PROCUREMENT IN THE SIGNAL CORPS
26 February 1946.

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PROCUREMENT IN THE SIGNAL CORPS
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GENERAL ARMSTRONG:

Gentlemen, this morning I have the great pleasure of presenting to you a classmate of mine in the Industrial College. He and I took the course which was the first of the ten-months courses given in 1926 and 1927. While we belonged to an archaic period and had to do much harder work than you gentlemen have to do--you will agree to that, General--he has been brought up to date, gentlemen, I assure you.

General Arnold started his service in the Infantry. He served in the Infantry in the First World War and then transferred to the Signal Corps in 1920. His service in the Signal Corps has been highly distinguished. He was in Australia early in World War II to set up the Signal Corps operations there before General MacArthur arrived.

He is a graduate of nearly every school the Army has to offer, including the War College. In view of his higher education in the Industrial College he thinks that is the reason he was put on supply and distribution in the Signal Corps, although during most of the war he did not serve in that phase of Signal Corps operations.

Gentlemen, it is a privilege to present to you Brigadier General Calvert Arnold, who will speak to you on procurement operations in the Signal Corps of the Army. General Arnold.

GENERAL ARNOLD:

General Armstrong and gentlemen, yes, in the archaic days of the Industrial College, in 1926 and 1927, I used to take work home with me. That must have been in the archaic days.

As a preliminary to our discussion of the Signal Corps procurement problem in this war, I thought I might just give you a glance at the Signal Corps procurement organization as it exists today and, in principle, as it existed throughout the war.

It is made up of a procurement district with subsidiary offices; the main purchasing office is in Philadelphia. The inspection agency comprised four major zones, which covered geographical boundaries of the United States; and the Contract Settlement Section which was made more active, of course, following VE-day. But, as that exists today it is being rapidly liquidated.

I have been asked to review the lessons of Signal Corps procurement which have impressed me as important. My first thought, when reviewing in my own mind the experiences of the war years, was that all the lessons were important. However, on considering further, I realized that although certain problems and their solutions were of intense interest to our own Service, they might not represent any great contribution to the

studies of this College. I am going to try, therefore, to confine my remarks to those phases of Signal Corps procurement which might have particular significance for industrial mobilization planning purposes.

As you doubtless know, the Chief Signal Officer was responsible for the procurement of signal communication, cryptographic and meteorological equipment, electrical apparatus for radio direction finding and for range finding, photographic supplies and equipment, and sound recording equipment relative to communications. These responsibilities were modified somewhat within the past year, by the transfer to Army Air Forces of the responsibility for procurement of signal equipment peculiar to that organization.

Prewar planning--In general, the Signal Corps procurement planning program, after World War I, followed much the same pattern as that of the other Services. This program included participation in the Facilities Allocation System and War Department Commodity Committees. We suffered from the same limitations on funds and personnel. We were able to investigate only a few of the supply problems which we considered the most critical. We just did not have enough people to work out fully the details of the procurement plans and keep them up-to-date. The rapid developments and changes in the communications and electronics industries, necessitated continuous revision of our requirements and procurement plans. Production studies and plans were confined generally to the larger facilities--the smaller plants could not spare technical men for participation in the planning program.

The Program for placing Educational Orders with Industry did much to relieve certain critical situations. Although funds for this Program were authorized by Congress in 1938, it was not until the latter half of 1939 that we in the Signal Corps took advantage of this opportunity for industrial preparedness. By that time, so many items had become critical, it was difficult to select those to be used in the Educational Order Program. In 1939, Field Wire and Field Telephones were selected for educational order contracts. Prior to the Educational Order, the production rate of the Telephone was less than 50 per day. Following completion of the Program, a daily production of over 2,000 was assured and three additional producers had been developed. In connection with the Field Wire Program, productive capacity was increased from approximately 1,500 miles per month to a maximum possible capacity of 73,000 miles per month. Eleven new manufacturers were added to the list of suppliers for this item; and, as a result of this Program, certain changes in specifications were brought about which contributed considerably to easier production and improved serviceability of the wire. In addition to these excellent results, the orders produced bills of materials, definite sources of each contributory item needed, as well as information on the raw materials required. These orders also revealed potential shortages in certain critical components and materials. It is interesting to note that the cost to the Government of the W-110-B Program was approximately $63,000. I doubt that there were many instances in military procurement history where the expenditure of so small an amount of public funds produced such large returns. These first Educational Order experiments led, in 1940, to the placement of additional orders covering items of cordage, switchboards and radio equipment for

which requirements were known to exceed surveyed capacity. The results of these orders were also satisfactory. Our only regret in connection with this educational program is that it was not broader in scope.

Even though it appeared that early foreign orders were beginning to interfere with our emergency procurement, their value--as an educational device--must not be discounted. After the passage of the Lend-Lease Act in March of 1941, requisitions of foreign nations were referred to the Service concerned for actual procurement. This enabled each Service to select the facilities with which contracts would be placed and thereby build up productive capacity where it was most needed.

Early plant expansions--We first felt the real impact of the National Defense Program of 1940 through acceleration of the Aviation Program. This increased Signal Corps' procurement of certain aircraft instruments, namely, radio compasses, frequency meters and direction finders. At that time, the Bendix Radio Corporation was our foremost producer of these instruments. After full consideration of other sources, we found it necessary to load this Company with more and more orders. It became evident that Bendix would require additional facilities, if schedules were to to be met. Therefore, in October of 1940, Bendix applied to the Signal Corps for financial assistance in establishing a new plant at Towson, Maryland. This confronted us with a problem which had long been a topic of study and discussion in the procurement offices of the Services--that of financing facilities with government funds. Although government financing had always been recognized, in planning operations, as a necessary companion vehicle to private financing, the enabling legislation was not provided until the middle of 1940. Policies and procedures were merely a matter of conjecture when the Bendix request was received. After investigation of all methods of financing, the Defense Plant Corporation--a subsidiary of the Reconstruction Finance Corporation--was requested to negotiate a lease agreement with Bendix, covering the construction of a new plant and the purchase of required machinery and equipment. This method was found most adaptable to the needs of our contractors, and was used almost exclusively for financing our major expansion projects.

As of 7 December 1941, ten individual Defense Plant Corporation financed expansion projects, with a total estimated cost of eight and one-half million dollars, were under construction, and numerous others were being initiated. These expansions were to provide additional manufacturing capacity for aircraft instruments--radio grade insulating materials, field telephone wire, and transmitting and special purpose radio tubes.

Industrial situation as of Pearl Harbor--Although I feel that a great deal was accomplished through prewar planning, I will not attempt to claim that our preparations were complete. Plans for production of individual component parts such as resistors, capacitors, tubes and the like were not complete. Our industrial situation as of Pearl Harbor may be summed up briefly:

On the credit side--In general, adequate facilities were available for production of the major end items such as radio sets and telephone equipment.

Some additional capacity for critical components and special materials was available as a result of private financing, and government-financed plants for production of certain other critical components were being established.

Some chokepoints had been revealed through the Educational Order Program and planning for procurement of these items was well advanced.

On the debit side--No reliable information was available regarding many of our component parts manufacturers, their productive capacities, or the quality of their products.

No exact information was at hand regarding the requirements of the Military Services as a whole for component parts and materials.

Very little had been done in developing components of a type which would meet rigorous military needs.

It will be noted that the "debit" side of our ledger consisted largely of a general lack of knowledge concerning component parts. This proved to be one of our major procurement problems.

Initial war procurement and expansion--Following the attack on Pearl Harbor, we, along with the other Services, worked on a 24-hour basis to place orders with prime contractors and to secure production of our equipment. These prime contractors immediately placed subcontracts with those suppliers of component parts who had demonstrated their ability to produce quality items. The net result of this activity was that many subcontractors, such as producers of insulating materials, tubes and quartz crystal assemblies, found themselves with backlogs of orders ranging in some cases up to three years, but in all cases calling for delivery within a period of a few months. Of course, the inevitable happened and these subcontractors, backed up by their prime contractors, descended upon us in hordes demanding financial assistance in expanding their overloaded facilities.

Although we had foreseen that some shortages would develop for certain components, we were unprepared for a situation of this magnitude and scope. The fact that the subcontract structure of the industry was largely unexplored territory, may be blamed to some extent on lack of sufficient personnel and funds for planning. However, it had been the opinion of most interested government agencies, as well as the prime contractors, that in general the supply of components would be adequate and that little expansion would be necessary. In fact, this was the general agreement at a meeting which the Office of Production Management held in January 1942--for the specific purpose of appraising the condition and ability of the radio parts manufacturers to meet the military radio program.

In rapid succession, in response to the needs of the subcontractors, the Signal Corps processed expansion programs for insulating materials, radio tubes, quartz crystal assemblies, dynamotors and other items.

The total cost of expansions in the Radio and Radar industry was about 227 million dollars. Roughly half of these expansions were financed with government funds.

The Signal Corps' share in this program was about 60 percent of the total, or 142 million dollars, of which approximately 82 million dollars was government financed--largely DPC. The balance was private financing, which we indorsed through the Certificate of Necessity medium.

In addition to the expansion of the Radio and Radar industry, about forty million dollars were spent on facilities for telephone and allied equipment, including wire and cable. A little over half of this was government money.

Although we had probably accomplished more planning for wire and cable than any other item, we learned soon after Pearl Harbor that our plans had not even begun to visualize the ultimate requirements for field wire. Lend-lease requirements alone exceeded previously anticipated total requirements for Field Wire W-110-B. This wire was persistently the most troublesome item in our Wire and Cable Program.

The following chart shows production of field wire W-110-B from 1942 through 1945. You can see that production almost doubled during 1942--as a result of private and government-financed expansions. During the first half of 1943, it will be noted that production dropped. This was caused by the indictment of certain wire company officials for falsifying test results, which created serious disturbances in the industry, with a consequent loss of production. Although production rose sharply again, the constantly increasing computed demands between that time and VE-day were never fully met. The situation in Germany, in December 1944, certainly did not help any.

In handling our expansion programs, we found it necessary to maintain a high degree of coordination between our procurement and laboratory development people. An expansion project might go through several changes before final determination was made as to the total amount of production equipment to be acquired and the exact product which was to result. In fact, this was true in the majority of our expansions. I do not mean to say that a manufacturer would start out making capacitors and wind up making tubes. Rather changes in specifications, dictated by field experience, might require--and often did require--a major change in production technique to meet the new specifications. The necessity for this flexibility in our expansions may be seen by a brief examination of the radio tube program. When the first expansions for tubes were authorized in 1941, the demand for tubes far exceeded the industry's capacity to produce. At the same time, our laboratories advised that new equipment under development for new tactical uses would considerably alter the pattern of tube requirements and place emphasis on types never before produced commercially. It was possible, however, to provide capital facilities, such as: buildings, power installations and basic production equipment--then, when the requirement pattern changed, to provide the specific tools, dies and special test equipment for the new tube types. (Chart on W-110-B follows.)

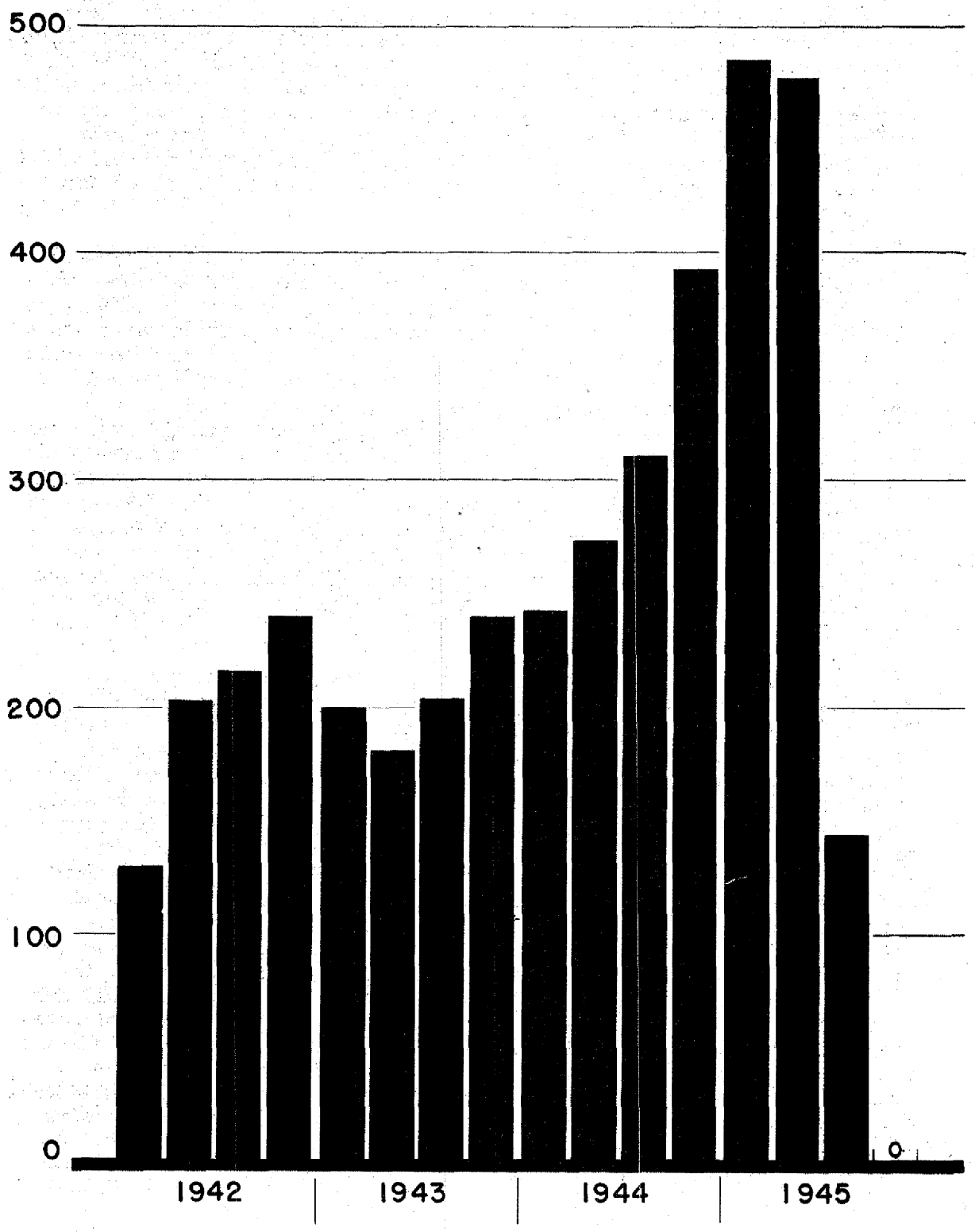
The next chart showing total deliveries of tubes from the beginning of 1942 through the first half of 1945, will give you some idea of the rate at which tube production climbed during that period. Deliveries for the first quarter of 1942 amounted to about 21 million dollars, while at the peak--the first quarter of 1944--the total value of deliveries was approximately 100 million dollars. This includes all types of electron tubes produced for all uses, including military radio and radar, proximity fuses, and essential civilian production. This production was the heart of all electronic equipment. To guarantee all urgent needs, the Signal Corps, the War Production Board and the Navy organized an informal committee to control distribution of tubes to the various users. This arrangement continued throughout the war, and no instance is known where we failed to meet tactical needs for tubes. I might add except to the first days of Australia.

We were also forced to expand for the production of end equipments, as experience was gained in the field and our laboratories developed new equipment, such as mortar-locating radar units, and extremely lightweight radio sets. Although our first government-financed expansion was of this nature, adequate capacity had, in general, existed for the final assembly and production of the end equipment. However, as the war progressed, we were faced with providing completely new facilities for production of equipment barely out of the development stage, of such radical nature that no existing plants could be converted to its manufacture. Gentlemen, I might say here that the Signal Corps came out of this war with practically no equipment except for what it had when it went into the war. Everything we came out with and used in this war was, as a whole, developed and manufactured during the period of hostilities. Approximately one-fourth the total cost of our government-financed expansions, was for expansions of this type. I mean of industrial capacity for new types of equipment.

Materials--As yet, I have not mentioned the effects of material shortages on our procurement program. We recognized the potential difficulties connected with material supply early in the 1930's, and began compiling bills of materials on signal equipment from which we could calculate material requirements. These material breakdowns were later widened in scope and used with machine tabulation methods. Unfortunately, under the WPB Controlled Materials Plan--inaugurated in the first part of 1943--we were not permitted to continue securing bills of materials from our manufacturers on commercially standard component parts, known under the Controlled Materials Plan as "B" items. Under the Controlled Materials Plan, the War Production Board assumed this responsibility. Notwithstanding that provision, we were still called upon--from time to time--to furnish ASF with material requirements for our equipment, including components. Likewise, the same problem arose when WPB would ask us to defend requests made by our subcontractors for allocations of materials involving these components. Since WPB information on "B" items was not in sufficient detail for our purposes, we were forced to rely on engineering estimates. Our job would have been simplified and considerabl more accurate--on the overall--had we been allowed to continue the work of getting bills of materials on all our items, directly from our manufacturers. (Chart on Tube Production follows.)

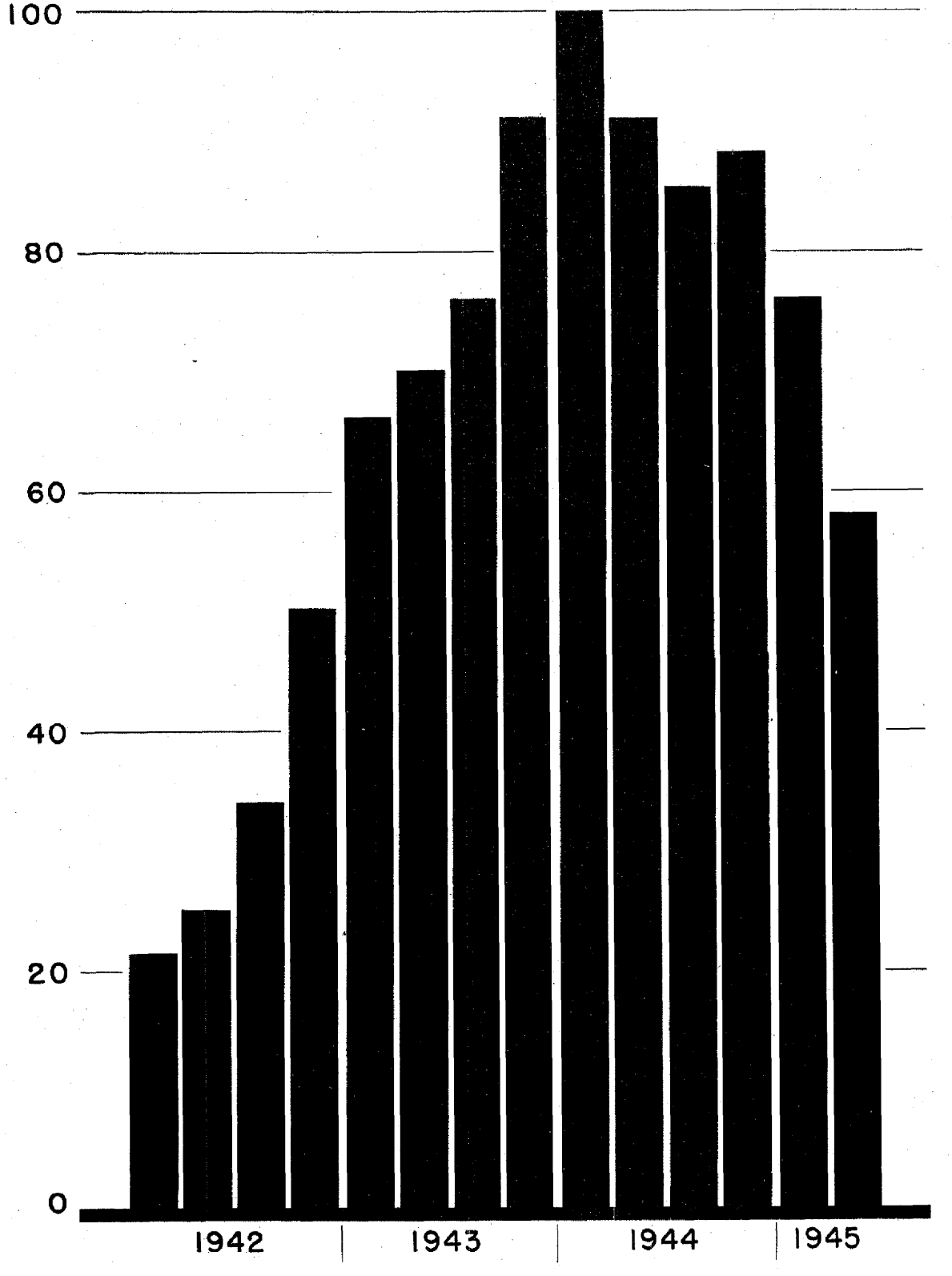
FIELD WIRE W-110-B

(MILES — THOUSANDS)



RADIO TUBES

(MILLIONS $)



Our material problem fell into two separate categories: First, there were the basic materials, such as steel, copper, aluminum, rubber and leather. Second, there were what we termed the "special" materials, such as quartz, tantalum, platinum and tungsten.

Our major requirement for rubber throughout the war was based upon the demand for field and assault wire. When we found, early in the war, that the reserves of crude rubber were rapidly being depleted, we exerted every effort to eliminate crude rubber from our tactical wire and cable, and to substitute synthetics. We received very good cooperation from the Office of the Rubber Director during the trying period of the changeover.

Our success in meeting this problem is demonstrated by the following chart which shows our rubber consumption in short tons. You will note that in 1942 and 1943, we were using only crude rubber for wire and cable. In 1944, we began extensive use of Buna "S", and by 1945 our requirement for crude rubber had dropped to exactly zero! (Chart on Rubber follows.)

Another basic material which became short, and caused our conservation people to work overtime, was leather. Our use of leather for telephone cases, linesmen's belts and tool cases was in direct conflict with the Quartermaster's needs for shoes. His needs we all keenly appreciated! We came up with a satisfactory substitute material for our cases and belts by using impregnated cotton fabric. In the year 1944, when this change took place, our requirement for hides dropped from 30,000 in the first half of the year to 3,900 for the last half of the year.

It may surprise you to learn--speaking of our special material problems--that we in the Signal Corps had a requirement for uranium. No, we were not turning out Atomic-powered radio sets, nor were we trying to compete with our friends, the Corps of Engineers, in developing a bomb. It just happened that some of our high-power radar tubes were designed around the use of uranium-oxide glass for sealing the glass envelope of the tube to the lead-in wires. Needless to say, we use very little of this type of glass now, as most of those tubes have been redesigned specifically to eliminate our requirement for uranium-oxide.

Another special material also deserves mention. This material is the rare metal--tantalum. Before our Air Forces gave the Berlin industrial area its thorough going-over, there were two plants making this material. Now there is only one, located in Chicago. The tubes in our first radar early warning sets were designed around the use of tantalum because of its high heat-dissipating characteristics, and the fact that it absorbs gases when working at a high temperature instead of giving them off and ruining the tube. We expanded the Chicago plant, about the time of Pearl Harbor, to meet our rising requirements for radar tubes. However, shortly after this tantalum project was under way, a new requirement appeared on which we had not counted. We learned that one of the chemical forms of tantalum, derived in the processing of the ore to the pure metal, was the most satisfactory material for use as a catalyst in one of the synthetic rubber processes. This new tantalum requirement threatened the supply of the pure metal needed for our radar tubes. To further complicate the situation, the only dependable ore supply available was in the Belgian Congo. The solution of this problem was not simple; it involved further plant expansion, development of new--though inferior--sources of ore, and greater efforts in substitution and conservation.

Briefly summing up some of our most significant lessons on materials, we have the following:

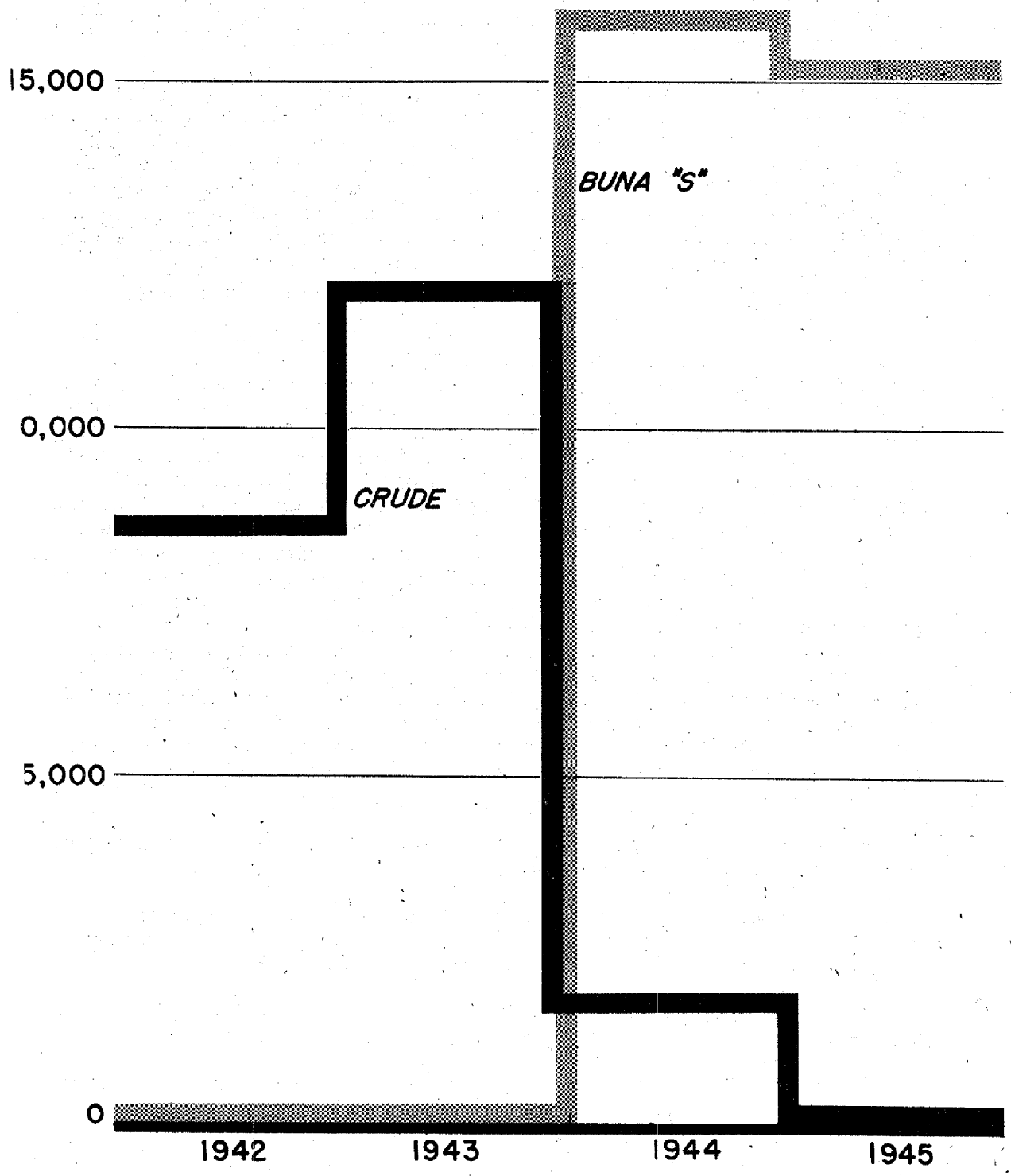
1. A materials requirement computation setup, based upon machine tabulation, is necessary in time of peace to provide wartime forecasts of requirements.

2. Full coordination with other Services and civilian agencies, must be had in order to plan for over-all material requirements.

3. No final resting place can be reached in substitution and conservation. They must be continually studied.

RUBBER CONSUMPTION

(SHORT TONS)



4. Peacetime procurements must direct manufacturers to use first one material and then another to stimulate substitution. One of the main stumbling blocks to substitution, in wartime operations, was that manufacturers had no experience in the use of many substitute materials.

Procurement and contracting--The magnitude of the Signal Corps' procurement program during World War II is illustrated by the next chart, which shows total production of Signal Corps equipment for the years 1941 through 1945. Over eight billion dollars worth of equipment was delivered during this period.

Prior to and during the war, our procurement was decentralized--being performed by three procurement districts--but our experience during the war, particularly with the subcontract structure of the communications industry, showed that our procurement could operate more efficiently by placing contracting in a single field office. As a result, we have moved formal contracting procedures to our Philadelphia Procurement District.

Another important step, which we took toward centralizing procurement responsibility, was to place operations on a commodity basis, rather than functional. Under the commodity basis, each contracting officer is responsible for buying a specific group of items--such as ground radio sets, ground radar sets, meteorological equipment, and so forth. This procedure requires that each contracting officer take complete responsibility for accurate buying, selection of reliable manufacturing sources, and timely delivery for all items assigned to him. In short, it makes him a specialist in his equipment line. Compare this, if you will, to the functional method whereby a contracting officer is responsible for only one detail of contracting, but in addition has to know the hundred and one variables applicable to all the thousands of Signal Corps items which he buys.

One of the most important procurement problems immediately after Pearl Harbor was, of course, that of placing many contracts. We took full advantage of the authority to place letters of intent and letter purchase orders. This proved to be very satisfactory in getting production lines started and giving prime contractors sufficient authority to plan facility expansions and plant rearrangements, as well as to place purchase orders for component parts and raw materials. Difficulties were encountered in the administration of letters of intent and letter purchase orders, particularly in connection with getting them promptly converted into definitive contracts. Any disadvantages, however, were far outweighed by the fact that they provided contractors with sufficient contractual protection to insure that they would take aggressive action leading to early production and deliveries. (Chart on Signal Corps Deliveries.)

A fundamental consideration of wartime procurement--forcefully brought to light--is that overnight our book of rules for awarding contracts was thrown away and there was no new book to substitute for it. This resulted from discontinuing the award of contracts by formal advertising and instituting the negotiation method, as authorized by the First War Powers Act and Executive Order 9001. All our people, who were

experienced in contracting, had been trained on the basis of formal advertising. This training was of little value in connection with the negotiation method. Basic procedures for negotiating contracts and contract articles, and for pricing contracts, all presented special problems quite different from those of formal advertising.

Another special problem confronting the Signal Corps, was the financing of large amounts of electrical and mechanical test equipment and special tooling for prim and subcontractors. Early in the war, most of these items were financed by Signal Corps contractors through the use of tax exemption certificates. The use of these certificates was virtually discontinued, however, in October of 1943 by Presidential Order. Other Technical Services of the Army financed such machinery and equipment by the use of the contract article provided in Procurement Regulation No. 332. This article provided that the Government would pay for such machinery and equipment acquired by the contractor, as separate items on the contract, and would immediately take title. Our objection to this article was that the contractor had to obtain the advance permission of the contracting officer for any changes made in the machinery and equipment. This was, in general, impracticable for Signal Corps operations because of the many changes in equipment design made during the life of a contract. Further, the price analysis operation, when applied to negotiated contracts, showed that contractors were including in their contract prices, substantial amounts to cover the complete costs of test equipment and special tooling, in which the Government's interest was not protected. Our contracting people developed special contract articles which provided that title to the test equipment and special tooling would remain in the contractor, until they were no longer required for use on any government contracts. When that time arrived, the Government would have the right to take title to, and possession of, the equipment, or, sell it to the contractor.

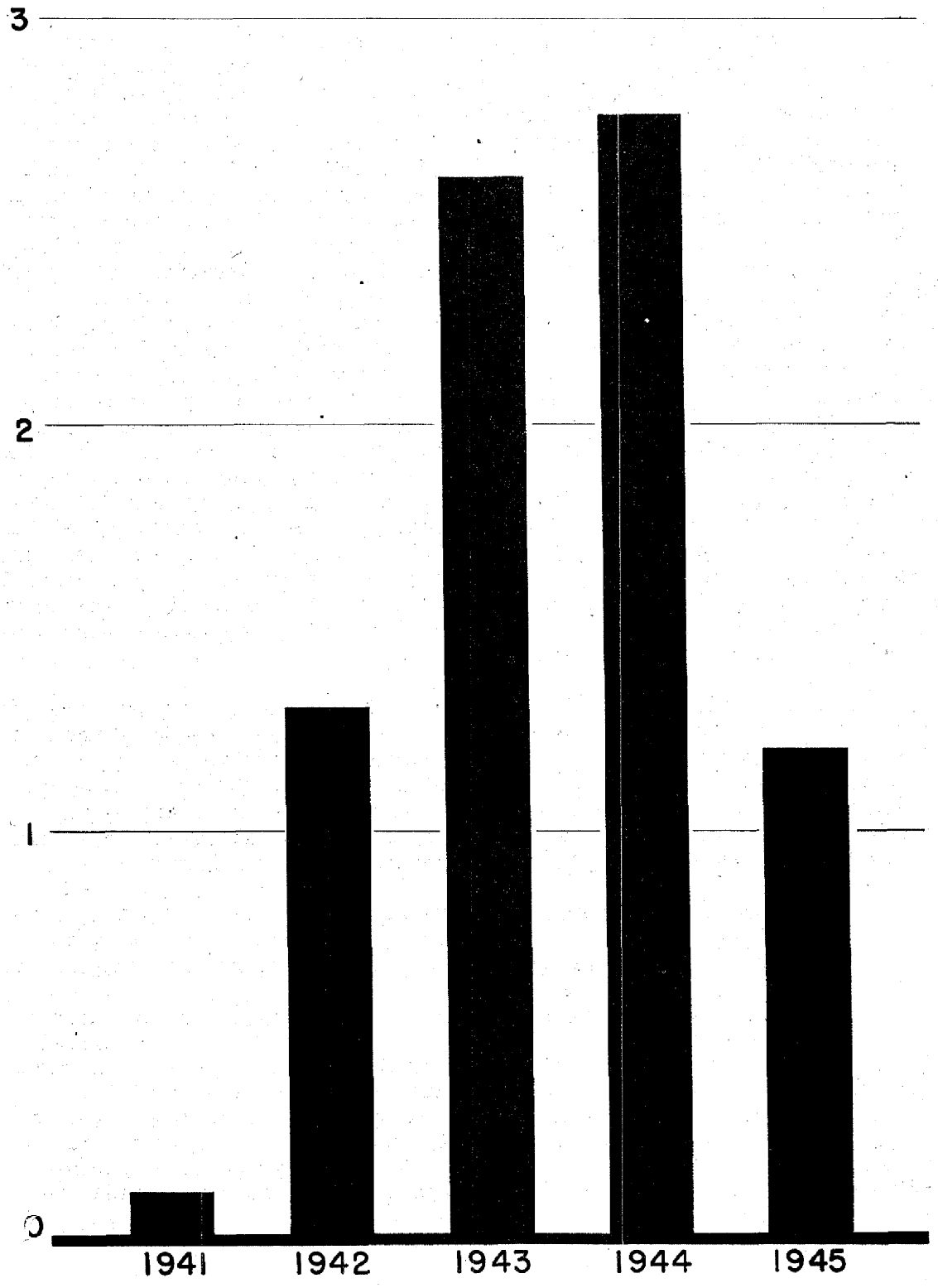
In the early stages of the war, a number of contracts were executed which did not properly provide for such protection of the government's interest in machinery and equipment, and special tooling. To correct this situation, we undertook a special project for the purpose of consummating agreements, known as "overall facilities agreements", with contractors having this type of contract. This established the government's interest in any equipment so acquired by the contractors.

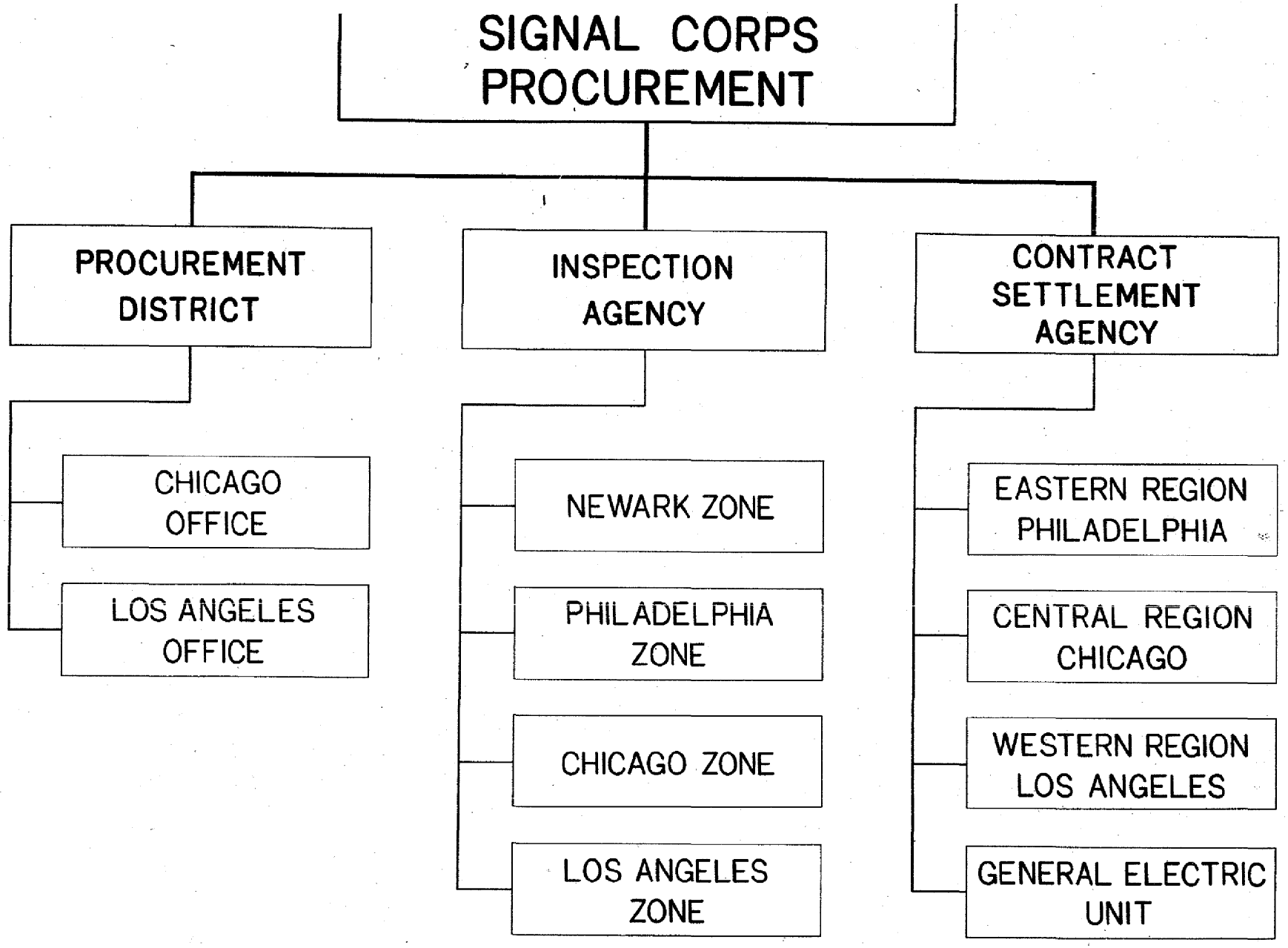
This difficulty clearly demonstrates the necessity of having contract articles available to protect the government's interest, with provisions compatible with the production problems confronting contractors.

Lend-Lease--At this point, I would like to say a few words about our Lend-Lease activity. Our procurement on behalf of the so-called Lend-Lease nations was an additional load to the already increasing demands of procurement for our own forces. The total value of Signal Corps equipment shipped to all Lend-Lease countries, as of 30 June 1945, was approximately one billion dollars. A little more than half of this amount, was for "common" or "standard" Signal Corps equipment transferred to these countries. While these standard items increased the

PRODUCTION

(BILLIONS)




SIGNAL CORPS PROCUREMENT
PROCUREMENT DISTRICT
INSPECTION AGENCY
CONTRACT SETTLEMENT AGENCY
CHICAGO OFFICE
LOS ANGELES OFFICE
NEWARK ZONE
PHILADELPHIA ZONE
CHICAGO ZONE
LOS ANGELES ZONE
EASTERN REGION PHILADELPHIA
CENTRAL REGION CHICAGO
WESTERN REGION LOS ANGELES
GENERAL ELECTRIC UNIT

total procurement load, few additional troubles were encountered beyond those which we were already experiencing on our own standard items authorized by the Army Supply Program.

The remaining quantity of material furnished the Lend-Lease countries, represented the so-called "non-common" equipment which was on a separate supply program. This equipment--largely vacuum tubes, dry batteries, capacitors, spare parts, nontactical equipment, etc.--was the biggest headache of our Lend-Lease job. These items were generally nonstandard and cut across the same production facilities as those supplying the standard items on the Army Supply Program. The natural result of this noncommon procurement was to increase the variety of similar types of equipment being produced, thus decreasing the production which might have been achieved had there been fewer types of items. This problem was only partially solved by securing the cooperation of the Lend-Lease nations in accepting our standard items as substitutes.

Production Control--The Army Supply Program, in theory, controlled the annual requirements for all major items of Signal Corps equipment. I say "in theory" because in actual practice, the Army Supply Program was changed and amended many times within a single year. New tactical units, additional theater demands, changing International Aid requirements--all these led to widely fluctuating demands. In order to meet these changing requirements, we found it necessary to hold production forecast meetings each month with our procurement districts. At these meetings, we discussed the causes of failure to meet the preceding month's objective; took steps to apply corrective measures where the need existed; and set up the succeeding month's production rates based on the latest change in requirements. As soon as the monthly production rates were determined, our contractors were notified by teletype of the quotas which the Signal Corps expected them to meet. These production quotas were followed closely during the ensuing month by our production expediting people in the field. They aided the contractors in solving their many and varied production difficulties, thereby insuring that on the whole, our goals were met.

Inspection--The importance which the function of inspection assumes in wartime is not often fully appreciated. Of course, the primary purpose of inspection is to insure proper performance and durability of equipment in the field. Under wartime conditions, it is essential that these qualities be guaranteed before the product is packed for export--before it is allocated valuable cargo space--before it is shipped to distant points where maintenance service is limited. These incentives are much more urgent than the mere objective of inspecting the product before the Government pays for it. We have found that the plant, where our equipment is fabricated, is the place where inspection should be performed. Early in the war, we established the Signal Corps Inspection Agency, with geographical subdivisions, entirely separate from our other organizations. We laid down the inflexible rule that inspection at any plant must be performed only by the Inspection Zone in which territory the plant is located. This gives each manufacturer only one point of contact on Signal Corps inspection matters. To those who have experienced

the confusion which results from multiple contacts between government and industry, the advantages of this system will be obvious.

Our biggest inspection difficulty was securing, developing and retaining qualified inspection personnel. The inspection organization grew from a peacetime strength of less than 100 people up to 6,000 by the middle of 1943. Obviously, made-to-order inspectors were not available in the quantities required. It was necessary to organize intensive training programs for new personnel. Furthermore, as new developments were made from time to time in equipment and in packing methods, it was necessary to retrain old employees. The employment of women for highly technical testing and inspection operations was eminently successful and aided materially in solving the personnel problem.

While intensified rapid training can go far in preparing people to handle the technical aspects of inspection, it cannot develop leadership, management, and judgment in individuals not inherently possessing these qualities. The requirement for a sufficient number of competent supervisors, capable of assuming widely diversified responsibilities, was one of the most urgent problems of our inspection organization. Our need for this type of personnel was never fully satisfied. Experience with this problem taught us that there must be a peacetime system for earmarking and training key personnel, based on a realistic understanding of the magnitude and character of the wartime inspection job.

The subcontracting procedure gave rise to a situation against which our inspection people had to guard. Prime contractors, in some instances, requested that Signal Corps inspectors be placed in the plants of subcontractors to insure the quality of components and subassemblies. This constituted a drain on our supply of inspectors, and relieved the prime contractor of part of his responsibility for quality of end item. We found it necessary to place strict control on this type of inspection, and it was permitted only if required to protect the government's interest.

Conclusion--Gentlemen, in conclusion we are going to leave some ideas on the subjects of Facilities, Materials, Contracting and Inspection.

First--Facilities:

1. Greater planning emphasis should be placed on the producers of component parts.
2. Close coordination of procurement with research and development organizations should be maintained to insure timely establishment of facilities for newly developed items.
3. There should always be available flexible and clearly defined methods of financing plant expansions.
4. Educational Orders should be used to the greatest extent possible.
5. Close coordination with industry is essential and its full cooperation must be secured.

Second--materials:

1. Complete knowledge of all materials going into our equipment is essential--preferably based on machine tabulations.
2. Full coordination with other Services and civilian agencies should be maintained to establish total requirements.
3. Substitution and conservation of materials should be continually studied and encouraged.
4. "Special" or critical materials should be anticipated, so far as possible.

Third--contracting:

1. The peacetime organization and operation should be adaptable to rapid expansion to meet wartime demands.
2. It should not be necessary to change basic contracting procedures in the event of war.
3. Letters of intent and letter purchase orders speed up procurement.
4. Contract articles should be available to protect the government's interest in manufacturing facilities, and should be flexible enough to meet contractor's need.

Fourth--inspection:

1. Inspection at the source and on a geographical basis was found to be most satisfactory for the Signal Corps.
2. A peacetime system of earmarking and training key personnel in industry is essential to meet the large wartime inspection needs. This personnel requirement also applies for all procurement functions.
3. Inspection at subcontractors' plants should be limited to protecting the government's interest.

With regard to future planning, the Signal Corps' industrial mobilization plans have always contemplated complete reliance on commercial sources to meet our requirements. We have no arsenal system, nor do we maintain and operate industrial plants to full first emergency requirements, as do some of the other Services. Therefore, our first efforts must be directed toward preparing, educating and assisting industry in every way possible to assume the burden it will have to carry in case of another emergency. We are going to know what industry is doing; and we are going to let them know what we are doing. We are not going to overlook any angles that we have learned, if we can help it.

GENERAL ARMSTRONG:

General Arnold, I congratulate you on your careful and thoughtful analysis of the Signal Corps' experience in procurement. It is going to be a very valuable document for the records of the Industrial College. I can speak, I think, for the Class of 1927 when I say we are very proud of our classmate and of his ability to tell a most interesting and valuable story.

Incidentally, you touched on something that is of profound importance to the work of this class and which has not been considered up to this time. It is a curious coincidence that yesterday afternoon I called Captain Worthington into my office and pointed out in our discussion that so far we have been talking almost exclusively about the question of quantity; that the equally-important question of quality, which General Arnold has so clearly brought out this morning, has been almost untouched. We shall pay a high price if, in the work of this class, we do not consider quality controls and the effect of quality controls on production. So, I am going to have here later on a good speaker on this very subject.

General Arnold, who was it that discovered the lack of quality in your field wire which was indicated by the slump in production which you referred to, and which we all recall, as a consequence of the trial of the officials of the wire companies for falsifying their inspection records--if that is what it was--on that wire? And how was it that they could do that?

GENERAL ARNOLD:

Well, certain of the company officials were indicted. I have looked into the facts that resulted, but as to how that situation was brought up and uncovered I cannot say. I was not in here at the time. I do not know. Do you recall, Major Arnn?

MAJOR ARNN:

No, sir. I do not know whether the case came up because of our own inspection findings or what the details were at that time. Maybe someone here can tell you.

GENERAL ARNOLD:

Maybe someone who was in Procurement at the time could tell us. Perhaps Mr. Brown might know.

MR. BROWN:

Now I am not definite as to what I know of it, but I understand the complaints came from the Russians.

GENERAL ARNOLD:

Well maybe the Russians could get through a complaint better than I could.

A STUDENT:

General, I believe I might contribute a thought on that. There was some squawk from the Russians with reference to the field wire. But I also believe some of the personnel in the plants repeated the story and the F.B.I. got in there, investigated it, and found the phony equipment,

whereby when they went through it showed the readings on the apparatus, but it actually was not up to par.

GENERAL ARNOLD:

The point that is so interesting to me is what part of it was covered by our own inspection of the plant.

A STUDENT:

I do not know whether it was one of our own inspectors who brought it up or whether it was a company employee. I just recall having been on the fringes of it at the time. I know there were some people who squawked in the plants and the F.B.I. got into it then.

GENERAL ARMSTRONG:

You always end up with the question, Who is going to inspect the inspectors? That is a good example.

Any questions, gentlemen?

A STUDENT:

General Arnold, I wonder if you would touch on the procedures that the Signal Corps used in handling their contract terminations. I believe they were a little bit different from some of the other Services.

GENERAL ARNOLD:

No, we are not different. We followed the same regulations. Of course we have a pretty tough nut to crack up at General Electric. We are handling terminations up there for everyone--Navy, Ordnance. Actually we were probably one of the smallest contractors at General Electric in terms of the volume of work they turned out. But we are not handling any contract terminations in any way different from others that I know anything about. Have you reference to any particular thing?

A STUDENT:

Yes I did. It was more with respect to the manner in which you were handling them in your organization; that is, turning the contracts over to the Contract Settlement agency and letting it handle the contracts from that point on.

GENERAL ARNOLD:

Well, we have a district contract termination setup in Chicago. We have one in Los Angeles for the western group; also one in Philadelphia for the eastern group. One also in Federal to take care of the company-wide settlements in Federal. One in G.E. to take care of the company-wide settlements in all G.E. plants for all government contracts.

Now the organization is such that the contractor submits his claim to the office which covers his district, or which covers his area, whether it is Chicago, Philadelphia, or what not. We also have an office in Philadelphia which supervises the over-all operation and takes care and reviews contract terminations over and above a certain amount. But most of the claim is settled right in the field offices.

GENERAL ARMSTRONG:

Gentlemen, I think the importance of the work of the Signal Corps is something that General Arnold has brought out this morning. An old artilleryman like myself knows pretty well what Signal Corps equipment means. I do not know whether it was more important up at the front, General Arnold, or in time of peace when you were getting hungry and you were waiting for that final "Close Station, March order." But at all events it was always a most essential and useful part of our military equipment.

That is all, gentlemen.

(4 March 1946--200)