communication companies. In order to complete our communications picture, it is necessary to review briefly some of the essential points of the new development of mass communication conducted by radio broadcasting.

Our broadcasting system in the United States has grown up largely under local auspices and through private initiative. Of approximately 600 radio broadcasting stations in the country, by far the preponderant number are independently owned and operated. Two important and competitive networks, the National Broadcasting Company, which is a wholly-owned subsidiary of the Radio Corporation of America, and the Columbia Broadcasting Company, supply broadcasting material for their own and subscribing stations.

Public policy has dictated against a generally united control of broadcasting activities, just as it would dictate against unified control of all the newspapers of the land. As broadcasting deals with the forces of information and education that affect public opinion, it has been deemed most advantageous to us in this country to leave this type of communication in private hands, under governmental regulation, and under the directing principle that stations shall be operated in the public interest, convenience and necessity. The inherent nature of this new art and the public demand for certain

types of programs of unusual interest or moment, such as the political conventions and election returns, as well as programs of outstanding entertainment value, require facilities for the prompt and efficient linking of numerous stations throughout the country, such as would be demanded by the exigencies of a national emergency.

### III

Technical Aspects of Communications Development      Prior to the consideration of a solution for the problems affecting American communications, examination must be made of some of the technical aspects of our communications development. These are important from the standpoint of national defense and the economics of the industry.

It is appropriate to consider, in this connection, whether any superior properties are possessed by one or another of the mediums of communication now in use. It must be determined also whether the research laboratory, as far as it can forecast its work, has important disclosures that will tend to make obsolete our present equipment or our established methods.

Cable vs. Radio      In the matter of speed, which is of the greatest importance in both military and commercial work, radio already has demonstrated its advantage over the cable. In the matter of capacity, radio lends itself to faster automatic operation than cables in use. Ninety-five per cent of the world's long distance cables are operating at speeds of only 100 to 200 letters -- not words -- per minute. It would be a poor commercial radio circuit which could not exceed this performance. In addition, technical developments in progress give promise of much higher communication speeds through space than are likely to be attained by cables. In the matter of economy, radio has lower capital and maintenance costs. In the matter of directness, it is not limited, like the cable, by the shore lines, and does not require additional manual retransmissions over wirelines to get from office of origin to office of ultimate destination. In matter of secrecy, whether by cable or radio, complete secrecy depends largely upon the ingenuity exercised in cipher construction and manipulation.

Considering the substantial difference in capital and maintenance costs between a long distance radio circuit and a long distance submarine cable, and having regard further to the ease with which a submarine cable can be cut in times of war, the question may well be asked -- both from an economical and military standpoint -- whether the long distance submarine cables are likely to be laid in the future and whether such cables would be considered at all had the radio developed first and the cable afterwards.

In the matter of communications progress, radio has obtained advantage from the great amount of research which has been directed toward the exploration of related fields. Communication engineers and research men

developed broadcasting, effective talking pictures and home receivers. While these developments have been in progress, radio communication has been pressed ahead to the place where our country's radio communication system is regarded as the technical standard for the world. From radio communication research came electrical entertainment, and from electrical entertainment research has come vastly improved telephone communication both by wire and radio. Television, primarily a product of the entertainment field, now promises to make vital contributions to the communications field. Diversification of activities and coordination of research have proved stimulating not only to the general development of the radio, but they have also advanced each individual phase of radio service. This is evident from the rapidity with which the entire industry has moved forward.

Television and Facsimile  
in Communications

In considering whether our present communication methods are likely to become obsolete, the possibilities of television and facsimile transmission should be considered fully.

Television experimental work has been carried on in close coordination with similar research in the field of facsimile transmission. Both developments seem destined to have revolutionary effect on our present methods of communication. Television is the art of converting light variations in such a way that they are able to modulate radio frequency energy. Thus images may be reproduced in clarity and detail at some remote receiving station. Radio facsimile, which has already had widespread commercial application, is the rapid transmission of exact copies or smaller reproductions of printed pages, documents, maps, drawings, photographs or other printed or written data.

Much progress has been made with these two developments since ultra short radio waves, in the band below five meters, came under intensive study and exploitation within the last two or three years. These waves, it may be explained, appear to have many properties of light waves in that they do not tend to follow the curvature of the earth and consequently are not suitable at this stage for long range communication. At a transmitting elevation of 1200 feet, they are serviceable within a horizon of twenty miles, and, therefore, provide coverage of an area about forty miles in diameter, or of a correspondingly smaller area at a lower elevation. Quite recently we have placed in successful operation an automatic, radio, two-way, duplex repeater station for ultra short waves that has doubled their service range, thereby clearly indicating the possibility of definitely overcoming the disadvantages of their inherent limitations.

Both television and facsimile transmission may have the most vital bearing on our future communication methods and should be studied carefully in relation to communications and the national defense.

With equipment that has been in use on transoceanic facsimile circuits for some years, approximately fifty words of normal size may be transmitted per minute. The later carbon recorder type of facsimile equipment with

which we are now experimenting in our communications work has a speed capability of 400 words per minute. This is approximately twelve times the speed of the hand key in telegraphic work and greatly in excess of any automatic transmission employing the telegraphic code.

However, an entirely different line of facsimile development now in progress, based on the principles of television, appears more likely to cause a fundamental change in communications work. This method consists of recording, by specialized equipment, a 240-line television picture. By this method, a facsimile transmission capacity up to 14,000 words per minute may be possible of ultimate attainment. Such transmission would accomplish what is at present done by 250 teletype machines or 450 telegraph operators typing messages from the Morse code. Experimental transmission of two newspaper pages, or about 14,000 words, may now be accomplished in five minutes. This time includes preparation, scanning and recording.

Study of Communications  
Progress Essential

Television and facsimile are of major  
significance, but they do not represent  
the full scope of present-day research

in communications or its associated enterprises. Experimental work and engineering are being pressed forward along many different lines. It would be of much benefit to the cause of adequate preparedness in communications, it seems to me, if the War and Navy Departments from time to time would assign capable communications engineers to the research laboratories of the American communication companies which maintain such facilities. I can state that so far as the Radio Corporation of America is concerned, it would welcome the opportunity to cooperate in this manner with the military and naval establishments of our country. There would be a double value from such assignments. Not only would our Military Services keep pace with prospective changes in communication practices, from the very inception of the research work, but also the work itself could be so directed as to develop, in the most practicable manner, the type of communication equipment best adapted to military communications needs. It is important, of course, that the military branches of the services not only be familiar with developments in the United States, but that they also be au courant with developmental work in progress in foreign countries.

We have seen from a review of the existing communications situation in the United States that,

1. In the field of voice communication, unified control has developed a strong, efficient company rendering good public service.
2. In the field of record communications, our domestic and international companies are weakened by the waste and strife of unrestrained competition and our companies engaged in international communications are at a pronounced disadvantage, because

of their intense competition, in transactions with the unified record communications organizations abroad.

3. The high importance of technical developments at present in the laboratory.

We may now consider how the nation's communications may be placed on a sound, economic and strategic basis in time of peace and made quickly adaptable to the needs of war.

#### IV

American Communications  
Policy Required

The initial requirement is the development of an American Communications Policy

The three points in an American Communications Policy, as I conceive it, should be.

1. Maintenance of voice communication under a single organization, conducting its telephone service with wires, radio or cables, as conditions may dictate.
2. Unification of internal and external communications of record under a single company, conducting telegraph service with wires, radio or cable, as conditions may dictate.
3. Establishment of a single governmental agency empowered to regulate American communications in the public interest, its authority to extend over voice, record and press communications irrespective of the mediums employed, whether they be cable, wire or radio.

Such an arrangement would eliminate duplication and overlapping. It would join in one unified company all phases of record communication, and leave, as at present, in a single company all phases of voice communication. It would simplify the problems of regulation now exercised by the federal government, which places wire lines and cables under the jurisdiction of the Interstate Commerce Commission and radio under the jurisdiction of the Federal Radio Commission.

To put the foregoing program into practical effect, changes would be necessary in existing laws.

Views of Army  
and Navy

It was interesting to me to find that my conclusions on the necessity for unification in the field of record communication, arrived at

independently and based on my own experience with the communications industry, are the same in principle as those advanced by officer of the Army and Navy, whose reports I have studied during my present tour of duty with the Signal Corps.

From the paper on communication control by Major General Carr, dated January 1933, I read as follows:

"The extension of American world-wide radio service has seriously threatened the supremacy that Great Britain has enjoyed for so long in the field of world communication. To meet this threat Great Britain has taken steps to effect a unification of her cable and radio interests, so that each of these methods supplements and strengthens the other in one great common system. In America, we have a contrary policy which separates these methods into competing corporate entities and forbids by law their combination. This policy is economically extravagant and technically restrictive and unsound. Not until these restrictions are removed can America hope to build communication systems that can compete on even terms with such unifications that which has been effected by Great Britain."

In the Army Industrial College Study on "Communications Control", Committee Report on Problem 53, dated April 23, 1932, Conclusion No 5 states clearly.

"That the restrictive provisions of the Radio Act of 1927, which forbids the merger of wire and radio companies is detrimental to the interests of American owned companies engaged in international communications service. It is the opinion of the Committee that the interests of the nation could be better served by permitting the existing American companies to pool their resources in their competitive struggle with unified foreign systems."

Recommendation No. 3 of the report of this same Committee suggests:

"That the War and Navy Departments lend their support toward modification of the present restrictive legislation which forbids unification of American companies dealing in international communications . . . ."

From the recent address made by Captain Hooper at the Naval War College, at Newport, R. I., on April 20, 1933, I read.

"It appears purely from an economic point of view that it would be greatly to the advantage of the commercial communications companies to amalgamate parts of their system. As pointed out above, the domestic landline companies are hard-pressed by other types of communication facilities, by

the general depression of business in the world and by the necessity of high-pressure competition, one with the other. If these two domestic landwire companies were permitted to combine, there would be a gradual reduction in operating and administrative expenses. There is little question that such a move would find opposition from those who would say that any amalgamation of commercial companies which would reduce the number of personnel employed is not to the best interests of the United States. If such a step is not taken, however, and the depression continues over a period of years (and even the most optimistic reports indicate that business will not return to its 1928 level for many years), these landwire companies will find themselves in an untenable position, analogous to that of the railroads."

It is to be hoped that when the question of modernizing our present laws affecting our world standing in communications is the subject of consideration by Congress, these views by officers of the Army and Navy, which are unquestionably sound and constructive, will come to the attention of our legislators. Congress alone has power to deal with this matter so vital to the nation's welfare and security.

In his address just referred to, Captain Hooper proposes a three-way grouping of our voice and record communication organizations, as contrasted with the two-way grouping I have suggested. Captain Hooper would reallocate communication activities into the following divisions:

1. A merger of all wire and cable record communication companies.
2. A merger of all radio record communication companies.
3. Leave unchanged the present wire and radio telephone monopoly.

This appears like a very simple set-up. There are, however, technical, financial and economic points to be considered.

I do not feel that communication organizations should be artificially restricted because of the nature of the medium employed. To do so would compel cable companies to depend perpetually upon frail pieces of copper on the bed of the oceans, when further technical progress may make them entirely obsolete. Enough cables already have been abandoned because of the competition offered by radio. Moreover, such division of record communications would ultimately require the radio company to provide its own "pick up and delivery" facilities, resulting in an unnecessary duplication of expense and effort. Such restrictions upon the separate wire and radio organizations would give the telephone monopoly -- which would be free to utilize both wires and radio -- a tremendous competitive advantage, and its telegraph

rivals a corresponding disadvantage. The American Communications Policy I favor is one which would permit a consolidation of radio, cable and wire, so that each medium may have the benefit of all technical advances. This would safeguard investments and at the same time permit competition between two entirely different forms of communications -- record and voice.

Advantages from  
National Defense  
Standpoint

From the standpoint of national defense, where the call for a program of unification is urgent, two communication companies - voice and record -- obviously would be more advantageous than three. The problem of coordination of all communication services in time of war would thus be greatly simplified. With two unified systems -- voice and record -- it would be a simple matter under the provisions of the National Defense Act relating to industrial mobilization, for a National Director of Communications to coordinate these privately owned systems with the communications of the Army and Navy.

An American Communications Policy such as I recommend would give to the United States the most powerful and comprehensive communication system in the world. It would substitute a strong, effective organization for a series of companies, which, individually and in competition with each other, are weak when opposed to foreign rivals, and which must inevitably grow much weaker as competition is prolonged.

From the standpoint of public policy, there should be no hesitancy in extending to the field of record communication the same type of unified operation that has proved so successful in the field of voice communication. To a generation that has witnessed the devastating consequences of an era of uncontrolled production, competition no longer remains the graven image to be worshipped under any and all conditions. In certain lines of enterprise, regulated monopoly under proper government supervision, would seem to be more in the public interest.

Coordination of  
Communications

As a result of my studies here, it is my belief that greater coordination is needed between the Army and Navy communication services even in time of peace.

My contact with this problem has been all too brief to justify any effort to be concrete, but I understand that this matter has been receiving careful consideration from the communications officers of the Army and Navy, and is now the subject of study by a committee appointed by the Joint Board of the Army and Navy. While I recognize the need for independent systems of communications by the Army and Navy to meet the peculiar and distinctive requirements of each service, it seems that there is still an area in which joint operation and service could be developed for the mutual benefit of both establishments in time of peace as well as war. If effective coordination is obtained in peace, this problem will not remain open at the outbreak

of war, when time is precious and energy vital for operations in the field and on the seas.

It is important also that the closest possible coordination be obtained with the private commercial communications companies. Before any emergency is reached, careful plans must be laid and a communications personnel, trained to military requirements, must be available. One would naturally hope that with a unified record communication system, virtually all officers and important employees of the organization would form a part of the reserve forces of the United States Army or Navy, where they could be instructed in duties that would be required in an emergency. They should be periodically drilled in peace-time for the tasks they would be called upon to perform in war. The management of our own communications companies, in fact, has sensed the importance of a peace-time organization, which might be converted overnight to accommodate the needs of an emergency, and has encouraged its principal officers and engineers, as well as its operating staff, to enlist in the Army and Navy reserves.

Should the present highly competitive situation in our record communications continue, it is doubtful if government control can go much farther in a future emergency than it did in the World War. It might be limited to matters of policy, general supervision and censorship by some federal agency. Naturally the element of competition would be removed and traffic loads would be distributed by a central agency. Nevertheless, the government would receive into its hands something of a hodge-podge of overlapping facilities and duplicating personnel, and only after a great deal of time could it build from this a single, efficient organization fashioned to our commercial requirements and military needs.

## V

Use of Broadcasting  
in National Emergency

After consideration of the plan for two unified communication services -- voice and record -- there remains the important problem of the third system of communications -- radio broadcasting.

The potentialities of broadcasting must be given careful study in our national defense plans. Propaganda methods of the last war, where aviators scattered handbills behind enemy lines, seem ineffectual and highly primitive when compared to a high-powered broadcasting station, either fixed or mobile, booming forth reports on the justice of a nation's contentions and the success of its arms on the battle line. Wars are sometimes won not only by military or naval engagements, but by the stability, courage and temper of the non-combatants in the homeland. Certainly the last great conflict disclosed that a nation may be vanquished without any important invasion of its territory and with its army still active in the theatre of operations. The first break of the Central Powers came in their morale.

Broadcasting should be under the close supervision of the Government in war-time. The Federal coordinator should have authority to keep open those broadcasting stations that best serve the interests of the country and to close down, if it be necessary, those that are not required. The country at all times should be adequately served. Broadcasting is now maintained on a competitive basis. In warfare it should be maintained on a national basis. The circumstances of the war and the type and position of the enemy should be the determining factors as to whether those broadcasting stations which are continued in operation should remain in private hands or be taken over by the government. Studies of this problem, and of the number and location of stations necessary to give adequate war-time coverage of the country, may be made in connection with the general communications planning work conducted in time of peace.

Our broadcasting policy in warfare should be designed first for the protection of our civilian population against attempts certain to be made by enemy propagandists. Prompt steps must be taken to counteract a deluge of misleading information. It would be neither desirable nor practicable to strip down the twenty or thirty million broadcast receiving sets that may then be in the possession of the American public. To do so would be to deprive our Government of all the advantages that can come from radio in a period of great national stress, and might in addition seriously undermine our own public morale. Nor does it seem certain that our stations, by generating interference, could altogether block such propaganda attempts. Efforts to "blast out" radio programs originating outside our territory undoubtedly would start rumors of calamities more harmful than a barrage of enemy words.

Our efforts, it seems to me, should be directed primarily toward offsetting propaganda through the proper use of our own facilities in close cooperation with governmental agencies. Emphasis may be placed on the importance of speed in matters of public information. Radio is a medium of instantaneous contact. Its general adoption in America may call for the issuance of more numerous bulletins from our armies in the field, and reports filed with the very least delay after important attacks or engagements. There is sometimes marked advantage for the individual or nation that first brings the news. Germany rushed to the world the first accounts of Jutland, and temporarily persuaded many that British naval supremacy was at an end.

Our ability to reach the neutral world or the homeland of an enemy nation is enhanced by the power and scope of our broadcasting systems. These are such, in fact, that in the unlikely eventuality of an invasion which would cripple our ordinary channels of communication, our hundreds of broadcasting stations could be organized for momentary conversion to radio-telegraph or telephone use.

Such is but a glance at radio broadcasting in warfare. Many broadcasting problems may be answered and some new problems may be raised by the coming of television, which will fortify sound with sight, and leave little

to the public imagination. Japan already has brought to its island empire the battle sounds on the Manchurian front. If war be long delayed our concern over matters of hostile propaganda may be laid to rest by the research laboratory, which is burning its lights into the night seeking to annihilate time and distance in our communications. Inventive resourcefulness may bring the full panorama of war to the instrument at our fireside.

## VI

Resumé                      As a resumé of the foregoing, it may be stated that,

1. The fund of information collected by Army and Navy authorities on a matter of such high importance to the national defense and to the economic stability of one of the nation's largest industries demonstrates the need for consideration by our Government of the establishment of a definite American Communications Policy.
2. A change in conditions is urgently required in the domestic record communication field, where great waste results from duplication and intensive sales effort.
3. A change is also imperative in the field of international communications, where competition is equally intense on this side and therefore American companies are not on a parity with foreign monopolies in negotiations affecting communications rates and services.
4. Existing conditions make difficult the formation of a satisfactory plan for coordination and prompt and efficient transfer of our communications facilities from a peace to war basis.

As a solution for these problems, it is suggested that,

1. Voice communication by telephone be maintained as a separate unified system using wires, cables or radio.
2. Internal and external communication of record be merged into a unified system using wires, cable or radio.
3. A single governmental agency should be established with sufficient power to regulate American communication companies, in the public interest.

This program is suggested as economically sound in times of peace, practicable for prompt and effective transition for use in war and one which will give the United States the strongest communications organization in the world.

ooOoo

Colonel McCain: Gentlemen, the conference is open for questions or comments.

Q. As I understand it, Colonel, at the present time the voice organization (telephone company) does have relation with the wire and record people. In other words, we can place our telegrams by telephone. Where the service of the wire company (record company) does not extend into more distant parts, if we can reach a telephone, we can call the telegraph company and send it. Would you continue that service or would you want to have competition between voice and record?

A. (Colonel Sarnoff) Under the proposed systems of competition between voice and record I would certainly favor the maximum flexibility of service to the public.

Q. Does the proposed reorganization of the Commerce Department furnish such a Federal regulating body as you have previously referred to? I refer to the proposed coordination of all communications in a division whose subdivisions would provide the necessary coordination in the separate but related fields of radio, land transportation, water transportation, etc.

A. (Colonel Sarnoff) The tentative proposal as reported in the press is as yet too indefinite to enable me to specifically answer your question. The purpose as I understand it is to provide unified control, but apparently the plan has not, as yet, been fully developed or reported in detail.

Q. (Captain Hooper, Director of Naval Communications) I think Colonel Sarnoff has certainly done us a great favor to give us such a wonderful talk. He told me the other day that he was going to quote something from my talk at the Naval War College and he suggested that I might want to discuss this three-point versus two-point idea. I discussed this with Colonel Sarnoff on several occasions and he is so eloquent and knows his subject so well that I usually agree with him as I talk to him, but after thinking it over for several days I come back to my own ideas. It really would seem impolite to take issue with him at this time. I agree on almost everything but there is a point on that particular subject which we are not agreed on, and unless it is proper, I would prefer not to discuss it at this time. Perhaps some other time, whatever you say or Mr. Sarnoff would like to do.

A. (Colonel Sarnoff) Go ahead.

Q. (Captain Hooper) I have a short paper giving my views if you would like to have me read it. Mr. Sarnoff and I agree on the main thing - that there should be a government communication policy, and we have both agreed that anything that he and I or anybody else can do to start the discussion on this so as to perhaps directly bring about an American communication policy, that it will be all to the good. Of course, we fellows in the Navy and Army are out to protect the Navy and Army (or national defense) and we want to get the very best possible out of it no matter what the set-up is. I don't any more agree that the radio record communication and wire record communication should be amalgamated than I would to say that the busses and the transcontinental airways and the railroads should be amalgamated. If the cable companies have gotten themselves into a bad financial condition through obsolete

material and cutthroat competition methods and processes, they have got to work their way out the best way they can, just as the British cables did. Because of the great investments the British public had in cable, they were perfectly willing to buy radio in with cable to save the cable investments.

#### LAW

Section 17, Radio Act of 1927, in brief.

"SEC. 17. After the passage of this Act no person, firm, company, or corporation, etc. - - - - in the business of transmitting and/or receiving for hire energy, communications, or signals by radio - - - - shall by purchase, lease, construction, etc. - - - - acquire, own, control, or operate any cable or wire telegraph or telephone line, etc. - - - - or shall acquire, own, or control any part of the stock or other capital share of any interest in the physical property etc. - - - - any such cable, wire, telegraph, or telephone line or system, if in either case the purpose is and/or the effect thereof may be to substantially lessen competition or to restrain commerce - - - - or unlawfully to create monopoly in any line of commerce, nor shall any person, firm, company, or corporation, etc. - - - - in the business of transmitting and/or receiving for hire messages by any cable, wire, telegraph, or telephone line or system, etc. - - - - by purchase, lease, construction, or otherwise, directly or indirectly acquire, own, control, or operate - - - - any system for transmitting and/or receiving radio communications or signals - - - - or shall acquire, own, or control any part of the stock, etc. - - - - other assets of any such radio station, apparatus, or system, if in either case the purpose is and/or the effect thereof may be to substantially lessen competition or to restrain commerce, etc. - - - -."

#### INTENT OF LAW.

Conforming to the Constitution, the fundamental principles upon which the United States is founded, the law demands that.

- (a) There be an assurance of wire telegraph, telephone and radio competition which will not throw the control of a great enterprise into the hands of a few, either to the disadvantage of the public or to the disadvantage or curtailment of legitimate business enterprise.
- (b) Science will develop unhampered by control of big business.

#### PRESENT SITUATION.

Radio, wire and cable companies have developed their systems unhampered to any great extent by any law, except that of supply and demand. A situation now exists which is analogous in many respects to that of the railroads. Landwire companies (Postal and Western Union) are every day approaching

nearer to receivership. The radio companies, RCA Communications, Inc., the Mackay Company, the Globe Wireless Company, the Tropical Radio & Telegraph Company, the Press wireless Company, are making ends meet with the greatest difficulty. All of these companies, with the possible exception of the Mackay Company, compete with Western Union and Postal cables. The only communication company left in the United States which appears to be on an assured, permanent, sound financial basis is the American Telephone and Telegraph Company. The situation demands immediate action. If nothing is done to change the set-up of the present-day system, the following may happen:

- (a) The landwire companies will go into receivership with the result that either the Government or the only strong company left, the American Telephone & Telegraph Company, will be compelled to take over their management.
- (b) One or more of the large radiotelegraph companies will go into the hands of receivers with the result that, as in the case of the landwire companies, the American Telephone & Telegraph Company, will have to take over the management, the company or companies will be completely wiped out or the Government will have to take over the control of all international radio.
- (c) Cable companies with their vast and extensive networks are certainly not paying propositions at the present time when their operating costs are compared to radio operation. They are being supported by other communication services which are associated with them. They are facing the same situation as other communication systems and will either carry down with them their associated companies or will be wiped out.

#### DISCUSSION

##### MONOPOLY

A single monopoly of communications which control all radio broadcasting, wire and radiotelephone, wire and radiotelegraph and cables, would be potentially dangerous and should never be permitted. The far-reaching influence that such a corporation would have on the economic affairs of the United States in peace-time is beyond comprehension. Every business would certainly feel the power of this organization. From a standpoint of national defense, such a monopoly in a national emergency would rule the nation. Congress would never permit it from a political standpoint. It is not a necessity for technical or economic reasons. It is true that the technical set-up of communicating agencies might be simpler, but the absence of competition would eventually slow the pace of development and the position of the United States in radio would gradually lag behind other leading powers.

All the pressure for the merger of all forms of rapid communication is due to the present depression. The Postal and Western Union companies were thriving enterprises for many years before the depression, and both Mr. Carlton

and Mr Mackay have always, up to the last two years, insisted that competition between two telegraph companies had great advantages and both of the companies could be justified from an economic point of view. Now, if the depression is drawing the Western Union and Postal companies under a single head for the protection of their capital investment, such a merged corporation must be kept as an entity in competition with the telephone company and radio must be given a chance to develop and find its place independently of both. If, in the past, it was necessary that the Western Union have a competitor in the telegraph field to bring it to its high state of development and prosperity, which Mr. Carlton has claimed, and with which I agree, certainly with this new merger, there will be a place for a competitor in the form of radio.

In the early days of testing trans-Atlantic radio, the cable and wire-telegraph executives stated that radio could not possibly compete with cable. This was my feeling also, yet Mr. Nally and Mr. Sarnoff and others thought that the experiment of radio competition with cable was worth attempting. As a result of their courage and vision, radiotelegraph companies prospered and the development of point-to-point radio is well known. RCA has its 40 direct circuits to foreign countries. This is the service which is taking the business from the two cable companies and reducing the income of the Western Union and Postal. None of this would have come about, at least from this side of the Atlantic, if radio had been kept under telegraph and cable executives.

The same parallel may be expected if merged wire companies are permitted to control domestic radio. The radio art is not developed and with micro and ultra-short waves for local pick-up and distribution, who knows what the position of radio will be thirty years hence if the opportunity is given?

Certainly, national defense must not dominate a picture of such economic proportions, but it is an important part of the scheme and commercial executives must give consideration to it. If we permit the set-up of communications of the United States to drift into a situation where development will not naturally keep pace with other leading powers, our Army and Navy will be that much less efficient and less able to perform their functions in national emergencies. With treaty radio Navies, a small technical advance either way may be the making of history.

The question of the regulation of rates must be given consideration. It is undoubtedly true that at the present time, in the midst of the depression, that anyone of several companies with slight readjustments could take over the work of the several competitors and in a short period could make their rates available to the public. A single monopoly of all types of communications would have the potential ability of giving the public the lowest rates possible. As stated before, the technical developments will be retarded and for this reason alone, such mergers should not be permitted. Also, regulation of rates by the Federal or State Governments is complicated

problem and it requires a large machine at the present to protect the interests of the public. Competition, on the other hand, provides a natural means of rate control, necessitating merely a checking, regulatory body. In addition, however, there is the fact that a merger of all communications under a single head would create more unemployment at the present time and this fact must be given due weight when considering the extent to which mergers may be permitted.

#### SOLUTION

##### Step 1.

Postal and Western Union companies to combine in the domestic field to compete with the Bell Telephone System and at a later date to compete with domestic radio. Permit this merged telegraph company to combine with cable companies.

##### Step 2.

Permit all radio companies to combine.

#### GENERAL CONCLUSIONS.

The main stumbling block to the above plan is found in Step 2 above, in that the pick-up and delivery service of a radio company which did not have an affiliated domestic wire company would be difficult, - particularly in case there were a single wire company as proposed in Step 1.

There are numerous methods of obviating this apparent disadvantage.

First, there is the strong possibility of a domestic radio service becoming an actuality.

Second, radio companies now have contracts with landwire companies which could be continued and if distinct disadvantage is seen to the radio companies through such an arrangement, wire companies could be compelled by law to make just contracts with radio companies.

Third, radio companies can confine their services, for the moment, to large customers at key points and utilize their own pick-up and delivery service. For example, I proposed three years ago that a commercial radio company could establish a party-line service with Detroit, New York on this end and several important European capitals at the other. Service could be offered at a rate from New York and Detroit which would compel large companies to utilize it as it can obviously be done cheaper than by wire and cable operating costs. Concentrate on big business and get their trade. At least at main points, a pick-up and delivery service would then become worth while. This could be made an immediate solution."

Mr. Sarnoff says that he would not want to be head of such a company.

I think that he might enjoy it a lot if he got into it. He has always been able to work his way up better than anyone else and I certainly think he is doing a wonderful work for the company. Thank you.

A. (Colonel Sarnoff) First, let me say that no officer in the Government service has done as much to advance radio communication and certainly no one has done more than Captain Hooper and so in rising to have this friendly discussion, I wish to express my belief that whatever his views may be, I regard them as coming from a patriotic officer who has given the subject of communications earnest study. Apparently there is an honest difference of opinion between us on one point. Captain Hooper told us that in Great Britain they have combined their cable and radio telegraph systems into a single organization. If you let the cable and radio telegraph companies combine here as they have done in England, you will have exactly the unified system of record communication that I have proposed to you in my address this morning. That is what I'm proposing and that is what I understand Capt. Hooper objects to. I therefore do not understand why Captain Hooper points to England as an example of what could be done here. Secondly, no evidence has been given by Captain Hooper as to why the two-point system I propose would be worse for national defense than the three-point system he proposes. He did express his opinion that a single monopoly might control the country. You have a monopoly in the Telephone Company at the present time but it has certainly proved effective in war as well as in peace. Nor is there any suggestion in my paper that there should be a single monopoly. I proposed two systems and strong competition between voice and record organizations. If you can control the telephone company why can't you control the record communication company? You can take them both over in time of war if that's the thing to do. In any event, I am not prepared to say that any private monopoly is greater than a Government in a national emergency. We are witnessing now what the Government can do even in time of peace. Moreover, if you have any fear of monopoly and you believe that the American system of competition in communication is the doctrine to be preserved, I respectfully submit to Capt. Hooper that if you let the telephone company have the right to use wires and radio and you restrict the telegraph companies to wire and cable only, the final result might be just the opposite of what the Captain desires. I know of no reason technically or financially why the telephone company cannot enter the telegraph business with its present wire system and organization. If it did so, the Telephone Company could obtain control of the telephone and telegraph business of the country. Certainly it is no secret that the Telephone Company is capable of putting any domestic telegraph company out of business. If the Telephone Company should decide to use telephone wires for telegraph services, you have some 19,000,000 potential stations in the country as each telephone station can also handle telegrams. There is nothing in the present laws I know of to prevent the Telephone Company from entering the telegraph business. Now Captain Hooper suggests that the cable and wire companies go on and catch up in this competition with Radio and the Telephone Company. If you are in a buggy trying to catch up a railroad train the chances of success are small! Radio circuits go directly to points of destination. Cables do not. We would expect in due time to convince the telegraphic public that they ought to send their international messages direct by radio instead of indirectly by cable and wire.

The advantages I have pointed out of radio over cable leave me with no doubt in my mind that long distance cables will ultimately disappear unless they can keep pace with the radio art. And so the objection that Captain Hooper expresses to my two-point program, namely, that it would result in monopoly, is the very objection I have to his three-point program. I propose competition between voice and record -- not monopoly. Captain Hooper's proposal, in my opinion, would result in a monopoly of both systems, (voice and record) although I appreciate that this is not his desire.

Q. (Captain Hooper) It seems like our guest should have the last word, but according to the rules of debating there is a rebuttal on the part of each. The interest of the Navy, and I presume the Army, is in the development of radio. That is where we stand. We don't care much about cable, some kind of wires are going to be there anyway. We are interested in keeping the development of radio ahead of any other nation. The Navy is dependent upon that. We don't want to see the radio tied up to anything that is going to give it less incentive in development. The argument has been used of the lack of development in countries of telephone monopoly. True, but the subscribers keep the telephone company right at their thumbs' end all the time. If there isn't the best service the public can expect, the subscribers en masse are going to insist upon it and that is what is behind telephone development. There always will be the telegraph mess ages which you put in the basket and ring a bell and you don't know just how long it takes them to get there. The radio is the thing we are interested in in the Navy and we want to be dead sure that due to the fact that any merger is made and the radio put under wire executives that there will not be any slowing down in the research and we certainly have witnessed the most wonderful example of what competition can do to the under dog. The radio has done it in the international field and I want to see it happen in the domestic field. I want to see radio go on and push the wire until it finds its place. After it finds its place in the development, then we can talk about a merger of telegraph radio and cables, I agree with you but I think it is a little premature.

A. (Colonel Sarnoff) I would like to put this question to Captain Hooper. Why do you propose a telephone monopoly to include wire and radio in the voice field, and insist on competition between cable and wire on the one hand and radio on the other in the record field? If the principle of competition within a system is to be preserved, then you can also set up a competition between radio telephony and wire telephony, especially so between long distance points. Laws might be enacted which would compel the Telephone Company to connect its wire service with the radio service. For example, the policy of the Telephone Company changed when the present international radio telephone system was established, because today a person in Paris or Poland can communicate at one end of the circuit over a foreign wire and foreign radio system with a person in Philadelphia or Chicago at the other end of the circuit, using the A. T. & T. wire and radio system, but a person in New York cannot communicate with another in Chicago except by using the A. T. & T. system at both ends of the circuit. Also, I would like to know why Captain Hooper thinks that for maximum radio development in the telegraph

field, competition is required between cables, wire and radio, while in the telephone field, he feels that competition is not necessary between radio and wires. I cannot see the distinction from the standpoint of technical development.

Q. (Captain Hooper) I think there are three separate natural fields and types of competition - radio telegraph, wire, cable and telephone, whether it be wire or cable or radio. I think you have to admit that there are some little things that are not exactly right under my set-up and that is one little weakness and I don't think it amounts to very much.

A. (Colonel Sarnoff) I think it is a big weakness.

Captain Hooper. I think that if you go ahead and have it your way it will be a bigger weakness than my way. I think that what we really need is an American policy - get the discussion going.

General Carr. As I see the points brought out in this discussion we have two elements under consideration, one is the depression and how we are going to keep our industries going under present conditions, the other is how can we establish a national policy that will put our communication industry on an equal competitive basis with the international and European communication systems. To my mind the latter is the criterion of what should be undertaken in this country

We must keep our national communication systems on a safe basis, both from the standpoint of efficiency and capacity for national defense and from the standpoint of promotion of our national commercial interests in foreign territory. That is the element in the formation of this policy which should control.

In our procurement system we prepare a specification and send it to industry for examination to see if the item can be produced economically and in quantities for our war needs. We request their frank criticism and comments and we proceed to adapt our military requirements to fit commercial and industrial possibilities.

The Government is not in a position to require industry to shape itself to be best adapted to military needs. On the contrary, the Government should so shape and plan its needs to be best adapted to industry as we find it from day to day.

It would be foolish for the Government to require industry to organize itself for war needs under conditions that would jeopardize the growth and prosperity of the particular industry and actually threaten its existence by being unable to compete internationally and with foreign competitors.

We prepared a specification for a national communication control organization and sent it out to industry. We gave one to Colonel Sarnoff and we

have his answer. We intend to make a study of that and we may come back at him again just as Captain Hooper has done. I told Colonel Sarnoff that if he failed to express himself frankly and freely he was neglecting his duty. He is probably the best qualified man in the country to pass on this subject, with his vast experience from the very ground work of the communication industry through all its divisions of operation and management to the presidency of that great corporation.

I want to stress one point - in formulating our plans for communication control they must be based on the industry as it now is, not as we hope it will be twenty years from now. It behooves us, therefore, to remain in touch with the latest developments in communication organization, operation, methods and equipment, in order to keep our plans up-to-date and workable.

Colonel McCain. Thank you very much, General, for your fine remarks. We are also very appreciative of Captain Hooper's coming over here and taking so much interest in our work. We are particularly grateful to Colonel Sarnoff, not only for an able and instructive address, but for giving us so much of his very valuable time.