Capt Pettigrew

THE

SIGNAL CORPS BULLETIN

▼

JANUARY–FEBRUARY, 1932

WAR DEPARTMENT
OFFICE OF THE CHIEF SIGNAL OFFICER
WASHINGTON, D. C.

THE SIGNAL CORPS BULLETIN

Published Bimonthly by the Chief Signal Officer of the Army

CONTENTS

Readers of the Bulletin are requested to submit to the editor articles or reports on signal communication or military subjects. Criticisms and suggestions are invited.

Opinions expressed and policies advocated in the pages of the Bulletin are not necessarily the opinions and policies of the Chief Signal Officer. They should be considered in each instance solely as the expression or view of the writer.

Address all correspondence to "The Editor, Signal Corps Bulletin, office of the Chief Signal Officer, Washington, D. C."

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, January 1, 1932.

To the SIGNAL CORPS:

It is a great pleasure to me to greet the Signal Corps personnel of the Regular Army, National Guard, and Organized Reserves on this occasion through the medium of the BULLETIN. My sincere wish for a happy and profitable New Year goes out to all of you who have in the past so generously cooperated to make the Signal Corps the splendid arm that it is.

I urge you to continue your patriotic service in the face of unfavorable conditions which surround us at the present time. I confidently expect that the coming year will see the same progress in the development of means and methods for promoting national defense that has characterized the Signal Corps in the past.

Sincerely yours,

IRVING J. CARR,
Major General,
Chief Signal Officer of the Army.

86878—31——1

RADIO FREQUENCIES FOR FIELD ARMIES, AND THE DEVELOPMENT OF RADIO EQUIPMENT FOR FIELD SERVICE

By Lieut. Col. A. L. RHOADES, *Signal Corps*

Introduction

In the modern world, mail service, wire lines, and radio are employed in the dispatch and message service essential to the conduct of its affairs. Field armies have adapted these means to their use and employ courier service, wire lines, and radio in effecting transmission of the messages which control military operations, and which secure the cooperation and effective action of all elements. In the Army, as in civil life, radio finds its main use in supplementing the two other communication agencies, particularly in circumstances which render their operation impracticable or unsatisfactory.

The satisfactory employment of radio communication in field armies depends upon the establishment of noninterfering channels, secured by a judicious allotment of frequencies, with respect to range and the density and importance of the anticipated traffic, as well as the production of suitable instruments for working such channels.

To facilitate supply, maintenance, and operation in field armies where changes in tactical disposition and personnel are the rule it is desirable to keep the number of types of radio instruments at a minimum.

The conflicting requirements of power, portability, selectiveness, and ruggedness make the use of the highest practicable frequencies desirable.

At the present state of the art certain operating characteristics limit the reliable employment in field armies of frequencies above 10,000 kilocycles to communication between airplanes in flight.

Satisfactory radio communication for field armies requires that it be founded upon the characteristics of the elements comprising such armies and the combat tactics employed by these elements.

FIELD ARMIES

With respect to requirements for radio communication, field armies consist of infantry divisions, cavalry divisions, artillery units, air units, and mechanized forces, all united and operated by a tactical chain of command. Speaking broadly, the purpose of the infantry

division is to closely engage opposing ground forces; and assisted by artillery, special air forces, and special mechanized forces, defeat and destroy its adversary. The purpose of the air force is to engage opposing air forces, dominate them, and obtain command of the air to the end that it may undertake distant operations of decisive character against all the elements of the opposing forces. It also assists the infantry divisions, cavalry divisions, artillery units, and mechanized forces in their operations.

The mechanized force is to operate on wide sweeping movements against the flanks and rear of the ground forces opposing the infantry divisions.

Cavalry divisions are employed in the same manner as the mechanized force, although usually at more restricted distances and on terrain less suitable for rapid movement.

It is necessary to provide for internal radio communication to insure team play within these units, air-ground radio communication for cooperation, and command radio communication to effect coordination of the efforts of all.

Five systems of radio communication are thus required, each of which must include a sufficient number of channels to provide for the simultaneous operation of all the units employing that system. These are:

(1) *Divisional.*—Internal communication for infantry and cavalry divisions.

(2) *Air.*—Communication between air units and planes in flight.

(3) *Mechanized force.*—Internal communication for such forces.

(4) *Command.*—Communication between major tactical units and higher commanders, and internal communication of army and corps ground troops.

(5) *Air-ground.*—Communication between planes in flight and ground stations.

BASIS OF PRESENT DEMAND FOR RADIO COMMUNICATION

A critical study of history shows that military development in peace time usually starts by the introduction of means and measures designed to utilize the experiences of recent combats and to perfect the measures that contributed to success. This process continues until, during a long period of peace, the development of weapons, means of transportation, and other agencies gives rise to circumstances which make new departures necessary.

These new departures are usually founded upon maneuver experiences and fundamental doctrines of war derived from a critical study of military history as ordinarily understood, and more rarely a detailed analysis of the technique of combat and its psychological

factors as influenced by the application of such technique in the special environment of battle. Unfortunately for responsible military authority but little reliable data are available for such analysis; the work of Ardent du Picq is still unique in this field.

The results obtained by such a process have often been peculiar and frequently serious. This has always been the case when one of the four sources, to wit, (1) recent war experience, (2) maneuver experience, (3) military history, (4) combat analysis, has been allowed to predominate.

The first three are the usual causes of such difficulty as they are the principal sources of such development; the rôle of the fourth, when used, has been to check and rationalize the ideas obtained from the first three. As recent examples it is only necessary to mention:

(*a*) The effect of the Spanish-American War, the Philippine insurrection, and the Boer War in nearly eliminating the bayonet from our service, only to have the Russo-Japanese War restore it. Application of (1), unchecked by (4).

(*b*) The French machine guns in 1870 and shrapnel in 1914. Application of (2), unchecked by (4).

(*c*) French tactics in August, 1914. Application of (3), unchecked by (4).

The present demands for radio communication in our service arise from maneuver experience with but slight reference to recent war experience or combat analysis. How misleading this may be is well illustrated by the epigram relating to fire effect: on the range, hits are the rule; in battle, the exception.

In maneuvers messages take the place of the effects of fire action, and a keen desire for activity greatly increases the number and imaginary importance of such messages. Almost the only action possible at battalion, regiment, brigade, or higher headquarters is to send a message and the urge for action makes for a high frequency in such transmissions. A comparison of the message center records of units in battle with similar units at maneuvers is highly illuminating.

It is to be noted that the result of this maneuver experience has been to emphasize the use and importance of regimental command nets. At the close of the World War, it was thought by many in all the armies that the most important ground radio communication was for the control of artillery fire from the front line. Similarly, great emphasis is now placed upon radio communication between Army and Navy air elements; due largely to the fact that our large overseas garrisons are also important naval stations. Joint exercises are frequent.

The military situations in the Army and Navy of the United States are very different. The Navy is essentially a force in being, and is

ready for immediate service on a grand scale. The field army exists only on paper and many arduous months must pass before an effective one can be organized.

The present demand for radio communication for field armies is necessarily based upon maneuver experience, but this should be checked by military history and combat analysis to a much greater extent that has yet been done.

FREQUENCY BANDS FOR FIELD ARMIES

The five main systems of radio communication of a field army requiring specific frequency bands are:

(1) Divisional.
(2) Air.
(3) Mechanized force.
(4) Command.
(5) Air-ground.

The frequency band for the divisional system must be sufficiently broad to permit of specific, noninterfering assignments of frequencies to provide for communication between division headquarters and headquarters of brigades, internal communication for brigades, communication between infantry and artillery, and between infantry and tanks, for several divisions in close proximity. As the circumstances of operation require a high degree of portability, the highest practicable frequencies are desirable.

The frequency band for the air system can be advantageously placed in the region of superhigh frequencies, thus avoiding interference with all the field army ground systems and utilizing the advantages of compactness, lightness, and small aerials which characterize the instruments operating on superhigh frequencies.

The circumstances of portability, power, and range logically place the frequency bands of the systems belonging to the mechanized force and to command next in order below the divisional band.

The frequency bands of the air-ground system should permit of communication with the three ground systems, each in its own frequency band.

The following assignment is proposed:

Divisional: 4,000 to 5,000 kilocycles; 2,000 to 2,500 kilocycles.
Air: 6,000 to 80,000 kilocycles.
Mechanized force: 3,000 to 4,200 kilocycles; 1,500 to 2,100 kilocycles.
Command: 1,500 to 3,000 kilocycles.
Air-ground: 3,500 to 4,500 kilocycles; 1,750 to 2,250 kilocycles.

Secondary frequency bands are assigned to the divisional, mechanized force, and air-ground systems, so as to permit the use of doublers to extend the range beyond the skip distance of the primary

frequency bands and to facilitate intercommunication and communication with the command system where needed. The band assigned the mechanized force overlaps the divisional band so as to permit the ready exchange of tanks and the assignment of special units of one force to the other.

The bands assigned above each have sufficient frequency assignments available for the purposes contemplated. These could be greatly extended in time of war by appropriation of the hostile frequencies and their employment except for frequencies radiated from high-power installations and the use of frequencies assigned other services where the low-power field-army instruments would not interfere with low-power instruments employed by other services.

TYPES OF RADIO SETS TO BE DEVELOPED

The development of types of radio sets for field armies should be based upon considerations which are not necessarily the same as those relating to the equipment of the active units of the Regular Army and the National Guard in time of peace. The factors relating to procurement, maintenance, and operation, while important, are of far less consequence in the organized peace forces than is the necessity for keeping the basis of training and field experience with all types of instruments as broad as possible.

The development of instruments for field armies is here under consideration.

Each of the five systems so far considered presents a separate problem in instrument development.

Divisional system: 4,000 to 5,000 kilocycles; 2,000 to 2,500 kilocycles; ranges, 5, 15, and 40 miles.

These sets comprise the bulk of the radio equipment to be procured, maintained, and operated in a field army. All these factors are materially assisted when the instruments are simple and the number of types is kept at a minimum. Procurement of a large number of types presents difficulties which may be overcome in time, but the rapid training of operators and maintenance personnel under the conditions which would now confront the War Department, should it be charged with raising a field army, would be impossible unless the number of types of instruments to be employed in the divisional systems is kept very small indeed.

The principle of simplicity here applies with full force.

Considerable sacrifices can be made in refinements and ideal applications of economical power to attain the end sought—one type of simple, rugged instrument for the whole divisional system.

The gain in expertness of operation, repair, and adjustment in a field army will more than compensate for individual departures from

ideal design. In developing such an instrument, the range desired can be controlled by varying the power and the radiation apparatus.

It is a fortunate circumstance that the greatest range is required where the demand for portability is least. For example, this equipment might work out as follows:

Range	Power	Radiator
40 miles	Gasoline engine driven generator	Antenna.
15 miles	Hand operated generator	Do.
15 miles	Gasoline engine driven generator	Loop.
5 miles	Hand operated generator	Do.

Better performance and more skillful operation will be possible under the circumstances, if the tuning range of transmitters be kept small, while that of receivers is made as large as possible with coil sets to cover such portions of the band as communication plans call for.

Such a system of net operation also assists in the development of more rugged instruments with sharply tuned transmitters, giving greater freedom from interference.

Doublers should be added where needed to cover skip distances and facilitate communication with stations in the command system.

Air system: 6,000 to 80,000 kilocycles; ranges, 10, 50, 100, and 250 miles.

The same principles as apply to the divisional system apply to the air system, the requirements for ruggedness and simplicity being even more strict.

It is hardly likely that the wide variations of range and frequency can be satisfactorily covered by one type, but it appears possible to do so with two types by a judicious combination of the range and frequency features.

Mechanized force system: 4,000 to 5,000 kilocycles; 2,000 to 2,500 kilocycles; ranges, 25, 50, and 100 miles.

The limitations on power are not nearly so close as in the divisional system, but the requirements for ruggedness are even higher than for the air system. The factors of simplicity for operation and maintenance are even more important than in the other systems, due to the wide scope of the tactical operation of the elements of this force. Due to the present state of design of these elements, a single type is impracticable, but in the development of designs for these vehicles the installation and operation of radio equipment should be fully considered, and due attention paid to the desirability of the reduction of the number of types of radio instruments where the circumstances of operation are so unfavorable and maintenance so difficult.

Command system: 1,500 to 3,000 kilocycles; ranges, 25, 50, and 100 miles.

The restrictions as to power and portability of the instruments for this system are not as high as those for the divisional system and the difficulty of procurement and maintenance is also much less.

Due to the large volume of business in the command net proper and the difficulty of obtaining high-speed operators, it is highly desirable to develop suitable mechanical transmission and reception instruments for this type of service. Direct printers are to be preferred.

Air-group system: 3,500 to 4,500 kilocycles; 1,750 to 2,250 kilocycles; range, 100 miles.

In this system it is contemplated that the instruments on the ground shall be those belonging to the three ground systems, except those at ground stations of the air force used to control air forces in the air.

Obviously the range of transmission to the plane will be the range of the ground station and this will undoubtedly lead to the issue of a high-power and a low-power transmitter to many front-line units. Having these instruments of a single type will confer many advantages in flexibility and certainty of battle communication.

The plane instruments for this system should conform to the principles already discussed; a sharply tuned transmitter and a flexible receiver capable of covering the assigned frequencies.

JOINT OPERATIONS

Joint operations call for communication between Army and Navy elements.

To begin with, history shows that successful joint operations are the fruit of long and careful planning, due consideration being given to the powers and limitations of both elements. As neither the Army nor the Navy are designed primarily for joint action, but each for its own purposes, it is to be expected that their joint operation will be attended with more friction between parts than is found in the internal operation of either. Reasonable means and measures to reduce this friction are advisable, but certainly is not so when made at the expense of the whole efficiency of either service.

The study of military history and combat analysis makes it appear likely that radio communication between Army and Navy elements likely to prove of real benefit to joint operations will be with the command, air-ground, and air systems in the Army to corresponding systems in the Navy.

Due doubtless to the interest of our overseas garrisons in naval operations, the character of the maneuvers conducted there and the

86878—31——2

fact that these forces constitute the largest active military forces in peace time, the activity displayed in the development of special communication for joint operations is out of all proportion to the place such activities occupy in the vital problem of the mobilization of field armies for national defense.

In the case of these overseas garrisons, when joint operations are contemplated as defensive measures, the forces involved are relatively small when compared with those needed for national defense; hence the procurement of equipment for this special service should not be permitted to complicate the development of radio instruments for field armies.

A careful examination of the operations called for in the plan of defense will show deficiencies of equipment for both services, and this should be corrected as a special solution in each case, first by the exchange of equipment between the two services, constructing special equipment only where absolutely necessary. The same principles apply to joint offensive operations where we can expect to solve the problem by the exchange of equipment. This will really be a relatively simple matter under the conditions which may be expected to bring about such an operation.

It does not appear that the question of joint operations need exert any great influence on the development of radio sets for field armies, particularly if our development proceeds in the direction of fixed transmitters and universal receivers.

TREND OF COMBAT TACTICS

The combat tactics of the World War were the inevitable outcome of the military systems employed. Great armies were mobilized from the civil population by methods approximating universal service with but little classification according to combat efficiency. As a result the whole war was fought with troops of low combat skill compared to those of the highest combat skill of the famous armies of history. This was natural as the system tended to give the forces the military virtues of the average man, while those found in the forces demonstrated as superior in history, were the military virtues of experienced fighting men. An attempt was made to improve the forces by the introduction of General Staff control of combat forces and the introduction of tactical doctrines.

These measures led to mass action with corresponding great slaughter. Successful maneuver battles became impossible between the main forces, due to the tremendous internal friction of the combat forces, and the inevitable effect of the control of combats from the rear. This doctrine of mass action, which appears appropriate

for the type of forces employed, nevertheless led directly to a system of coordination, which hampered the initiative of the man on the spot and made it impossible to immediately utilize such favorable chances of battle as appeared. This circumstance was fully realized by a number of notable commanders who took every action in their power to restore the maneuver battle to its supreme position as a means of combat, but those on the main front were limited by the system of coordination and the character of the forces employed.

During the period, now over 13 years, that has elapsed since the war, several developments have taken place.

The introduction of mechanized forces, improvements in the air forces, and the organization of forces of selected fighting men with long service in Germany and Italy tend to restore the maneuver battle while the development of chemical warfare promises great destructive and neutralizing power.

The use of chemicals and explosives by air forces will have a pronounced effect upon the maneuvers and supply of large ground forces and will tend toward the development of armored forces for decisive maneuvers. The armor will not be of steel to protect the wearer against cuts, blows, and arrows as in the Middle Ages, but chemical clothing to protect him from the effect of chemicals hurled against him by a variety of means. The number of troops so protected will necessarily be small compared to the forces employed in the last war and if they are to be effective they will have to be composed of men of high military virtues and long training. The development of mechanized forces and air forces also leads to a similar selection and training of personnel. All of these forces will have to be highly mobile and their combat tactics will be founded upon greater freedom of action than has obtained in recent years. This will require an increased use of radio communication to insure effective cooperation between battle units and with the service of supply for such forces in battle. The development of radio instruments for this purpose must take into account the necessity for chemical proofing, increased range, increased ruggedness, increased portability, and increased reliability including means for avoiding hostile interception and interference.

RADIO EQUIPMENT FOR ORGANIZATIONS OF THE REGULAR ARMY AND NATIONAL GUARD IN TIME OF PEACE

This discussion has so far related to the development of radio communication for field armies to be raised in accordance with the provisions of the national defense act and employed in the operations of war. Simplicity has been the controlling principle on account

of the difficulties of procurement of equipment and the difficulties of procuring and training the personnel required to operate and maintain such equipment in battle.

This consideration does not necessarily apply with so much force to the supply of equipment to active units in peace time.

It is, of course, essential that these troops receive full training with standard war equipment and that the supplying service should receive the benefit of the experience which can only be had by placing its instruments in service in field training and exercises.

But training need not necessarily be so limited in peace time and the development of satisfactory instruments for war may be greatly assisted by placing additional equipment in the hands of troops where it appears that useful training and experience will be had. Equipment for overseas forces may be added to or modified for special service and joint operations without the need of adding such equipment to the tables of basic allowances for units of field armies.

It would be advisable to supply organizations with the adopted standard war equipment in all cases and provide special equipment wherever it appears desirable to do so by setting up special allowance lists to be added to the equipment indicated by the tables of basic allowances.

In some cases, as where joint operations or special operations are contemplated for immediate action on the outbreak of war, such allowances could be permanent for the forces to be so used while in other cases the allowances should be for specified periods only.

THE TREND OF RADIO

By Lieut. Col. W. Jefferson Davis, *Signal Reserve*

The problem of policing, regimenting, and apportioning the air waves has in recent years become increasingly urgent. Although legislators for the first time enter the field of what might be termed "three-dimensional legislation," they still are bound by two-dimensional precedent, and their task is to evolve new legal patterns conforming to a legal structure built without regard to the possibility of taming the ether.

The air commerce act of 1926, the radio act of 1927, and the keen official and public interest in radio problems were indisputable signs of "America's coming of age," so far as aerial problems—involving both transportation and communication—are concerned. Economic necessities, as well as the amazing technical genius which has flowered in America since the World War, account for the vast amount

of far-sighted and constructive work which has been done in this field.

The American Bar Association, in sponsoring the radio control act of 1927, did much to minimize the inevitable confusion and to clear the way for orderly and equitable adjustment of problems of radio broadcasting. In fact, it was the steady and continuous efforts of the American Bar Association during the period from 1920 to 1926 which resulted in the passage by Congress of the radio act of 1927.

As to the matter of issuing licenses, the courts were already on record as indorsing the "first come, first served," principle. Under the 1912 law, the Secretary of Commerce had no discretion in issuing licenses. The court so ruled in the case of Hoover *v.* Inter-City Radio Company (286 Fed. 1003). The Secretary of Commerce had refused to grant an application for a license to a new operator on the ground that there was no available wave length which would not interfere with some former assignment. In sustaining the company, the court unquestionably followed the law—but the laws of physics are more obdurate than the laws of man, and the errant air waves continued to tread on each other and to fill the heavens with unseemly clamor.

The 1912 statute was simple and effective—on paper, but not on the air. This naturally resulted in litigation and then the court held, in the case of the United States *v.* The Zenith Radio Corporation (12 Fed. (2d) 614), that operation upon a wave length other than the one assigned by the license did not subject the company to penalties.

A chaotic condition immediately resulted, incidentally productive of much dissonance and disgust, so far as the listening public was concerned. The public, quite obviously, wanted many of the existing stations shut down to insure less interference and better reception. The American Bar Association Air Law Committee [1] concluded that no existing legislation met the problem, and recommended a law providing for the closing of superfluous stations. Naturally the issue of confiscation arose. The committee recommended the payment of "just compensation" to such stations from revenue derived by taxation of the stations retained.

The passage of the 1927 law did much to clear the chaos in the air. In the face of almost insuperable obstacles, it is keeping the way open for continued radio progress, but much more fundamental legislation will be necessary to assure the full development of the industry. The question of vested rights in a wave length, for in-

[1] Now divided into two committees, Committee on Aeronautical Law and Committee on Communications.

stance, suggests a legal impasse which will require the best efforts of specialists in property law before it is settled. The doubts and difficulties of ascribing this vested right are obvious, but that rights exist is unquestionably contemplated by the present law. This appears in the fact that the law requires an applicant for a license to sign a waiver of any rights he may claim. This requirement is perhaps an admission that rights exist. The licenses are issued for three years, and are renewable at the pleasure of the Secretary of Commerce.[2]

A new and adequate framework of law, national and international, must inevitably be the great concern of radio. That is why the conferences at Geneva and Washington assumed world-wide importance. Constructive radio control had to be evolved, and with as little delay as possible.

An applicant for a license must first sign a waiver of rights. Cases have arisen in which the applicant, after signing the waiver, was refused a license. On appeal to the courts, which the act provides he may do, the applicant is handicapped by the fact that he has previously waived any rights he might otherwise have.

Questions of monopoly loom ahead. The air law committee recommended, before the passage of the present law, that the antimonopoly provision be eliminated. The committee took this position on the ground that any monopoly clause would be an unnecessary and superfluous duplication of the Sherman and Clayton laws. The suggestion of the committee was not followed and the antimonopoly provision was retained. This is, perhaps, not a detail of primary importance for the present, but it is illustrative of the underbrush remaining to be cleared before radio becomes as smoothly and effectively legalized as, for instance, public utilities are to-day.

Heavy books might be written, and doubtless will be some day, on the theme "Who Owns the Ether?" The legal exegesis of this and other basic problems is still to come. The preamble to the new law sidesteps this question by omitting the former reference to it, and proceeds under the commerce clause of the Constitution. A wave length is apparently conceived as a franchise, to be assigned, withheld, or withdrawn, and carrying none of the characteristics of a vested right, and yet, as noted above, some kind of rights are recognized by the requirement for waiver in advance.

Radio began as a curiosity, progressed to the stage of a popular amusement, and then suddenly flowered into the most overwhelming agency in the history of communication. It assumed financial and commercial significance; it became an indispensable instrument for the transmission of news; it became a cultural factor of tremendous

[2] See section 3, amendatory acts of 1928 and 1929.

significance; it began to foreshadow a new internationalism, leaping all barriers of insularity and searching out countless millions with new impulsions to a wider and richer cultural life.

Blackstone distinguishes carefully between laws which are obviously "enduring and founded in reason and justice" and laws which are "necessary and justifiable to meet issues as they arise." It is apparent that radio legislation is progressing from the latter to the former stage. New radio legislation was imperative. The 1927 law meets this emergency sensibly, with a minimum of bureaucracy, but progress to more deeply grounded and more profoundly reasoned position is imperative. This has been the unfailing method as organized society has from time to time met new problems. Humanity first encounters what William James terms "the stubborn, irreconcilable fact." It then builds around it a philosophical rationalization, and, if it is an economic fact—which radio is—a pattern of definite and regulatory law.

Disinterested and studious formulators of the new radio code are mindful of the fact that this new wizardy of communication figures heavily in the equation of democracy. America's millions particularly have responded so enthusiastically to the mental and cultural stimulus of radio that lawmakers would be foolish to forget for a moment that the people themselves must be first parties in interest in whatever is done. The eager amateur, experimenting with apparatus on the roof of his house, gets into this picture along with the manipulator who is "scalping eighths" on radio stock.

The technicians are treading on the heels of the lawyers in all this. Man had no sooner discovered the ether than he began to load his willing packhorse to the ears. Overnight came television, trans-Atlantic telephony, picture transmission—all on the threshold of tremendous commercial utilization. Sagacious and powerful commercial interests are motivating these developments. We have thrown open a theater whose pit is the seven seas and whose roof is the Heaviside surface. Who is going to get the reserved seats? How are the proprietary governments going to make everybody happy?

Participating in the Geneva conference in 1927 and at later conferences were international lawyers, jurists, and technicians of the countries represented, who, fully realizing that technical progress is inevitably bringing all nations into closer association, presented detailed and definite recommendations bearing on international adjudication of radio transmission.

Much consideration was given to the elusive but tremendously important question of primary rights in radio waves, as indicated in the foregoing. Years may pass before the ultimate determination of the question of possible vested interest. In its larger aspect the

problem involves two main considerations: (1) The allocation of air rights on the basis of equity without confiscation or discrimination, and (2) legal adjustments which will augment and reinforce, rather than obstruct, the development of radio as an agency of tremendous human value.

The problem of international adjustments is necessarily more immediately urgent in Europe than in America, which, to a degree, accounts for the fact that nations across the sea took the lead in building a new legal structure in conformity with the new problems. Foreign voices are still rare on our American radio sets, but it is easy to see that the small, close-lying countries of Europe face a literal confusion of tongues and, of course, inevitable competition for air lengths, unless they find a means of meeting and solving these various complexities.

Economic necessity was the underlying, basic motive actuating the call by Washington to the nations of the world to the International Radio Conference held in the fall of 1927. While European radio experts were sitting at their desks preparing for the Washington conference, the International Congress of Jurists at Geneva was the initiating forum for discussion of radio legal problems.

The United States reached manhood's estate in radio far more rapidly than in the development and utilization of its companion means of aerial communication, the airplane. Man's creative genius launched this mechanical bird of flight into the air just in time to utilize it for observation purposes over the front line trenches in the World War; then pilots quickly converted a vehicle of transportation into a weapon of aerial combat. It is along this line that the airplane first developed in the United States, although its principal use now is for transportation and communication.

A system of law should keep pace with the economic development of the country. Recent developments in the use of the air, both as a means of transportation and a communication system, have been so rapid that the advent of each new vehicle of commerce was ushered in far ahead of rules governing it.

The air commerce act of 1926 and the Federal radio control law of 1927 lodged great power and corresponding responsibility in the Secretary of Commerce and the Federal Radio Commission; but Mr. Hoover, first as Secretary of Commerce, and afterwards as President, demonstrated that he was a man of large vision in national problems, and the members of the Federal Radio Commission have all been outstanding authorities in this new field.

Under Mr. Hoover's guidance and direction, national radio conferences were held in Washington at which representatives of the radio industry could gather and discuss their problems. It was Mr. Hoover who first expressed the idea of a public interest in radio communications. Applying this principle, broadcasting, which prior to 1924 was considered strictly a private enterprise, and one held divorced from any public element, began to evolve on the theory that it was primarily based upon service. Radio quickly passed from the field of adventure to that of a public utility, and is now considered a great agency of public service.

The ether is now considered a public medium and its use must be for a public benefit. The use of radio channels is justified only if there is a resulting public benefit.

"The dominant element for consideration in the radio field is, and always will be, the great body of the listening public." [3]

These underlying principles found expression in the radio control law of 1927. This law followed the rapid development of an industry, which from the sale of radio apparatus alone did a business of $400,000,000 in 1926, and had in operation some 700 broadcasting stations, representing a cost of over $15,000,000 and serving an audience of over 20,000,000 listeners.

In 1928, however, the receipts to the industry had increased to $650,000,000. The number of broadcasting stations had been reduced to 630, but their audiences had expanded to over 40,000,000 listeners.

This trend continues.

Third dimensional legislation involved two new and strikingly useful instrumentalities of commerce and communication. The airplane added a new instrument for the destruction of life in war. The development of radio in its early stages from ship to shore added a new means of communication resulting in the saving of life from loss at sea. The wireless SOS call for help made a vivid impression upon the imagination, and the world was quick to realize what it meant in terms of human life. The radio apparatus became an essential part of every ship's necessary equipment.

Broadcasting is but one form of radio telephony, but like any other startling innovation, it has developed without legal precedent, and completely changed the habits and thought of entire nations. Countless millions now depend upon radio not only for education and instruction, but for amusement, entertainment, and relaxation. In the opening of the trans-Atlantic long-distance circuit between London and New York, by which telephone conversation was stepped up over a great gap in space, we witnessed a most notable achievement in radio telephony for strictly business purposes.

The radio legal problems therefore have assumed an international aspect, and it is not enough for nations to content themselves with

[3] From a public address by Mr. Hoover in 1927.

national laws on the subject. International codes had to be drawn up. That is to say, the international principles and rules governing radio had to be drafted by mutual agreement. Mr. Hughes has very succinctly defined international law as the principles and rules adopted by civilized states as binding upon them in their dealings with each other.

One hundred years ago a Postmaster General of the United States recommended to Congress that some way be devised to carry the mail through the air, but even 23 years after birth the air industry had made little progress in the utilization of this field of commerce, and was so slow in reaching maturity that its growth seemed permanently stunted.

On the other hand, its air twin, broadcasting, a lusty infant of scarcely more than eight summers, has displayed such precocity that its voice can be heard nightly from one end of the country to the other, and it has become virtually a necessity in all homes, not only in our own country, but abroad as well.

The distinguishing feature about American broadcasting is that its service is free to its audience of listeners. In Great Britain a tax is levied upon receiving sets, and in Europe generally the entire industry is conducted upon the principle of "let him who receives pay."

To-day we are progressing so rapidly that the law of radio and the air is beginning to develop to keep pace with these new scientific inventions.

The American Union owes its strength to free and untrammeled interstate commerce. Two factors have made this possible—the railroad and transcontinental highways physically, and the Supreme Court of the United States legally. The third factor in the development of interstate commerce of the future will be our transcontinental airways, developed by and with the aid of the Federal Government in the same manner as have been our transcontinental highways. Of even more importance in the commercial life of the Nation will be the channels of radio communication through which the intelligence of the Nation will find its medium of expression, and commercial intercourse flow unimpeded from the transmitting stations in our great centers of population outward in every direction to the outlying communities.

The first international wireless telegraph convention was signed at Berlin in 1906 and was the result of joint conferences between representatives of the United States and European countries held in Berlin in 1903 and 1906. Various drafts of conventions were discussed, but without appreciable result.

The Berlin convention of 1906 is still effective for questions arising between the United States and countries signatory to it but

which have failed to ratify or adhere to the London convention of 1912. The international convention on safety of life at sea was signed at London in 1914, providing for radio equipment on vessels, but, lacking complete ratification, is not binding.

At the Conference on Limitation of Armaments the signatory powers by resolution provided for a commission of jurists. This commission met at The Hague, and in 1923 promulgated rules for the control of radio in time of war. The United States has indicated its willingness to enter into a treaty embodying the rules as adopted. Article 16 of the Rules of Air Warfare provides that any aircraft transmitting intelligence while engaged in a flight is deemed to be engaged in hostilities. The Hague conventions of 1899 and 1907 deal to some extent with the status of radio stations in time of war, as does also the land war neutrality convention.

In 1920 the Washington Conference on Electrical Communications made an unsuccessful attempt to obtain a general allocation of wave lengths throughout the world. Due to difference in time, there has been no interference between European and American transmission. But in that period when government control of wave lengths was ineffective in the United States the piratical seizure by some few American broadcasting stations of channels set aside by agreement for Canadian use caused interference and made necessary the early adoption of some immediate agreement.

Both the Washington radio telegraph convention of 1927 and the North American treaty of 1929 have been approved and are now effective.

RADIO SETS FOR COAST ARTILLERY

By Capt. Fred G. Borden, *Signal Corps*

Disregarding the radio sets issued to harbor defense units and to harbor vessels and Army mine planters, the new table of basic allowances prescribes the following radio sets for Coast Artillery Corps units: 1 SCR–132 for each brigade and regimental headquarters of railway, antiaircraft, and tractor-drawn artillery; 1 SCR–136 for each battalion headquarters and regimental headquarters battery of railway, antiaircraft, and tractor-drawn artillery, and per lettered battery of railway artillery.

These two sets have many characteristics in common. Each was designed primarily for communication from ground units to aircraft. Each can transmit and receive the three types of signals in common use, viz, continuous wave telegraphy, tone or buzzer modulated telegraphy, and voice (telephone).

The power supply for the transmitters in the field is ordinarily furnished by means of a gasoline-engine-driven generator; however,

provision is made to obtain the necessary power by means of a motor generator at any location where either 110 or 220 volt single phase alternating current is available. The motor generator for the SCR–136 is designed also to operate from a 110-volt DC power supply.

A table showing some of the characteristics of the two sets follows:

	SCR–132	SCR–136
Frequency range, kilocycles	150–350	330–860
Wave length range, meters	850–2000	350–900
Total weight of set, pounds	2, 250	975
Weight of heaviest component parts (power unit) pounds	900	365
Weight, transmitter set box, pounds	400	127
Consistent range, CW, approximate, miles	150	80
Consistent range, voice, approximate, miles	50	30
Cost of complete set	$5, 595. 00	$1, 675. 00

The approximate consistent ranges above given are for ground-to-ground communication between similar sets under usual conditions, but under abnormal conditions they may be considerably reduced by the effect of static or other interference. The consistent ranges between these sets and sets in aircraft are approximately the same as those given above. Under some conditions all of these distances may be greatly exceeded.

Complete descriptions of the sets, including details as to their installation and operation, are contained in the following technical regulations:

SCR–132—TR 1210–30
SCR–136—TR 1210–20
(recently printed and distributed).

These sets are exceptionally well built, mechanically, and, considering the necessarily delicate nature of all radio apparatus, will stand fairly rough handling. Due to the considerable weight of the component parts, both types require vehicular transportation. An entire SCR–132 can be transported on one standard class B truck; two light trucks are, however, preferable.

All motor vehicles used for transporting radio sets should by all means be equipped with pneumatic tires.

The transmitting antenna system of the SCR–132 is of the modified umbrella type, the mast being 80 feet high. The antenna proper is composed of two sets of six wires each arranged in 45° fans on opposite sides of the mast. The counterpoise is also composed of two 6-wire fans directly under the antenna wires.

The antenna system of the SCR–136 is a single fan and consists of three antenna wires each about 155 feet in length on masts 30 feet high, the antenna wires being spaced about 22½° apart. There are three counterpoise wires directly under the antenna wires and about 4 feet above the ground.

Both of these sets represent the highest attainment that has been obtained in the radio art for sets of this character either in our own

or foreign armies or by commercial concerns, and the SCR–132 is probably the most powerful portable set in common use to-day. Every effort has been made to keep the weight and size of each set to the minimum consistent with the required ruggedness and the power required to insure long-range communication (the power required by the SCR–132 is sufficient to light one hundred 50-watt lamps). Both of the sets are in the intermediate-frequency band. The possibility of the use of higher frequencies requiring less power, and hence, permitting a great decrease in the weights of the sets will be discussed later.

All organizational radio equipment should be designed solely from a standpoint of its practicability in war and no characteristics should be sacrificed which would tend to make it less efficient in combat in order to make its operation more convenient in peace. For example, it is possible to permanently build a radio set into a motor vehicle and to operate it therein and for peace-time training and maneuvers the installation is feasible, but when examined from a standpoint of its use in war, many problems present themselves. For example, the vehicle may break down or encounter impassable roads, which would prevent the transportation of the set to the necessary location; due to enemy observation it may be impossible to use roads and all equipment must be transported across country by use of animal-drawn vehicles; due to enemy aerial activity it may be necessary to install all radio sets in dugouts. The advantages and disadvantages of such installations must be compared and decisions made as to what is most practicable under such combat conditions as might be considered normal.

Luckily, an opportunity to install and operate both the SCR–132 and SCR–136 under adverse conditions for long periods presented itself in connection with the Nicaraguan Canal survey recently conducted by the Corps of Engineers. Two SCR–132 and two SCR–136 sets were furnished to the engineer battalion in November, 1930, and were in practically continuous operation for several months, the most serious interruption being caused by the breaking of a piston in one of the gasoline engines. It is difficult to imagine a more impassable country over which to transport large and heavy radio sets or a climate offering more difficulties in the proper maintenance of radio equipment. A small detachment of Signal Corps enlisted men was furnished for the installation and operation of these sets. That they performed their duties well is evident from the following:

> The Chief of Engineers is pleased to note the exemplary and efficient performance by enlisted men of the Signal Corps attached to the United States Army Engineer battalion in Nicaragua of their duties.

In this connection it may be said that reported failures of radio equipment can usually be traced to faulty operation. Radio sets are

necessarily complicated, and unless the operation and maintenance personnel are thoroughly competent, successful results can not be expected.

While the furnishing of high-frequency radio sets to the Coast Artillery Corps in the near future as a replacement for the SCR–132 and SCR–136 sets is not contemplated at present, yet, since the tendency of radio development is more and more toward higher frequencies, it might not be out of place to discuss briefly some of the powers and limitations of and some of the problems encountered in connection with high-frequency development. The most striking advantage of high-frequency sets over intermediate or low-frequency sets is the great distance of transmission attainable with a minimum of power and since the weight and size of a radio set are in direct ratio to the power requirement, the great military advantage is immediately evident. A set having a range of 100 miles need be only about one-fourth as large or as heavy when designed for frequencies of the order of 3,000 kilocycles than when designed for those around 300 kilocycles. On the other hand, high-frequency communication contains a lot of quirks, some of which are not yet fully understood, and which are not encountered when using intermediate frequencies such as are those employed by both the SCR–132 and the SCR–136. For example, high-frequency sets have a skip distance over which no communication whatever can be carried on. This skip distance is usually greater at night than in daylight and varies with the season, terrain, and even from minute to minute. Due to the fact that a radio signal appears to have two components, a ground wave and a sky wave, the former very limited in range, this skip distance will not begin directly at the set but commences at the point at which the ground wave disappears. This distance varies greatly depending upon the frequency used and on many other factors.

Assuming that the ground wave is of sufficient strength to insure continuous communication up to 20 miles from the set, then the skip distance will commence at 20 miles and no communication will be possible until the sets are far enough apart to be within that area to which the sky wave has been reflected. The higher the frequency the greater this latter distance will be. As stated above, the skip distance effect is greater at night because the reflected distance is greater during darkness. Except for very high frequencies, the ground wave and reflected sky areas overlap during daylight, hence communication is continuous.

Since it is evident that for all distances over which the SCR–132 and SCR–136 are designed to work the effect of a skip distance will prevent communication in certain areas, it is evident that, in order to obtain the great advantages of small power and light weight, the

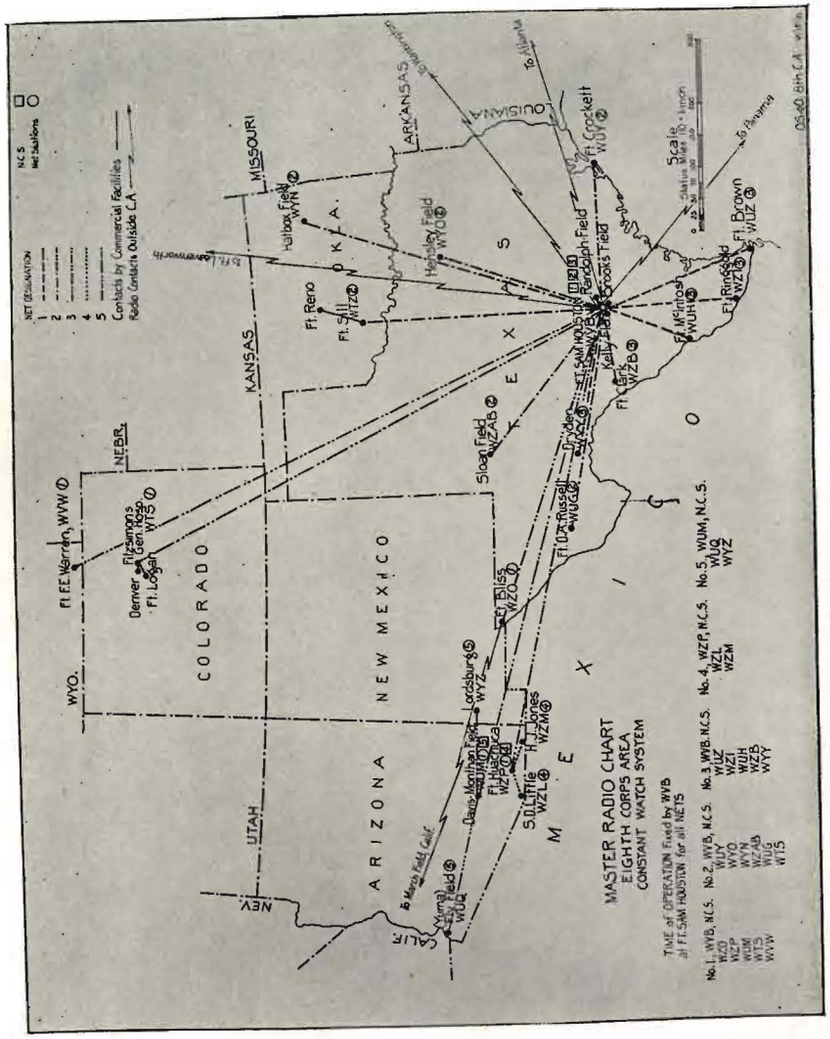


FIGURE 1.—EIGHTH CORPS AREA RADIO NET

frequencies adopted must be those which will insure that no skip distance will normally exist. This is a matter that will require an extended research over various kinds of terrain and at widely separated locations. A comprehensive study of this character is now being made including sets having frequencies as high as 50,000 to 60,000 kilocycles involving wave lengths of around five or six meters. Results so far obtained are being examined with a great deal of interest.

THE CONSTANT WATCH SYSTEM OF RADIO COMMUNICATION FOR FIXED STATIONS

By Capt. HARRY REICHELDERFER, *Signal Corps*

Notwithstanding the skepticism and even protests of many old time radio operators the entire radio communication scheme of the Eights Corps Area was reorganized on December 1, 1930, and since that time has been functioning under a constant watch system with surprisingly satisfactory results.

The purpose of this article is to present the details of the plan and to indicate how some of the complications incident to the well-known schedule system are overcome.

The problem of furnishing reliable and continuous radio communication in the Eighth Corps Area has been in the past, and still is, one of extreme complexity. Not only must the operation of a large number of radio stations be carefully coordinated in order to serve the largest of the corps areas, but complications due to operation within the corps area on both central and mountain time must be eliminated. Operating methods must also be flexible enough to permit operation with Yuma, Ariz., on Pacific time and with Washington, D. C., on eastern time.

The Eighth Corps Area contains 21 radio stations and has outside the area contacts with Fort Leavenworth, Washington, Fort McPherson, and Panama. Stations within the corps area are separated by distances varying between 130 and 900 miles with four stations over 800 miles from corps area headquarters at Fort Sam Houston. (See Figure 1.)

Formerly the corps area was divided into nets and subnets with net control stations at Fort Sam Houston, Fort Bliss, Fort Huachuca, Fort Sill, Fort McIntosh, and Kelly Field.

Fort Sam Houston contacted and worked Fort Sill, Fort Bliss, Fort Clark, Fort McIntosh, and Fort Brown.

Fort Bliss worked Fort Huachuca, Lordsburg, Davis-Monthan Field, and Fort D. A. Russell.

Fort Sill worked Fitzsimons General Hospital, Fort Francis E. Warren, and Hatbox Field.

Fort McIntosh worked Fort Ringgold.

Kelly Field was the net control station of a so-called alert air net which comprised Fort Crockett, Dryden, Hensley Field, and Hatbox Field. It was about 25 per cent efficient at best and Fort Sam Houston usually had to clear traffic for two of these stations while Fort Sill handled a third.

These nets all operated on prearranged schedules which, in so far as the stations at Fort Sill and Fort Bliss and the smaller stations in the vicinity of Fort Sam Houston were concerned, were fairly satisfactory. However, messages from outlying stations such as Fort Francis E. Warren, Davis-Monthan Field, and Fort Huachuca often suffered delays of three to four hours because of insufficient schedules and overlapping due to the scarcity of frequencies. The limiting number of frequencies assigned to the corps area precluded any increase in the number of schedules so some other method of improving service had to be arranged.

Credit for the basic idea of the constant watch system belongs to Col. A. C. Voris, Signal Corps, who was signal officer of the corps area for the four years prior to July, 1930. He evinced a strong personal interest in the radio operating conditions of the area and tried to instill the "streak of rust" idea into the operating personnel. It is unfortunate that he did not remain signal officer long enough to see his idea fulfilled. However, the work that has been done since he left is no less a monument to his untiring efforts in this direction.

Now as to the scheme in operation. By referring to Figure 1 again you will note that we have five nets in operation in the corps area where before we had six, but also note what is more important, that three of these nets comprising 16 outlying stations have their net control stations at Fort Sam Houston. This leaves only three outlying stations in the corps area and one in the Ninth Corps Area to be reached by relay through outside net control stations. This, of course, excepts Kelly Field which, under the system, is served by means of a printer telegraph circuit connected to Fort Sam Houston. The grouping of the stations into nets was not made by a haphazard choice but rather by giving careful consideration to the amount of traffic, the differences in time, the distance from the net control station, etc. A total of six high frequencies and four low frequencies including the air corps frequency of 200 kilocycles are used. The frequencies in use in Net No. 1 are harmonics of those used in Net No. 3.

All stations in Net No. 1 except Fort Sam Houston, operate on mountain standard time. Two of them, Fort Bliss and Davis-Monthan Field, Tucson, have meteorological stations and weather reports from them must reach Kelly Field by 7.45 a. m., central standard time. There will be more about meteorological messages later. All of these stations operate continuously on one frequency from 6.20 a. m., mountain standard time in the case of Fort Bliss and Tucson, and 7.20 a. m., mountain standard time for the remainder until good night is given by Fort Sam Houston some time after 5.30 p. m., central standard time. All stations in all other nets, except those in Net No. 5 which operate the same hours as Fort Bliss, operate from 7.20 a. m., central standard time until good night from Fort Sam Houston after 5.30 p. m. The Sunday starting time is one hour later in all instances and the closing time is usually about noon.

All stations in all nets are equipped with loud-speakers and during working hours the receivers are tuned to the frequency of the net control station. They transmit to no station other than their net control station. The stations in Net No. 5 are also equipped with high-frequency receivers capable of receiving Fort Sam Houston on special occasions such as for the reception of weather broadcasts which will be explained later. Needless to say the net control station in each net also has a loud-speaker equipped receiver tuned to the net frequency which is thus available for incoming signals at all times. Since the more important stations are directly in communication with a net control station at corps area headquarters, almost ideal conditions exist in these nets and priority traffic is in reality given priority.

After approximately nine months' operation, I do not believe there is a single operator in the corps area who would desire to change to the schedule system of operation.

Now as to weather information. All posts having meteorological stations transmit, as soon after opening as possible, early morning weather messages which contain reports of upper air observations. Meteorological observers are instructed to file these messages not later than 7.20 a. m. central standard time. As fast as these messages are received at Fort Sam Houston they are relayed on a telegraph printer circuit to Kelly Field, which is the flying center of the corps area, and at the same time are compiled into a broadcast message. At 8 a. m. central standard time this broadcast message is transmitted on all net frequencies and is copied by all stations interested. Thus all stations have meteorological reports from all other stations in the corps area prior to 8.15 a. m. daily. These weather broadcasts are usually transmitted automatically and are sent twice. The same procedure is again followed commencing at 11.20 a. m., central standard time, culminating in a broadcast at noon. Reports of afternoon balloon runs are not generally used in this corps area since

practically all flying is completed by 1 p. m. However, each radio station has specific duties to perform in this connection and must be available in case of emergency.

Should any station miss any part of the weather broadcast, it merely has to ask its net control station for the missing part immediately after the broadcast is over. Changes in flying conditions are reported to Fort Sam Houston as they occur and are broadcast as soon as received. In this one feature alone the constant watch system has saved an immeasurable amount of time.

The system is still operating on the experimental basis and means are constantly being sought for its improvement. It is hoped that before January 1, 1932, sufficient equipment will have been installed in the corps area to place all stations in first-class condition and permanently discard any question of schedule operation. The results obtained to date indicate such a marked improvement over the old method of operation as to cause wonder that it was not discarded long ago. One particular instance of rapid service made possible by the constant watch system is in the transmission of a daily Coast and Geodetic Survey message from Tucson, Ariz., to Washington. This message is filed at approximately 8.00 a. m. central standard time, reaches Fort Sam Houston within five to ten minutes and Washington a few minutes later. On the date this was written, the message reached Washington 13 minutes after filing time in Tucson. It is not believed that commercial facilities could approach this time within an hour. There are a multitude of similar examples of extremely rapid service which space will not permit quoting. However, seeing is believing, and if you have an opportunity to see a message originating in the Eighth Corps Area, check up on its filing time and received time. I believe it will convince you of the merits of the system.

THE FORT GEORGE G. MEADE CUT-OVER

By Col. C. A. Seoane and Capt. J. M. Heath, *Signal Corps*

A new manual telephone exchange was placed in service at Fort George G. Meade, Md., on September 18, 1931.

Every one in the service knows that Fort George G. Meade, Md., commenced operations as a war time military camp. A large commercial telephone system was installed by the Chesapeake & Potomac Telephone Co., of Maryland, to cover the needs of this cantonment. The cantonment accommodated, at its height, about two divisions. About 1920, the war being definitely over, it was contracted into a post to accommodate an infantry division of peace time strength, and the large commercial telephone system was replaced by a 200-line automatic switchboard of North manufacture. This latter was a Government-owned system, installed by the North people for the Signal Corps, and has been in operation ever since.

Fort Meade, having been designated by the War Department as a permanent post, permanent construction under the housing program commenced about 1928 and is following a progressive plan, which contemplates some 10 years to complete. For a moment we may refer to new construction as the new post and the old buildings where troops are housed at present, as the old post. The new post is located about 1 mile air line and 2 miles by road from the old post. The old automatic telephone system found itself off the communication center and unequal, with its 200-line capacity, to answer the needs of the new post. A new telephone system was naturally in order. This has been located in what is approximately the new communication center, and the outside features of the plant are being built as the post progresses with its new buildings.

With these fundamentals in hand, an engineering estimate was prepared covering the telephone needs for the future post, and a 400-line board was decided upon. From this the next question to be decided was that perplexing subject, which has been haunting telephone engineers for some time, and will continue to do so during the future, viz, manual or automatic. The existing system being automatic requires a great deal of care and attention to keep it functioning, principally because of its location in a loosely constructed war time building on sandy ground. All precaution could not prevent wear and tear from dust and sand, and in the technical language of the day, the board, in 1930, was considered " shot."

Conferences were held with the post commander, who, much to the surprise and gratification of the Signal Corps personnel, said the existing system was the best post telephone system with which he had ever come in contact, and that he wanted none better. This post commander is now a general officer. The question of manual or automatic did not, however, continue much further, because the office of the Chief Signal Officer provided the information that a new 400-line manual board was in existence, having been purchased out of funds from a previous year, and that there were no funds available for the purchase of a new 400-line automatic board. The question decided itself.

Next came the question of the physical location for the new board. This consumed more than a year of administrative struggle before a satisfactory solution was reached. An existing policy provided that post telephone centrals should be located in the administration building. Time estimates for an administration building in the new post placed the same as 10 years in the future. In the meantime,

the post commander indicated that we might occupy space in the basement of one of the new brick barracks. Washington suggested that one of the old war buildings might be moved to the communication center and used temporarily. Wait 10 years—go into the basement of the barracks—erect or move over a temporary shack. Here was to be a modern post with its communication on a makeshift basis. What a dilemma and how impossible. Nevertheless, a project was submitted for a new building, supported by all the facts which ingenuity could devise; no funds; disapproved! What next?

The corps area signal officer, recalling his days of fighting the war in Washington, had observed the Munitions Building go up as a temporary building. How simple! A temporary building could be devised that would do permanent work on a temporary status.

The location of this building had been submitted for approval of the War Department, and that point having been settled, it was found that hollow tile construction and concrete floors could be provided within corps area means, and the Signal Corps definitely in position not only to stay until an administration building of permanent construction should come into existence, but to stay in a place satisfactory as to size, location and character of building for any length of time, no matter how long.

The communication building consists of 6 work rooms and 2 rest rooms, as follows:

1 room for the switchboard equipment.
1 room for the terminal apparatus.
1 room for the post signal office.
1 room for the telegraph office.
1 room for storing light material.
1 room for repairing equipment.
2 rest rooms (each equipped with a washroom and lavatory).

Moving the location of a telephone central is not an easy matter. The Signal Corps may feel happy that no occasion, so far as peacetime communication at Fort George G. Meade is concerned, is at all likely to arise which will compel such a move.

a. The underground conduit plant consists of:

1 18-foot cable vault, constructed directly underneath the terminal room.
7 6-foot concrete manholes.
22 4-foot concrete manholes.
421 trench feet 4-multiple vitrified clay conduit.
8,700 trench feet 2-multiple vitrified clay conduit.
4,400 trench feet 2-inch creosoted yellow pine conduit.

b. The underground cable plant consists of:

3,500 feet 11-pr. 22-gage cable.
850 feet 16-pr. 22-gage cable.
1,300 feet 26-pr. 22-gage cable.
1,900 feet 51-pr. 22-gage cable.

510 feet 101-pr. 22-gage cable.
875 feet 152-pr. 22-gage cable.
316 feet 202-pr. 22-gage cable.
1,000 feet 303-pr. 22-gage cable.
1,000 feet 404-pr. 22-gage cable.
2,102 feet 606-pr. 22-gage cable.
25 11-pr. terminals.
4 16-pr. terminals.
1 26-pr. terminal.

c. The aerial cable plant consists of:

2,500 feet 26-pr. 19-gage cable.
1,600 feet 51-pr. 19-gage cable.
6,300 feet 101-pr. 19-gage cable.
6,800 feet 202-pr. 19-gage cable.
1,300 feet 16-pr. 22-gage cable.
1,600 feet 26-pr. 22-gage cable.
1,275 feet 303-pr. 22-gage cable.
42 11-pr. terminals.
11 16-pr. terminals.
2 26-pr. terminals.

INSIDE PLANT

The central office equipment consists of the following apparatus:

a. One Kellogg 4-position multiple switchboard, wired and equipped for 400 subscribers' lines and 20 trunks.

b. The cord circuits of the switchboard are so arranged that positions one and two, and three and four can be connected together to afford one operator command of practically 30 cord circuits each.

The switchboard is equipped with a flashing circuit which can be used either for busy test or to enable the operator to test out the various cord circuits to determine whether or not the supervising circuits are operating satisfactorily.

The terminal room has the following equipment installed therein:

a. One Sands Electric combination distributing frame, consisting of 6 verticals with a capacity of 160 outside lines per vertical. The horizontal side of the distributing frame accommodates the answering jacks and subscribers' multiple.

b. Two bays of Kellogg relay rack equipped with 400 Kellogg line and cut-off relays, twenty 2-way trunk circuit relays, and one line relay fuse panel per bay.

c. One Holtzer-Cabot motor-driven ringing machine.

d. One 120-ampere hour Gould type sealed storage battery, which is maintained on a trickle-charge basis.

e. One Western Electric type 1407 wire chief's test set, which is so wired that the wire chief can test all lines direct through the switchboard by use of the order wire and test cords.

f. Power panel and battery-charging equipment.

On account of the fact that the old post automatic switchboard was equipped to serve only 200 lines, it was necessary during the command post exercises of 1930 to install three temporary field centrals at this station.

The present 400-line manual switchboard is believed to be sufficiently large to serve any future similar problem without the necessity of installing a field central within the post proper.

In addition to the above, the trunking facilities for tactical units located outside of the reservation limits can be routed through the post cable system from cable terminals conveniently located at both the Laurel gate and the Odenton gate.

The arrangement outlined above will effect large savings in equipment, wire, and personnel, as the addition of the necessary tactical trunks and 50 or 75 local tactical lines to the new post switchboard would necessitate only a slight addition in normal operating personnel.

TRAINING FILMS

By Capt. F. W. Hoorn, *Signal Corps*

Some time ago the Chief Signal Officer initiated a program for producing training films with sound. Since that time the Army Pictorial Service has installed sound-recording equipment and has been engaged in the study of problems relating to promotion of this activity and the technique of producing sound pictures.

The first step involved the installation of a single recording channel in the projection room of the office of the Chief Signal Officer. This permits the recording of an explanatory lecture on positive stock, in approximate synchronism with the picture. The sound record thus made is then transferred to the positive print, by the same printer which transfers the picture from negative to positive. The result is a combined print containing both sound and scene, commonly known as the movietone print.

Reference was made above to approximate synchronism between sound and scene. This is in general satisfactory when the subject matter to be presented lends itself to the method of presentation wherein the screen presents a visual demonstration of the subject and the voice presents explanatory lecture, filling the gaps in the information transmitted. This method is ideally suited to the presentation of subjects involving matériel, diagrams, or any subjects in which human beings are not factors.

In presenting subjects of a tactical nature it may later prove desirable to provide facilities for exact synchronization of sound and picture so that when a verbal order is transmitted the speaker can be seen issuing it without loss of realism due to lack of coordination between the sound and the lip movements of the speaker. Other situations may occur also in which it would be desirable to convey information by means of the speech of participants in the action, as a relief from the necessity of listening continuously to the mysterious voice which knows all and explains all.

One of the difficulties in making adequate progress in the sound film program is the fact that both the supply and the demand must be created. Until portable sound projection equipments are available in adequate numbers, there will be small demand for sound training films, but a supply of film subjects must be built up before we can hope to acquire the projection equipments. This means that all concerned must be kept cognizant of the advantages of this method of instruction and the advisability of building up a sound film library as a supplement to the training literature library.

In the meantime it appears desirable, in spite of the disadvantages of delivering any considerable amount of information by means of subtitles, to continue the printing and distribution of the old silent films, and to make new films in silent version, as well as for sound, inasmuch as the demand for this type of film continues.

There will soon be available for distribution a sound film depicting ordnance displayed at Aberdeen Proving Ground on ordnance day, and TF–9, The Tactical Employment of a Battery of 155–mm. Guns (Tractor Drawn). TF–46 and TF–47, Elements of Map Reading, are being revised and the scenario prepared for sound and silent versions. A Signal Corps scenario is in process of preparation, covering communication in the Infantry division. This film will not be completed until some time next year. A sound film for the Infantry was planned and ready for shooting when changes in the regulations made postponement seem advisable.

The steps are slow and laborious and all personnel engaged on training film work carry it on in addition to other duties. However, the project should be given all possible support inasmuch as the sound film is an excellent instructional medium, and a major war would instantly impose a demand for a large number of well prepared subjects.

SIGNAL CORPS PERSONNEL COMMENDED

It is with considerable satisfaction that the Bulletin is able to publish the following order to which the Chief Signal Officer adds his commendation:

HEADQUARTERS SIXTH CORPS AREA,
OFFICE OF THE SIXTH SIGNAL SERVICE COMPANY,
Chicago, Ill., October 16, 1931.

Company Order No. 20.

1. The following letter from Headquarters Camp McCoy, Sparta, Wis., dated October 15, 1931, is published for the information of all concerned:

Subject: Commendation.

To: Commanding officer, Sixth Signal Service Company, Chicago, Ill., Commanding officer, Camp McCoy, Wis.

Sergeant Hourigan, Privates Tell and Hamel worked under my direct supervision this year while installing the Camp McCoy telephone system and Private Westfall from about August 15, 1931, until the termination of the project about October 5, 1931.

I wish to commend the above named soldiers for the excellent performance of their duties and especially Sergeant Hourigan for the force and initiative displayed.

WALDO E. ARD,
Captain, Third Field Artillery, Signal Officer.

[First indorsement]

HEADQUARTERS CAMP MCCOY,
Wisconsin, October 15, 1931.

To: Commanding officer, Sixth Signal Service Company, Chicago, Ill.

I concur in the above commendation and especially that of Sergeant Hourigan.

H. R. PERRY,
Colonel, Infantry (DOL), Commanding.

2. The company commander is very proud, indeed, of the fine record achieved by Sergt. John J. Hourigan, Pvt. (First Class) Antonio Hamel, Pvt. (First Class) Leonard S. Westfall, and Pvt. Stephen R. Tell, and it is his sincere wish that all signal men of this Corps Area aspire toward the standard of thoroughness and efficiency attained by the soldiers mentioned above.

J. J. GRACE,
Lieutenant Colonel, Signal Corps, Commanding.

RETIREMENT OF STAFF SERGT. JOHN O'NEILL SHERLOCK

The long and splendid active service of a Signal Corps soldier came to an end at Omaha, Nebr., on October 31, 1931, when Staff Sergt. John O'Neill Sherlock, Nineteenth Signal Service Company, was placed on the retired list.

Sergeant Sherlock began his service in the Field Artillery in 1900 and continued in that arm until 1903 when he enlisted in the Signal Corps. He served at various stations in the continental United States and in Alaska. He was for some time quartermaster agent on the cable boat *Cyrus W. Field*. He is a graduate of the Signal School, Fort Leavenworth, Kans.

Sergeant Sherlock attained the grade of master signal electrician in August, 1917, from which he was commissioned first lieutenant,

Signal Corps, in September, 1917. He served in the American Expeditionary Forces as adjutant, Three hundred and fifth Field Signal Battalion, and for a time acted as signal officer, Eightieth Division. He participated in the Meuse-Argonne and Somme offensives. He resigned his commission in 1919 and was reappointed a master signal electrician. He accepted appointment as warrant officer on January 1, 1921, in which grade he served until September 18, 1931, when he resigned in order that he might reenlist in the arm in which he had served so long. He reenlisted as a private for the Nineteenth Signal Service Company on September 25, 1931, and was promoted to the grade of staff sergeant on October 20, 1931. Sergeant Sherlock held a commission as first lieutenant, Signal Reserve, until 1924, when he was transferred to the Air Corps Reserve.

During his long service Sergeant Sherlock had many interesting details. He was chief radio operator aboard the United States Army transport *McClellan* from February, 1913, to January, 1914. While serving as a radio operator at Fort Sam Houston, he tested the first radio wagon set purchased by the Signal Corps. This was a Marconi instrument and received its service test on the Mexican border. He served in the office of the Chief Signal Officer, Washington, D. C., during which time he prepared the first training pamphlet on divisional message centers. His duties in the chief's office included those of officer in charge of the progress and statistics section. Since his appointment as a warrant officer he has been chief clerk in the office of the air officer, headquarters, Seventh Corps Area, Omaha, Nebr.

Sergeant Sherlock will make his home in Seattle, Wash., to which place the best wishes of the Signal Corps follow him.

RETIREMENT OF MASTER SERGT. JOHN R. NICHOLSON

Master Sergt. John R. Nicholson first enlisted in the Regular Army on July 3, 1900, and was assigned to duty with the Twelfth Infantry, which was then on duty in northern Luzon. As a member of the mounted scouts of that organization he participated in several of General Funston's raids in the latter's campaign against Aguinaldo.

After Aguinaldo's capture he was attached to the Signal Corps as a telegraph operator and served in the campaigns on the island of Samar. He was later transferred to the Eleventh Infantry and was headquarters telegraph operator with that organization until July, 1903, when he was sent to the United States for discharge. While with the Eleventh Infantry Sergeant Nicholson was a witness to the wholesale massacre of a company of Philippine Constabulary at Surigao, Mindanao, in the early part of 1903.

Sergeant Nicholson reenlisted in Company F, Signal Corps, upon his return to the United States and was immediately returned to the Philippines, serving on the island of Negros his entire enlistment.

On his next enlistment Sergeant Nicholson served in the Coast Artillery, and at its expiration returned to civil life, where he remained until 1914. During this period he spent most of his time in railroad construction camps in Central America.

Sergeant Nicholson experienced the Army urge again in 1914 and enlisted in Company E, Fifty-fifth Telegraph Battalion. His service in the Signal Corps has been continuous since that date. In addition to the Fifty-fifth Telegraph Battalion, Sergeant Nicholson served with the Seventh Signal Service Company, the Ninth Signal Service Company, the Sixteenth Signal Service Company and the First Signal Troop. He has been with this latter organization since early in 1928.

Sergeant Nicholson has been a Signal Corps noncommissioned officer continuously since 1914, having reached the grade of master sergeant in December, 1929.

Sergeant Nicholson retired from active duty on August 31, 1931, and his many friends in the service wish him a long life and success in his future career.

MASTER SERGT. WILLIAM T. BARR RETIRES

After 28 years' service Master Sergt. William T. Barr, Signal Corps, was placed on the retired list at the Presidio of San Francisco, Calif., on October 31, 1931.

Master Sergeant Barr's service began with his enlistment in the Infantry at Lincoln, Nebr., in December, 1903. He served in Company H, Twenty-eighth Infantry, until February, 1905, when he was transferred to the Signal Corps. He has remained continuously with the Signal Corps since that date. Stations at which he has served include Fort Wood, N. Y.; Fort Myer, Va.; Habana, Cuba; Fort Omaha, Nebr.; Fort Des Moines, Iowa; Fort Bliss, Tex.; Fort Leavenworth, Kans.; Texas City, Tex.; and Fort D. A. Russell, Wyo. He served two tours of duty in Alaska and one in Hawaii. Sergeant Barr graduated from the telephone electrician's course, the Signal School, in 1926. Upon his return from foreign service in 1929 he was assigned to the Eighth Signal Service Company, Presidio of San Francisco, Calif., where he served to the date of his retirement.

During his long service Master Sergeant Barr held many important positions including property clerk, headquarters, WAMCATS, Seattle, Wash.; bookkeeper and telegraph accountant, Seattle, and operator in charge of the Western Union telegraph office, Fort Huachuca, Ariz.

This veteran soldier is an expert telegraph operator and his work on maneuvers added greatly to the success of organizations of which he was a member. His exceptional ability as a soldier, whose attention to duty and impartial supervision of subordinates was evident at all times, endeared him to all with whom he came in contact.

The best wishes of the Signal Corps are extended to Master Sergeant Barr.

TECHNICAL SERGT. STUART HAMELL DISCHARGED

It is with considerable regret that the BULLETIN announces the discharge of Technical Serg. Stuart Hamell, Signal Corps, at Fort Sam Houston, Tex., on August 31, 1931, because of physical disability incident to the service.

Sergeant Hamell, an electrical engineer, graduate of the University of Pennsylvania, entered the service in the Signal Corps on June 12, 1917, after more than 13 years' experience in commercial signal engineering. He attained the grade of master signal electrician on June 16, 1918, and was later assigned to the Second Field Signal battalion. He served with various Signal Corps organizations among which were the Ninth Field Signal Battalion, Fifth Signal Company, Fifty-first Signal Battalion, Fourth Signal Service Company, First Signal Company, and Seventh Signal Service Company. A large proportion of Sergeant Hamell's duty consisted of organization and instruction of classes and schools in signal communication. He is a graduate of the telephone and telegraph electrician's course, the Signal School. Many officers under whom he served have attested to his ability, efficiency, and excellent personal characteristics.

The Signal Corps regrets the loss of this excellent soldier and extends its wishes for his future happiness and prosperity.

NEW PUBLICATIONS, NATIONAL BUREAU OF STANDARDS

Copies of the following publications of the National Bureau of Standards may be obtained, at the prices indicated, from the Superintendent of Documents, Government Printing Office, Washington, D. C. Orders should be sent direct to the Superintendent of Documents and not to the National Bureau of Standards. Remittances should be included with the order in the form of cash, postal money order, or coupons sold by the Superintendent of Documents in sheets of 20 for $1. Stamps are not acceptable. For foreign countries (other than Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama) add one-third to total amount of publications ordered;

for example 3 publications at 20 cents = 60 cents; 20 cents foreign = 80 cents—amount to be remitted by a foreign purchaser.

The Superintendent of Documents is an official of the Government Printing Office, an entirely separate organization from the National Bureau of Standards, and in an entirely different section of the city.

RESEARCH PAPERS

RP330. Automatic Volume Control for Aircraft Radio Receivers. W. S. Hinman, jr.

An automatic volume-control device is described for use primarily in the reception of visual-type radio range-beacon signals, the device being easily applied to existing aircraft radio receiving sets. This device operates on the output voltage of the radio receiver, and is provided with a filter unit to prevent operation of the automatic volume control by signals other than those from the range beacon. The controlling voltage is derived from the output of the radio receiver, part of which is rectified and then applied as negative bias to the radio-frequency amplifier. The automatic volume control maintains a substantially constant output voltage for input voltage variations of the order of 5,000 to 1. A distance indicator, operating in conjunction with the automatic volume-control device, is provided to serve as a gauge of distance from the transmitting station. A variation of the automatic volume-control device is given which is intermediate between completely automatic and manual volume control; 10 pages. Price, 10 cents.

RP336. A course indicator of pointer type for the visual radio range-beacon system. F. W. Dunmore.

The reed converter gives radiobeacon course indications by means of a zero-center pointer type indicating instrument. The radiobeacon signal operates two tuned reeds. The motion of these reeds generates small alternating voltages which when rectified by oxide rectifiers and passed in opposing polarities through the zero-center indicating instrument, give the course indications by the deflection of the instrument pointer in the direction of deviation of the airplane from the course. A simple form of switch is used to select the proper two reed converters. There are three units, one tuned to 65 cycles, another to 86.7 cycles, and the third to 108.3 cycles, thus adapting the converter type of indicator to any course of a 4 or 12 course beacon. A second instrument is used as a signal volume indicator. The two instruments may be combined into one, giving (1) radio range-beacon course indication; (2) radio range-beacon signal volume indication; (3) runway localizer beacon course indication; (4) blind landing beacon path indication; 24 pages. Price, 15 cents.

RP338. Theory of Design and Calibration of Vibrating-Reed Indicators for Radio Range-Beacons. G. L. Davies.

This paper gives a treatment of the theory of design and calibration of the vibrating-reed indicator for the aircraft radio range-beacon. The equations of motion for the reed are solved by the aid of the assumption that the reed may be replaced by an equivalent particle. Equations are set up for deriving the constants of this equivalent particle in terms of the constants and dimensions of the reed. An equation derived by Mallett is used to explain the characteristics of the reed vibration at large amplitudes. Equations are derived for practical design work and their use explained. The various factors of design and operation which affect the performance of the reeds are discussed, and a calibration procedure is outlined to take account of these factors; 19 pages. Price, 10 cents.

TIMELY TOPICS

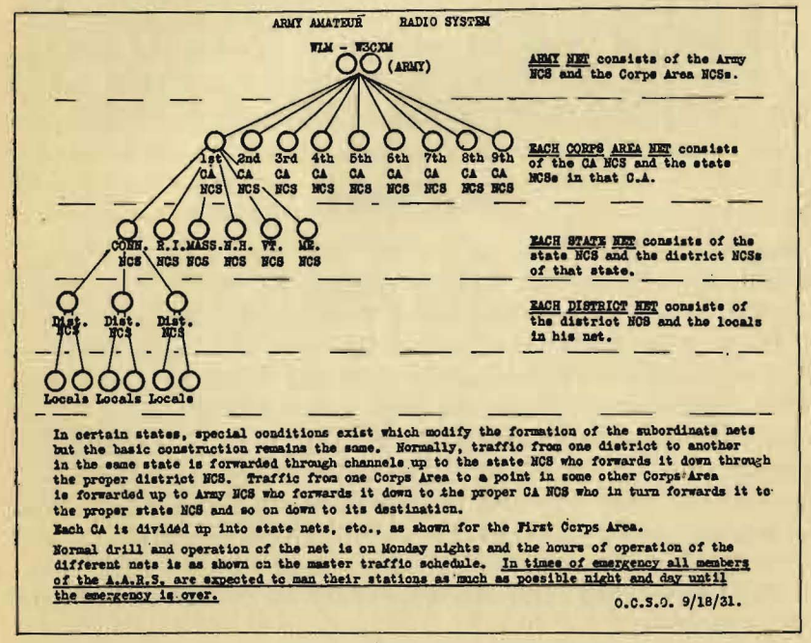
Army-Amateur News.—On August 31, 1931, from 6.30 to 7 p. m., Pacific standard time, the Ryan monoplane *NC 740 M*, call letters KH1YB, from Hancock Field, Santa Maria, Calif., made a test flight for the A. A. R. S. A message from the corps area signal officer to all Army-amateurs was transmitted, and was copied by Army-amateur stations in every state in the corps area except Wyoming. This plane has been made available to the A. A. R. S., this corps area, for emergency use, by the Hancock Foundation College of Aeronautics, Santa Maria, Calif. In case of disaster in the Ninth Corps Area (such as occurred when the St. Francis Dam collapsed) KH1YB will fly over the stricken area keeping radio contact with the Army-amateurs and forwarding information necessary for prompt and efficient relief measures.

The Ninth Corps Area has a very efficient corps area network, having won the last two intercorps area competitions held between the networks of the nine corps areas, and this plane will make a very valuable addition to the emergency service afforded by the A. A. R. S. of the corps area.

A special nation-wide Red Cross drill was held on October 12. Twenty-five messages addressed to the Red Cross, Washington, D. C.; Red Cross, St. Louis, Mo.; and Red Cross, San Francisco, Calif., were forwarded by mail to certain outlying stations of the A. A. R. S., and these stations were directed to send out the Army-Amateur call for a simulated emergency sometime during the regular drill. When their emergency call was answered they forwarded their messages and these were relayed to their destination as quickly as possible. Each station relaying or handling one of these messages sent a copy of his

log to the Chief Signal Officer so that the route taken by the messages, time required, etc., could be recorded. These drills approximate as nearly as can be devised, the actual operation of the A. A. R. S. in an emergency.

Novel use of homing pigeon.—The following extract from a letter of the officer in charge of the air-service division, New York City Police Department, illustrates a new use for homing pigeons. However, this problem was met with an adequate solution which probably did not enter into the calculations of those who employed the bird.



It may interest you to know, that acting on your advice given to me over the telephone two weeks ago, we were able to successfully follow with our airplane, a carrier pigeon which was used by extortionists to obtain ransom.

The bird was coated with a water color of deep orange hue, which made it stand out in flight against the background of the green terrain and scattered houses, and was quite easy to follow direct to its coop located about three miles from the point of its release.

We deeply appreciate having received your very helpful advice, and are quite sure that you would like to know how valuable it proved to us.

New meteorological pamphlet.—The meteorological division, Office of the Chief Signal Officer has just issued a new pamphlet entitled: "Instructions for Preparing Signal Corps Meteorological Forms." This pamphlet is a revision of Instructions for Preparing Meteorological Forms, February 7, 1923. The material has been revised and

brought up to date. It is arranged in the same form as are Training Regulations and should be of material assistance to meteorological personnel in the field.

Signaling by means of pyrotechnics.—The Signal Corps is interested in pyrotechnic signaling from two angles—first, as a using arm actually employing such signals at division and higher headquarters, and, second, as the coordinating agency charged with formulating instructions, codes, and other data for the use of all using organizations throughout divisions and higher units. Due to the nature of this signaling agency its use must be limited to a very few signals and the type of pyrotechnics used must be carefully chosen to insure that each message is distinct and not likely to be confused with other messages sent by this means. Another point which must be borne in mind is that it is frequently impossible to decide whether a certain signal has been transmitted from an airplane or from high ground. All of the using arms were requested to state the message meanings which they considered necessary to be sent by means of pyrotechnics. The replies were coordinated in this office and the list of signals as given below has been approved by all the using arms. The number of messages to be transmitted has been limited to eight, as follows:

1. Fire barrage.
2. Artillery is firing short.
3. Understood.
4. Objective taken.
5. Lift barrage.
6. Mark your front lines.
7. Display panels.
8. Friendly plane.

The Ordnance Department is now developing various types of signals some of which have been service tested by the Signal Corps Board, and when the development has been completed it is hoped that it will be found possible to clearly transmit each of the messages indicated above without possibility of confusion.

Army extension courses for Army amateurs.—The suggestion has been made that something more than merely the handling of traffic and military radio procedure be made available to Army amateurs. The extension course of the Signal School, which has been entirely revised this year, is open to amateur radio operators. The subcourses comprising this extension course have been prepared at the Signal School, Fort Monmouth, N. J., and are conducted by extension schools, one of which is located in each corps area and overseas department. An inquiry addressed to "Commanding General ——— Corps Area" (inserting appropriate corps area number) or to "Com-

manding General, Hawaiian (or other) Department" will bring full information concerning the courses offered and instructions for enrollment. Many subcourses will be found to be of value to radio amateurs.

Field printer development.—Due to the number of telegrams which are necessary in war and to the limited number of American Morse operators it has become evident that some form of mechanical printer telegraph apparatus is probably essential. Commercial printers have been successfully operated for many years. These printers, however, are installed at locations which are well sheltered from the elements and which have available the commercial electric power necessary for their operation. Since the conditions stated above usually do not exist during combat it was decided to modify commercial printers in such a manner as to render them suitable for use under combat conditions. Among the modifications are (a) the replacement of the usual 110-volt motor by a 12-volt motor thereby permitting storage-battery operation, (b) equipping each station with special remote control apparatus permitting both stations connected to a printer circuit to be controlled from either station, (c) a special type of visual speed indicator, and (d) mounting each set in a substantial wooden case thus rendering the entire set portable.

Service tests of four of these modified printers have been conducted by the Signal Corps Board and by the First Signal Company, in the latter case under field conditions. Reports of these service tests appear to indicate that the equipment is suitable for the purpose intended. Additional service tests will be conducted by the Tenth Signal Company in Panama and by the Second Signal Company at Fort Sam Houston, Tex. The apparatus under test is of the "tape" type, printing its characters on a gummed tape which is then cut and attached to regular message forms. It is contemplated that in addition to tests of the "tape" type printer, service tests will be conducted using "page" type printers thus permitting a comparison to be made of the advantages and disadvantages of the two types.

Pigeon activities at Scott Field.—Pigeons from the Scott Field, Ill., loft, entered by the commanding officer, Lieut. Col. John A. Paegelow, in the Toledo Futurity, have made exceptional showings at their last two appearances.

Of all the birds entered from the western district in the Toledo Futurity, and released at Lafayette, Ind., on September 27, only two homed the same day. The winner from this district, a Scott Field bird, trapped about an hour and a quarter ahead of the other bird from St. Louis. Of the five entries from this loft all have returned while it is understood that several birds from St. Louis have not yet returned.

The latest event in which Scott Field birds have participated was the St. Louis National held in connection with the National Dairy Show held in St. Louis on October 10, 11, and 12. Competing with over 300 entries from all parts of the country, the 10 birds entered from Scott Field came home with 10 firsts, a perfect score.

Conditions at Scott Field are very favorable for raising and training pigeons and it is believed that Scott Field birds will continue to win their share of prizes and to be a credit to the Signal Corps.

Blue ribbons for Scott Field homing pigeons.—Scott Field homing pigeons carried away a fine lot of ribbons in their first indoor showing of the season at the Illinois State Fair at Springfield, Ill., on August 24. Staff Sergt. Marinus Bronkhorst took 20 of the Government birds to this show, and every bird except one was in the prize money. The loss of a prize by this one bird was due to the loss of many feathers while being shipped.

In the class for 100-mile record birds, one of the toughest in the show, the Scott Field loft carried away first and second honors in both the hen and cock classes with the four birds entered. Two fine birds, entered in the 300-mile class, took the two first ribbons, and another fine cock landed the blue ribbon in the 400-mile class. Three cocks all landed first place honors in the young bird classes and three hens all placed.

In addition to the homers, Sergeant Bronkhorst took four pouter pigmies to the show. These birds, which belong to Mrs. John A. Paegelow, wife of the post commander, brought home a first, second, third, and fourth place ribbon.

The total prizes awarded the Scott Field birds were nine firsts, seven seconds, three thirds, three fourths, and one fifth.

Pigeons.—Successful night flights of pigeons from boats 5 miles from land have recently been conducted in Hawaii. This training is to be continued. It has been noticed that the presence of lights, either red or white, on the loft doors does not appear to aid the birds in homing and all night training is now conducted without loft lighting.

Meteorological data for pigeon fanciers.—Peace-time activities of the Signal Corps cover many ramifications. One of these has recently been brought to the attention of this office by means of a letter which included the following:

As a member of the Capital City Concourse Association who is not blind to the wonderful help you have rendered the homing pigeon enthusiasts of Washington I feel that I am at liberty in addressing this communication to you. We have for some time back had a singular amount of success and satisfaction in our races and you, through your kindness in giving us available weather prognostications, are in no small way responsible for this. I, for one, am aware of this fact but I do not think the rank and file of local fanciers know

of the help given us, otherwise I think that you would have been deluged with letters of thanks.

Removal of dry batteries from communication equipment.—The following letter relative to this subject was sent by the Chief Signal Officer to the chiefs of the various using arms on September 21, 1931:

It has come to the attention of this office that, not infrequently, communication equipment is stored for a considerable period of time without first removing all dry batteries from the sets. Radio sets, telephones, wave meters, and similar equipment may be seriously damaged if stored for more than a few days without first removing the dry batteries. It is suggested that you advise your using organizations of the necessity for removing all dry batteries from communication equipment stored for a period longer than one week, except in the Tropics where battery deterioration is very rapid and all batteries should be removed when the equipment is to be stored for a period longer than one day.

Radio set survives crash.—Rather a remarkable incident in connection with the crash of the airplane from which Lieut. Harry A. Johnson, Air Corps, of Selfridge Field, Mich., jumped on August 6 last, was the condition of the radio installed in the ship. Although the airplane was a total wreck, with practically nothing left of it which could be salvaged, the radio set with which it was equipped survived the crash. It was well shaken up when the plane hit the ground, but not even one tube was broken and, following some minor repairs, the radio set was serviceable again.

Field manuals.—The long-awaited Basic Field Manual, Volume IV, Signal Communication, has been printed and distribution has been made by The Adjutant General. This volume contains a chapter on field wire systems which was originally prepared as a revision of Training Regulations No. 165–5 but which was included in the field manual instead. Volume IV also contains Training Regulations 160–6, Dropped and Pick-Up Airplane Messages; Training Regulations 160–10, Message Center Procedure; a portion of Training Regulations 162–5, Visual Signaling; Training Regulations 163–5, Radio Procedure; a portion of Training Regulations 160–5, Signal Communication for All Arms and Services; and a chapter on Meteorological Information. It also contains an up-to-date chart of radio communication equipment.

This publication is designed to meet the needs of signal communication personnel of all arms. It may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 50 cents per copy.

The printing of the Signal Corps Field Manual, which will cover Signal Corps troops and Signal Corps operations, is nearing completion and its distribution is expected in the near future. It will appear in two volumes and will contain much information hitherto

unpublished. Drills for signal troops are prescribed and duties of special Signal Corps units are given in detail. It supplements Basic Field Manual, Volume IV, for Signal Corps personnel.

Twenty-first annual convention American Racing Pigeon Union.—On October 22–25, 1931, the twenty-first annual convention of the American Racing Pigeon Union was in session at the Commodore Perry Hotel, in Toledo, Ohio.

This session was a most important one. It marked the close of the first year's operation under the managing committee system of government adopted in 1930, and the end of three years' cooperative relations with the International Federation of American Homing Pigeon Fanciers under the joint committee.

Four hundred and fifty-five delegates, representing 34 States, Canada, and Cuba were present. The atmosphere of all meetings was harmonious, and local and regional differences were conspicuously absent.

In the relations between the Signal Corps and the great civilian pigeon organizations, this meeting was most profitable. An outline of a proposed plan for the mobilization of a war strength pigeon service in the event of an emergency was presented to the convention by the Signal Corps representative, which was unanimously approved by the assembled delegates. The three A. U. members of the joint committee were by resolution designated as a voluntary "war service committee" with full power and authority to deal directly with the War Department in the formulation of a complete and detailed war plan for the pigeon service.

Other features of the convention were the futurity race, won by Mr. W. C. "Rube" Wallace of Louisville, Ky., and the futurity winners show, in which Signal Corps birds brought away two substantial awards.

EDITOR'S PAGE

There are on hand extra copies of the following issues of the BULLETIN which will be furnished without cost within the limit of available copies, to anyone who addresses a request therefor to the editor, SIGNAL CORPS BULLETIN, office of the Chief Signal Officer, Washington, D. C.

No. 28. January, 1925.
No. 29. March, 1925.
No. 31. September, 1925.
No. 32. January, 1926.
No. 37. January, 1927.
No. 39. June, 1927.
No. 40. September, 1927.
No. 41. December, 1927.
No. 43. June, 1928.
No. 44. September, 1928.
No. 45. November, 1928.
No. 46. January, 1929.
No. 47. March, 1929.
No. 48. May-June, 1929.
No. 49. July-August, 1929.
No. 50. September-October,1929.
No. 51. November-December, 1929.
No. 52. January-February, 1930.
No. 53. March-April, 1930.
No. 54. May-June, 1930.
No. 55. July-August, 1930.
No. 57. November-December, 1930.
No. 58. January-February, 1931.
No. 59. March-April, 1931.
No. 60. May-June, 1931.
No. 61. July-August, 1931.

U. S. GOVERNMENT PRINTING OFFICE: 1931

OPERATIONS OF THE SIGNAL CORPS

The following extract from the Report of the Chief Signal Officer for 1862 is as applicable to-day as it was in the first year of its operation of the Signal Corps:

"The corps (Signal Corps) has served under different rules with different armies. With some it has been broken in small parties, scattered with the various divisions; with others, the officers have been kept together, and have acted under a chief, who orders all movements. Experience has seemed to indicate, that the duties of the corps with an active army, are most efficiently rendered when these services are controlled by one officer, who, properly informed at headquarters of movements contemplated or making, understandingly takes steps to place his officers where their labors may be most useful."