RESTRICTED

THE PRODUCTION DIVISION, ASF--PROBLEMS FACED IN 1942-45, WITH CONCLUSIONS

13 February 1948

L48-86

CONTENTS

Page

SPEAKER--Brigadier General H. C. Minton (Retired), Vice President and Manager, Production Department, Koppers Company, Inc. 1

GENERAL DISCUSSION 10

Publication Number L48-86

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

WASHINGTON, D. C.

RESTRICTED

THE PRODUCTION DIVISION, ASF--PROBLEMS FACED IN 1942-45, WITH CONCLUSIONS

13 February 1948

COLONEL CRANE: Ladies and gentlemen, during the war the problems of coordination of the activities of the various technical services in the Army were finally solved by the establishment of the Army Service Forces. Despite our own personal biases, prejudices, and opinions of what the Army Service Forces did, we all must recognize the tremendous problems of the coordination that was effected by that organization. Those problems were complex and they were great in magnitude.

We are extremely fortunate today in having here to speak to us the Chief of Production of the Army Service Forces during the war. He is not unfamiliar with the problems of the technical services, having served many years therein. You are familiar with his record in that respect. He is not unfamiliar with industry, where he occupies a position of considerable responsibility today in a company which has pioneered in developing an industrial mobilization plan of its own. I take great pleasure indeed, ladies and gentlemen, in presenting to you the Vice President and Manager of the Production Division of the Koppers Company, Brigadier General Hugh C. Minton, retired. General Minton.

GENERAL MINTON: Captain Worthington, Colonel Crane, and Officers of the Industrial College of the Armed Forces: I deem it a privilege to talk to this elite group of Army, Navy, and Air Force Officers. It has been slightly over ten years since I appeared on this platform, or rather on the more modest platform the College used in the old Munitions Building back in 1938. It is somewhat more than ten years since I graduated from the Army Industrial College. The diploma handed me at that time is still one of my treasured possessions.

The College, even in those days, was one place where teamwork was the rule between students who wore blue suits and students who wore tan suits.

The mention of "teamwork" reminds me of a young couple I heard about the other day. They were constantly quarreling with each other. One morning at breakfast Friend Wife got up from the table after a wordy battle, walked over to the window, and noticed a loaded wagon being pulled by two horses. After watching them for a few minutes, she called to her husband, "Peter, come over here and look at this team of horses pull together." Peter walked over to the window and watched the team of horses pull the loaded wagon. His wife turned to him and asked, "Peter, why can't we pull together like those two horses?" Peter replied, "By heck, Helen, maybe we could if there was only one tongue between us."

It is my understanding that the Armed Forces now have one tongue to speak for them. Certainly teamwork was never more important than today--teamwork within the Armed Forces; teamwork between the Armed Forces and other government agencies; and teamwork between the Armed forces and industry.

Real teamwork among the many war agencies was not achieved until the latter part of World War II. If we can start the next war with all groups and agencies pulling together, we shall have made a real stride towards winning the war--this College has done and is doing a great job in developing the spirit of teamwork.

In tackling any job, it is always good practice to state the objective. The objective of this conference I conceive to be somewhat as follows:

To remind you of the size of the procurement job of the Army Service Forces and to again outline to you the ASF organization.

To briefly discuss the Production Division, ASF, its mission, organization, personnel, fields of interest, procedures, and relationship with other Staff Departments, the Technical Services, and the War Production Board.

To enumerate some of the production bottlenecks and road blocks encountered by the Production Division during World War II.

To draw certain conclusions which may possibly be of help in planning for the next war.

Consider the first objective, the size of the ASF procurement job and the organization of the ASF. I have placed before you several charts. Look first at No. 1. This chart appeared in the Production Division's Progress Report for 31 August 1945, and is a record of procurement during the war years and a projected schedule through the calendar year 1946. The chart, I think, speaks for itself. (Charts attached to lecture.)

Please refer now to chart No. 2. This is the over-all organization chart of the Army Service Forces as of 15 June 1945. Under the functional Staff Divisions you will find a main division, Director of Materiel. Under the Director of Materiel there is shown the Production Division, along with five other divisions. We are going to talk about this Division for a few minutes.

Now look at chart No. 3. This is the organization chart of the Production Division as it existed on 30 May 1945. The Division was in existence from the early part of the war until well after VJ-day.

711

Briefly, the mission of the Division was to:

Assist in assuring fulfillment of the ASF supply objectives by initiating, developing, and supervising policies and procedures relating to production activities within the technical services.

Represent the ASF in all echelons of the War Production Board on all matters relating to production, and

Supply personnel and services to the Army and Navy Munitions Board.

The activities of the Division were divided into two groups, one under the Assistant Director for Production Service with five Branches, the other under the Assistant Director for Materials and Products with seven Branches.

In general, those functions and duties which had to do with production activities within the technical services came under the Assistant Director for Production Service, while those which had to do with production activities within the War Production Board came under the Assistant Director for Materials and Products. There were some exceptions to this generalization. These exceptions are, I hope, made clear in the organization chart and in the procedure chart, which we will consider a little later.

There were five Branches under the Assistant Director for Production Service. Consider first the Program and Liaison Branch. It had to do primarily with programmed procurement, scheduling and adjusting programmed procurement, production scheduling and reports, liaison with the technical services and with cutback procedures.

The Production Urgency Branch had to do with the many types and kinds of control set up during the war by the War Production Board and its predecessors. These controls started, you will recall, as early as the summer of 1940, when it was found necessary to give military orders preference over civilian orders. This was done through the priority system. This system, with various modifications, lasted through 1942, when the war machine really began to gain momentum and the demand for materials greatly exceeded the supply. The priority system was not designed to control procurement but merely to fix the order of essentiality of contracts. This weakness led to the Controlled Materials Plan, which was a means of cutting materials requirements to fit the available supply. It was a tremendous job to inaugurate the Controlled Materials Plan. The Plan became effective in the second quarter of 1943.

Before leaving the Production Urgency Branch, we should mention the fact that the Branch worked closely with the Special Rating Division of

the WPB. This you will recall was the division that administered the triple A rating. This rating was of an overriding nature which could be extended and served to break bottlenecks within prime as well as subcontractors' plants. It was used to accelerate the delivery of urgently needed end-items.

Also, you will recall that there existed an even more powerful instrument than the AAA rating. This was known as a "directive." A directive superseded all other ratings and effected the required delivery by diversion from some other order or by scheduling the fabrication of the item ahead of all others regardless of preference ratings.

The Facilities Branch was charged with handling the Division's responsibilities to the Under Secretary of War and the Commanding General, ASF, for industrial facilities. Assistance was frequently given the War Production Board in expediting the construction of facilities required for programs which were mainly the concern of the military war agencies. Important programs of this type were for penicillin, atabrine, and sulfuric acid facilities for increased powder production.

Another duty of the Facilities Branch was to assist in providing labor for critical Army Service Forces plants. Manpower first became really critical in the summer of 1943 and on the west coast where there was centered ship construction and airplane production. The Production Urgency Committees and Manpower Priority Committee set up on the west coast later spread to other critical areas until at one time some 125 of these committees had been established throughout the country. ASF was represented on all of these committees.

The Requirements and Demobilization Branch had to do with planning for demobilization. This work was started as early as April 1944 and a practical plan was evolved. When VE-day finally came most of the necessary actions had been anticipated and it was only necessary to order them into effect.

The Foreign Branch, the last of the Branches under the Assistant Director for Production Service, was concerned with production activities in France, Italy, and Belgium after these countries had been liberated by the Armed Forces.

Please look now at the other side of the organization chart and note the Branches under the control of the Assistant Director for Materials and Products. The Specifications and Inspection Branch had to do with conservation, inspection, specifications, and standards. This Branch was under a member of your present faculty and I am sure Colonel Neis has told you plenty about how busy he was during the war.

Three of the remaining six Branches were concerned with commodities, metals and minerals, textiles, leather and rubber, and three with transportation and automotive equipment, general industrial equipment, utilities and machine tools.

These Branches paralleled bureaus and divisions of the War Production Board and the officers assigned to the Branches worked in the main directly with the WPB personnel. In fact, they lived with them. These officers were ASF representatives on WPB Divisional Requirements Committees. They kept the division director, deputy director and assistant directors informed of all activities in the WPB concerned with production. These officers were all men from civil life with fine industrial backgrounds or were technical experts on such materials as steel, chemicals, textiles, forest products, etc.

I should like now to mention the very fine personnel we had in the Production Division during the war years. All of the officers came from civil life, were either Reserve Officers or were commissioned directly. We found early in the game that in dealing with the services we did not need production specialists, but rather men with broad business training; men who could interpret statistics; men who could deal with the top people in the technical services and in the War Production Board. Bankers, lawyers, engineers, and business men all did fine jobs. The technical services were made up of trained specialists and it was their business to carry on the details of the production program. It was our business to see that these programs were carried out expeditiously and insofar as possible economically. I cannot say too much in praise of the officer and civilian personnel of the Production Division.

The fields of interest of the Production Division covered practically everything having to do with production, including production operations, management, techniques, equipment, organization, processes, programs, plans and controls, and cost reduction, labor utilization, equipment utilization, data and reports, new plants, inspection and quantity control, maintenance, materials and materials handling, incentive plans, programming, and scheduling.

Now as to procedure, both within ASF Headquarters and with the technical services and the War Production Board, I thought you would be interested in having chart No. 4, which shows, and I am sorry it is not more readable, the flow of work from branch to branch, division to division, and agency to agency. You may care to examine this chart at your leisure. We haven't time to discuss it this afternoon.

None of the ASF Staff Divisions worked in a closed room. We were continuously in contact with other staff divisions both ASF and General Staff. We worked with all of the technical services but always in a

staff capacity. One of our troubles, as I look back, was teaching our officers from civilian life how to function on a staff assignment. Many of them were big operators in civilian life and their natural tendency was to go out and do the job which was the responsibility of the technical services. General Lucius D. Clay, when he was Director of Materiel, issued a memorandum on staff procedure which I have always considered outstanding. All of the officers of the Production Division were required periodically to read and reread this memorandum. New officers joining the Division were required to read and absorb it.

Our relations with the War Production Board were direct and continuous and, in spite of articles that appeared in the newspapers from time to time during the war, usually pleasant and cordial. Its people were the same kind of people that we were and I must say we had very little difficulty working with most of them. Of course, occasionally some of the WPB personnel would attempt to do not only his own job but also part of the Army's job. This we naturally objected to and would not permit.

Our third objective concerns production bottlenecks and road blocks. Most of the production bottlenecks, road blocks, problems, difficulties--call them what you may--that continually bothered us during the war period stemmed from requirements, facilities, materials, labor, controls, contract placement, and distribution and maintenance.

First of all take "Requirements." Requirements fluctuated constantly and continuously. This was bad for short, lead-time items and worse for long, lead-time items; many of these required over twelve months to produce. I suspect more time and energy were expended on the subject of requirements than any other single subject; yet I must say we never found during the war a satisfactory solution from the production point of view. When the Army Supply Control System came into being, we were told what the "procurement objective" was for each item in the supply program. This amount had to be resolved into a more practical figure which was termed "Programmed Procurement." This programmed procurement figure was arrived at after giving consideration to production feasibility. Determination of production feasibility involved a detailed consideration of labor, facilities, materials, and components required for the manufacture of an item. It was, of course, impossible in many cases to realize the procurement objective because of lead-time considerations and a production limitation amount was established. If the procurement objective was decreased from the previous figure, cutbacks or reduction in programmed procurement was necessary.

We were always quite rigid about this in order to conserve materials and make labor available for other programs. The "production limitations" placed on certain items served as a notice to supply echelons that there

probably would be a shortage of this item. Distribution and supply agencies could then plan accordingly. A regular procedure was worked up with the War Production Board for utilizing facilities released by cutbacks in the Army Program to other war agencies. Similarly, new facilities, if required, had to be approved by the War Production Board in order that availability of labor, materials, etc., could be given appropriate consideration in an over-all sense.

During the war someone coined the phrase "The Fluidity of War." I believe this phrase aptly described the reason for the many fluctuations in requirements. At any rate, it was used to great advantage in explaining to contractors why their contracts were radically changed from time to time and on very short notice.

Next consider facilities.—We had the problem of new versus existing facilities. Was it necessary to really construct a new plant? How big should it be? What should be its character? Should it be for a complete end-item or for components? Where should it be located and what considerations should govern its location? We, of course, now have additional worries—dispersion and whether or not a new plant should go underground.

For all of the critical items we tried to have more than one source of supply; this should be of even greater importance in your present planning. Bear in mind that new facilities for some of the more complicated items of ordnance required a long time to construct. Therefore, constantly changing procurement programs greatly influenced the need for facilities, their size, location, etc.

Now materials.--We didn't know enough about the over-all availability of materials required for the production of the items in the Army Supply Program. We didn't have suitable bills of material for the items in the program until the CMP came into being. Without accurate bills of materials, materials requirements couldn't be accurately computed. We were slow in starting conservation measures and measures for controlling our supply of materials. We were slow in developing and adopting substitutes for strategic and critical materials.

Next let's take labor.--We had insufficient knowledge of labor availability in our great industrial centers. We didn't know labor requirements for specific plants or for specific items in the supply program. We didn't have good methods for settling grievances. We couldn't prevent strikes, and didn't get good production from the labor that was available. Many plants had to be constructed in sparsely settled areas, like loading plants, high explosive plants, etc. To staff these plants, we had to construct housing on or near the plant sites. Labor had to be secured from other areas. This in turn frequently resulted in decreasing the labor supply in these areas to a point where plants already in production could not be manned. In short, we never did at anytime during the war have real control of manpower.

Affecting requirements, facilities, materials, and labor, were the several nation-wide control systems set up during the war. We first had a priority system to insure that the more urgent military programs were speeded up at the expense of civilian items and less urgent military items. The priority system was not designed to control materials and failed when materials became the great stumbling block, as happened in late 1942 and 1943. This failure led to the Controlled Materials Plan. This Plan did work but required tremendous quantities of paper and a lot of people to make it work. This Plan really became effective, I believe, in the second quarter of 1943. Then we had WPB limitation orders to control the supply of other relatively scarce materials. We have already mentioned triple A priorities to insure that a specially urgent program received attention ahead of less urgent programs. We also had "Directives," which were a more stringent method of favoring one item or program over another.

While not the direct concern of the Production Division, contract placement had a tremendous bearing on the speed with which an item could be placed into production. Various methods were developed, and I am sure you are familiar with all of them. We used "Letters of Intent" in order to get projects underway quickly and letter contracts; then there were two basic methods of contracting for supplies, the cost-plus-a-fixed-fee type and the fixed-fee type. Then we had no satisfactory pricing method until towards the latter part of the war. This led to renegotiation to insure that undue profits were not made by manufacturers.

Distribution was not a function of the Production Division but did affect requirements and, therefore, facilities, materials, and labor. The better the distribution system, the smaller the number of items required to fill the pipe line.

Maintenance of equipment in the field requires spare parts. The production of spare parts all through the war affected the production of end-items, and in many cases it was necessary to even stop the production of end-items in order to insure availability of spare parts in the several theatres. I do not believe the spare parts problem was ever satisfactorily solved and perhaps it is impossible of solution. Certainly tremendous quantities of spare parts were manufactured, yet there was always a demand for more and more spare parts from overseas commanders.

We come now to the fourth and final objective of this Conference—Conclusions," which may possibly be of help in planning for the next war.

I think we can agree that the next war will come quickly and with little advance notice. It will be an all-out war and will stretch even our great productive capacity to the limit.

We should know now--today--our over-all or total requirements. Total requirements for an all-out war equals the sum of essential civilian and military requirements.

Our total requirements must be balanced against our total supply potential. This procedure may be visualized somewhat as follows.

Our total supply potential less minimum essential civilian requirements leaves a remainder for the military effort. Strategic war plans are evaluated against this remainder. Army, Navy, Air Force, and Maritime Commission requirements are adjusted to fit this military remainder. A tailor cuts his suit to fit his cloth; so will each of the Services adjust its requirements to fit that part of the military remainder allocated to it by the agency having this responsibility. I imagine it is still the Joint Chiefs of Staff.

This would appear on the surface to be a difficult job, but it needn't be so. Every military end-item has a controlling element. This controlling element may be a critical material, or an important component or a facility for producing the item itself. Many times during the war we were forced to cut back or adjust programs because there wasn't enough steel, or copper, or aluminum, or rubber, or ball bearings, or small motors, or aviation gasoline, or manpower to do what all the war agencies wanted to do. Next time it may be petroleum. Let's do this cut-and-try business ahead of time and not bog down as we did with facilities in 1942; with materials in late 1943 and with manpower in 1944 and 1945.

Next time let's be sure that our requirements can be cut from our materials cloth, our facilities cloth, or our manpower cloth. Let's have a minimum of war agencies and let's have that minimum simple and direct. Let's have command authority and not boards and committees. Let's have simple and direct controls for facilities, materials, and manpower and let's have these controls ready before we need them and not be forced to develop them when the production machine bogs down as was the case in World War II.

Let's consider conservation measures and substitutes ahead of time and above all let's have ample stock piles of strategic and critical materials. Let's have our designs production engineered for mass production. Let's have "bills of material and manpower" ready for each end-item and each component.

Now we talked rather glibly awhile back about balancing total war requirements against total supply potential. I have heard the phrase "total supply potential" used many times. I don't believe we know what our "total supply potential" is and after we get into a fighting war it will be too late to find out. The phrase certainly includes the things

we grow on the farms, dig out of the mines, extract from the ocean or pull out of the air. All of it stems to a degree from industry, even the agricultural part.

If then we knew our national industrial potential, we could form a pretty good idea of our total supply potential. Our industrial potential is a composite of the industrial potential of each plant, each company, and each industry, including oil, transportation, mining, agriculture, etc.

We need to know our national industrial potential in some detail before allocations can be intelligently made; before the feasibility of strategic war plans can be fairly determined and before a balance of total requirements against total capacity can be achieved.

We need now a living, working Industrial Mobilization Plan with industry participating actively rather than passively. We need now as full a knowledge as possible of requirements, both military and essential civilian; and we need now a detailed knowledge of the Nation's industrial potential. If we don't have these things now, we should get them as soon as possible.

Now please don't forget the idea of teamwork--teamwork within the Armed Forces, between the Armed Forces and other government agencies, and teamwork between the Armed Forces and industry.

Thank you.

QUESTION: General Minton, you have mentioned measuring the total supply potential and the industrial potential. What would you suggest as a yardstick for such measurement?

GENERAL MINTON: I think you have to know your over-all industrial potential before you can do it. I don't think we know that. Do you think we do?

QUESTION: No, sir: I do not. That is the problem I am working on right now. We have to know how to measure it.

COLONEL CRANE: He is looking for a common denominator, I think.

GENERAL MINTON: One theory is that our national industrial potential could be built up plant by plant, company by company, industry by industry, and finally the sum total would be the over-all industrial potential for the country. That is a big job.

QUESTION: Colonel Crane has mentioned the industrial mobilization plan which has been developed by the Koppers Company. There were brief

references to that in the "New York Times" a few months ago, and I have assumed that that same plan is a licable generally to industry. Would you care to sketch the high lights of the elements of that plan?

GENERAL MINTON: The company I work for has as its president, General Somervell. It was quite natural that we should develop a company industrial mobilization plan. It took three months to make it. We never put one extra person on the pay roll to do it. We started with the plants, and had the plant managers prepare returns showing the complete data for their plants.

Now, our company has, I think, fifty-six plants. These plants funnel up to the president of the company through operating divisions. Each operating division is headed by a vice president and general manager. So the returns of the plants under a particular operating division funneled to the office of the head of that division and were consolidated there. Finally each operating division's plan funneled up to company headquarters and all were consolidated on a company basis.

The plant surveys themselves are the basis for the plan. They are rather complete surveys. We use them in our day-to-day business. Even aside from the possible help they might be in an emergency, I think they are well worth while in day-to-day operations.

There are about six hundred pages all told in all the plant returns, the division returns, and the composite for the company. We could not reproduce all of the plan, but we did reporduce, in pamphlet form, the composite for the company. We have that available and have given copies of it to the Munitions Board and to the National Security Resources Board. I will be glad to leave a copy of it with Captain Worthington.

We have also set up within the company's regular organization an Industrial Mobilization Organization. The president is the director of Industrial Mobilization; the vice president and manager of the Production Department is the over-all Industrial Mobilization representative for the company; each Operating Division general manager or his production manager is the Industrial Mobilization representative for the particular Operating Division; and each plant manager is the Industrial Mobilization representative for his plant. These key individuals, spread throughout the organization, are kept advised of current developments in Industrial Mobilization Planning. Each of these executives has within his possession a copy of that portion of the company's Industrial Mobilization Plan which pertains directly to his phase of the company's business.

We wanted to be in a position so that, if the Navy or the Army or the Air Force came to us and asked, "What can you do and where can you do it?" we could tell them right away what we did in World War II, what we are doing now, and in addition what other thin s we think maybe this particular plant or that particular plant could do. And we are in that position.

QUESTION: I would like to pursue that just one step further. Are the Armed Services working with you in any way to utilize your plan in their plan now?

GENERAL MINTON: I am sure they will. When they reach the stage for allocations and detailed planning, I am sure they will use some of the data we have accumulated.

QUESTION: What would be your recommendations as to what the military services should do in seeing that similar surveys are made or in seeking to get similar surveys across the board in industry?

GENERAL MINTON: I would not have a recommendation to offer on that.

There has been some interest shown in our company's plan. We have sent copies to other companies and to individuals. Other companies have developed their own plans. Our outline includes, I think, all the information the Munitions Board or the Chief of Ordnance or the Quartermaster General or the Navy or the Air Force might ever need to know about our plants. Our outline might not be directly applicable to other companies; but its principles could be applied, I think, to any company, large or small.

QUESTION: General Minton, I would like to carry that just a little further. Assuming that by some means you have determined your total industrial capacity, and that then on the other hand you have your military requirements in the form of end-items, can you think of any rapid way, any method of approximation, that would permit a quick check of one against the other? Would raw materials be a possible way of doing that?

GENERAL MINTON: It is certainly a very involved problem. I think you can compute your requirements for clothing, for food, and for other soft, or easy to produce items, and that raw material availability might well be a yardstick for measuring total requirements against total production potential--assuming that you know both of these.

On the other hand, for the hard or difficult to produce items, you have a very different and a much more difficult problem. You always have a better weapon around the corner and you can't stop development.

In my own mind I have divided requirements for these hard items into the "known" and the "unknown." The known requirements ought to be the greater part of your total requirements for whatever the strategic plan may be. You ought to be able to spell these known requirements out in detail and to allocate them company by company.

716

Now, the "unknown" requirements may turn out to be the most important part of your total requirements. You will have new weapons you will want to put in production. Maybe you will have a V-2 bomb by M-day or something equally important. So, in making allocations to industry of the "known" part of military requirements, suitable capacity, perhaps some of the best capacity, should be reserved for these "unknown" requirements which you will want to put into quantity production.

For the "hard" or difficult to produce items, I don't think you can use materials availability as the sole yardstick for matching requirements against potential. It seems to me that you would have to go into considerable detail in planning for the production of this class of requirements. This detail planning would doubtless involve production studies, factory plans, educational orders, and actual trial orders. This type of planning, if carried out on a national scale, should develop the need for new plants on a realistic basis. I am afraid I haven't answered your question very well.

QUESTION: General, getting back to the plant survey problem, would you comment on the practicability of using trade associations as means of getting those surveys made?

GENERAL MINTON: I think they could be helpful. Of course, there are things you need to know when you survey a plant that are not usually listed in the trade association's book of capacities. For instance, one steel mill rolled cartridge brass on a steel rolling mill. Many steel companies made shell forgings. Some of them made guns. So, you need to know not only what their capacity is to make their regular products, but what other things they could best adapt their facilities to produce. However, I would think some trade associations could do that very well.

COLONEL GREER: In your company plan did you consider the availability of labor and anything on the deferment of skilled labor?

GENERAL MINTON: I have that right here. This is what I told you about a while back—the company's composite plan. Everything is summarized in this pamphlet. In the back we have an outline for survey of the plants. For each plant we asked in item No. 3, the number of employees on 30 June 1947, male and female, annual and hourly, and percent skilled. Then we defined what we considered skilled employees and in item No. 26 asked the maximum number of employees at the plant in World War II. Then, in item No. 2 we asked for thumbnail sketches of key personnel (age, education, experience) and also that those key personnel who could be replaced only with great difficulty be suitably marked. For a plant employing 200 people, fifteen to twenty would be classed as key employees and thumbnail sketches would be supplied for them. We did not go into details of actual deferment.

COLONEL CRANE: Is there any record of the age groups in which these skilled personnel happen to be?

GENERAL MINTON: I don't believe we covered the age groups, Colonel Crane. We did have each plant and each division list its key supervisory personnel and scientifically trained personnel and supply a brief sketch of each of them, so that we would know just where we stood in case of war and whom we could spare and whom we could not.

COLONEL CRANE: General Minton, on behalf of the students and faculty of the College I want to thank you for a most interesting and instructive discussion. Thank you very much.

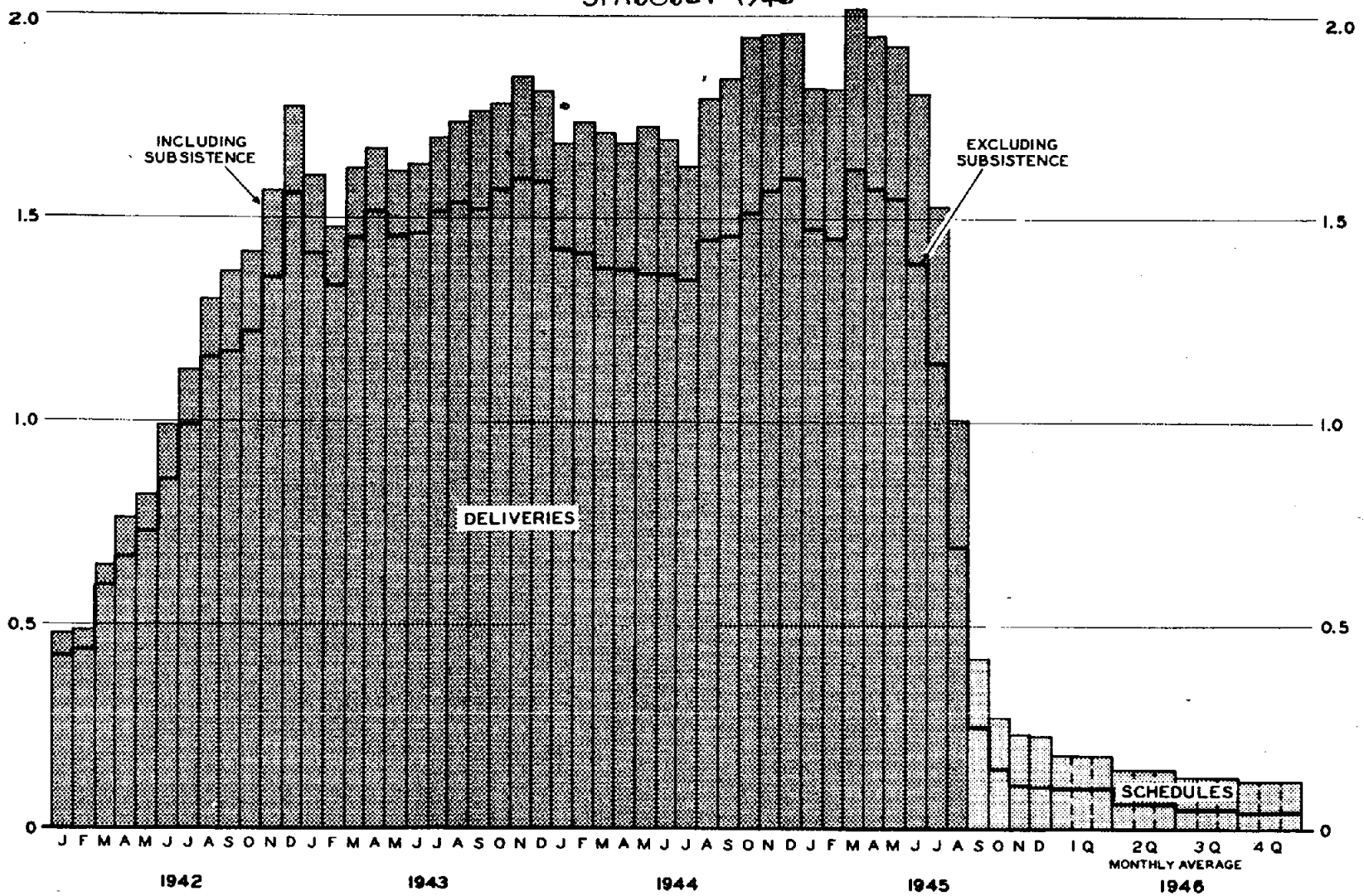
(1 March 1948--450)S.

RESTRICTED

TOTAL ASF PROCUREMENT DELIVERIES AND SCHEDULES

BILLIONS OF DOLLARS

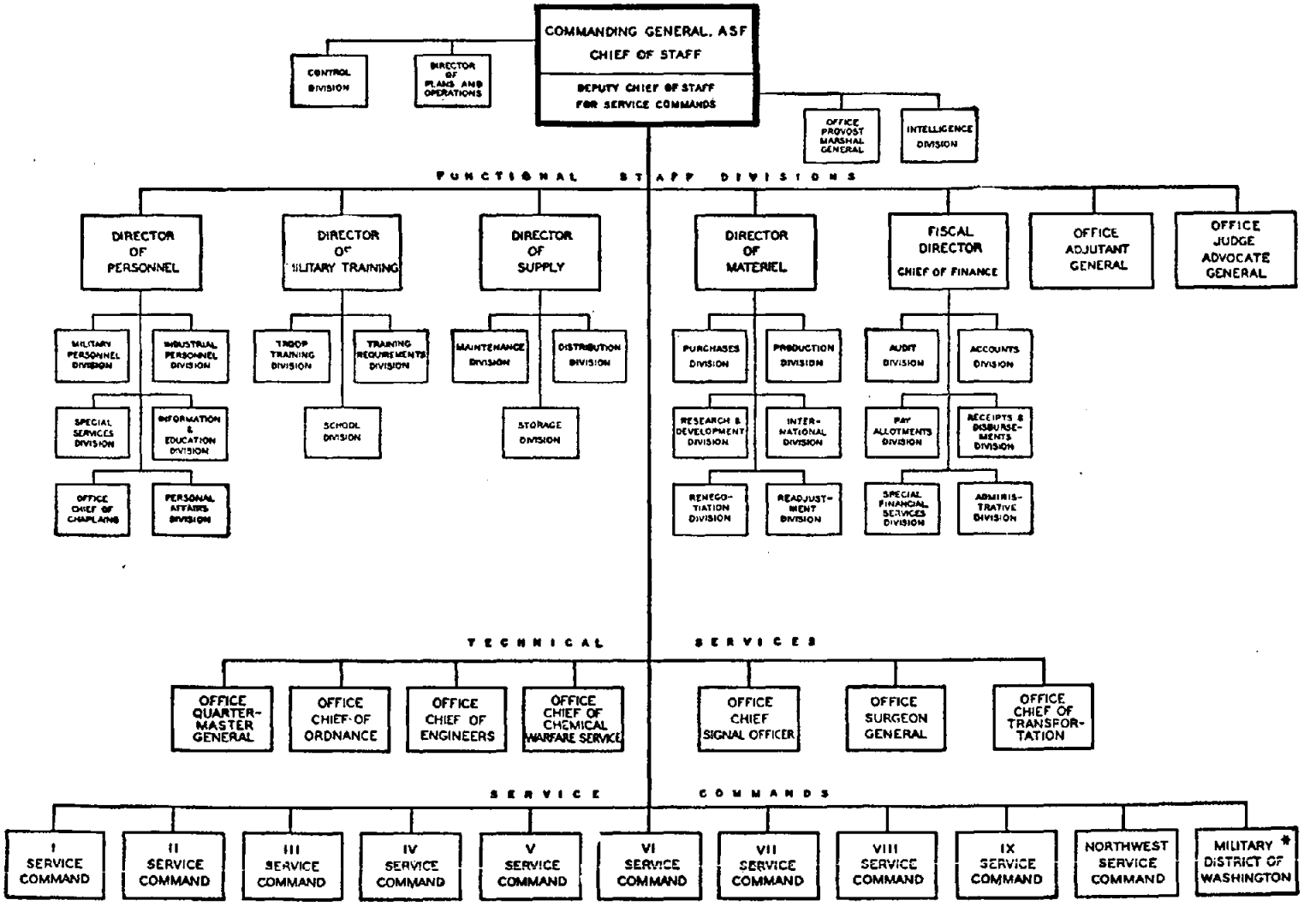
31 AUGUST 1945



RESTRICTED

ORGANIZATION OF THE ARMY SERVICE FORCES

15 Jun 45
Chart D

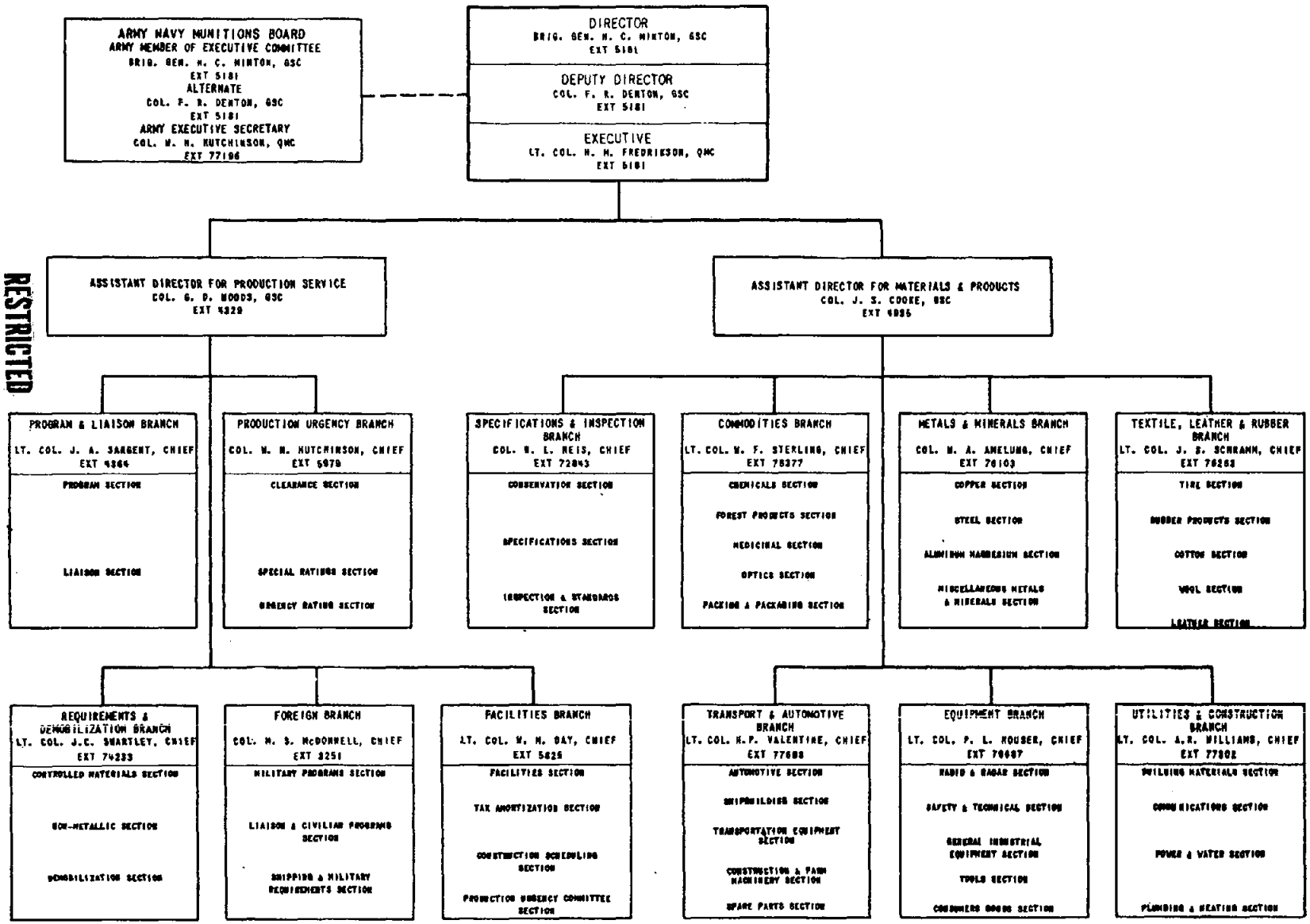


* UNDER ARMY SERVICE FORCES FOR ADMINISTRATIVE AND SUPPLY FUNCTIONS

PRODUCTION DIVISION
HQ., ARMY SERVICE FORCES

APPROVED H.C. Minton
BRIG. GEN. H.C. MINTON, GSC
30 MAY 1945

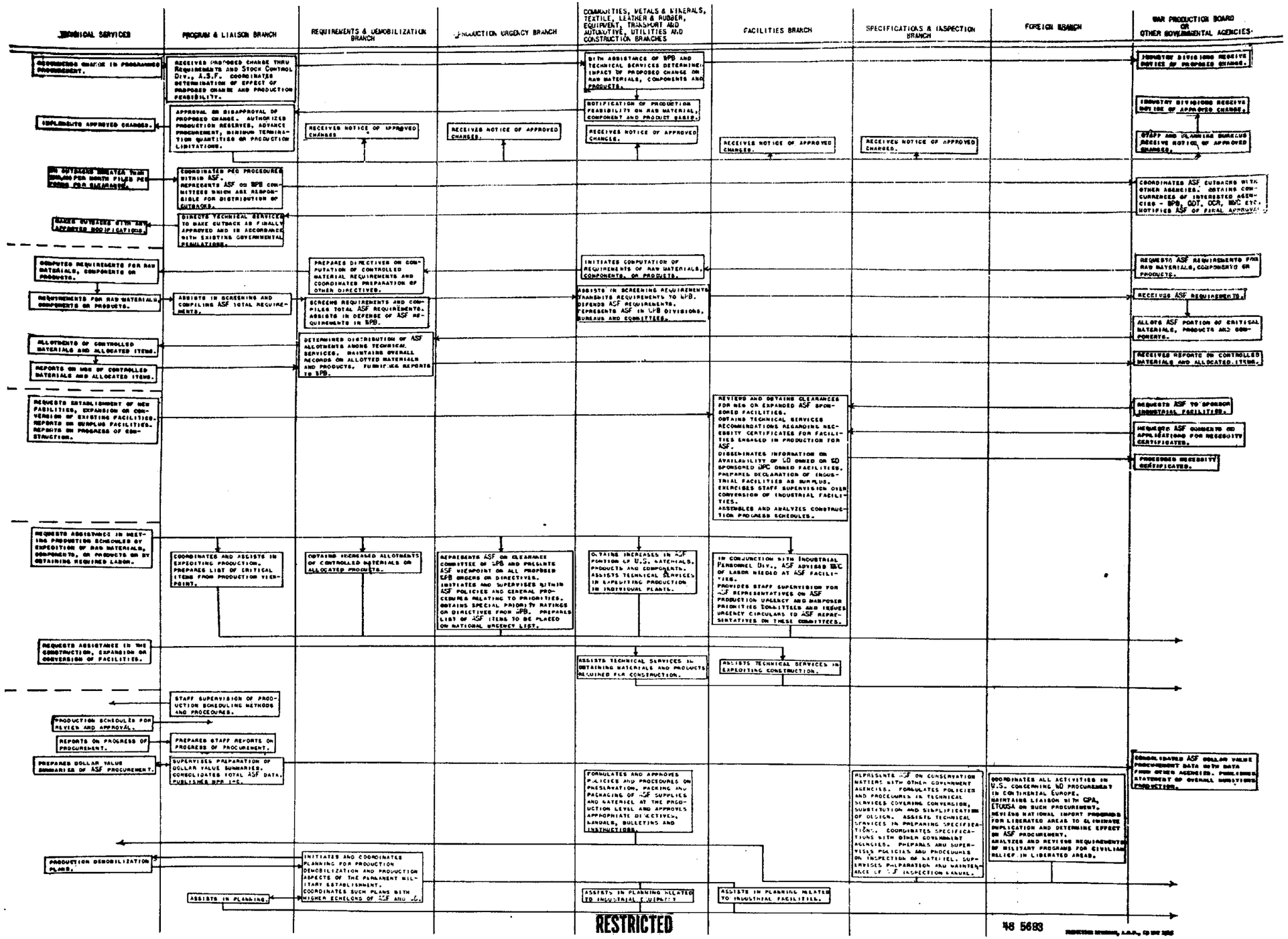
RESTRICTED



RESTRICTED

25-42718-500

PRODUCTION DIVISION, ASF PROCEDURES



48 5693

TECHNOLOGY, WAR POTENTIAL, AND WAR-PLANNING

10 October 1947

CONTENTS

SPEAKER—Ralph E. Turner
Durfee Professor of History
Yale University

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

WASHINGTON, D. C.

TECHNOLOGY, WAR POTENTIAL, AND WAR-PLANNING

10 October 1947

For those who are concerned with military matters the most important single fact in the history of warfare in the twentieth century is that Germany and Japan, the two nations in which war-planning was on the most advanced professional basis, lost their wars. It is the purpose of this brief to examine this phenomenon in order to find, in an explanation of it, some factors important for war-planning to which the German and Japanese general staffs failed to give proper weight.

Both the German and Japanese general staffs drew their theories of war-planning mainly from Clausewitz, the early nineteenth-century German philosopher of warfare. His ideas were formulated largely on the basis of observations and interpretations of the Napoleonic wars. In general these wars were decided by a single campaign culminating in a single decisive battle. Similarly, they were conducted as offensive operations. Also we should recognize that Clausewitz thought in philosophical, not scientific terms. In other words, he sought to establish formal principles applicable to all wars. Except for political factors that set the objectives of a war and, consequently according to his theories, determined its strategy, he was not interested in peculiar conditions that might affect the outcome of a particular war. Although he recognized that weapons and geography were important for the conduct of a war, his analysis of warfare was carried on above the level of their influence.

"War," he said, "was an act of violence pushed to its utmost bounds," its culmination was "battle" for the purpose of destroying the enemy's forces, and its ultimate basis was "the will to victory." Real victory was achieved when this "will" of the enemy, not merely his forces, was broken.

In these terms he developed his conception of the organization of a state for war. The duty of the state was to prepare the "violence." Hence the creation of a military establishment. It was the task of the military establishment to exercise the violence so as to destroy the enemy, usually in "battle." Hence the war-plan. It was the obligation of the nation to sustain the state and the military

establishment with the "will to victory." Hence the inculcation of the military spirit. Thus the nation, the state, and the military establishment were fused in a single shaft of power that could and should be hurled at the enemy at the opportune moment.

However much the foregoing statement may be an oversimplification of Clausewitz's elaborate doctrines about war, they suggest the principles which guided the German general staff's preparations for the wars of 1914 and 1939 and the Japanese general staff's actions in 1941. Both sought to win a victory by quick strokes that would break the military power of their opponents and, thereby, assure a short and successful war.

For an explanation of the failure of the Japanese war-plans, we need look no further than the conclusion of James A. Field, Jr., The Japanese at Leyte Gulf (1947). On the next to the last page of this work which, based on interviews with both Japanese planners and Japanese commanders, assesses the responsibility for the defeat of the Japanese navy, the author says:

> "Much more, however, than a battle of commanders, Leyte Gulf was a struggle of navies and of nations, and in this struggle was implicit all the history of the war. Japanese technical inferiority, most apparent here in the unsatisfactory performance of radio and radar equipment, was the predictable result of an attempt to wage modern war by a people with a short experience of industrial civilization, by a nation with a third rate industrial base . . . . Here as everywhere the past was present: in addition to fighting the United States, the Japanese were fighting history (p. 146-147)."

The blow at Pearl Harbor was surprise and stratagem in the Clausewitz tradition. The seizure of the Philippines, the Malay Peninsula, and the Dutch East Indies, so easily achieved, realized one of the main objectives of the war, and very quickly at that. But the Japanese lacked the shipping required to transform these conquests into a significant addition to their war-potential. As far as the conduct of the war itself was concerned, except as they deprived the enemy of vital resources, they were more expensive than profitable to the Japanese. On the principle "now, if ever," the Japanese war-planners took advantage of what they believed to be a favorable political situation to start a war which, if they had measured correctly their own capacity against that of their enemy, they certainly should have avoided.

Close adherence to the Clausewitz formula only increased the Japanese illusion that victory was possible. And not the least factor in this illusion was the inculcated "will to victory" that the formula emphasized.

The circumstances that brought failure to the Germans in their wars were more complex but no less certain.

In both cases the wars were planned on the theory that a quick victory, by which was meant the destruction of the enemy's military forces, was possible and necessary if the wars were to be won.

Writing in The Art of Modern Warfare, Hermann Foertsch, Colonel of the German General Staff, summarizes the planning for the first war as follows:

> "War for Germany was a question of resistance against superior forces. The strategic foundation . . . was a fight on the inner line . . . . As is well known, the course decided upon in the years before 1914, in answer to this extremely difficult choice, was for the bulk of the German forces to attack the nearest opponent in the West, first, and to defeat him in a great battle, after which the opponent in the east, who, in the meantime, would have to be held off as well as possible, was to be attacked in his turn."

We need not concern ourselves with the events to which this plan led and brought its original failure. We wish to point out, however, that the plan never took account of the ultimate war-potential that could be brought against Germany. Needless to say, its original failure necessitated the use of the submarine in order to prevent the consolidation of the power of England and France, and this action, in turn, contributed largely to the entrance of the United States into the war, with the concentration of the maximum power against Germany.

Of course hindsight is always wiser than foresight, but it is interesting to speculate on what the course and outcome of that war would have been if German war-planners, by their first acts, had sought not the destruction of the military force of their nearest enemy but the creation of a situation that would have made as difficult as possible the concentration of the war-potentials of their western enemies. Undoubtedly such planning would have sent the German armies to the Atlantic ports from Holland to Brittany or even further. The effects of this action upon the western front, the blockade laid down by England, and the German use of the submarine would have given the war a quite different course from that it did take.

The Nazis and the German General Staff undoubtedly believed that the lesson of the failure of the 1914 plan had been learned when they prepared to strike west in 1940. Their campaigns were directed at the seizing of the coasts of Europe from northern Norway to southern France. And they gained their objective with startling ease.

However, they were limited in their preparation for following up this success to the use of the aerial "blitz" against England. It was conceived in terms of the Clausewitz "terror." And it broke on the courage of the English people and, more, on the technological superiority of the English "Spitfires." For the historian it is interesting to observe that this superiority was of the same order as that which brought disaster to the Spanish Armada in 1588. The English vessels were mobile gun platforms carrying a superior fire-power to the enemy by quick advances for delivery and rapid retreats for reloading. The "Spitfires" were also gun platforms carrying their fire-power in a manner that made the mobility of the planes the means of directing and concentrating it. The German heavy and dive bombers were at a disadvantage before this superiority.

The failure of the aerial "blitz" left England and whatever allies she could find in the west the opportunity to develop and consolidate their war-potentials for a counter attack, and Churchill turned every device of diplomacy to the accomplishment of this end.

In the period between the two wars both the Nazis and the German General Staff gave much attention to the economics of war. The results were embodied in the Goering Four-Year Plan. Its slogan, "Bullets instead of butter," indicates that the aim was the preparation of military forces for combat, not the organization of the German war-potential to face and overcome possible enemy war-potentials. Certain facts support this view. In spite of the common belief at the time that a total mobilization of the German economy for war had been carried out, we know now that it had not even been planned when the war was begun. The integration of the conquered peoples and resources into the German war-potential was conceived and carried out more as the plunder of raw materials, machines, and labor than as the organization of a European-wide system of production under German leadership. The support of the African campaign was insufficient in view of the extent to which its success would have meant to the disorganization of the economic support the western powers obtained in the Middle East.

Although the German war against Russia was undoubtedly planned and undertaken under the spell of a fear of the growing industrial power of Russia, it was conducted along traditional military lines. The objectives of the German armies were the usual ones of armies in the field and the capital cities — Leningrad, Moscow, and Stalingrad. Of course, the winning of such objectives would have weakened greatly the "will-to-victory" of the Russians, just as their successful resistance strengthened it. But the efforts which the Germans made to gain them would have been far better spent upon the drive that finally splashed over the northern foothills of the Caucasus mountains. If it had carried on to the Caspian Sea, the oil fields of Baku, and the northern borders of Iraq and Iran, Russia's economic power and, with it of course, her "will to victory" would have been very adversely affected.

In summary it may be said that if the war-planning of the Germans had been conceived in terms of rival war-potentials and their military power had been used to weaken that of their enemies and to strengthen their own, the drive in the west would have carried to Dakar in western Africa, the African campaign would have been given the assistance necessary to reach Suez, the Russian campaign would have been aimed at seizing the Caucasus region. German military power was probably sufficient in 1940 and 1941 to have gained these objectives. Certainly the effect of such successes would have made enormously difficult the consolidation of the power of her enemies for the counter offensive that brought victory to them. If Germany had been in control of the African coast to Dakar, she could have cut off much of the support the United States and England were able to draw from Africa and eastern South America. To have won the Caucasus region as well as the Ukraine would have deprived Russia of two of her three important sources of raw materials and industrial products. The occupation of Suez, especially if combined with a conquest of the Caucasus, would have altered the situations in Iran, Turkey, and the Arab lands so that they would have become useless to the western Allies as sources of oil and other raw materials.

Japanese and German war-planning, so this argument runs, failed because it did not conceive of the primary use of military force to strengthen their own war potential and to prevent the full use of those of their enemies. In other words, because the Axis war-planners were still guided by traditional conceptions of warfare, they disregarded war potentials, both their own and those of their enemies, in developing their strategy.

If we turn from this argument to the consideration of the positive place that war potentials should have in war-planning, we must be clear at the outset about what is meant by a "war potential."

In briefest terms, a "war potential" may be defined as the total capacity of a nation to make war. It adds up ultimately to the creation and maintenance of the maximum force, combining numbers, weapons, and organizations, that a nation can support. Three ponderables — manpower, natural resources, and technology — unite to establish it; one imponderable — organization — has a decisive effect on it. Although it is not the purpose here to discuss this imponderable, let us note that it has three main aspects, (1) the general social organization of a nation, (2) the type of economic system of a nation, and (3) the form of the military organization of a nation. Weakness may arise from each of these sources; a maximum potential can be achieved only by uniting them in support of the general objective — maximum production and most effective use of forces armed with the most advanced weapons. The peculiar function of war-planning would seem to be just this objective.

Of the three ponderables mentioned above, technology is the most important, for it commands the need for and the uses of both manpower and resources. Similarly, the fundamental patterns of social organization at the three levels — social, industrial, and military — are fixed by it. For this reason any nation that sets out to produce its maximum war potential is bound to tend towards totalitarianism.

Thus, today, because technology has become the decisive factor in determining a nation's war potential, it is the central and formidable consideration in every phase of war-planning.

This fact has been commented upon by many writers, but as yet neither writer nor, probably, responsible official has given naked attention to it.

Two of the many recent writers may be quoted here because they point so clearly not merely to the general fact but also to the specific factors which technology has made paramount. Herman Foertsch, to whom reference has already been made, wrote of the war of 1914-1918:

> "The triumph of technology was complete. The demand for supplies of all kinds was unlimited . . . . The artillery had gained an importance to a degree never dreamed of. . . . The engineers developed into specialists in many fields . . . Above all, there were new arms: tanks, gas, and aircraft. . . Tactics were revolutionized by technology which, from being the servant, seemed to have become the master . . . And the domain of strategy was not unaffected by these developments."

Douhet, the Italian prophet of aerial warfare, declares in his book, "The Command of the Air," "Victory smiles upon those who anticipate changes in the character of war, not upon those who wait to adapt themselves after the changes occur." The quotations point directly to the two primary effects of present technology upon warfare, (1) the need for maximum supplies of materiel and (2) the development of organization, tactics, and strategy that will realize the full military potentialities of the most advanced weapons.

It is possible to illustrate the significance of each of these items from the general history of warfare, but surely it is not necessary to do this for American military men who have had the experience of the Second World War.

The place of technology in war-planning can be summarized under a few headings.

1. Technology and weapons

Weapons are merely a branch of technology -- the means of violence in contrast to the means of production, transport, and communication. Since a maximum war potential is possible only if the most efficient means of violence are employed, the first task of war-planning is the creation of these means by "a program of research and development." In this connection it is important to emphasize that research in "pure science" which becomes the theoretical basis of new inventions is the spearhead of an advancing military technology. In this connection it is also pertinent to emphasize that special adaptations of the means of production, transport, and communication must be made for both combat and secondary military purposes.

2. Technology and industrial mobilization

Once the types and designs of the means of violence have been chosen, their production must be undertaken and assured, finally, in maximum quantity and highest quality. Three steps may be recognized in this effort. First, adequate supplies of these means of violence must be available for the opening phases of a war. Second, special plants must be ready for the immediate increase of their production. And, third, a full plan must be prepared for the adaptation of the national industrial apparatus to the achievement of their continuous maximum production. Special care must be taken to prevent "freezing" of models from resulting in a technological inferiority of military force at some phase of the war. An estimate of the time

required for the achievement of the maximum output of the means of violence and their employment in combat must be made to guide both the commander in the field and the executive in charge of production.

3. Technology and manpower

Technology fixes the demand for both quantity and quality of labor. Here labor means the distribution of the national manpower for the performance of all the particular tasks a war requires.

For a clear understanding of this fact, it is necessary to recognize that today there is a "grand sequence of technological arts" extending from the obtaining of raw materials of all kinds to the final projection of violence against the enemy. At every step in this sequence both adequate and efficient labor is required; so national manpower must be selected and allocated with this requirement, and the availability of the proper labor at any point in the sequence influences the whole chain of actions.

At the outset of their work war-planners must estimate (1) the size and character of the permanent armed forces available for immediate combat, and (2) the maximum number of armed forces and the distribution of this number in specialized forces the nation can support. Following from these estimates, allocations of manpower must be made to every part of the "grand technological sequence," and a schedule of the achievement of these allocations must be prepared for guidance of the movement toward the nation's full war potential.

Certain observations on the significance of some phases of the "grand technological sequence" for the distribution of manpower may be made. The standard of living which the carrying on of a war permits a nation to maintain sets the proportion of the national manpower that can be allocated to food production. The remainder of the manpower can be divided among three necessary groups, (1) production, transportation, and communication, (2) professional services, and (3) the armed forces. The decisive factor in this distribution is the military technology the nation is using. Its use in combat will require a certain proportion of the national manpower, but this proportion cannot be so great that it will leave a proportion for industrial production, transport, and communication inadequate to supply the armed forces. A special word on the allocation of manpower to professional services is in order. Inasmuch as the levels of vigor and training of a population are the product of professional services, their neglect is likely to bring a deterioration of manpower and, consequently, of its capacity for effect

on effort at any point in or along the entire "grand technological sequence." The more advanced technology becomes, therefore, the greater is the role of professional services in creating and maintaining a war potential.

In the allocations of labor to the several phases of the "grand technological sequence," that part of the national manpower assigned to the armed forces must be selected and trained for the use of the military technology in the most efficient manner. In this connection it can be pointed out that the more advanced the technology of a nation is, the greater is the familiarity of its manpower with the modes of action and the skills required for the handling of a steadily improving military technology.

It appears then that with a given military technology a certain balance in the employment of labor in food production, industrial production, professional service, and military action will be most effective for achieving the maximum war potential. War-planning must take account of this balance.

4. Technology and natural resources

It is obvious, of course, that a given technology requires certain natural resources and in determinable proportions one to another. For a given output these materials must be made available in relatively fixed amounts. These quantitites must be sufficient (1) to maintain the existing technological apparatus, (2) to provide for its expansion if that is necessary to achieve maximum war potential, and (3) to sustain the output required for the war effort.

The primary condition affecting the obtaining of raw materials is the fact that no nation today is or can be self-sufficient in all raw materials. Some raw materials must come from other lands. Where and how can these materials be obtained? What are the materials without which an effective military technology is not possible — the "strategic materials?" What are the materials without which a full war potential cannot be achieved — the "critical materials?" It is in connection with the answering of these questions that the geography of the distribution and production of raw materials enters the war-planning picture.

War-planning can find the answer to these questions in several ways. The chief economic answer to them is "stock-piling" or the opening up of new sources. The political answer is arrangements between states that will assure accesses to their sources once war

has begun. The military answer is the seizing of areas at the outset of a war so that access to adequate supplies will be assured or that the enemy will be weakened by depriving him of access to certain sources or, much better, that both of these objectives will be accomplished by one action.

In view of the criticisms leveled at German and Japanese war-planning in the opening paragraphs of this paper, it may be stated positively here that, in the view of the author, the original strategy of a war should be determined with reference to the needs of a nation for the raw materials required to achieve its full war potential. It is the task of war-planning to compute these needs and prepare the military strokes that will at once, if possible, limit the enemy's access to supplies of necessary raw materials and assure the nation of ammounts adequate to the achievement of a maximum war potential.

In summary, it can be seen that technology is now the decisive term for war-planning because it determines all other factors — weapons research and development, production and manpower allocations, raw material needs, and as a result war potential. Similarly, it calls for economic, political, and military action to support the war potential. Lastly it sets tactics or, in other words, the use of weapons, and directs strategy towards the gaining of certain objectives. Today technology has made warfare not merely the combat of armed forces but the engineering of violence between rival societies.

The conception of a nation at war implied by the foregoing remarks is that of a vast machine with both material and human parts. The task of war-planning is to shape this machine for action, to determine those primary actions which will most effectively limit the enemy's power and increase its own power, and to direct its full power against the enemy. In this view the armed forces are the cutting edge of the machine, and its power is no more than that which the nation's war potential will support.

In the conflict of such vast machines, it is doubtful that a quick decision is possible. Victory can come only as one of the machines — either in its material or in its human parts — outlasts the other. At this point it should be emphasized that technological superiority in battle is probably the greatest support of morale, while technological inferiority in battle is the great weakener of morale. In fine, advanced technology has made almost certain that a war, once begun, is likely to be long. American war-planners may be so impressed by the prospective use of the atomic bomb that they

may disregard this effect of technology upon warfare — to the detriment of their country.

War between two such vast machines is likely, it seems, to develop in the following pattern:

1. Initial military moves will aim at increasing the advantage of one nation over the other for the production of a full war potential.

2. Continuous strikes will be made by the rival military forces at their respective war potentials, each aiming at the destruction of manpower and the disruption of production of the other, and, especially, at the delivery of materiel to the fighting forces.

3. Areas of conflict between the rival military forces will be established where materiel will be a decisive factor in achieving a decision between them. Quality as well as quantity of materiel will be important. With the development of air transport some of these areas will be established undoubtedly, not at the borders but but within the enemy nation. The choice of such areas will be affected by (1) location of sources of raw materials, (2) concentrations of productive capacity, both equipment and manpower, and (3) centers of disaffected population, if any.

If, as has been argued here, the war potential, as determined by technology, is the central consideration in war-planning, the problem of measuring it must be faced. There are many approaches to this problem. As may be expected, it seems to this writer that the best solution can be found in technology or in social factors related to it.

The most important aspect of a technology from this point of view is the interdependence of its parts. For example, the development of the use of coal for smelting was a necessary step to the production of steel in large quantities. The improvement of steel making was preliminary to the development of alloy steels and other alloy metals. And the invention of these alloy metals, which withstand great heat, was the antecedent condition required for the development of jet-propulsion. In other words, each advance in technology rests upon earlier achievements, so that the whole technology is an integrated system. What then are the decisive materials for operating a contemporary technology especially in order to produce the most effective means of violence in maximum quantities? In these terms two materials are necessary in great quantities and several others in adequate, although small, amounts. Those required in large quantities are coal and iron ore, the fundamental raw materials of steel-making. Those required in small but adequate amounts are the alloy

metals — manganese, chrome, nickel, molybdenum, tungsten, vanadium, and cobalt. Manganese is necessary for production of all steel in quantity. Chrome and nickel are important for the quantity production of military steels. The other alloy metals are required for the production of precision tools and innumerable instruments and devices of military use. In other words, steel and its derivatives are the heart of a war potential, as well as decisive for many advanced military implements.

From this point of view petroleum, copper, lead, and tin, although important in the operation of a technology, are not decisive for computing a war potential. If the items mentioned in the preceding paragraphs are not available in sufficient amounts, the war potential is seriously affected, regardless of the supply of oil, etc., available. As a matter of fact, a modern technology can achieve a high potential even if the supplies of the latter are limited.

From the social point of view, a war potential depends, of course, upon its population. Numbers are important only when three other qualities are present: (1) the skills to operate an advanced technology, (2) a highly efficient agriculture which liberates a large proportion of the population for industrial and military service, and (3) an average life expectancy between fifty and sixty years. This third condition reflects the existence of a healthy, vigorous population, with a high proportion of military age. The proportion of a population living in cities is a fair index of the first two social qualities required for a high war potential. The life expectancy figure is, of course, the measure of the other social quality.

For purposes of war-planning, these indices of war potential should be carefully considered in the distinctive combination they made in each nation. Of course, all other information available to war-planners should be used to illuminate the situation which these indices reveal.

Finally, after estimates of war potentials for various nations are made, the combinations into which the international political situation is likely to group them must be considered. Nations that can be placed in opposing groups should be studied and their combined potentials should be computed. Nations likely to remain neutral but open as sources of raw materials should be grouped. Nations where opposition to the political policies of one or the other belligerents is likely to affect their economic and political

action should be classed together, and the effects of their probable actions estimated. Finally, those areas and their contribution to the war potentials of the rival states which can be affected by military action must be carefully studied, for they are of primary importance for planning the strategy of the war.