

WARTIME PRODUCTION CONTROLS

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PREFACE

THIS BOOK presents a critical appraisal of the techniques of production control devised and administered by the War Production Board and its predecessor agencies during the war years 1940 to 1945. It concentrates on a detailed analysis of the methods and procedures by means of which the wartime administration of the industrial economy of the United States was conducted. From the review of what was actually done during the war years, it attempts to distill the lessons of experience to provide an adequate framework for any future emergency requiring similar government action, and to recommend a course of action designed to enable this country to discharge its responsibilities for national defense and world security. In doing this, the book provides criteria for the objective evaluation of the National Security Act of 1947 and any further legislation which may be recommended in the interests of national security.

The book does not treat administrative problems which were the prime responsibility of agencies other than the War Production Board and its predecessors. It does not cover questions involved in the operating control of manpower, transportation, prices, or that segment of rationing to ultimate consumers which was the responsibility of the Office of Price Administration.

Effective mobilization of a private enterprise economy requires the control by public authority of the factors of production and many of the forces which influence the functioning of free markets. This includes the administration of production and distribution of raw materials, fabricated parts, components, and end products; the determination of the purposes for which existing plants are to be utilized, as well as the complementary decision with respect to the construction of new ones; the recruitment, training, assignment, and employment of labor; the use of existing public utilities, their extension, and construction of new facilities; and, finally, establishing control over the movements of prices and wages. All these areas of administrative responsibility were important in the coordination and direction of the nation's resources for military victory. Each had its special problems of policy, management, organization, procedure, and technology which can be adequately reviewed and ap-

praised only by men with intimate and detailed experience in the agencies having direct administrative functions.

The authors spent varying periods of time ranging from four to six years in the agency directly responsible for the administration of industrial production. They had no direct experience with the operations and problems of agencies assigned to other phases of wartime and economic management. For this reason, the analysis is confined to that segment of wartime administration with which they were directly and intimately acquainted. This limitation of subject matter does not in any way suggest that other areas of emergency management were less important in the coordination and direction of the nation's total economic resources.

This book does not deal with the making of policy. It deals with the machinery for carrying out policy decisions. It is the conviction of the writers that the major error in industrial administration, in the war recently concluded, was the failure to appreciate the dominant significance of *methods of executing determined policies*. For this reason, the present volume concentrates on a detailed analysis of the administrative methods and procedures by means of which broad policies were made effective or permitted to fail.

Detailed analysis of administrative experience requires two things: first, searching and selective examination of the mass of administrative documents, procedures, and methods accumulated during the war; and second, an intimate knowledge of the actual working of this machinery, not in terms of its over-all impact, but rather in the detail of its day-to-day operations and results. It was in this area that the writers participated directly in the tasks of public management of war production. It is hoped that others who had the opportunity for similar participation in other phases of the wartime organization and administration of our complex economy will be able to make parallel analyses of their administrative methods and procedures, successes and failures. It is only in this way that men facing problems of comparable magnitude and complexity in the future can build on the experience of the past.

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WARTIME PRODUCTION CONTROLS

CHAPTER I

INTRODUCTION TO THE PROBLEMS OF WARTIME PRODUCTION CONTROL

TWICE within a single generation, the American economy has been brought under centralized direction to secure maximum war production from our industrial resources. The scale of the undertaking directed by the War Production Board in the second World War dwarfed the job handled by the War Industries Board in the first World War. But the character of the assignment and many of the policy and procedural problems in the two wars were similar. Inevitably, they look forward to the pattern of action which this country will have to follow in any future emergency of equal magnitude.

When the record of industrial control in the war just concluded is reviewed against the background of the experience of the War Industries Board (1917-18), it is impossible not to be impressed by the extent to which history repeated itself. Such problems as the establishment of priority of claims on material supplies, conservation of critical materials through limitation or prohibition of non-essential uses, and scheduling of production in the two wars were closely related. Procedures and operating methods were similar. In spite of this similarity, however, many of the mistakes in the administration of controls in 1917 and 1918 were repeated in 1941 and 1942. Each new production or material-control problem was approached as if there were no fund of experience on which to draw. Time after time, the administrative and procedural blunders of the earlier years were reproduced in new settings.

The wartime administration of any economy as tremendous, complex, and diversified as that of the United States cannot be made simple. But because we salvaged only minimum gains from the administrative successes and failures of the first World War, and even in 1943 and 1944 from the earlier years of the defense program, the job of running industry inflicted unnecessary burdens on both private and public management. It was a bitter experience for all concerned. Many who participated in it

are convinced that it will be an act of high irresponsibility if the administrative record is not subjected to critical analysis.

The primary question in industrial mobilization is not the shaping of policy. Always an intricate and puzzling assignment, that task is eased under wartime pressures by universal agreement on the ends to which this nation is committed. Nor is the primary question that of determining the magnitude of economic goals and the size of individual military programs within the total war effort. That, too, is a basic and necessary undertaking, complicated by the need for continual adaptation of plans to the lessons of experience, the strategy of the enemy, and military innovation and invention. Our experience in two wars clearly shows that the real problem is neither what to do (policy) nor how much to do (determination of total industrial goals and individual military, export, and essential civilian programs). The real problem is *how to do it*; how to achieve the determined goals; how to fulfill the necessary programs.

It is precisely here that our wartime experience has the most to teach us. During the war years almost every possible variation of industrial control technique was given an extended or limited trial. As a result, there is a basis in experience for answering most of the significant questions about operating procedures. The importance of this practical experience becomes clear when we recognize the special character of the central management job in a war economy, and the reasons why the selection of operating methods—the problem of *how to do it*—is the fundamental administrative assignment. Neither the wartime economy as a whole, nor any part of it, can be governed by a czar who from his Washington desk decides all things from the erection of a Willow Run plant to the organization of production lines; or makes the daily decisions which tie together purchases of materials and parts, levels of inventories, rates of production, and shipments of finished products. No man, no organization, and no system could possibly handle such an assignment. And yet a way must be found to accomplish the necessary objectives of wartime control. These are to replace with the single governing rule of maximum output for war the normal industrial incentives of price and profit, the normal private industrial choices of what to make and how to make it, from whom to buy and to whom to sell. The only way which offers a possibility of success is to determine centrally, on the basis of full information, the policies which the national interest requires, and then to turn

all attention to the development of the methods which will best serve to utilize existing industrial procedures for the ends of war. In this go-between role, the methods of control clearly carry the most important part of the assignment. If they disturb industrial practices too much, there is grave danger that manufacturing activity may be impeded so that it will not reach maximum production goals. If they do not interfere enough, there is equally grave danger that materials, labor, and industrial plant and machinery urgently required for war production will be diverted to other uses, and again the attainment of maximum output for war will be interfered with or made impossible.

In the effort to establish the most effective control techniques, the War Production Board and its predecessor agencies at different times, and often concurrently, used individual priority actions (separate application for authority to place a single preference-rated order for a piece of machinery, a tool, or a specified quantity of a production material), and "blanket" priority authority, without application to Washington, for procurement by selected industries (as in an order assigning a preference rating to all manufacturers of machine tools, to be used in purchasing production materials). Under different control procedures, at one time manufacturers applied for authorization to purchase material required by an entire plant, considered as a single operating unit, and at another time, they made application and received authorization to purchase separately for each product, even when as many as ten products were made in a single plant, or one product in several plants. Some authorizations were made under a "horizontal" system in which the War Production Board allotted material to each material user, regardless of his position as the fabricator of a completed product, such as a tank, or as the maker of a tiny part at the fifth subcontracting level. Others were made under a "vertical" system in which material allotments were transmitted from WPB to the military services through their procuring units to prime contractors and on down through the subcontracting chain. For some products, the volume of production was limited by a quota system, expressed in absolute dollars or units, or as a percentage of actual output in a specified pre-war base period. The production of other items was limited by the quantity of material permitted for their manufacture. At one time, requirements for maintenance and repair of industrial plant and equipment were met by a system of individual application to Wash-

ington. At another, manufacturers were permitted to self-assign their own rated procurement authority, limited to a percentage of their dollar expenditure for maintenance and repair in a specified earlier calendar period. For some materials, the control over purchase and use was imposed even on consumers of negligible quantities; for others, small users were exempt from control. At one time, almost all controls were centralized in Washington. Late in the war, responsibility was largely decentralized and many functions were transferred to WPB field offices.

It would be unfortunate if in a comparable national emergency those responsible for mobilizing our resources started with the assumption that the systems of control developed by the end of the war represented either perfected techniques or administrative patterns capable of expansion. At no time were the controls over production fully effective in securing maximum balanced production for war purposes. Within limited areas and for certain control techniques, the abrasion of administrative procedure against hard experience finally evolved workable operating methods. In its largest scope, however, the control of war production was not effective. The result was that some critics of the performance of the War Production Board were led to comment that the remarkable thing was that, in view of the inadequacy of many of the controls, the output of goods was large enough and sufficiently well balanced to enable us to win the war. This appears to be an unduly harsh judgment. But it is sound in its reference to the inadequacy of many of the administrative methods and procedures.

The experience was so varied, the record so complex, the problems so important, that analysis of the successes and failures of the techniques and procedures of industrial control under federal direction should be an essential part of our national defense program against any future emergency. On the basis of that analysis, a program for industrial mobilization should be developed which includes both policy and procedures. The framing and continual re-creation of the industrial mobilization program should be the responsibility of a permanent agency, as the military phases of national defense are entrusted to the Army, Navy, and Air arms. That agency should be under civilian direction, working in close cooperation with the military services, but not subordinate to them. Finally, the agency should have an experienced staff specializing in the methods and techniques of wartime industrial control.

The importance of administrative method is a commonplace in the management of private business and established government agencies. During long years of operating history in individual companies and public departments the procedures and techniques have been thoroughly worked out. Organizations of men and methods exist for translating policy into action efficiently, and for carrying action through to results which can be appraised in terms of the initial policy and the determined goals. The concept has become so routinized through continued use that it is accepted without question. For this very reason it was not earmarked as a major problem when the national emergency created new areas of administration as a public function to be performed for the whole economy. It was no longer a problem in well-run private and government agencies because they had resolved it. But it was a new and unrecognized problem for the administrators of the defense program. They became aware of it only through slow and painful experience.

At the beginning of the national defense effort, it was assumed that a small civilian top staff could make policy which would be carried out by the administrative organizations and methods already established in the procurement divisions of the Army and Navy. The War Resources Board (1939), the National Defense Advisory Commission (1940), and the Office of Production Management (1941) all tried to act on the assumption that policy making was the primary job and administrative method could be neglected.

But this desire to minimize the staff superstructure failed to take into account two basic considerations. First, the size of the industrial war effort grew at such an explosive rate that it interfered with the normal functioning of the entire economy, affecting, through material and component shortages, even remote business activities clearly unrelated to the military program. Successive increases in military requirements led to inter- and intra-service competition in procurement, upset schedules, and, at an early stage, pushed the horizons of the job assigned to the defense administration far beyond the capacities of the supporting military organizations. Second, systems established to account for normal expenditures by government agencies and to provide profit-and-loss accounting in private industry did not yield the basic information essential to the operation of a centrally directed administration of our industrial resources. The policy makers found themselves without the facts necessary

to determine the feasibility of military programs, their impact on the rest of the economy, the magnitude of industrial plant expansions required to meet future production schedules, the relative success in meeting the goals of current military programs, and many other related problems.

The natural first reaction to this informational vacuum was to inaugurate a large-scale effort to collect statistics. Even at this early stage, unfortunately, the desire for information still did not relate the collection of statistics to the management job and the techniques of production control. It was still inherent in administrative thinking that once the factual basis was established for the determination of policy, the execution of policy was semi-automatic. As a result, considerable attention was given to the development of statistical devices for collecting information. Under the stimulus of expanding war requirements and early military reverses, short cuts were resorted to in the effort to determine the best way to service wartime requirements for industrial data. Improvised statistical methods stopped some of the gaps in knowledge. However, because we were still thinking of industrial statistics as chinking in holes in the broad informational background of the functioning of the wartime economy—and not of statistics as a management tool, tied directly to the procedures of industrial control—the data collected did not provide answers to the questions which the top management of the war effort was beginning to ask. We had vast arrays of statistics. But no one could say how good they were, or how complete. No one knew how they could be used effectively. Above all, no one could use them for administrative purposes to control and appraise the effectiveness of the implementation of policy decisions.

These deficiencies in the development of the machinery of policy execution stemmed directly from the staggering magnitude of the administrative job involved in organizing the industrial side of the defense program, from its novelty as a management problem, and from our collective failure to preserve, study, and profit from the parallel experience of the first World War. The roster of executive personnel who came to Washington early in the defense era was impressive. Many of the most successful and best-known executives of this country's largest, most efficiently run, and most profitable corporations gave their services to the guidance of the nation's war production. That these men failed to see the need for developing adequate administrative machinery is in no way an indict-

ment of their performance. All of them had achieved distinguished successes in companies which had been in existence for a long time. These organizations had developed operating techniques and *procedures* and the related management tools during many years, and had met the continuing tests of profit-and-loss statements to determine the effectiveness of operating methods. It was only natural for men from such organizations to assume that the execution of their policy decisions would be automatic. They had the right to make this assumption. That is what happened in the companies from which they came. But in Washington, it was a dangerously false assumption. The administrative machinery did not exist. The Army and Navy Munitions Board had been functioning for many years. The Army, and particularly the Navy, had been engaged continuously in procurement activities. There were, in addition, other established government agencies with a long record of exploring on a statistical front various aspects of the American industrial economy. But none of these agencies had developed methods which related statistics to administration, and, in general, their statistical personnel did not recognize the significance of the process which translates policy into action.

Probably the greatest lessons for industrial mobilization to be learned from this experience are these. First, there must be a policy. Second, there must be information on which to develop this policy and keep it flexible. But unless a third factor, controlled implementation, is introduced, neither policy nor information will of themselves produce the desired result. Many may believe that the tremendous production for war which we achieved and the phenomenal victory which was finally ours demonstrate either that effective control was developed between 1940 and 1945, or that effective control is not needed. There is no questioning the magnitude of our effort or the success of our arms. But they are less a testimony to the effectiveness with which we mobilized our resources than they are to the tremendous economic wealth which this nation possessed. If we dare assume that we will have, in any future emergency, the same wealth of human, natural, and technical resources, and if we also dare assume that the methods of waging war will permit us the time needed for the accidental forging of these resources into a war machine, then we need not be concerned about the adequacies of the methods used during the second World War. If, however, we believe that the recent

demands made upon our resources may leave less than adequate quantities for the next major effort, or that new methods of warfare will not permit the months required to bring our production machine together in a less than perfectly controlled scheme, then we must look critically and objectively at the accomplishments of which we are so proud and determine the extent to which they can again assure victory for us.

Many of the shortcomings of our recent effort might have been avoided if an established industrial warfare agency had been in existence in 1939. If such an agency had been in existence for a decade or more prior to 1940, the assumptions of the first members of the National Defense Advisory Commission would not have been in error. If an industrial warfare agency had been doing its job, there would have existed both in the military procurement services and in their supplying industries procedures and methods by means of which information for policy decisions would have been available and established policies could have been carried out effectively. If this agency had been fortunate enough to recruit an able staff, these methods would have been reasonably simple, efficient, and economical, not only in their mobilization of resources, but also in their demands for personnel and paper work required in the actual administrative process.

Without an established agency, without men in place, procedures written, and methods tested, no plan, however ideal, is possible of execution. We must, therefore, recognize as the first lesson of this experience that industrial mobilization can be made effective in a short period of time only if there is an existing and continuing agency aware of the problems and skilled in the methods for dealing with them. The problems to which methodology is applied may change with the years. It seems unlikely, however, that the basic principles will be modified. These principles indicate clearly that the steps in which industrial mobilization control must proceed are: (1) information; (2) determination of the specific problem; (3) decision; (4) administrative methods through which the decision can be effectively carried out; and (5) efficient record-keeping by means of which the execution can be controlled and an accounting obtained of the extent to which implementation actually fits within the pattern of the policy established. The first and last steps in this program can be made fully effective only if the information and accountability are obtained in exactly the same terms.

The material in the following pages has been assembled as a first step in a critical appraisal of our wartime techniques of industrial control. It concentrates on the methods of control over industrial production, as exercised from 1940 to 1945 by the War Production Board and its predecessor agencies. It is a study of control techniques; therefore it excludes consideration of most of the other problems commonly associated with the framing of wartime administrative policies. From our wartime experiences is developed a preliminary statement of the principles of industrial control in a time of national emergency. The full exploration of the lessons of recent economic history, the adaptation of tested principles of centralized industrial control to the changing military requirements of the future national defense program, and detailed studies of the problems of collecting industrial statistics as they relate to the production and materials records of private industry are jobs for the future. They are major assignments for those responsible for planning in peace our industrial mobilization for war.

The present analysis appraises the kinds of problems involved in selecting appropriate control systems. It considers alternate methods for authorizing material procurement and effecting conservation of scarce materials. It analyzes the relationship of production and material control techniques to internal administrative procedures and existing records already maintained by private industry and within the controlling agency and the other departments of the federal government holding wartime management responsibilities. It also gives consideration to alternate methods of controlling and directing the volume of construction, expenditures for maintenance and repair of plant, and the level of industrial inventories.

The military lessons of the war have been brought home to every citizen. The twin goals of world security and domestic preparedness are accepted today as the standards of national policy. It is of the greatest importance that we prepare to give industrial backing to the military aspects of security and defense. We were able to provide this support in the second World War only through the time bought for us by the courage of our allies. No future emergency of equal magnitude will give us similar breathing space, or the months in which to fumble and experiment toward a system of working controls to command the full capacity of our resources.

Despite the hardening of the national will to secure this country and the world community against wars of aggression, we are confused about ways and means. If there is any discernible consensus of opinion, either informed or general, it is that we must help to create and support the international political organization of countries and individuals; and that we must also, for the protection of the world state and, if it should fail, for our own domestic security, maintain an air force, an army, and a navy adequate for the defense of this country and its global interests. The confusion of opinion is increased by the atomic bomb and by conflicting arguments about its impact on the traditional ways of waging war. On one side we are informed that the totality of national defense rests with the bomb. All armies and navies are obsolete; ships and planes and guns have been reduced in military significance to the potentialities of the slingshot. If there is another war, it will end in five minutes. On the other side we are told that the atom bomb is only one more in the long series of military weapons the introduction of which stretches back to pre-history. In their time, the catapult, the cross-bow, the musket, the rifle, the steel ship, the machine gun, the submarine, the airplane, and the tank were hailed as revolutionary weapons of offense which armed their inventors as invincible. And yet the recent war was essentially similar to the wars of history in strategy, in tactics, and in relative techniques. Those who hold this view disparage statements concerning the more extreme implications of atomic fission, as in *Barron's* (December 10, 1945) editorializing on Dr. Vannevar Bush's comment: "I think the coming of the atomic bomb will stop great wars."

Some people said the same thing about the bombing plane before World War II. Furthermore, although modern weapons are new, devastation through war is not. What Rome did to Carthage, what the Arabs did to the Mediterranean world and what Genghis Khan did to Persia and Eastern Europe make the ruin we visited on Germany look pale by comparison. None of those devastations deterred later aggressors, and the development of new instruments of death—such as the tank and the grenade-carrying plane—at the ends of wars has merely encouraged nations to believe that by using them they could win the next conflict quickly.

There is no reason to believe that the nature of man has changed. When part or all of the world is divided into rival ideologies a contest of arms is always a possibility, even if there is no direct wish on either side to provoke that possibility. The only way peace has ever been attained anywhere in the world

has been through agreements to submerge one sovereignty to a larger one, generally by conquest. This was true of the ancient warring states of China, of the city states of Greece, of the lands which finally enjoyed the Pax Romana, of England, Scotland and Wales, of the groups which later made up France, Italy and Germany, and even, be it remembered, of our own United States.

Those who hold this view believe that if we fight another war, the drain on the economy will be greater, the time in which to prepare shorter, and the need for industrial control more acute.

Resolution of the security problems is an assignment for the scientists and the generals. Ultimately, the Congress will be called upon to determine policies of national defense. For the present, however, it is clear that we are planning the continuation of a large navy, and of an army and an air force several times the size of the pre-war establishment. As long as we are committed to this type of military organization, the economic lessons of two world wars cannot be misunderstood. Armies and navies are useless unless they are supported by industrial economies which can be rapidly organized to feed them the materials of war in the quantities and at the times needed. There is no real security in a military organization without economic support.

If we are wise, or even only fortunate, the immeasurable cost of two world wars and the development of atomic energy may make another war impossible. As long as we intend to maintain a military force as the ready instrument of national defense, however, we must be prepared to support it in a crisis with a plan for an organized economy. The lessons in industrial mobilization which we have experienced twice must be recognized and applied to defense planning as a "stand-by" asset. Of potentially greater importance, we should examine this experience to determine that we are not carelessly discarding knowledge which will help to strengthen and enrich our economy in time of peace.

CHAPTER II

THE BUSINESS AND GOVERNMENT BACKGROUND OF WARTIME CONTROL PROCEDURES

THE CONDITIONS of industrial production in time of war differ in a number of important ways from those which govern the normal operation of the economy in peace. An appreciation of these special conditions of wartime production is essential for an understanding of the problems associated with the methods and techniques of economic control in a national emergency. The special conditions create the need for controls. They determine the extent and character of the controls. They influence the timing of the imposition of controls. Finally, to a surprising extent, as the wartime experience clearly demonstrated, the effectiveness of the whole undertaking is determined by the success of the administrators of the controls in shrewdly shaping their procedures toward the necessary compromise between the special conditions of the war economy and the underlying customs, habit patterns, and routines of industry and government.

The most significant feature of wartime industrial activity is the unchallenged primacy of military needs. Regardless of the cost to the existing economic system, military needs must be guaranteed a prior claim on the industrial resources of the country. All policies and all procedures must be directed toward this single end. As the war effort expands and military demands claim an increasingly larger part of total industrial output, the policies and procedures of control must be brought within the framework of the control system to compel the necessary expansion in production for the military and the contraction which this usually occasions in production for civilians. The policies and procedures adopted must be broad enough to cover the entire productive potential of the country and must include the use of management, materials, products, facilities, and manpower.

The second World War placed an unprecedented load on the nation's productive capacity. From July 1, 1940, through July 31, 1945, the production of major munitions and products was valued at almost 200 billion dollars. At the peak of the war effort in 1944, more than 40 percent of gross national product represented war outlays. At the same time, consumer expenditures, after adjustment for price changes, were slightly higher than in 1939. Between 1939 and 1944 the annual gross national product of the United States—the total output of goods and services—rose by more than 50 percent after allowance for price changes. In dollars, before price adjustment, the increase was almost 125 percent, from 88.6 billion dollars to 198.7 billion dollars. The volume of manufacturing activity nearly tripled. The output of raw materials increased by 60 percent. At its peak in 1942, the volume of new construction, most of it required to build new war plants, military camps, and housing for defense workers, was more than double the 1939 level. While this phenomenal increase in production was being achieved, 10 million men in the most productive age groups were taken from the labor force by the armed services and 7.5 million men and women were added to the group of civilian employed, most of them going into manufacturing. Even this increase in the number of workers in manufacturing would not have been sufficient had not the length of the average manufacturing work week been increased by 20 percent, from 37.7 to 45.2 hours, while the construction work week went up from 32.4 to 39.5 hours, and the mining work week was lengthened from 32.3 to 43.9 hours.

This mighty productive effort strained every industrial facility, the sources of all basic materials and fabricated components, and the labor force available for employment. Under these extraordinary demand conditions the economic system was subjected to stresses of the greatest severity. It became impossible to attain the desired volume and character of production under free market conditions.

The normal functioning of the peacetime economy first had to be supplemented and ultimately had to be replaced by a system of centralized control. Not only did military requirements draw upon the normal industrial processes of the country for a large share of the output of civilian goods; they also created wholly new demands for types of goods not produced in time of peace. To satisfy these new demands, it was necessary to convert existing production facilities and build new ones. To sup-

port the desired rate of activity in both converted and new facilities, the available supplies of basic materials and components first had to be expanded to the limit of potential output, and later had to be redirected from civilian to military consumption. Concurrently, civilian claims against facilities, materials, and components had to be curtailed to the extent necessary to support the desired level of military production.

Next in order of significance among the changed conditions of wartime industrial production is the substantial abandonment of the normal forces which shape economic activity in time of peace. In peace the major influence upon economic activity is *profit*. The ultimate measure of the desirability of undertaking certain industrial activities or carrying them out in certain ways is the anticipated effect of the final result on the individual enterprise's profit and loss statement. Since the peacetime economy is made up of a multitude of individual enterprises, it is important to each one, but not to the nation, whether its particular choice of policy or method is profitable or not. The classic justification for non-interference by government in business is that the accidents of individual choice result in the greatest possible production from the national resources. In time of war, however, the nation cannot wait for each of these individual experiments to produce the desired result. An over-all control of economic activity must be substituted for individual planning under the profit motive. And not only must the control agency make the industrial decisions; it must do its job without either the profit and loss test of the wisdom of its policies and the efficiency of its methods, or the time required to apply any other test.

In the war economy, the prices of the products needed for the military machine are of no importance. Failure to provide the necessary weapons results in a national calamity—defeat, which is a price greater than that which would be paid in supplying the weapons at any economic cost. It is true that part of the attention of the government is devoted to price controls and the avoidance of inflation. Those concerned with this problem, however, are looking out for the general health of the economy during and after the war. Price is never a factor in influencing the satisfaction of the needs of the war machine. Industrial output for military needs is taken outside the sphere of peacetime economic operations.

In the normal competitive market, profit as reflected through the cost-price relationship determines the use of resources. In time of war, neither

profit nor price can be depended upon to determine the level of production of any item which is required for direct military and essential civilian needs. Nor can price or profit be permitted to establish the rate of activity in less essential or non-essential civilian activities which compete with the wartime requirements for management, men, facilities, and materials. Although the price-cost relationship must be recognized as a basic factor in the production equation, war needs preclude permitting this factor to determine either the level of output or the distribution of the final products to individual uses. The level of production and the distribution of production must be determined in terms of an over-all plan which establishes military and essential civilian requirements for both the items being made and the factors which enter into their production.

The inevitability of this order of precedence can be illustrated by a review of the housing problem. Although it would have been socially desirable to increase the volume of housing available to the nation (and there is little doubt that a start on such an expansion would have occurred during the war under the stimulus of the improved level of individual incomes), wartime demands could not permit the direction to this purpose of resources which would follow the magnetic compulsions of the free functioning of the price system. Men, materials, and facilities could not be spared for socially desirable housing when they were also required for the production of desperately needed weapons. These competing requirements existed throughout the economy. Construction engineers and construction labor were needed on projects directly related to the war. Plumbing, wiring, and other items of house construction competed with direct military and more essential civilian requirements for critical materials, production facilities, engineering "know-how," and trained labor. Perhaps the most significant reason for not permitting this un-directed expansion of private housing lay in the fact that the newly built facilities and newly expanded output in production directly related to the war made it necessary to provide housing at certain critical geographic locations. Although some of the needed housing might have been provided in these areas through the operation of the competitive forces of the free market, the national need could not permit the risk that this would be less than required, or that the quantities of materials which could be made available for housing might be dissipated outside the areas determined to be critical.

Illustrations of this character could be multiplied to demonstrate that national needs must determine the rate of economic activity and the use of resources. Because the effect of price is random and non-selective, in time of war price manipulation cannot be used as the major tool for directing the use of the nation's resources. Purposeful direction guided by the national government must be substituted for the random direction offered by price relationships and the free market.

One result of this change is the denial of freedom of individual choice throughout practically the entire range of economic activity. In place of the forces of profits, prices, and competition, which normally influence the decisions governing the volume, character, methods, and location of industrial activity, the machinery of priorities, allocations, directives, and prohibitions is used by the government to carry out its decisions on what shall be produced, how much shall be produced, and by whom it shall be used. As the volume of military requirements increases, the area of control must grow. Ultimately, in the total war economy there must be total industrial control.

This logical construction of the philosophy and technique of wartime control was not recognized in the earlier phases of production for the second World War, although it was clearly delineated in the experience of the first. The failure to recognize this situation was in part the result of an underestimate of the magnitude of war requirements. In part, it was the result of an unwillingness to introduce more extensive controls than the exigencies of the moment dictated. But in more general terms, it resulted from the absence of an established industrial-mobilization organization which had a long-range view of both the problems of controlling wartime production and the methods for dealing with them.

In peacetime, when plans for industrial production are made on a long-range and recurrent basis, we lose sight of the unusually protracted period of time between the development of final products such as automobiles, refrigerators, and machine tools, and the digging of the ores, the smelting of the metals, and the fabrication of the machines and parts which precede their final assembly and delivery. Without a broad understanding of this lag between the development of end products and their first impact on the early stages of production, we do not readily recognize the need for introducing controls earlier than is warranted by the ap-

parent conditions of the moment. In the beginning of war production, there is an inevitable hostility between the military needs of the nation, *civilian demands for non-essential or less-essential goods*, and the desires of individual businessmen to profit from their normal trade. It is in this setting that the proper timing of the introduction of controls must be determined. The over-all problem is usually presented in three stages: first, planning based upon projected requirements translated from end-product schedules into demands on facilities, materials, and components; second, determination of administrative policies to direct the economy to the desired objectives; and third, selection of methods for implementing the policies. The selection of procedures must look to the choice of those which will function with the least disruption of existing routines in business, the greatest economy of administrative burden in government, and the most effective coordination of all policies, all authorities, and all decisions toward the single objective of maximum production for war needs.

The triple operation of planning, policy making, and implementation must be carried out with constant reference to the importance of the proper timing of each individual move. This is required by the circumstance that the industrial phase of preparation for war must precede the period when weapons and equipment are actually used in combat. Before the final assembly of such products as tanks and planes and ships, motors, fuselages, propellers, guns, and other parts of the final products must be on hand. These component parts require magnetos, carburetors, switch gears, and many other components which are themselves made up of forgings, castings, and, ultimately, the direct products of the basic raw material producers, such as the steel, aluminum, brass, and copper mills. Moving even further back in the war production cycle, before the output of basic metals can be directed toward their proper uses, the competing requirements of the various military and essential civilian programs must be weighed in the same balance, and certain fundamental decisions must be made concerning the distribution of the available supplies of basic materials. Prior to the comparison of competing requirements, there must be set up the systems or procedures which will provide the essential data on these competing requirements, guide the distribution of materials, channel the critical components, and ultimately direct

every part of every essential end product to its proper place in military and civilian production schedules.

As a result of the chain of fabricating levels through which materials must be moved before they emerge from the final assembly lines as completed products, thousands of subsidiary assembly lines must be set up and placed in operation months (in some cases years) before the crucial need for such products is generally recognized by the civilian population or by labor or industrial management. The basic planning, the first policy decisions, and the selection of methods and procedures must take place even earlier than the beginning of production at the most remote manufacturing levels.

It is relatively easy to recognize the elapsed time in the production of things with which we are familiar; for example, the 6 to 12 months from the drawing of plans for a house until it is ready for occupancy as a home. It is much more difficult to attribute a similar elapsed time to the production of things which we normally buy ready for delivery in a store. Even manufacturers who are familiar with the months or years necessary for the translation of designs into specifications, procurement, production, and final assembly in making their own products frequently overlook the comparable time needed for the production of items on which they get immediate or quick delivery from vendors or supply houses. As a result, although the National Defense Advisory Commission and the Office of Production Management were staffed largely with top officials drawn from the country's great manufacturing concerns, there was a striking failure to recognize the 6 to 18 months' production cycle lag that had to be covered in the imposition of effective industrial production and distribution controls. There was a similar blind spot in the thinking of the procurement planning branches of the armed services.

} Detailed analysis of these time-production ratios would require a volume of description equal in length to this book. Although the description in terms of tank production, shown in Exhibit I, is greatly simplified, it may serve as a suggestive illustration of the magnitude of the problem and its significance in the establishment and development of control policies and administrative practices.

EXHIBIT I

Industrial Control Problem in Tank Production: Selected Treatment of Time-Industrial Processing Ratio in Terms of a Single Material—Alloy Steel

MATERIAL USED	PROCESS PERFORMED	PRODUCT FABRICATED	TIME REQUIRED—MONTHS	
			Specific Step	Cumulative
Pig iron, steel scrap, manganese, nickel, etc.	Melting	Alloy steel billets, bars, rod, wire, etc.	2-4	2-4
Alloy steel bars, etc.	Pickling, drawing, heat treating, etc.	Alloy shapes used in further fabrication	1-3	3-7
Finished alloy shapes	Processing such as machining, boring, etc.	Tank treads, axles, gears, bearings, etc.	¼-1	3¼-8
Bearings, etc.	Assembly	Motors, selsyns, engines, transmissions, etc.	¼-2	3½-10
Components enumerated above plus countless others	Final assembly	Finished tank	¼-1	3¼-11

The obvious oversimplification of the production process in Exhibit I understates the time required since there are no allowances for order placement, specification changes, delivery delays, and other time-consuming factors involved between the entering into production of the basic material—alloy steel—and the final assembly of the end item. A minimum allowance for these factors would be 3 months. This would increase the production time shown in Exhibit I to 6¼-14 months. From this it may be seen that a control policy that cuts across the materials, components, and fabricating facilities engaged in tank production would require at least 7 months to become fully effective, *even after the approval of designs, the determination of quantities, and the resolution of facility and related problems.*

Elapsed time is only one factor in the control problem. Full appreciation of the complexity of control requires the recognition of the need for distributing materials and components not to a single end product, such as a tank, but to the host of competing demands as well. Like the "elapsed production time" problem, that of "competing demands" is not readily recognized by those engaged in only a single phase of industrial production. Again, the situation is greatly oversimplified to show competition

THE BACKGROUND

between components and final-use articles in Exhibit II, and among military, essential non-military, and civilian items in Exhibit III.

EXHIBIT II
*Industrial Control Problem in Distributing Alloy Steel:
Competition Between Components and Final-use Items*

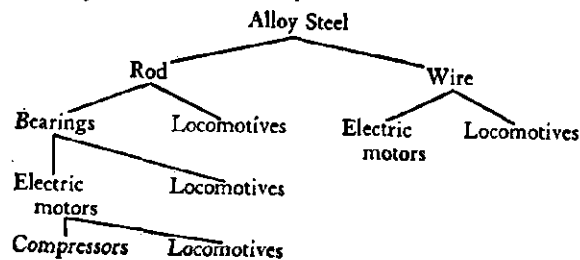
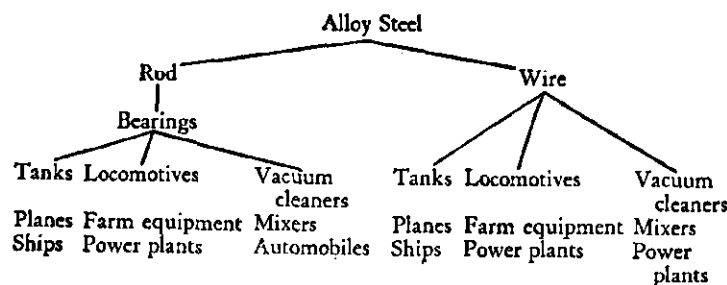


EXHIBIT III
*Industrial Control Problem in Distributing Alloy Steel:
Competition Among Military, Essential Non-Military,
and Civilian Items*



Even the few items shown in Exhibits II and III involve complex decisions and administrative action starting with the alloy melt schedule shown in Exhibit I. The alloy melt schedule precedes by 7 to 14 months the delivery of many of the final-use items. At the melting point specifications are poured into the product. Military specifications are usually different from civilian specifications. Specifications for finished-item alloy shapes frequently differ from specifications for shapes used in producing components. And within each category there are thousands of variations of alloy composition, finish, and size. If the proper delivery of finished

items is to be made, a multitude of decisions and directions must be prepared 7 to 14 months prior to the scheduled delivery dates. Is the furnace to be charged for military, essential non-military, or civilian items? Should the melt be for components or finished items?

When the decision is to make a stipulated quantity of alloy steel for standard bearings or electric motors, decisions must still be made as to whether the bearings are to go into a tank or a locomotive or are to be used as replacements for burned out bearings in civilian automobiles. Some of these choices can be made in specific terms, others only as broad policy criteria. But all decisions must be made in terms of stipulated quantities and time periods. And once the policy decisions have been made, thousands of administrative decisions must follow to accomplish the translation of high policy into the lowly actions of charging the alloy melt furnace or distributing its alloy steel products. These actions require elaborate administrative procedures which in turn take months, possibly years, for their development, installation, and effective operation.

The recognition of this lead-time factor extending from the first stage of planning to the ultimate high-volume output of essential end products is basic to a clear understanding of the problems which are inevitably associated with the introduction of centralized administrative controls in time of war. The industrial atmosphere in which these controls must be introduced is always one in which military needs appear to be of relatively slight importance compared with the normal operation of the free enterprise peacetime economy. Business managers naturally are concerned with the desirability of securing a continued output of the products which make up their normal business. Trade names are important, as is the retention of the most desirable distribution channels and sales outlets. These considerations call for the continuing availability of the products of industry to the extent demanded by market conditions. Inevitably, business managers are reluctant to engage in the manufacture of unfamiliar war products which may require reorganization of plants and production lines or training of labor in new processes or the use of new materials. Many specialized problems are attached to the production of materials manufactured for the military services. Government procedures of procurement and payment must be learned; frequently, they are slow and cumbersome. New and more stringent specifications of a kind unknown in civilian production must be satisfied.

Above all, there is the traditional American attitude toward government and its interference in the functioning of the free enterprise system. The government authority finds itself in the position of intruding to establish the controls necessary to accomplish the objectives it has in view at a time when the natural climate of opinion is adverse to such developments. As a result, each intrusion of central authority which interferes with or sets aside the functioning of the free enterprise system is regarded as an unwarranted incursion upon industry. The procedures of control, therefore, are subjected to a twofold operating difficulty. First, they must carry the burden of whatever deficiencies they may have as operating methods in a complex and diversified manufacturing system. Second, they must cope with the natural reluctance of business to adapt itself to control, to change its methods, and to supply information which the central authority considers necessary to its continuing administration of the war effort.

A related problem grows out of the desirability of selecting for each industrial control the procedure which most effectively compromises the inherent differences in the objectives of government and the established routines of private industry. The most successful procedures are always those which operate through existing industrial records, procurement practices, and manufacturing methods. It is not possible, of course, to follow this principle in all wartime material and production controls, because the character of the control problem in the national emergency breaks sharply with the normal functions and motives of the economy. But even in these unusual circumstances, alternative control procedures must be appraised in relation to the current practices of the industries to be controlled, and their range of adaptability.

The reasons for emphasizing the significance of this relationship between the design of central control procedures and the methods of industrial operations are not always given adequate consideration. First, the control procedure which accommodates itself to industrial practices can be instituted with a minimum of operating friction. Every new control system must go through a "warm-up" period in which industry becomes familiar with and adjusts to the new routine. To the extent that operational changes are held to the minimum consistent with the compelling objectives of the control, this initial period is shortened and the time when the control bites into economic activity is hastened. Second,

such a control system builds meaningful operating statistics from the start because its reports can be compiled from existing business records. Third, this type of control meets less objection from business managers who have been conditioned by the free enterprise economy to react against outside interference with their policy decisions and operating methods. Fourth, since the training of most of the administrators of the control system has been in existing industrial operating procedures, they become familiar with the control more readily, and use it as a tool with greater effectiveness. Finally, through the combination of these conditions, the principal objective of the control—the direction of the economy toward maximum production for military and essential civilian requirements—is attained most rapidly.

The application of this principle, as the War Production Board learned from four years' experience, requires the critical review of proposed orders, procedures, and distribution practices in each affected industry. Equitable treatment of all competing concerns in an industry in which production must be cut back, for example, may suggest the application of a uniform production ceiling in terms of a flat percentage of output in a base period. Because of differing cost structures, one company will be able to operate successfully under such a limitation while a competitor may be forced below the level of output at which a profit can be earned. In one industry, it may be established procurement practice for each company to purchase production materials for specific end products (procurement against individual orders), rather than to purchase for inventory replacement. In another, the contrary practice will prevail. Control procedures which are not tailored to procurement practices in each industry will be ineffective, and may be the cause of a major disruption of production. A control procedure which uses the principle of extension of preference ratings through all supplier levels rests on the assumed industrial practice of procurement for individual end products or end-product production schedules. This will not work satisfactorily in an industry in which the established practice is to procure for stock and to withdraw from inventory to support current production.

Similar examples of the necessity for relating controls to business practices can be found in the variety of internal practices within individual companies. The extension of wartime controls uncovered the fact that a substantial part of American industry has regularly operated without

organized material records and systematized internal controls. Many manufacturers, for example, did not maintain detailed stock records and could not from their books relate procurement to production. In some cases, of course, it was necessary to make the control effective by forcing the establishment of such records; in most cases, however, the control system had to be adapted to existing practices. Experience proved the soundness of the general principle that, with rare exceptions, a control which runs directly counter to existing industrial practice is seriously handicapped and may never operate successfully.

The problem of collecting statistical information is closely related to the establishment of control procedures. Statistical data are essential to the effective operation of all controls and cannot readily be separated from the control systems. Again, long experience clearly points to the desirability of collecting such information through the normal operation of the control system and not as an independent activity. Industry resents the collection of statistical data which are not clearly related to an essential government activity and which do not lead directly to priority, allocation, or similar action. Purely statistical surveys were opposed by industry whenever there was no clear connection between the collection of the data and responsive action by the War Production Board. On the other hand, industry did not resent the submission of data on application forms, because these forms were integral parts of material control systems and were the basis for the authorization of materials and the assignment of preference-rating assistance.

A parallel issue is the relation of the scope of data requests and the area under control to the significance of the data secured and the allied control action. This is essentially an analysis of a cost-profit character. Under the Production Requirements Plan, for example, it was found by analysis of material consumption reported on Form PD-25A that a total of 1,650 companies representing about 4,000 manufacturing plants reported carbon steel consumption of 8 million tons per calendar quarter, equal to 82 percent of the total quantity of carbon steel consumed in all metal-using industries. Similar concentrations of consumption were reported for the other critical materials.

This general concentration of material consumption in a small number of producing units has an important relation to the impact of control procedures on both industry and government. For industry, it means that

the objectives of material consumption and distribution controls can, in most cases, be attained without imposing a serious clerical and record-keeping burden on the bulk of the small enterprises in the industries under control. The advantage of extending the control to a 100 percent basis ordinarily does not justify the burden such complete coverage places on small operating units. The general application of this principle means that methods can be used which impose the onus of a centralized control only on those companies which, because of the large scale of their operations, are best equipped to assume the burden.

A wholly different aspect of the problems of industrial control is presented when we consider the management job in the government agency responsible for the organization of the economy for maximum production for war. The first consideration is the relative size of the military program. The effectiveness of any control system depends in large part on the accurate appraisal of two things: first, the absolute magnitude of military requirements; and second, the relation of military and essential civilian requirements to total material and product supplies. Neither of these is a simple calculation. Military requirements are a direct function of the size of the armed forces and of determinations with respect to their equipment. But these factors are themselves influenced by the rapidly changing fortunes of war, strategic decisions of both our own command and that of the enemy, climatic conditions prevailing in the war theaters, the geographic locations in which we fight, the length of the "pipe line" to the battle front (and the number of ships, freight cars, and trucks required to move material through that pipe line), the level of stocks to be carried at home and at theater supply centers, and many similar considerations.

Even after these factors have been taken into the calculations, the resultant is only a statement of end-product requirements. The job remains of translating (with appropriate lead-time allowances) specified numbers of tanks, guns, ships, and planes into quantities of motors, turbines, bearings, fuel pumps, and piston rings; or back to castings and forgings, or to sheets and plates and wire—the products of the basic metal mills. Off to one side will be calculations of machine tool requirements. Off to another, calculations of packaging requirements, with subtranslations into requirements for lumber and paperboard. Off to a third, trucks and tires—which present a problem of constructing plants on schedule

to make synthetic rubber (and building the equipment for these plants)—which sets up parallel requirements for tire cord and carbon black. Nor does the calculation of military requirements complete the job. There is still the civilian economy to be maintained: housed, clothed, fed, transported, repaired.

Finally, the accumulated requirements—military, civilian, and export—must be taken into one side of the balance, broken down in the detail of products and materials and by time periods; and anticipated supplies into the other. These are the vital relationships, present and future, which help to shape the procedures of control.

If the military program is of a size which requires only a relatively small proportion of the total supply of any material, a simple type of priority machinery can be put into the hands of the procurement agencies without endangering the functioning of the established commercial distribution mechanism. On the other hand, when military demand is of a size which approximates or approaches total supply, unrestrained use of the priority power by the military will create a series of dislocations in essential civilian programs. Finally, when the military program reaches a point where the requirements for its fulfillment exceed the supply of any given material, a series of internal administrative controls must be established, not only to prevent procurement agencies from using up the entire supply, but also to reduce to a minimum the frictions and conflicts among the agencies themselves.

The impact of the military program on the supply of materials, manpower, and facilities arises from the placement of prime contracts together with the subcontracting which is entered into for components. An adequate internal control must begin, therefore, by establishing some appropriate working relationship between the civilian agency in charge of total production and the military procurement agencies. This was not recognized in the first years of World War II.

This failure may be explained in part by the results of the government's handling of the problem in 1917 and 1918. During these years contracts of the procurement agencies involving the purchase of a critical material were subject to review and approval by the War Industries Board prior to placement. By the middle of 1918 this job, which had been done previously by the Clearance Committee, had grown to such a size that it was turned over to the Commodities Sections of the War Industries

Board. By the end of the war, it was generally recognized that this procedure—limited as it was to immediate requirements only—did not provide the advance information necessary to insure the fulfillment of future requirements. The end of the war came before the production effort had reached the point at which the entire clearance procedure could be expected to collapse of its own weight.

What students of the 1917-18 control technique failed to recognize was the significance to be attached to the fact that our production resources had *not* been engaged in an all-out war effort. The United States entered the war at a late date. The "arsenal of democracy" and the operation of Lend-Lease were to come into existence twenty years later. The use of maximum efforts in the prosecution of the war had not been made necessary by overwhelming demands brought about by a military program which required the entire resources of the country.

It seems clear in retrospect that any basis for disapproving the placement of a military contract was absent under the conditions prevailing in 1918. Comparison between the importance of any proposed purchase and the importance of the particular need which might go unsatisfied, as a result of the use of the critical material for the approved contract, was not possible without some measure of aggregate demand resulting from all orders placed.

However, when the United States became a major participant in a production war fought with materials, weapons, and equipment produced in astronomical quantities, the government found itself without a technique for distributing available material and facilities to the various military and essential civilian programs which presented an aggregate claim far in excess of the capacity of the country's productive facilities and material supplies.

The procedures employed in 1917 and 1918 and during the early defense program in the second World War can now be criticized realistically. The so-called "clearance" function contributed little to the control of procurement in quantitative terms. Its value was largely derived from spreading the load as much as possible and, by this means, helping to reduce production delays due to bottlenecks. The price paid for this accomplishment was a fairly heavy one. It introduced delays in placement of contracts. It required the transmission of hundreds of thousands of pieces of paper. It demanded the time and services of a very substantial

number of people. The decision of 1941 was not to assume this burden for the civilian production agency.

While this decision was undoubtedly a wise one in view of the lack of any general, manageable control machinery, it introduced a new series of problems and at the same time obscured the vital relationship between the power to issue priorities or allocate materials and the size of military procurement. In late 1941 and early 1942 the efforts of the War Production Board were largely concerned with two aspects of the material control problem. One was the effort to deal with the internal and external paper load resulting from the uncoordinated and unrestrained use of priority ratings, and to measure the impact of such actions. The second was the effort to siphon out of the industrial system information which would enable the War Production Board to determine the relative importance of the activities carried on in each of the industrial plants claiming a share of critical materials. These efforts were illustrated by the Defense Supplies Rating Plan, the ever-increasing number of materials made subject to specific allocation procedures, and the culmination of these efforts in June, 1942, with the issuance of Priorities Regulations No. 10 and No. 11. The first of these was a device for identifying the end use of materials at various levels of the production process and the second was the official authority which served as a basis for the Production Requirements Plan.

The Production Requirements Plan recognized the necessity for validating the approved claims of industrial applicants. At the same time it took a long stride toward coordinating the various kinds and levels of priority authority granted to a single industrial plant. This was accomplished by requiring an application from each of the large metal consuming plants every calendar quarter. The application form permitted the applicant to list the kinds and quantities of products made in the plant and the preference ratings against which they were shipped. Estimated shipments and orders on the books for future delivery were analyzed in the same way. On the basis of this information, the importance of the plant to the war effort and the probable future changes in its output were determined.

Having established the importance of its claim, each plant was then required to demonstrate what its claim would amount to in terms of material. Information was furnished on material inventories, past consump-

tion, and future requirements. The aggregate of such material claims permitted a comparison of the total demand for and the supply of each critical material. Authority to purchase materials was given in specific quantities with appropriate preference ratings determined by the relative importance of each plant. The preference rating under this scheme simply became a device for determining precedence in delivery.

The fundamental weakness again was derived from the failure to tie this mechanism to the procurement actions of the military services. Characteristically, the total demands for critical materials far exceeded supply and a device was lacking for determining which of the industrial applicants was to be cut back. Each was able to demonstrate his own participation in the military effort on the basis of high-rated shipments and orders. In short, the prime contracts which had been let months before now appeared as shipments and subcontracts on the books of the applicants, with the aggregate of such rated orders far exceeding the ability of the material supply to satisfy them. The crucial task of deciding which of the military demands were to be met and which were to be cut down had been transferred from the level at which prime contracts were initially placed to the level at which military orders were translated into material requirements by industrial subcontractors. The control system was destined to fail because it did not provide an internal administrative mechanism for curtailing the procurement actions of the military agencies.

Hardly had PRP been made mandatory when work commenced on the preparation of a new material control mechanism which embodied this additional feature. In the fall of 1942 the first draft of the Controlled Materials Plan was made public. This plan was put into partial effect on April 1, 1943, and was made the basic material control system on July 1 of that year.

CMP represented another effort to grapple with the problem of establishing a workable internal control over the results of procurement actions as a substitute for dealing directly with the procurement activity itself. It required each of the claimant agencies (that is, the War Department, Navy Department, Maritime Commission, etc.) to translate its projected program into common tender. The units chosen were the so-called controlled materials: carbon and alloy steel, copper, brass, and aluminum. Having translated into the common units programs for ships,

tanks, planes, guns, ammunition, and other military and civilian products, the various agencies presented their claims to the War Production Board. After total claims had been balanced against total supply, and each of the competing claims had been measured against the others to provide a basis for cut-back decisions necessary to reach a balance, each claimant agency was allotted an appropriate share of the total supply of each controlled material. This was an aggregate allotment covering all programs for the agency.

CMP was never a procurement control in the sense that the size of the programs for which contracts were let was limited by the allotments of controlled materials made to the individual claimant agencies. CMP was an effective control over the procurement of the individual controlled materials for which specific allotments were made and a specific accounting maintained. The claimant agencies were never directly and specifically compelled to cut back the totals of programs under procurement or contract in those cases in which allotments of controlled materials would have called for either cancellations of contracts already placed or the withholding of new contracts. This was very pointedly illustrated in the case of the Army Air Forces: when it was found that the quantity of aluminum allotted for the third and fourth quarters of 1943 was less than 85 percent of that required to execute the program which was regarded as minimum, manufacturers were encouraged to buy all of the uncontrolled materials and components necessary for the full program in the hope that manufacturing economies might be introduced which would permit the spread of the sheet aluminum and aluminum extrusions actually allotted to cover the total of the contracts under procurement. Similarly, in the case of the Maritime Commission, propulsion equipment and other heavy items required for the final assembly of ships remained under contract even though sufficient steel to complete the assembly was not allotted to the Maritime Commission. The successful maintenance of the Maritime program on a reasonably balanced level was not due to any curtailment arising from an attempt by the Commission to limit its procurement to the quantities of steel allotted, but rather to slippages in deliveries of propulsion equipment and actual completion of ships on the ways.

It is important to distinguish between CMP as a control over the allotment of specified quantities of material and CMP as a control over

total procurement. Since the plan did not control the making of contracts, the claimant agencies were not compelled to cut back the total of their purchases to the quantities required to carry out the end-product production schedules for which steel, copper, and aluminum were allotted. Purchases of other materials and components which could not be supported by allotments of steel, copper, and aluminum imposed an unwarranted demand upon non-controlled materials such as lumber, textiles, and chemicals, and upon components which were not specifically controlled, such as bolts and nuts and metal stampings. In fact, in the component area, the significance of this overordering was that it compelled the introduction of very detailed scheduling controls, which were in fact more specific controls than CMP itself. However, even in the scheduling schemes the methodology used was to deal with the problem of meeting current deliveries required for the most urgent items and not to cut back the volume of orders placed under contract by the prime or subcontractors.

Under CMP, as a substitute for procurement control, a specific quantity of material was allotted to each claimant agency—War, Navy, Maritime, Petroleum Administration for War, and so on—to carry out the production schedule for which materials could be made available. The claimant then made allotments to each of its prime contractors. This process was repeated by the prime contractors in reallothing to component and material suppliers. Budgetary accounting control was mandatory at all levels from the claimant agency through the prime contractors and the subcontracting chain.

The general accounting requirements in terms of common units supplied one management device which had been lacking in all previous attempts at procurement control. Since the total quantities of materials which had been allotted were within supply, it became necessary only to insure that no claimant and no contractor actually purchased equipment requiring materials in excess of the quantities which had been established in the bank account for that purpose. On the other hand, the individual actions of the claimant agencies were not subject to review by the War Production Board, which merely required a bi-weekly report indicating the results of the totality of contracts placed in terms of quantities of controlled materials. This provided the necessary freedom of action through decentralization for the smooth operation of military

procurement through the proper agencies. But the failure to grapple directly with procurement actions continued to plague the War Production Board throughout its operation.

No one who lived through the experience of wartime industrial production, as either business manager or civil servant, survived without his private score of special circumstances which make the experience unique. Certainly this quality of difference was so marked that, once the gravity of the national emergency was deeply grasped, there was no significant opposition to the imposition of controls. The argument shifted to methods, timing, and extent of coverage. But what was not readily understood was the fact that the special conditions of wartime industrial production were not limited in their impact to the creation of the need for controls. They also shaped the controls. In the end, those controls which were most effective in operation were the ones drafted and administered with the most comprehensive understanding of the conditions of industrial production, in private business and in responsible federal agencies.

CHAPTER III

MATERIAL CONTROL PROCEDURES: EARLY DEVELOPMENTS

IT HAS BEEN SAID with justification that industrial and material control mechanisms grow only with the immediate experience of the men developing them. Certainly, the evidence of 1940-45 would tend to substantiate the truth of this observation. It has been pointed out in the previous chapter that the inadequacies of the controls established during the first World War were not generally recognized until 1918. The unhappy consequences which could have been expected as a result of the cumbersome and ineffective procedures employed were avoided by the end of the conflict.

A similar pattern of trial and error groping emerged in World War II. While a close study and analysis of the experience of the first World War would have enabled the government production management agencies to avoid many pitfalls, the lessons were learned only after a new generation had broken a new set of legs. It appears, in retrospect, that each of the advances toward production control objectives was made only when the inadequacies of the current system became so glaring that a change—almost on a for-better-or-for-worse basis—had to be made. A number of proposals for dealing with existing problems were accepted at such a late date that timing problems themselves either threatened to negate the advantages of revised procedures, or in fact actually destroyed them. Looking back, one can almost say that the control procedures established were always barely adequate to deal effectively with the problems encountered in the period immediately preceding their adoption. However, it seems that the problems grew faster and more complex than the orders and regulations which were issued to solve them. Consequently, each new phase of the developing production effort created a new set of problems requiring a new and more far-reaching set of procedures to deal with them.

In this and the chapters following is presented a description of the ma-

material control mechanisms and tools employed by the wartime agencies to cope with the problem of attaining maximum production for war. To provide background to assist in understanding and evaluating the importance and significance of each of the procedures employed, a brief description of the purposes and general character of the principal control devices is provided at this point.

The earliest formal effort consciously to guide the output of industry toward the manufacture of weapons and other products necessary for national defense or war consisted of the issuance of preference ratings on individual preference certificates. These certificates established a priority for the purchase of products essential to the national defense. That is to say, they gave the government military services authority legally to take precedence in the utilization of industrial facilities. Emphasis was on procurement of end products on a priority or "come first" basis.

This step was soon followed by the extension of the priority concept to a defined list of critical materials and items needed for the manufacture of the products ordered. Such priority ratings were assigned by officers of the military departments of the government. Action was taken on a spot basis, usually at the plant requiring the production materials. Preference ratings were used to make certain that deliveries against specified military orders were placed at the head of manufacturers' production and shipment schedules and that the materials to meet the schedules were actually available when needed. As soon as the production effort for military purposes attained a sufficiently high level, the inordinately large numbers of individual actions required to continue on this basis led to a search for a time-saving device.

Such a device emerged as the first General Preference Order P-1 issued in the spring of 1941. "P" orders were designed to assign preference ratings on an automatic basis to a general group of products. Aside from the obvious advantage of replacing the meaningless and burdensome review of the individual preference certificates described above, the general preference order technique emphasized the shift from a concern with the procurement of the end products themselves to an emphasis on the purchase of the materials and items to make them. The manufacturers of the products included in the scope of general preference orders were given authority to extend the designated ratings to their suppliers for the procurement of production materials.

The operation of the general preference orders produced two new problems of major proportions. First, the provisions of the orders governing the use of the preference rating extension led subcontractors into a difficult and often an impossible position, as a result of the necessity for identifying their own component output and related material requirements with end products in which they would be ultimately incorporated. Sometimes such end products were many manufacturing and sub-assembly layers away from their own level. Second, the issuance of blanket P orders led to a rapid extension of the application of preference ratings to purchase orders for materials. This, in turn, resulted in the development of conflicts among preference-rated orders for certain materials and a consequent general uneasiness that all was not well.

The rapid strides which the issuance of general preference orders and their rating-extension provisions made toward the usurpation of the total supply of critical materials resulted in the development of a new set of controls designed to deal with the problems at the mill level. These were known as Conservation Orders and were issued in the "M" series.

These orders rapidly passed through a phase in which a major effect consisted of reducing the lawful consumption of the affected critical materials to a percentage of a pre-war base. First issued in March, 1941, before the end of the year they were the major control device for the allocation or parceling out of specific quantities of materials covered by the orders for specific uses. Allocations, or authorization for a mill to ship to specified customers, were made on the best available evidence of the importance of the end product in which the material would ultimately be incorporated. M orders reflected the shift in emphasis from the facilities for the production of end products to the limited supply of critical materials, so as to insure their use for only the most important purposes. In this development lay the seeds of the administrative turmoil which was later to lead to many bitter conflicts in the Office of Production Management and the War Production Board. The power to allocate or approve the delivery of a specified quantity of a critical material for a particular purpose was the power to veto decisions regarding the relative importance of the same use made at the end-product level. Since such decisions were made in the absence of information regarding their impact on the supply of particular materials, however, they led to the

growth of such rated orders and conflict at the mill level. The M orders represented an effort to resolve such conflicts.

While each of these allocation orders had the virtue of maintaining authorized and directed shipments within the limitations of available supply, certain difficulties appeared at an early stage. Not the least of these was the difficulty of identifying material shipments at the mill level with end products in which the materials were ultimately incorporated.

Perhaps even more important was the lack of cohesion brought about by the independent decisions reached by the materials divisions within the war agencies. With respect to a given material each division made decisions independent of those reached by other material divisions with respect to other material requirements for the same product. As a result, allocations and actual deliveries of particular materials could be made without any assurance that the products requiring such materials would be manufactured in the face of the possibility of lack of balance in the flow of *all* required materials. The administration of M orders led to a large-scale expediting job to repair omissions of this kind.

As indicated above, M orders frequently included provisions for limiting the use of specific materials for civilian purposes. However, as material shortages spread to an ever-increasing list, as facilities themselves began to appear as production bottlenecks, and as the material and manpower requirements of the military effort together produced the first signs of labor shortages, the need for action on a broader front became clear.

The control device employed to conserve the supply of materials, facilities, and labor in the aggregate was known as a Limitation Order. These orders were issued in the "L" series and usually reduced the output of a class of products by restricting production to a percentage of some base or by forbidding production altogether.

Limitation orders served several related purposes in addition to the major one stated above. The reduction of output of the products subject to limitation orders tended to relieve the pressure on suppliers of critical materials and components. Such relief assisted in bringing about a somewhat more effective operation of the positive controls established to direct the distribution of critical materials. Further, limitation orders frequently established the level of output of products needed for the continued func-

tioning of the economy. In this way they introduced a rough production control device.

These efforts to conserve the supply of critical materials were supplemented by several subsidiary devices. Measures were taken to standardize the production of civilian products. Priorities Regulation No. 1 represented an effort to maintain inventories at minimum working levels so as to spread the available supply of critical materials as far as possible. Because of the complex problems encountered in controlling the level of industrial inventories the regulation was general in nature and provided little in the way of tools for effectively assuring compliance. Efforts were made to conserve materials by altering the specifications of civilian products. Specifications affecting the composition of military products were determined through contract placement by the war agencies. Negotiations to alter specifications for military products were conducted on an informal basis by the production agencies and the military services.

The net result of the totality of these actions was to open the door on a new problem. It became increasingly clear that the use of priorities, allocations, and similar devices for the distribution and use of material inevitably tended toward their application in an ever-broadening area *once they were applied to an important segment of the economy*. Products selected initially for preferential treatment were not by any stretch of the imagination a complete list of products important to the economy and the military program. Rather, they constituted a list of important products for which production was either seriously falling behind program objectives, or which required active assistance if program objectives in terms of the nation's needs were to be accomplished. Equally important products not receiving priority or allocation assistance cropped up as new problems in increasing numbers as losses in production of such products reflected the diversion of critical materials to the programs originally selected for preferential treatment. It became apparent that the result of this growth must be a comprehensive system of material control.

The forerunner of such a system was the Defense Supplies Rating Plan. This grew out of the need for consolidating for manufacturers of components the paper work required by the uncoordinated series of individual controls. Shipments, orders, and requirements were classified into broad groups, and reviewed for a calendar quarter at a time, instead of on a spot basis. Participation was voluntary, with manufacturers given

the option of operating under the plan. This paper work, however, was only the physical manifestation of a conglomerate of individual production control procedures which, in the aggregate, had grown so complex that the ability to grapple with them had been lost, not only by industrial management, but by the government itself.

Consequently, the next stage in transition was the spreading of the Defense Supplies Rating Plan to complete production areas on a mandatory basis. This had the effect of introducing, for the first time, the essential elements of a "system." Expressed requirements approximated total demand for the critical materials included. Reported consumption in previous periods approximated total use. Consequently, quantitative authorizations issued on such a basis had the required characteristic of permitting the division of the total supply of certain critical materials. This, of course, was the major advantage of the individual allocation control procedures established under the M orders. In addition, the simultaneous action taken for a number of materials provided the means for coordinating the actions with respect to *total* production requirements of such products and introducing some measure of balance in the flow of critical materials into a given plant. These principles were embodied in the effort to establish a comprehensive material control system in Priorities Regulation No. 11, which became known as the Production Requirements Plan.

Despite these advantages, the Production Requirements Plan had two inherent weaknesses of major proportions. First, relationship was established only between the War Production Board and the individual consumers of critical materials. This was known as "horizontal" allocation. At the component level, it was plagued by the old difficulty of identifying the use of critical materials with the end products in which they were to be incorporated. This was true at the broad policy level in the determination of whole-industry quotas and at the individual plant level as well. Efforts to fill this gap with a systematic end-use code stamped on purchase orders and passed through the industrial system (Priorities Regulation No. 10) ended in abysmal failure. Second, it lacked the elements necessary to permit the development of a relationship between the placement of prime contracts by the government procurement agencies and their impact on material supply. In short, supply problems did not react directly on a procurement program requiring a quantity of materials beyond the nation's industrial capacity to produce them.

The Controlled Materials Plan, the over-all control device in operation at the end of the war, had all of the advantages of the Production Requirements Plan. In addition, it provided the basis for relating material allocations to supply contracts and military programs. Further, it provided machinery for establishing a relationship between the material requirements of components and of end products. To the extent that it was practicable, these desirable characteristics were incorporated in the plan through a system of vertical allocation.

CMP represented the last step achieved in the direction of complete governmental control of the industrial machine. Even this procedure was still in the process of development, however, when the conclusion of the European war relieved the pressure to go further in harnessing the country's facilities for the production of military items.

Only the early history of individual preference certificates and the general preference, conservation, and limitation orders is reviewed in the balance of this chapter and in the following one. The period covered is from the middle of 1940 to the early part of 1942. Subsequent developments in the history of these controls will be referred to in later chapters.

The issuance of preference certificates to operate a system of military preference ratings preceded by almost a year the establishment of full legal foundation for the exercise of the authority. Incomplete authority for establishing a system of priority determinations was given the President in Section 2 (a) of Public No. 671, signed June 28, 1940. This provided, in part, that in the President's discretion Army and Navy contracts should take priority over all deliveries for private account or for export. Priority actions based on this partial authority began in the month of August, 1940, and continued on an expanding scale until the approval of the Vinson Bill on May 31, 1941, and the creation of the Supply Priorities and Allocation Board on August 28 of the same year. This period of priority action with incomplete authority paralleled the experience in the first World War when a similar priority mechanism was established and utilized for almost a year upon the sole authority granted by Congress to control transportation.

The first step in the development of the priority system was taken in June, 1940, when the President established the Office of the Coordinator of National Defense Purchases and directed him to "investigate the neces-

sity for and make recommendations to the President relative to the granting of priority to all orders for material essential to the national defense over deliveries for private account or for export." The second step was the announcement on August 12 that the Army and Navy Munitions Board would issue priority ratings on critical and essential items for all Army and Navy contracts, followed, on August 14, by the publication of the first critical list of items for which procurement difficulties were being experienced and to which priority ratings might be assigned by requisitioning, contracting, or purchasing officers.

Supplementary organizations directed toward the resolution of problems in the industrial area ancillary to that directly affected by Army and Navy contracting included the Commercial Aircraft Priority Committee (established October 23, 1940) and the Machine Tool Committee (October 30). By Executive Order of October 21, 1940, there were created the Priorities Board and the Office of the Administrator of Priorities (to which was delegated the priority authority granted for Army and Navy contracts in the bill of June 28).

Because of the limited authority for priority actions established by that legislation, until September, 1941, at all manufacturing levels below that of the military prime contractors the operation of the preference-rating system was voluntary. Priorities in production areas essential to the war program, but not under Army or Navy contract, were non-mandatory. So, too, was the preferential status of contracts placed for the account of foreign governments. Whatever the operational feasibility, the contemporary governmental and industrial atmosphere favored such a system.

A communication dated September 9, 1940, addressed to machine tool manufacturers by the Advisory Commission to the Counsel of National Defense, stated that

continuance of the proposed voluntary system depends on complete voluntary cooperation of Government and industry to assure completion of contracts on specified delivery dates and in accordance with the order of importance established by the strategic needs of the Army and Navy. The Commission favors continuance of the voluntary system until it appears that more authoritative measures are required.

Two things are clear. First, a system described as "voluntary" was far from voluntary in operation, both by the will of the procuring military agencies and because of the patriotic and economic considerations under-

lying the operations of manufacturers participating in the program for national defense. Second, even under such conditions, a system described as voluntary must break down at certain critical points because of the *inability to force* compliance where compliance was most needed. It was inevitable, therefore, that the expanding military program would compel the transition from a voluntary to a mandatory system. Indeed, it might be observed that the expression "voluntary system" is a contradiction in terms.

The basic operating tools in the early priority system included: (1) a Priorities Critical List of items to which preference ratings might be assigned; (2) a scale of preference ratings ranging from A-1 to B-10 (AA reserved for emergencies); (3) a Priorities Directive stipulating the preference rating to be assigned to each of the various items cited in the Priorities Critical List; (4) preference-rating documents which served as instruments for (a) the assignment of a rating to a specific contract or *order*, and (b) the extension of a rating by a prime contractor to his supplier; and (5) a procedure governing the application of preference ratings with these instruments.

The first Priorities Critical List was issued on August 14, 1940, and was expanded repeatedly in revised editions. In general, the early lists consisted of end items and such prime components as generators, motors, crank shafts, and turbines. The early lists also cited such critical basic metals as aluminum shapes and brass castings. The list was designed to limit the materials and products to which preference ratings might be applied. This limitation was imposed to prevent the introduction of preference ratings for materials and products (1) where such action was not necessary to meet procurement schedules, (2) where the items were not of prime direct military importance, (3) where the effect of the appearance of ratings might be to induce scare buying by non-military users, and (4) to circumscribe the authority of military procurement officers as a safeguard against intra- and inter-service competition in order scheduling.

Under the procedure established for guiding the operation of the early priority system, the appropriate rating, determined by the Priorities Critical List and the Priorities Directive, was applied to a contract by the procuring officer. This rating could be extended by the prime contractor to his direct suppliers, with every such extension subject to the counter-

signature of the military contracting officer or his agent. Contracting officers were instructed not to countersign "Extension of Preference Rating" forms for items not appearing on the Priorities Critical List. Extension beyond the first supplier level was prohibited. An appeal procedure was provided for relieving scheduling problems at secondary supplier levels. Machine tool builders who received non-extendible ratings and required priority assistance to complete deliveries on schedule were directed to request such assistance from the Priorities Committee of the Army and Navy Munitions Board in Washington, supporting each request (a separate request for a rating to be applied to each supplier) with complete identification of the order. In other cases in which completion of a contract threatened to be unduly delayed as a result of the inability of a supplier to get materials without priority assistance, a report of the difficulty and a request for assistance were addressed to the Priorities Committee, ANMB, through the prime contractor, the contracting officer, and the Office of the Chief of the Procurement Service concerned.

Serious operational problems began to make their appearance at an early date. Machine tools were the first choke point in expanding military procurement. The nature of the problem was described in the ANMB letter to machine tool builders (November 5, 1940), which stated in part:

Owing to the fact that the majority of preference-rated orders in the machine tool industry carry a rating A-1, it appears desirable at this time to state the relative standing of some of the orders which carry this rating. The order of importance indicated below will therefore be effective temporarily until a more detailed study may be undertaken. When the use to which tools will be put is known or can easily be ascertained, the following list will doubtless serve machine tool makers as a valuable aid in solving many of their problems:

Machine tools for manufacture of:

1. Gauges
2. Machine tools
3. Small arms ammunition
4. Aircraft engines
5. Airframes
6. Fire control, optical, and aircraft instruments
7. Heavy forgings, rolled and forged armor plate
8. Guns and gun mounts
9. All other defense items

The inadequacy of such informal treatment forced official splintering of the A-1 band. This was accomplished in the ANMB Directive of November 27, 1940, which subdivided the A-1 band into categories from A-1-a to A-1-j and specified the precise content of each new band. Army and Navy prime contractors were instructed (letter of December 5, 1940) to reschedule production and deliveries accordingly.

A second operational problem arose out of delays in establishing priority support for procurement at the suppliers' level, particularly in the case of specially built equipment with a long manufacturing cycle. The issue came to a head in the machine tool industry and was resolved by assigning a blanket A-1-a preference rating to firms in the industry, with authority to extend the rating by furnishing to vendors photostatic copies of the assigning letter. Related action (ANMB Directive, December 4, 1940) permitted subcontractors to extend preference ratings. Extensions continued to be subject to countersignature by an authorized procurement official, and to be applicable only to items appearing on the Priorities Critical List.

At the same time the Priorities Committee, ANMB, moved into the area of a third operational problem: what were the volume and character of priority actions in American industry which resulted from initial field assignment by procuring officers and central assignment by the Committee in Washington?

The first issuance of blanket preference ratings was accompanied by an instruction to supply to the Priorities Committee the following information for each order against which the rating was applied: (1) item and quantity ordered; (2) delivery date desired; (3) supplier's name; and (4) date of order placement. Again, informality of action was soon abandoned in favor of mandatory procedure. The new priority instruments issued in December called for the filing of two copies of every executed form with the Priorities Committee, ANMB, Washington, D.C.

This was a gesture of colossal futility. A natural curiosity was stirring for current information on the volume of preference ratings outstanding, their impact on components and materials, and other measures of the relative significance of military procurement. But the instruction to send copies of priority actions to Washington did not and could not provide answers to these questions. Within a short period, more paper was arriving daily than could be tabulated and analyzed. Yet it was clear (from

estimates derived from data on military procurement as well as from direct reports of businessmen) that the incoming paper did not represent the totality of priority actions. The data could not be handled by sampling techniques because there was no way to determine what proportion of all priority activity was represented by the forms received by the ANMB. Even simple tabulation was largely nullified by incomplete, vague, and non-uniform identification of items ordered with preference ratings. Nor was it possible to get meaningful aggregates for calendar periods because reported delivery dates bore no relation to reality, and often were succinctly but not helpfully phrased, "As soon as possible."

As a result of the explosive growth of the war program, the rapid expansion of the volume and economic significance of priority actions (including the emergence of questions of priority in industrial areas other than those directly related to military procurement) drew attention to the importance of coordinating all actions under a single authority. This step was taken early in January, 1941. By executive order the Office of Production Management was established with three principal divisions: Production, Purchases, and Priorities. The same executive order directed the establishment of the Priorities Board as an advisory group. Priority authority remained thereafter within the general area of over-all civilian control, passing, through various administrative transitions, ultimately to the Director of the Division of Industry Operations of the War Production Board.

Developments in the composition, content, and use of the early general preference rating instruments resulted in the adoption first of five and eventually of two forms:

PD-1: A general-purpose application for preference assistance.

PD-2: Used for the assignment of preference ratings in response to *PD-1* applications under the original procedure. To speed issuance, this form was abandoned in favor of stamping the assigned rating on the *PD-1* application. After March 1, 1942, *PD-1* was revised and identified as *PD-1A*.

PD-3: Used for the assignment of preference ratings on Army and Navy contracts and subcontracts subject to the ANMB Priorities Directive.

PD-4: Used for the assignment of preference ratings to contracts of certain government agencies other than the Army and Navy.

PD-5: Used for the assignment of preference ratings on contracts for certain foreign governments and for contracts under the Lend-Lease Act.

After March 1, 1942, forms PD-3, PD-4, and PD-5 were replaced by PD-3A.

The discussion to this point has related the history of individual priority instruments. After the initiation of priority activities, the burden of paper work involved in handling individual applications, the mushroom spread of the area in which preference was necessary, and the uniform importance of *priority actions within whole industries* led to the development of blanket preference orders establishing preference ratings for the procurement of production materials for broad classes of end products. By the early part of 1941 the unbalanced supply-demand equation for many critical materials made it necessary to restrict consumption by the least essential end uses. There were developed a series of limitation, conservation, and allocation orders which eventually grew into the long list which controlled production in the war economy.

The detail of these several assistance and control procedures is presented in Chapter IV. They are noted here only to indicate that a number of different operating procedures grew up simultaneously in the early stages of the war effort. Individual preference certificates antedated all of them. Although the importance of this control technique declined rapidly after the middle of 1942, it was never abandoned.

The principal reasons for shifting from individual certificates as the major operating procedure governing war production can be traced to the growth of the war production program. Whenever military requirements and essential civilian needs resulted in an aggregate demand in excess of the supply of any material the individual preference-certificate procedure broke down.

The granting of preference ratings on an individual basis is essentially a device for providing assistance rather than control. It is a means of identifying the more urgent requirements and giving them a preferred status in procuring production materials. This works until the urgent requirements begin to compete with one another on a time basis. The assignment of priorities to end-product producers and their extension to suppliers, therefore, could operate effectively only in the earliest stages of the war program when military requirements were a relatively small part of total industrial output. Up to this point, the system served to put first things first. Rather early in its history, however, it was inevitable that it would lead to administrative chaos.

The principal factor hastening the breakdown of the individual rating procedure was the absence of any quantitative measure of priority activity. The attempt to tabulate priority actions ultimately collapsed under the impact of the paper load. Even if the paper had been tabulated, its character was such that the control authority could not have known what it meant or whether it was complete. For this reason, the data could not be used for administrative purposes. The result was that there was knowledge of neither the scope of priority actions nor their impact on the available supplies of critical materials. Two consequences followed. First, the holders of preference-rating instruments became mutually entangled in their own urgencies, so that there was a continuing depreciation of preference ratings resulting from an accumulation of authorized demands in the highest rating bands. Second, the totality of approved and rated procurement authority so quickly equaled or exceeded available supplies that it disturbed the effective scheduling of production in other areas of the economy related only indirectly to military procurement. Because there was no quantitative control over the issuance of preference certificates, and because the expanding war program caused the more essential demand to gain upon supply with explosive speed, administration under this system broke down completely.

The rating officer assigned to a plant countersigned rated purchase orders. But this responsibility consisted, in the main, of attaining maximum production. His actions were subject to review by superiors whose responsibility consisted, in the main, of attaining required production objectives for all the plants participating in the program. Ultimately, the responsibility rested with the chief of each procurement service, whose major objective was the production of more tanks, more ships, or more aircraft, depending on his uniform and insignia.

Under these conditions, it was inevitable that the use of rating privileges by manufacturers would rarely be disapproved. Not only was each officer's performance measured by his success in raising production levels to meet expanding military requirements, but there was no yardstick with which to measure the relative importance of competing programs.

From these fundamental difficulties stemmed a number of related operating problems. First, the system of independent priority actions made program integration impossible. Deficiencies in integration were also experienced for individual military contracts. Production schedules

were under continual revision because of the failure to attain a balanced flow of components and materials. These problems were not serious in the beginning stages of the war production effort in the summer and fall of 1940. As military procurement increased, however, and material controls at the mill level were introduced in the early M orders, production for war was carried on under two different systems simultaneously.

It now became necessary to establish allocation controls for the distribution of the most critically short materials among the competing demands. Decisions at one end of the production line, embodied in the assignment of preference-rating assistance to end products, might be negated by decisions at the other end of the production line, embodied in allocation actions for war materials. Even when the effect of the simultaneous operation of two control systems was not total contradiction, there was no machinery for coordinating the independent sets of decisions so as to assure the completion of the most important schedules on time, with the proper control and assistance at all levels of manufacturing from basic materials through components to end products.

The result was to put a premium on expediting to break bottlenecks wherever they occurred. Relief by expediting was feasible when the bottlenecks were few in number, readily identified, and capable of resolution by spot decision without concurrently creating other production difficulties. Expanding war programs could not be handled on this basis, however. Breaking a bottleneck at one point in one production schedule inevitably created a choking of supply at another point in another production schedule. No top administrative authority could make decisions on any broad basis when there was no over-all coordination of information with respect to (a) the size of military end-product programs; (b) the impact of the demands created by these programs on components; (c) the impact of the demands on basic materials; or (d) the related demands created in other industrial areas not directly tied into military end-product programs. The larger the programs, the greater was their impact on productive capacity and the more difficult the task of administration.

A second operating problem was the establishment of a method of dealing with the unknown area of demand at subsidiary supply levels. The qualitative and quantitative impact of preference ratings at sub-contracting levels could not be appraised. This laid the groundwork for

a series of difficulties in directing the supply of components and basic materials, which became increasingly serious as the war program expanded. Efforts to deal with the size of programs in terms of end products were continually frustrated by the inability to translate these programs into the necessary components and raw materials required for their fulfillment. Since the increase in consumer purchasing power and the consequent general increase in civilian production were operating simultaneously to inflate the total demand for components and materials, the task of organizing production for war was subject to continually increasing handicaps. These were apparent in terms of both the shipment of the necessary quantities of components and materials for the fulfillment of military end-product programs and the timing of their delivery to minimize production delays. To the extent that the scheduling of procurement by the military services was not closely integrated for related items, the administrative difficulties were further increased.

A third operating problem was the establishment of criteria for processing applications for preference-rating assistance. In the early stages of war production it was relatively easy to identify and single out for assistance the most urgent military requirements. Later, it became necessary to distinguish between several levels of urgency and to set up standards on the basis of which certain applications might be denied. In the absence of over-all data on total requirements and supplies, it was impossible to establish and adhere to criteria for approving or denying. Any applicant might object to any decision with the claim that it was unfair. There was no way to prove that all demands had been taken into consideration and that the available supply had been divided on the basis of established criteria which might be criticized, but which were not subject to claims for additional assistance. Because there was no way to demonstrate this fact, it was inevitable that processing authorities would be more inclined to approve than to reject, and would not hold their actions within the limits of known supply. The direct result of this situation was, of course, that preference-rating authority was extended to procurement in excess of available supply, so that *priority paper* was worth less than its face value and might at any time and place be worth little or nothing.

A fourth operating problem was the cumbersomeness of the procedures which this type of machinery required. Applications were received irregularly and had to be acted on in the same way. Any effort to tie

together decisions on several applications for assistance for a single production program would inevitably lead to a search for related paper. This was at best a time-consuming procedure. Any attempt to organize actions in terms of over-all programs would take even more time and effort and produce even less usable results. The efficiency of the management job in the war effort declined in inverse ratio to the increase in the volume of paper, which was itself a direct reflection of the expansion of the total war program. The task became more important because it was larger; at the same time, the possibility of handling the job declined because of the inordinate paper burden.

Finally and above all, the machinery not only did not direct attention to, but to a large extent diverted attention from, the principal technical problem involved in the administration of the war production effort. This was the job of relating the available supply of materials and components to the size of the war program over-all and in the detail of end products. From these quantitative comparisons must necessarily follow decisions to curtail some programs and adjust others until they were in over-all balance and in proper relation one to another. This problem was not faced at that time. The issue was to a large extent clouded by the character of the procedures which were in use. It can be seen in retrospect that if the issue had been clear when it first evolved, much of the difficulty with which the managers of the war program struggled in 1941 and 1942 could have been avoided.

The individual certificate system also created operating problems for manufacturers participating in the war program, which paralleled those facing the administrators of wartime materials controls. Requesting preference ratings for assistance in the procurement of individual products and materials was essentially an appeal to a spot-expediting procedure. When this procedure was used to assist in the procurement of the entire range of materials and components going into a complete production schedule, its deficiencies became apparent. The rating assigned for any single material meant little without equal assurance of delivery for all other materials and components. A series of individual and unrelated decisions did not provide the uniformity of treatment required for the most efficient balanced production. The inflation of preference ratings caused by the character of the system required a continual refile of applications for assistance at higher rating levels. As the volume of

war production increased, the individual certificate system placed an intolerable paper burden on manufacturers and at the same time added to the disorganization of production schedules which followed the failure to coordinate military procurement from end products through components to basic materials.

CHAPTER IV

ORIGINS OF GENERAL PREFERENCE, CONSERVATION, AND LIMITATION ORDERS

BY EARLY 1941 a significant portion of American industry was engaged in the manufacture of products linked directly or indirectly to military requirements growing out of the defense program. The number of purchase orders placed and delivery releases issued involving war products was expanding weekly by geometric progression. The economic implications of this new factor introduced into the industrial system, representing the cumulative impact of an increase in the rate of spending, a channeling of the distribution of end products, and a priority of claims on materials, components, and facilities, were far-reaching. The disturbances were felt in all parts of the economy.

One result was that increased importance was attached to the techniques used to direct the distribution of critical materials and products to plants engaged in the military effort. In the early stages of the defense program, authorization to apply preference ratings to purchase orders was handled largely on a spot basis. Requests for priorities assistance were filed by each individual manufacturer for the particular materials required for the manufacture of specific products. With the growth of the total program, the number of individual applications for preference ratings reached such a volume that it became apparent that a continuation of this procedure would result in a paper-handling delay that would seriously threaten the production of military equipment. Beyond this, the almost 100 percent affirmative response to requests for priority assistance from large sectors of industry was making it ridiculous to continue the review of individual applications originating from these sources. Finally, the early priority certificate system did not cover the indirect equipment requirements of military contractors, and a method had to be found to aid them in maintaining and expanding their machinery engaged, partially or wholly, in defense production.

A technique used in the first World War was adapted to deal with

this aspect of the production problem. General preference order P-1 was issued on March 12, 1941. This order set the pattern for the greater part of the general priorities actions taken during the balance of that year. P orders were issued to assign preference ratings for the procurement of materials needed for the production of a general class of products. For example, order P-1 assigned a preference rating of A-1-c to the producers of electric traveling cranes. Order P-2 assigned a rating of A-1-a to the producers of machine tool parts.

The first general preference orders were prepared in series, with a separate order assigned to a named producer (or group of producers), limiting his use of the rating to the purchase of materials required for the production of a specific product falling within the general class identified in the order. The application of the assigned preference rating was confined to materials required for production under contracts for the Army, Navy, or Great Britain, to be used only when materials could not be procured on schedule without the extension of the rating.

The early orders were individually addressed to manufacturers. Each manufacturer was required to sign an affidavit saying that he would use the rating only in the manner prescribed by the order. Such agreements were carried out by requiring the producer to return a signed copy of the order to the *Office of Production Management* and to file photostatic copies of the agreement with each of the suppliers furnishing him with material to be used in the manufacture of the product covered. Each such supplier was permitted to follow a similar procedure with respect to his sub-suppliers.

Two other general characteristics of the early P orders are worth mentioning. First, each order contained a list of critical production materials. Use of the rating was confined to purchases made of such listed materials. This was an outgrowth of the original critical list developed in connection with the assignment of ratings by the Army and Navy Munitions Board. It was, of course, a continuation of the effort to prevent preference ratings from being used as an expediting device in the procurement of materials still in relatively comfortable supply. Second, the early orders had a stipulated life of only 90 days. The concept of an emergency of limited duration, requiring only temporary action, was characteristic of contemporary policy making and administration and was the root of

many of the unconscionable delays in the introduction of controls adequate for the emergencies three and six months ahead.

General preference order P-1 (electric traveling cranes), issued March 12, 1941, listed the following materials as eligible for preference rating: electric motors; switches; controllers and connections; finished or semi-finished fabricated parts and assemblies; and steel bars, plates, shapes, forgings and castings. Order P-2 (machine tool parts) contained a longer list including: alloy steel shapes; steel and aluminum castings; cutting tools; abrasives; oil resisting hose; cranes and hoists; powerdriven metal working machines; hydraulic and mechanical presses; and welders. Order P-3, airframes (airplanes without engines, propellers, instruments, and so on), referred to the materials included in the current ANMB Priorities Critical List.

Later orders were addressed generally (priority assistance for the procurement of materials for the production of industrial lift trucks, metal working equipment, and so on), to all serialized producers, and the list of critical production materials was eliminated in favor of the sweeping "any commodity, equipment, accessories, parts, assemblies, or products of any kind."

The essential difference between individual certificates and general preference orders lay in permitting designated prime contractors and suppliers engaged in important programs to extend or reextend preference ratings on purchase orders without individual clearance. Periodic reports were filed by each contractor, generally listing the purchase orders placed, the preference rating used, the name of the supplier, the name of the material or component purchased, the quantity, and the value. Later, as the preparation of lists became too burdensome, copies of purchase orders were filed in lieu of the specified report forms. Eventually, individual war contractors were regularly shipping to Washington packing cases filled with carbons of purchase orders. It was originally hoped that these *post-factum* reports would improve compliance by forcing contractors to keep OPM informed regarding their actions under the order, and at the same time provide a flow of information helpful in measuring the impact of defense procurement on material supplies. The size and character of the reporting system prevented the attainment of either objective.

The significance of the introduction of the general preference-order technique lay in the indication it gave of the shift in emphasis from problems encountered in the procurement of fabricated end products to problems connected with the purchase of production materials. Until the spring of 1941, preference ratings had been thought of, first, as a device for giving the government a prior claim on manufactured end items and, second, as a means of usurping fabricating facilities and labor for the production of military products. This concept influenced official thinking up to the point at which the requirements for production materials to satisfy the rated prime contracts, as well as corollary military needs for facilities and equipment such as overhead cranes and machine tools, reached such a volume that the demands placed upon material and component suppliers exceeded their ability to satisfy them.

A "multiplier" factor was loose in the economy. Requirements for materials and components for the production of military products were growing at an unprecedented rate, and this demand was being superimposed upon consumer demand for civilian products, which in turn was continually stimulated by heavy government expenditures for military items. Within the space of a few months a number of material shortages made an appearance, particularly in those metals which were characteristically used in the production of consumers' durable goods as well as military equipment. It was becoming clear that the imposition of preference ratings on fabricated end products by the military services would lose much of its force unless the contractors receiving the ratings could exercise prior claims against the suppliers of materials and components, who found themselves unable to meet their customers' delivery schedules.

Such extension of the rating power was permissible under the individual certificate system, but the machinery was cumbersome, designed to resolve only the occasional difficulty. The issuance of general preference orders met this problem squarely. It permitted the relatively free use of priority power by prime contractors. In addition, a simple extension procedure was provided to meet the needs of suppliers and sub-suppliers.

Certain undesirable procedural features still remained as part of the P order technique. In terms of the problems of early 1941 the most important of these was the requirement for identifying each material purchase with a given fabricated product produced by the plant applying

the preference rating. Each person using the preference rating assigned by a P order was required to file a monthly statement listing the individual purchases made with the use of the rating assigned. While this ordinarily imposed no insuperable burden on prime contractors manufacturing military end items to given specifications, it assumed the existence of material control systems and procurement procedures at subcontracting levels. The inability of many subcontractors to operate in accordance with the provisions of P orders governing the use of ratings, together with their natural desire to supply components of military products on schedule, resulted in substantial and widespread abuse of the rating privilege.

Finally, the groundwork was laid for a rapid inflation of preference ratings, which by 1942 was virtually to nullify their effectiveness as a scheduling mechanism. The general preference-order technique had the same basic deficiency as individual certificates: the solution of one problem often created a dozen others. The absence of quantitative information about the use of ratings *initiating* through individual certificates permitted the development of preference-rating squeezes. The rating which put one military customer at the front of the line for a critical material might simultaneously force another to lose his place at the end of the line. The latter would promptly request assistance; this was invariably granted, since the *urgency of his needs could not be compared* with those of each of the other customers requiring the material. This process was repeated at each supplier level. General P orders hastened the process by operating on an industry or program scale rather than on an individual purchase basis.

During March, 1941, the month in which general preference order P-1 was issued, a further step was taken to supplement the procedures established by that order. This took the form of general preference order M-1, designed to conserve the supply and direct the distribution of aluminum. Similar orders for magnesium (M-2); ferro tungsten, tungsten metal powder, and tungsten compounds (M-3); neoprene (M-4); nickel bearing steel (M-5); and other critical materials followed in rapid succession.

The first M orders were issued as general preference orders, rather than as conservation orders, and they actually supplemented and extended the

preference concept embodied in the P series. In their initial phase, M orders did two important things. First, they made the sale of the critical materials governed by their provisions subject to preference ratings. Second, they automatically assigned a preference rating of A-10 to any defense order which did not bear a higher rating. Defense orders were defined as all contracts or orders placed with producers for delivery of a critical material which was to enter directly or indirectly into the manufacture of any product for the Army or Navy, for Great Britain, or for other countries whose defense the President held to be vital to the defense of the United States. In this way, the priorities system was greatly extended on an automatic basis with much the same effect on rating inflation as was created by the P orders.

M orders extending the preference-rating system had a brief existence, and within a short period were replaced by an entirely different instrument—conservation orders—also issued in the M series. The very issuance of the early M orders of the preference type contributed in no small measure to the necessity for the establishment of a far more drastic type of material control embodying the principles of quantitative allocation and use restrictions.

M orders establishing individual material allocation authority represented the most popular single control technique used by the successive civilian agencies responsible for the organization of war production. Conservation orders were not uniform, with respect to either the allocation system employed or the material consumption restrictions established. Nevertheless, they possessed a number of common characteristics derived from the fact that each represented an effort to balance supply and demand for an individual material at the mill-delivery level. The selection of this control point for allocation actions made it imperative to establish procedures to provide the information necessary for intelligent decision. The importance of these procedures in their relation to policy is made clear when one examines the background and objectives of M orders, their characteristics, and the techniques used for both information flow and purchase or shipment authorization.

M orders started with the material rather than the product made out of it. The problem was thought of in terms of conserving the supply of a critical material rather than of expanding the production or directing the distribution of end products. This basic philosophic concept was sup-

ported by the unbalanced demand and supply of materials required for the manufacture of direct and indirect military as well as essential civilian products.

The early M orders were not unlike P orders; they extended the preferential system through the semi-automatic granting of priorities ratings. As soon as rated demand reached a point beyond the capacity of the metals producers to satisfy it, pressure was exerted on that part of OPM responsible for supply to meet such requirements as possessed a valid claim on a portion of the supply in the form of a preference rating.

Two types of action can be taken to deal with this problem: those designed to increase supply, and those designed to decrease demand. In a country possessing the economic resources of the United States, it might seem that the more obvious decision would be to lessen the gap between supply and demand by increasing the total supply of those materials for which imports did not represent the major source of supply. An analysis of this controversial subject is not germane to this study and the efforts made by NDAC, OPM, and WPB in this area are a matter of record elsewhere. A brief note, however, will make more understandable the reasons for the otherwise incomprehensible gyrations resulting from the procedures prescribed by the provisions of the long series of "M" orders designed to change the pattern of demand to reflect the needs of an industrial war production machine operating at an unprecedented rate.

There were always potent forces which made it difficult to increase the supply of most materials. Because of the time necessary to provide the proper plant facilities and equipment it was essential to take this kind of action well in advance of the time when the materials were to be needed. Reliable information about the size of future military programs, and requirements related to them, was invariably lacking. Consequently, the imperative need for providing the means for increasing future supply became the subject of interminable and inconclusive debate. The effect of the increased supply on the post-emergency price structure was a consideration of utmost importance, with a tendency to dampen the ardor of certain segments of the industrial economy for substantial increases in our capacity to produce the basic materials for industrial production. Finally, the expenditure of materials, facilities, equipment, and manpower was always a significant immediate price to be paid for delivery of material in the distant and uncertain future.

The interplay of these forces is illustrated in the wartime history of steel which, because of its crucial position as a production material in almost every phase of the war effort, presented continuing problems of greater production and effective distribution. Up to the beginning of 1941 it was broadly assumed that the industry could satisfy all demands against its capacity. This view was supported by the first Gano Dunn report on 1941 and 1942 steel supply and requirements. By the middle of the second quarter of 1941, expansion of the defense program and the lifting of non-defense demand to prosperity levels brought total ingot production to capacity. At this time OPM recommended the addition of a blast furnace in Utah and a large integrated plant on the West Coast, and was actively considering other projects.

The second Dunn report reached markedly different conclusions. The effect of the expansion of defense demands and the establishment of Lend-Lease would result in a 1941 ingot-supply seriously short of demand, and a 1942 deficit four times larger. Contemporary thinking began to shape a consensus in favor of further expansion of ingot production, application of priorities to all steel mill products, and sharp curtailment of non-defense orders on the mills. This was followed by the issuance of the first orders limiting production of the major steel-using consumers' goods, notably passenger automobiles and domestic mechanical refrigerators.

The situation grew rapidly worse in the next few weeks. Manufacturers of civilian products were loading mills with orders and exerting heavy pressure for prompt deliveries. The developing shortage of pig iron and scrap, and the hot summer weather, forced a decline in steel mill productivity. Producers were unable to meet their full commitments for military, export, and essential civilian uses. For some steel mill products, notably plates, the situation was extremely serious. Sixfold action was undertaken: (1) approval of a 6,500,000 ton expansion in blast furnace capacity; (2) establishment of a full allocation system for pig iron; (3) issuance of M-21, the general steel preference order; (4) bringing all Lend-Lease steel under allocation; (5) establishment of a full priorities system for steel plate; and (6) additional reductions in production quotas for leading civilian steel-consuming uses.

All the unfavorable factors in the situation were intensified by the outbreak of war. Within two months it was clear that production must

be expanded even further and demand curtailed even more stringently if the war effort was not to be crippled for lack of its almost universal basic material. Drastic action was taken to increase supply, starting with the ore. An attempt was made to open the Lake Superior ore transportation season earlier than usual. A nation-wide scrap collection drive was instituted. Inventory controls were established. The blast furnace expansion program was enlarged and its completion speeded.

Expansion of iron and steel-making facilities was a complex undertaking. The need for expansion was clear. But the necessary projects required large amounts of steel and other scarce materials. Current and longer-term needs had to be carefully appraised to secure the most equitable and efficient utilization of available steel. Concurrently, a large-scale drive was initiated to redistribute inventories of steel mill products frozen in the hands of steel consumers as a result of the issuance of conservation and limitation orders and the changing composition of the war program.

As this brief note on the wartime history of steel indicates, supply expansion alone was not enough. While issues were debated, assumptions attacked, and data collected, shortages grew worse. The shortages had to be dealt with at the time they occurred, regardless of the decision on steps to increase supply. Because the growth in the military program (and consequently *material requirements*) was invariably underestimated, shortages in many materials persisted throughout the entire period of war. This situation made it mandatory to deal with shortages largely by curtailing the volume and type of demand. The actions taken can be classified into three general types: (1) limitations on use; (2) limitations on procurement and inventories; and (3) allocation.

The first type of action is illustrated by the issuance of regulations designed to reduce the consumption of a scarce material. The issuance of limitation orders on the manufacture of end products might be included in this category. However, the limitation-order technique was not used on a wide scale until 1942 and discussion of this type of regulation is reserved for separate review.

The initial measures taken through the M order technique consisted of establishing the percentage of each producer's available output to be shipped against orders falling within various preference-rating classifications. This type of action was characteristic of the M orders issued in

early 1941. Later in the year, a variation was introduced in the form of a direction to producers to reserve a specified percentage of their output subject to direction by OPM.

Before the end of 1941 it became necessary to take a much more drastic *step at the consumer rather than the producer level*. This consisted of incorporating in the order a list of civilian products for which the manufacture of the critical materials could not be used. The first important list of this kind was contained in order M-9-c, forbidding the use of copper in the manufacture of a long schedule of products. The stress on the aircraft program and the consequent need for aluminum in quantities well in excess of total supply resulted in the most drastic prohibition of this kind. Order M-1-i contained a *short list of military combat materiel*. The use of aluminum in the manufacture of any product not on the list was forbidden. The restriction applied to military as well as civilian products.

At the same time, an attempt was made to achieve a similar result by changing manufacturing specifications. In the non-military field the use of critical material was forbidden for certain parts of civilian products. For example, decorative trim for automobiles and other products could not be made of chrome steel, and the use of copper in the manufacture of radios was limited to parts conducting electricity. In general, the use of critical materials was limited to functional parts for which no substitute material was available.

This kind of restriction was reasonably successful in the civilian area. When it cut across military specifications, however, the efforts of the War Production Board and its predecessors were characterized by a striking lack of success. Consumption restrictions contained in the prohibitive lists did not apply to military orders, with the single exception of the aluminum order. In order to effect changes in combat equipment, it was essential for OPM and later WPB to deal directly with the military agencies establishing the specifications of the products which they were purchasing. At all times the civilian found himself in an awkward position in trying to convince military procuring officers to accept equipment made of anything but the very best material. Not only was the civilian at a disadvantage in discussing the performance of military equipment with Army and Navy officers, but the obvious dependence of the lives of soldiers and sailors upon the equipment used in combat made it

exceedingly difficult to advance even reasonable arguments for changes of any character.

The second general type of action, limitations on procurement and inventories, was designed to spread the available supply as thin as possible, consistent with the manufacturing needs of war contractors. Unfortunately, the impact of government action to achieve this undoubtedly desirable objective must be limited. Decisions with respect to the quantity of production materials required in a given *manufacturer's operation* can easily encroach upon the area of activity ordinarily reserved for industrial management. Purchasing habits, inventory levels, and procurement schedules make up only a *fragment* of the complex of judgments and decisions which is generally regarded as the private domain of the plant manager, the purchasing officer, and the shop foreman. Actions in this field were, therefore, limited to admonitory finger shaking through general regulatory provisions.

The conditions prevailing in 1941 were such as to lead inevitably to the growth of a number of economically normal, but, from the point of view of the total production effort, undesirable practices. Representatives of government agencies at manufacturing plants were characteristically interested in obtaining delivery of end products, but not in the effect of overbuying on material supplies. Patriotism impelled manufacturers to try to insure themselves against future production slowdowns *resulting* from lack of material. Little risk of loss from price declines could be anticipated in view of the ever-increasing pressure exerted by growing military programs and expanding consumer demand. These conditions, with others of a similar character, made it good as well as patriotic business to buy with little regard for minimum needs. Delivery of as much material as possible as soon as possible was basic procurement policy. The more critical the material, the more impelling were the reasons for getting as large a share as possible of available supply.

To meet this problem, the early M orders prohibited the placement of duplicate purchase orders. Provisions were made for persons possessing or using critical *materials to file periodic inventory reports*. Unfortunately, the information furnished on the inventory reports was almost completely divorced from total plant operations, as well as from material control procedures. As a result, the reports did little to curtail scrambling for materials. General inventory regulations could hardly be more specific

than to direct manufacturers not to accumulate more material than "minimum practicable working levels," but what was minimum or practicable remained a question subject to a multitude of interpretations and *honestly differing judgments*.

Government officials charged with responsibility for controlling the supply of critical materials found themselves in an awkward situation. To increase supply was a difficult task, and, at best, the time necessary to construct facilities required that a procedure to deal with the distribution of critically short materials be provided for an interim and indefinite period. General regulations proved to be ineffective in curtailing the volume of demand. The absolute prohibition of the manufacture of civilian products was a step which had been regarded as too drastic in the first World War, and information was lacking to demonstrate its absolute necessity in a country psychologically unprepared for it in 1941. That left priorities as the major vehicle for dealing with 1941 conditions.

But the priorities machinery was already weakening under the burden of a load for which it had never been designed. Rated contracts placed by the military services were rapidly reaching such proportions as to strain the country's productive capacity. The issuance of the early M and P orders had expanded the preference principle to include those civilian fields indirectly linked to the achievement of military programs. Sub-contractors in both military and essential civilian programs had been authorized by the revision of the priorities mechanism to rate their own orders and to authorize the semi-automatic extension of ratings by suppliers. The aggregate of rated orders reaching the producers of some critical materials was more than sufficient to absorb their total output. This condition was aggravated by the character of the production process at the mills. Steel mills and producers of wrought aluminum products did not fill purchase orders by shipping material taken from a convenient shelf. Orders carried alloy and size specifications, with the usual time lag between the receipt of the order and delivery of the material running as high as four months. Under such conditions, a high-rated order received after mill operations had commenced on a lower-rated or an unrated order had to wait its turn, despite its greater relative urgency. Priorities regulations had to provide for such flexibility if complete production chaos through constant rescheduling of mill runs was to be avoided.

The essential problem consisted of determining which orders on the books of the material suppliers were to be filled and which were to be postponed or left unfilled. The solution was incorporated in the newly added allocation provisions of Order M-1-i, dated August 18, 1941, a revision of Order M-1 described above. Paragraphs (c), (d), and (e) of Order M-1-i are quoted below. These provisions were significant not only because they controlled the distribution of aluminum until the introduction of the Controlled Materials Plan in the second quarter of 1943, but also because they established a pattern which was followed quite closely in most allocation orders for other materials.

(c) *Allocation of Aluminum.* Allocation of aluminum will be made by the Director in the interest of war production by approval of an application on the applicable Form of the PD-26 Series (hereinafter referred to as Form PD-26).

(d) *Delivery and Use.* Except as authorized, subsequent to October 31, 1941, pursuant to an allocation on Form PD-26 or other specific authorization of the Director, (1) no producer, smelter or fabricator shall deliver any aluminum, and (2) no person shall accept the delivery of any aluminum from any producer, smelter or fabricator or use any aluminum in manufacture.

(e) *Application for Allocation of Aluminum.* Each producer, smelter, fabricator, or such other person as the Director may designate, seeking an authorization required by this order for any month shall file a Form PD-26 for such month, on or before the 15th day of the second preceding month. Except where the customer is required to file an application on Form PD-26, no item shall be included unless the customer, on or before the 5th day of the second preceding month (1) shall have definitely requested the delivery thereof in such month, and (2) shall have filed with his purchase order, information as to the exact part to be made from the aluminum, the product in which such part is to be incorporated or assembled, and the end use to be made of such product, also, any further information which may be necessary to enable the supplier to fill out his Form PD-26. Where the customer is a fabricator or producer or smelter, he need only indicate to the supplier that he has filed such information on his Form PD-26. The Director will issue specific allocations authorizing the deliveries which may be made, or the aluminum which may be used in manufacture during that month. A supplementary schedule permitting delivery for emergency items may be filed at any date, on Form PD-26.

Perhaps the most significant observation which can be made with respect to Order M-1-i is that it placed the authority for the distribution of a critical material in the hands of a material division of OPM. The

Aluminum Division in this case was responsible for the supply of aluminum. More important, the division was responsible for making the final decisions with respect to its distribution. The very important relation of this action to material control procedure in general was shown clearly in the long series of actions taken during the following three years through priorities regulations, application and reporting forms, and numerous other devices designed to make the system work.

Among other significant observations, the following were outstanding. First, the disposition of available supply among competing programs and products was being made at a point most remote from the determination of prime contracts and delivery schedules for end items of military and industrial equipment. It became necessary, therefore, to provide a mechanism for transmitting through the manufacturing chain of subcontractors information to identify each order with the program or end product in which the material was to be ultimately incorporated. Second, the decision with respect to each individual order was being made independent of the disposition of similar requests for other critical materials needed to make each product. Third, while Order M-1-i required that the most minute detail be provided with respect to each purchase order placed, no broad appraisal of the validity of each requirement in terms of plant operation could be made, because consumption and requirements data at the customer level were lacking. Finally, the decisions were being made after the fact, in the sense that the prime contracts had been let, production and delivery schedules set, components and subassemblies ordered, and each program translated into requirements expressed in terms of orders placed at the basic materials producer level.

As military requirements grew, the operational impacts of this type of control procedure were all in the direction of disorganization, waste, and planlessness. Even in a mature administrative agency controlling stable military programs, it would have been difficult to make intelligent decisions on the basis of information supplied, or to secure even a nominal measure of uniformity in carrying out determined policies. In the dynamic expanding war economy the inevitable outcome was chaos. With "essential" demand in excess of supply, there was no administrative machinery available for executing policy decisions governing the distribution of steel, copper, or aluminum among competing war, war-related, and civilian uses. There was no way to balance allocations of several criti-

cal materials required to fulfill a single production schedule in one plant. A manufacturer might be allocated copper and denied the aluminum he needed for the same product. Since allocation actions took place only after orders appeared on mill schedules, there was nothing in the system to prevent a manufacturer from placing orders for, or even receiving deliveries of, a number of materials and components, only to have his production plans upset by a denial or short allocation of a single key metal. And over all else, the endemic plague of wartime control—government applications and reports—attacked both business management and the staff of the controlling agency. Every separate control system had its own application and report paper. The same information was supplied to Washington in quintuplicate on parallel forms, while in the temporary buildings along the Mall there was always a scarcity of clerks to receive the mail, edit the forms, and tabulate material consumption and requirements, and a dearth of professionals to review mill order boards and make the allocation decisions.

By the spring of 1942 it was becoming clear that the M order was a useful operating tool for eliminating non-essential uses of a material, effecting conservation through substitution, and exercising general controls over hoarding. But it could not be employed effectively to set up an allocation procedure for a material in general use. Above all, the M orders in themselves provided no machinery for integrating industrial control. This destroyed the possibility of either making plans or carrying them out.

By early summer of 1941, it was apparent that the P and M order techniques required the support of a different type of control instrument. With a bubbling prosperity spreading through the economy, the end products of peacetime production were claiming shares of material supplies which could not be spared from the growing war production, and were inhibiting management from a rapid conversion of manufacturing facilities from peace to war. Caught in the competitive forces of the free market, no single producer of refrigerators or passenger automobiles could contemplate closing his doors in the face of eager crowds of customers (and endangering the continuance of his carefully nurtured distributor organization) in order to prepare his production lines to make machine guns, tanks, guns, and airplane subassemblies. Such decisions

could be made only on an industry-wide basis, and this could be brought about swiftly only through government direction.

The instrument devised to accomplish this job was the limitation or L order. On August 30, 1941, the Office of Production Management issued L-1 "to limit, and to facilitate the acquisition of scarce materials for, the production of certain motor truck and public passenger carrier defense products." *The thinking behind the early limitation orders was clearly delineated in the introductory "whereas" clauses of L-1:*

WHEREAS, the manufacture of "Motor Truck and Public Passenger Carrier Defense Products" requires the utilization of large quantities of scarce materials; national defense requirements have created a shortage in these materials for defense, private account and export; action has already been taken to conserve the supply and direct the distribution of such materials to insure deliveries for defense and for essential civilian requirements; and

WHEREAS, it is necessary in the interests of defense to stimulate the production of "Heavy Trucks"; and

WHEREAS, the present supply of scarce materials will be insufficient for defense and essential civilian requirements if the rate of production of "Medium Motor Trucks" should increase over levels prevailing from January 1, 1941 to June 30, 1941; and

WHEREAS, therefore, it is appropriate in the interests of defense and to meet essential civilian requirements to limit the volume of production of "Motor Truck and Public Passenger Carrier Defense Products," to afford priority assistance in the procurement of scarce materials required to maintain an average annual rate of production within such limits, such measures to be operative for a limited period of time only, and to require each producer to reduce and eliminate the use of scarce materials in the production of such products; and

WHEREAS, it is hoped that such measures will reduce the requirements for scarce materials in the production of "Motor Truck and Public Passenger Carrier Defense Products," will encourage use of existing inventory, an appropriate scheduling in the replenishment of inventory and will, accordingly, permit the continuation of priority assistance beyond the limited period of time presently provided in this Order . . .

Following this preamble of explanation and justification, the order proceeded to set up machinery for determination by OPM of each producer's production schedule for each category of truck, truck trailer, and bus for the three-month period, September 1 to November 30. On September 12, Donald M. Nelson issued an amended order, L-1-a, which

moved significantly beyond the original order. The "whereas" clause was shortened and sharpened to the following:

WHEREAS, the manufacture of medium motor trucks, truck trailers and passenger carriers requires the utilization of large quantities of aluminum, chromium, copper, nickel, nickel steel, rubber, steel, tin, tungsten and other critical materials, and national defense requirements have created a shortage of these materials for the combined needs of defense, private account and export; action has already been taken to conserve the supply and direct the distribution of such materials to insure deliveries for defense and for essential civilian requirements; and the present supply of these materials will be insufficient for defense and essential civilian requirements unless the manufacture of medium motor trucks, truck trailers and passenger carriers is curtailed and the use of critical materials for such manufacture thereby reduced.

On the basis of this preamble, the order limited each maker's production of trucks, trailers, and carriers in the period September 1–November 30 to one-half the number produced from January 1, 1941, to June 30, 1941, and the production of functional replacement parts to 60 percent of sales in the same base period. Base period sales and forward production of vehicles and parts specifically excluded sales to the Army and Navy and certain other U.S. defense agencies, as well as to the United Kingdom, Canada, Russia, and other countries "on our side"; and for Lend-Lease.

The following day L-2 was issued, setting up a production quota for each manufacturer of passenger automobiles. Simultaneously, OPM announced L-3, restricting the production of light motor trucks for civilian use. Within a few days, these were followed by L-4, restricting the production of replacement parts for passenger automobiles and light trucks, and L-5, governing the production of domestic mechanical refrigerators. The press release accompanying the latter order called attention to the aim of the restrictive program "to reduce consumption of steel in the manufacture of refrigerators by 175,000 tons a year, to effect substantial savings in consumption of other scarce materials, to help relieve the pressure on material supplies from consumers' durable goods industries, and to release facilities for defense work." The release also described the techniques of management and labor participation in the drafting of the order and suggested, by implication, the pressure on industry to shift to defense work:

In preparing the program, the Civilian Supply Division first held an industry-wide meeting to provide manufacturers an opportunity to discuss their problems and to indicate to them that material shortages would force a reduction in output. A tentative curtailment program was then drafted and discussed with a panel of representative refrigerator manufacturers. This tentative program was subsequently modified in light of the criticisms received. Thereafter, the program was discussed with representatives of a number of labor unions concerned. Both management and labor representatives were told that the program would merely establish production maximums. Furthermore, they were told there is no guarantee that there will be sufficient materials available to reach these maximums.

As the inexorable squeeze tightened on material supplies and as pressures increased to force the conversion to military production of the plants, machines, labor, and management of the major consumers' durable goods industries, the early L orders were repeatedly amended. At each successive step, production quotas were reduced. L-2-g, issued January 21, 1942, finally stopped all production of passenger automobiles after February (ultimately effective February 28). On the same day, L-3-f prohibited the production of light trucks after February 1. The manufacture of domestic mechanical refrigerators after May 1, 1942, was prohibited by L-5-c, issued February 23. Passenger automobiles, light trucks and refrigerators had already been frozen in free distribution and brought under rationing procedures.

The application of the limitation technique to a large number of products resulted in a variety of individual control devices. L-1-a (motor trucks, truck trailers, and passenger carriers), as issued September 12, 1941, restricted production in the following terms: "During the period commencing September 1, 1941 and ending November 30, 1941: a producer shall not manufacture more than one-half the number of Medium Motor Trucks, Truck-Trailers and Passenger Carriers . . . produced by him during the period from January 1, 1941 to June 30, 1941." The September 30 edition of the order, restricting production for the month of March, 1942, established quotas for named producers in numbers of vehicles. L-1-h, issued November 19, 1942, refined the quotas by subdividing each manufacturer's output into several gross vehicle weight classifications with an authorized unit ceiling in each category. L-2 (passenger automobiles) set unit quotas by producers and brand names. The L-3 series (light trucks) used the percentage-of-base-period-production

method, as did L-4 (replacement parts for passenger automobiles and light trucks). The latter, however, introduced a slight twist by imposing a production quota based upon a percentage of base period sales rather than factory output.

Order L-5 (domestic mechanical refrigerators) presented new complications. Recognizing the range in the size of companies in the industry, and the greater facility with which the larger concerns could convert their plants to military work, the order divided manufacturers into three size classifications, based on monthly average sales in the year ended June 30, 1941. In the two larger size classifications, individual companies were permitted to produce under the higher of either a production quota in units or a percentage of factory sales in a specified base period. L-6 (domestic laundry equipment) was set up in similar terms. L-7 (domestic ice refrigerators) turned to a different avenue of control, in the following language:

During the four-month period from September 1 to December 31, 1941, inclusive, no manufacturer of domestic ice refrigerators shall use more than four times 65% of the monthly average of steel used by him during the twelve months ending June 30, 1941. The restriction . . . shall apply to use of steel from the manufacturer's own inventories of raw and semi-processed metal, as well as to use of steel from all other sources.

L-13 (metal office furniture) combined the techniques of L-5 and L-7. It divided manufacturers into size groups, imposed the more restrictive quotas on the larger producers, and defined the quotas in terms of a percentage of base-period steel consumption.

When shortages of chlorine, phenol, and glycerine required curtailment of the production of cellophane, it was recognized that misdirected distribution of a reduced supply would handicap the defense programs in which cellophane found many essential uses. To deal with this problem, L-20, as issued November 8, 1941, placed no direct restrictions on production, but provided a list of non-essential items in the manufacture or packaging of which the use of cellophane was prohibited. This list was freely extended in amendments to the order. Responsibility for compliance was attached to producers, suppliers, and consumers.

The richness of invention indicated by these and other variations of production control techniques embodied in later L orders might suggest a carefully reasoned adaptation of method to problems in each individual

case. A more accurate description of the process by which administrative techniques were created at that time would be in terms of an opportunistic yielding to business and economic pressures. Some understanding of the atmosphere—a compound of fact, fiction, and a kind of administrative osmosis—in which the decisions were made may be gained from a review of the circumstances surrounding the establishment of controls over chlorine.

The uses of chlorine are many and varied. Its principal peacetime use is as a bleaching agent. Almost half of the output of chlorine in 1939 was used to bleach foodstuffs, textiles, shellac, pulp, and paper. Chlorine was also employed to purify water, in dry cleaning, and in premium gasoline compounds. It had additional uses in vitamin products, insecticides and fungicides, plastics, cosmetics, and toilet preparations. Military uses of chlorine included polyvinyl chloride for insulating degaussing cable, trichlorethylene for degreasing and cleaning metal parts, chlorinated paraffin for preserving tentage, carbon tetrachloride for fire extinguishers, ethylene glycol for recoil cylinders of guns and anti-freeze solutions, in poison-gas compounds, in cellulose for smokeless powder, in hexachlorethane for smoke screens and for numerous other purposes.

Given this variety of uses, many of them of an indirect or component character, the control problem could not be simple. The first control action was taken on July 26, 1941, with the issuance of M-19. In the familiar pattern of the contemporary M-series orders, M-19 brought deliveries of chlorine under the preference-rating system and gave an automatic A-10 rating to otherwise unrated defense orders. It also permitted producers to make deliveries on non-defense orders after providing for all rated shipments. At this stage, the order served only to formalize for chlorine the general rules governing priority of delivery for defense orders. It was becoming apparent, however, that mounting military needs were upsetting the supply-demand balance and some action was necessary to limit consumption in non-essential uses.

The first steps were rather informal. The large producers of chlorine were asked to report the volume of shipments against defense and non-defense orders. In August, additional military orders were directed by OPM to producers who reported defense shipments at less than 50 percent of total shipments. This forced a reduction in quantities delivered to their regular customers with preference ratings in the low B scale, or

with no ratings. The major impact was on paper and pulp producers who used large quantities of chlorine as a bleaching agent. In this way, defense business was spread among the large chlorine producers. Concurrently, steps were taken to collect the information required to set up a systematic monthly allocation system. Five statistical reporting forms were sent to the industry in October. PD-158B and PD-158C were one-time reports on past shipments and consumption in producers' own plants, analyzed by end use. PD-159A, PD-159B, and PD-159C were repetitive monthly reports. The first form covered production, inventories, and forward production estimates. The second analyzed shipments. The third covered "own-plant" consumption by chlorine producers.

In the meantime, the chlorine pot was boiling over in the pulp and paper industry. The informal squeezing out of the non-defense business of the larger producers of chlorine was creating frictions, charges of favoritism, and generally inequitable treatment of pulp and paper producers. OPM decided to resolve the difficulty by formal restriction of the use of chlorine in the manufacture of pulp, paper, and paperboard. A debate immediately broke out over the technique of control. One group proposed a percentage-of-base-period-consumption quota for each producer, to be used as he saw fit. A second group favored establishing consumption controls in terms of brightness of bleach. The principal argument for the first proposal was that it dealt directly with the problem at issue, control of chlorine consumption, and did not enter into control of trade practices or interfere with competition between pulp and paper producers. The opposing group argued that this was precisely the weakness of the proposal. Competitive pressures would continue, and those responsible for the control would be open to the charge of having created a situation in which ordinary errors of business judgment might be the source of charges of inequitable treatment.

The resulting limitation order (L-11, issued November 15, 1941) inevitably sought a compromise somewhere between the two positions, although nearer to the second than the first. It provided that "no producer . . . shall . . . use chlorine in a quantity in excess of that specifically authorized herein or increase the brightness of pulp, paper, or paperboard in excess of the degree of brightness established herein. No producer shall increase the brightness of any pulp, paper, or paperboard produced by him on June 11, 1941." It established an over-all limit on the

use of chlorine in the bleaching of rag stock at 80 percent of base-period consumption. For other pulp, paper, and paperboard, the order established specific brightness ceilings.

Limitation order control techniques of the ceiling or outright prohibition variety were used throughout the war (in sequence numbering, the L order series ran to 350). Their scope was expanded to control distribution of end products, either by individual application for authorization to purchase or by setting up categories of buyers or uses which could automatically, without application, assign designated preference ratings to their purchase orders. In time, they became almost universal control tools, continuing to perform significant functions even after the adoption of over-all production controls.

The major deficiency of the limitation order as a control device was its inflexibility. This characteristic ordinarily was experienced in several ways. The process of issuing or amending an L order was inordinately time-consuming. There was little that could be done to remedy this difficulty. The implications of rapid or ill-considered action were so great that an elaborate order review and clearance procedure had to be adhered to for the protection of the affected industries, the War Production Board, the military services, and the other government agencies charged with wartime management responsibilities. From first discussions through initial drafting, review with Industry Advisory Committees, review with affected federal agencies, arguments over controversial issues, disputes over problems connected with labor aspects of proposed controls, and constant revision and re-revision of text to final issuance inevitably consumed a minimum period of three months. Often action was delayed as much as six months. Further, since reasonably smooth operation required the issuance of an order prior to the date of its effective application, an additional delay occurred before the beginning of the period of actual control.

A second type of difficulty was the result of the broadside application of the restrictive provisions of an L order. Most orders dealt with all members of a given industry or with all members of a specified class of producers or consumers. An order did not usually provide a mechanism for reaching individual producers or consumers. It was impossible, therefore, to use the control as a flexible management tool which could take into consideration operating problems, volume of production, size of

material inventories, and the military importance of shipments in the individual plants governed by the provisions of the order. To counteract overreaching the objectives of control, it was necessary to limit rather sharply the restrictions of the typical order and to provide for specific application in all cases outside the established boundaries of control, and for a procedure for appealing from the restrictive clauses of an order.

To complete the picture, brief mention should be made of certain other alphabetic order series which for technical reasons were not included in the P, M, or L series. "E" orders were designed to control the distribution of semifinished and finished equipment products, principally machine tools, and cutting tools, resembling the M orders for materials. "U" orders were instituted to replace earlier L orders governing power and communications activities after the transformation of the Power Division of the War Production Board in the Office of War Utilities. The major rubber order, R-r, had the characteristics of both M and L orders and ultimately included the authorization for and operating procedures of the comprehensive Tire Allotment Plan.

CHAPTER V

TOWARD PLANNING IN PRIORITIES

FROM MID-1940 to the end of the year the organization of American industry for national defense was planless. Constructive action in industrial control was confined to identifying defense contracts and expediting their completion by assignment of a priority. This function was carried on through individual preference-rating certificates. The priorities force was exerted at the top of the industrial structure on the end product and then transmitted through the supply chain. There were no measures of the quantitative significance of priority actions. Although there was some thinking in terms of programs, some effort to translate end products into bills of materials, to appraise total requirements—military, export, and civilian—material by material against total supply, and to make over-all judgments with respect to the feasibility of various magnitudes of military contracting, there was no machinery for translating these efforts into positive administration. It was only because of the small size of the defense program relative to the capacity of the economy, and the substantial slack in the supplies of facilities, materials, and labor, that the haphazard production activity could be carried on without serious interruption in the defense program.

As military requirements continued to expand month after month in 1941, however, the inadequacies of the priorities mechanism became more and more apparent. The lack of quantitative control over the issuance of preference ratings, ignorance of the scope and significance of their spread through the industrial system and their impact at the more remote supply levels, failure to weigh in a single balance the sum of all demands against the economy's resources, inability to array competing claims in the order of their importance to national security, absence of a production organization and control techniques, and the difficulty of aggregating requirements without translating them into common units of measure were threatening to become significant impediments to defense production. At least as serious was the disposition of some of the

basic material producers to disregard priority orders to the extent necessary to serve their favored civilian customers. The year 1941 was marked by a series of efforts to supply these deficiencies. Without the administrative discipline which might have been derived from critical study of the history of industrial organization in 1917 and 1918, what took place was a painful record of experimentation, with a slow advance from early mistakes. At every step, decisions to institute controls had to contend with the opposition of those who disbelieved in the urgency of the growing crisis, the natural preference of large segments of industry for free market conditions and their resentment of control from the top, the absence of a program of military requirements scheduled forward to cover the inevitable expansion of needs, and the overwhelming tendency to act as if the emergency would be of short duration. Every action was initiated and planned as if its cause would disappear in ninety days.

In such an atmosphere, against the contemporary pressures, and without the support of a carefully plotted machinery of industrial mobilization to which all the dominant interests—military and civilian—were committed, it was impossible to take comprehensive action. What was accomplished of positive advantage was the demonstration that priorities without quantitative controls destroyed their own usefulness. The slow dissemination of this knowledge provided a foundation on which, by mid-1942, the first integrated production control system could be established.

The first significant step in this direction was the introduction of the Defense Supplies Rating Plan in May, 1941. The scheme had its origin in the recognition that manufacturers of such general purpose products as standard electric motors, twist drills, and mill supply items received defense orders indirectly and on shorter delivery cycles than the time required to produce them. Deliveries of these products were made from stock, and procurement of scarce materials to replenish finished product inventories could not be accomplished by the extension of individual preference certificates for the small amounts of material going into each motor or twist drill or mill supply item. The same difficulty was experienced by the general class of subcontractors, the makers of bits and pieces, who found individual priority extension time-consuming and administratively expensive. The plain fact was that a preference rating system based on individual certificates applied to individual purchase orders was

completely unrelated to normal manufacturing, purchasing, and stock control operations in American industry. A partial recognition of this difficulty in special cases induced the issuance of blanket P orders early in 1941. But this type of action was extremely dangerous in the face of the expanding defense program because it flooded the economy with preference ratings not subject to any type of quantitative control. It was another step in priority inflation, with the value of the preference rating diminishing concurrently with the extension of its use. Beyond this, a number of activities essential to the maintenance of the civilian economy, or indirectly tied to continued high-level production for the military or for export, were not adequately provided for either under the P orders or under the B ratings in the early M orders.

The Defense Supplies Rating Plan struck directly into these problems. It established a procedure for assuring a continuous flow of materials to manufacturers engaged in defense production, as support for advance scheduling of their production and maintenance of schedules as established. It removed from manufacturers participating in the defense program the burden of filing multitudinous individual applications for preference rating assistance for identical production schedules. For the use of priorities as an expediting device after the fact, it substituted machinery for getting priority authority to manufacturers in anticipation of defense production. Above all, it provided a method for accumulating manufacturers' requirements and tying priority authority to quantitative controls. At all these points, DSRP foreshadowed the later, more comprehensive, and sophisticated controls, and built a valuable operating experience in the administrative personnel of the Office of Production Management. Perhaps more important in the long range, it began the all-important job of recasting responsible thinking in the military services, the civilian management agencies, and industry.

The essential thinking on this subject was circulated in April, 1941, under the title, "Percentage Priority System." This proposal developed from requests presented by manufacturers of such items as electrical equipment, anti-friction bearings, twist drills, and radio parts to be given: (1) relief from the burden of individual certificate extension in industries making tanks, guns, and explosives; (2) a method for anticipating defense requirements; and (3) some more adequate method for handling the needs of basic economic activities such as railroads, utilities, and

mines. These requests were crystallized in a formal memorandum by a group of electrical equipment manufacturers requesting that all of their sales be classified by industry and a set percentage assigned defense status.

As ultimately developed, the proposed procedure for general preference-rating assistance to producers participating in the defense program was issued as the "Defense Supplies Rating Plan." The principal objectives of the plan were summarized in the introductory paragraph:

To assure the provision in certain well-defined cases of scarce materials, including parts and assemblies, which are essential to the production of defense supplies: (1) in quantities necessary to maintain the flow of raw materials and work-in-process for production essential to defense, and (2) to permit production of defense supplies for stock to the extent that such production is essential to defense.

The use of the plan was optional with producers and was limited to scarce materials (defined as materials, parts, and assemblies not currently obtainable promptly enough to fulfill required defense production delivery schedules).

Under DSRP, participating producers were directed to submit each calendar quarter an application for the assignment of a preference rating to be used in procuring scarce materials. In preparing estimates of the quantities of materials for which preference-rating assistance was requested, the producer was instructed, first, to determine the total dollar value of business done during the preceding three months, using incoming orders, shipments, production, or any other consistent basis adapted to his method of record-keeping. Next, on the same basis he determined the dollar volume of business in the preceding quarter which could be identified as "defense supplies." Defense supplies were defined as materials, parts, and assemblies entering directly or indirectly into material for delivery under contracts or orders (a) placed by the Army or Navy; (b) for the defense of Great Britain; (c) for the government of any other country whose defense the President held vital to the defense of the United States; (d) for the account of specified agencies of the United States Government; or (e) carrying a preference rating of A-1-a to A-10 inclusive. Finally, having determined the dollar volume of his defense business in the preceding quarter, the producer calculated his total requirements for scarce materials for production during the quarter for which the application was submitted.

The relation of the volume of defense business to the volume of total business determined the quantity of scarce materials for which a preference rating was requested. For example, if, in terms of incoming orders, shipments, or production, defense business was 50 percent of a producer's total volume of business, preference-rating assistance would be granted on 50 percent of his scarce material requirements for the current quarter. Estimates of requirements of scarce materials calculated in this way were submitted to OPM's Division of Priorities at the beginning of any three-month period. The division reviewed the estimates, approved or modified them, and assigned a preference rating of A-10 to deliveries of the approved or adjusted quantities. All producers to whom the plan was extended were treated on a common basis and all materials, parts, and assemblies were assigned the same rating, A-10.

Application for assistance under the plan was made on Form PD-25, "Report of Requirements for Scarce Materials." In instituting the plan, it was recognized that many producers did not maintain records which would permit the preparation of an accurate determination of their volume of defense business. For this reason, the plan stated that in filing his first application on PD-25 a producer need only estimate the relation of his defense business to his total business. He was directed to explain and justify the basis for the estimate and was further instructed, as a minimum effort, to communicate with his principal customers and obtain from them an estimate of the business placed by them that could be described as defense supplies. The plan stipulated that each participating producer should immediately establish the necessary bookkeeping records so that his second and subsequent PD-25 applications would not rest upon estimates.

Form PD-25 required a statement of the product to be manufactured and the percentage relation of defense supplies volume to total business. In the body of the form, applicants listed scarce materials, parts, and assemblies, and reported for each listed item consumption during the preceding quarter, closing inventory at the end of the quarter, minimum working inventory level, total requirements for the current quarter, and requirements for the next three months' defense supplies production.

The following procedure was established for the assignment and extension of preference ratings. Upon receipt of a certified copy of Form PD-25 from the Division of Priorities, together with an assigned serial

number, the producer was directed to execute a copy of the order and deliver it to the Division of Priorities. An additional copy of the order was prepared for each supplier to whose delivery of scarce material the A-10 preference rating was to be applied. This procedure covered all deliveries of material during the quarter by each supplier up to the maximum quantities certified by the Division of Priorities. Extension of ratings by a supplier was permitted by the execution of additional copies of the rating order originally issued to his customer. A supplier extending a rating in this manner forwarded one executed copy of the order to the Division of Priorities and an additional copy to each of his suppliers. Extension to more remote supply levels followed the same procedure.

The concept of broad priority authority, with its accompanying elimination of individual preference certificates, was picked up from the Defense Supplies Rating Plan and rapidly extended to other important segments of the economy. The most significant of these developments were the Maintenance and Repairs Rating Plan and the Health Supplies Rating Plan, both prepared and issued in the summer of 1941.

The Health Supplies Rating Plan¹ was projected directly from the requirements approach to the problem of priorities first presented in the Defense Supplies Rating Plan. By mid-1941, a serious problem had developed in maintaining the supply of a number of products necessary to general civilian health. It was becoming difficult for civilian hospitals to obtain their minimum requirements of surgical instruments and X-ray and other hospital equipment manufactured from metal. Raw materials going into medicinal chemicals and other medicinal products were almost as difficult to procure. To relieve these problems, and at the same time eliminate much of the paper work involved in submitting and processing individual requests for preference-rating assistance, the Health Supplies Rating Plan utilized the pre-authorization technique of DSRP.

The plan authorized any manufacturer of listed products to make application for preference-rating assistance in procuring his necessary supplies and materials. In submitting his application, the producer followed the pattern of DSRP, reporting to the Office of Production Management his total dollar volume of business during the preceding quarter, the dollar volume of business which he could identify as "health supplies," and his total essential material requirements for the current quar-

¹ For discussion of the Maintenance and Repairs Rating Plan see Chapter XV.

ter. The proportion of his total dollar volume of business represented by health supplies determined the percentage of his total essential material requirements for which a preference rating might be requested. For example, if in terms of incoming orders, shipments, or production, health supplies volume was 50 percent of a producer's total volume, he was entitled to receive a preference rating on 50 percent of his requirements of essential materials for the current quarter. The original list of health supply products included anesthesia apparatus and supplies, biologicals, anti-toxins and serums, diagnostic instruments, hospital laboratory and operating room equipment and supplies, surgical and dental instruments, medicinal chemicals, surgical dressings, and medical and dental X-ray equipment and supplies.

Under the established procedure, an authorized producer of health supplies received an order from OPM bearing an assigned serial number. The producer executed an additional copy of this order for each supplier to whose deliveries of scarce materials he applied a preference rating. After serving a copy of the order on a supplier, the producer simply noted his serial number and preference rating on all future purchase orders placed with the same supplier. Provision was made for the extension of such ratings by suppliers by signature on additional copies of the same health supplies rating order. Producers of health supplies were limited in their use of the rating authority by the restrictions imposed in the original authorization, and suppliers extending such ratings were limited to the quantities of materials required to make deliveries to customers applying rated orders to them.

Almost from the introduction of the Defense Supplies Rating Plan, there was active consideration of its deficiencies as a technique for resolving the problems of mobilizing industrial resources for national defense. Continuous expansion of military programs, preferential assistance for the requirements of the anti-Axis nations, provision for the needs of industries indirectly, but essentially, related to defense production or the civilian economy, and the uncontrolled spread of priorities through the supplying strata of the industrial structure all contributed to a sharpening of the crucial issues of administration. The armed services were insisting on assurance that priorities would get them the weapons and other materials in their programs on schedule and in the required quantities. Manufacturers participating in the defense program

were demanding assurance that materials and component parts would be delivered in time to enable them to meet their own delivery schedules. Priority claims against materials and components were interfering with the operation of non-defense industries and services. Each of these was immediately concerned to protect its position by securing the right to use the magic preference ratings. The Office of Production Management was inundated with briefs arguing the essentiality of the functions performed by various industries and the consequent need for authorizing preference ratings to be used by their members in procuring production materials. The continual pressure to admit new members to the priorities club inevitably intensified the drive by old members to strengthen their rights and privileges. This generated a demand for up-rating which was rapidly congesting the top preference brackets. The overloading of the A-1 categories diluted the effectiveness of the authority. The most vicious and self-inciting type of inflation was well under way.

The term "inflation of priority ratings" must be defined in different terms as it is applied to different periods. Prior to the summer of 1942, there was no general inflation in priorities; the existing condition could be described more accurately as an excessive pressure of rated demand for the quantities of goods which suppliers as a whole were willing to set aside as their contribution to the defense or war effort.

The first series of A ratings used an array from AA through A-10, with A-1 as a single rating band. As early as the autumn of 1940, the use of the single A-1 band for all machine tools proved inadequate because the rated demand for machine tools was greater than the total output. To deal with this situation, a precedence list was established, subsequently broken down into classifications A-1-a, A-1-b, and so on. By the early spring of 1941, pressure of demand for such specialized items as Garwood winches induced competition among the Engineer, Ordnance, and Quartermaster Corps in their efforts to procure winches for installation on trucks. In both of these cases, there was general priority inflation. More priority certificates of equal value were outstanding than could be satisfied by the total supply available from the producing industries.

A somewhat different situation existed in such items as turbines, electric overhead cranes, and other long-cycle products. Here the demand was so great relative to the normal productive capacity of the industries

that *priority inflation* was inevitable as long as there was no recognition of the need for cutting back programs to the limits of the ability to produce. In contrast, for items like bearings, twist drills, and electric motors, adequate capacity existed to supply the level of defense requirements supported by priorities in late 1940 and the spring and summer of 1941. In these industries an apparent inflation was created as a result of the resistance on the part of some producers to the assignment of their total output to rated orders when other producers were still free to serve part of the unrated demand, and when it was clear that part of the unrated demand had indirect defense significance. As a result of the continuous expansion of the defense program, the pressure of ratings on the limited portion of productive capacity reserved for defense shipments led to continuous requirement for higher ratings.

Another pressure toward inflation of ratings came from the introduction of the Defense Supplies Rating Plan. The plan had two major objectives: (1) resolution of the administrative problem for priorities; and (2) pressure on manufacturers to shift from peace to defense business. The latter was never openly described, but it was actually practiced in the administration of the plan. Another feature of the administration of DSRP which induced a demand for A-rated orders and, later, for orders rated higher in the A series was the limitation of assistance to A-rated business.

By the late summer of 1941, the combination of an increased defense program, the unwillingness of many manufacturers to ship all their product against rated orders, and the greater-than-capacity demand for some items, resulted in the A-10 rating becoming ineffective for the procurement of certain products or certain sizes of products. In an effort to deal with this situation, first the Navy and later the Army insisted that manufacturers who had military orders be given the same rating assistance under DSRP as they would have had if they had extended the individual PD-3, -4, and -5 certificates. This induced the development of a PD-25F form on which a manufacturer could state the specific volume of orders in each of the individual rating bands and receive lump sum priority assistance in terms of higher ratings such as A-1-a and A-2. Since the higher ratings promised better delivery, the net effect of this administrative practice was that, by the summer of 1941, manufacturers were continuously seeking the highest possible ratings from their custom-

ers in order to obtain higher ratings on their own requirements for materials and components. To some extent, this type of pressure for higher ratings was offset by the use of the request for higher rating from the customer as a means of getting rid of undesired business. When a manufacturer determined that he would supply only 30 or 40 percent of his business against rated orders, and when the ratings which he received represented more than this portion of his production, the easiest way to get rid of the unwanted customer was simply to say that he was full up with higher-rated orders. The customer would then turn to either the military or OPM and request a higher rating. If he had started off with an A-2 or A-3 and had been raised to A-1-j when he presented the higher rating, he was told that in the meantime still higher rated orders had come in and he would have to get an A-1-d. This policy was followed until he was finally told that A-1-a would not get the delivery he wanted.

Through 1941 and early 1942, this type of relative priority inflation, rather than absolute inflation, such as existed in turbines and machine tools, was a commonplace. With the marked increase in the munitions program which occurred in 1942, absolute priority inflation became inevitable. In addition, the widespread introduction of L orders wiped out the possibility of continued production of "butter" products and forced conversions to "guns." As a result, American industry did convert largely to the production of guns and in mid-1942 was frantically scrambling for customers. From this period on, priority inflation usually meant inflation in the absolute sense, that is, the failure to limit the number of certificates issued, frequently resulting in a rated demand many times greater than the ability of industry to supply the goods needed to carry out the program.

The core of the problem was ignorance. There was no machinery for measuring the magnitude of the priority load. In the absence of this basic information, every decision to extend the preference-rating authority or to assign higher ratings was taken without knowledge of either the validity of the arguments for taking the action or the significance of the results of the action. The attempt to measure the priority impact by tabulating individual preference-rating certificates and their extensions broke down for several reasons. The staff assigned to the job was too small to handle the incoming paper load. Big as the load of paper was, there was no assurance that it represented the totality of all priority

actions; in fact, there was support for the belief that much of the paper never arrived in Washington. There was no way to test the accuracy of the information reported on the incoming paper. Attempts to work out a solution from the other end of the industrial structure, by measuring the priority load at the metal mills, did not produce satisfactory results.

The mill order boards were too far from the sources of rating authority up through the chain of metal fabricators to permit meaningful evaluation in terms of the originating industry, the size of the load attributable to individual certificates, specific P orders, and related questions. And, as has been pointed out in Chapter IV, solution of the immediate supply-demand equation for a single metal by allocation at the mills did not contribute to easing—in fact often intensified—the over-all problem of organizing and directing the nation's production for defense.

As in every later period of administrative uncertainty during the war, there was no dearth of proposals for handling the difficulty. Whatever their character, however, they carried inherent weaknesses. The size of the military program was undetermined and every month brought new and higher goals. At the same time, there was no clear concept of what was "essential" in the civilian economy. Beyond this there was no agreement on the fundamental proposition that to be effective a control must be comprehensive. Finally, the dominant intellectual pressures, particularly in industry and in OPM's recent staff recruits from industry, were toward priority assistance and against restrictive controls. The pre-Pearl Harbor industrial climate favored assisting military needs with preference for its material requirements. That competitive forces built up overpowering pressures for the extension of rating assistance, that the definition of defense activity could not be narrowly drawn, that the overissuance of ratings could end only in the destruction of the priorities system, that overcrowding of the top rating categories cheapened the value of all high priorities outstanding—all these considerations had the status of folklore. No one denied their validity. But equally, no one was prepared to act in accordance with their rigid logic and the inescapable conclusions. It was a period of drift. In these circumstances, the best indicators of pressures, tendencies, and the growth of policy were the competing proposals for reform.

The greatest operational difficulty for the Defense Supplies Rating Plan was the preference rating assigned—A-10. This represented a con-

siderable down-grading of the level of priorities attached to incoming purchase orders. Even more serious for the success of the plan, the use of the A-10 preference rating for procurement of scarce materials often resulted in inordinate delays in deliveries and, in certain cases, in complete inability to secure scheduling of purchase orders by suppliers.

In the prevailing atmosphere of the early summer of 1941, it was difficult to push proposals for up-grading preference-rating assistance assigned to manufacturers participating in DSRP. The tendency to consider the emergency as temporary still dominated administrative thinking. Fear of further inflation of the preference-rating structure was another inhibiting factor. Some objection was raised on grounds of technical feasibility, including doubt of the ability of many manufacturers clearly to identify incoming orders as representing significant defense production. The increasing seriousness of the problem sketched above, however, the continued expansion of military requirements, and the threat that DSRP might collapse as a working mechanism because of the inability of participating manufacturers to complete their purchase requirements under the assigned rating, combined to stimulate thinking about the operating aspects of the Plan.

The first proposals for modifying DSRP, circulated in June and July and in large part prepared without reference to the practical details of operation, nevertheless contained the seeds of the needed reforms. They included the following projected changes:

1. Manufacturers applying under the plan would no longer report the percentage of their total business classifiable as "defense," but rather would certify the percentage of business done in each preference rating category.
2. Authority to use preference ratings assigned on any other rating instrument, such as PD-3, would be removed from manufacturers participating in the plan.
3. Participating manufacturers would be assigned specific limitations on procurement of materials to be delivered within a calendar quarter for which application was made.
4. Assigned preference ratings would be scaled commensurate to the rating pattern of incoming orders certified by the participating manufacturer.

The principal arguments for the proposed changes were: (1) that they would make it attractive for many manufacturers to come under the plan, who had hitherto remained outside its operation because they could not buy all the materials they needed with the flat A-10 preference rating;

(2) that they would establish a foundation for a total control of priority authority assigned to all users of scarce materials; (3) that they would advance the preparation of an integrated production and material control technique which would eventually replace the burgeoning piecemeal and unrelated controls; (4) that they offered a pattern of control which, through a single instrument, could provide both procurement assistance for material requirements for essential production and limitation of procurement authority for less-essential or non-essential production; and (5) that they would first encourage and ultimately force programing of military, export, and civilian production. In terms of the eventual development of production and material control techniques, these half-formed recommendations were wholly sound in concept. If they had won immediate acceptance in principle, it would have been possible to concentrate on the difficult problems of filling in the operating details, with potential savings of at least twelve months in organizing and directing the nation's resources.

Closely related to the ferment of industrial control plans brewing in the summer of 1941 was the abortive proposal to establish levels of general preference ratings governing the material and facilities requirements of all American industry. Although the proposal sketched below did not at this time advance from talk to action, it was very significant in its impact on the managers of the war effort in calling their attention to the need for total organization of industry and the important interrelationships of civilian, indirect military, and direct military industries. The language of an early draft of the proposal illustrates this point fully:

The paramount purpose of priorities is the selective mobilization of the products of the soil, the mines, and the factories for direct and indirect defense needs in such a way as will most effectually contribute toward solving the problems of the emergency. The President has placed upon the Director of Priorities the responsibility for determining and administering all priorities in production and delivery. The determination of the relative importance of all industries and plants for both production and delivery by a single agency renders it possible to reasonably maintain a well-balanced program with respect to the several factors entering into production, which include: (a) plant facilities, (b) fuel supply or electric energy, or both, (c) supply of raw materials and finished products, (d) labor, and (e) transportation by rail, water, pipelines, or otherwise. Without all of these, speaking generally, production is impossible.

The proposal created a preference list covering all American industry. It was noted that the classifications established in the list did not affect preference ratings in the A series granted on identified defense requirements of these industries. The classification, however, did attempt to establish levels of preference which should prevail in the satisfaction of all things subject to priority whenever such requirements had not been given A-rating status. All industries were divided according to their relative importance into four classes. In determining the relative position of industries, consideration was given to all of the following factors:

(1) the intrinsic importance of the product itself for use during the emergency, and the urgency, as measured by time, of the demand or of the use to which it is to be put; (2) the necessity for maintaining or stimulating and increasing the total quantity of production, which in turn depends largely upon the relation of the supply to the demand for essential uses; (3) the proportion of the capacity of the industry or plant which is devoted to the essential production.

It was proposed that, after approval of the preference lists by the Director of Priorities, each plant in the listed industries should file by the 15th of each month a report covering its activities during the preceding month. This report would be the basis for reclassification of the priorities list. In general, the industries tentatively located in Class I included those producing basic materials as well as total defense industries such as those manufacturing explosives and munitions, fire arms, aircraft, and ships. In Class II were placed all types of food-producing and processing activities, some of the clothing industries, the lumber industry (from raw material to end product), the paper industry, the leather industry, and many of the more important machinery and capital goods industries. In Class III appeared the construction industries, many less-essential clothing industries and many other consumer goods industries. In Class IV were placed the luxury industries, and most of the major consumer durable goods industries which ordinarily consumed large quantities of scarce materials (such as automobiles, refrigerators and washing machines).

During the following weeks, much of the attention of the administrative personnel of OPM was directed to the avenues of development for control techniques opened up by these early proposals. The plans were gradually hardening around the earliest recommendations for renovating DSRP to make it a more flexible and usable control instrument.

The struggle to find a way out of the priorities swamp continued in the summer of 1941. Strong pressures were building for the construction of an integrated control system. At the same time, the cheapening of priority currency, as a result of blind overissuance, was directing attention toward ways and means of shifting from priorities to allocations, particularly for those parts of the economy tied directly into the defense production drive. Two proposals of the late summer period significantly illustrate the ways in which administrative thinking was moving. Neither proposal was immediately adopted, but both were in the main stream of policy and methodology formation and contributed to the ultimate decision to modify the Defense Supplies Rating Plan and press for the abandonment of many of the independent sources of preference-rating authority.

The first proposal was circulated in draft under the title "Basic Priority Procedure." It pointed strongly in the direction of allocations as a substitute for the less effective priorities, and obviously found its motive in the evidence accumulating from all sectors of American industry that OPM's preference authorizations were only hunting licenses giving the right to go after scarce materials, but no assurance of actually getting them. It was proposed to establish a type of allocation procedure as the basic distribution control mechanism for scarce materials for all producers whose defense shipments were in excess of 50 percent of their total business. OPM would establish a preferential list of uses as a guide to the directors of the commodity branches of OPM in allocating materials and to industry in placing its purchase orders. All essential uses would fall within 10 categories identified from A-1 to A-10. An attempt would be made to assure by allocation the minimum material requirements for these uses. The remaining industrial activities would be divided into a B classification and C classification. Scarce materials would be rationed to the B part of the preferential list as far as supply permitted after full satisfaction of the basic requirements of all essential uses in the A category. It was suggested that some such rationing formula as 50 percent of 1940 consumption might be used. Activities in the C part of the preferential list would be cut off from access to scarce materials where necessary, and in any event would not be permitted to procure more than stated minimum quantities which would not be assured by allocation.

It was proposed to furnish a standard form of requirement certificate

to be used by all fabricators. This certificate would be delivered once a month by each fabricator to the appropriate commodity branch of OPM and would state the fabricator's inventory of the related scarce material, the uses to which the required material would be put, and actual requirements for several months. A separate requirement certificate would be submitted for each category of use from A-1 to A-10. The commodity branches of OPM would allocate specific quantities of scarce materials to fabricators, by class, filling essential requirements of the A-1 uses before A-2, A-2 before A-3, and so on, through the A part of the preferential list. Such allocations would be absolute in their effectiveness to the extent that material supply was available after satisfying the full needs of higher A categories. The requirements of the B part of the preferential list might be met on a broad reduction basis, and any remaining supply might, at will, be permitted to selected uses in the C part of the list. Despite its obvious administrative faults which would have provided almost insuperable operating difficulties, the proposal still presented many of the most important features later developed in operable form by the War Production Board. It looked to an integration of total requirements, a balancing of requirements against supply, a distribution of total supply among all uses, an array of uses from most to least essential, a curtailment of total allocations within total supply, and, thereby, an underwriting of all tickets for scarce materials issued by the control authority. Under the proposal, the major part of the flood of priority certificates then circulating through the economy would become unnecessary. Individual certificates would be retained only as instruments for application and authorization for expediting purposes.

The preliminary array of material uses by categories is of some interest as indicating the play of contemporary judgment on the relative significance of all economic activities in the defense program. In the A-1 category were placed selected Army and Navy end products, the 1941-43 merchant ship program, bottleneck capital equipment items, expansion of selected facility bottlenecks (magnesium casting capacity, neoprene, etc.), emergency repair and maintenance of essential industries, expansion of raw material capacity, government health and safety services, and defense area power expansion. In the A-2 category were placed maintenance and repair of essential municipal services and public utilities, expansion of metal-fabricating and chemical industries, and Lend-Lease.

For the A-3 category, the proposal suggested the production of new, and the maintenance and repair of existing, transportation equipment. In A-4 were placed the maintenance and repair requirements of public airports, the production of basic raw materials (coal, oil, lumber, steel) and of synthetic products substitutable for scarce materials. In the B category, to which scarce materials would be rationed on a broad percentage of base-period consumption, were included, among others, general industrial construction, housing (except defense housing) and essential housing equipment, farm machinery, government activities (not included in one of the A categories), consumers' durable goods, food industries, newspapers, clothing and shoes, building materials, and general health and safety items. In the C category, potentially subject to an embargo against the procurement of scarce materials, were the luxury industries using scarce materials the denial of which would not create serious problems of unemployment or public morale.

The second proposal brought forward in the late summer of 1941 was a draft of a "Total Purchases and Raw Materials Rating Plan." This proposal stemmed directly from the existing Defense Supplies Rating Plan. Under it, the applicant supplied additional quantitative data on each of the scarce raw materials needed by him to produce that part of his scheduled output in each preference-rating group represented by incoming purchase orders. The applicant would show, for each raw material, receipts and consumption in the quarter preceding the one in which application was made, end-of-period inventory, and estimated requirements for the following quarter. He would also furnish the rating pattern of deliveries scheduled in the preceding period, and his estimate of the rating pattern for the current period based in part or wholly on his backlog. OPM would assign a preference rating applicable to a value of purchases not to exceed a specified number of dollars, and also to scarce raw materials not to exceed specified quantities. Preference authority applicable to the procurement of raw materials would be limited in terms of that material which was scarcest and the quantity established as the procurement limit for that material.

This proposal retained the systematic philosophy of the priorities approach, but supported it by its emphasis on requirements and the authorization of the use of priorities for specified quantities of materials. It indicated once more the troubled atmosphere created by the uncontrolled

use of the priority power which resulted from the broadside issuance of individual preference certificates and of the blanket P orders with their uncontrolled extension privileges. It was clearly an unrefined proposal which was of greater significance in its influence on current thinking than as a control technique for industrial production subject to immediate adoption.

By mid-October, planning was beginning to crystallize around a revision of the Defense Supplies Rating Plan with the following major changes: (1) the acceptance of the requirements approach as the basis for the extension of all procurement authority; (2) the enlargement of the scope of the plan to include all major industries; and (3) approval by OPM of procurement by applicants of specified quantities of specified production materials. In addition, the new proposals for the first time gave adequate recognition to the importance of inventories in the hands of consumers of scarce materials, and provided machinery for tailoring procurement authorizations in terms of current inventory holdings.

One difficulty still unresolved had its source in the fact that these were considerations of technique which assumed (and clearly it was necessary that they should assume) that *OPM was in a position to express in common units of measure and aggregate the total program which industry must fulfill*. The quantitative measurement of programs was the essential foundation of an integrated control system. In fact, without this knowledge, no control could operate. In a sense, the shaping of controls, the revision of DSRP, in the autumn of 1941 was ahead of itself. If the proposed system had been adopted, it would have been equivalent to running the engine of an automobile in neutral without engaging the gears. The proposals were aimed directly at bringing order out of the chaos of controls as they existed at that time. But more was required than the abandonment of numerous separate and non-integrated controls in favor of a single all-inclusive system. This was a job of administrative engineering and it had to be done. But beyond this, the control authority needed the determination of goals and the aggregation of the total job assigned to American industry, including the requirements of the military services, the export agencies, and the civilian economy.

Increasing pressure on supplies of scarce materials had resulted in haphazard and uncoordinated efforts designed, first, to control the flow

of each material, and, second, to assure materials for the production of certain end products. Separate material control systems were in operation for aluminum, copper, neoprene, nickel, and steel, each using its own method and applying its own criteria of essentiality of use. Concurrently effective were the array of P orders offering assistance to the material claims of certain end products (chiefly important to the military services). Efforts were being made to assure the maintenance of limited production of selected civilian products. As in the case of the M orders, there was neither consistency nor uniformity in the P orders. Above all, there was no clear policy dictating the formation of competing programs, and no way to add them together to get significant totals.

What was imperatively called for was the *formulation of a policy and a program* which would encompass, in common units, both materials and end products, and fit the job in the order of importance of its component parts within the resources of the economy. In the absence of such a policy and program, material and production resources were being wasted and the defense schedule was not being met. The consecutive steps required to deal with the situation included:

- 1) recognition of the fact that certain minima of civilian production were as essential to the defense program as the production of military equipment itself;
- 2) establishment of standards or criteria of relative importance of products in themselves and in their uses (both military and civilian);
- 3) acceptance of the governing principle that in the event that unrestricted military demand claimed the total supply of a material, the military demand must be screened and cut back to a level which would make minimum quantities available for a predetermined level of irreducible and non-substitutable civilian requirements;
- 4) use of estimated quantities of materials available for civilian purposes as the basis for advance determination of civilian production programs to be realized through the control system;
- 5) development of homogeneous classifications of materials and end products so that programs could be aggregated in common units;
- 6) as interim operating procedure pending the collection of total material requirements in common units, acceptance of forced cutbacks in material consumption for clearly non-essential uses, by prohibiting the manufacture of selected end products;
- 7) adoption of a uniform technique for collecting material requirements data for all segments of the economy.

The application of a control technique using these principles was outlined in an October proposal to start allocating to each important industry or other segment of demand a definite share of the supply of each scarce material. The farm machinery industry was suggested as the test case. But the plan could be extended to other industries as rapidly as *administrative machinery*, personnel, and operating procedures could be prepared. Again, however, the critical reviewer notes that the plan carried the implicit assumption that it was part of an over-all control system in which total demand for and total supply of each critical material were forcibly balanced by *programming each essential requirements* area and eliminating non-essential uses to the extent necessary to secure a balance.

The proposal was framed in terms of allocating to the farm machinery industry the quantities of scarce materials required to carry out a predetermined program in which was spelled out specific production of the various types of farm machinery by each of the producing companies. The suggested procedure included the following administrative actions:

- 1) selection of a rough approximation of the total amount of each scarce material to be permitted to the industry—for the purpose of the proposal, this was placed at 80 percent of 1940 consumption;
- 2) with the aid of an industry advisory committee, selection of appropriate classes of subassemblies and parts entering into the manufacture of the end products, which were not usually manufactured by the farm machinery industry; industries producing these selected subassemblies and parts (such as fractional horsepower motors, bolts and nuts, and screws) to be considered as separate industries to which direct allocations of materials would be made; material entering into such parts not to be included in calculations of material requirements of the farm machinery industry;
- 3) obtaining from the farm machinery industry bills of materials in standard material classifications, covering all important materials for each class of equipment to be manufactured;
- 4) determination of definite production programs for the more critical production items, such as dairy and poultry equipment, these items to be produced in predetermined quantities, if necessary at the cost of other production;
- 5) with the industry's help, making the most extensive possible application of conservation practices, to reduce scarce material consumption to minimum practicable quantities;
- 6) allocation of quantities of scarce materials required for determined pro-

- duction schedules of most critical equipment, and spreading the balance for each material over the remaining equipment output;
- 7) obtaining from the industry a recommended apportionment of the total production of each type of equipment among the several manufacturers;
 - 8) based on such recommendations, the setting of production schedules and allocation of materials to each manufacturer;
 - 9) assignment of an industry allocation code symbol: FM;
 - 10) requiring purchase orders placed by each manufacturer in the industry, and by each of his suppliers, identified by this allocation symbol, to be segregated from all other purchase orders;
 - 11) proceeding in the same way with the makers of subassemblies and parts, whose material requirements were excluded from those prepared by the farm equipment industry;
 - 12) validation at face value by raw material commodity sections of OPM of purchase orders received on mill order boards as the basis for screening under various M orders (as with copper, aluminum, and nickel).

The proposal noted that it was probably in advance of its time, but stated that a transition could be effected through a revision of DSRP, granting preference ratings to the procurement of specified ceiling quantities of scarce materials. In this period of bridging the gap between the rating procedures in use and total allocation, the expanded DSRP would replace preference-rating orders and force the abandonment of individual rating applications and extensions through the PD-1, -2, -3, -4, and -5 system. All industries and their suppliers operating under the revised DSRP would be prohibited from using these instruments for individual applications. Only the distribution of end products would continue to be governed by individual preference-rating certificates.

The general administrative and processing procedures involved in this transition from priorities to full allocation by way of the requirements bridge were roughed in. Through a general application form, such as the PD-25 of DSRP, all direct military prime contractors would submit their material requirements. These would be aggregated by product classes (tanks, ordnance, ships), screened by a correlating agency for maximum conservation and use of excess inventories, and submitted to OPM. Screened requirements for these industries would be met on a 100-percent basis. Application would be made in the same way by important defense manufacturers other than prime contractors. Many of these plants would be the major subcontractors in the military programs. Here, too, conservation practices and inventory draw-down standards

would be applied to submitted requirements. Stripped requirements would be met as fully as supplies of scarce materials permitted, but a cutback would be instituted from absolutely free operation to force curtailment or prohibition of collateral activities to the extent necessary to achieve full and *prompt accomplishment of defense production schedules*.

The next class governed under the integrated plan would be the vital public services: utilities, governmental activities, hospitals, and so on. The basic policy here would be to maintain the services at going rates, using historical material-consumption patterns as standards for procurement authorization. After one period of operating experience, it might be possible to impose limitations in terms of dollar ceilings, since the bulk of the material use was for maintenance, repair, and operating supply purposes. The philosophy of allocation would be that of high preference status within predetermined limits.

For such important underlying industries as lumber, paper, and textiles, requirements would be submitted on the standard form, but assistance would be at a level representing a cutback from historical consumption patterns. All other manufacturing activities would be handled through a simple formula to minimize administrative paper and personnel burdens. A similar control would be used for the distribution services, without application, on a historical dollar expenditure basis.

Within the next month, the pressures toward a rationalization of industrial controls forced the adoption of the heart of this proposal. The forces of resistance were still strong enough to prevent the full transition to allocation, or even to the mandatory substitution of the revised DSRP for the heterogeneous array of piecemeal controls. But the first and most important step was made with the issuance of the Production Requirements Plan, as the amended DSRP was called.

PRP was initiated on a voluntary basis, but framed in such fashion as to make it attractive to many producers who had hesitated to replace the irksome and expensive multiplicity of individual applications by the simplified DSRP procedure. At this stage, the importance of the new control system was in its technique. It carried the seed of the entire philosophy of control which had been fought over for more than six months. It provided a device for quantitative control of both input of materials and output of finished products. It offered, in Materials List No. 1, uni-

form terminology for raw materials, facilitating the assembly of more complete information on requirements than had been available up to that time. It was designed to work on the basis of the smallest inventory control unit maintained by each participating manufacturer. Information required in the application included in-process and finished goods inventories, measured in gross totals. Above all, it provided for the supply of essential operating data and the granting of priority assistance on a single form. The philosophy of control was summarized in the introductory statement:

This plan has been designed to enable the manufacturer to present a complete picture of his operations in relation to Defense and essential civilian needs, and to state his production requirements for these purposes. In this manner it will be possible for the Division of Priorities to give the manufacturer the proper priority assistance.

Applicants submitting Form PD-25A should report information on the basis of the smallest breakdown of their operations which existing inventory records permit. If it is not practicable to make application for each separate class of products, the form may be submitted for a Department, Division, or Plant. When the form is submitted for a Department, Division, or Plant, all the classes of products manufactured in that Department, Division, or Plant should be included in Section B. *Existing inventory records determine the breakdown by classes of products.*

Preference ratings or allocations authorized will be determined by the importance of the products in relation to Defense and essential civilian needs as evidenced by preference ratings received directing delivery of the products, by the end use of the products, by the types and quantities of materials used in their manufacture, and by such policies as may be established from time to time by the Office of Production Management.

Applicants were directed to report the dollar value of shipments of each class of product produced in the reported inventory unit. Examples of such product classes were: iron body valves, brass valves, steel valves, conduit fittings, industrial lift trucks, and portable electric tools. Actual shipments were reported for the calendar quarter preceding that in which application was made, and estimated shipments for the current and next succeeding quarters. End-of-quarter inventories (in gross dollars) were required for the two preceding quarterly periods, for raw materials, work-in-process, finished goods, and supplies. Applicants were required to analyze total dollar shipments in the preceding calendar quarter, by preference ratings and end use.

Materials List No. 1, accompanying the form, was a lengthy schedule which itemized separately every important nonferrous metal and alloy in mill shapes (ingots, pipe, plates, rod and bar, sheets, tubes, castings, etc.); the ferroalloys; iron and steel (in mill shape detail); and many other materials, including a long list of chemicals. Applicants were instructed to show, for each of these materials used in production, input in the preceding calendar quarter (beginning-of-quarter inventory, receipts, consumption, and end-of-quarter inventory) and requirements for the quarter for which application was made. Similar information was called for covering other materials, not included in Materials List No. 1, for which preference ratings were requested. This reportage also covered purchased parts and assemblies. A separate reporting, showing similar information in dollar value, was required for maintenance, repair, and operating supplies.

Opposite each material requirement, OPM indicated the quantities to which preference ratings, as assigned, might be applied in procurement in the ensuing quarter. One copy of the application, so processed, was returned to the applicant, showing quantities to be rated and ratings to be applied. Preference ratings assigned ranged from A-1 through A-9, reflecting the defense and essential civilian significance of the applicant's shipments.²

At this stage, participation in the Production Requirements Plan was voluntary. Only those manufacturers reported who found in the plan a sound basis for organizing their operations and a useful device for simplifying their priority problems. Many manufacturers who had easier access to raw materials under other priority instruments were not interested in filing PD-25A. Industries which had been made the beneficiaries of generous P orders found nothing to attract them in the Production Requirements Plan. They already had access to materials and did not have to submit to a pre-audit of the validity of their requirements, a review of their inventory position, or an appraisal of their ability to fabricate stated quantities of materials during the period in which delivery was to be made. In addition, a number of industrial concerns were receiving more favorable priority assistance through PD-3A certificates issued by the military agencies.

² Further and more detailed review of the operation of PRP is reserved for the next chapter, in which the later period of mandatory use of the plan is brought under critical examination.

As long as a large segment of industry had no reason to file under the Production Requirements Plan, the administrators of the war program were unable to develop a complete statement of the material requirements of the American war economy. Even if all industry had filed PD-25A applications, it would have been impossible with the existing form to have made such a calculation in time to solve the immediate problems of balancing material requirements and supply, because the form then in use was not organized in such fashion as to be readily tabulated and had not been designed with this objective.

The shortage of critical materials, particularly the basic metals, and inequities in the distribution of these materials interfered with the most efficient use of our production facilities. Nothing short of carefully controlled, over-all, integrated distribution of key materials was adequate to secure maximum utilization of facilities and maximum output of essential military and civilian goods. The demands for scarce materials had to be squeezed to fit a limited supply, but such a program could be neither initiated nor, once begun, administered intelligently in the absence of full knowledge of manufacturers' receipts, use, inventories, and requirements.

To explore the possibility of securing such a tabulation for the critical metals, form PD-275, "Report on Metal Consumption and Requirements," was introduced on February 1, 1942. This form was a counterpart of PD-25A, but applicable only to the scarce metals, and was a statistical report and not an application. During the first week in February, the form was mailed to 11,000 manufacturing establishments which, according to the Census of Manufactures, accounted for more than 90 percent of the metal-fabricating industries of the nation. By mid-March, almost 10,000 returns had been received and tabulated.

The report requested data on receipts, use, inventories, and requirements for all critical metals in mill shapes. Data on receipts and consumption covered the fourth quarter of 1941. Inventories were reported for the beginning and close of that quarter, and requirements were stated in terms of quantities of specified metal shapes which manufacturers anticipated would be put into production in the second quarter of 1942. Reporting plants also classified by preference ratings their fourth-quarter shipments of products they manufactured.

The summary tabulations provided the first over-all measure of metal

consumption and requirements segregated by significant product classifications. They indicated clearly that, if essential production was to be continued at the levels called for by the expanding war program, drastic curtailment of non-essential production was necessary. The data also revealed large quantities of critical metals lodged in excessive inventories held by many metal fabricators. They threw into sharp relief the need for a tighter and more efficient control over the flow of critical metals.

The extent of the growth in the over-all military program, and the continuance of civilian production, were indicated by the analysis of fourth-quarter shipments in terms of preference ratings. Almost 40 percent of fourth-quarter shipments by the metal-fabricating industries was made against A-1 preference ratings. Most prominent in these industries were those producing steel forgings, power boilers, ordnance, ammunition, search lights, wire and cable, turbines, construction machinery, machine tools and accessories, pumps and compressors, armored cars, tanks, airplanes, and ships. Another 9 percent of total shipments was reported in the preference classes A-2 through A-9, with a heavy concentration in such product groups as railroad equipment and commercial autos and trucks. Less than 50 percent of total shipments was unrated.

Analysis of the individual reports indicated that a number of items important to the war program were still being shipped against unrated orders in the fourth quarter of 1941. Among the products in this group were power boilers, steel containers, electrical measuring instruments, transformers, internal combustion engines, turbines, construction and metal-working machinery, and power transmission and railroad equipment. In addition, many materials and parts important in the further production of military end products were still being shipped against unrated orders. Among such products were foundry items, steel wire products, steel forgings, galvanized and coated metal products, fabricated structural steel, and semifinished products of copper, copper alloy, zinc, lead, and tin. Finally, manufacturers reported substantial unrated shipments of finished products, part of which were essential to war production, but the bulk of which were essential to the maintenance of civilian life. These included cutlery and tools, building components, tin cans, wiring devices and supplies, insulated wire and cable, X-ray apparatus, tractors, agricultural equipment, and special industry machinery.

For the first of these groups of products (important in the war pro-

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gram), it was recommended that a review be undertaken to assure that the full needs of the war and essential civilian programs were being met without dilution by production for non-civilian uses. For the second of the groups of products (important in further production of military items), a recommendation was made for detailed examination to determine whether the substantial quantities of materials used in these industries and their specialized facilities were fully directed toward the war effort. For the third group of products (mostly essential for the maintenance of civilian life), the recommendation was made that a review be undertaken to insure that the large quantities of metals consumed and the facilities employed in producing less essential civilian goods were reduced to the minimum possible, and that conversion of facilities was aggressively pushed. Finally, there were identified certain consumers' durable goods products still in production for which review was urged to determine whether existing orders had provided adequately for conservation of materials and conversion of facilities, and the extent to which additional action should be taken immediately to prevent further consumption of critical materials and diversion of usable industrial facilities. Among these products were heating and cooking equipment; enameled iron sanitary ware; clocks and watches; domestic electric appliances; office and store machines; household refrigerators and air conditioning units; washing, pressing, and sewing machines; passenger cars; metal furniture; and a number of other non-essential metal products.

In recognition of the need for allocating critical metals, which the first PD-275 so clearly indicated, the decision was made to undertake a second survey and to extend its coverage to include all metal users in the industrial system. In mid-April, 1942, therefore, more than 20,000 forms were mailed to a comprehensive list of manufacturing establishments (including many not covered in the first report), as well as approved projects, arsenals, Navy yards, railroads, mines, and merchant shipyards. Beyond this, summary reports were prepared by the Office of the Petroleum Coordinator for the major divisions of the petroleum industry, by the Power Branch of WPB for the utility industries, by the Maritime Commission for its direct purchases of metals, by the Federal Works Agency for all public construction other than housing, and by the Housing Branch of WPB for all housing construction. A summary

report was also prepared for all foreign requirements, including Lend-Lease.

By May 22, over 18,000 reports had been received. About 5,000 were rejected from the tabulation because neither metal use in the first quarter nor metal requirements for the third quarter was valued at over \$5,000. Estimates of coverage indicated that the tabulation included in excess of 90 percent of the metal requirements of the American economy. The addition of late schedules and of the requirements of small plants would have increased the coverage to about 95 percent.

A number of important conclusions were drawn from the tabulation. Anticipated AA and A-1 requirements for several important kinds and shapes of metals for the third quarter were in excess of total first-quarter consumption of these metals, whether rated or not. A large volume of non-essential production was eliminated during the first half of 1942, but important non-rated and less-essential manufacturing activity was still consuming substantial quantities of critical metals. The flow of vital materials was still being choked up in large inventories held by producers of some types of metal products. Manufacturers generally were looking toward a striking conversion of industrial facilities to war production in the near future. One overriding conclusion was that, in the aggregate, this country's capacity to consume critical metals was well beyond our ability to supply them. If the production of the most vital military and civilian goods was to be expanded, therefore, rigid control over the distribution of metals was urgently needed.

Of the developments of the summer and autumn of 1941 and the early months of 1942, which culminated in the introduction of the revised form PD-25A and the procedure briefly outlined above, this much should be said. The period was in all respects a formative one in which the learning process was being carried on simultaneously by industry and government. Progress toward the evolution of the needed integrated control system was slow—indeed, *too slow for the rapid advance toward peak defense output required by the exigencies of the international situation.* But the experiments made, the proposals advanced, and the philosophy of control ultimately adopted foreshadowed all that proved most effective in the later period. In a very real sense, the last half of 1941 and the first quarter of 1942 was the most significant period of the entire war for

the growth of control techniques, the clarification of administrative thinking, and the organization of methods, paper, and personnel required to carry through the immense tasks of mobilizing the full resources of this economy for war.

CHAPTER VI

THE PRODUCTION REQUIREMENTS PLAN

THE FIRST integrated production control plan was introduced on June 10, 1942, with the issuance of Priorities Regulation No. 11. This regulation brought all manufacturing users of significant quantities of scarce metals under the Production Requirements Plan and denied them the right to use preference ratings stemming from any other source. More than eight months had elapsed since the full mandatory PRP had first been urged as the most effective way to coordinate control of the distribution and use of scarce materials in the interests of maximum production for war. During this period, PRP had been continuously in operation on a voluntary basis. The roll of plants functioning under the plan had increased from 2,000 to 7,000 by the second quarter of 1942. But large segments of manufacturing industry continued to procure materials with preference ratings derived from PD-1A and PD-3A certificates and from various "P" orders. Separate allocation systems continued to function through the machinery established by the M orders which provided for order board review of procurement at the mills. In this period, and particularly following Pearl Harbor, the military program had grown from an annual rate of 24 billion dollars to an annual rate of 60 billion dollars. The inflation of preference-rating currency had progressed so far that for a number of critical materials the supply appeared to be inadequate to meet even the highest rated orders (down through A-1-c). The fight for materials was being conducted almost entirely through competitive expediting which made intelligent programing impossible. War materiel was being produced, but war production was not being administered. Machinery did not exist to carry out the decisions of the top policy-making groups. There was general agreement on the inadequacy of existing material and production controls, but general disagreement on what to do to resolve the problem.

A special committee appointed by the Chairman of the War Production Board in April to consider downward revisions in current objectives

of the war munitions program concluded that the major limiting factor on achievement of high production goals was the inadequacy of existing controls over the flow of materials. The most significant evidence of that inadequacy was found in the leakage of scarce materials into non-essential uses (clearly proven in the tabulations of reports on PD-275); the hoarding of materials in excessive and unbalanced inventories (shown in the individual PD-275 schedules); and the uninterrupted race of preference ratings to the highest categories, with the accompanying emphasis on immediate deliveries. Four control systems were operating concurrently. The first was the system of individual preference certificates, responsible for the initiation of rating authority to military prime contractors (through PD-3A authorizations), and for a heterogeneous collection of priorities issued on PD-1A's. The second was the distribution of materials among broad classes of use, represented by the policy decisions of the newly formed Requirements Committee.¹ No specific machinery existed to carry out these decisions in the terms in which they were made. The third control system operated through the detailed allocation of selected critical materials under M orders administered by the several commodity branches of WPB. The fourth was the voluntary Production Requirements Plan.

The situation was complicated further by the fact that the four control systems did not govern four separate industrial areas. Material alloca-

¹ Following the creation of the War Production Board, in January, 1942, the Chairman directed the establishment of a Requirements Committee to deal with the general and detailed problems of relating supply and requirements of critical materials which, earlier, had been coordinated by the Supply, Priorities, and Allocations Board.

The over-all terms of reference for the committee, as outlined by its chairman, were "to act as a coordinating center where careful consideration will be given to all factors relevant to the determination of requirements of our own war effort, of our essential civilian activity, and of our aid and commerce abroad for essential and critical raw materials and industrial materials. The Committee will also ascertain total supplies of such materials available for the American economy, determine the extent to which available supplies of such materials shall be increased to meet requirements, and determine the allocation of such materials as between broad classes of demand."

As originally constituted, membership on the Committee included representatives of the War and Navy Departments, Board of Economic Warfare, Office of Lend-Lease Administration, U.S. Maritime Commission, and WPB Division of Civilian Supply. Later, membership was extended to representatives of other management agencies, including Office of Defense Transportation, National Housing Agency, Petroleum Administration for War, and War Food Administration. A close working relationship was established between the Requirements Committee and the Combined Raw Materials Board. The Committee was served by a statistical and economic staff with the principal assignment of preparing reports on the supply-requirements position of critical commodities.

tions by the commodity branches through their review of mill order boards and approval of shipment schedules effectively superseded all decisions made through the other three systems. In this administrative chaos there was no way to secure coordination of material allocations required for individual end product programs, or even for an individual production schedule in a single plant. Finally, actual shipments by producers of controlled materials were often at variance with the allocation decisions of the commodity branches, in effect introducing a fifth control system run by the order scheduling departments of the metal mills.

The historical development of this patchwork of controls traces a *pattern of opportunism* in administration. The preference-rating system was originally established to govern priority of deliveries. It was an effective device as long as material supplies were substantially in excess of rated orders. As the war production program expanded, the first attempt to ease the pressure on supplies was the issuance of limitation orders to reduce civilian consumption of materials. But military requirements grew faster than civilian demand was cut back. In a period of aggravated material shortages, the decentralized authority for issuing priorities induced rating inflation with pressure on immediate deliveries. To deal with this situation, material allocation systems were established by the commodity branches operating through order board machinery set up under various M orders. To supplement these efforts to bring supply and requirements into balance, the Requirements Committee was established as a policy-making body with responsibility for dividing supplies of critical materials among major areas of consumption. But there was no mechanism for translating these policy decisions into action, because there was no integrated control machinery. In fact, policy decisions of the Requirements Committee were being unsystematically distorted if not destroyed by independent decisions made all over the country by Army and Navy procurement officers, by independent decisions within each of the commodity branches of WPB, and by independent decisions in the order-scheduling departments of the producers of critical materials.

The absolute conflict between an over-all integrated control and the existing systems of material allocation by the commodity branches was clearly defined in the methodology of the principal individual controls for aluminum, nickel, and steel.

In the case of aluminum, forty-five days prior to each allocation month all producers, smelters, foundries, and other primary fabricators of aluminum filed form PD-26A as application for authorization to ship specified quantities of aluminum shapes to specified customers. When shipment requests for individual aluminum mill products exceeded prospective supply, the Aluminum and Magnesium Branch requested from the Army and Navy Munitions Board a decision on curtailment of selected demand areas. Proposed shipments of aluminum to individual consumers were checked against quarterly reports of receipts, consumption, and inventories filed by manufacturers on form PD-40A. Control over the movement of aluminum beyond the allocation stage—that is, after shipment by primary fabricators to their immediate customers—was through the general preference-rating system, completely free of direction by the commodity branch.

Melters of nickel submitted monthly statements of proposed shipments on form PD-27, showing quantities, preference ratings, government contract numbers, and end uses. Information was also noted on stocks and past consumption of nickel users. Submitted reports were reviewed by the Nickel Branch, the Bureau of Industrial Conservation, and ANMB, and the appropriate allocation decisions were made.

The Iron and Steel Branch maintained separate controls over the flow of pig iron, iron and steel scrap, and steel plates. Under M-17, the branch received monthly reports of capacities and orders from pig iron producers, and of inventories from purchasers of pig iron. Allocations were made without reference to the Requirements Committee or other policy-making group. In the case of iron and steel scrap, the branch acted as placement office for scrap orders, allocating them to dealers at the rate of from 100 to 200 daily. Other scrap distribution was not controlled. In the steel plate allocation system, producers filed advance monthly delivery schedules on form PD-169, listing customers, order numbers, preference ratings, government contract numbers, end uses, and quantities required. Steel plate consumers submitted their requirements in similar detail on form PD-298 to producers and to the Iron and Steel Branch. Consumers also reported on form PD-299 actual plate consumption, receipts, inventories, and requirements. Consumption and requirements data indicated ordering agencies or industries. The branch reported monthly to the Requirements Committee, which directed the distribu-

tion of plate among the various use areas in broad terms. Production and shipment schedules were set by the branch following these directives. Again, as in the other control systems, there was no coordination between, and no machinery for coordinating, allocations of steel plate for a specific purpose, use, or individual consumer and allocations of other materials for the same purpose, use, or consumer.

The conditions confronting the War Production Board in the spring of 1942 presented four distinct but closely related problems for administrative action. The first was the organization of planning (both long and short-range) at the top policy level. The second was the establishment of a uniform system for identifying end use all the way through the industrial structure from end product to mill. The third was the task of cleaning out the preference-rating system which had degenerated into a meaningless cluster of ratings in the top categories. The fourth was the initiation of an integrated material distribution control system.

The continuing failure to develop additive programs representing the total requirements for military, export, and essential civilian purposes in each calendar period set up an absolute block to intelligent policy making. What was required was a statement of proposed goals translated into additive material requirements for each of the important consuming groups in the war economy. To be most useful, this statement first must be presented in terms of numbers or values of end products to be delivered by time periods, as 2,000 M-4 tanks in the third quarter of 1942, 500 B-17 bombers in the fourth quarter, 300 locomotives for the U.S.S.R. ready for shipment in the fourth quarter, or 150,000 garbage pails for defense housing projects in the fourth quarter. Second, the statement of proposed program goals must be projected into the future for at least four calendar quarters. Third, the end-product schedules must be translated into the quantities of scarce materials required to execute the proposed programs, using bills of materials as the basis for estimating material equivalents (allowing for scrap) of finished products. Fourth, appropriate manufacturing lead-time schedules must be calculated to space out by calendar periods the material requirements of proposed end-product delivery schedules. (For example, steel plates for an M-4 tank scheduled for delivery in November had to be delivered by the plate mill to the hull maker in June in order to maintain his working inventory and the continuous assembly process on his production

line.) Finally, the demands against the basic material producers must be aggregated for all programs by calendar periods for comparison with the anticipated supply of each critical material, shape, and alloy.

It is one of the most serious indictments of the management of the war program that in mid-1942, more than two years after the initiation of production for national defense and six months after Pearl Harbor, the necessity for doing this programing job was still being debated and techniques for executing the assignment had not progressed beyond the drawing board. In the absence of this fundamental information, it was impossible to make the policy decisions crucial to the total organization of industry for winning the war. With demands for scarce materials over-running supply, the Requirements Committee could not carry out the job for which it had been created. It could not measure total demand against total supply of each critical material in each calendar period, establish the appropriate sequence of essentiality for proposed programs, direct the cutbacks necessary to bring supply and demand into balance, and organize the approved programs in such manner that there could be reasonable expectation of carrying them through to completion uniformly and on time.

In this continuing chaos, the resources of the country could not be assigned to the service of the national needs in the war emergency in any rational manner. It was difficult to determine with confidence the desirability of expanding production of the basic critical materials, in the absence of responsible firm quantitative measurements of future requirements calculated month by month in the periods in which they must be met. Lacking this information, it was also difficult to determine the optimum size of facilities expansions and the most desirable completion dates for the individual segments of each facility program. This problem was made even more difficult by the further cut in end-product manufacture resulting from the diversion of materials to the expansion in facilities. No intelligent decisions could be made with respect to the relationship of one part of an important program to another. No one could define authoritatively the extent to which civilian activities could or should be maintained. No one could underwrite our export commitments with assurance that they would be met without dangerous inroads on immediate military requirements.

Stemming from this problem of developing programs, balanced over-

all and in detail, was the assignment of projecting a workable system for identifying the component parts of each program. Without a method for tying the output of each particular component to its end use, the job of carrying all segments of an integrated program through to completion at the same time was an impossible assignment. The key to the puzzle was the development of machinery for accurate identification of end products manufactured by prime contractors, which could be transmitted through the entire industrial system to the basic material producers. With such a system, it would be possible to follow the progress of the component parts of each important end-product program and assure its completion on a balanced schedule.

Even with a system of defined and identified programs, there was still the task of establishing time-sequence relationships governing deliveries in each control period. The logical device to handle this job was the preference-rating system. But eighteen months' maladministration had rendered the existing priorities system worthless. What was required in the spring of 1942 was either a ruthless cleaning out of the existing system, or its abandonment and the substitution of a wholly new schedule of preference ratings. The only significant function which could be effectively performed by a priorities system was that of determining the sequence of production and delivery under market conditions in which supply was in excess of demand. For any other purpose, or under any other supply-demand relationship, the priorities system was worse than useless; it was a source of real danger for the accomplishment of the entire war production program.

Finally, an integrated material distribution control system was needed to give effective execution to organized, balanced, identified, and timed programs. This was the machinery required to translate planning and policy making into action, and to provide, from operations, the administrative statistics with which to measure the success or failure of executive decisions.

In the spring and summer months significant efforts were made to deal with each of these issues. The nature of its charter forced the Requirements Committee and its staff to give continual consideration to the problems involved in balancing supply and demand and in allocating supply to the major segments of demand. Progress was made in driving home to all participants a realization of the importance of developing

programs in quantitative terms by calendar periods, aggregating total requirements in common units of measure, and determining their feasibility over-all and in detail. But without an integrated material-distribution control system the gap between policy and action could not be bridged. At best, decisions of the Requirements Committee distributing supplies of critical materials served as general policy guides. More often, existing control techniques simply did not permit the execution of policy decisions. And at no time was it possible to derive from actual operations the type of administrative statistics which would measure the extent and effectiveness of implementation and fix responsibility for failures or departures from the lines of determined policy. Reviewing the history of the War Production Board in the first four months of 1942 by concurrent study of the policy determinations of the Requirements Committee and the operating actions of the materials branches, the objective critic is left with a sense of futility.

A bold experiment in end-use identification was prepared in the late spring and introduced through the issuance of Priorities Regulation No. 10 in June. The creators of every material-allocation system had experienced the need for some type of end-use information to help appraise the war, or war-related, significance of purchase orders. Acting independently, they had established a variety of end-use definitions which were, at best, crude devices for collecting essential information. In the absence of a formal procedure for passing end-use information through the industrial system, an informal customer-supplier exchange was forced upon producers, which was wasteful, onerous, and non-uniform. Inevitably, much of the information reported on order board forms was inaccurate.

Study of the allocation forms for the more important critical materials reveals that there were almost as many different approaches to the concept of end use as there were materials under allocation. The aluminum system required consumer identification and a listing of "ultimate" uses. The consumer identification called for the reporting of one of the supply arms of the Army, Navy, or other procurement agency, or of one of several rather broad classifications of industry, such as "construction" or "automotive." Ultimate use called for identification of the physical part to be made from the aluminum shape ordered, such as "cylinder head for aircraft engine" or "replacement piston for passenger cars." The

copper allocation system involved an industry use classification. The instructions stated: "All copper and copper alloy products should be classified . . . according to end use, i.e., the final completely assembled product of which they are a part." The vanadium system required an analysis of proposed consumption by types of products in which vanadium was to be incorporated. Instructions defined such products as specific parts—punches, bits, or armor plate; however, other suggested classifications were of a different character—aircraft parts, road machinery, shovels, and cranes. The tungsten system required an analysis of the applicant's proposed consumption of tungsten by types of steel, with a further breakdown of each type of steel into several of its uses, and an analysis of proposed consumption of tungsten in metallic products other than steel.

As material supply positions became more stringent, dissatisfaction with one type of end-use system often led to the imposition of another and more detailed procedure. The resulting confusion testified to the desperate search for significant evidence bearing on the importance of each purchase order. It also indicated the impossible burden placed on the first fabricator of a mill shape, who was called upon to justify his order by supplying descriptive information which could be secured only by reaching up the contracting chain through several supply levels. Fabricators of finished products containing more than one allocated material were called upon to define their activity in a variety of terms, without knowing whether such differences provided satisfactory definitions of end or ultimate use. The information derived by the material branches clearly was not systematic, could not be tabulated, and could not be employed effectively in reviewing applications for allocations.

The allocation classification system established by Priorities Regulation No. 10 was directed at the standardization of reported end-use information.

To allocate intelligently, it is necessary to know the subdivision of the war, industrial and civilian programs for which materials are going to be used. For example, it is essential to know whether the materials are going to tanks, or destroyers, or railroads, or to office machinery and supplies in order to determine allocation policy. In addition, it is necessary to know . . . what type of purchasers will eventually receive particular products of industry, i.e., whether the products will eventually be delivered to the Army, Navy, etc.

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The system was one of dual classification, consisting of a number sequence designating the kind of product for which material ordered would be used, and a letter sequence indicating the general class of purchaser to which delivery would be made.

Under the allocation classification system, every purchase order was identified by the appropriate symbol. All businesses were segregated into one of two categories: those which noted on their purchase orders the symbol representing the business for which a purchase order was placed (for example, a manufacturer of tanks placed the symbol 3.10 on all of his purchase orders), and those which placed on their purchase orders the symbols received from their customers (for example, a manufacturer of electric motors receiving an order from a railroad bearing the symbol 10.10 placed the same symbol, 10.10, on his purchase order for materials to fulfill the railroad's order). Special rules were provided for mixed cases. Letter symbols identifying Army, Navy, Lend-Lease, other foreign, and domestic civilian purchasers were also transmitted.

The allocation classification system had to be abandoned. It was cumbersome in use, unworkable in large segments of industry, and productive of unreliable order identification on the mill order books (for several successive months, copper and brass mill reports indicated shipments of significant tonnages for the construction of a "civilian" aircraft carrier and the manufacture of "civilian" ammunition in calibres of eight inches and above, presumably for the defense of the same carrier). The source of the failure was in methodology, but the experiment made a valuable contribution to operating experience, if only as an object lesson of what not to do.

This experience should not be permitted to discount the inherent difficulties in developing a comprehensive and workable end-use classification. It might be observed that a group of the most competent classification experts in the country, working with the authority of the Executive Office of the President and in cooperation with representatives of other government agencies, for years has been wrestling with the task of establishing a comprehensive product classification. This job is still unfinished. In many respects, the "use" concept is more elusive than the "product class" concept. This makes clear the need for intensive preparatory work if the problem is to be dealt with on a considered basis.

The breakdown of the preference-rating system was resolved by its

abandonment in favor of a new series of rating categories embodied in Priorities Regulation No. 12: AAA for emergency assistance, and bands from AA-1 to AA-4 for all other preference assistance. The content of each band was carefully defined; and, with the realization that any yielding to pressure to overload the top classes could result only in diminishing their significance as a timing device (if everything is first, then nothing is first), the new rating system stood up for the rest of the war. Inevitably, the AA-1 band was forced to accept new occupants. By January, 1945, the usefulness of the lowest categories was considerably less than in January, 1943. But the total collapse of the preference-rating system which occurred in the spring of 1942 was not repeated, partly as a result of a strong and continuing battle in defense of the integrity of the top rating bands, partly as a result of balancing the supply-demand equation for critical materials and executing these policy decisions through an integrated material distribution control.

Finally, after repeated delays, Priorities Regulation No. 11, establishing the mandatory use of the Production Requirements Plan by all metal-using industries, was issued on June 10, 1942. Under this regulation any company (or operating division of a company maintaining a separate inventory) using more than \$5,000 worth of critical metals in a calendar quarter was required to make application on form PD-25A for authorization to procure materials under PRP. An exception to this direction was made for federal or other government agencies (but not including those engaged in manufacture such as government-owned shipyards, arsenals, and prison factories which were subject to PRP); companies or persons engaged in: transportation; furnishing heat, light, power, electricity, gas or water; mining or quarrying; production, refining, transportation, distribution, or marketing of petroleum; communications; sewerage or drainage; distribution industries and all other operations not involving the manufacture or processing of materials; extracting, smelting, refining, alloying, or processing metal ores or scrap into raw metal; and construction. With these exceptions, all companies using over \$5,000 worth of metal were required to file an application not later than June 30, 1942, stating their third-quarter production material requirements.

To prevent leaks in the program, all such metal users were prohibited, after July 1, from using or extending any preference ratings other than those assigned on PD-25A, with the exception of preference ratings as-

signed in connection with approved authorizations for capital equipment or construction. Further, no PRP unit was permitted to accept delivery of materials listed on PD-25A in quantities greater than those authorized, even if the materials could be obtained without the use of a rating. Companies operating under PRP and requiring capital equipment or priority assistance for construction were permitted to continue to make application as in the past on PD-1A or PD-200 (the facility application form).

The fundamental control program set up under the Production Requirements Plan was simple in concept. PD-25A applications would be tabulated and a summary prepared covering the bulk of the metal requirements of American industry for a calendar quarter. On the basis of this statement of requirements, supplemented by other information, the Requirements Committee of the War Production Board would establish general policies governing the distribution of critical metals. Directives would then be issued allocating lump quantities of critical metals to industries. The industry branches of the War Production Board and the military services would process the individual PD-25A applications. Each such processing unit would be charged with responsibility for limiting total authorizations of critical metals to the quantities allocated by the Requirements Committee to each processing unit and industry. In effect, the Requirements Committee would "cut the supply pie" for each critical metal, assigning a piece of the pie to each industry. The processing units would then distribute their assigned pieces to the individual applicants on the basis of past use of metals, inventory position, war-related importance of shipments, and future requirements.

The major objective of this procedure was to balance requirements and supply for every critical metal. No longer would authorizations and preference ratings be assigned for procurement in excess of the actual supplies of metals; no longer would there be a race to inflate preference ratings. If the plan worked as projected, it was reasonable to assume that all authorizations on PD-25A would be validated and the preference ratings would become a timing device, as they were first intended to be.

Although at first the plan was directed specifically at the control of critical metals, it was anticipated that it might be extended later to other materials and to the more critical categories of parts and subassemblies.

In the intervening period it was proposed to process PD-25A applications for materials other than the critical metals in rough proportion to the directed processing for the metals themselves.

Priorities Regulation No. 11 was issued so late in the second quarter that the operation of the Production Requirements Plan in the third quarter was largely on an experimental basis. It was not found feasible to issue processing directives to the industry branches. For the fourth quarter, however, the plan was extended in full operation as originally proposed.

As a foundation for fourth-quarter operations, form PD-25A was mailed on July 22 to all PRP units, with instructions to return the completed applications to the War Production Board not later than August 10. In organizing the plan for the fourth quarter, the decision was made to eliminate form PD-275 and to incorporate its essential features in PD-25A. PD-275 differed from PD-25A in only three significant respects: (1) it contained a preprinted metals list and therefore could be readily tabulated; (2) it was sent to all users of metals; and (3) reporting firms were required to file the completed PD-275 at least 45 days before the beginning of the quarter to which the statement of requirements applied.

The elimination of PD-275 required the inclusion of these three factors under the PD-25A system. Priorities Regulation No. 11 had accomplished the second with its definition of the PRP units for which filing under the Production Requirements Plan was mandatory. The metal section of PD-25A was made tabulatable for the fourth quarter by preprinting the critical metals list directly on the form. Finally, applicants were directed to file PD-25A for the fourth quarter much earlier than most of them had done for earlier quarters.

Applicants were reminded that

in the attempt to simplify and reduce the volume of priorities paper which you must submit, form PD-275, Report on Metal Consumption and Requirements, will not be used for the fourth quarter 1942. Form PD-25A under the Production Requirements Plan, therefore, fulfills a dual purpose: (1) it serves as the basis on which the Requirements Committee will determine total requirements for critical metals for the fourth quarter of 1942 and will make allocations to industry; (2) it is your application to the War Production Board for preference rating assistance in purchasing authorized quantities of critical materials.

The plan of operation for the fourth quarter paralleled that projected for the third quarter. The Bureau of the Census was assigned the function of tabulating data on receipts, use, inventory, and requirements reported on PD-25A. On the basis of these tabulations presented for more than 200 separate product groups, the Requirements Committee cut pies for all critical metals and issued directives allocating critical metals to industries. On the basis of the PD-25A applications, the processing units then distributed their allocations among the individual companies coming under their assigned responsibility. The Requirements Committee was responsible for cutting back requirements as submitted so that the total allocation of each critical metal was held within the anticipated available supply. The processing units were responsible for limiting the authorizations to individual applicants so that the total quantities of metals allocated to each industry did not exceed the quantities made available to that industry by the Requirements Committee. Supply and demand for each critical metal were kept in balance. Authorizations on PD-25A were valid and preference ratings functioned simply as timing devices. The flow of critical metals through the wartime economy was controlled by an over-all plan designed to eliminate the haphazard distribution of metals to non-essential purposes and to reduce inventories wherever they might exist.

A brief summary of the more important parts of form PD-25A will help in understanding its use as an operating instrument. Section A of the form consisted of instructions to the applicant on how to complete the form, conduct his operations under PRP, and purchase materials under Priorities Regulation No. 11. This section also included Materials List No. 1 (Revised), organized in two parts. Part I listed only the critical metals; these metals were also preprinted on the form in Section E, Part I. The second part of the list included the critical ferroalloys, nonferrous metals, oxides, and compounds, non-metallic minerals, and agricultural, animal, and forest products.

Section B of the form was divided into three parts. In Part I the applicant reported actual shipments for every class of product produced in the calendar quarter April-June, 1942, in the inventory unit covered by the report. For each class of products the applicant reported shipments (or, in the case of shipyards and similar industries, billings) in total and analyzed by preference ratings. In Part II of Section B were shown, for the

calendar quarter October-December, 1942, estimated shipments for each class of products in total and analyzed by preference ratings on the basis of booked rated orders scheduled for shipment during the quarter. In Part III of Section B the applicant reported the total dollar value of unfilled rated orders on his books at the most recent available date. In general, this section was designed to reveal in the greatest possible detail the nature of the applicant's business and the war-related significance of his production. This information was reported for both actual operations during the second quarter and anticipated operations during the fourth quarter.

Section E of the form was divided into two parts. (Sections C and D included in previous versions of PD-25A were eliminated from the fourth-quarter form.) In Part I, for each of the shapes and forms of the listed metals which the applicant used in the manufacture of the products reported in Section B, or for maintenance and repair, he was directed to record the following information: for the April-June quarter, the quantity received during the quarter, the quantity put into production (used) during the quarter, and inventory on June 30; for the October-December quarter, the quantity which it was anticipated would be put into production (requirements). A column was included for optional use in which the applicant was permitted to estimate his inventory position on September 30. This part of the application form provided detailed data on receipts, use, inventory, and anticipated requirements. In analyzing each application, it was possible to compare anticipated requirements with actual use; both requirements and use with anticipated and actual shipments of end products; and both requirements and use with a recent closing inventory.

Following the list of preprinted metals was a blank page with column headings similar to those just described. On this page, the applicant reported material consumption, inventories, and requirements for all materials appearing in Part II of the Materials List. The chief reason for the distinction between Part I (critical metals) and Part II of the Materials List was that the metals in Part I were considered in detail by the Requirements Committee and were subject to specific allocations to industry; this part of the list, therefore, had to be tabulated. To speed the tabulation, the list of metals was printed on the form. Materials requirements entered on the blank page at the end of Section E, Part I, were

subject to processing and authorizing in the same manner as in the case of the critical materials. In general, the processing instruction was to authorize suitable quantities of these materials to complete the production schedule established by the allocation of critical metals.

In Part II of Section E, the applicant reported material use and requirements for each class of products manufactured in the reporting unit. If the reporting unit manufactured more than one class of products and so indicated in Section B, the applicant was directed to split material use and requirements in Part II of Section E among the several classes produced. The objective of this part of the application was to reveal use and requirements by product classes. Thus, if a plant produced an essential war product and a non-essential civilian product, using similar materials and maintaining only a single consolidated inventory record, it would reveal in Part II of Section E its essential and non-essential material requirements. On the basis of this statement, it was possible to process the application more intelligently and to authorize critical materials only for essential requirements.

In Section F, the applicant was directed to report on other production materials for which he requested the assignment of preference ratings. The column headings in Section F were identical with those in Section E, calling for data on receipts, use, and closing inventory for the second quarter and anticipated requirements for the fourth quarter. Materials (including parts and subassemblies) not listed on *Materials List No. 1, Revised*, were grouped into not more than ten classes of similar items or types of items, using dollars as the unit of measure.

In Section G, the applicant was directed to report, as a single dollar figure, use and requirements for all supplies except those purchased in forms listed in the Materials List and included in Section E, and other items specifically included in Section F. In Section H, use of which was optional, applicants were permitted to set up anticipated production requirements for additional calendar quarters. They were instructed to list only those materials for which it was necessary to place delivery orders more than three months in advance. Where such advance authorizations were made, however, applicants were directed to file a complete PD-25A each quarter and were warned that materials authorized on advance quarter applications could not be received into plants unless the

quantities were subsequently authorized on PRP certificates for each quarter.

To enable the Requirements Committee to consider total requirements for critical metals and to compare them with anticipated supply, it was essential to secure the most complete possible coverage of all metal requirements. In addition to mailing PD-25A application forms to all PRP units, an attempt was made to cover the material requirements of all important non-PRP areas. Late in July the mines were brought under the Production Requirements Plan and received PD-25A applications for the fourth quarter. The railroads were already operating under a requirements plan of their own for maintenance, repair, and operating supplies, through the use of the Transportation Branch's form PD-351. This form contained a printed critical metals list identical with the list printed in Section E, Part I, of PD-25A. From the information submitted on PD-351, the Transportation Branch prepared a master PD-25A for the fourth-quarter metal requirements of the railroads.

Other reports were also prepared for the consideration of the Requirements Committee. The Office of the Petroleum Coordinator prepared master reports covering metal use and requirements in the five main divisions of the petroleum industry: production, refining, transportation, marketing, and natural gas. The Power Branch of the War Production Board prepared master reports covering metal use and requirements for the following major divisions of the utilities industry: electric light and power, gas, water, and sewage. With the cooperation of the Board of Economic Warfare and the Office of Lend-Lease Administration, master reports were prepared covering metal use and requirements for all foreign countries. Similarly, master reports were prepared by: the Maritime Commission, covering metal use and requirements for all materials purchased directly by it; the Federal Works Agency, for all publicly financed construction except housing; the Housing Branch for all housing projects; the Communications Equipment Branch of WPB, covering metal use and requirements of telegraph companies. The War Department submitted a report covering direct Army purchases of certain metals appearing on the Materials List. By special arrangement, Canadian manufacturers and mines submitted individual PD-25A schedules showing their total fourth-quarter requirements and the part

of those requirements to be satisfied from the United States. Through these and other similar arrangements, an attempt was made to include in the master tabulation a statement of use and requirements for every important metal-consuming area which would draw upon supplies of critical materials in the fourth quarter.

The administrative aspects of the integrated materials-distribution control system are suggested by a review of the proposed management program for the third quarter of 1942. The objective of the control was clear. It was to obtain a complete picture of basic metal requirements for the third quarter, to distribute the available supply of each metal in such manner as to cover essential requirements as completely as possible, and, finally, to control the flow of metals from primary producers to fabricators in accordance with these policy decisions. The control point was defined with equal clarity. It was the first fabrication process applied to the product of the metal mills. Every significant manufacturer who purchased critical metals in mill shapes was limited in his procurement by an allocation from the War Production Board. Procurement of other materials and fabricated parts, in the first operating projection of PRP, was limited by broad ceilings designed to permit the completion of the production levels authorized by the metal allocations. (It was anticipated that in succeeding operating periods the allocation procedure would be extended to key materials other than metals, and to selected critical components.)

Repeated delays in the formal adoption of the Production Requirements Plan severely handicapped efforts to set up the organization of personnel, procedures, and administrative machinery required to put the plan into operation. The result of these delays was an almost total lack of training for the staff which had to carry out the management aspects of the plan, as well as inadequate personnel to handle the paper load, ill-conceived preparation for internal routing of paper, and incomplete processing procedures.

These weaknesses were apparent to those responsible for the plan's administration. The solution, admittedly designed to deal only with an emergency, was to shortcut the total organization of personnel and procedures in a number of ways. First, recognizing that an immediately compulsory control for all manufacturing and service establishments and covering all metals would bog down, third-quarter coverage was limited

to consumers of basic metals in amounts larger than the agreed minimum of \$5,000 per quarter. Second, it was recognized that certain specialized areas of industrial activity did not readily fit into the control pattern established for manufacturers. Among these special areas were the utilities and the petroleum industries, both of which were already operating under their own control systems. It was proposed to obtain from them information on metal requirements in the standard terms and to make an allotment to them as a matter of policy only. This total allotment would be subtracted from anticipated metal supplies before distributing the balance to metal-fabricating plants operating under the PRP procedures. Third, it was recognized that construction requirements could not be brought under the plan immediately. It was agreed to estimate the total amount of materials required for construction in the third quarter, make a policy allocation to this area, and, as with the utilities and petroleum industries, subtract the quantities of metal covered by the policy allocation from total metal supplies before distributing balances to metal fabricators.

For the third quarter these specialized fields of activity would continue to operate under their existing orders. However, an effort would be made to increase the effectiveness of the controls quantitatively in order to translate the policy allocations into action. It was admitted that the existing controls did not permit full compliance with this general policy line.

The decision was also made to leave the requirements of small consumers of metal (less than \$5,000 for the third quarter) under the existing procedures. An estimate would be made of the quantities of critical metals which would be claimed under such procedures and the appropriate deductions made from total supplies before general distribution under the plan. For future quarters, the program called for the creation of a simplified PRP-type quarterly application to be used by small manufacturers.

The proposed administrative program, tailored to fit the abbreviated period available, included the following steps. First, the Bureau of the Census would complete its tabulation of PD-275 forms filed by all important metal users. This tabulation would be summarized into 200 industry groups and the summaries would be furnished to the industry branches of WPB, the armed services, the civilian supply staff of WPB, and the Requirements Committee. Second, the Requirements Commit-

tee would be responsible for determining the size of an appropriate reserve to take care of unforeseen or emergency requirements. In view of the lack of experience in the administration of such a control plan, it was thought wise to make an overgenerous provision for the quarter's emergency reserve. The Requirements Committee would also make the appropriate policy decisions for all special industrial activities not covered by the PRP procedure for the third quarter. Other decisions to be made by the Requirements Committee included the establishment of policy with respect to the assignment of preference ratings and maximum inventory levels. Following the completion of these policy decisions, the appropriate directives would be issued to all processors of forms.

The next step departed completely from the ordinary routine of processing in the effort to shortcut the time required to receive and review applications on PD-25A and return them to manufacturers with procurement limitations and appropriate preference-rating assistance. Because of the late decision to make PRP mandatory, PD-25A applications from all metal-fabricating plants could not be expected in Washington earlier than June 20. But most of the same manufacturers had by the end of May filed with the Bureau of the Census reports on PD-275 which for the critical metals provided the identical information to be reported on the PD-25A applications. To save time, it was therefore determined that the Bureau of the Census would apply to the reports filed on PD-275 the processing directive shaped by the Requirements Committee policy decisions. On a strictly mechanical basis these percentage cutbacks, with the appropriate allowance for inventory adjustments, would be applied to submitted third-quarter requirements, and the appropriate allocations would be calculated and indicated on each PD-275. PD-25A applications as received would be paired plant by plant with the PD-275 report and transmitted to WPB.

The paired PD-275 reports (already processed) and PD-25A applications would be distributed to the industry branches and to the armed services and bureaus responsible for the products manufactured in each plant. Personnel in these processing units would exercise discretion in making adjustments in the third-quarter allocations determined by mechanical computation at the Census Bureau. To maintain the effectiveness of the over-all Requirements Committee policy decisions, however,

an instruction was issued that adjustments must be within the limits of the quantities of metals allowed for the group of plants for which each particular industry branch or service arm or bureau was responsible. PD-25A applications would be addressed to a particular branch or military service arm or bureau. Applications received from plants producing several products which were assignable to more than one industry branch, service arm, or bureau would be processed centrally by a special Production Requirements Plan Branch. Representatives of the various industry branches concerned would be assigned to assist in processing these mixed-product forms. The entire group would be assembled in one place to avoid lost motion in the routing of papers. Provision was also made for review by the materials branches of WPB at this stage in the procedure. Again with the objective of minimizing motion lost in routing applications through WPB, arrangements were made to assemble representatives of the materials branches at one point for review purposes.

Following the completion of these phases of the processing procedure, directives would be issued covering the calculation of the adjustment of all other material requirements in proportion to the allocations of the critical metals. The PD-25A forms so processed would be returned to the applicants and would govern their operations for the third quarter. The materials branches of WPB would be directed to recognize such approved procurement in their scheduling operations under existing M orders.

To make the system fully effective, provision was made for reviewing all incoming PD-1A applications for metal and denying applications submitted by companies operating under the Production Requirements Plan. These companies would also be instructed that PD-3A and other priority instruments received from their customers could not be extended to supplement materials authorizations received on PD-25A.

Even this telescoped program could not be executed as planned. Applications on PD-25A arrived more slowly than had been anticipated. The termination of many general preference orders as of June 30, planned to coincide with the introduction of PRP on a mandatory basis, left large segments of American industry without a source of preference-rating assistance for the third quarter. The Requirements Committee machinery functioned slowly as the staff struggled with its new assign-

ment of balancing demand and supply of critical metals for the whole economy. Inadequate preparations had been made for assembling and training the staffs required to process individual applications in the industry branches. Procedures had not been worked out fully and in the necessary detail. By the last week of June, it was recognized that any further delay in the issuance of priority assistance for the third quarter would seriously interrupt war production, confuse industry, and possibly do irreparable damage to the future operation of the Production Requirements Plan. For these reasons, it was decided to issue PD-25A authorizations immediately without waiting for formal Requirements Committee decisions on the quantities of metals to be approved for each class of product. The following arbitrary procedure was adopted.

1. Reported requirements on each application were compared with past consumption and cut back if, in the analyst's judgment, it appeared that the plant could not maintain the anticipated metal usage for the third quarter.
2. After this adjustment, requirements for military items were authorized at 100 percent.
3. Requirements for other rated shipments were covered by authorizations at a flat rate of 85 percent.
4. All inventory adjustments were based on allowing the applicant a 45-day stock on hand at the end of the quarter.
5. Critical materials were eliminated if they were not permitted for the indicated use by existing limitation and conservation orders.
6. Ratings assigned for use in purchasing authorized quantities were in direct proportion to the ratings reported by applicants for anticipated shipments.

This action broke the log jam of PRP applications at the end of June. But it was not the Production Requirements Plan, the introduction of which was in effect postponed for one quarter. The delays and lack of preparation which were the direct causes of the failure to make PRP effective for the third quarter provided the background for more realistic preparations for the management of the plan in the fourth quarter. The tabulation of PD-25A applications for the fourth quarter began in mid-August and total requirements were summarized for some 230 product groups. Reported requirements were balanced with supplies of critical materials available for distribution under PRP, and the appropriate cut-backs were determined by the Requirements Committee for each product group. In accordance with these decisions, processing directives were issued to the industry branches of the War Production Board

governing the treatment of individual applications for fourth-quarter allotments.

A basic change in administrative procedure was made in the effort to secure uniform policies and procedures in all branches of WPB, and to provide for the necessary training of personnel in the technique of operating under the plan. All control of PRP processing in the industry branches was centralized in the hands of one executive, who was responsible for the administration of the plan. As many PRP applications as possible were distributed to industry branches, and the minimum number of mixed product applications were retained in a central PRP branch. The review functions of the Priorities Division and of ANMB were discontinued, so that each application could follow the shortest path from receipt to issuance. Essentially the same procedure was followed in handling PRP applications for the first quarter of 1943, the last calendar quarter in which the Production Requirements Plan was the official materials-distribution control system.

The Production Requirements Plan never won the full support of all policy-making and top operations personnel of WPB. Opposition to the plan had been the principal factor responsible for the delays in its introduction in the early months of 1942. Almost from the start, the military services had maintained stubborn resistance to the introduction of PRP. By midsummer of 1942, executive consideration was being given to alternative material control systems. By late September, the decision had been made to abandon PRP as soon as another system could be prepared and installed. And on November 2, the official announcement was made of the decision to replace PRP with the Controlled Materials Plan. Since the Production Requirements Plan was not operative in the third quarter, it can truthfully be said that the decision to abandon the plan was made before the plan had been installed as the principal materials-distribution machinery. The reasons underlying this strange decision afford an interesting insight into the forces which shaped executive thinking at that stage of the war effort.

The immediate failure of the Production Requirements Plan can be traced to two major causes. The first was *maladministration* within the plan itself. The second was objection on theoretical grounds to the philosophy of control technique which the plan represented.

The magnitude of the administrative assignment, the accomplishment

of which was absolutely essential to successful operation, was at no time fully understood by the personnel responsible for the administration of the plan. The assembly of the professional staff required to process and the clerical staff required to receive, tabulate, control, and dispatch some 15,000 complex applications for production materials each quarter; the detailed training of personnel in new assignments; the education of industry in operating under the plan; and many other administrative problems were still unresolved when the decision was made to adopt PRP. It was never fully understood that the institution of the Production Requirements Plan required the complete reorganization of the War Production Board, so that the Board as a whole would become a PRP organization. Even after the plan was in operation, at no time was the requisite attention given to the management job. The decision to abandon PRP had already been made and the efforts of administrative personnel were focused on its successor.

The failure to grasp the fundamental relation of WPB organization to PRP administration is clearly illustrated by the problem of coordinating the product groups in which PRP applications were tabulated with the system of product assignments to WPB industry branches. The greatest difficulty was encountered in June, 1942, in routing PRP applications to the appropriate industry branches. It was discovered that the products of a single plant were often assigned to as many as ten branches. Concurrently, individual products, such as storage batteries or motors, were administered by more than one branch, the divided responsibility following lines of end use. An analysis of product assignments and PRP tabulations indicated that only 50 percent of the product assignments to industry branches were consistent with the classification of industry used in tabulating PRP applications.

To secure effective operation of PRP it was essential that there be a single point within WPB at which responsibility for each plant could be centered. One of the key points of the plan's operation, effective control of individual plant inventories, would be impossible of achievement unless there was at some point in WPB full knowledge of the input of materials and the output of finished products for each plant.

The conclusion was inescapable. If the existing system of branch assignments was continued, it would be difficult in many areas and for many companies to utilize PD-25A as an instrument for allotting scarce

materials. What was required was a reorganization of branch assignments to bring them into line with the actual structure of industry. Only in this way would it be possible to effect a total reconciliation of the industry product codes used in tabulating requirements and the branch product assignments used in processing applications.

Repeated but generally unsuccessful efforts were made to secure the reorganization which this problem demanded. There were deeply entrenched interests which tied individual companies to certain branches. There were personnel assignments which over many months had resulted in the accumulation of significant administrative experience in the handling of individual products. And there were the usual power jealousies which rapidly organized to maintain the status quo. The problem might have been resolved if PRP had been effective in the third quarter and its continuance assured by top policy decision. But with the *shift of interest to devising a replacement for PRP*, the possibility disappeared of forcing the extensive readjustment of product assignments.

It is fair to raise the retrospective question: why was the administrative job scanted? One factor certainly of significant influence was the failure of many of the WPB staff fully to understand the implications, procedures, and techniques of the Production Requirements Plan. In part, at least, this was the result of the prolonged bitter struggle between the small group of proponents and the large group of more or less active opponents of an integrated material-distribution system. Those who were supporting the introduction of PRP on a mandatory basis were forced to devote most of their time and energy to the fight for the adoption of the plan. They had little time or energy left for educational and missionary work, particularly among second and third-level personnel who, in the operation of the plan, were often in key positions to shape its success or failure.

Of at least equal significance was the fact that the importance of administrative procedures in securing effective operating performance was still not fully understood by the top management of the War Production Board. This was an extension of the same unawareness of the gap between *policy and action* which had plagued the administration of the war effort since 1940. The minutes of top policy discussions on the advisability of inaugurating PRP and the memoranda which carried the daily debate on policy determination in the spring of 1942 clearly point

to the rather widespread belief that the major issue was that of deciding whether or not to issue Priorities Regulation No. 11. Only occasionally was attention directed to the fact that the issuance of the regulation would not in itself establish the Production Requirements Plan as an effective materials-distribution control mechanism. Only occasionally was official attention directed to the necessity for hiring a large staff of clerical and professional personnel; preparing detailed instructions and procedures for receiving, editing, coding, and tabulating incoming applications; planning the distribution of PD-25A forms to the appropriate industry divisions; training the professional staff to process the applications; organizing the machinery for reviewing processed forms prior to issuance; and creating and installing the accounting control system required to tailor the execution of policy within predetermined lines and provide administrative statistics to check implementation and appraise the relative effectiveness of the control machinery. This was a massive undertaking. When the successor to PRP was first projected, the size of the administrative task was understood much more clearly, and a period of five months was allowed for creating and installing the administrative procedures within the War Production Board, and training government and industry in the techniques of operating under the plan.

The true magnitude of the failure of the administration is apparent from the record of its history. Although the debate over Priorities Regulation No. 11 or its equivalent was carried on without interruption from November, 1941, until June, 1942, it was not until two weeks before its issuance that an administrator was appointed and an administrative staff assigned. Up to that date, only rudimentary efforts had been made to recruit clerical and professional staffs. Up to that date, no education and training program had even reached the planning stage. Up to that date, no procedures for paper handling had been prepared.

Although substantial progress was made in the next three months, the performance was at all times below requirements for fully effective operation. A share of the blame for this condition can be traced to the turnover of PRP administrators. Within the short space of two months, the management functions were performed by five administrators, one of whom served for less than three days, another as the chairman of a 12-member administrative committee, and two more as joint and simultaneous general managers! The working staffs immediately under the ad-

ministrators—responsible for preparing, installing, and checking every detail of operating procedure—consisted of loaned personnel, many of whom had other assignments.

Finally, the influence and prestige of PRP as a technique of administrative control were continually weakened by the failure to force the abandonment of the individual material-allocation systems managed by the material branches. Manufacturers operating under PRP found that their PD-25A allocations were not guaranteed procurement tickets, but were still subject to review and cancellation on the mill order boards.

Objection to PRP, on grounds related to the philosophy of control technique, came from three principal sources: the military services, the WPB materials branches, and a section of the WPB policy and planning staffs. The unremitting opposition of the military was rooted in two considerations. The first was a belief that the control of war production was a military and not a civilian function, one to be exercised by the Army and Navy and not by the War Production Board. For at least some of the military personnel, this consideration was strong enough to support a total opposition to the initiation of any control plan which had for its technical rationale the balancing of total supply and demand for each critical material under the administration of a civilian agency, and the distribution of materials to manufacturers principally by the civilian agency's staff. A second consideration, perhaps of even greater influence, was the belief, held by many Army and Navy officers in the procuring arms and bureaus, that a horizontal system of material allocation, such as PRP, could not effectively tie the input of materials to established schedules of end-product output destined for military use. Under PRP, allocations of critical materials to industry were made plant by plant without knowledge of the direct relation of specific quantities of materials to specific military end product programs. These officers feared that critical materials would be diverted to non-military production and that their most important end-product programs would not be carried through on schedule.

Typically, these officers supported a vertical system of allocation as against the PRP horizontal system. They favored some form of warrant or coupon plan of material allocation (described in the next chapter). Such a system would operate through allocations of materials to prime

contractors who would in turn make the necessary quantities of materials available down their suppliers' chain.

The material branches of WPB had built up detailed allocation systems under the authority and with the procedures provided by various M orders. For most of the critical materials, there had been set up mill order board reviews the effect of which was to center responsibility and authority in the hands of the personnel of the material branches, who reached decisions after consultation with representatives of the services. This in effect resulted in the operation of a series of "Requirements Committees" composed of the staff of the materials branches and officers of the services with full power to overrule decisions of their own superiors at the top WPB Requirements Committee level. Many of these individuals viewed the introduction of PRP simply as a threat to remove their control over material allocations and relegate them to the relatively subordinate function of responsibility for material production.

The objections of this group were expressed on some occasions in the form of attacks on the theory and philosophy of control represented by PRP; at other times, as detailed and critical analyses of the administrative difficulties which would hamstring the plan in operation; and on still other occasions as doubt with respect to the ability of the end-product branch staffs to make as wise a distribution of critical materials for war purposes as could be done by the experienced personnel of the materials branches.

The critical position maintained by many of the individuals assigned to the top policy and planning staffs rested on certain determined criteria or standards which defined an effective, integrated material-distribution control system. The more important standards set up by this group included: (1) integration of responsibility for coordinating strategic decisions, production programs, material distribution among major claimants and groups of industries, allotments to each individual industry, and allocation to individual companies; (2) integration of long and short-range decisions to reduce to the minimum the number of decisions made each calendar quarter; (3) shaping of policy in terms of a significant schedule of end uses; (4) coordination of allocation decisions for the several scarce materials; (5) coordination of allocation decisions for each applicant; and (6) limitation of policy decisions to a relatively small number of critical materials and components. Additional criteria

called for adequate provision for the material requirements of small firms (given special treatment under PRP) and maintenance, repair, and operating supply requirements for all firms.

Measured against these standards, it was noted that the Production Requirements Plan held out certain specific advantages. First, by basing its information requirements on existing business records it minimized the burden of paper work for industry. The effect was to bring in through PRP the same type of information that would be required for control purposes under any other control plan. Second, inventory control in each existing inventory unit was an essential feature of the plan. Third, the Production Requirements Plan was sufficiently closely related in procedures and techniques to earlier types of assistance and control mechanisms to minimize the shock of transition.

Measured against the same standards, the principal weakness of PRP as determined by this group was the failure to establish a close relation between the allocation of materials to individual applicants and the end-product goals established by the military agencies, the export agencies, and those agencies concerned with the maintenance of the essential domestic civilian economy. The result of this failure to link individual applications to end-product programs was that part of the allocated materials might be diverted from more to less essential production; that it might be difficult to balance actual production against end-product requirements through the intermediate levels of manufacture; and finally that it was difficult to secure a rapid adjustment of material allocations to changes in end-product programs.

Since the Production Requirements Plan was abandoned before it had a chance to build an operating record, it is difficult to evaluate the relative effectiveness of horizontal and vertical material-distribution control systems. Whatever judgment might be reached, it is clear beyond all doubt that the struggle between conflicting views which preceded the installation of PRP and the tragic administrative history of the plan made two contributions of outstanding significance. First, they won the battle for integration of controls. And second, they made it possible for PRP's successor, the Controlled Materials Plan, to be organized and put into operation with careful preparation and under experienced management. At least a part of CMP's success can be traced to what was learned from PRP's failure.

But there was a deficiency in PRP even deeper-rooted than any of the considerations described in the foregoing pages, a problem which would have caused the most serious operating difficulties even if all other problems had been resolved. This was the failure to bind the material-distribution control system to the contracting authority of the military services. Throughout the period in which PRP was being planned, and during its three quarters of operation as well, the Army and Navy continued to place contracts for the delivery of all types of war materiel *totally without regard to the level of deliveries which could be supported by the quantities of scarce materials allocated for these purposes to military prime and subcontractors*. Producers' books were overloaded with military orders bearing the highest ratings. But in the face of material allocations inadequate to support a military program of such magnitude, the effect of this overcontracting could only be to transfer the critical decisions on the size of the military program—in total and detail—from the placing of prime contracts down to the level at which key subcontractors placed orders for materials in short supply. The questions of paramount importance which should have been answered at the highest echelon in the Pentagon Building were being answered every day, through accident or ignorance, by the managers or even by the stock-room clerks in thousands of industrial plants all over the United States. And at the same time, the appearance of that overload of contracts in the shape of rated orders scheduled for delivery by American manufacturers was clouding the decisions of the Requirements Committee, putting a premium on the competitive skills of Army and Navy expeditors, and creating completely unnecessary choke points in the supply of materials and components which should have been adequate for a balanced over-all program defined in terms of the limits of the national resources.

The forces which impelled the services to "reach for the sky" were, of course, completely understandable. They were inherent in the world crisis into which we had been catapulted unprepared and almost defenseless. Our military needs, and those of our allies, were universal and without limit. But yielding to these considerations inevitably meant that no rational decisions could be made and executed. The size of the gap between desire and ability is suggested by the shifting military program figures of those years. In November, 1941, munitions production and war construction scheduled for 1942 was valued at some 28 billion

dollars. Pearl Harbor shattered these figures, which had been estimated by Donald Nelson to be well below our 1942 industrial potential which he placed at approximately 40 billion dollars. (At that time he looked to a 1943 potential of almost 60 billion dollars.) Post-Pearl Harbor military requirements for 1942 called for total munitions production and war construction valued at 60 billion dollars, rising to 101 billion dollars in 1943. By April, feasibility considerations had driven the 1942 program from 60 billion dollars down to 50 billion dollars. The year's actual performance record was 44 billion dollars. Concurrently, the 1943 program was scaled down from 101 billion dollars to 75 billion dollars. The actual performance for 1942 was 63 billion dollars.

This overplaying of the military hand loosed dangerous influences in the industrial structure. The establishment of schedules and the letting of contracts are the basic forces which set demand in motion. Once the contracts have been let—or even, under wartime pressures, once the intention to let the contract is made clear and the prime contractor is urged to go ahead and get started—program review can do no more than give priority to the more important segments of a total demand which is acknowledged to be in excess of supply. But even when the allocation machinery brings one or several key materials into balance, many other demands which can be satisfied with low or no priority continue to disturb the markets, dissipate resources, and feed the future growth of other cancerous spots.

Of all the handicaps which plagued PRP, this was the most serious: the War Production Board did not compel the military to curtail their procurement within the limits of available supplies of critical materials. The issue was debated repeatedly; but it was not forced. And perhaps the most serious indictment of the Production Requirements Plan is that there was no mechanism in the control which directly illuminated this problem. The plan required a statistical appraisal of military programs and a statistical balancing of demand and supply. But in operation it looked to the direct users of materials, not the ultimate purchasers of the end products. The result was that, although the proponents of the plan were aware of the overwhelming importance of cutting back the services' programs, they were unable to make an effective presentation of the issue, and they could not draw from PRP operations the dynamics of administrative statistics to prove the point beyond all argument.

CHAPTER VII

ALTERNATIVES TO THE PRODUCTION REQUIREMENTS PLAN

FROM THE BEGINNING of the government's effort to mobilize industry for prosecution of the war there were rooted differences of opinion about the selection of methods for doing the job most effectively. While the effects of many government activities, such as the limitation or suspension of production of certain products, the placement of prime contracts, the construction of new facilities, or the conversion of existing plants to military production were of basic importance in mobilizing industry, none was of greater consequence than the direction of available supplies of raw materials. Although varying judgments were reached on each aspect of the industrial mobilization problem, the overwhelming majority of debates and discussions inevitably concentrated on the question of the kind of material control system to be adopted.

A material control "system," or "plan," as used in this context, is distinguished from a special allocation procedure in that it represented an effort to go beyond the solution of a single material problem toward the integration of the functioning of the industrial system under a coherent and general control mechanism. This implied, as a general rule, the quantitative allocation of more than one material, the authorization of production schedules, and a conscious effort to affect the distribution of corollary scarce materials by controlling the most critical and widely used materials.

The first and most important point of difference developed in the formulation of an over-all material control system centered in the choice between vertical and horizontal control procedures. As has been pointed out previously, a "vertical" system was one in which the material control was established at the prime contract or end product level of manufacturing activity, and extended from purchaser to seller, with the process repeated for the satisfaction of the seller's own material needs. A "horizontal" control, on the other hand, was one in which authorization

passed from a government agency directly to each contractor or subcontractor. The Production Requirements Plan was the prime example of the latter approach, with each plant assigned directly by the War Production Board its purchase authority in terms of preference ratings and quantitative authorization for the procurement of its material supplies.

Clearly there are advantages and disadvantages in each approach. Generally, however, a single advantage or disadvantage was of overwhelming importance in its effect on a certain phase of the industrial mobilization effort. For example, the vertical approach to the problem lent itself much more than did the horizontal to the development of statistical information regarding military programs as a by-product of operation. Consequently, individuals with primary responsibility for programing strongly favored the vertical system. Similarly, persons involved in the central administrative phase of material control problems tended to favor the simpler and more direct relationships established by horizontal control. Since most responsible government officials were concerned only with a limited sphere of activity, the groundwork was laid for widely divergent views as to the most desirable approach.

Discussion about the over-all system to be officially adopted by the War Production Board reached its most intense stage in the first eight months of 1942. During this period various plans designed to meet the government's needs were formally reviewed by a Committee on Control of the Flow of Materials, established by the WPB Chairman for the express purpose of selecting the most effective plan and terminating the seemingly endless debate. Despite the adoption of the Production Requirements Plan in June as the official material-control mechanism of the War Production Board, there was little slackening in the efforts of the advocates of a vertical technique. It was generally felt that the adoption of the Production Requirements Plan was not a conscious selection of the most desirable control mechanism, but an action dictated by the necessity for improving the sorry state into which the material-control mechanism had fallen. It was little more than a decision to utilize the only administrative machinery at hand for dealing with problems that pressed for solution.

Although the subjects debated by various officials of the War Production Board and other government agencies varied during the period in which the basic outlines of the ultimate control systems were formulated,

a review of the documentary evidence indicates that certain fundamental considerations arose so often that special importance should be attached to them. An attempt is made in the following pages to evaluate the horizontal and vertical approaches to material control in terms of these criteria. For convenience, the criteria are divided into two groups. The first group consists of those which were of crucial importance; the second includes several considerations of less significance.

Six points were accepted as fundamental in appraising a control mechanism:

- 1) the rapidity with which it could be put into operation;
- 2) its usefulness as a device for accumulating essential statistical data;
- 3) its administrative feasibility;
- 4) its effectiveness as a device for carrying out broad policy decisions;
- 5) its flexibility in meeting the demands of dynamic military requirements;
- 6) the paper work involved in making it operate.

Of the many additional considerations which gained prominence from time to time, the following justify special mention in considering the merits of a material control mechanism:

- 1) its *conformance* with established records and procedures of private industry;
- 2) its adaptability as an inventory control device;
- 3) its contribution toward effecting desirable changes in the managerial operations of business from the point of view of national objectives;
- 4) the degree of practicable participation which it permitted to industrial management.

The first consideration in deciding upon a control mechanism in any emergency must be the speed with which it can be put into operation. Wartime controls were always established to meet specific emergencies, for reasons outlined in earlier chapters. As a result, a system of control had little chance for adoption if it required a prolonged period of education and training, even though it might be well designed to accomplish its objective. Material controls during the war represented an uncoordinated and non-integrated series of emergency measures, largely because emergencies had to be met and solutions produced without delay. In the absence of information permitting the anticipation of crises before their

development, and with the traditional hostility of industry to the imposition of controls before their need was beyond dispute, the managers of the war production effort were left little choice.

From the beginning of military production a vertical system of authorization had been employed. PD-3A applications had been filed in connection with military contracts, and the preference ratings received, together with purchase orders for materials and components, were promptly passed through the chain of subcontractors. This was an extremely rapid method of providing to plants the authority to obtain necessary supplies for the fulfillment of delivery schedules against such contracts. As a device for achieving this purpose, the PD-3A instrument was effective and efficient in the early months of the defense effort. On the other hand, it lost much of its value as soon as production reached the level at which competition for available materials took place among various military and essential civilian demands all identified by top preference ratings. At this point the necessity for a control as well as an authorization device became evident.

Because authorizations for procurement through the use of preference ratings lacked quantitative control, they had little effect on industrial record-keeping. The translation of the vertical system of priority authorization to a vertical system of material control, therefore, required a long preparatory period, which was equivalent to a fresh start. As the need for control of individual materials became apparent, the individual allocation orders described in Chapter IV were issued to deal with the situation. On the other hand, the Defense Supplies Rating Plan, combining quantitative control and preference rating authorization, was extending over a wider area. The ready adaptability of the Defense Supplies Rating Plan—or a voluntary Production Requirements Plan, as it was later known—to an over-all scheme for the quantitative control of materials provided the machinery for much quicker establishment of an integrated control. It was this factor which weighed so heavily in the issuance of Priorities Regulation No. 11 in June of 1942. The desperate material situation demanded a decision which could be executed rapidly only by the utilization of existing administrative machinery. The necessity for action in the middle of 1942 therefore dictated the choice of an over-all horizontal control, with the merits of the administrative mechanism relegated to a position of secondary importance.

A second consideration of great importance in selecting the over-all control was the facility with which a management agency, such as the War Production Board, could derive meaningful and useful information from the operations of the control system. All during the war it was repeatedly demonstrated that meaningful information had to be derived as a by-product of administrative control. Divorced from the day-to-day actions governed by the control technique, statistical data were difficult to obtain and, in addition, were rarely tailored to provide the information required for the solution of administrative problems or the framing of policy decisions.

In theory, the vertical approach was admirably suited to meet this requirement. Since material authorizations moved from end product down to raw material supplier, it was possible to use the passage of the authorization itself to associate material requirements at various levels of manufacturing activity with the end products into which they were destined to be incorporated. Unfortunately, the complexity of the American industrial system was not fully comprehended by the majority of the proponents of vertical control. Consequently, the information which presumably was to be obtained through the operation of a vertical system ordinarily fell into the class of a desirable rather than a practical objective. At those stages of production which were characterized by a wide dispersion of purchasers of a standard item (as in the case of bolts and nuts, or bearings, for example), the passage of information in terms of end products down to lower levels of manufacturing and raw material supply was blocked. On the other hand, the strong demand for information about end-product programs in terms of their raw material equivalent made it essential that a device be established for the development of such information in so far as it was practicable—regardless of the control mechanism.

One of the less widely known characteristics of the vertical approach was the mechanism it provided for the development of more and better information about the demand for critical components and materials. Statistical studies designed to measure these demands tended to reflect the reporting firms' overstatement of their individual requirements far beyond genuine needs. This inflation in aggregate demand resulted from divorcing the compilation of requirements data from the act of incurring financial responsibility, which was associated with the placement of

orders with suppliers. The procedural association of authorization authority with the placement of purchase orders, therefore, had, as a by-product, the development of more meaningful order load, and consequently demand figures. As a result, the vertical system had a distinct informational advantage over the horizontal approach. In addition the vertical approach provided a mechanism for portraying future demand for an extended period. Since orders for future delivery could be placed as far out in the future as was permitted by authorized production schedules, reports submitted by suppliers of both components and raw materials reflected the full impact of the authorized production program. Thus, the tool for measuring meaningful demand against raw material supplies was ultimately placed in the hands of the War Production Board through the vertical approach embodied in the Controlled Materials Plan.

A third characteristic of the two competing control systems, which served as the basis for widespread discussion, debate, and recrimination, was the series of problems derived from differences in administration. Persons with responsibility for central control and management generally resisted any attempt to wrest authority from their hands, but such a change was inherent in a vertical control system. Authority had to be passed from the central civilian agency to the military service interested in a given program, then to the prime contractors engaged in the production of the end item, and finally down through the chain of subcontractors to the raw material level. Experience with the PD-3A vertical authorization technique had amply demonstrated the dangers in delegating authority over so wide a range.

The question of the degree of control which had to be retained during the operation of a vertical control system was one which had not yet been settled at the time the first vertical control system, the Controlled Materials Plan, was officially announced. The first pamphlet released to the public at the initiation of the Controlled Materials Plan contained a control document, later known as CMP-5, which permitted the War Production Board to trace back authority for any raw material order to the prime contractor and claimant agency responsible for the end product in which the material ultimately was to be incorporated. The fact that this control was never employed in the operation of CMP bears witness to the fact that this decision was actually reversed after the official

release of the statement explaining the structure and working of the control mechanism.

In contrast, in the operation of the Production Requirements Plan control was simple and direct in so far as it related to the administrative relationship between the War Production Board and individual manufacturers. All authorization paper moved directly from WPB to the manufacturer. This completely dissociated such actions as the placement of contracts and establishment of production schedules which took place between buyers and sellers (for example—a military agency and a prime contractor) from the authorization to procure the material necessary to manufacture the products in accordance with the agreed delivery schedule. This was a serious handicap to the efficient operation of the procurement services as well as of purchasers and sellers at various stages of manufacturing activity. The directness of administrative control under a horizontal system resulted in widespread adverse criticism from the services and military production plants that wished to see the authorization aspect of the control system meshed into the contract and purchase order placement phase of industrial operation.

Out of this same situation there developed in the horizontal approach a serious disadvantage to the central management agency as well as to the military services and industrial procurement personnel. If it was true that contracts were let and production schedules agreed upon without the accompanying material authorization, it was equally true that the size of the total projected production effort, as reflected by aggregate contracts and production schedules, found no limitation in the total supply of available materials. In short, whereas the people with responsibility for achieving program production objectives complained about the failure of the horizontal control to integrate authorization with the placement of orders, the central management group objected to the absence of the related control or quantitative limitation element. The control technique therefore inevitably forced the central authorizing agency into a position in which it was virtually impossible to distinguish among the competing demands for material when these were far in excess of the raw material supply.

Of overriding importance in the minds of the top managers of the war production effort was the need for a material control system designed to implement their decisions. While it was true that a soundly devised

horizontal control system, such as the Production Requirements Plan, could achieve this objective, the basic policy decisions were not made in the terms permitted by horizontal control. The Requirements Committee of the War Production Board, staffed by representatives of the military agencies as well as civilians, thought in terms of tank programs, plane programs, ship programs, and farm machinery programs. To carry out a decision regarding the division of available supplies among such competing programs required a control mechanism which cut vertically through the industrial system. That is, it was necessary that the authorization to procure materials pass from buyer to seller in terms of the program for which the decision was made. Even in the early stages of the war effort decisions of this character were made by the Requirements Committee, although materials were distributed on the basis of individual allocation mechanisms in the absence of any general material-control system. The authorization for shipment of a material for fabricating any given component frequently had to be made in the complete absence of any information respecting the ultimate destination of the component itself.

Similarly, authorization to receive materials, issued by the War Production Board under the Production Requirements Plan, was made in terms of the products manufactured in the particular plant filing the application. The judgment as to the importance of the products was made on the basis of the preference-rating patterns of past shipments, unfilled orders, and estimated future shipments. After Priorities Regulation No. 10 was issued, shipments were submitted in terms of ultimate destination classified by end-use symbols, but, as has been explained earlier, these were statistics rather than operating information.

After the official adoption of the Production Requirements Plan, the Requirements Committee actually issued policy determinations dividing up the available supplies of material among competing demands for the manufacture of stated *classes of products*. Since many products were not identifiable in terms of their ultimate use, the Requirements Committee constantly found itself in the position of superimposing additional program decisions on top of the product determinations. As might be expected, this led to a chaotic situation since there was no reason why the effects of the determinations made on two different bases should coincide, either in total or in the operation of given plants. When the lack

of adequate administrative machinery for implementing the program determinations through individual raw material allocation techniques is taken into account, it is clear that the material-control problem during 1942 was rapidly assuming top importance as a factor in the successful prosecution of the war.

A fifth problem which had to be solved in terms of material-control techniques was presented by the constantly changing production schedules and production specifications inherent in the manufacture of war equipment. The overwhelming bulk of equipment used for the prosecution of the war was newly planned, designed, and produced. While extensive tests were undertaken before mass production commenced, battlefield experience resulted in a practical demonstration of the deficiencies of much equipment and weapons, as well as suggesting possible improvements. Superimposed on this situation were the constantly changing military requirements for materiel, which reflected either changes in military strategy or shifting battle grounds.

These changes were almost inevitably reflected in revised material requirements of the individual plants participating in the manufacture of components of end products within a given program. Since the horizontal approach operated on the basis of a manufacturing plant as an entity, and since authorization to procure was divorced from the placement of purchase orders, changes in material requirements could not easily be reflected in the authorizations granted to plants. While supplementary interim plant applications could be filed to reflect any additional material requirements under the horizontal plan, inability to demonstrate essentiality of components by relating them to the importance of the end-product program made this a relatively ineffective device. Also, it might be observed that the contraction in orders which resulted from down-scaling production programs could hardly be expected to be reflected in requests for corresponding deflation of purchase authorizations. In short, the horizontal approach lacked the program flexibility inherent in the vertical approach.

In considering the factors of major importance in comparing the two systems, any discussion would be incomplete if it did not include that strange phenomenon best known as "paper work." Omitting all reference to the practicability, efficiency, and effectiveness of any given control, the mere volume of paper work involved frequently assumed an

importance second to none in influencing basic decisions involving the welfare of the country. While such a situation may seem incredible at a time of national emergency, it was brought about by the fact that the volume of reports, applications, and other documents was one of the few tangible, measurable things which emerged from a welter of theoretical concepts and ideas. As such, it lent itself to effective presentation in debate. To this may be added the inherent distaste with which American businessmen, both in and out of the government, regard the government's physical instruments of control, and the setting is laid for the emotional level at which discussions of paper work were conducted.

War brings about manpower, as well as material, shortages. The available supply of personnel skilled in the efficient preparation of reports as well as the routing and handling of documents is limited. This is true for both private industry and the federal government. In dealing with an operation as complex and large as the American industrial system, therefore, it is not difficult to develop a control system which will break down of its own weight. As an example, one need only recall the early days of the priorities system described in Chapter III. The volume of individual applications for preference ratings far exceeded the ability of any central authority to review them intelligently for expeditious action.

It was this situation which was primarily responsible for the initiation of the Defense Supplies Rating Plan. When this procedure later developed into the Production Requirements Plan, this fundamental paper-saving characteristic was never lost. Despite misunderstandings which later developed, the primary horizontal control system of the War Production Board was without any question a most ingenious device for minimizing the flow of paper and reports and simultaneously providing the War Production Board with the essential tools needed to carry on the war production effort.

On the other hand, any vertical system of control had within itself the seeds of industrial revolt against government paper work. By its very nature it reached into the multitude of industrial transactions and automatically provided a possible factor inducing its own collapse. Failure to appraise the complexity of the American industrial machine in these terms, for example, accounted for the constant efforts of one group of vertical proponents to insist on adopting the British steel control in this country. While the relative simplicity of the British steel distribution

system permitted the use of a strict vertical control of this material, its adoption in this country would have been a disaster of the first magnitude.

In retrospect, it is difficult to name a factor more important than paper work in delaying the appearance of a real vertical system of control until 1943. The case for the horizontal approach in this realm of reality and tangibility was so clear and decisive that all positive arguments for vertical control on almost all other important fronts were insufficient to bring about the objective earnestly desired by many persons in positions of power and influence. Indeed, it can be said that until the paper work argument against vertical control was answered by the introduction of special horizontal procedures to handle the most difficult spots, no vertical control was adopted.

In addition to the foregoing considerations of primary importance, there were several secondary characteristics which achieved considerable importance. While none of them can be said to be of vital consequence, from time to time discussion centered about each of them to the exclusion of any or all of the foregoing major considerations.

The first of these was the degree of conformance of government applications, reports, and procedures to the industrial records which had been developed over the course of decades. While the growth in both the size and complexity of the American production and distribution system had in itself hastened the establishment of internal record-keeping, the needs of a central management agency were not satisfied by the statistics made available. Furthermore, while individual company records were obviously limited to a reflection of the company's own operating experience, in time of war the government required information which could be developed only by the transmission of information from one company to another—a procedure which obviously is not feasible or possibly desirable in time of peace. Moreover, the critical consequences attendant upon the consumption of certain components and materials for any use but the most desirable in terms of the country's military needs required a degree of informational detail quite foreign to the profligate practice of a country accustomed to an apparently inexhaustible supply of materials and products.

The horizontal approach to material authorization, with its single line of relationship between individual plants and the War Production Board,

was designed to utilize such industrial records as were already in existence. The treatment of the individual plant as an entity conformed to a large degree to the managerial approach to which American industrialists were accustomed. In a sense, it substituted one manager for another.

The vertical approach, on the other hand, with its insistence upon relating and even meshing the operations of plants, introduced a concept generally foreign to industrial management. There were certain groups, such as the automotive industry, which had established a series of inter-plant relationships for the purpose of scheduling the flow of components and materials, not unlike the operations of the vertical system. Such industrial procedures were limited in scope, however, and did not reflect the characteristic operations of other industries. In one sense, therefore, the establishment of a vertical system could be regarded as a device for introducing to other industrial groups the scheduling "know how" of the automotive industry.

The second minor consideration, which frequently assumed major consequence in discussions on material control procedures, was the degree to which the level of inventories could be minimized through material-control techniques. If this objective was to be achieved by means of the control mechanism, it was clearly necessary to operate through the horizontal approach. Inventory control records were hardly likely to be set up so as to control separately the level of inventories for individual programs—particularly when the number and variety of programs in which any given plant was likely to participate in the future was not known. Treating the plant as a entity through a horizontal control at least theoretically permitted the determination of quantity authorizations after a review of its inventory position.

Unfortunately, efforts to introduce inventory considerations into the quantity of scarce materials authorized for a plant gave rise to other procedural problems. The time required for inventory analysis interfered with the expeditious handling and processing of plant applications. The inventory data available at the time of processing frequently were so out-of-date as to prove misleading. Finally, the material classifications for which inventory information could feasibly be handled on reports were so broad that they often failed to reflect the causes of the inventory position of the plant filing the application. For example, an excess inventory position reported in terms of a broad class of material could easily

be due to an overstock of some particular shape or size not reflected in the aggregate figures reported.

To summarize, then, the apparent feasibility with which the horizontal mechanism could be utilized for control of inventories was frequently advanced as an argument in its favor. Experience indicated, however, that practical difficulties of timing and detailed operational problems made this approach less effective than appeared on the surface. The control of inventories through allocation or authorization procedures was at best a minor consideration in the selection of an effective material-control system. In any event such effectiveness as was attained probably could be achieved through separate controls.

The degree to which government controls should be adapted to industrial records and procedures, as opposed to the degree to which industrial records and procedures should be changed to meet the government's objectives in wartime, is a subject in which judgment and point of view play such a large part that it warrants little more than mention in this discussion. As a rule, participants in this dispute take the position that regulations which are most strictly adapted to industrial records and procedures are for that reason unworkable; or conversely, that government regulations establish the only acceptable records and procedures during the emergency. In so far as the selection of the most effective material control mechanism is concerned, it is essential that each case be judged on its own merits. Industrial records frequently merely reflect the basic characteristics of the industry for which they are used. Any control which requires a change in those records might for that reason conflict sharply with the material or commodity flow to be controlled. One example of this lay in the efforts to establish a complete vertical control in those industries producing standard items sold to numerous customers. Such efforts were condemned to failure; probably the first warning was provided by the serious difficulties met in attempting to adapt the industry's records to the control procedure.

On the other hand, some change in industrial record-keeping is inevitable if wartime controls are to be effective. For example, it was essential for the government to obtain information about future demand for materials on the basis of purchase orders placed on the books of suppliers. It was not the practice of a substantial segment of industry to place orders for delivery sufficiently far ahead to serve the govern-

ment's interests. In this connection, it was found necessary in the operation of the Controlled Materials Plan to provide in the regulations that orders be placed a specified period of time before delivery was requested. It might be observed that the government's insistence that industrial habits be changed in the timing of the placement of purchase orders resulted in providing suppliers with the information necessary for scheduling their own operations with maximum efficiency.

The intangible effect of the working relationships established by any material-control mechanism appropriately rounds out the list of relatively less important considerations which should enter into its appraisal. Examples of such relationships are provided by the division of authority and responsibility between the central civilian control agency and the military and other procurement services; or the relation of the procedural machinery established between the procurement arms of the government and prime contractors and that established between prime contractors and subcontractors. Probably of first importance was that intangible and psychological atmosphere frequently described as "government-industry relations." While much importance can be attributed to the place that a cooperative attitude on the part of industry has in the successful operation of a plan, experience indicated that with only a few exceptions this attitude was determined largely by the practicability of the plan and industry's understanding of it. If a plan was flexible enough to deal with the difficulties of individual operation, basically simple in its elements, and explained thoroughly enough so that industry grasped its principles, cooperation was forthcoming.

The preceding pages summarize the major issues which were under discussion during the summer of 1942. Numerous "plans" were proposed. Outstanding among them were the following:

- 1) Coupon Plan;
- 2) Federal Reserve Plan;
- 3) "Automobile Industry" Plan;
- 4) Contract Production Plan;
- 5) Steel Budget Plan;
- 6) Materials Scheduling Plan.

The last three were carried forward into efforts to solve administrative and operational problems to a much greater degree than the first three,

and incorporated most of the important features of the first three. The following discussion is, therefore, limited to the fourth, fifth, and sixth plans listed above.

The first major effort to supplant the Production Requirements Plan with a vertical system was the so-called Contract Production Control. After several months of debate, an experiment designed to test the practicability of the Contract Production Control was authorized in August, 1942. A clear description of the procedure to be followed under this plan is provided by the August 15 letter of the Director General for Operations addressed to companies affected by the test.

To Prime Contractors, Part Suppliers, and Sub-Suppliers:

The Contract Production Control program is an experiment being conducted by the War Production Board in cooperation with the United States Navy in an attempt to obtain more complete control over production. The present experiment is being conducted with three Navy Contracts for radios.

Under the Program each Prime Contractor must furnish the Contracting Agency (United States Navy) with a list of all the parts, whether fabricated by himself or by his Part Suppliers, which will be required to fill the contract. (See CPC-1 form General Instructions.) There will thereupon be furnished to each Prime Contractor a set of CPC-1 forms and as many sets of CPC-2 forms as there are different parts going into the completed Unit.

A CPC-1 form to be filled out by the Prime Contractor will contain the dates by which the Prime Contractor agrees to make deliveries of the completed Unit under the terms of the contract, and a list of all the materials going into the completed Unit (including Spare Parts and Overages) with the dates by which it is necessary that the first processor of the material in the form listed must receive such materials.

The CPC-2 form to be filled in jointly by the Prime Contractor and each Part Supplier will specify the dates by which the Part Supplier agrees to make deliveries of Parts to the Prime Contractor and list the materials going into the Parts to be delivered by the Part Supplier, with the dates by which it is necessary that the first processor of the material in the form listed must receive such materials.

Upon the original receipt of these forms from the Contracting Agency, the Prime Contractor shall fill in certain sections in the CPC-2 forms (as required by the instructions) before forwarding them to his Part Suppliers. Each Part Supplier in turn shall obtain from his suppliers the information necessary to enable him to fill in his CPC-2 forms. Where the Prime Contractor plans to fabricate any of the Parts himself, he shall fill in CPC-2 forms for each such Part, as if he were a Part Supplier.

Part Suppliers shall, on or before the date specified, forward three copies of

each CPC-2 form to the Prime Contractor and the Prime Contractor with the aid of this information should complete his CPC-1 form and return three copies together with one copy of each CPC-2 form to the Contracting Agency.

The CPC-1 forms will be returned to the Prime Contractors showing the monthly percentage of the required material which the Prime Contractor and his Part Suppliers are authorized to purchase under the program.

Upon receipt of his processed CPC-1 form, the Prime Contractor shall process all CPC-2 forms in accordance with the instructions attached to said forms, countersign one copy of each form, and return to the appropriate Part Supplier.

Such Processed CPC-2 forms shall constitute the authorization to each Part Supplier to apply a specified preference rating to the delivery to him monthly of the quantity of material set forth on the form and in accordance with the schedule therein approved, and authorization for the Part Supplier to make deliveries to the Prime Contractor in accordance with the same rating. The Part Supplier shall apply such ratings to his Sub-Suppliers by endorsement on the purchase orders in the manner set forth in Priorities Regulation No. 3, including the Production Code Symbols required by Priorities Regulation No. 10, and including the Certificate Number specified in Section F of his CPC-2 form, and shall also attach a copy of this letter to each purchase order as authority for the extension by his suppliers of higher ratings, as provided in the following paragraph. Sub-Suppliers shall, in the same manner, extend the rating to their Suppliers by similar endorsement on their purchase orders, and attach a copy of this letter to their purchase orders to which they extend such ratings as the authority for re-extension. (Additional copies of this letter may be obtained from Prime Contractors or Part Suppliers to whom the material is going.)

While the Program does not constitute a guarantee of delivery, a high rating will be authorized. Companies which are operating under the Production Requirements Plan (whether Prime Contractors, Part Suppliers, or Sub-Suppliers) may not during the period to the end of 1942 apply the rating authorized under the CPC-1 or CPC-2 forms to more material and may not receive more material than they are authorized to receive under their PRP Certificates. However, in spite of the prohibition in paragraph (d) (1) (i) of Priorities Regulation 11, such companies may apply the rating authorized on the CPC-1 or CPC-2 forms, if it is higher than the rating authorized on their PRP Certificates, in order to enable them to receive the required material on time. Starting with the first quarter of 1943, companies operating under the Production Requirements Plan shall eliminate any requests for materials required under the Contract Production Control program from their PRP applications and shall indicate, in a letter accompanying their PRP applications, the amounts of materials to which they have been authorized to apply ratings under the CPC-1 or CPC-2 forms.

The cooperation of all Part Suppliers and Sub-Suppliers of any contract under this program in speedily and accurately compiling the information called for under the forms is urged. Address communications to the Contracting Agency, or to Contract Production Control Section, War Production Board, Room 3025, Social Security Building, Washington, D.C.

August 15, 1942

/s/ AMORY HOUGHTON
Director General for Operations

This represented complete vertical control. No exceptions to the procedure were made to deal with the problems faced by manufacturers unable to identify their material requirements in terms of specific end products and customers. All parts incorporated in the end product and all materials needed for the manufacture of the parts were included in the scope of the plan. It was fortunate that the experiment was limited to three Navy prime contracts. The volume of reports, calculations, requests, letters, and general paper work surpassed even the most pessimistic predictions of the plan's opponents. Before the paper that was generated by even this circumscribed experiment could be gathered, edited, coded, tabulated, and put in shape to use, the Controlled Materials Plan had been selected as the official material control by the War Production Board. This rather naive experiment rendered a valuable service, however. It demonstrated conclusively that a successful plan must be flexible enough to meet special problems in different industries, must be limited so that the reports it generates can be handled by both industry and the government, and finally must provide statistical information for use in determining the size of the production program. CPC met none of these tests and the events leading to its sad demise taught the War Production Board management a striking lesson.

From the extensiveness of CPC the pendulum next swung in the other direction. The summer of 1942 found a rapidly growing group of adherents gathering behind a different approach to the problem which became known as the Steel Budget Plan. Where the Contract Production Control was broad, the Steel Budget Plan was narrow. Where CPC thought primarily in terms of prime contracts and secondarily in terms of the materials needed to carry them out, the Steel Budget Plan thought primarily in terms of steel and its distribution, and secondarily of the prime contracts which gave rise to steel requirements. While presumably it was to affect the whole war program to a significant degree, the control

itself was limited entirely to the distribution of steel among military and essential civilian users.

The thinking of the group was influenced by British wartime experience. The plan was modeled closely after the British steel control. It represented an effort to impose on the complex network of the giant American production machine a mechanism which had proven successful in solving the relatively simple British problem of a similar nature. The essential elements of the proposed plan are outlined below.

1. The Requirements Committee would name certain government agencies and charge each with the duty of authorizing all steel purchases for the fulfillment of its own contracts, and for the manufacture of end products and the maintenance and repair of industries which it was particularly fitted to administer.
2. The agencies would consist of the following government departments and such others as might be added by order of the Requirements Committee, and would be identified by the letter symbols shown:

Aircraft Scheduling Unit: A
War Department: W
Navy Department: N
Maritime Commission: M
Office of Lend-Lease Administration: L
Board of Economic Warfare: E
Office of Civilian Supply: C

Each agency would submit to the Requirements Committee each calendar quarter an estimate of its steel needs and the Requirements Committee would establish a quota for each agency.

3. Within the limits of its quota, each agency would issue steel certificates. Except as noted in the following paragraphs, no steel could be delivered without a certificate. Thus, the agencies would have the strongest incentive to parcel out their allotments economically. From its quota each agency must provide steel to meet its own procurement needs, and also for the manufacture of those end products and the maintenance and repair of those industries which were assigned to it by the Requirements Committee. A certificate would be issued by an agency to a prime contractor who might extend it, in whole or in part, to his subcontractors, who might make further extensions. The total tonnage of steel ordered

on a certificate and all its extensions must not exceed that authorized in the original certificate. Each certificate would indicate a particular month for delivery, and would be void at the end of that calendar quarter.

4. Steel certificates would not be used to provide steel to non-integrated steel producers or to warehouses; this would be handled by direct allocation. Warehouses would be permitted to deliver limited quantities of steel to consumers without certificates.

5. The Director for Steel Industry Operations would be responsible for the performance of the steel industry under the plan. In addition, the Director would:

a) Provide the Requirements Committee with current information on steel supply, over-all and with respect to proper balance among the various steel products.

b) Issue steel certificates in cases where no agency had been assigned responsibility. It was hoped that eventually every certificate could be issued by an agency. Where no single agency could be identified as the proper one to handle a particular application, the certificate would be issued by the Director, and the tonnage authorized would be divided and charged against the quotas of the appropriate agencies.

c) Issue production directives to the steel mills, setting forth the minimum tonnage of specific steel products to be produced for shipment each month. A mill would not be allowed to accept orders for shipment of any product in any month in excess of an amount slightly higher than its production directive. By this method an operation with a reasonable and efficient balance among products would be assured. The Director would be kept currently informed of the order load on the mills, and would be able to adjust production directives to provide the necessary tonnage of all products. If demand for a particular product at any time should exceed the reasonable capacity of the industry to produce, the Director would advise the Requirements Committee, so that the agencies' allotments could be adjusted to bring them within such capacity.

This proposal represented the views of the "material minded" officials of the War Production Board. It will be noted that decisions with respect to steel might or might not have conflicted with decisions made with respect to other materials needed to carry out production schedules. In this sense, it was an extension of the existing M-21 steel order of the War

Production Board. Emphasis was placed on the *distribution of steel*, rather than the tailoring of the war production program to the available supply of steel.

In addition, it will be noted that steel deliveries were to be made on the basis of steel certificates. These were also known as "warrants." Since the normal inclination of persons approaching material-control problems from the materials level was to insist that deliveries of material at the mill level be made to the fullest extent possible on the basis of end-product identification, the paper work involved in carrying the steel certificates through all industrial fabricating levels raised a serious question as to the feasibility of the plan. It was noted, for example, that each steel certificate provided space for a prime contract number. This meant in effect that all purchase orders placed by prime contractors and extended through subcontractors down to the mill level had to be separately identified by prime contract number. The implications of this requirement in terms of an industrial system as complex as that of the United States represents one example of what can be looked for as a result of a predilection to focus attention on materials problems at the expense of production schedules.

The Steel Budget Plan was actively considered by the War Production Board for adoption in the late summer of 1942. The imminence of official adoption brought together the disorganized groups which up to then had contented themselves with criticism of the individual allocation orders as well as of the Production Requirements Plan as an over-all control. Faced with the threat of having the steel control superimposed on an already top-heavy and unintegrated materials-control structure, most of the elements of the opposition fused and developed an over-all procedure known as the Materials Scheduling Plan.

The group which developed the Materials Scheduling Plan was composed of persons with experience gained in up to three years of struggling with material control procedures and problems. The extension of the scope to the three basic metals on which the military production effort rested, the provisions allowing flexibility to meet individual problems, and the limitation of the materials coverage to a manageable number of metals, all reflected the lessons learned in previous efforts. The prescribed procedure under the plan, with a justification for the steps recommended, follows:

While horizontal allocation under PRP remains a most effective and appropriate device for controlling the flow of materials to manufacturers of "off-the-shelf" goods and of miscellaneous items which are widely distributed throughout industry, it is a faulty mechanism for insuring a balanced flow of materials, parts and components to selected end-product programs where manufacture must be integrated vertically in conformity with approved production schedules of end items. There is no effective means under a horizontal control by which end use of materials may be so accurately identified and so carefully interlocked at each stage of manufacture that production schedules of finished items can be maintained or altered without considerable loss of time and excessive waste of materials. In this area of "line production," which includes tanks, guns, ammunition, planes, motor vehicles and other major military and civilian end products, is likely to fall the bulk of domestic consumption of scarce materials. Here, effective implementation of policy determinations demands a mechanism which will permit an integration of production schedules and requirements for materials, parts and components at various levels of manufacture with defined end product shipment schedules and which will provide a flexible *vertical control* of schedules and the correlated flow of materials in conformity with determined changes in such end product shipment schedules.

A workable plan of materials control for the effective implementation of policy determinations must comprehend basic differences in industrial relationships. It must continue to provide horizontal controls for industries the output of which cannot be geared efficiently to the production schedules of selected end product manufacturers. How many such manufacturers there are can be determined only in practice, but they are likely to include most producers of such products as gears, bearings, bolts and nuts and screw machine products. Where vertical integration of production schedules and material requirements is feasible, the "Materials Scheduling Plan" should provide a vertical control to achieve a balanced flow of materials to approved production schedules of end products by making maximum use of those practices which have been evolved by industry for the same purpose. Finally, as programs are determined and groups of manufacturers involved in the production of such end products are shifted from horizontal to vertical controls, the plan must provide for a running check on material supplies available and material authorizations issued on each basis so that the War Production Board may keep total demand within total supply without duplication of authorization.

Manufacturers who find it impractical or literally impossible to identify their material requirements with specific contracts so as to procure material under vertical control, will continue to be controlled on the basis of a modified PRP. At the outset, it is proposed to leave to the fabricator himself the decision whether to join with a prime contractor under vertical control as programs

are set up or to remain under horizontal control. Eventually, this determination should be made by the War Production Board.

A vertical group will be defined by that number of subcontractors and sub-subcontractors that agree to present their requirements through and receive their authorizations to purchase materials, parts and components from the prime contractor.

Vertical controls begin with the determination of aggregate monthly production schedules for specified end products in an approved program. These are translated into firm monthly shipments schedules for each prime contractor by the claimant agency (Army, Navy, Maritime Commission or Civilian Supply). The War Production Board will then issue to each prime contractor a program allocation number and a single preference rating which are applied on all purchase orders for materials and parts needed to complete his portion of the program.

The right to apply this program-allocation number and preference rating to purchase orders may be delegated by the prime contractor to those subs and by them to their subs who are operating under the vertical control. The right of the prime contractor and his subs to use the authorization will continue without further confirmation.

Although the program-allocation number and the preference rating will be applicable on all necessary purchase orders (as defined above), it is proposed that specific quantitative control of the most critical materials will be sufficient to keep programs in balance. Thus, contractors under vertical control will be required to report their monthly requirements for only a selected group of materials—carbon steel, alloy steel, copper, copper-base alloys, aluminum shapes and rubber—as purchased by them in any of the forms listed in Materials List #1. Neither parts and components purchased from manufacturers outside the vertical group nor the material contained in purchased parts or components will be reported; but the prime contractor will be required to indicate what proportion of the aggregate material content of his end product is represented in the total requirements reported for his group.

If authorizations made under the "Materials Scheduling Plan" are to provide assurance of delivery of materials, it is clear that the total amount of material authorized under both vertical control and horizontal control must be kept within total available supply without duplication. This requires, in the first instance, that programs have been approved only after they have been deemed do-able on the basis of their material requirements based on a complete bill of materials. Granting this, it is necessary to set up a current record to control the flow of raw materials in basic mill shapes to manufacturers of parts, assemblies, and end products at which point they lose their identity. This can be done only if there exists one point at which all authorizations are issued and recorded. This presupposes the submission of a manageable flow

of applications and reports containing a limited number of materials requiring checking, posting and tabulating on a current basis.

It is proposed to control the flow of only the principal and most critical materials in the form of mill shapes as an adequate means of controlling the distribution of all materials. A running check will be kept on only those critical materials mentioned in the foregoing section.

When the quarterly demands of manufacturers operating under horizontal control are tabulated, they are to be cut down to total available supply after *subtracting* the authorizations made previously to the vertical programs. For that part of their output which is under vertical control, manufacturers of intermediate products will subtract their requirements for the production of programmed parts and assemblies, thus permitting a smooth transition of authorizations from a horizontal to a vertical basis without duplication. Authorizations will be made to individual manufacturers of this type in two ways: (1) on the Contractor's Form through the prime contractor, and (2) on a PD-25 certificate for that portion of their requirements authorized through horizontal control.

The foregoing summary was supplemented by detailed appendixes providing information on specific operating procedures, forms, flow charts, and a description of recommended supplementary controls for handling the distribution of maintenance, repair, and operating supplies as well as the inventory level on a plant basis. It was the first major effort on the part of the War Production Board staff to work out a genuine over-all material control that dealt with the problem not only in its major aspects, but also in its ramifications into industrial operating details.

The Materials Scheduling Plan represented the transition between the uncoordinated and unrelated hodgepodge of individual allocation and conflicting priority procedures of the War Production Board of 1941 and the first half of 1942, and the over-all control which was established in the fall of the year under the title of the Controlled Materials Plan. Above all, it placed the emphasis on programs, production schedules, and the integration of the effect of actions taken so that they could be appraised in terms of the total available supply of critical materials. It provided for a practicable transition from the Production Requirements Plan to the new control without undue disturbance of existing procedures. Through the accumulation of bills of material and the material requirements of projected production schedules in terms of program and allocation symbols, it furnished the statistical information needed for intelligent management of the war production effort. By substituting

program allocation symbols for contract number and end-use identification in the vertical stream and the maintenance of the horizontal approach where appropriate, it leaned over backwards in establishing administratively feasible procedures. Through its emphasis on production schedules and program allocations as well as preference ratings it provided an effective device for implementing policy decisions. For the same reasons flexibility was introduced into the materials control mechanism to the maximum practicable degree for the purpose of keeping pace with the dynamics of the military program. Finally, the consciousness of the importance of paper work was reflected in the simplification of procedures and the insistence that the volume of materials requests, other operating documents, and product identification be kept at a *minimum* level.

The introduction of this proposal at a time when the top management of the War Production Board was on the verge of officially accepting the Steel Budget Plan led to one of the most dramatic series of events of the whole war production effort. The proponents of the Steel Budget Plan arranged for a hearing in which representatives of the steel industry had the opportunity to present their views. Similarly, the group which had developed the Materials Scheduling Plan arranged for a hearing in which the top management of the automotive industry could present their views.

Feelings at the automotive industry hearing became so intense that representatives departed from the quantitative allocation provisions incorporated in the Materials Scheduling Plan and substituted a general admonitory provision forbidding plants to order critical materials in excess of authorized production schedule requirements. It was this alteration of the Materials Scheduling Plan, resulting largely from the emotional heat of debate, which later identified the Materials Scheduling Plan as the Automotive Industry Plan.

As a result of these discussions a committee was instructed to prepare a new over-all material control mechanism. In order to guide their deliberations, they were provided with a list of sixteen objectives to be achieved by the new plan. As a result of this committee's intensive work over the next several weeks, the War Production Board was enabled to make public the Controlled Materials Plan on November 2, 1942. Discussion of this plan is presented in the next chapter. It might be observed

the assignment. Above all, the first projection of the plan itself was subjected to painstaking review, test runs, and operating experience. On the basis of these analyses and experiments the plan was modified in a number of operating details.

What was perhaps of more significance than the provision of the time necessary for these preliminary tests of administrative and operating details was the recognition of the importance of viewing the war production program as a whole. The period before actual operation under the plan was to begin was also to be devoted to an intensive effort on the part of all the war agencies to accumulate information reflecting the effect of their programs in terms of material requirements. The insistence that all participating agencies translate the total of their scheduled production into common material classifications quantitatively expressed for specific time periods was a radical departure from previous practice. The frank recognition of the fact that any plan which attempted to distribute materials to programs requiring quantities far in excess of material resources was headed for failure was unprecedented. That the time allowed for accumulation of requirements through bills of materials and other devices was insufficient for the purpose, was of little consequence compared with the significance of this evidence that WPB had finally recognized one of the major causes of previous failures.

With the informed judgment of long hindsight, it is possible to give fair weight to the relative influence of the factors which create success or failure in an undertaking of this character. Certainly it was important that by the end of 1942 both industry and labor had reached a full understanding of the gravity of the position in which this country stood. The smashing L orders of the spring of the year had finally stopped the drain of scarce materials and compelled the conversion of facilities wherever earlier judgments on the feasibility of the change-over had been clouded by reluctance to abandon consumer markets. The shortages in materials had progressed so far that military opposition to centralized control had been compelled to yield to the pragmatics of supply and demand. Within the War Production Board itself, the relative failure of PRP (as against what it might have accomplished) had forced the hardest thinking about the crude mechanics of materials distribution in support of war production. At the same time, the relative success of PRP (as against what preceded it) had swept away much of the opposition which had its roots

in the established authority of the material branches. All of these considerations were influential in shaping the acceptance of CMP, its schedule of indoctrination, its installation and modification, and its ultimate success as the complex source of power for the major segment of the production juggernaut which armed and supplied the military power of the United Nations.

But the long view back adds stature to another force to which little recognition was given at the time—the informing and guiding influence of management method and its tools which for the first time secured the attention required for the efficient performance of the war assignment. The difference in the introduction and management of PRP and CMP was the difference between amateur and professional performance, and the debt of the latter to the earlier experience was a heavy one. For the first time, with CMP, the problems of administrative and operating procedures were studied in the detail essential to successful policy implementation. The procedures which direct and control the performance of assignments in large organizations were plotted, tested, revised, and tested again. Statistics were used as a management tool. Accounting controls were established at every action point. The whole organization of the War Production Board was torn down and reassembled to make it a functioning arm of the Controlled Materials Plan.

CMP did not spring full-grown from the brains of its creators. It was an amalgam of the alternative material distribution schemes which had been the subject of debate during the previous months, together with a modified PRP for the handling of industrial segments not adaptable to straight vertical control. And in the period between its first announcement and its full operation, analysis and experiment dictated a number of significant changes without which the plan would, at best, have been a much less efficient control technique, and, with a smaller share of good luck, might have been a total failure, swamped in an unmanageable accumulation of paper. For this reason, the best insight into the role of management may be afforded by a chronological review of CMP as first projected for the public on November 2 and in its later variations.

Before this contribution is discussed in detail it is worth mentioning its counterpart—that is, the ability of WPB to respond to constructive criticism through revisions of the plan. Not the least of the plan's assets was the excellent procedure established for revising and improving its

provisions. By organizing WPB around the operations of CMP it was simple to center responsibility for changes which in turn permitted the establishment of a formal clearance procedure for altering the plan to meet problems as they arose. That this accounted in important measure for the later success of CMP is at least partially substantiated by the large number of changes in the original provisions in the form of amendments, interpretations, and directives. Thus, CMP was a living, ever-changing set of regulations responsive to new problems and susceptible to adaptation to meet them.

The fundamental objectives of the Controlled Materials Plan were clear from the start. They were: (1) to assure a balance between supply and demand for the principal production materials designated under the plan as "controlled materials"—carbon and alloy steel, copper, brass, and aluminum; (2) to secure that balance by a coordinated review of military, export, and essential civilian programs in terms of their controlled material equivalents, and by adjustments, wherever necessary, to yield that total commitment of our production resources calculated to secure maximum output for world military victory; (3) to schedule production for each approved end-product program in order to secure the maximum level of balanced output at all levels of production from metal mill to final assembly plant; (4) to maintain continuing control over production and over the distribution of materials required to support approved production levels in all parts of the economy; and above all (5) to cut down the size of the total war production program to realistic proportions by expressing all projects in addable currency common to virtually all programs—steel, copper, and aluminum.

To accomplish these objectives, the plan established centralized administration by the War Production Board, through its Requirements Committee, over the division of the quarterly supply of controlled materials among the claimant agencies¹ and the industry divisions, and the

¹ The original group of claimant agencies under the Controlled Materials Plan was composed of the War Department, Navy Department, Maritime Commission, Aircraft Scheduling Unit—later Aircraft Resources Control Office (agent for Army Air Forces and Navy Bureau of Aeronautics)—Office of Lend-Lease Administration, Board of Economic Warfare, and Office of Civilian Supply. Within a few months, the list was considerably expanded, principally by splintering the area of responsibility assigned to Office of Civilian Supply in order to give direct representation on the Requirements Committee to certain important economic functions and agencies. The new claimants included the Department of Agriculture (later claiming under the title of War Food Administration), Office

maintenance of accounting controls to assure determined delegations of authority, to control the use of authority, and to assure performance within material budgets by claimant agencies, industry divisions, manufacturing users of controlled materials, and producers of steel, copper, brass, and aluminum. Each claimant agency and industry division was made responsible for adjusting its programs and production schedules within the limits of the quantities of steel, copper, brass, and aluminum allotted to it. Materials other than these controlled materials continued to be distributed through the existing priorities and allocations systems. However, while the distribution system remained unchanged, it should be noted that approved production schedules received a preference rating usable for the procurement of all materials, parts, and components as required for its fulfillment. The original prospectus for the plan noted that additional materials might be brought under control as future supply-demand balances dictated. This step was never taken, however.

The Controlled Materials Plan was the most complex piece of administrative machinery created during the period of the war emergency. The heart of the plan, however, was a relatively simple concept of requirements accumulation and allotments distribution which differed from PRP largely in its emphasis on *programs* rather than *products* as significant segmentation.

Two streams of paper carried requirements and allotments information through the interlocked industrial and governmental structure. The first stream of paper, leading up to the supply-demand balance for the total economy determined each calendar quarter by the WPB Requirements Committee, began at the lowest layer of manufacturing subcontractors. Bills of materials (detailed schedules of the amounts of each contained material required to make one unit of a fabricated product) were transmitted up the manufacturing ladder to the assemblers of end products and other prime contractors. There they were accumulated, each prime contractor combining his own and his subcontractors' material requirements, and transmitted to the procuring claimant agency. From bill-of-material information and other sources, each claimant agency prepared estimates of controlled-materials requirements in total

of Defense Transportation, Office of Rubber Director, Facilities Bureau (representing the interests of industrial construction other than direct military), Petroleum Administration for War, National Housing Agency, and Office of War Utilities.

and by program detail and submitted the estimates to the WPB controlled-material branches (steel, copper, and aluminum) and the Requirements Committee staff. Although developed principally from bills of materials, the estimates reflected procurement needs by calendar quarters. This required the adjustment of bill-of-material data to projected production schedules through the application of appropriate lead-time factors. The controlled materials branches reviewed all claimant requirements, recommended cutbacks necessary to strike an over-all balance with total anticipated supply for each controlled material, and submitted the revised statements as recommendations to the Requirements Committee. After further review by the Requirements Committee staff, the final reconciliation between demand and supply was made by the Requirements Committee and issued as a quarterly program determination which allotted specific quantities of each controlled material to each claimant agency.

The second stream of paper began at this point with the allotment of materials to each claimant agency, representing its share of the anticipated supply of each controlled material available for purchase directly by the agency and by its prime and subcontractors. On the basis of quarterly applications for controlled materials procurement authority, accumulated up the contracting chain and aggregated by each prime contractor, the claimant agency distributed allotments (authorizations to purchase) to its prime contractors. The prime contractors retained that part of their allotments necessary to cover their own direct procurement from the metal mills, and reallocated the remainder to their suppliers. In this way procurement authority—accompanied by identification of the claimant agency and program—was transmitted down through all levels of subcontractors. Each consumer of a controlled material was limited in his quarterly procurement by the allotment received from his customer less the quantity reallocated to his suppliers of parts and components. The total purchase authority within each program was thus limited to the claimant's allocation to the prime contractors in that program. All orders placed with the metal mills were identified by claimant and program. To the responsible WPB controlled material branch the metal mills reported orders placed and shipments in the detail of claimant program identification. The controlled material branch in turn reported metal mill shipments to all claimant agencies for all programs.

This reporting system served as a measure of performance and program accomplishment.

The November 2 prospectus established a flexible management device for assuring adequate control over shape, form, and alloy varieties of each controlled material. Directions were laid down for the proper metal-mill product detail to be used by claimant agencies in submitting requirements. For steel, the CMP breakdown was less voluminous than the product classes established under the Production Requirements Plan. The CMP list carried thirteen categories of carbon steel and ten of alloy. Copper-product classifications were in four broad categories, two of which had further shape detail: four classes of copper-base alloy products, *three classes of copper shapes, and wire mill* and foundry products. Aluminum products were summarized in twenty-one classes of shapes and alloys. The objective of this reporting detail was the proper balancing of supply and demand, giving full consideration to the limits imposed by facilities available for producing each reported shape and alloy. Individual programs making particularly heavy use of a single shape in short supply (as ODT steel-rail requirements) might be cut back to secure a balanced load on specialized mill facilities.

To secure simplification of the allotment procedure, however, the November 2 announcement projected the transmission of allotments in much less detail: carbon steel; alloy steel; copper and copper-base alloy wire-mill products; brass mill products; foundry products; and aluminum in a shape breakdown to be determined at a later date.² Allotment authority was to be transmitted and control records maintained in these terms by claimants and their suppliers.

This distinction reflected WPB's confidence in its ability to assure delivery against orders for individual shapes within the broad categories in which allotments were made. This view was based on the accumulation of advance knowledge of the distribution of demand by individual shapes drawn from the requirements data, together with the flexibility in steel product facilities within the limitations imposed by the total ingot supply.

²In operation, allotments were made in 17 categories: carbon steel; alloy steel; brass mill copper products; wire mill copper products; 4 shapes of copper-brass alloy—sheet and strip; rods, bars, and wire; tubing and pipe; and foundry products; and 9 aluminum classes—rod, bar, wire, and cable; rivets; forgings; castings; rolled shapes; sheet and strip; tubing; ingot and powder; and unclassified.

The truly revolutionary step in CMP was not in these operating procedures, however. It rested in the simple statement: "The delivery of controlled materials . . . shall not be affected by preference ratings." This meant the adoption of a total allocation system for the basic materials of war production. Once the Requirements Committee, acting through its chairman, determined the distribution of steel, copper, and aluminum which in its judgment was best calculated to meet war, export, and essential civilian needs, all approved programs had equal validity. The extent of the concessions made by the military agencies to rational administration of the national production complex is dramatically portrayed in their acceptance of this provision. An allotment of steel for the production of civilian garbage cans had the same standing on a steel mill order schedule as an allotment of steel for an M-4 tank. This operating principle could be accepted only if there was absolute confidence in (1) the ability of the Requirements Committee to make an effective distribution of available supply after full consideration of all claims, and (2) the integrity of the control, audit, and compliance machinery and its ability to prevent kiting of allotment checks at all levels of manufacturing. The acceptance of the full allocation procedure did not extend beyond the controlled materials. The distribution of allotments of steel, copper, and aluminum was accompanied by the assignment of preference ratings to prime contractors' production schedules, and these ratings were extended to subcontractors together with the reallocation of controlled materials. The preference ratings had significance only in the procurement of products and materials other than the controlled materials.

At this point, full understanding of the administrative machinery of the Controlled Materials Plan requires more detailed description of certain phases of the operating procedures as they were projected in the November 2 summation of the plan. In a number of details of great significance in the day-to-day functioning of the control, the first prospectus was more ambitious than government and industry practice could support. A large share of the ultimate success of CMP stemmed from the critical review of the experience recorded in dry runs and operational experiments in the field in the months between the first announcement of the plan and its installation as the central machinery of wartime industrial control, together with the willingness of the top management of WPB to alter its decision after further consideration of some of the issues

which had been decided at the time of the original announcement of the plan.

The Controlled Materials Plan developed from an original intent to adopt a vertical system of material allocation under which procurement authorizations would be transmitted through the manufacturing system from prime contractors down the suppliers' chain. As the plan was hammered into shape, it was recognized that producers of certain types of products could not function effectively in such a procedural environment because of the nature of their products, the number and variety of their customers, and their established production, inventory, and procurement practices.

To accommodate the plan to these realities of existing business practices, all manufactured products containing any quantity of one or more of the controlled materials were divided into two broad categories known as A products and B products. Class B products were generally defined as items normally sold on the open market and those subassemblies or miscellaneous or specialized items of equipment for which individual specific allotments down the supplying chain from claimant agencies to prime consumers and from prime consumers to secondary consumers were thought to be impractical. A Class A product was defined as any product made from a controlled material and not included in Class B.

Class B products were defined in positive fashion by specific listing. The November 2 announcement foreshadowed the listing in a preliminary schedule which included such items as agricultural machinery, batteries, bearings, bolts and nuts, communication equipment, furniture, electric generators, heat exchangers, measuring instruments, machine tools, electric motors, plumbing equipment, pumps, switchgear, turbines, valves, and wiring devices. This list was expanded and made more specific as to breakdown by type, size, and model in the November 14 prospectus and at later dates. The facts of industrial production repeatedly forced modification of the original list which represented an effort to maintain the A-product system throughout the greater part of the economic structure.

The distinction between A and B products was an important one. It marked the segregation of the requirements accumulation and allotment distribution procedures between two methods of conducting business under the Controlled Materials Plan. Material procurement authority

for A products was distributed through a vertical allotment system, with allotments originating in the program determinations of the Requirements Committee of the War Production Board, and passing thence to the claimant agencies, the prime consumers, and on down the supply chain to the manufacturers of A-product components and parts. In this system, producers of A products applied for their materials to their customers. Prime consumers accumulated in their own applications to the claimant agencies the aggregate material requirements for their own operations and for the operations of all their suppliers of A components. Producers of B products made application direct to the appropriate industry divisions of the War Production Board, including in their applications the controlled materials requirements of their A-component suppliers, but not the requirements of their suppliers of other B products.

The general effect of this dual system of application and allotment was to mesh the modified horizontal allocation procedure of the Production Requirements Plan and the vertical allocation procedure urged by the principal opponents of PRP. The chief modification consisted of providing that manufacturers of B products include the material requirements of their A-product suppliers in their own applications for controlled materials. The horizontal procedure was maintained for those products sold on an off-the-shelf basis, on the open market, or generally manufactured in standard production runs which were distributed to a variety of end-product producers. The vertical or A-product procedure was used to bind together the principal end-product production schedules and the production schedules of the specialized components. The objective of this vertical procedure was to resolve what had been regarded as a fundamental weakness in the Production Requirements Plan: the lack of assurance to prime and principal subcontractors that their suppliers were receiving the material required to complete the production in their plants necessary to fulfill the production schedules established for the prime contractors. In adopting this procedure, the Controlled Materials Plan reflected the desirability of tailoring the material distribution techniques to fit the different segments of industry affected. Serious consideration had been given to the adoption of a complete vertical system, in which all makers of components and parts would have submitted requirements to their customers up the chain, with the prime contractors accumulating total requirements for all elements of the end product, and in turn dis-

tributing total allotments to all of their suppliers. Contract Production Control, described in the preceding chapter, provides an example. In the framing of the crucial decisions on the organization of the Controlled Materials Plan, this procedure was recognized as impracticable when applied to the producers of standard or off-the-shelf products normally sold on the open market.

It is interesting to note the difference in technique between CMP and the proposed Materials Scheduling Plan outlined in Chapter VII. CMP specifically designated B products which would use a horizontal allotment procedure. MSP provided for both a vertical or A-product treatment and a horizontal or B-product treatment. Products were to be handled on an A or B basis only on agreement between buyer and seller. While CMP had the advantage of being more clean-cut and providing for simpler accounting controls, the tremendous task of defining B products, which continued until almost the end of the war, was a disadvantage which later threatened to weaken industrial support of the plan. There is evidence that much of the resentment engendered by the provision for vertical treatment of products which manufacturers thought properly belonged on the B list was reduced by the ability of some of these manufacturers to take advantage of the difficulty of exact classification and operate under horizontal procedure. Since constant practice of this kind did not violate the basic principles of the plan, little damage and perhaps much benefit came from such ingenious, if unofficial, participation in the shaping of a workable control.

The issue of the method of treatment of material allotments through the horizontal or vertical procedure serves to illustrate the considerations involved in a decision of this kind. The proponents of the voluntary contractual relationships of the Materials Scheduling Plan were very conscious of the economic implications for further centralization of industrial power involved in forcing manufacturing establishments to depend on their customers for the satisfaction of their material requirements. This was an important factor in the case against across-the-board treatment of certain products. While no evidence is available to illuminate the results of the CMP procedure, it would appear that the emergency situation, together with the patriotic response of business executives, served to avoid what could have been an undesirable by-product of the material-control mechanism.

The decision to adopt a horizontal allotment system for producers of B products left the residual problem of programing the distribution of these products. The first public projection of CMP established the following procedure to govern the preparation of requirements and the issuance of allotments of controlled materials for B products. Each claimant agency was directed to prepare requirements estimates for B products and to submit these estimates to the Office of Civilian Supply at least one month prior to the scheduled date for the submission of controlled materials requirements for A products to the controlled materials branches and the Requirements Committee. The Office of Civilian Supply was assigned responsibility for translating total claimant agency requirements for B products into controlled material equivalents. This translation was supported by authority for the compilation of bills of materials, such information to be obtained from industry only through the appropriate industry branches. The Office of Civilian Supply was directed to inform each claimant agency of its charge for B-product controlled materials, which must be included in the requirements presentation of each agency and provided from the allotment made to each agency. The industry branches of the War Production Board receiving applications from producers of B products were responsible for the issuance of allotments of controlled materials. These allotments were to be charged to each claimant agency in the quantities determined by the Program Vice Chairman. In the event that total claimant agency requirements for any B product exceeded the capacity of fabricating facilities, the Program Vice Chairman was responsible for directing the revision of affected programs and schedules to secure a balance of supply and demand. Finally, the Office of Civilian Supply was authorized to assume complete responsibility for the compilation of requirements and the allotment of controlled materials for certain classes of B products for which claimant agency allotment was not feasible.

The responsibility of the controlled materials branches was clearly defined in the November 2 projection. A careful reading illuminates the character of the compromise between the established *rights and privileges* of these organizational units based on their early allocation authority, and the overriding necessity for concentrating allocation authority at a central point to assure uniform allocation policies for all production materials. The controlled materials branches were responsible for submitting to the

Requirements Committee a summation of requirements for each claimant agency, in shape detail for each controlled material. They were also responsible for submitting an estimate of the quarterly supply of controlled materials in similar shape detail. These two statements were to be reconciled by the controlled materials branches through recommended cutbacks of requirements to the extent necessary to effect a balance of supply and demand. In carrying out this reconciliation of requirements and supply, the Controlled Materials Branches were instructed to meet with the claimant agencies and develop the appropriate reductions in submitted requirements in such fashion as to minimize the impact on projected production schedules for war and war-related programs. In addition to these responsibilities, each controlled material branch was charged with securing maximum mill production, and assuring that allotments were supported by production and shipments performance.

These decisions resulted in a sweeping curtailment of the programming authority of the materials branches, which had been successfully maintained despite the introduction of PRP. The separate allocation systems for steel, copper, and aluminum were abandoned. The power of the materials branches to review and revise central allocation decisions as they appeared in the form of purchase orders on mill production schedules was removed. The opportunities for contradictory allocation policies for complementary production materials were closed. Even in this apparently clean-cut case, however, the change was not accomplished overnight. Mill shipping schedules containing all the end use, contract number, and other information were still filed monthly for one controlled material after CMP became operative. It was only after the most intense debate that the paper providing the material for the same kind of review and conflicting decisions that wrecked PRP was completely eliminated.

Because of the importance of the maintenance of program control over allotments as they moved from the Requirements Committee to the metal mills, the system of allotment identification provided in the November 2 draft had great significance for the successful functioning of CMP. In its ambitious detail, the system attempted to establish the basis for a complete internal audit of performance. It provided that each allotment by a claimant agency or industry division would carry an allotment number consisting of a letter and nine digits. This would identify the

claimant agency, the issuing office within the claimant agency, the program, the authorized production schedule (thereby identifying the consumer receiving the allotment), and the month in which shipment was authorized. In the allotment number "W-1234-567-16," for example, the letter would identify the War Department, the first four digits the program number (as, Ordnance, light tank program), the next three digits the authorized production (as, on a specific production schedule under contract with the ABC Tank Arsenal), and the last two digits the month in which shipment of the allotted controlled materials was authorized. This allotment number would pass from the prime contractor to his A-product suppliers and would be used by the prime and his suppliers to identify their controlled material orders placed with material producers. In the language of the November 2 prospectus: "Thus the origin of orders received by producers of controlled materials can be ascertained. If errors or violations in dividing allotments have occurred, responsibility can be fixed and, if emergencies arise at the mill level, adjustments can be intelligently made."

The allotment number system was an integral part of the accounting control machinery which was made mandatory at every action point within the CMP system. The techniques of budgetary control, essential for the effective administration of the affairs of large-scale organizations in private industry, were applied to the management of controlled material procurement authority. Each claimant agency and industry division receiving material allotments from the Requirements Committee was directed to set up control accounts in the detail of the program determination. Against this over-all agency account would be debited the appropriate quantities showing the agency's distribution of its materials among its various offices and programs. These actions would simultaneously appear as credits in each individual program account. Allotments to prime contractors in each program would appear as debits in the program account. The status of claimant agency and industry division allotment accounts, showing for each controlled material the allotments received, allotments issued, and the balance, was to be the subject of periodic reports to the War Production Board. This procedure was supported by the requirement imposed on prime and subcontractors to maintain similar accounting control records, showing controlled material allotments received, segregated by allotment numbers, and allotments issued, whether

on purchase orders placed with mills or on further distribution to suppliers of fabricated parts.

Special provision was made under CMP for two types of industrial activity the material requirements of which had presented difficult problems of integration within a total control program. Each claimant agency was made responsible for submitting controlled material requirements for construction and facilities to be used exclusively for its own production schedules. All other construction and facilities requirements were made a responsibility of the Office of Civilian Supply. For the first time, construction materials were to be scheduled and aggregated with production materials. The second special problem area, industrial maintenance, repair, and operating supplies, was covered by two provisions. Material requirements for claimant-owned and operated plants were to be included in each agency's quarterly requirements submission, and covered by allotments. General industrial MRO was to be covered by a special regulation specifying the maximum allotment to which each plant would be entitled and the preference rating to be used in purchasing fabricated parts and other materials. This open-ended provision was later fulfilled by the issuance of CMP Regulation 5, the operation of which is described in Chapter XV.

Having outlined the projected operation of the Controlled Materials Plan to this point, the November 2 bulletin concluded with specific provisions to govern the transition from PRP to CMP (and concurrently the transition from the individual material allocation schemes under M orders),³ directions to establish the necessary administrative organization within WPB, and a chronological outline of the steps to be followed from first announcement of the plan to full operation:

Step 1: November 2, 1942—CMP announced and instructions issued to claimant agencies and to industry.

Step 2: November–December, 1942—Claimant agencies complete collection of bills of material and estimate requirements pursuant to instructions from Requirements Committee.

Step 3: January 1, 1943—Claimants submit requirements to controlled materials branches and Requirements Committee.

³ "The Controlled Materials Plan shall be in full effect by July 1, 1943. Thereafter, no controlled material shall be shipped or received except in accordance with the Plan, and with respect to controlled materials, no preference ratings, individual material allocations under M orders or similar precedures or authorizations under the Production Requirements Plan shall be valid."

- Step 4:* January 1-15, 1943—Submitted requirements analyzed and preliminary reconciliation effected between requirements and supply.
- Step 5:* December, 1942, and January, 1943—Claimants and prime consumers develop information necessary for making final allotments following top-level determination by Requirements Committee.
- Step 6:* February 1, 1943—Requirements Committee allotment of controlled materials to claimant agencies for second quarter of 1943.
- Step 7:* February, 1943—Claimants distribute allotments to prime consumers.
- Step 8:* February and early March, 1943—Prime consumers redistribute allotments to suppliers and all consumers place orders with suppliers.
- Step 9:* March, 1943, and thereafter—Controlled materials branches supervise placing of orders on mill books and assist consumers unable to find open schedules.
- Step 10:* July 1, 1943—All alternative plans and procedures for controlled materials abolished; thereafter, controlled materials obtainable only under CMP.

Responsibility for translating the November 2 manifesto into operating reality was assigned to a newly created Controlled Materials Plan Division, staffed with management personnel drawn directly from industry and a number of experienced procedures specialists in the War Production Board. A large-scale program of education and training was immediately initiated for government personnel in Washington and the field offices and for private industry preparing to operate under the plan. A CMP policy committee, with representation from the claimant agencies, met regularly to consider problems of broad operating significance requiring unanimity of agreement for coordinated action. An Engineering Board of Review was established to work with the controlled material branches and the claimant agencies in developing procedures to be followed in collecting bills of material, and critically surveying bills and lead factors submitted by claimants in support of requirements estimates. The Program Controller Branch undertook the development of the budgetary accounting control records and procedures for claimant agencies, industry divisions, and three controlled material manuals. The first of these manuals established standards of accounting control responsibility and performance for the claimant agencies, which were permitted to work out detailed methods and procedures adapted to their established operating techniques and special requirements. The second prescribed the controls—methods, procedures, forms, and reports—to be

used by the industry divisions of the War Production Board. The third manual, for private industry, explained and illustrated the record-keeping responsibilities of manufacturers operating under CMP, and suggested simple procedures to meet the obligations for allotment accounting imposed by the plan. In addition, it served as a source for further educational material prepared by trade publications, business advisory services, and manufacturers of business record systems.

The management handbooks which establish standards of performance for the execution of policy and administrative control in private industry have succeeded in the past two decades in making the development and application of these techniques familiar to all large organizations, and their essentiality for efficient and informed operations has become a commonplace. The job of wartime industrial control was infinitely more complex. It involved the equivalent of organizing the bulk of the industrial resources of the country into a single integrated production mechanism. In spite of the general acceptance of this principle of mobilization for war—it appeared so frequently as a figure of speech in the public statements of prominent officials that it became one of the most overworked of all trite phrases—a massive inertia inhibited the use, in daily operations of public business, of the management procedures without which the responsible heads of relatively minuscule private business could not have fulfilled their responsibilities.

Until the publication of the November 2 statement, with its commitment of American industry to the Controlled Materials Plan, the debate over the philosophies, policies, and techniques of control had been conducted for the most part within the War Production Board and the military agencies. Only a few of the country's largest industrial organizations had participated, either directly or through former employees holding wartime assignments on the War Production Board staff. Great secrecy had surrounded the final debate over specific procedures written into CMP, in the effort to prevent the argument from spilling over into policy issues already determined or from building new support for the special interests (such as the military services and the materials branches) which had been persuaded to accept some reduction of authority and compromise of principle. The seriousness with which the secrecy policy was applied is suggested by the manner in which the final draft of the plan was prepared. As each day's paragraphs were hammered out, they

were carried to New York by special courier, printed overnight, and copies returned to Washington for limited circulation the following morning. Only a handful of numbered copies were distributed; in the final stage, these copies were available for review only in the rooms of the working committee and were collected from all participants at the exit.

As a result of this policy, many channels of potential criticism were closed, whether they represented genuine operating difficulties growing from existing practices of segments of private industry, the unfulfilled desires of special interest groups, or partisan public support for some types of existing controls which operated advantageously for certain companies or sections of industry. After November 2, these criticisms flooded the War Production Board. Although many of the critical attacks were obviously framed with only a careless regard for the dominant national interest in wartime, or on the basis of poorly informed judgment on the deficiencies of existing material controls, some made important contributions to the review of the CMP prospectus and gave needed industrial support to internal criticisms of significant operating procedures. One result was a considerable lightening of the task of persuading the acceptance of changes in projected administrative techniques which might have made the plan unmanageable.

One of the first attacks came from segments of the automobile industry, which had already presented a production and material control proposal adapted to their established methods of doing business. The objections were in two parts. Those concerns which were functioning primarily as military prime contractors reargued their case for organizing the control by contracts. Their procurement, inventory, and production practices were on a contract basis, and they expressed the fear that the adoption of CMP would compel wholesale changes in working procedures and the addition of thousands of clerical workers to handle the administrative load. The latter fear was also expressed by other segments of the industry deep in subcontracting various standard and semi-specialized parts and subassemblies. This group of supplying firms found PRP a comfortable operating mechanism and began incessant agitation for extension of the B-product list to permit them to continue to function under a PRP type of control.

A second and very different line of critical attack was generated by

the industrial area customarily described as "small business." The pyramiding of war contracts and the government drive to spread subcontracting had developed a widespread participation in war work by thousands of medium and small concerns, many of them converted to metal fabrication from completely unrelated peacetime output. Their objections to CMP reflected *their fear that the vertical allocation system through the A-product chain (including the A components of B products) would bind them as slaves to their customers through the dominating power to allot materials.* Under the Production Requirements Plan, they argued, they received scarce materials directly from the War Production Board and retained a certain degree of freedom in negotiating for subcontracts and determining prices. They expressed great concern that the CMP procedure would put them at the mercy of the prime contractors, most of which were pre-war industrial giants. They argued that the power to allot materials could be used to *influence prices and determine suppliers' production schedules*; in extreme cases it might be used, without recourse, to force recalcitrant small producers out of business. Nor did they confine their argument to the immediate war period. They expressed the fear that power entrusted to large prime contractors might be used to secure commitments and favorable competitive positions for the post-war period. As a result of the active Congressional interest in small business, this general line of criticism was reinforced by legislative support.

The manufacturers of components generally attacked the plan as unworkable when applied to the *special characteristics of procurement and production in their industries.* They argued that the output of their plants went to all industries, all programs, and all claimants. Nevertheless, all production was from common materials and inventories. Their assignment of A-product allotment procedure, and their understanding that compliance with the plan would require physical segregation of inventories by allotment numbers and records that would relate procurement, inventories, and production by authorized production schedules, generated unrestrained critical attack.

Renewed critical attack of a different character boiled up from the WPB controlled materials branches, particularly the copper and aluminum branches. In the debate which preceded the introduction of the Production Requirements Plan, one of the positions defended most strongly by the materials branches had been their superior qualifications,

knowledge, and experience for making the crucial allocation decisions. Their arguments had been successful in accomplishing the anomalous operating decision to accept PRP and the individual M order allocation systems as simultaneously effective management techniques, a policy substantially equivalent to trying to steer a boat from both ends at the same time. Having accepted the Controlled Materials Plan, these branches looked with concern on the prospect of the removal of most of the allotment authority, not merely to another part of the War Production Board, but actually to outside claimant agencies. They freely expressed the fear that the accounting control system would not be an effective safeguard against overallotment and eventual destruction of the entire control machinery. To protect against this danger they insisted on the adoption of two safeguards. First, copies of each application by and allotment to a prime consumer, as processed by a claimant agency, were to be directed to the controlled materials branches for tabulation. And second, to tie up the control at the other end of the allotment process, controlled material consumers placing orders with metal mills were directed to accompany their orders with three copies of a special purchase authority form. One copy would be returned by the mill to its customer, as evidence of the acceptance or rejection of the order. One copy would be retained in the mill files. The third copy was to be transmitted to the appropriate controlled material branch which planned to set up a machine tabulation system that would yield a daily tabulation showing the status of claimant agency programs by shipment month, product, and producer.

This form, widely known as CMP-5 because of its identification as Exhibit 5 in the November 2 statement, provides a good example of the conflicting philosophies which embroiled WPB in a constant debate regarding the degree of control necessary for success. Since the form called for the full nine-digit allotment number, it would have been necessary for each secondary consumer—or subcontractor for A components—to prepare a separate copy for each material order for each customer from whom he received an allotment of controlled materials. This proposal came from the materials branches. The objective was to insure that no prime contractor together with his chain of A-product contractors would be in a position to use more allotment authority than had been received from the claimant agency for use in carrying out the production schedule.

The procedural and methodological groups pointed out the enormous quantity of paper which would have to be prepared by the contractors and their subcontractors, the difficulties in handling the reports both at the mills and WPB, the large proportion of errors that would creep into tabulations through transposition of digits in the full allotment number, and finally the small likelihood that a deliberate violator would publicize his evil deeds by entering a description of them on a piece of paper and making it available to WPB. The group pointed out that the plan provided adequate protection through its provisions relating to the maintenance of budgetary controls over the receipt and disposition of allotments. They argued that it was here that compliance emphasis should be placed.

While the plan was actually initiated without the form, it was tacitly understood that this would be introduced if experience indicated that it was needed. The decision to shorten the allotment number for transmission purposes put an end to further discussion by making it impossible to achieve the compliance objective either with or without the form. Subsequent operation under the plan demonstrated that the fears of the materials-minded group were groundless. It demonstrated that manufacturers would follow rules providing these were clear and specific.

The early criticism within WPB came from the paper-handling and accounting specialists and was directed toward the record-keeping problems raised by the use of the nine-digit allotment number. It was argued that the paper work (maintenance of detailed records, posting of control accounts, and so on) involved in full compliance would impose an unmanageable load on industry, centering with particularly savage impact on producers of A-product parts and subassemblies serving a large number of different claimant agency programs. This argument looked to reform through (1) the acceptance of a quarterly rather than monthly allotment period (with general monthly percentage receipt controls to minimize mill overloads in the early weeks of each calendar quarter); and (2) simplification of the production schedule section of the allotment number, sacrificing detailed identification in favor of effective industrial operation. Beginning with opposition *in vacuo*, the supporters of this line of criticism buttressed their position by a dry-run test on a hypothetical allotment situation. The test indicated that even with relatively skilled professional and clerical personnel, operating under favorable conditions and in a small physical space, the number of individual post-

ing entries in material records required to carry out the plan's prescribed procedure was substantially in excess of off-hand estimates, while at the end of the one-day test the "mill" records of allotments received on accepted purchase orders could not be reconciled, in aggregate or by programs, with the "claimant agency" records of allotments to "prime consumers." This dry run was supported by parallel evidence from private industry of the monumental clerical burden required for full compliance with the CMP allotment and control provisions as projected in the November 2 statement.

Finally, and in addition to the above specific and constructive criticism, there was a general and indiscriminating outburst against the paper aspects of the plan (applications, allotments, records, extension of allotments, purchase order authority, reports). Half-humorous, half-serious, these critics complained of locofoco administration, talked about beating plowshares into swords and swords into reports, exchanging butter for guns and guns for paper, and devised as many verbal extensions of the familiar initials CMP as the GI variations of SNAFU.

Through November and December the searching wind of critical analysis accompanied the selection of staff, preparation of procedures, education and training of government and business personnel, collection of bills of materials, and calculation of requirements. The volume of criticism directed at certain crucial operating phases of the plan, and the absence of a background of experience from which to draw confirmation or denial of alleged weaknesses and impracticalities, led to the decision to undertake a "guinea pig" experiment in advance of the full commitment of the war economy to an untried control. The Army and Navy mechanical time-fuze program was selected for the test. Participating manufacturers were exposed to the full range of CMP operation from submission of requirements up the contracting chain through allotment, reallocation, and the procurement of materials. The objectives were to test the questioned phases of the plan, give the war agencies experience in handling the administrative problems involved, and observe the extent to which industry would fulfill or short-cut the detailed operating procedures called for in the prospectus. War Production Board staff members reviewed the experience of the military agencies in handling the application and allotment paper and then visited the plants of a number of prime and subcontractors participating in the program to

check their performance. From the detailed critical review of the CMP projection by the staffs of the War Production Board and the other war agencies, the dry runs and field experiments, the exploration and free discussion of operating problems by private industry and its advisors, came a number of changes in operating techniques and procedures which were incorporated in the plan as it moved from paper to reality.

One of the most important changes was the extension of the B-product list. The early projection of the plan had envisaged a short list, with minimum sacrifice of the fundamental operating principle of vertical allocation from prime consumer to metal mill. As it was eventually worked out, the B list contained the following four general types of products: (1) civilian-type end products, such as farm machinery and sewing machine needles, distributed to the general market through thousands of outlets; (2) industrial machinery and equipment; (3) products requiring small quantities of controlled materials, such as wood furniture; and (4) standard components, such as bolts and nuts or electric motors, generally produced and sold "off-the-shelf" rather than made to order. While the expansion of the B-product list departed from the philosophical concept which dominated the original CMP thinking, it did so in recognition of established industrial procedures and made a significant contribution to the effective operation of the control.

A second important change was the decision to amend the allotment number procedure. The original projection of a nine-digit number to be transmitted from claimant agency to metal mill would have imposed an overwhelming burden on consumers at secondary levels receiving allotments initiated in a variety of claimant agency programs. This was simplified by providing that allotments from prime consumers to secondary consumers and all lower levels down to the mills should be identified only by the claimant agency letter, the first digit of the program number, and the calendar quarter for which the allotment was valid. This revision substantially reduced consumers' record-keeping by permitting them to group allotments by major program numbers and to decrease the number of separate allotment accounts required to provide an adequate record of CMP activities. At the same time, obviously, this action simplified record-keeping for producers of controlled materials, since they could not maintain accounts providing greater detail than was available on allotment numbers accompanying incoming purchase orders.

Closely related to this simplification was the decision to allot on a quarterly rather than a monthly basis. Congestion of orders calling for delivery early in a calendar quarter was prevented by the stipulation that consumers could not request delivery of more than one-third of their quarterly allotments in the first month or more than two-thirds in the first two months of a calendar quarter.

The zeal of the *controlled materials branches to protect the system* against mill overloads by double-locking the allotment process (tabulating claimant actions and mill order loads) resolved itself in two ways. First, the special consumers' purchase-order authority form was abandoned, thereby removing the basis for a daily tabulation of mill orders in program detail. Second, copies of claimant agency allotment actions descended on the branches in such quantity that they could be neither reviewed nor tabulated. As operating experience accumulated, the *strength of the accounting controls* and the general disposition of the greater part of industry to live within the framework of a control system which was reasonable and understandable were demonstrated beyond all question.

The effort to simplify CMP procedures for small manufacturers met with much less success. This action took the shape of a provision releasing users of stipulated small quantities of controlled materials from the identified allotment-reallotment procedures. The streamlined procedure was never widely used, nor could the reasons for the failure to use it ever be clearly established. Most prominent among the alleged causes was the hesitation of eligible businessmen to adopt an operating technique which they did not fully understand. In view of the rush of orders and regulations spewed out by the war agencies and the limitations of time and personnel in small enterprises, this situation is not surprising.

The Controlled Materials Plan was a plan for total control covering all industrial activity into which steel, copper, and aluminum entered as production, construction, or maintenance and repair materials. The prospectus therefore outlined detailed procedures for control of inventories, provision of materials for construction, and support of essential levels of maintenance work. These aspects of CMP are reviewed in the chapters devoted to the history of these activities throughout the war period, and have been omitted from the discussion at this point.

By the end of the third quarter of 1943, the Controlled Materials Plan

was functioning with reasonable effectiveness. It was apparent that the supplies of basic metals and the techniques of their distribution no longer were the most significant factors influencing production. The major problems incident to the establishment of a new system for controlling the distribution of materials had been resolved. The problems which remained were related to the detailed technical operations of the system. Because of the insight they give into the management job in the controlled economy the most important of these technical operating problems are reviewed in the following paragraphs.

In the formation of CMP, it was recognized that not all of the material made available to the claimant agencies would result in the placement of orders on the books of producers of the controlled metals. Very early in the operation of the plan, it became apparent that there was a substantial difference between the quantities of steel, copper, and aluminum distributed by program determination and actual shipments by the metal mills. Quantities allotted by claimants to prime consumers were less than quantities distributed by program determination; orders placed against metal mills were less than allotments to prime consumers; and actual shipments by metal mills were less than orders placed. This disappearance of allotments was widely discussed under the name of "attrition."

Many of the causes of the disappearance were readily apparent. Probably the most important was the discrepancy between requirements as originally submitted by consumers and their actual production needs. This discrepancy resulted from one or more of the following factors: (1) errors in calculating requirements from bills of materials; (2) failure to make proper adjustments for inventory holdings; (3) a general tendency to overstate requirements in anticipation of cutbacks; (4) estimating material requirements on the basis of optimistic forecasts of the volume of future operations; and (5) unanticipated cancellation of contracts or changes in end-product specifications.

These factors were influential at all levels in the process of accumulating total material requirements. They were a direct cause of attrition when at the consumer or claimant level they created unissued balances after the actual requirements of manufacturers had been satisfied. They were also a cause of attrition when unissued balances did not become available for reallocation in time for translation into orders on mill schedules.

Allotment disappearance also resulted from the reserve policies adhered to by claimant agencies and prime consumers. Among the more important reserve policies were: (1) the necessary provisions for quantities of material to meet the demands of late applicants, emergency appeals, and program adjustments; (2) the necessary creation of the multiplicity of reserves by claimants and consumers who issued allotments on a decentralized basis, which often resulted in the accumulation of a larger total reserve fund than would be necessary if only a single reserve were maintained for all programs; and (3) the necessity for maintaining reserves to meet changing requirements on the part of those claimants which did not have clearly defined programs. The net effect of these policies, when either the emergencies for which the reserves were established did not occur, or reserve requirements were overestimated, was to leave unissued balances in the allotment accounts.

A certain level of allotment disappearance was inevitable in the distribution of materials under CMP. Claimant agencies, industry divisions, and consumers had to preserve minimum operational flexibility. There was also the requirement to provide a small overload at the mills in order to maintain capacity production. In order to establish program determinations under CMP at the optimum level, it was necessary, therefore, to have some quantitative measure of the extent of the allotment disappearance required to assure the proper operation of the plan. If the total quantities of material made available by program determination in any accounting period were balanced too closely with estimated supply for that period, some claimants and some programs might receive smaller allotments than metal supplies justified. In these circumstances, both claimants and consumers would be handicapped in meeting contingencies and in making necessary adjustments, and the operation of some metal mills might be below capacity. On the other hand, if the total quantities of materials distributed by program determination were substantially in excess of anticipated supply, the metal mills would be forced to reject some orders. Under the CMP procedure which required that orders be accepted by the mills in the sequence of placement, some orders with a high degree of urgency might not be accepted, or, if accepted, might not be delivered in the scheduled period. If the allotments made to claimant agencies were large as compared with their minimum require-

ments, the claimants would make increased quantities of material available to their less essential programs. It would be inevitable, with effective over-allotment, that certain orders placed by consumers in programs of great importance would be refused because of lack of mill capacity to handle them. The predetermined schedules of relative program urgency would be upset and production of some end products considered most essential might be impaired.

For these reasons, both underallotment and overallotment were undesirable. It was essential that the quantities of materials distributed each calendar quarter be such as to facilitate smooth operation of the allotment distribution process, induce capacity production by metal mills, and make possible the acceptance of orders by metal producers, which would result in shipments large enough to support the balanced production programs of the claimant agencies.

The optimum level of program determination could be estimated by adding to mill capacity (1) the overload of orders necessary to insure capacity production and (2) the overload of allotments necessary to maintain operational flexibility for claimants and consumers. The first factor was established by CMP regulations governing mill acceptance of orders in relation to production directives and capacity. Under CMP Regulation 1, a controlled material producer was permitted to accept orders up to 110 percent of the production called for by his production directive or, in the absence of a production directive, up to 105 percent of his anticipated production.

The second factor could be determined only by a careful review of all available quantitative and qualitative information bearing on the quantities of materials necessary to "grease the wheels" of the CMP allotment distribution system. In the first quarter of CMP operation there was no evidence which could be used to measure the magnitude of the necessary allotment disappearance. For the third quarter, however, some quantitative evidence was available and it was possible to make a preliminary appraisal of the necessary claimant and consumer attrition. On the basis of unissued balances held by the claimant agencies and industry divisions and reported to the central accounting office of the War Production Board, and from estimates of unissued balances held by prime and secondary consumers, a preliminary estimate was made that over allotments

of approximately one million tons of carbon steel per quarter were needed to assure smooth distribution through the claimant agency system. Comparable quantities of other materials were also required.

In later quarters greater experience with CMP encouraged both claimants and consumers to operate on smaller margins, and the magnitude of necessary overallotment by the War Production Board Requirements Committee was thereby reduced. At no stage of the war was it possible, however, to assure smooth capacity operation under the plan from claimant to mill with an overallotment of substantially less than 15 percent of supply for carbon steel and comparable though varying percentages for the other controlled materials.

A second technical operating problem arose out of the provision in the plan for making advance quarter allotments. The objectives of this provision were (1) to enable manufacturers to place firm orders with their suppliers for future delivery, and (2) to permit manufacturers to determine their operating schedules at least as far in advance as had been customary under their normal peacetime procedure. To fulfill these objectives, it was essential that the procuring claimant agency place firm contracts for future periods at least as far ahead as advance quarter allotments were made.

In the early stages of CMP, however, field surveys indicated that some claimants were making advance allotments of controlled materials without extending the related military contracts for parallel periods. This lag in letting contracts produced a delay in the reallocation of materials by some prime consumers, who experienced a natural hesitation in placing firm orders with their suppliers when they did not themselves have the support of firm contracts from their customers. Secondary consumers were thereby prevented from planning production and ordering materials and components for future delivery.

The accumulation of lag-time factors at several consumer levels meant that the basic materials required to produce critical components at remote secondary levels must be acquired months in advance of the date set for completion of the end product in which they would be incorporated. A manufacturer of a complex end product with firm contracts extending only six months ahead, however, might be unwilling to make advance allotments to his suppliers despite the fact that he had received advance allotment authority for four future quarters. The net effect of

a failure to coordinate contracts with advance quarter allotments was to dam up these allotments at the prime consumer level. Contractors did not get the full benefit of advance allotments and the objectives of the procedure were not met. The exploration of this problem in the early stages of the plan and its detailed review with the military agencies were helpful in alleviating pressures and in permitting the plan to operate with reasonable smoothness well out ahead of the current calendar quarter.

A third technical operating problem was created by delays in passing down allotments through all consumer levels. In the early stages of CMP, it was found that some prime consumers, upon receipt of allotment authority, issued their own purchase orders for controlled materials before making reallocations to their suppliers of A-product parts and sub-assemblies. The first level of secondary consumers were, therefore, delayed in transmitting allotments down the chain to their suppliers and the entire process of allotment distribution was slowed. Because of the reluctance of secondary consumers to demand that their customers expedite reallocation, practices of this type were disclosed so late in the calendar quarter that correction was difficult. It had been anticipated that some difficulty might be experienced in completing the reallocation procedure with sufficient speed to enable manufacturers of A components four or five steps removed from the prime consumer level to procure the materials necessary to fulfill their authorized production schedules. Recognizing this problem in the first quarter of CMP operations, several claimant agencies made special allotments direct to selected key secondary consumers, which cut the transmission of allotments through multiple levels of manufacturers.

For the third quarter, a special procedure was established to facilitate the production of A products at remote secondary levels. Manufacturers in this position were permitted to make application direct to the War Production Board for their material requirements for the third and fourth quarters. Among the products which were given direct assistance were such items as automotive superchargers, electric starters, oil filters and cartridges, oil and water pumps, springs, metal stampings, and screw machine products.

By the fourth quarter of 1943, review of CMP operations indicated that the plan had become completely effective as a metal allocation system.

Careful attention to the details of day-to-day administration had resolved all major problems connected with the control of the distribution of basic production materials. There remained only a small number of relatively unimportant technical operating problems which, on the whole, were smoothly handled without serious disturbance of the area of production governed by the Controlled Materials Plan.

CMP continued as the basic production and material control through ten successive calendar quarters to the end of the war in the Pacific. It has been appraised in retrospect as an effective administrative instrument, and it earned that judgment. It did not, however, fulfill all the anticipations of its begetters. At least some of the supporters of the plan had expected to control all important war production through management of the distribution of a small group of basic materials. Whether steel, copper, and aluminum alone would be sufficient was not clear. The November 2 prospectus held the door open for the addition of other materials, and the PRP experience with a much larger materials list was a significant source of reference. The underlying philosophy was clear, however. It was the general expectation that the keys to all important production difficulties were: (1) curtailment of total program authorization to the limits of feasibility imposed by the supplies of the basic production materials; (2) limitation of procurement authority to the quantities required to carry out authorized and balanced programs; and (3) integration in scheduling production of parts, components, and end products through vertical allocation of materials.

These objectives were not fully realized in performance. In its attack on the uncontrolled expansion of military programs CMP had one important advantage over the Production Requirements Plan. Its machinery of requirements accumulation and allotment distribution compelled the procuring services to consider the feasibility of their goals by juxtaposing production schedules and the controlled materials required to carry them out. The PRP technique obscured this relationship. But the crucial step of outright contract cancellation was rarely, if ever, taken. The inclination toward incentive scheduling on the part of some of the services, and manufacturers' freedom under CMP to use their preference ratings to buy parts and materials other than the controlled materials, combined to bear with unnecessary and often disturbing pressure on the supply of many items in shorter relative supply than the controlled materials.

In this way, although CMP effected a partial redemption of the War Production Board's failure to seize and hold control over the letting of contracts—the real source of power in the war production economy—by no means did it realize a total solution.

As a result of the expansion of facilities for producing the raw materials of production and the CMP limitation of authorized demand to anticipated supply in each calendar quarter, by mid-1943 the choke point in war output had ceased to be the controlled materials. But this partial success exposed a partial failure. Through its allotments procedure, CMP secured a closer integration of component and finished product output. It did not and could not achieve a balance of supply and demand, however, for all other production materials and the key components. New problems arose in lumber, textiles, and other materials, and in engines, electric motors and controls, friction and anti-friction bearings, valves and pipe fittings, heat exchangers, compressors, and other fabricated parts and components.

CHAPTER IX

PROBLEMS UNSOLVED BY THE CONTROLLED MATERIALS PLAN

ALTHOUGH the Controlled Materials Plan had the benefit of more careful planning than any other control procedure in both its grand projection and the development of its administrative detail, as a device for exercising centralized direction over industrial production it left some basic problems unsolved. It would be unfortunate if in another national emergency those responsible for mobilizing the nation's resources started with the assumption that CMP represented either perfection as a technique or a control that could be expanded in scope within the same framework to eliminate the material control problems that plagued the War Production Board throughout the war.

It is not easy to assemble a meaningful appraisal of CMP in terms of its success in measuring up to the original projection of the control. The difficulty arises because of the basic difference in point of view with respect to the way in which the plan was to be developed. Some of its most practical-minded proponents, for example, assumed that the influence of CMP would be extended not through expansion through the addition of more materials to the controlled materials list, but rather by the adjustment and revision of existing controls, or the formulation of new controls, so as to relate them to the basic control structure established by CMP. On the other hand, its deficiencies appear much larger when a comparison is made between CMP as an operating mechanism and the more ambitious of the plans for its extension to other materials.

The original projection of the Controlled Materials Plan implied that in its ultimate full development CMP would serve as both a scheduling device for the delivery of finished products and their components, and a universal, integrated material control. To accomplish the first objective it anticipated (1) that all allotments of controlled materials from claimant agency to the lowest level of subcontractor would be tied to quantita-

tively determined production schedules, and (2) that the claimant agencies would cut back their total programs and their contracts to the limits of feasibility determined by the quantities of controlled materials made available to them each calendar quarter by the War Production Board Requirements Committee. To accomplish the second objective the plan contained, in addition to the list of forms and shapes of the three controlled materials (steel, copper, and aluminum), a schedule of other materials. This list included beryllium, cadmium, cobalt, cordage fibers (manila, sisal, jute, and istle), magnesium, mercury, mica, monel, nickel, nylon, high tenacity rayon, rubber (crude, liquid latex, reclaimed, and synthetic), tin, tungsten, wood, and zinc. It was regarded as a distinct possibility that after the institution of CMP at least some of these materials would be transferred to the category of controlled materials and their distribution administered in the same way.

As a scheduling device, the original concept of CMP rested on two premises. The first was the belief that the claimant agencies would be forced to cut back their schedules of end-product deliveries to match the quantities of materials made available to them by program determination. The second was the belief that once the end-product schedules were firmly established, delivery schedules for components and subassemblies would be timed to meet end-product deliveries and would be frozen in terms of promised delivery dates so as to permit orderly production and shipment. In actual practice, the military claimant agencies did little to adjust their end-product procurement to the limits of feasibility established by controlled material allotments. As a result, it was common experience for programs to fall short of their original goals as projected by calendar periods. This performance became standard operating procedure to such an extent that a special term—slippage—was invented to describe it. Slippage meant performance below schedule, but because of its special character was a relatively non-invidious word. For the same reason—that is, failure to cut back end-item programs—there was a tendency at all times for top-layer contractors to place orders for more components and subassemblies than could be utilized in the fabrication of end items for which controlled materials had been allotted. This tendency extended through both the A and B-product chain. To the extent that it overflowed into the B-product area, an additional difficulty was encountered, because there was never very precise knowledge of the

quantities of B products required for the final delivery schedules projected in the "approved" programs. The stringency was particularly sharp for B components because of the tendency on the part of the WPB Requirements Committee to resolve controlled material bottlenecks by meeting the direct requirements of the military claimant agencies and financing the deficit by sharp cuts in allotments to B products. Often the result of this policy of expedience was to allot less material to the manufacturers of B products than was required to meet the demands of important end-product schedules.

Any original intent to project CMP as an integrated control for all materials could not be realized for two reasons. Many of the problems of material distribution could not be resolved within the CMP framework with its vertical flow of procurement authority. Such a proposal would not stand up under detailed examination which explored the special and peculiar conditions of supply and demand under which distribution was normally carried on for the listed critical materials. Of scarcely less importance, the administrative problems involved in an all-out control were of such magnitude that even after nine months of preparatory work those engaged in the administration of CMP were so fully occupied with developing interpretations and emergency procedures and preventing the issuance of conflicting controls that little serious consideration was given to the extension of the plan to other materials, even when this was feasible.

As a control scheme, CMP operated through the principle of accumulating requirements for end items included in the programs developed by claimant agencies. In this framework each manufacturer of a finished end item developed his own requirements and those of his suppliers in terms of basic materials. He presented the summary requirements to his claimant agency, which in turn accumulated all of its contractors' requirements into its own final end-product program. When the controlled materials had been allocated by WPB and the claimant agency had completed its program, it distributed materials to the prime contractors who in turn passed the allotments on to their direct suppliers of materials or down their subcontracting chain. This formal model could not be realized without adaptation even for copper, steel, and aluminum when the item produced by the supplier or subcontractor was a standard part delivered to a large number of customers, or was an item the material re-

quirements for which were so insignificant that it could not efficiently bear the burden of the cost of accumulating requirements and controlling material allotments in the detail contemplated by CMP. The concept of vertical distribution could not be applied universally to the metal products which later became identified as B products. These were always treated on a horizontal rather than a vertical basis. The WPB industry divisions allotted materials directly to the manufacturers, regardless of their position in the contractual structure. As in the case of the B products, the problems of material distribution encountered in lumber, textiles, and other materials did not permit the vertical accumulation or distribution processes; therefore these materials could not be handled through the vertical stream under a CMP-type system.

In the face of these difficulties, why was CMP a success? No facile answer can be provided for this question. The causes were both positive and negative, leading to acts of both commission and omission. On the record there appears to be little doubt about the paramount importance of the performance of the management job. The lessons of the PRP failure in this area were seriously studied. Nine months were devoted to planning, training, education, and review. Operations were critically surveyed right down to petty details. The result was that CMP "worked" where PRP did not. But also on the record, effective management performance alone would not have been sufficient to underwrite success if other factors had not contributed.

Not to be discounted in importance was the refusal to extend CMP by the blind addition of additional materials to the controlled materials list. The efforts of the staff in immediate charge of operations were devoted to making the plan fully operative within its original framework and to shaping the controls over the distribution of other materials to avoid conflicts with CMP schedules. While the continuation of many difficulties gives ample evidence of partial failures in this assignment, the unspectacular successes drew less attention with their general contribution to smoother functioning of material distribution. In this area, an important contribution was made in what might be termed negative administration—the refusal to permit the plan to be thoughtlessly enlarged in scope or its fundamental techniques extended to materials to which they were not applicable.

Another significant consideration was the general lowering of de-

mands for *some* non-controlled materials to the point where judgment and intelligence could be brought to bear on the problems of distribution. One of the effects of the institution of CMP was the reduction of the inflationary gap between supply and demand for many materials. This matched one of the prime requisites of sound material control—that this gap be kept within bounds which permit good administration to be applied to the problems of distributing a limited material supply.

Some significance should also be attached to the unplanned and accidental results of the overestimates in material requirements submitted by the claimant agencies. This was particularly true of the statements furnished by the military agencies. One effect of such overestimates was a failure to make full use of the original allotment authority which had been granted in response to the requirements statements submitted. This situation permitted partial solution of the difficulties in programs for which allotments had been correspondingly reduced, by a redistribution of the unused allotments at the time consequent emergencies arose.

Illustrative of this was the allocation of alloy steel for the second and third quarters of 1943. When the second-quarter schedules were first reviewed, the major claimant program for alloy steel was the Army tank schedule. The chief B-product program was ball and roller bearings. The tank program required tremendous quantities of alloy steel. There was a disposition on the part of the Requirements Committee to meet this claim. In order to satisfy the Army claim, and still preserve the supply-demand balance, cutbacks had to be made. The principal burden of the cut fell on the ball and roller bearing program, even though its total requirements were small in relation to the quantity required for tanks. The cut applied was almost insignificant as a contribution to the tank program, but it meant a drastic reduction in bearing production. A parallel situation was again presented when allotments were made for the third quarter. By the late spring of 1943, shortly after the third-quarter allotments had been made, it became apparent that the cuts in the ball and roller bearing program were so great that many important needs for bearings could not be satisfied from the production supported by CMP allotments. If the tank program continued in effect as originally projected, it would have been impossible at that time to find the alloy steel needed for supplementary allotments for bearings. Fortunately, at this point the Army concluded that on the basis of its African experi-

ence the projected tank program was unrealistic, with the result that part of the alloy steel made available for tanks was not required. This permitted supplementary allotments to the bearing makers, and opened space on mill books through which these additional allotments could be translated into current deliveries.

The aircraft program offered a parallel situation in its handling of requirements for aluminum extruded shapes. Here, requirements were calculated from bills of materials, resulting in mathematically determined needs for extrusions far in excess of the supplying industry's capacity to produce. Actual allotments were made at the maximum level which anticipated supply appeared to justify. After two quarters' operation through the Aircraft Resources Control Office at Dayton, Ohio, it proved possible to make an efficient distribution of the available supply and to get maximum aircraft production without serious interference because of a shortage of aluminum shapes. Although the strict logic of the Controlled Materials Plan required that programs and contracts be cut back within the limits of feasibility determined by controlled material allotments, the War Production Board never forced the issue. In this case, the failure to insist on the full performance of the CMP line of theory was salvaged by the overstatement of requirements. At this stage, the administration of the aircraft program indicated a willingness to operate from what amounted to a double set of books. The first represented the objectives for finished planes and the calculated requirements to build them. The second represented actual material allotments and the production schedules which could be obtained from these allotments. The gap between plan and reality was prevented from rising to general notice because of errors in the requirements data.

Similar illustrations can be found in the Army-truck and Maritime-ship programs. In the case of trucks, reliance on bills of material yielded requirements far in excess of actual production needs. The error here was all the more striking because it was the product of the automotive industry which was reputed to know more about bills of material and to have more accurate bills than any other industry. In the case of ships, plate allocations at peak levels were short of stated requirements, but freighter and tanker production was not delayed for lack of plates because the yards could never build the scheduled production.

With the effectiveness of CMP limited to a considerably smaller area

than had been originally staked out, a number of important problems remained to be solved. The failure of the War Production Board's top management to force cutbacks in end-product programs to the limits of feasibility deprived CMP of much of its significance as a scheduling device. These unresolved problems led to the installation of elaborate independent machinery, including order M-293, described at length in Chapter XIII. At no time was any single success recorded, and much of the blame must certainly be traced to the failure to bring all scheduling actions within the operating framework of the Controlled Materials Plan, or at least to coordinate decisions made with the results of actions taken through CMP procedures.

With the decision not to extend the coverage of CMP beyond the three metals originally defined as controlled materials, the problem remained of making adequate provision for controlling the distribution of other materials in short supply, some of which gave evidence of moving into a more critical supply-demand position than steel, copper, and aluminum. Shortly after the beginning of the third calendar quarter of 1943, in which the Controlled Materials Plan was firmly established as an *effective operating instrument*, certain proposals were advanced for discussion with respect to extending controls over the distribution of "non-controlled" materials. The early stages of the discussion split the general problem into two segments: (1) ways and means of coordinating controls governing the distribution of non-controlled materials and tying them in with authorized production schedules and supporting allotments of steel, copper, and aluminum under CMP; (2) ways and means of meeting the non-controlled materials requirements of non-CMP producers. The link between the two parts of the general problem was, of course, the CMP and non-CMP producers' consumption of non-controlled materials and the consequent necessity for dealing with them as related controlled areas. It was precisely at this point that the most significant failure was recorded.

It was agreed that the effective operation of the Controlled Materials Plan required coordination of the distribution of controlled and non-controlled materials. Existing allocation methods permitted a processing officer in a division responsible for one of the non-controlled materials to withhold material required to carry out an authorized production schedule already determined by the successive decisions of the

Controlled Materials Divisions, the WPB Requirements Committee, and the claimant agencies, and supported by allotments of steel, copper, and aluminum. Among the more extreme cases, it was pointed out that a manufacturer of welding electrodes might have to file as many as 15 separate applications for non-controlled materials after receiving an authorized production schedule supported by an allotment of controlled materials. The decision on any one of this series of applications would be as effective in determining his actual production as the original decision reached on the basis of his CMP application. Authorized production schedules under CMP were, therefore, at the mercy of a series of uncoordinated decisions made by a number of different officers in different places and at different times, and based on a variety of criteria.

It was agreed that all planning should be directed toward the organization of a procedure which would determine production schedules in the light of the available supply of both controlled and non-controlled materials and which would provide manufacturers with related authorizations to procure both types of materials for future calendar quarters. The following proposal was outlined as a tentative solution to the problem:

1. A general application form similar to PD-25A under the Production Requirements Plan would be prepared for use by CMP consumers of non-controlled materials.
2. The form would contain a materials list divided into two sections. Section I would consist of those materials for which CMP consumers used a substantial part of the total available supply. Section II would consist of other materials under allocation or related controls, which were used by CMP consumers in relatively small quantities. The first section of the list might be characterized by such materials as zinc and cadmium; the second section by such materials as textiles and chemicals.
3. Consumers operating under CMP would file a single quarterly application for non-controlled materials, showing the quantities necessary to carry out authorized CMP production schedules.
4. A related PD-25A type of form would be prepared on which would be listed materials in Section I only. This form would serve as a quarterly application by non-CMP consumers of Section I materials.
5. The two sets of applications together would provide the War Production Board with a total picture of CMP and non-CMP requirements for the listed non-controlled materials. These could be compared with prospective supply for each material as a basis for cutting back requirements where necessary.
6. In those cases in which non-controlled materials were not available in

sufficient quantities to carry out production schedules for which the requirements of CMP manufacturers were presented, the schedules might be adjusted and quantities of controlled materials allotted to support these schedules might be proportionately reduced. It was noted that this procedure might contribute to increasing the accuracy of CMP manufacturers' statements of requirements for non-controlled materials, since inflation of requirements would result in reducing their authorized production schedules.

7. CMP manufacturers would not have their requirements of materials in Section II cut back below the quantities stated as necessary to carry out authorized production schedules. By definition, this section of the materials list would consist solely of materials the total CMP use of which was limited. Full authorization of requirements to CMP consumers would, therefore, be possible without reducing production schedules because of difficulties in obtaining such materials.

8. A non-CMP consumer would be authorized to procure quantities of non-controlled materials in Section I of the materials list in the same way as CMP consumers. All existing allotment procedures and application forms in connection with materials in Section I would be suspended. This would have the effect of simplifying all allocation procedures for these materials and of placing them in a position comparable to that of steel, copper, and aluminum.

9. Distribution methods for materials in Section II would not be changed immediately, with the exception of the relatively small amounts authorized to CMP manufacturers under the procedures outlined above. The decision temporarily to set aside consideration of necessary changes in distribution methods for these materials was made in the belief that they presented special problems. It was pointed out that distribution methods and the necessary controls for such materials as textiles, chemicals, and lumber had not been carefully studied and that, prior to a careful study of distribution methods and problems, it would be *injudicious to bind the major users of these materials* to a single application form connected with CMP.

This proposal was completely unsuccessful in winning support from the *staffs of the materials divisions*. The special interests had dug themselves in to resist all further encroachments upon determined lines of authority. To the end of the war, the Controlled Materials Plan was tied to steel, copper, and aluminum, and was unsupported even by a related integrated control for allied production materials. The only concession to expediency was represented by the issuance of Priorities Regulation No. 11B, in the early summer of 1943. This regulation provided priorities assistance in obtaining production materials for the manufacture of products other than Class A and Class B products under the Controlled Materials Plan. Its limitations were double-posted for public notice in the

following warning: "A manufacturer of a Class A or Class B product cannot use this regulation to get priorities assistance to buy production materials needed for the manufacture of a Class A or a Class B product."

Under Priorities Regulation No. 11B manufacturers of "unclassified products" were given an avenue of approach to needed priorities assistance through a single application form (WPB-2613) on which they could state their production requirements and receive procurement authorization, together with an authorized production schedule. The regulation was never widely used. It did not grapple with the far more important problem of the non-controlled material requirements of the CMP producer, which to the end of the war were subject to the whims and vagaries of the independent material allocation systems.

Even casual review of the conditions of production and distribution made it clear that the CMP technique as applied to steel, copper, and aluminum was not appropriate for many of the other materials in short supply. Mica affords a good illustration of a situation in which the CMP technique would be inappropriate. Mica differs from the controlled materials in the character of its production, its normal methods of distribution, and in the way in which it is used in the manufacture of end products. Very little of the domestic mica requirements is produced in United States territory. Imports from India are the principal source of supply, supplemented in small measure by production in the United States and imports from other countries. There is, therefore, no set production schedule such as is available for steel or copper or other materials for which the domestic supply constitutes the basic source. In normal times, most of the mica imported into this country is fabricated in the detail which will be required by the user. Under wartime conditions, a substantial quantity of mica was imported raw and further fabrication was carried on in this country. Because adequate fabricating facilities did not exist at the outset of the war, a large expansion program was undertaken, principally through government financing, which resulted in a processing situation substantially different from that in most other materials. As a result of government intervention, there were fewer fabricators than might have developed in a normal competitive situation and both the input and output of material could easily be made subject to detailed control.

Another feature which distinguished mica from the controlled mate-

rials was the fact that practically no finished product was made of mica. The material was used almost entirely as a supply or component in the fabrication of other items. For the most part, mica parts represented an insignificant portion of the total value of the electrical or electronic products in which they were incorporated. In addition, the handling of mica was highly specialized; the firm delivering the final product in which the mica was incorporated usually either had a separate department in which the mica parts were fabricated or relied upon outside sources.

Under these conditions of production, practically all mica was used in a few specialized outlets and there was little knowledge of or interest in it on the part of deliverers of finished items in which the mica assembly was incorporated. To adopt the CMP technique in this case would have meant including minute requirements for mica as shields, resistors, and similar products in contracts for the ships, planes, and other end items in which the mica-bearing assembly was finally incorporated. In such a mass, the mica detail would have been extremely small, a cumbersome appendage to the total scheme for the accumulation of requirements and distribution of allotments. It was much more economical to handle mica through a horizontal allocation system in which the basic material was distributed to the few places in which it was normally fabricated.

This situation represents the extreme opposite from that in materials such as steel, copper, and aluminum. However, the problems of most other materials bore a stronger resemblance to mica than they did to those involved in the three basic metals under the *Controlled Materials Plan*. On the whole, the decision not to carry out the original projection and bring them into the CMP system was a fortunate development, although as an administrative decision it was never clearly formulated, was influenced by the wrong pressures, and never came to grips with the important underlying issues. The consequent failure to frame an integrated control complementary to CMP—and the concurrent laxness in permitting the continuance of assorted material-control procedures which interfered with and often vetoed CMP decisions—was a serious management mistake.

CHAPTER X

LUMBER

REVIEWED in the context of other wartime controls over the distribution of individual materials, the history of lumber stands among the more successful examples of government management in the national emergency. If some of the administratively simple allocation systems for special products with a small number of producers and consumers are eliminated from the comparison, the history of lumber, particularly in its later stages, offers probably the best example of the development, installation, and management of a complex material distribution control system.

A good part of the credit for this performance must go to the fact that lumber became critical later in the war than most other basic materials. But the willingness of the top staff of the Lumber Division, as well as the planning and policy-making personnel of the War Production Board and the procurement and distribution personnel of the military agencies, to lean on experiences of success and failure in related control problems for other materials was almost unique. Those responsible for controlling other materials had the same historical patterns available for study; in most such instances, however, it was necessary to repeat the earlier mistakes and learn the lessons of administrative effectiveness anew for every material. In lumber this dismal pattern did not prevail.

The early wartime history of lumber was graphically described by the chairman of the War Production Board, Mr. J. A. Krug, in his final report:¹

From the start of the defense program through 1942, forest products were commonly regarded as a great reservoir which could be drawn upon almost at will and in any quantity to meet expanding requirements. When critical shortages developed in other materials—notably the metals—wood, in one form or another, was seized as a substitute. Wood boxes and paper were enlisted for agricultural packaging when the burlap supply from India was cut

¹ *Wartime Production Achievements and the Reconversion Outlook*, October 9, 1945, Government Printing Office, Washington, D.C.

off; tight cooperage took the place of metal drums in many special uses; timber replaced steel in small, fast marine craft such as subchasers and torpedo boats; construction designs were changed to specify timbers rather than steel for the long beams and arches over plant floors, for bridge members, and for river barges and radio towers; experiments were made looking to the use of veneer and plywood in large quantities in place of the then-scarcer light metals in gliders and in trainers and transport planes.

The huge military construction program which began directly after Pearl Harbor was handled with comparative ease, feeding generously from the fat inventories (well over 6 months based on 1941 usage) held by the lumber industry when the deluge of orders descended. At the same time, many lines of civilian activity, such as furniture manufacture, which depended upon wood as their major fabricating material, were even permitted to expand.

The impression that lumber would continue to be available in any needed amount for any war purpose, and that it also could serve as a substitute for the more critical metals, was shared by the War Production Board and industry alike. Production had expanded from its peacetime level of 26 billion feet (the 1935-1939 average) to 36 billion feet annually in 1941 and 1942, a gain of around 40%. There were 17 billion feet in the hands of mills and yards at the time of Pearl Harbor. Although roughly 6 billion feet of this inventory was worked off in 1942 to carry the initial cantonment construction program along with virtually unrestricted civilian use of the same softwoods, few persons inside or outside the government were alarmed.

The wartime lumber shortage was the direct result of the unprecedented demand. Unlike metal, wood was not used primarily as a direct production material in the manufacture of guns, tanks, planes, and other weapons. It was easy, therefore, to overlook the significance and magnitude of indirect military demand for lumber which might result in an excess of demand over supply. In each of the three major uses of lumber—as a shipping material, as a production material, and as a construction material—the ultimate impact of military demand was massive. Since the greatest demand—as shipping material—did not become apparent until production reached its highest level and large quantities of materiel were ready for overseas transfer, the existence of a critical problem in lumber was not recognized until late in 1943.

Weapons and machines must be transported from the plants which produce them to the area in which they are used. Before the final assembly of this equipment by the prime contractor for delivery as a finished product, a greater and more important freight movement occurs. Production materials such as steel, copper, and aluminum, as well as

fabricated components such as forgings, electrical devices, and engines, must move up the industrial chain from mine and mill through component manufacturers to final assembly plants. Each of these steps requires shipping lumber for boxing and crates, and for skids, blocks, shoring, and dunnage. One measure of the increased demand for lumber for these purposes is provided by the rise in manufacturing activity during the war period. The total value of manufacturing output was estimated at 94 billion dollars in 1941, 121 billion dollars in 1942, and 148 billion dollars in 1943. Since these figures include the value of shipments of components as well as end products, they are adapted for analytical use in appraising requirements for shipping materials.

Of even greater importance than the increases in total shipments were the changes in the types of products shipped. While total shipments went up almost 60 percent in this three-year period, shipments of durable goods increased by almost four-fifths, with non-durables rising less than one-third. Since the quantity of lumber used for wooden shipping containers and dunnage is greater for durable than for non-durable goods, the total demand for lumber for use as shipping material actually rose faster than total industrial output.

Another factor serving to increase the quantity of lumber used per dollar of shipments was the unusually high proportion of industrial production prepared for overseas transport. Additional quantities of lumber were required for dunnage of ship cargoes, as well as for special crating of export goods. Part of this demand derived from the movement of troops and their equipment to foreign theaters. It was estimated that about 50 board feet each month were required to keep an overseas soldier supplied, and about 10 times that quantity to ship his original equipment from the United States.

The end product of these factors is indicated by the direct measure of lumber consumed as shipping material. While approximately 5½ billion board feet of lumber were used for wooden shipping containers and dunnage in 1941, consumption in 1942 reached 9½ billion board feet and jumped to 16½ billion in 1943.

Despite the widespread use of lumber as a production material, the aggregate quantity consumed in the manufacture of fabricated wood products is not the most important part of total lumber consumption, even in peacetime. During the war, this use of lumber in fabricated prod-

ucts experienced a relative decline. Furniture, caskets, machines, and vehicles, together with all other end products made either entirely or partly from wood, resulted in aggregate consumption of only slightly more than 4 billion board feet in each of the years 1941 to 1943. The high utility of most of these products, and their importance for essential civilian and military purposes, indicated that a planned further reduction in consumption in this area would cause a serious loss to the war-supporting effort while contributing little to relieve the drain on total lumber supply.

Construction is the principal normal use for lumber. Aggregate consumption of lumber for construction uses, both civilian and military, amounted to some 27 billion board feet in 1941, 28 billion in 1942, and 17 billion in 1943. These totals include the lumber necessary to maintain domestic manufacturing plants, railroads, utilities, and farms, together with all the other industrial enterprises participating in America's war effort.

In addition to these uses of lumber, there were a number of miscellaneous but highly essential uses, such as for export under the Lend-Lease program and for repair and maintenance of civilian dwellings. On balance, demand aggregated not less than 35 billion board feet annually during the war. These requirements included only those derived from essential needs, all related directly to military uses or to the continued functioning of the industrial economy. They did not include the non-essential demand cut off by successive WPB limitation and conservation orders. A review of wartime lumber supply in the light of a demand of this magnitude provides a measure of the lumber distribution control problem.

Along with other raw material producing industries, the lumber industry was forced to operate in the war years under the handicap of general labor and equipment shortages. The situation was aggravated by a significant movement of labor from logging and sawmill operations to higher-paid jobs in other industries. Despite these difficulties, total production reached 36 billion board feet in both 1941 and 1942. Increasing production difficulties in 1943 forced total output down 5 percent to 34 billion board feet, with the outlook at that time for continuation of the downtrend.

Despite the high production attained in 1942 and 1943, demand in

those years exceeded production to such an extent that lumber stocks in the hands of mill and concentration yards and wholesale and retail distributors dropped 10 billion board feet (from 17 to 7) from the beginning of 1942 to the end of 1943. At that level they were close to the minimum essential for efficient distribution operations.

Any attempt to appraise the problem of establishing controls over the distribution of lumber must start with an understanding of the existing business structure for lumber distribution and consumption. This structure is composed of over 31,000 sawmills; some 25,000 retail, wholesale, and "concentration yards"; 20,000 manufacturers of wood products; over 75,000 consumers of box and crating lumber; and countless thousands of other customers including utilities, railroads, and construction contractors, to which should be added millions of farmers, homeowners, and other small consumers. Sawed lumber is distributed directly to consumers and also through a system of lumber yards. Approximately 450 concentration yards receive the output of mills; sort, grade, and season the lumber; and distribute it to 1,000 wholesale and 22,000 retail yards and to consumers.

At an early stage in the war, the line of growth of lumber distribution controls split into at least five directions, reflecting the complex and different conditions of production and distribution. One is illustrated by the controls established over imported woods, all of relatively minor importance quantitatively, but of considerable significance at certain key points in the war program. The growth pattern for administrative direction over foreign woods followed a simple three-phase history: (1) loss of, or maintenance of only a hazardous contact with, principal sources of supply; (2) drastic limitation of shipping space to bring in foreign stocks; (3) issuance of WPB control orders prohibiting virtually all non-military consumption.

Among the first imported woods to follow the pattern was mahogany. Order M-122, issued in February, 1943, prohibited the use of "war-use" (better grade) mahogany except in plywood and parts for aircraft (about 38 percent of consumption), boats and ships (almost 62 percent of consumption), and in insignificant quantities in patterns and models for the manufacture of products bearing AAA or AA-1 preference ratings.

In the early stages of the control, two difficulties arose. First, South

American sawmill capacity was not great enough to permit the shipment of lumber rather than logs. Many of the logs received in this country produced lumber only half of which was suitable for war use. The balance was therefore available for use as furniture, instrument cases, and similar non-essential purposes. An attempt was made to resolve this difficulty by minimizing the importation of logs so that the limited shipping space available to mahogany might be used more efficiently. The second problem related to the distribution of war-use mahogany within the United States. Lend-Lease requirements, generally satisfied directly from South America, presented no control problem. The early domestic control, however, permitted manufacturers to accumulate unnecessarily large inventories, thereby contributing to maldistribution. This situation was dealt with by freezing stocks and imports, and centering control in the Lumber Division over all transfers to intermediate or final consumers.

The importation and use of balsa presented a problem similar to mahogany. Production of this wood is confined to tropical South America, and almost entirely to a single country, Ecuador. The Board of Economic Warfare established a purchasing system functioning through six importer-agents. Balsa of the lowest weight per cubic foot was used by the British for combat planes; the American use for this weight was principally in flotation devices. Domestic use of balsa of all weights was limited by order M-177 to flotation devices, aircraft and ship uses, and gyroscopic equipment. In the early phase of the control, the Lumber Division received a copy of a BEW report listing each import by ultimate receiver, weight, and specifications. This permitted further investigation of imports the use of which was doubtful or unknown.

Several other foreign woods imported in relatively small quantities were also controlled in substantially the same way. The three principal species were teak, rattan, and lignum vitae. All inventories of teak were brought into the hands of the Navy. Order M-248 prohibited the use of rattan except on war orders. Lignum vitae, imported from South America, was used solely in ships for stern tube bearings.

The second line of early control development was that worked out for aircraft lumber (principally western softwoods: Sitka spruce, Noble fir, western hemlock). The special characteristics of producers and consumers of this type of lumber made the control of its distribution rela-

tively simple. For the same reason, however, the possibilities of extending a parallel technique to other woods were limited.

The production of aircraft lumber required top grades of logs and skilled sawing. To secure this performance in production, the Lumber Division, through its Western Log and Lumber Administrator at Portland, Oregon, allocated the supply of logs of Sitka spruce, western hemlock, and Noble fir to sawmills and directed sawmills' shipments. Any sawmill desiring to cut lumber from these types of log filed a monthly allocation request with the Western Administrator. The applications reported consumption during the preceding month, and estimated consumption during the current month and for the next three months; production of lumber by grades; unfilled orders showing purchase and delivery schedules; and end-of-month log inventories. On the basis of these applications, the Western Log and Lumber Administrator allocated the output of specific producers to the sawmills.

Distribution of aircraft lumber by sawmill operators was also controlled by the Western Administrator through monthly shipment directives. An audit system was provided by a regulation requiring each of the approximately 55 sawmills receiving allocations of aircraft logs to send a copy of every shipping invoice for aircraft lumber to the Western Administrator.

A third line of control development was characterized by the techniques worked out for plywood and veneer. The two types of plywood, softwood and hardwood, differ markedly. Softwood plywood is produced by a relatively small group of plants located in the West Coast states. Its wartime quantity uses were for military housing, pontoon bridges, ship interiors, packaging, and lifeboats. Hardwood plywood and hardwood veneer (single layers of ply; there is a substantial use of individual sheets of hardwood veneer) were manufactured in a number of plants, both large and small, some independent and others captive to such industries as furniture. Hardwood plywood and veneer found wartime uses in combat and aircraft ships, landing craft and torpedo boats, furniture, and shipping containers.

The early distribution history of softwood plywood was marked by assistance for the more important direct military uses through the preference rating machinery. Priorities were issued by the military agencies and the Industry Divisions of the War Production Board. As in so many

other instances in which the priority power was freely granted to independent agencies and industry divisions, the Lumber Division of the War Production Board could not exercise any over-all integrated control. Widespread substitution of softwood plywood and other materials, often without regard for its more appropriate uses, failure to screen requirements for its more important uses, and the absence of any procedure to provide a systematic review of orders on the books of producers resulted in the accumulation of serious backlogs. By late spring of 1943, approximately 90 percent of manufacturers' shipments were being made on orders rated AAA and AA-1, while 98 percent of new orders bore AA-1 preference ratings.

Early in the war the Lumber Division made several attempts to allocate logs to specific plywood manufacturers and to institute an allocation system for all softwood plywood. There was general opposition to such a program by the military services, for reasons parallel to those which supported the opposition to the introduction of the Production Requirements Plan: fear of the transfer of authority into the hands of a civilian agency. The increasing pressure on producers' backlogs, the steady deterioration in the significance of preference ratings as applied to softwood plywood, and the growing volume of upset production schedules resulting from the failure to secure delivery for the most important uses finally forced the acceptance of a total allocation system. The administrative aspects of this system were relatively simple, inasmuch as the allocation machinery covered only 33 manufacturing establishments serving less than one thousand different consumers.

As in the case of softwood plywood, hardwood veneer started its wartime distribution history under the impact of preference ratings which were extended to the manufacturers of hardwood plywood by the producers of end products. The supply-demand balance, however, was considerably more favorable and it did not prove necessary to move into an allocation system. The pressure on producers was eased at least to the balancing point through efforts to limit the quantities of plywood going into non-essential uses.

The control problem for hardwood lumber, which illustrates the fourth line of control technique development, was more complex. A large number of species are included within this general category, each with special characteristics which make its use attractive for certain pur-

poses. The production of each individual species is relatively small, as is total hardwood production when compared with total production of softwood. The principal wartime uses of hardwoods were in construction, mine supports, ships, aircraft, vehicle bodies, tool handles, gun stocks, textile machinery parts, and shoe lasts. Over-all war distribution of hardwood lumber was substantially in the following pattern: factory use, 34 percent; box and crating, 30 percent; civilian construction (chiefly railroads and defense housing), 19 percent; and military construction and Lend-Lease, 8 percent.

The early approach to the control of distribution of hardwood lumber was through preference ratings. For a time, the Lumber Division attempted to discourage it, but was finally compelled to begin issuing preference ratings in order to regain some control over distribution. Preference ratings for hardwood lumber were being issued by the military agencies and by some of the WPB Industry Divisions. Sawmills found it necessary to establish a rating pattern for their shipments in order to qualify for assistance in procuring maintenance and repair materials. Only by issuing ratings, therefore, could the Lumber Division secure delivery on orders which it judged to be essential.

The net result of this development was a familiar one: the race of preference ratings for the highest category. Full control could not be exercised by the Lumber Division while the authority to issue ratings without quantitative restriction was retained by other divisions of the War Production Board and by the military agencies. Hardwoods, therefore, continued to be procured with preference ratings for uses which the Lumber Division often appraised as non-essential. Preference ratings assigned under the Controlled Materials Plan for fabricated products and non-controlled materials were often high enough to procure lumber in large quantities for relatively non-essential uses. One of the more serious situations of this type was created by the issuance of a CMP preference rating for a production schedule requiring only a small allotment of steel for nails or metal cleats, but a substantial quantity of lumber procurable with the high rating. This type of activity continually negated the pattern of essentiality established by the Lumber Division.

With production in from eight to ten thousand small mills, located throughout the United States east of the Rocky Mountains, the establishment of a distribution control starting at the mill was most difficult. The

condition existing in the spring of 1943 was one of drift. The Lumber Division assumed no responsibility for the positive direction of the movement of hardwood. This inertia permitted, in fact required, the Central Procuring Agency² of the military services to exercise positive control. Enforcing no conscious direction over the distribution of hardwood lumber, and lacking information on the character and location of consumption, the Lumber Division was in the position of observer rather than of responsible controlling agency.

The two early orders relating to hardwood were M-209, governing white oak, and M-279, governing yellow poplar. The principal objective of the first was to make certain that white oak logs suitable for use in ships were not cut into veneer. The principal objective of the latter order was to assure that yellow poplar logs of aircraft grade should be processed only to make aircraft veneer or aircraft lumber.

The chief control problem of the Lumber Division was softwood lumber, the production of which accounted for five-sixths of total output, and the uses of which mounted into the thousands. In 1942, almost 75 percent of the consumption of softwood lumber was in construction, another 20 percent was for box and crating, and the balance was consumed in the manufacture of wood products. In 1943, consumption for box and crating mounted sharply, the curtailment being absorbed largely by civilian construction. One other complicating factor was introduced by the widespread production of softwood lumber in almost 30,000 sawmills, many of which were very small and produced only a few inferior grades.

The softwood control problem made its appearance as both a general problem and a series of special problems. Aircraft lumber was predominantly softwood. Douglas fir, the chief all-purpose wood, was in demand for aircraft lumber, ship decking, marginal planking, pontoon lumber, softwood plywood, and other high-stress requirements. By early 1943,

² The Central Procuring Agency was created on September 1, 1942, to centralize purchasing of lumber for the War and Navy Departments, Maritime Commission, and Defense Plant Corporation. The principal reason for its organization was to cut through the confusion created by the uncoordinated and competitive purchasing of construction lumber by the various service arms. As its operating experience developed, CPA's responsibility was extended to cover the procurement of lumber for any purpose in which any of the competing services was concerned. The Central Procuring Agency made no accounting to WPB for its purchases. Inevitably, the growing strength and responsibility of CPA sapped the control authority of the Lumber Division.

requirements for this species were so large that the substitution of structural steel for Douglas fir was being encouraged—a total reversal of the 1941-42 line of material substitution. Douglas fir and the other western softwoods were also in demand for shell and ammunition containers. The lower grades of western softwoods and the eastern softwoods, principally yellow pine, were in demand for construction purposes, for containers, and for general manufacturing uses. In dealing with these diverse control problems, the Lumber Division attempted to distinguish between the special and general uses of softwoods.

The first control over Douglas fir reworked the now-familiar pattern. Order L-218 provided unlimited procurement authority for the Central Procurement Agency of the armed services and its designated contractors. All other distribution was subject to special authorization by the War Production Board. This was one more example of abdication by the Lumber Division and the transfer of the reality of control to the Central Procuring Agency, the actions of which were uncontrolled and largely unreported.

Increased buying pressure on softwoods, induced particularly by the control over Douglas fir distribution, led to the issuance of the western lumber order, L-290. Under this order, the larger producers of the controlled species (production in excess of 10,000 board feet daily) were prohibited from shipping to any purchaser except to or for the account of the Central Procuring Agency, one of its designated contractors, to or for the account of other government agencies, or on special WPB releases.

The order accomplished for western softwoods what L-218 had done for Douglas fir. The military services were given unrestricted procurement authority; civilian users were compelled to apply to the Lumber Division for individual authorization of purchase orders. The net gain was in two parts: first, the elimination of non-essential civilian uses through screening of individual applications; and second, the prevention of the indiscriminate issuance of rating authority by the industry divisions of the War Production Board. The philosophy underlying the action assumed that the elimination of clearly non-essential civilian uses would provide enough western lumber for all other wartime needs. The order did nothing to bring the reins of control within the grasp of the Lumber Division.

Because of the relatively wide range of substitutability in lumber, the successive imposition of controls over species preferred for military purposes threw heavy residual pressures on the remaining species, and principally on yellow pine, by far the most important quantitatively. Here finally was felt the mounting pressure of requirements for containers, general manufacturing uses, and civilian construction.

The first move toward easing the pressure was the issuance in January, 1943, of M-208, establishing a special rating system for non-preferred uses of lumber. Preference ratings were assigned to itemized uses of lumber, with a ceiling at AA-2X. Inevitably, the scheme did not work. Military and Lend-Lease ratings, and ratings issued under CMP for fabricated products and non-controlled materials, almost uniformly outranked M-208 ratings. And beyond this difficulty was the underlying objection to the course of action pursued by the Lumber Division in most of its other control actions—unlimited authority to assign ratings was retained by the military agencies and by WPB's industry divisions. Within the self-imposed limits of this situation, the Lumber Division could act only in terms of expediency. It was ignorant of the consumption of softwood lumber for each class of use and was compelled to rely on estimates prepared by the Forest Service, which at best were crude approximations in terms so broad as to be useless for purposes of over-all allocation.

This was one of the most serious handicaps to the growth of an integrated lumber distribution control system. Beginning with the early summer of 1942, the Lumber Division repeatedly requested the claimant agencies to submit requirements for lumber, showing the types, species, grades, and sizes needed. No satisfactory requirements data were submitted by any claimant during the balance of the year. It was not until well into 1943 that the division was able to assemble relatively complete and comparable statements from the principal claimant agencies. Even at this point, there was no way to test the validity of the stated needs.

There were a number of obstacles to the compilation of a complete statement of requirements. Outstanding among them was the argument among and within the claimants' organizations with respect to the size of their real lumber needs. This argument was a reflection of the early neglect of lumber as a significant war material, rapid changes in the

magnitude of requirements, and the failure to build trained staffs capable of making the translations necessary to compile reasonably accurate requirements estimates. A second obstacle was the absence of clearly defined areas of responsibility for the presentation of requirements. Probably the most obvious and difficult problem was presented by containers. The Containers Division of the War Production Board was asked to act as claimant for part of the supply of lumber, but no agency was in a position to estimate its requirements of containers. Nor could an intelligent judgment be made by the Lumber Division with respect to the appropriate division of responsibility for presentation of requirements by the military agencies. Finally, there was no direct connection established between the presentation of requirements estimates and the actual procurement of lumber. The agencies which were called upon to submit requirements did not themselves directly control the procurement of the total quantities for which they were standing as sponsors. This relationship tended to make it difficult to estimate requirements, to define areas of responsibility, and to compel the claimants to present such estimates promptly.

In the absence of the presentation of direct requirements estimates by the claimant agencies, an effort to forecast lumber consumption was made by the Forest Service of the Department of Agriculture in cooperation with WPB's Statistics Division. These estimates divided anticipated consumption between hardwoods and softwoods and for each of these classifications among direct military use, indirect military use, and civilian use. The estimates were prepared carefully, based on lumber content factors tested by the Forest Service over a period of years. Necessarily, however, they were derivatives of other programs. For example, box and crating needs were estimated on the basis of future production goals and anticipated shipments of munitions and other products; while construction needs were based on the anticipated construction program. Framed in this way, the data clearly departed from reality and, however carefully assembled, were bound to contain substantial errors. In addition to these difficulties of forward estimating, it was impossible to check the forecasts by actual experience. No complete reports on the consumption of lumber were available except for aircraft lumber which represented a very small percentage of total use.

The adoption of the Controlled Materials Plan as the principal metal

allocation system inevitably led to its consideration for lumber. The CMP technique, however, required that material be identified with its immediate and ultimate use and associated with the end use of the final product in which it was incorporated. This was workable within the CMP framework because the controlled materials were almost universally purchased for particular production purposes and ordered in terms of weight, size, and composition specifications. Lumber, on the other hand, was used in large quantities for boxing, crating, dunnage, shoring, maintenance and repairs, and a multitude of other uses for which exclusive and individual purchase specifications were not essential. Consequently, it was concluded that any effort to saddle the industrial system with an unrealistic and unworkable end-use system within the framework of flexibility in application which characterized lumber utilization would be likely to fail.

A different and potentially more serious problem was presented when consideration turned to the character of lumber producers and consumers as contrasted with the producers and consumers of the three major controlled materials. It was recognized that it would be difficult to establish full control over the output of the 31,000 sawmills, most of which were extremely small and located in remote places. These small mills could not be expected to provide detailed reports on shipments and unfilled orders parallel to those supplied by the steel, copper, and aluminum mills. It was agreed at an early stage that control of lumber at the mill shipment level could be extended only to those species produced by a relatively small number of mills, each one of which was large enough to maintain records of shipments and to receive and summarize allotments appearing on consumer purchase orders.

This type of control was imposed in 1943 on the producers of western softwood and softwood plywood. A large part of the over-all lumber problem, however, centered in woods which could not readily be controlled in this way, especially the southern and eastern pines, the species of lumber produced in the greatest quantities and by the largest number of mills.

By late 1943, the type of control represented by the orders governing the principal hardwood and softwood species had become inadequate; it failed to provide the management tools required to deal intelligently and efficiently with current problems. Outstanding preference ratings

were in excess of supply, and control through the priority system was breaking down. This situation paralleled in a dramatic way the conditions governing the distribution of metals in 1941 and early 1942. The most important consumers of lumber were free, under the existing orders, to procure and consume without direct quantitative control over their actions. Other essential uses were handled on a day-to-day basis without reference to the total supply-demand balance as the basis for approval or disapproval of individual requests. There was no opportunity to appraise one application against another in terms of available supply and the needs of alternative users.

The administrative problem, following the inexorable pressures of wartime demand, had progressed from disorder through confusion to chaos. In terms of even minimum estimates, military and essential civilian requirements were in excess of probable supply. But complete, detailed, and reasonably valid requirements statements had not been submitted to the Lumber Division. The Division had no practical working control over procurement. The military services were permitted to buy as much lumber as they wanted, without restriction as to species or grade. The WPB industry divisions were generally free to assign preference ratings good for quantitatively uncontrolled lumber procurement. Important non-military and military-supporting uses, such as containers, agriculture, railroads, and housing, were at a disadvantage relative to the dominant procurement position of the military agencies. This situation was made progressively worse by the Lumber Division's policy of rescuing endangered military requirements by the issuance of orders which denied all lumber to non-military uses except through specific application and release. Under this policy, there was no assurance that essential civilian uses would receive even their minimum requirements. For the military agencies, the Central Procurement Agency performed a large and expanding function with ultimate responsibility for the procurement of lumber for any use in which its sponsors were interested. A necessary concomitant of the power of the Central Procurement Agency was the administrative weakness of the Lumber Division. It was a source of power for CPA, but its grants of management authority were issued as blank checks which were always covered by restriction of other procurement. Since a large part of the demand for lumber not provided for by CPA procurement was of indirect military significance—as in con-

tainers, reels, matches, and wood products—the unrestrained purchasing activity of the military often was the source of their own troubles. Beyond all else, the heart of the problem lay in a conflict of management philosophies. The personnel of the Lumber Division had generally accepted its function to be the expediting of military requirements rather than the administration of the distribution of total lumber supply to all claimants.

To deal with this situation, a wholly new approach was made to the problem of administrative control. An allocation mechanism was designed to assist the War Production Board to program the distribution of lumber supply in an orderly manner by directing available lumber to the most essential of the conflicting demands. The control system provided for a quarterly summation of the requirements of all important consumers, and a balance of total requirements against total anticipated supply for the same period. Once a decision was reached on the quantity of lumber to be allocated to each competing demand, individual consumers within each demand area were authorized to receive lumber in accordance with the over-all program determination. Inasmuch as potential lumber users ranged from the individual householder purchasing a few board feet to repair his fence to the industrial concern using a million board feet each month to crate manufactured equipment, a number of different procedures were established, each adapted to the segment of consumption and the individual consumer to which it related.

It is interesting to note that even at this late stage in the development of industrial controls, the institution of an over-all integrated system was strongly resisted. There was a recurrence of the familiar disinclination to accept and apply the lessons learned in handling other material problems. The marked difference in the ultimate efficiency with which lumber was distributed can be traced in large measure to the wholehearted support and vigorous administration won for the control plan finally adopted.

The lumber control established by Order L-335 in the spring of 1944 governed all lumber except certain species and grades subject to established administrative procedures.³ Under the terms of the control plan,

³ Principally aircraft grades of Sitka spruce and Noble fir, shingles, lath, railway and mine ties, hardwood flooring, and log segments produced for conversion into veneer.

industrial users of more than 50,000 board feet per calendar quarter made application to the War Production Board for authorization to purchase. The application form called for a reporting of past and anticipated quarterly shipments of all products (made of wood or not) made in each "inventory accounting unit" of each manufacturing plant. Shipments of fabricated wood products were further analyzed by preference ratings so that the importance of the products themselves could be appraised and the volume of their output controlled through lumber authorizations. Purchase requirements were submitted in species and thickness detail for softwoods, and species and grade detail for hardwoods. Applicants also reported consumption by species for the preceding calendar quarter and end-of-quarter inventories. This group of industrial users accounted for the bulk of the total lumber needed for wood-product manufacture, shipping containers (produced in both commercial and captive plants), and dunnage. Each military and export agency filed a master application for its total calendar quarter requirements of lumber to be purchased for its own account.

Small industrial consumers (using less than 50,000 board feet quarterly) were authorized to receive lumber without filing individual applications. The purpose of this provision was to minimize the volume of paper coming into Washington and to provide a simple procedure for the large number of consumers who used lumber in limited amounts. These small industrial consumers were authorized to place "certified" orders for quantities necessary to carry out production schedules authorized under the Controlled Materials Plan or any other regulations of the War Production Board.

Certain large industrial users whose quarterly lumber consumption was generally known and stable were authorized to procure lumber on the authority of the basic orders or certifications governing their operations. Included in this group were the mines and smelters operating under Order P-56, petroleum companies operating under Petroleum Administration Order No. 11, and construction jobs authorized by the War Production Board or other federal agency. Farmers were authorized to buy lumber by authorizations issued through local offices of the War Food Administration. The War Production Board made available a quantity of lumber for farmers which the War Food Administration

divided among its local offices. The County War Board offices authorized individual farmers to purchase lumber under quotas established for each office.

All buyers in the foregoing classes defined their purchase orders as "certified orders," thereby informing their suppliers that the consumers were authorized to receive the lumber ordered. Such certified orders received by retail and wholesale lumber distributors were extendable to the sawmills. In this way, each lumber dealer was permitted to purchase and make available to his customers or replace in his stock that quantity of lumber which the customers were authorized to buy. At the same time buyer-seller arrangements were largely maintained, together with the advantage of a continuance of the competitive relationships of the lumber market. The control was made complete by a prohibition of sawmill deliveries except on certified orders.

No preference ratings for lumber were issued under the control plan. In the words of the order:

If a consumer has a rating to get production materials for a product, he may continue to use that rating to get lumber to be incorporated in the product. If a consumer has a rating . . . to get lumber for maintenance, repair, or operating supplies . . . he can also continue to use that rating to get lumber for such purposes. A consumer who does not have a rating but needs one to get lumber may get it in the same way as a rating for any other material (except in the case of farmers who get a rating through the War Food Administration).

The control provided both the information and the administrative machinery required to balance supply and demand each calendar quarter, to cut back less essential requirements to the extent necessary to satisfy more essential needs, to justify the cutbacks by reference to the more important claims against available supply, to distribute procurement authorizations to individual consumers within the over-all pattern established by Requirements Committee determination, and to assure the orderly distribution of lumber from sawmill to ultimate consumer so as to secure the most effective utilization of all types of lumber for the total war program. In the application of the control, the total quantity of lumber for which certified orders could be placed was limited to total supply. Each lumber user had reasonable assurance that the quantity of lumber he was authorized to receive during the succeeding calendar

quarter actually would be delivered. Integration of the machinery with other WPB controls provided for the distribution of lumber to authorized programs in such manner as to support levels of production for which other critical materials had been allocated.

Probably the most important change introduced by L-335 was its organization of a new philosophy of distribution control. From the beginning of the war production drive until the spring of 1944, military procurement of lumber had been free from all restrictions. The policy of the Lumber Division, expressed in all of its limitation and conservation orders, had been to facilitate every direct military need, without review of its urgency or of the impact of unlimited military purchasing on other lumber requirements, many of which had an important relation to the fulfillment of military programs. The net effect of this policy had been to lodge in the hands of the Central Procurement Agency acting for the military services whatever measure of control existed over lumber and to leave a minimum of residual authority in the Lumber Division of the War Production Board. Order L-335 accomplished a complete reversal of this position. Allocations of specified quantities of lumber were made to the military agencies. Indirect military requirements were given adequate protection within the limits of anticipated supply, as were export and essential domestic civilian needs. Artificial deficits, created by the common practice of multiple placement of purchase orders, were removed. And above all, the focal point for control, together with responsibility for its administration, was reassigned to the War Production Board, the only effective source of management for an integrated control system.

Perhaps the best appraisal of the operating value of the new control plan was expressed in the final report of the Chairman of the War Production Board:

The system was effective in channeling lumber to direct and indirect military and essential civilian uses, and was sufficiently flexible in operation to deal equally well with the rapid decline in requirements during the fourth quarter of 1944 and the abrupt upswing in the first quarter of 1945. Mill and yard stocks, which had been drained to dangerously low levels, were stabilized. Inventories of industrial consumers were reduced (from over 60 days' supply to 54 days') without disrupting their operations. Duplication and pyramiding of orders were eliminated. The services effected improvements in procurement, inventory control, and lumber utilization.

Under critical review, the debt of the lumber distribution control machinery to earlier material-control experience is abundantly clear. The recognition of the key position of the balance of total supply and total demand through the accumulation of valid requirements supported by past consumption and inventory data was a direct inheritance from the debate which prefaced the introduction of the Production Requirements Plan. The application form was an adaptation of PD-25A. It differed most significantly in that it recognized the validity of claims based on authorized production schedules and attempted to permit the War Production Board to channel an adequate supply of lumber to support such schedules, rather than permit a reappraisal of the importance of the products themselves, as was the case in the distribution of production materials. This was the reason for the different treatment of products made from wood. The concept of application by and authorization to each industrial consumer of lumber and treatment of direct military and export needs on a master application and authorization basis also followed the PRP experience. The decision to minimize the paper load for both manufacturers and the War Production Board stemmed from the PRP discoveries of the extent of concentration in industrial use of scarce materials. The care devoted to the organization of procedures and personnel to administer the control followed the failures of PRP and the successes of CMP in these important adjustments to effective management. The creation, installation, and auditing of allocation accounting systems in the claimant agencies and industry divisions were based on the parallel systems and experience developed under the Controlled Materials Plan. Above all, the understanding of objectives, techniques, and disciplines by the personnel of the military agencies, the War Production Board and industry—which more than anything else contributed to the successful operation of the control—grew out of the recent history of the Controlled Materials Plan. From the start, it supported confidence in the lumber control, minimizing or overriding both theoretical and practical objections. On its record, the lumber control is the best wartime example of the ability to learn from experience and to recognize the related character of technical administrative problems as they appear in new settings for different production materials.

CHAPTER XI

TIRES

WARTIME PROBLEMS of control for tires presented a number of features not common to other materials and products for which central administrative machinery was established; some of these characteristics were unusual to the point of uniqueness. The need for control was for a long time masked by the desperate military urgency of the synthetic rubber program. Failure to break through to a solution here might well have meant losing the war. Even after the massive technical difficulties had been overcome and after the rubber-making plants had been constructed and had entered in production, the approaching crisis in tires was not fully anticipated. It was the changing tactics and fortunes of war which built an Army and Lend-Lease truck program beyond the quantitative projections of the most ambitious schedule makers and then ran the tires off the trucks at the record-breaking depreciation rate required to maintain the Soviet supply lines, the Army Supply Force's Red Ball Express, and similar highway supply systems. Only at this point, late in the industrial history of the war (which, because of manufacturing lead time from raw material to end product and the time required to fill the endless supply "pipelines" of the global struggle, always antedated the military history by at least nine months), did the supply of tires, particularly in bus and truck sizes, appear as a major management task. And then, in the manner made familiar in so many other bottleneck crises, each step in the development of controls uncovered hitherto hidden shortages—of tire cord and carbon black, to name only two—in addition to the tire distribution and production control problems. These added difficulties made the administrative job more complex and forced the emergency shaping of control techniques in patterns which probably would not have been chosen if the corollary problems had been foreseen.

The rubber problem and the inadequate handling of it started long before Pearl Harbor. The Rubber Reserve Company was created in 1940

to build an emergency stockpile against the calculated contingency of the disappearance of Far Eastern sources of supply. Imports were lifted by 100 percent from the 500,000 long tons brought into this country in 1939. This was designed to create a stockpile. But the managers of the import expansion program did not restrain consumption, with the result that stocks were only slightly above normal when the Japanese struck. Emergency measures were introduced after Pearl Harbor and peak stocks were achieved in April, 1942, with holdings of over 600,000 tons. This was the precarious margin on which the safety of the nation rested pending the exploration and accomplishment of synthetic production, until then largely untested and with unresolved problems of mass production in plants still taking shape on the drawing boards of engineers. While the new industry was being created, emergency action was taken to maximize output from the meager rubber-producing areas still accessible. Non-essential consumption of rubber was eliminated and, outside the military reservation, essential uses were curtailed. The existing stock of the principal rubber end-product in use, automobile tires, was conserved through gasoline rationing and related actions. And steps were taken to enlarge the use of reclaimed rubber.

Within the synthetic program the conflicting considerations of techniques, processes, relative costs, alternative raw materials, scheduling of construction, requirements, and priorities of materials and components (which cross-cut military goals for other munitions items) were brought into focus in the summer of 1942 by the recommendations of the Baruch Committee. To carry out these recommendations, full administrative responsibility was delegated to a specially appointed Rubber Director. For the balance of 1942 and the greater part of 1943, all attention was concentrated on the building of a tremendous synthetic industry with a total plant expenditure of more than 700 million dollars.

While this was taking place, a complex of controls was erected over the distribution and use of both natural and synthetic rubber and their intermediate and end products. These were consolidated in the basic comprehensive rubber order R-1. Among the collateral conservation measures were the establishment of standards for recapping and replacement of civilian automobile tires, compulsory tire inspection, and nationwide enforcement of a thirty-five-mile-per-hour speed limit. At the same time, a rudimentary supply-requirements balancing procedure was in-

stituted by the Rubber Director, which looked to programing the production of end products and directing the distribution of the raw material to meet authorized production goals. Framed in a shadow-structure of the basic material-control system established by CMP, the first rubber distribution machinery attempted to deal with requirements by a series of allocations to claimant agencies. The clumsiness of such a procedure when applied to a material moving, for the most part, to end items which resembled the CMP B-products more than they did the A-products, induced its abandonment in favor of monthly consumption authorizations made directly to rubber product manufacturers for permitted uses. Authorization limits were determined by master production schedules for estimated end-product requirements roughly converted into rubber raw material requirements. It was against this background that the supply unbalance in tires suddenly obtruded itself.

The reasons why this unbalance failed to appear before the latter part of 1943 were almost all on the side of demand. Existing facilities and equipment in 1942 and early 1943 were able to process all the natural and synthetic rubber then produced and made available for tires. Civilian vehicles, both passenger and truck, had entered the war equipped with tires in relatively good condition, and under the rationing system all essential vehicles had been maintained in service with new tires. Military requirements were protected by priorities and were held at levels which did not tax operating facilities. By the middle of 1943, progress in the development of synthetic rubber indicated that the peak goals established for future quarters were attainable. At that time, the tire industry started a privately financed expansion program with an aggregate value of 100 million dollars. Within six months, however, it was clear that tire production facilities, particularly those equipped to produce truck and bus sizes, would not be able to serve future requirements. The military program for trucks requiring both new and replacement tires was mounting at a sharp pace. Requirements were concentrating in the larger sizes of tires which were more difficult to build and were produced less rapidly. It was in these sizes of tires that the existing production capacity was relatively small, because the pre-war pattern of tire demand was arrayed in size groups which reflected the dominant importance of the smaller truck and passenger automobile tires. Concurrently, two years' wartime rationing of tires to civilian buses and trucks was accumulating a bur-

den of undermaintenance which by the summer of 1944 would have to be supported by larger allocations.

The concentration of these inflationary factors of demand in the closing months of 1943 compelled recognition of the inadequacies of the existing distribution controls, which utilized the familiar device of military priorities. In December, 1943, an allotment procedure for tires was set up under the direction of the Office of Rubber Director. On the organization chart, this office was a part of the War Production Board, but the authority delegated to the Rubber Director was so great that the office functioned in actuality as an independent agency.

The tire allocation for the first quarter of 1944 presented one more example of the futility of issuing a policy decision without the pre-planning and pre-establishment of the machinery necessary to its execution. As the chairman of the War Production Board noted in his final report,

At that time, no effective mechanism had been set up for implementing the allotment decision, and the program was not successful. Military agencies in the first quarter of 1944 received only 75 percent of their allotments, while civilians received almost 125 percent. Pressures from the civilian economy for larger quantities of truck and bus tires were increasing, and in the absence of Government compulsion to adjust production patterns to include larger percentages of military types, it was difficult for tire producers to resist this pressure.

Veiled in the charitable language of a terminal report, this statement has a familiar undertone. In 1941 and early 1942, it was difficult for the metal mills to "adjust production patterns to include larger percentages of military" orders because they were under the pressure of their civilian customers to continue deliveries on a pre-war basis. The same characteristic inability of producers to adjust production patterns has also been noted in the wartime history of the lumber industry, the cotton textile industry, the copper industry, and, in fact, at any point in the production complex where the pre-war customer-supplier relationships first came into conflict with wartime derangements. The allotment decision represented policy in its purest sense, totally unrelated to execution. It was a perfect replica of the policy decisions handed down by SPAB in the autumn of 1941 and by the WPB Requirements Committee in the spring of 1942 when, in the absence of any administrative machinery for translating wish into actuality, a series of determinations on questions of the greatest impor-

tance bore little relation to the operating techniques then in existence and, even with a will to carry them out (which was largely lacking), could not have been executed in the terms in which they were handed down.

The failure to carry out the allocation pattern of the first quarter of 1944 in accordance with the program forced intensive study of ways and means of implementing an allocation policy for tires. The immediate action taken was described in the final report of the chairman of the War Production Board in the following language:

A control instrument was hastily drafted in January by the Office of Rubber Director and issued as Appendix IV to Order R-1. Its weaknesses were immediately apparent, and the chairman of the Rubber Requirements Committee appointed a task group representing the three largest claimants—Army, Navy, and ODT—plus representatives of the Office of Operations Vice Chairman and Office of Program Vice Chairman of WPB to revise it. The result was the amended Appendix IV, which came to be known as the Tire Allotment Plan.

The facts underlying this general descriptive statement illustrate in striking fashion the tremendous range of problems involved in executing a basic policy decision. For this reason, the original control scheme projected in the first issue of Appendix IV to R-1 is outlined in some detail below. The deficiencies of the tire control are only one example of the type of difficulty which constantly plagued the management of material distribution schemes in all parts of the Board throughout the defense and war periods.

The original issue of Appendix IV to R-1 was dated February 16, 1944. The order placed truck-bus, tractor-implement, and industrial tires under allocation and prescribed a procedure for the distribution of these products among claimant agencies on a quarterly basis. It took over the claimant agency concept of the Controlled Materials Plan, dividing the agencies into two groups. The first group consisted of the military claimants, defined as War Department, Navy Department, Maritime Commission, Aircraft Resources Control Office, and Foreign Economic Administration (separated into its two segments of Lend-Lease and Economic Warfare). All other claimants were defined as "indirect military claimants," including Office of Defense Transportation, War Food Administration, and Office of Operations Vice Chairman, WPB.¹

¹ The Office of Operations Vice Chairman, WPB, was designated as claimant for certain programs to the extent that they involved the manufacture of rubber-borne vehicles or

The plan provided that

two months preceding the quarter to be covered by allotments to the claimant agencies or on or before February 15, May 1, August 1, November 1, each producer shall submit by letter to the Office of Rubber Director forward estimates of his production for the quarterly period in each of the groups and sub-groups set forth in the following paragraph. In addition, each producer shall submit similar forward estimates of his production for the following three quarterly periods.

For purposes of production estimating and allotments, the plan divided the controlled tire categories into seven classifications of truck-bus tires, four classifications of industrial tires, and one classification of truck-implement tires. Two months before the quarter to be covered by an allotment, each claimant agency was directed to transmit to ORD its requirements for the coming quarterly period in terms of these tire categories. Requirements were to be further divided within each category as between original equipment and replacement needs.

On the basis of submitted requirements, the Office of Rubber Director proposed before the fifteenth day of the second month preceding the allotment quarter to allot to each claimant quantities of tires in each category. Five days after the receipt of its allotment, each claimant was directed to report back to ORD a breakdown for each category between original equipment and replacement tires. Within 10 days after the issuance of allotments to the claimant agencies, ORD would send to each tire manufacturer a production directive for the approaching calendar quarter. The directive would describe the percentage of each producer's facilities, identified by tire categories, to be allocated to the production of the following classes of orders: (1) vehicle manufacturers authorized by military claimant agencies; (2) replacement by military claimants; (3) vehicle manufacturers authorized by indirect military claimants; and (4) indirect military replacement.

For original equipment tires, the plan directed that

on or before the first day of the month preceding the quarter covered by its allotment, each claimant agency will, within its allotment, determine the

equipment for indirect military use. These programs included cranes, shovels, hoists, and drilling machinery; tractors and tractor equipment; other construction machinery; industrial equipment; safety and technical equipment; mining equipment; and off-the-highway vehicles. The Office of Operations Vice Chairman was also delegated claimant for replacement tires for off-the-highway vehicles and equipment.

number of tires by groups and subgroups which may be shipped to each of its vehicle manufacturers during the quarterly period, and will authorize each vehicle manufacturer in writing to accept delivery of a specified number of tires. No vehicle manufacturer may accept delivery of tires for his production of vehicles or equipment unless he has been specifically authorized to accept such delivery by the claimant agency.

The plan provided that a claimant agency might, at its pleasure, transfer all or part of its allotment of tires to the appropriate WPB divisions for distribution among vehicle manufacturers. If this were done, the WPB division "will issue authorizations in writing to the vehicle manufacturers under the claimant agency symbol."

Producers of tires were instructed to report to the Office of Rubber Director by letter, not later than the twentieth day of the month preceding the first month of a calendar quarter, their open capacity for the production of tires in each category, after making provision for the scheduling of all orders placed with them. Producers were prohibited from accepting any orders for tires after the fifteenth day of the month preceding the first month of a quarterly period without specific authorization from ORD, "except orders for indirect military replacement." For this class of orders, producers were free to accept orders, produce, and ship, providing such action did not interfere with their frozen production schedules.

Having established this production and allocation procedure, the plan directed producers to accept orders without regard for preference ratings. Producers' interchangeable facilities were to be utilized in accordance with Appendix II of Order R-1. This Appendix established a production pattern "in order to secure maximum output from existing tire and tube production facilities in accordance with the essentiality of demand." Tires and tubes were classified into seven levels of essentiality ranging from airplane tires to bicycle tires and tubes. Interchangeable facilities could be extended to a classification at a lower level of essentiality only after an inventory equivalent to a 15-day supply had been established in each higher category for which the interchangeable facilities could be used.

Detailed review of this proposal for implementing an allocation of truck-bus, tractor-implement, and industrial tires suggests that its framers had a vague general familiarity with the allocation machinery of the

Controlled Materials Plan and were attempting to utilize the same overall framework for the distribution of tires. What they clearly did not have, however, was any understanding of the technical administrative machinery required to put such an allocation program into operation. The plan was announced on February 16, 1944, and was scheduled to become effective for the second quarter of that year. An investigation of the status of the operating machinery necessary to translate the plan from a paper description to a functioning reality revealed that at that date not one step had been taken to provide any of the essential administrative tools. There was no application form in existence on which manufacturers of vehicles authorized by the Transportation Equipment, Farm Machinery, Automotive, General Industrial Equipment, Safety and Technical Equipment, and Construction Machinery Divisions of WPB could submit their requirements for original equipment tires. No forms had been prepared on which the claimant agencies could submit requirements to the Office of Rubber Director. No accounting system had been devised, much less installed and personnel trained to use it, under which the claimant agencies might exercise budgetary control over the use of their allotments of tires. No investigation had been made by ORD which would have revealed the fact that claimant agencies had no knowledge of the original equipment tire requirements of producers of all types of vehicles and equipment for which, presumably, they were to enter claims. In short, literally no part of the elementary details essential to reasonably successful functioning of the projected tire allotment plan had been prepared or even projected, despite the fact that at the time Schedule IV to R-1 was issued the period in which the plan was to be operative was only six weeks ahead, and many of the actions necessary to make second-quarter operations feasible should have been well under way, utilizing established procedures, forms, documents, and controls.

In retrospect it seems almost impossible that this state of affairs could have been permitted to exist. It is particularly difficult to understand how in February of 1944, more than two years after Pearl Harbor and more than three years after the start of the defense program, management personnel could have been so lacking in comprehension of the elementary details of translating policy into operations as to have announced to the public a plan for controlling the distribution of a commodity in critically short supply before even the rudiments of procedures, forms, organiza-

tion of personnel, and techniques of collecting basic information had been explored, prepared, tested, and started into use. The utter uselessness of such action had been exposed repeatedly in earlier years for one material after another. The only explanation lies in the isolated position of the Office of Rubber Director which stood, throughout its existence, as practically an independent agency. Its staff had only a surface familiarity with WPB operations and, in their own experience, had never dealt with a distribution control problem on a non-commercial basis. The circumstance serves as one more example of the tendency to repeat administrative mistakes in the illusion that each new material presents management problems so unique that experience built in other materials is not only useless but dangerously misleading.

To deal with the critical tire distribution problem, the original Tire Allotment Plan was amended, but most of its schematic features were retained. The principal amending work was in the preparation and installation of the overlooked mechanics of operation: forms, procedures, budgetary controls, assignment and training of personnel. Because of the date at which this work began, the plan functioned only on a *pro forma* basis in the second quarter of 1944.

The amended Tire Allotment Plan outlined a procedure which drew upon much of the experience developed by the War Production Board in connection with the operation of the Production Requirements Plan and the Controlled Materials Plan. An application form was prepared for mailing to vehicle manufacturers making tire-mounted equipment, to be filed with the appropriate division of the War Production Board. This application was addressed to all producers making equipment classified within listed product groups. In addition, all other manufacturers of tire-mounted equipment not included in the list of products were permitted to file the same application with the claimant agency from which they normally received allotments of controlled materials. Vehicle manufacturers reported on their applications tire requirements in size, ply, and tread detail to meet their established production schedules. Original equipment tire requirements were submitted in the *tire-group detail* of Appendix IV to R-1 for both the third and fourth quarters of 1944. Separate applications were prepared for each of the listed production groups. The claimant agencies reported to the appropriate industry divisions their tire requirements for the third quarter and the three following

calendar quarters for each of the listed product groups. The industry divisions tabulated tire requirements as reported by the vehicle manufacturers and compared this tabulation with the statement of tire requirements presented by the claimant agencies. After reconciliation of the two statements, the industry divisions prepared for each listed product a statement of original equipment tire requirements by tire groups for the third and subsequent quarters, segregated by claimant agency. Concurrently, the claimant agencies developed original equipment tire requirements for vehicles or equipment outside the listed product areas, as well as their replacement tire requirements in each of the tire group categories. The claimant agencies submitted to the Requirements Committee a statement showing by tire groups: (1) original equipment requirements for each listed product; (2) original equipment requirements for other products within their jurisdiction; and (3) replacement tire requirements. The Operations Vice Chairman of the War Production Board presented to the Requirements Committee a statement by tire groups of the original equipment tire requirements for each listed product, segregated by claimant agency. In addition, the Operations Vice Chairman, WPB, presented a summarized statement by tire groups of original equipment tire requirements segregated by claimant agency including OVC, and replacement tire requirements under the exclusive jurisdiction of OVC.

The Requirements Committee considered the tire requirements as reported by the claimant agencies and the Operations Vice Chairman in making a determination of allotments consistent with the estimate of the supply of tires within each tire group. The gross statement of requirements by the claimant agencies was used in considerations of essentiality, to the extent that adjustments in requirements must be made to bring them within the limits of supply. Each claimant agency determined the extent to which its replacement tire requirements should be adjusted to meet original equipment requirements. After the completion of the appropriate adjustments, as among claimant agencies on the basis of essentiality and within each claimant as between original equipment and replacement tires, the adjustment was reflected in the statement of claimant agency original equipment tire requirements reported for each listed product by the Operations Vice Chairman.

Allotments of tires were made direct to each claimant agency for (1)

original equipment requirements for vehicles, and (2) replacement tire requirements under each agency's jurisdiction. Allotments were made direct to the Operations Vice Chairman, WPB, for (1) original equipment tires for the listed products for all claimant agencies, and (2) replacement tires under the jurisdiction of the Operations Vice Chairman. The Controller Division of the War Production Board issued instructions to the industry divisions and the claimant agencies, notifying them that the allotments by tire groups should be recorded as the control quantities for the purpose of accounting for disbursements against such allotments.

These actions were supported by the issuance of production directives prescribing the percentage of each producer's capacity by tire groups to be allocated to the production of the following classes of orders: (1) original equipment for vehicle and equipment manufacturers; (2) replacement by military claimant agencies; and (3) replacement by other claimant agencies. After consultation with claimant agencies' representatives and reference to relevant vehicle production schedules, WPB industry divisions issued tire allotments for original equipment for each manufacturer producing one of the listed products. The claimant agencies issued original equipment tire allotments to vehicle and equipment manufacturers making other than the listed products. Both the industry divisions and the claimant agencies maintained budgetary accounting controls in the CMP pattern over the issuance of tire allotments. The control system included the deduction of allotments from balances in the tire accounts maintained by the issuing offices and periodic summaries of allotments received, allotments made to tire users, and unissued balances. The Controller Division of the War Production Board was responsible for receiving and summarizing reports submitted by the issuing offices in both the claimant agencies and the industry divisions. Vehicle and equipment manufacturers were responsible for the maintenance of accounting controls over their own procurement of tires, pursuant to allotments received, in precisely the same fashion as for their procurement of controlled materials. The military claimant agencies practicing central procurement were required to deduct quantities of tires procured from the replacement allotments made for each tire group. Military agencies using decentralized replacement tire procurement procedures arranged to establish in each procurement office suballotment

accounts in which replacement orders as made were deducted from credit balances. The non-military claimant agencies determined with the Office of Price Administration the total quantities of tires in tire group detail which could be purchased from tire producers under the OPA rationing system. Such quotas were deducted from the replacement tire allotments and reported to the Controller Division. Appendix IV of R-1 was revised to provide for a certification to accompany purchase orders placed by the military claimant agencies for replacement tires. Appendix IV also provided for a reference to the types of certification on purchase orders against which tire producers would be permitted to ship replacement tires for non-military claimant agencies. Finally, each vehicle manufacturer reported unplaced orders to the Office of Rubber Director which attempted to find a home for such orders within the open capacity of the tire producers as currently reported to ORD.

The chief objectives of the production directives were: (1) to establish a uniform pattern of order acceptance for all producers; (2) to reserve production capacity for the fabrication of tires for military replacement and original equipment uses; and (3) to limit the percentage of total tire output permitted to flow through dealer channels for civilian or indirect military replacement uses. In fact, however, the production directives did not establish controls in terms of number of tires, nor did they in any way influence the number of tires which could be produced. Actual tire production was determined by the tire manufacturers. Before the beginning of a calendar quarter, producers were authorized to accept certified orders for original equipment and military replacement uses from vehicle manufacturers and procuring claimant agencies, and, in addition, non-certified dealer orders for replacement tires in accordance with percentages established by directive. Additional orders could be placed by the War Production Board with any producer on the basis of a review of his open capacity reports submitted before the beginning of a calendar quarter. The accepted orders at the beginning of a quarter became frozen production schedules under the provisions of Priorities Regulation No. 18.

In its early period of operation the tire allotment plan was far from successful. Review of performance under the plan for the third and fourth quarters of 1944 indicated that a number of problems remained to be solved. First among these, and always basic to the successful opera-

tion of any control, was correlation of the policy decisions embodied in program determinations and the machinery for executing those policies, in this case embodied in production directives. The quarterly program determination for tires established a distribution allocation for a stated number of tires in various classifications and for three types of end use: original equipment, military replacement, and other replacement. The production directive, however, established a percentage pattern for order acceptance by kinds of end use, without indicating the number of tires to be produced. Only by accident, or by constant adjustment of the production directive percentage for each manufacturer, did the application of the percentage pattern for order acceptance coincide with the quantitative allocation established in the program determination.

A second difficulty arose in connection with adjustments based on open capacity reports. To obtain maximum use of the production capacity of the industry, and to expedite the placing of unfilled orders, the Rubber Bureau undertook to review producers' open capacity reports and, so far as possible, to fit unplaced orders into available unclaimed capacity. These orders were placed on the basis of capacity to produce without regard for the percentage distribution pattern established by the original production directive. The effect of this order placement activity often was to modify substantially the quantities originally provided in the program determination.

A third problem arose in connection with shipments to dealers for non-military replacement purposes. The production directive established a maximum percentage of tire production to be made available for shipment to dealers for inventory replacement after fulfilling orders for non-military use supported by OPA ration certificates. This percentage was modified from time to time by the Rubber Bureau. By controlling rationing quotas assigned to the Office of Price Administration, an attempt was made to balance the authority to issue rationing certificates against shipments to dealers. For the first two quarters it proved impossible to establish a precise balance between the release of ration certificates and the release of tires to dealers' stocks, and neither of these releases bore any necessary relationship to the distribution allocation established in the program determination. It was difficult to estimate the probable demand for approved civilian replacement tires by sizes and to relate it to the sizes available for shipment to dealers. A major problem

resulted from the fact that manufacturers preferred not to hold tires in inventory pending receipt of new orders for original equipment and military replacement. The manufacturers' desire to release tires from inventory as promptly as possible was coupled with their natural inclination to channel the maximum quantity of tire sales through dealer facilities in order to maintain organizations and retain their share of consumer markets as a basis for post-war business.

A fourth adjustment problem arose from slippages in the production schedules of vehicle manufacturers and changes in procurement schedules for military requirements for both new and replacement tires, which resulted in a large number of cancellations of orders placed with tire manufacturers. Either the fabricated tires released in this way became part of manufacturers' inventories or, if the tires had not yet been produced, the facilities which would have been devoted to them were subsequently made available to fill other orders. In either event, the result tended to be an increase in shipments of civilian tires to dealers.

Finally, the tires covered by the tire allotment plan were classified in three major groups and a number of subgroups on an arbitrary basis. Some individual tire sizes within a single subgroup were in more critical supply-demand position than others within the same group. The combination of production and distribution data for more and less critical tire sizes within a single group had the effect of masking the true situation for the more critical sizes. While it was obviously impossible to issue allotments on the basis of each size-ply-tread category, it would not have been impractical to expand the number of subgroups in order to isolate the more critical sizes for individual attention.

In the face of these problems, it was evident that the distribution of tires did not follow the pattern laid down in the program determinations. Under the existing system, substantial quantities of tires could be diverted from more essential to less essential uses without opportunity for review of their distribution by the Requirements Committee. Unanticipated increases in the supply of tires were also distributed without review. The current supply-requirements balance was unfavorable and the prospect was for little improvement for some time ahead. Truck and bus tires were included in the list of critical programs in the fourth quarter of 1944. Requirements were continuing to follow a rising trend and demand was well in excess of the industry's manned capacity. Neces-

sarily, part of the solution would lie in expansion of facilities for the manufacture of most critical sizes and the assignment of manpower to these and existing understaffed facilities. The immediate problem, however, was to insure that the existing manned facilities produced the maximum quantities of the most critical sizes and that these tires were distributed in the proper proportion to the most essential uses.

The character of the forces acting to expand the demand for truck-bus tires, and of the factors inhibiting rapid increase in their supply, reinforced the need for more effective control over the distribution of current output. In the military area, tire mortality on the roads of France and the beaches of the South Pacific was at a much higher rate than had been anticipated. At the same time, the military truck was proving a much more useful munitions item than the program makers had foreseen. With stepped-up production goals, tire requirements were expanding for both original equipment and replacement purposes. In the civilian area, deferred needs were growing more urgent, and there was serious danger that continued undersatisfaction would threaten interruptions to essential services, with secondary repercussions in war production. The Chairman's final report was specific as to obstacles to increased production.

Manpower had been dissipated during the period of rubber shortage, and it became increasingly difficult to recruit men with the skill and brawn to build large tires. Synthetic rubber tires developed more internal heat than those of natural rubber, which made substitution of rayon tire cord for cotton cord necessary in heavy-duty tires, to keep the heat down; and rayon tire cord facilities had to be expanded to meet the new demand. When many of the problems had been licked, it turned out that carbon black, in adequate supply previously, was not available in sufficient quantities for the stepped-up tire program, and a carbon black expansion program had to be undertaken.

By late fall of 1944 it seemed imperative, therefore, to modify the tire allotment plan to provide machinery by means of which the production and distribution of tires could follow more closely the program established by the Requirements Committee. By this time, however, the allocation for the first quarter of 1945 had already been made and it was impossible to adjust the plan in time to secure effective revision of first quarter procedures. The decision was therefore made to concentrate all planning efforts toward a reconstitution of the control to be effective during the second quarter of 1945. Appendix IV to order R-1 was re-

vised to bring about the desired changes. In its new form, the Tire Allotment Plan was directed toward the control of order acceptance, production scheduling, and distribution in accordance with over-all policy decisions. The major changes in the plan included the following:

1. Tire allotments to claimants were made by size groups for those tires which accounted for the bulk of military requirements, and by size groups for civilian tires. This permitted a more complete scheduling of production and distribution of the critical sizes.

2. The former production directive established a percentage pattern for order acceptance by kinds of tires and end use without indicating the number of tires to be produced. Under the revised plan, producers were required to submit quantitative production schedules which were frozen under the provisions of Priorities Regulation No. 18.

3. The number of tires shipped to dealers was made a specific quantity subject to direct control of the Rubber Bureau, rather than an open-end percentage of potential production subject to control by manufacturers.

4. The new plan provided for the placement of advance quarter orders. Uncertainty with respect to the carbon black situation made it undesirable to issue advance quarter allotments for the third quarter of 1945 simultaneously with allotments for the second quarter. When this could be resolved, the advance allotment phase of the plan was scheduled to be put into effect.

5. The procedure for rescheduling production was tightened. Certified orders had to be placed before the fifteenth of the month preceding the quarter for which the allotments were valid, and unplaced orders had to be reported to the Rubber Bureau. Producers were required to submit proposed production schedules which the Rubber Bureau could modify to incorporate unplaced orders before returning them as frozen schedules.

6. A number of additional modifications were made in the plan to increase its operating flexibility, including provision for over-allotting supply by 5 percent to maintain steady pressure on productive capacity, incorporating carry-over provisions for past-due orders, and requiring that delivery of indirect military replacement tires in any single month should not exceed 40 percent of the quarterly scheduled production.

This was the form of the Tire Allotment Plan at the conclusion of the war. By this time it had been pounded into shape as a positive mechanism

for full execution of quarterly program determinations covering the production and distribution of truck and bus tires. On the supply side, installation of new equipment at bottleneck points in some plants, a drive to recruit labor, and the introduction of a seven-day week had combined to push truck and bus tire production to its wartime peak. On the demand side, although requirements were high and rising, the plan's improved distribution control features (including quantitative production directives and closer scheduling of supercritical sizes) were working effectively to bring performance into line with government objectives.

CHAPTER XII

COTTON BROAD-WOVEN FABRICS

WITH THE EXCEPTION of a small group of specialized fabrics, production and distribution controls for cotton broad-woven constructions remained in a rudimentary stage until rather late in the war. Reviewed in critical perspective, the record in cotton broad-woven fabrics is one of dominant inertia in the recognition and anticipation of control problems. The inertia was partially redeemed by the ultimate satisfaction of military and export requirements; but it was significantly marked, on the other hand, by a failure to deal promptly and effectively with problems of civilian supply. Beginning in the latter part of 1943 and continuing to the end of the war and even well into the post-war period, the cotton fabric area presented a series of problems of administrative policy and technical procedure which were complex and stubbornly resistant to solution. Only the abrupt ending of the war avoided the most acute squeeze on the domestic front. It roughly coincided with the end of a long period in which the vast deficiency in supply had been met in important measure by the draw-down of fat inventories, including stocks in consumers' personal wardrobes.

It is not easy to apply cause-effect reasoning to this record of malperformance. The influential factors were numerous and not simple. Nor did they originate in any single source. Part of the difficulty can be traced to the fact that in the defense period and the first war year the supply of most cotton fabrics was more than ample to cover the total demand. Production of cotton fabrics mounted from 8.3 billion linear yards in 1939 to a peak of 11.2 billion yards in 1942. Both the industry and the responsible administrative personnel in Washington anticipated the maintenance of at least the general level of production achieved in that year. In the first year of 1943, output attained a slightly higher rate but, beginning in the spring, production started to decline. The primary influence on the down-trend was the gradual emigration of mill labor, induced by the higher wages paid by the new munitions industries and

partly a result of selective service. This diversion of labor occurred at a faster rate than its replacement by new workers. The decline in production followed in the same pattern. By the second half of 1943, production of cotton broad-woven goods had fallen 13 percent below its peak rate to an annual output of about 10 billion yards. In the following year, mill output dropped to 9.5 billion yards and the down-trend continued in 1945.

The failure to foresee this trend and take the action necessary to protect the industry and its customers against its effects was one of the fundamental causes of the later difficulties in controlling the production and distribution of cotton fabrics. It was not the only cause, however. The pricing policies established by the Office of Price Administration generally followed the line of attempting to maintain output in price lines unchanged from the base period. At the same time, however, inflationary forces were at work on raw cotton prices and, to some extent, on the output of cotton mills. The result of these two sets of pressures was a squeeze on manufacturers of civilian-type products, in many cases driving them to seek relief by evasion. In part, this was accomplished through steady deterioration of quality standards. In part, relief was sought through the marketing of "new" items not subject to base-period pricing controls.

The pressures were intensified by the sharp expansion of consumers' spendable incomes. Purchasing power ordinarily devoted to the procurement of durable goods, travel, and other peacetime outlets that were curtailed or closed during the war was forced into the soft-goods area and blown up beyond normal impact by more-than-full employment, better-than-standard wages, and overtime pay. Military demand was at a relatively low level in the defense period and the early war years. With the sharp expansion in the size of the armed forces in 1943, however, the development of special types of clothing and equipment for use in unusually hot or cold climates, and the growth of an unprecedented indirect demand for textile fabrics following the invention of new packaging methods, the military claim on the output of the cotton mills was multiplied many times over.

All of these forces came to focus in the administration of the production and distribution of cotton broad-woven fabrics in late 1943. Production was falling and little effective action could be taken to halt this general decline. Consumer demand was at peak levels, and rising military demand also was establishing a new high. Military requirements for

special fabric constructions were resulting in an even more than proportionate curtailment in output for civilian uses, because of the diversion of special production facilities. The deterioration of standards had the effect of depleting wardrobes unusually quickly and at the same time compelling their enlargement (through such factors as increased factory employment and the breakdown of commercial laundry service). All these considerations had their influence on the steadily worsening supply-demand balance.

For a small number of specialized fabrics, shortages were experienced early in the war. The first serious unbalance of supply and demand, recognized early in 1942, was in cotton duck, as a result of a military demand which outstripped the capacity of the looms normally assigned to the production of this fabric. In March, the initial step was taken to apply controls to a cotton fabric. Order M-91 froze cotton duck stocks and the operation of facilities producing cotton duck. Selected carpet and rug facilities were converted to the production of cotton duck, and yarn suitable for duck production was diverted from other uses. Through this program, output was increased by almost 50 percent in the next twelve months. Characteristically, military demand slumped in 1943, and a number of converted looms were released for other production. When Army requirements again mounted in the second quarter of 1944, the conversion process was repeated, supplemented by the assignment of part of the denim production facilities to the production of duck substitutes. After delays, production of duck was again forced up and the military demand was ultimately satisfied, but the diversion of denim and other coarse fabric looms created a shortage in work clothes fabrics.

The second problem, in chronological sequence, was shaped by the Japanese offensive, which adversely affected shipments of burlap from India. Since this fabric was a primary source of essential agricultural bagging, it had to be replaced by cotton bagging materials. Late in April the first step was taken toward general control of production facilities with the objective of redirecting the assignment of convertible looms. Under Order L-99, about 45,000 looms previously manufacturing such fabrics as denims, towels, tickings, and draperies were transferred to the production of bagging fabrics. At the same time, bag manufacturers were authorized to use an A-2 rating in procuring cloth, as a means of underwriting their competitive status against military procurement. (In cotton

fabrics, as for other materials, military priorities, uncontrolled in quantity, were used from the start through the PD-3A system.) Successive amendments to L-99 accomplished a gradual broadening of its area of control. In March, 1943, lighter weight sheetings and plain print cloths were added. The range of permitted constructions was curtailed and many of the standard constructions were changed with the objective of securing greater productivity per machine-hour. In May, carded gray goods were brought under the order. Later additions resulted in the ultimate control of all looms except those on combed goods.

The philosophy of control which governed the gradual broadening of L-99 authority rested on two foundations. The first and more important was the satisfaction of military requirements for certain fabric constructions. The second, recognized more slowly and never fully developed, was the increased output of staple fabrics for the domestic civilian market. At no stage in the war was loom conversion pushed to the limits of potential adaptability, particularly if consideration is given to the possibilities of using subsidies and public purchase devices to alleviate unfavorable cost equations resulting from the mandatory assignment of specialized production facilities to the manufacture of fabrics for which they were not designed.

Until the end of 1943, distribution controls were non-existent in the civilian area of consumption. The military services met their needs by the issuance of preference ratings, either directly in their own procurement of cloth or by assignment to their contractors. Industrial users of duck were assisted by the allocation system operating under M-91. Special provision had been made for the requirements of manufacturers of agricultural bagging. But general industrial and civilian requirements were unrated and competitive in the open market. It was not until December, 1943, that order M-317 was issued, establishing rating authority for many classes of essential users of cotton fabrics. These ratings were self-assigned by fabric consumers and were not subject to quantitative controls.

There were a number of reasons for the slow introduction of controls over the distribution of cotton fabrics. Many of the top staff of the Textile Bureau shared with other personnel of the War Production Board the belief that the prime obligation of an industry branch was to facilitate military procurement and assure the full satisfaction of military require-

ments. The application of this policy inhibited any effort to subject military demand to critical review. It obscured the importance of those areas of demand indirectly related to the military programs, and completely ruled out consideration of the desirability of making adequate provision for the essential needs of the wartime civilian economy. It acted as a magnetic pole in dragging the thinking of responsible administrators away from the organization of an integrated allocation system and toward the uncontrolled use of priorities.

Reinforcing this intellectual bias was the strong feeling of antagonism toward preference ratings shared by all segments of the cotton fabric industry. The marketing structure¹ of the industry is characterized by rooted supplier-customer relationships. The wide use of controlled preference ratings or the introduction of an allocation system could not fail to disrupt these ties, compel the formation of new business relations, and create immediate problems of credit and style, as well as potential repercussions in postwar markets. For all these reasons, influential segments of the industry exerted a strong continuing pressure against priorities. Since most of the important management positions in the Textile Bureau were occupied by men drawn from the industry, it was only natural that they should be sympathetic to these views. This attitude was strengthened by their belief that they could shape their actions in accordance with their own desires and the desires of the industry, and at the same time carry out their primary obligation to secure the satisfaction of all military requirements.

¹ Producing units in the cotton textile industry are widely scattered and, for the most part, are small in size, independent in operation, and specialized in output. Only a small portion of the industry is characterized by vertical integration. Most mills merely supply raw material for the next processing function.

The first step in the marketing process is the sale of yarns by spinning mills the production of which is in excess of their own weaving requirements. The majority of the mills both spin and weave. In many instances, however, operations are not balanced, and mills both buy and sell yarn in the open market.

Few mills perform manufacturing functions beyond the production of gray goods. The common distribution pattern is for gray goods to be sold by producing mills to converters, either direct or through commission houses acting as selling agents. A few large mills operate their own converting departments.

The actual mechanical operations of bleaching, dyeing, and printing gray goods are performed by finishers who ordinarily do not operate for their own account, but on a toll basis for the account of various converters. The finished cloth is sold by converters to garment manufacturers, wholesalers, mail-order houses, department stores, and chain stores. Cotton fabrics for industrial consumption (mostly cloth in the gray) are usually sold direct by the mill to the industrial consumer.

Beyond this was the unwillingness of the top WPB management to accept responsibility for segregating civilian requirements into categories of essentiality. This concept was, of course, totally unknown to the peacetime economy. Under conditions of peak consumer incomes, high level production, and record profits all the way from the mills to the retail stores, it was extremely difficult to direct the attention of management to the important part played by all types of textile products in the composition of the cost-of-living index, or to such related subjects as the connection between rising living costs and rising wage demands.

When these considerations were set in the framework of the current statistics of supply and the reluctance of the industry to consider the strong possibility of a steady and alarming down-trend in production, the delays in the installation of controls become understandable. As the inheritance of this nexus of actions, hesitations, and habit patterns, in the late spring of 1944 the production and distribution of cotton textiles were controlled by five limitation and conservation orders.

Order L-99 established operating conditions for spindles and looms producing cotton textiles. The order designated, with reference to a base period, the percentage of spindles and looms to be assigned to the production of specified categories of yarns and fabrics. It also provided for the issuance of production directives by the War Production Board, and for the filing of quarterly production reports by operating mills. The order had three principal objectives: (1) to secure the economies derived from simplification in production by limiting the variety of constructions produced within each fabric category; (2) to insure the use of selected production facilities for the manufacture of fabric constructions required by the more essential programs; and (3) to freeze specified production facilities within certain product categories.

Order M-91, covering cotton duck, generally restricted producers from delivery except to fill direct military and selected industrial orders. The order did not provide a mechanism for allocating mill output for duck among competing authorized claimants or purchasers.

Order M-317, applicable generally to all cotton yarns and woven fabrics (including bed sheets, pillow cases, blankets, towels, diapers, face cloths, and table "linens") except cotton duck, established a number of preference-rating schedules which assigned priorities to producers of specified types of textile items, for the procurement of specified cotton fabrics.

These provisions, however, did not govern "purchases for delivery or ultimate delivery to, or for incorporation into any product for delivery or ultimate delivery to the United States Army, Navy, Maritime Commission or War Shipping Administration." The order also contained distribution schedules which established for producers of cotton fabrics for each construction category (1) the minimum percentage of total quarterly production which must be delivered against rated export orders; (2) the minimum percentage of total quarterly production which must be delivered against all rated orders including export; and (3) the percentage of total quarterly production beyond which rated orders need not be accepted. The purpose of the preference-rating schedules of the order was to establish a preferred position for certain end uses in claiming the production of designated cotton fabrics. The system functioned entirely through the self-assignment of priority authority without quantitative limitation. The principal purpose of the distribution schedules was to spread the impact of rated orders evenly among all producing units. It accomplished this objective by stipulating the minimum percentage of total production which must be diverted to rated orders and the maximum percentage of total production upon which rated orders had a claim.

Order M-328 established the conditions under which preference ratings could be used for textile and related products. The result of the order, in general terms, was to invalidate all preference ratings assigned by an L, M, P, or other order, or by any general regulation such as CMP-5, *thereby removing from the cotton textile system all priorities originating outside the system.*

Order M-328B created a procedure for assisting in the fulfillment of special civilian programs by providing priority assistance, making allocations, or issuing directives. Under the terms of this order, manufacturers desiring to participate in special programs made application to the War Production Board and were assigned preference ratings for the procurement of stated quantities of cotton fabrics to be used in producing specified quantities of products for which the special programs had been established. This order was issued in May, 1944, and early programs were confined to infants' and children's low-priced apparel.

These orders provided part of the basic machinery of general administrative control. Under L-99, the War Production Board could direct sim-

plification of production, force the conversion of spindles and looms from less essential to more essential output, and freeze manufacturing facilities in essential fabric categories. Under M-317, a preference-rating structure was established for guiding selected categories of fabrics to their most essential uses. Mill reports of production made available the data necessary (1) to measure production in absolute yardage for a long list of items and generally against potential capacity in place on a company basis; and (2) to check compliance with Order L-99 and the distribution schedules of M-317.

The quantity of each type of fabric made available for military, export, and rated industrial and other civilian requirements was limited by the percentages in the distribution schedules of Order M-317, which established the maximum proportion of output to be devoted to rated orders. The use of this type of ceiling over the acceptance of priority procurement was first conceived as a device for spreading rated orders among all producers, thereby permitting each mill to reserve part of its output for its pre- and postwar trade. As the pattern and magnitude of wartime demand were determined, the continuance of the ceilings was necessitated by the inclusion of essential civilian requirements in the non-rated category. In the absence of quantitative controls over rated orders, however, there was no assurance that the yardages made available would be distributed in accordance with the real needs of each program.

The quantities of fabric available for non-rated civilian requirements were determined by the residual yardage produced after the satisfaction of the rated-order load placed on the mills. The potential limits were established by the minimum and maximum rated-order percentages of the distribution schedules. For example, if for a given fabric category the distribution schedule provided that mills must accept a minimum of 30 percent rated orders and need not accept more than 50 percent, the yardage available for non-rated civilian orders would be from 50 to 70 percent of total production, dependent on the volume of rated orders actually received.

The yardage shipped against non-rated civilian orders under these conditions might or might not be sufficient to meet essential civilian requirements. Even if the total yardage produced for civilian use was sufficient to meet the essential part of civilian demand, there was no assurance that non-essential civilian uses would not take such large quantities that some

essential needs would not be met. The mills were given no basis for distinguishing between essential and non-essential civilian orders, when these were lumped together in a single non-rated category. As a result, shipments were made on the basis of mill selection of customers in terms of established buyer-seller relationships.

Under Order L-99, the cotton textile industry continued to manufacture a substantial yardage of fabrics which were not serving military, export, or essential civilian needs. Among these constructions were velvets and plushes, table damasks, bed sheets, drapery, upholstery and tapestry fabrics, and specialty weave fabrics for higher price garments. The 1943 production of these fabrics was approximately 375 million linear yards, 4 percent of the year's total output. In addition to these specialty fabrics, there were produced in 1943 some 315 million linear yards of lawns, organdies, marquissettes, and sateens, only a small portion of which was utilized for military, export, and essential civilian requirements. This did not include less essential yardage of certain other fabrics, such as fine broadcloth for men's tailored shirts. The production of cotton fabrics distributed to less essential uses in 1943 was, therefore, well in excess of 500 million linear yards. The machinery and labor used in this production were generally adaptable to the production of a variety of more essential fabrics. Many of the looms which in 1943 produced the half-billion yards of less essential fabrics might have been devoted to the manufacture of fabrics in short supply, with some loss in output and some relative increase in unit production costs. Under the freedom permitted the mills, however, it was only to be expected that such a course was not followed.

The cotton fabric production and distribution control system in the spring of 1944 reflected certain problems peculiar to the textile industry. For this reason the system differed from the control machinery developed for many other materials. It established a framework of basic controls which could be used to carry out, in full, military, export, and essential civilian programs, provided that the total supply of cotton fabrics was sufficient for all needs. A substantial part of the difficulty in cotton textiles could be traced to the failure to utilize the existing system established by orders L-99 and M-317 to the extent necessary to achieve maximum control over production and distribution. The most important weakness of the existing system was the absence of quantitative control which

would limit procurement by the services and export agencies and for various other rated uses. The establishment of this type of control would require a new approach to the problem.

Before steps could be taken, however, either to tighten the existing system or to develop a new one providing quantitative control, at least two outstanding policy issues had to be resolved. The first was the question of limiting the War Production Board's responsibility and related actions to the satisfaction of the requirements of *direct military programs* and essential industrial uses closely related to these programs. The second policy issue was the feasibility of making distinctions among more essential, less essential, and non-essential civilian requirements. These issues might be rephrased in the following terms: Should the War Production Board attempt to evaluate the importance of all uses of cotton fabrics as a basis for controlling their distribution? This question had been resolved by WPB for other materials, components, and end products for which requirements exceeded available supply. In almost every case the ultimate decision had been to deal with *total requirements* rather than with segments of the over-all demand.

Early in 1942, when metal shortages were developing and the general supply-demand relationships were comparable to the 1944 conditions in cotton textiles, the production of less essential civilian items such as automobiles and refrigerators was stopped. Demands for metal for the manufacture of such products were thereby prevented from competing with the demands for military and essential civilian programs. The products which were made were given preference ratings in accordance with their importance in order to insure the procurement of production materials. Finally, when the total rated demand exceeded the available supply of any material, it was found necessary to establish over-all quantitative controls or allocations.

During the early part of the war, a *comparable problem* did not arise in cotton textiles. By early 1944, however, the supply-demand balance had been upset by three factors: first, the drop in total cotton fabric production; second, the mounting war and war-related requirements; third, the increase in consumer incomes and the concentration of their spending in soft goods.

As a result, the War Production Board faced a situation in cotton textiles in 1944 which was the counterpart of the general metals problem

of 1942. The unbalance of supply and demand required the determination of the kind of treatment to be accorded such products as drapery and upholstery fabrics (comparable to refrigerators and automobiles) as against work clothing and children's low price garments (comparable to farm machinery). Fabrics usable for essential civilian requirements were still being consumed in the manufacture of products not essential to the war effort. Looms which could be devoted to the production of fabrics essential to the prosecution of the war were still producing substantial yardage of non-essential fabrics.

The general problem was the familiar one of determining how to secure maximum output and direct its distribution to uses essential to the furtherance of the military program and the maintenance of the essential structure of the basic civilian economy. Consideration of this problem led directly to a fundamental policy question. On the basis of what criteria was the War Production Board to determine which civilian requirements were essential to the maintenance of the basic civilian economy in time of war? In establishing these criteria, WPB had to resolve such issues as the selection of products made from cotton fabrics which could be dispensed with by a nation at war, and the determination of the extent to which WPB should influence the production of textile products in terms of price lines. Such action could be taken only as a result of the recognition of the importance of textile products in the cost-of-living complex, and the relationship this had to the maintenance of war production through its insurance of relative stability in workers' "real" incomes as applied to textiles.

The importance of making these decisions was not so readily apparent for textiles and their end products which were used principally by civilians, as when the manufacture of such items as civilian radios was stopped and the output of fractional horsepower motors expanded for military uses. The growing deficiency in the supply of cotton fabrics, however, was helping to make it clear that the problems were parallel, were both related to the prosecution of the war, and that the government, therefore, had responsibility for making the same decisions for textile products which it had already made for metal products.

These conclusions were not universally accepted. What some officials regarded as a critical situation, which in all likelihood within a few months would approach the dimensions of an emergency, was dismissed

by others as a temporary difficulty which could be confined to the civilian area and should not be allowed to become a matter of serious concern. Moreover, the participating interests were more complex in cotton fabrics than for any of the metals. The civilian share of total wartime output was considerably larger than for any of the other materials already brought under control. With the exception of a few fabrics, the requirements of the services were being satisfied through their existing priority powers. The export agencies were struggling with special purchasing difficulties, the solution for which could not be sought through the imposition of new controls. Partial relief for these agencies had been secured by the introduction of an export reserve at the mills under the machinery established in order M-317.

In these circumstances, the answers to the policy problems could only be sought at the highest policy-making level. The fundamental question was that of determining a segregation of essential and non-essential demands of the domestic civilian economy. It was argued that it was both relatively easy and generally equitable to distinguish in terms of essentiality when the choice was among direct war, war-related, and civilian demands; but when the distinctions had to be drawn solely among civilian demands, they were portrayed as infinitely more difficult, and in most instances infinitely less meaningful. Such questions as the following became of paramount significance. Were men's shirts more or less essential than children's garments? Were all children's garments at all prices of equal essentiality? Shirts at all prices? Could a distinction be made between more and less essential demand by using price as a yardstick? Was the War Production Board justified in taking action to force certain individuals out of business or compel their conversion by the issuance of limitation orders? This had been done at the beginning of the war emergency for producers of items made of critical metals. Could similar action be taken for textile products with as much justification when the shortage did not bear directly on military needs, but rather arose from competing civilian needs?

As a result of conflicting attitudes, differences of opinion with respect to the boundaries of WPB responsibility, and the general unfamiliarity of the personnel of the Textile Bureau and its industry advisors with the techniques of material distribution control which had been evolved and tested for other materials, a variety of recommendations were advanced.

In one way or another, they all reflected the indissoluble relationship between policy and technique. Because of the dominant interest of the civilian economy in the issue—in which respect the cotton textile question differed from most of the other important control problems—they created a unique record of wartime administration.

An integrated program for dealing with the conditions of supply and demand as they existed in the spring of 1944 was prepared; it was strongly supported by a group of material control technicians outside the Textile Bureau. This program recommended as the first and most important step that production of non-essential end products made from textile fabrics be prohibited or quantitatively limited by an L order in every case in which the fabrics were also usable for more essential purposes. The second step was the prohibition or limitation of the production of fabrics used principally for non-essential purposes. Facilities and labor thus released could be assigned to the production of more essential fabrics. It was recognized that this action might require the government to compensate the owners of converted facilities who were unable to meet production costs of their new competitors. Next, it was proposed that a list be prepared of essential products (defined by product class and price line), the production of which would be supported by preferential assistance in procuring fabric. This recommendation could be carried out by amending the preference-rating schedules of M-317. The fourth step was to bring the production and shipment of cotton fabrics completely under the provisions of Priorities Regulation No. 1 by revoking the maximum rated-order limitations in the distribution schedules of Order M-317. Adoption of this recommendation would have the effect of compelling the mills to accept all rated orders placed with them up to the full limit of their production.

Consideration of the feasibility of establishing precise quantitative controls began with the observation that the control might be imposed either on the mills (with respect to their acceptance of orders) or on consumers of fabric (with respect to their placement of orders). An effective control at the mill level would require detailed statistical analysis of the industrial and essential civilian demand for fabrics. It would then be necessary to translate these requirements data into the order load to be placed on the mills in terms of fabric categories and rating bands. This would be a difficult operation. Even if it could be carried through, it

would result in freezing the production of each individual mill in the loom assignment pattern applicable to the industry as a whole. Operating flexibility on the part of the individual mills would be handicapped by such action, threatening the effort to secure maximum fabric production.

These difficulties could be avoided, it was noted, by programing and controlling use at the industrial consumer level. To establish this type of control, certain basic information must be obtained. This could be collected more expeditiously by requiring the larger users of cotton fabrics to obtain authorization to place orders on the basis of applications filed with the War Production Board. The measurement of total demand would be completed by fabric requirements presented on master applications prepared by the procuring claimant agencies for their own direct purchases, with estimates of the requirements of small users not included in the specific application procedure. After comparison of total demand and supply, and the cutbacks necessary to secure a balance, procuring claimant agencies and individual applicants would be authorized to place orders for specific quantities of cotton fabrics. Those areas of demand not required to apply to WPB would be provided for by the establishment of appropriate reserves. Industrial consumers in this category would be authorized to place rated orders subject to quota limitation. In this manner, the gathering of the necessary operating information, the determination of the magnitude of programs on the basis of their relative importance, and the establishment of a mechanism for distributing appropriate quantities of fabrics to the approved programs would be coordinated in a single control system. This approach to the problem of distribution control was strongly recommended in preference to the establishment of control at the mill level.

The preparation and issuance of the appropriate regulations and procedures for carrying out this program would require careful exploration of a number of operating problems. Among the more important of these were: (1) providing for a flow of fabrics through retail channels to civilian consumers; (2) extension of authorizations through wholesale channels; (3) determination of the classes into which the different types of cotton fabrics were to be grouped for purposes of control; (4) division of manufacturing consumers of fabrics into "large" and "small" categories; (5) establishment of appropriate reserves for users exempt from application procedures; (6) provision for a transition period and pro-

cedure from current to proposed control methods; and (7) establishment and training of the internal WPB organization required to administer the control.

Underlying this proposal was the implicit acceptance of a continuance and worsening of the existing fabric shortage for civilian uses. It was essentially a proposal for distributing the shortage so that the burden would fall least heavily on those who were least able to bear it. It recognized that those responsible for the administration of the home front were for a number of reasons unwilling to commit their support to the drastic measures required to reverse the down-trend in production and maximize mill output of those fabric constructions which could be utilized in the manufacture of cost-of-living merchandise. Such a program would have required control of the assignment of labor within mills to insure full application to looms producing utility fabrics; payment of incentive bonuses; creation of some type of Textile Reserve Corporation (a) to import foreign cloth at over-ceiling prices, (b) to subsidize third shift production in the United States, (c) to buy at over-ceiling prices the output of mills forced to convert from fancy to utility fabrics, and (d) to purchase yarn from the spindles of makers of fancy fabrics with non-convertible looms; action by OPA to establish special utility garment prices and lift price ceilings for manufacturers operating within utility price lines; priority assistance to mills in purchasing additional equipment pledged to utility fabric construction; ruthless extension of mill directives under L-99 to reflect mill-by-mill review of loom assignments to compel the most favorable balance of equipment for maximum output of utility fabrics; and union cooperation in effecting in-plant transfers of workers, with adjustments or waivers of seniority and wage differentials. Such a program, combined with an effective control of distribution, would have been equivalent to forcing the cotton textile industry "to go to war" in the same hard-boiled fashion as the metal-using industries. Because of the special character of the supply-demand unbalance in cotton fabrics, however, it was impossible to win the necessary support to drive these drastic measures through against what would have been the most bitter opposition. Neither the industry nor the war administration in Washington was willing to accept the proposition that a failure to assure a minimum supply of fabrics for low-price garments and other essential civilian uses was comparable to a failure to meet mili-

tary requirements. In these circumstances, the best that could be done was to accept the down-trend in production and juggle distribution of the available yardage in the effort to use it most effectively.

A counterproposal prepared in the Textile Bureau outlined a different approach to the control problem, particularly with reference to the selection of the strategic point at which to impose distribution controls. This plan recommended the extension of the M-317 mill set-aside procedure to provide a reserve at the mills for the requirements of each claimant agency. In effect, this proposal looked to a program determination division of the anticipated supply of each category of cotton fabric, and the implementation of that decision by the use of percentage set-asides at the mills, making available to each claimant the appropriate quantity of cotton fabrics. The plan effected a partial elimination of the influence of preference ratings in the acceptance of orders by cotton mills.

The principal weakness in the proposal was that the decision to abandon preference ratings as a mechanism for identifying the relative urgency of competing programs and assuring their fulfillment in proper sequence could be made only if there was precise knowledge about the size and distribution of the order load on mills in the details of claimant programs. The outstanding example of the abandonment of the preference ratings as a control device—the Controlled Materials Plan—was made possible only by the availability of this precise knowledge drawn from two years' experience with other metal control systems. It seemed doubtful that there was anything approximating this knowledge for textile products, or that it could be accumulated in time to meet the existing emergency. In the absence of this knowledge, the preference-rating system provided a flexible administrative tool, and guarded mill production against serious mistakes in gauging the size of programs and their impact on producers. As a minimum, it gave assurance that the effect of such mistakes would be felt only in the programs judged of least importance and, therefore, bearing the lowest preference ratings, or by non-rated civilian demand.

The system of fixed percentage set-asides at the mills was urged by the Textile Bureau as necessary principally in order to provide a quantitative control over the use of self-authorized preference ratings originating in the M-317 system. It was clear that complete freedom in the use of self-applied ratings would be dangerous in the extreme. It was far from

clear, however, that the only alternative to mill level controls was a universal application and authorization system for all consumers, as further argued by the Textile Bureau proposal. Such a system would create a volume of paper too great for the WPB to digest and completely stall the distribution of cotton fabrics.

One practicable alternative to mill set-asides for all end-use categories was a system of mixed control techniques, using for each major consuming area the control pattern best adapted to it. Such an approach to the problem had the advantage of retaining the administrative flexibility of the preference-rating system. For the military claimant agencies, budgetary control over procurement could be substituted for mill set-asides. For the essential industrial and agricultural uses, two control mechanisms could be instituted: (1) specific application-authorization procedures for selected large consumers of fabrics; (2) quota limitations in terms of a base period for all other fabric users applying self-assigned ratings. Because of the special procurement problems of the export agencies, it would probably be desirable to retain the mill set-aside procedure in this area. For selected programs of high essentiality, such as those for children's low-priced garments, the specific authorization procedure under M-328B could be continued and, as personnel expansion permitted, could be extended. In those areas of most essential civilian demand in which the specific application system was not thought desirable (because of the volume of paper it would generate or for other reasons), a base-period quota-limitation technique could be used to insure the production of necessary quantities of fabrics for other civilian products.

It could be forcibly argued that assignment of percentage limitations or set-asides governing mill acceptance of orders for industrial and civilian categories would introduce an element of inflexibility which would interfere with the effort to get maximum production for the most essential programs. Orders placed with individual mills would not fall in set-aside categories in the precise proportion established for the industry as a whole. Whatever procedure was adopted for juggling orders among mills to adjust their production loads to conform with percentage limitations, it was likely that some frictions and rigidity would be encountered. Either production would be handicapped, or a degree of non-compliance must be accepted as normal. The proposal advanced by the Textile Bureau, looking to the creation of machinery for quota trading among

mills, did not appear to be a practicable operating procedure. There would be a general inclination among all mills to get out of certain types of orders and into certain other types (for example, out of military and into civilian). This would handicap individual mills in their efforts to balance quotas by trading. If the function were handled largely by the mill selling agents, it might provide a basis for charges of discriminatory trading. Beyond this, it would be necessary to carry on quota trading in terms of fabric yardages because the percentage limitations for each fabric would apply to the anticipated quota production of each mill taken as the base quantity. Therefore, in addition to the problem of trading orders within end-use categories, there would be the additional problem of matching yardages. Again it appeared likely that the outcome would be either interference with production or a degree of general non-compliance. Neither result could be regarded as desirable.

The alternative procedure suggested by non-Textile Bureau technicians covered six points:

- 1) use of preference ratings in accordance with the provisions of Priorities Regulation No. 1;
- 2) limitation of mill set-asides to approved export requirements;
- 3) establishment of budgetary procurement controls for the military and export agencies;
- 4) use of specific application-authorization procedures for selected large agricultural and industrial users, such as the agricultural bagging manufacturers;
- 5) provision of the self-assigned preference-rating system for other approved agricultural and industrial uses and the limitation of their application of such ratings in terms of a quota against base period use;
- 6) division of total civilian requirements into three categories:
 - (a) most essential programs. These would be handled by specific application-authorization under the M-328B procedure. Authorized applicants would be assigned preference ratings for the purchase of specific quantities of fabrics.
 - (b) least essential products. These would be placed on a prohibited list.
 - (c) all other products. These would be unrated, but their manufacture would be permitted from such fabrics as were available after the mills had met the entire rated demand.

It was argued that this procedure would permit the allocation of fabrics to selected civilian programs, and the expansion of the list of such programs as rapidly as possible. It would also permit additions to the

initial list of prohibited products to the extent necessary to make fabrics available for the approved but unrated civilian products. Preference-rated orders would all be valid. Total authorized and rated demand would be held within total anticipated supply for each fabric category. In these circumstances, if a sufficient yardage was not available for all essential civilian programs, it would be necessary to reexamine the quantities authorized for military, export, industrial, agricultural, and rated civilian programs and appraise their needs against the needs of the other essential civilian programs. These recommended procedures were generally consistent with the objectives of the Textile Bureau as outlined in its proposal and had the added advantage of using accepted and tested WPB operating techniques.

From the debate which was carried on over these and related proposals, there was developed a program for control which had the affirmative, if reluctant, support of both the Textile Bureau and the cooperating specialists in control techniques. This proposal looked to a minimum revision of existing operating procedures, in the interest of prompt action and minimum confusion. Changes in the distribution of fabrics were to be secured substantially through the creation of internal controls rather than through the introduction of new procedures for cotton textile fabric producers and consumers. The recommendation was supported by the following observation:

This proposed extension of existing controls over cotton textile fabrics provides an integrated procedure which can be instituted in the third quarter, with the minimum of confusion for cotton fabric producers and consumers and the maximum utilization of existing control mechanisms and procedures. It is recognized that a further deterioration of supply-demand relationships may require an even tighter control of a somewhat different character. Preparations for setting up such a control system would in any event be so extensive as to delay its installation until the first quarter of 1945. In view of this, the proposal is advanced for immediate adoption, with the understanding that preparatory work on a more extensive control plan will go forward as soon as the recommended controls have been established.

The proposal began with the recommendation that the machinery be started to set up a supply-demand balance for the third quarter of 1944. Following earlier instructions, claimant agencies had already submitted third-quarter requirements in a number of specified cotton fabric categories. Requirements as submitted had been subjected to preliminary re-

view and balanced against anticipated supply within each fabric category. The anticipated supply within each category could be divided among the claimants through the Requirements Committee procedure without delay.

The first departure from existing controls, therefore, was the recommendation that the necessary administrative machinery be established for carrying out such a program determination. This machinery was to be established through the installation of budgetary controls over procurement by the military and export agencies. These agencies would be prohibited from placing purchase orders beyond the quantity limitations authorized by the program determination.

Underlying this proposal was a plan to win the support of the military agencies by assuring their procurement precedence on mill schedules in return for their agreement to operate within predetermined fabric budgets. To insure delivery, it was proposed to remove two restrictions which at that time were interfering with the fulfillment of military programs. The first was the possibility of mill avoidance of certain rated orders under the rather loose priority rules established by Priorities Regulation No. 1. To strengthen the existing system in this respect, it was proposed to establish in each fabric category a minimum rated-order acceptance floor high enough to absorb the total rated demand. No mill would be permitted to accept less than the stipulated rated-order percentage in any fabric category which it produced. The second restriction was the existing maximum percentage limitations on the acceptance of rated orders by mills, as currently included in the distribution schedules of Order M-317. It was proposed to wipe out this limitation on the acceptance of rated orders. The result would be that rated orders could claim the total output of any mill. Installation of budgetary controls was advantageous for the civilian economy because it assured residual fabric yardage for essential civilian requirements.

The next recommendation was to segregate requirements processed by the Office of Civilian Requirements into two categories. The first, known as "essential general programs," would be listed in a preference-rating schedule, and manufacturers engaged in the production of essential products would receive AA-4 preference ratings to be used in purchasing listed textile fabrics. The second category, labeled "special critical programs," would be listed in the existing order, M-328B, and handled

under the application-authorization procedure already in use. Manufacturers participating in these programs would receive AA-3 preference ratings for the purchase of listed textiles to be used in the manufacture of specified end products.

The recommendation for "essential general programs" reflected the inability of the Textile Bureau to bring a significantly larger number of items under the existing application-authorization machinery of Order M-328B. Such an attempt would result in the receipt by WPB of a volume of paper greater than the existing staff could possibly handle. The proposal therefore looked to the use of a self-assigned rating procedure at least for an interim period.

The procedure selected to carry out the group of essential general programs was embodied in Order M-385, issued at the end of July. This order had the single objective of channeling a minimum yardage of cotton fabrics into the production of a group of selected products (principally garments) at low and medium prices. Under the order, a producer of one of the selected end products was authorized to assign an AA-4 preference rating in purchasing any of the listed fabrics from a jobber or converter. This assignment of preference rating was accompanied by certification that the fabric was to be used in one of the selected essential end products. Each converter of the selected cotton fabrics was directed to set aside for AA-4 rated orders for each controlled fabric at least a specified minimum percentage of his own procurement of gray goods without the use of a preference rating. The AA-4 preference rating was not extended to the mills. It served only as a means of identifying orders placed with converters covering fabric required to produce the selected essential end products.

The effect of the order was to insert a control over the distribution of unrated gray goods moving into the hands of converters. A portion of that free yardage was directed to the production of the most essential low and medium price items. This diversion was accomplished by directing converters to set aside a specified portion of their unrated procurement and to sell this yardage only to producers of garments who agreed (1) to use the fabric purchased from the set-aside in the production of the listed items, and (2) to sell these items to their customers at or below the listed wholesale prices.

During the balance of 1944, M-328B and M-385 continued to serve

as the major instruments for channeling fabrics to the more essential needs of the civilian economy. The percentage set-asides in M-385 were raised and the list of fabric constructions covered by the order extended. At the same time, the number of programs prepared under M-328B was increased, so that between the two orders a minimum of success was achieved in moving fabrics to civilians in the shape of products at the lower end of the price range.

In the early months of 1945, the supply outlook became even worse, and the question of joint WPB and OPA action to increase the flow of cotton fabrics into moderately priced civilian products was reexamined. OPA issued its Maximum Average Price Regulation prohibiting any clothing manufacturer from selling garments at an average price greater than his average price for the same class of garments in a 1943 base period. WPB issued Order M-388A which extended the coverage and raised the percentages of the M-385 schedules, but used essentially the same technique of trapping unrated fabrics purchased by converters and directing their movement into cost-of-living items.

A broad appraisal of the effectiveness of cotton fabric controls in the late spring of 1945 reveals the limited successes and the area of significant failure. Comparison of allocations and issuances with mill shipments indicates that, in terms of total linear yards of all fabric categories combined, each of the three broad claimant areas (military, export, and domestic non-military) had received approximately the yardages which were allocated by the Requirements Committee. With very few exceptions, reasonable relationships also existed between allocations and shipments for individual fabric classifications. Since the individual claimant agencies within the military and export areas controlled their own procurement, it seems reasonable to assume that each was receiving its appropriate share of mill production. The general conclusion therefore can be reached that the existing distribution control system was reasonably effective for the military and export agencies.

The available data do not permit an appraisal of the extent to which programs of the non-procuring agencies were being fulfilled. Because of the character of the existing distribution controls, they were less effective in these areas. A current appraisal noted that it did not appear desirable at that time to recommend wholesale revision of distribution controls for two reasons: first, a revised system could not be installed and oper-

ative before the first quarter of 1946; second, assignments could be carried out under existing control procedures if these were extended to cover the relatively large yardages still moving uncontrolled. The rated but uncontrolled yardages moving under the self-assigned preference-rating schedules of Order M-317A were destined to be controlled in the third quarter of 1945. An application-authorization system was to be instituted for agricultural, industrial, commercial, and selected essential civilian uses, which would permit budgetary accounting for authorized yardages. Even after the establishment of the procedure, however, it was believed that some 500 million yards of cotton fabrics would still be shipped by the mills against unrated orders. Of this total, about 180 million yards would be set aside by converters and sold for items listed in Order M-388A. This would leave a residual quantity of free goods of approximately 300 million yards. The continuance of earlier drives to increase mill production by the recruitment of additional labor still did not appear to offer any significant relief. The relatively low wage levels prevailing in cotton mills, the approaching summer season, and the psychological drag of higher hourly wage rates in munitions industries combined to inhibit rapid progress. Assistance to the mills in modernizing existing machinery and adding new high-speed equipment also looked to results several quarters ahead. As in earlier reviews, this appraisal again called attention to the fact that, for the immediate future, there were much more promising possibilities in drawing usable fabrics from less essential and luxury items the production of which continued to be permitted under existing controls.

The end of the Japanese war found the Textile Bureau still struggling with the problem of dividing up shortages in such fashion as to minimize the impact at the most critical points in the civilian economy. Perhaps the most charitable appraisal of administrative control over cotton fabrics during the war was made in the final report of the chairman of the War Production Board:

The extreme complexity of the textile industry contributed importantly to the delay in establishment of this comprehensive control program. A tremendous amount of detailed work was involved in setting up controls extending from the initial processing of raw cotton through the production and distribution of end items by tens of thousands of individual establishments. As regulations were gradually extended, each step involved numerous unforeseen problems

which could be resolved only upon the basis of accumulated experience. Moreover, each new regulation encountered considerable objection from the several segments of the industry affected and compliance with WPB regulations often proved difficult and was never perfect.

A somewhat harsher appraisal might conclude that the cotton fabric distribution orders and procedures made up a non-integrated, non-uniform collection of controls, created as a result of the developing severity of the cotton fabric shortage over a period of several successive calendar quarters, and the failure to anticipate future trends and take action sufficiently far in advance. The system grew without plan, additional controls being imposed at successive trouble points to meet emergencies, with little attention to the integration of the several parts of the control system. *If the textile problem had been attacked cooperatively and with imaginative administration by industry and government personnel, it might have been possible to secure much more effective distribution of fabrics for essential civilian needs during the war. In addition, this more favorable background of wartime control in all likelihood would have made a significant contribution to the easing of the post-war shortages which continued to plague consumer markets after the termination of hostilities.*

Detailed analysis of wartime operations in cotton fabrics indicates that the system worked reasonably well for broad claimant areas following the installation of budgetary accounting controls for the procuring agencies in the third quarter of 1944. For all fabrics combined, the procuring claimants received in mill shipments a gross approximation of the yardage for which they had authorized procurement, and that yardage in turn was substantially in balance with the quantities allotted to them by program determination. As a result, the residual fabric yardages available for the non-procuring claimants were also in balance with the quotas of cotton fabrics established for these areas by quarterly program determinations.

Until the establishment of an application-authorization system for the principal industrial, agricultural, and commercial uses in the third quarter of 1945, there was some abuse of the self-assigned rating authority established under Order M-317. Overconsumption of fabrics for these purposes diverted needed yardages from essential civilian uses which were not supported by priority assistance. All the evidence, however,

indicates that the heart of the problem was not these limited diversions, but rather the disposition of available cloth among more essential, less essential, and non-essential civilian uses. With the exception of the limited controls imposed under orders M-328B, M-385, and M-388, this problem was never directly attacked. Even within the scope of authority set up by these orders, the controls were never pushed to their potential limits. Some indication of the magnitude of the yardage involved in these failures is provided by an analysis of mill shipments in the first quarter of 1945. Almost 600 million yards of cotton fabrics were shipped by the mills on unrated orders. Less than 200 million yards were covered by set-asides at the converter level and channeled to end uses and price lines regarded as essential to the maintenance of cost-of-living ceilings. The balance of almost 400 million yards was uncontrolled. In the absence of limitation orders prohibiting the manufacture of either non-essential or luxury items, much of this yardage was shipped to such uses.

Although the evidence is fragmentary, it is possible from an analysis of data reported by finishers of cotton fabrics to discover some of the less essential end uses to which substantial yardages of unrated cotton fabrics moved. More than 90 million yards were finished for curtains, draperies, and upholstery purposes, and almost 16 million yards for tablecloths, napkins, and dresser-cover fabrics. These end uses claimed substantial quantities of such fabrics as marquisettes, print-cloth constructions, sheeting and tubing, drills, twills, and colored yarn fabrics. Other yardages were reported by finishers for the following miscellaneous uses the essentiality of which is suggested by their identification: neckties, retail package goods, powder puffs, ribbons, binding, buntings, *doll faces*, and *doll clothes*. The reported data did not permit a determination of the uncontrolled yardages moving to higher price apparel items. But any appraisal of the merchandise on sale in retail-clothing stores in the latter part of the war makes it clear that a significant proportion of this cloth was used for such garments.

The administrative performance for cotton fabrics indicates two significant failures. The first was slowness to recognize supply-demand unbalances in advance of their impact and in initiating the necessary action to resolve the difficulties before they grew into crises. The second was a general unwillingness to transfer and apply in the cotton fabric area the record of success and failure in administrative control techniques which

had been built up in other material areas in the war. Members of the cotton fabric industry, like the members of all other industries in the war, were fond of describing their trade as "different" and therefore presenting control problems not to be compared with others. The fact is that in all significant essentials control problems are the same for all materials. In the case of cotton fabrics, the confusion was increased by the rejection by the top war management of the determination of degrees of essentiality in civilian requirements as a matter lying outside the scope of authority of an agency devoted to prosecution of the war. It was this basic point of view which underlay the hesitance and timidity in taking action to increase supplies of textile products selling at low and medium prices. The cost of such action clearly would have been the elimination of many luxury and less essential products and, to the extent that they were unwilling or unable to convert, of the producers of these products. The harshness of such actions was accepted as necessary in the interest of winning the war in the metal trades. It was never accepted in the textile industry.

There were two reasons for this negative attitude. First and clearly most important was the fact that unlike the other industries where the choice was between military and civilian needs and the decision was to force the sacrifice on civilian needs, in the textile industry the choice was substantially between categories of civilian needs, and the war agencies were unwilling to limit themselves to the full implications of the decision to serve what were clearly the most essential needs. The direct tie with military operations was lacking. The second reason was the appearance of the shortage problem much later in the war than was the case for most other materials. By the time the impact on the civilian economy had become recognizable, the end of the war was in sight. The judgment was frequently expressed that forcing producers out of business or into undesirable conversion at that stage of the war would be unreasonable.

CHAPTER XIII

SCHEDULING

THE ADMINISTRATIVE KEY to mass production is the painstaking planning, timing, and direction of the flow of materials and parts through the manufacturing process so that each item arrives at the final assembly line where and when it is needed. Arrival ahead of time clutters up the production line or the factory with unnecessary materials. Arrival behind time interrupts the assembly operation and slows the production flow. This is the essence of the scheduling job in the individual plant expressed in its simplest terms. In a larger sense, this is also the scheduling job in the national economy in time of war.

The national scheduling assignment might be described as the job of mobilizing the resources of the country by treating them as if they were the composite parts of a unified production complex. Under the impact of the national emergency it may mean ignoring boundary lines between *plants, companies, and industries*; *cutting through* established customer-supplier relations cultivated in time of peace; and redirecting and re-timing the flow of materials and component parts for the purpose of attaining maximum production for military, export, and essential civilian needs. Obviously this can be accomplished only by a judicial allowance for customary sources of supply, price relationships, geography, comparative production costs, and all other considerations which in time of peace shape the organization of the free enterprise economy, limited by their positive contribution to meeting the national objectives during the emergency period.

Under the impact of the war production program, however, the term "scheduling" acquired a number of different meanings, and the definition suggested in the preceding paragraph was never translated into the sort of action required by efficient production engineering. From their inception, priority ratings were a kind of scheduling machinery, operating as a *loose method of controlling end-item delivery schedules* by putting first things first. But because they were a general and qualita-

tive rather than a specific and quantitative control, and because their significant impact was largely confined to end products, they were not capable of effecting any meaningful coordination in the flow of materials and components to the end assembly point. As this review has pointed out repeatedly, every attempt to use them broke down eventually under the overload of priority-rated demand. From time to time throughout the defense and war periods, there was discussion about the urgent need for scheduling (the term being used in a rather loose sense, but generally referring to the organized direction of the flow of materials and parts to end-product assemblies), but no comprehensive plan was ever developed for dealing with what was probably the most important aspect of the administration of wartime industrial mobilization. Instead, there was continual resort to a variety of piecemeal, half-way measures which applied a number of different management techniques to individual material, component, and end-item situations, apparently reflecting the hope that something short of complete scheduling would be reasonably effective in providing a solution to the universally recognized problem. The ultimate objective of all-out scheduling—the centralized direction of the entire economy as if it were a single manufacturing plant—was never even remotely approached.

The disposition during the war years to grasp at weak imitations of rational scheduling reflected a retreat from a plan for industrial preparedness which had been in the making since the close of the first World War. The National Defense Act of 1920 was framed on the basis of information and experience gained from the lack of industrial preparedness in the war years. The Act provided for a permanent peacetime director of procurement and production for the War Department, in the person of the Assistant Secretary of War. To administer peacetime procurement for the Assistant Secretary, there was established in his office a Current Procurement Branch. Under this Branch was a Procurement Control Section the duties of which were: (1) to prepare, coordinate, and revise the instructions governing procurement; (2) to collect information relative to the progress of current procurement; (3) to make current procurement information available to the public; (4) to review all current procurement operations and, where necessary, initiate corrective action; (5) to make statistical studies and prepare reports relating to current procurement; and (6) to arrange for the procurement of surplus

property from other government departments and agencies for use by the Army and National Guard.

Under the Army General Staff a Planning Branch was created in the office of the Assistant Secretary of War, to establish the program under which the Current Procurement Branch would operate. The work of the Planning Branch, largely defined, was to obtain answers to the following questions: (1) What items are wanted by the various branches of the Army? (2) How much of each item is required? (3) What is the chronological schedule of requirements for each item? (4) Where can each item be obtained? (5) How can each item be obtained in the necessary time and quantity? Determination of answers to the first three questions was the responsibility of the General Staff, based on an over-all program broken down in the detail of the requirements of each of the service arms. The answers to the last two questions required the Planning Branch to trace the blueprints of the greatest scheduling job ever attempted.

Work started on this program as early as 1924. It was determined that military requirements fell into two general categories. The first consisted of special items for which it was inevitable that procurement difficulties would be encountered. The second consisted of items of general use for which ample sources of supply existed in normal times. In 1939 there were approximately 1,100 items in the first category. These were made subject to detailed scheduling by the Procurement Planning Division. The 7,000 items on the "normal supply" list were not treated in such detail, but were made the subject of comprehensive surveys through the Army field organization. Plant surveys were undertaken, resulting in the allocation of some 10,000 industrial plants to the production of specific items. The planning went into considerable detail. For example, a 75-millimeter shell was broken down into shell body, cartridge case, fuse, primer, explosive, and container. The plan was worked out in such detail that for any item, such as fuses, not only were the facilities of selected precision manufacturers assigned on paper to the making of the fuses, but tributary plants, which would supply piano wire, springs, screws, brass fittings, and similar parts, were also allocated to the appropriate contractors for the complete subassemblies.

In the summer of 1940, this entire plan existed on paper for all the supplies which the General Staff had estimated as necessary for armies

ranging from 1.1 to 4.4 million men. The plan was ready to be declared operative on M-Day. A number of educational contracts had been awarded and provision had been made for the additions to plant and the supply of supplementary equipment which would be required to produce the assigned schedules. Strange as it may seem, however, because no M-Day was specifically designated as such, and because of personnel frictions and power jealousies, the military services regarded the plan as not operative and proceeded to find new patterns in production and procurement as Congress voted increasingly larger appropriations for national defense. We may speculate about what the results might have been if the military procurement authorities had recognized the first defense appropriations at increased levels as the equivalent of a declaration of M-Day. If they had proclaimed M-Day at that time, they would have placed their procurement against the paper-allocated manufacturers and this would have had two obvious results: (1) the conversion of many plants to war production might have been expedited by months or even years; (2) an orderly procedure would have been set in operation, and might have provided a systematic basis for the further expansion and development of procurement and production methods. Whatever the benefits might have been, the fact is that almost twenty years of planning were junked when the nation began to mobilize for war.

Since the program of defense procurement required the creation of new facilities and the extension of old facilities for the production of war materiel, one of the first bottlenecks on the industrial front was the supply of machine tools. When machine tool manufacturers were compelled by the mountainous demand thrust upon them either to give delivery dates one or two years in the future, or to reject orders because there was no likelihood of their delivery within a reasonable period, it became necessary to undertake some method of scheduling which would assure the early supply of the necessary machine tools at the most vital points. Efforts to deal with this problem were directed at picking up where machine tool control had ended in 1918. This system required a notice to Washington by the manufacturer on the acceptance of each machine tool order. The manufacturer also notified Washington when he entered the tool into production and when he shipped the finished tool. With this information, the first objective of the administrators was to fill up all open capacity, and when this no longer satisfied the overriding

urgent demand for tools, they attempted to reschedule either shipments or production so as to satisfy emergency needs.

The size of the demand for machine tools made it difficult to administer this system. Under appeal, every order became the most urgent and the most important order in the economy, and it was soon discovered that when everything was expedited, nothing was expedited. Repeated efforts were made to substitute generalized directions, such as priority lists, in the hope that the problem could be worked out without the cumbersome administrative load required if each order for the production and delivery of a specific tool were to be scheduled. No such generalized scheme ever had even a modest success, and the order-board form of scheduling of machine tool production continued in use throughout the war.

As similar problems arose for other equipment items, such as electric overhead cranes, compressors, and turbines, the pattern of scheduling used for machine tools was adopted with only slight variation. For the most part, these efforts at scheduling were reasonably successful because the number of manufacturers of the scheduled equipment was limited and the individual users and uses of the finished items could be fairly well identified. In critical review, however, it is clear that these operations did not enter into scheduling in the sense of controlling the size and timing of the flow of materials and parts required in manufacturing. Rather they were a scheduling of the delivery of finished items and, to a much lesser extent, of their production. As the war production program expanded in 1942 the problem of delivery of components became increasingly acute. Specialized scheduling procedures were attempted from time to time for such items as fractional horsepower motors and bearings. But these individualized controls did not resolve the problem because the order-board method broke down under its own administrative weight when hundreds of suppliers and thousands of customers had to be brought within the administrative procedures.

Early in the fall of 1942, there was evidence of a rapidly growing tendency on the part of the operating branches to institute elaborate programs for scheduling production and deliveries based on monthly order-board reports which showed each respondent's schedule of unfilled orders identified in complete detail as to status. For example, Order L-100 placed compressors under this type of control requiring, in the case of

one manufacturer, a report running to 120 pages. Amendment No. 1 to order L-112 imposed production scheduling control on manufacturers of industrial power trucks. Order L-193 placed some 500 manufacturers of conveying machinery and power transmission equipment under similar control. Attempts were being made to initiate similar scheduling activity for several other industries, including construction machinery and power-generating equipment.

This tendency was viewed with alarm by at least some of the responsible top officials of the War Production Board. It was noted that, while the Board had a record of at least qualified success with scheduling activities for a limited number of extremely tight materials and their products, particularly in the case of the armed services, the extension of this type of control to products of great diversity and a high degree of complexity might be very dangerous. The proper operation of complete production scheduling for any item required an intimate and detailed knowledge not only of the operations and programs of the industry and the individual manufacturers scheduled, but also of the operations and programs of all industries to which the scheduled item was shipped as a component. If this meshing of programs could not be secured, the apparent production control would rapidly deteriorate into a minor type of trouble-shooting or expediting function. Such a system would impose severe burdens on industry. It would also burden the responsible WPB industry divisions with such a mass of clerical work as to vitiate their efforts, and it was seriously feared that the results would fall far short of expectations and would be out of proportion to the amount of work involved.

Recognizing the desirability of using scheduling techniques in certain carefully selected circumstances, it was urged that general guidance rules be established for selecting criteria to be used in determining when and in what circumstances the scheduling type of control might be desirable. Such criteria should be formulated from the standpoint of both the critical nature of the product to be scheduled and the diversity or complexity of the conditions of its production. This admonitory attitude was particularly significant in view of the tendency of many of the divisions to follow the current fashionable pattern in the issuance of questionnaires and reports which might be vital to intelligent operation in the division originally using them, but which, for some of the branches seeking to

follow the established pattern, could result only in the accumulation of a mass of data of no administrative usefulness and which might even obscure a simpler and more effective approach to the control problem.

The most ambitious and by far the most complex undertaking in this area was general scheduling order M-293, issued at the end of February, 1943. The background of the decision to move into the scheduling of critical common components through the machinery established by this order illuminates the forces with which WPB administrators were struggling in their efforts to mobilize the nation's production resources. For several months there had been repeated evidence of interference with production as a result of the inability of end-product manufacturers to obtain delivery of essential component items. There were charges of duplicate ordering and indications that the use of crude priorities, as applied to the delivery of fabricated parts and subassemblies, was an influence at least as disturbing as it was favorable. A somewhat different problem was introduced early in 1943 by the discovery that there was a serious unbalance in the order load placed on competing manufacturers of the same and related products. Some producers in an industry were operating on a three-shift basis and had unfilled back orders equal to many months or years of output. Other manufacturers in the same industry were working one or two shifts without pressure and with only 30 or 60 days' orders on their books.

It was apparent that at least two factors were responsible for this condition. First, some manufacturers, because of past reputation and actual performance, were favored as sources of supply. This position was bolstered by the desire of many of their customers to strengthen business relations with an eye toward their postwar status in the reconversion period. Some of the competitors of these producers enjoyed less favorable status because of deficiencies in their pre-war performance, disadvantageous geographical location, non-competitive price policies, relatively weak financial standing, or recent entry into business. To some extent, the unbalance occurred because the customers believed that the favored producers enjoyed particularly good relations with their suppliers of basic materials and would not be likely to have their production curtailed because of inability to get steel, copper, aluminum, and other production materials.

A second factor was the failure of many end-product producers to place firm orders for the delivery of components and subassemblies well in advance of current production. This was itself the result of a complex set of conditions. Components, in normal times, were largely off-the-shelf items which were ordered for immediate delivery from distributors' or manufacturers' stocks. Even "special" items were obtainable on short notice, since the "special" specifications usually involved only minor changes in basic stock items. It was difficult to get purchasers to recognize the changed conditions of procurement resulting from the huge and specialized wartime demand. Undoubtedly many manufacturers had found their own production seriously upset by repeated changes in military schedules or specifications which forced rapid and extensive adjustments in the rate or composition of their own final assembly. In these circumstances they had a natural inclination to curtail future commitments to suppliers and endeavor to operate within a margin of safety, even if this heightened the risks involved in their inability to secure components and subassemblies on schedule. This behavior pattern was strengthened and the attached risks were minimized by the belief of many end-product producers that in any emergency they could call upon the Army and Navy for expediting assistance. Since Army and Navy procuring branches would actually perform in this manner and, in fact, often encouraged producers to rely upon them for this service, manufacturers could adopt the practice in the belief that it was a favored operating procedure.

The inevitable effect of this complex of circumstances was to upset and interfere with scheduled production by the makers of key components. Failure to secure maximum utilization of material and component resources was no more serious a threat to high level production than were the repeated raids by Army and Navy expeditors who were accustomed to high pressure selected orders through the plants of their contractors in response to appeals from prime contractors for emergency assistance. Inter- as well as intraservice rivalry in expediting made no insignificant contribution to the resultant disorganization.

Therefore, the War Production Board, with the concurrence of the top staff of the procuring agencies, in January, 1943, directed all manufacturers by February 6 to place advance orders for their first and second-

quarter requirements for more than 30 important categories of critical components, and by March 1 for the balance of their 1943 requirements. Following this restriction, the War Production Board issued general scheduling order M-293 as the instrument to be used in reshuffling and scheduling all orders placed with the producers of the selected types of critical common components.

The master scheduling order divided the critical components to be controlled into three categories representing three stages in the severity of the shortage or the crowding of manufacturers' order books. The categories were overlapping and not mutually exclusive. The most important and the largest group consisted of the least critical components. Manufacturers of these items were directed to file a repetitive operating report with the War Production Board. The information to be reported, in most cases, covered production capacity, unfilled orders, orders received, shipments, cancellations, and orders scheduled for production. No further action was to be taken with this class of components. In effect, they were placed in a pool to be watched for indications that they should be transferred into a more critical category.

The second group of components was designated Class X. Producers of these items were directed to submit a monthly operations report similar to that outlined above. In addition, they were instructed to file a special report listing their proposed delivery schedules. Under the terms of the order, after April 1 manufacturers would be permitted to deliver such components only in accordance with their proposed delivery schedules as approved or amended by the War Production Board, regardless of preference ratings and notwithstanding directives, rules, or regulations.

The third and most critical group of common components was designated Class Y. Producers of these components filed the regular operations reports. In addition, all persons attempting to place an order for any Class Y component were directed to make specific application to the War Production Board for authorization to procure. The authorization received by a successful application might even specify the individual manufacturer with whom the order was to be placed. Any authorized order under the terms of M-293 had to be accepted by the manufacturer with whom it was placed, provided that the customer met his regular price and other terms of sale. Having accepted such an order, the manu-

facturer had to make delivery in accordance with the schedule, regardless of preference ratings on other orders.

At this point (early spring, 1943), the scheduling apparatus of the War Production Board was composed of a non-integrated collection of disparate rules and procedures. These included the scheduling requirements of the Controlled Materials Plan; the rules established by Priorities Regulation No. 1 with respect to the rejection, acceptance, and production sequence of orders; the scheduling rules of Priorities Regulation No. 11B for manufacturers of products outside the CMP system; and general scheduling order M-293 and related orders.

The original projection of the Controlled Materials Plan contemplated tying the allotment of controlled materials to a production schedule. These schedules would be established by the claimant agency for its prime contractors, by the primes for their first tier of suppliers, and in sequence down the supplying chain. Deliveries were to be determined by months in physical units, so far as feasible, and, where this was not possible, in dollar value. In practice, the later history of CMP proved that this could be carried out only in the A-product sequence; even here it was actually used only to a limited extent. Assigning schedules requires precise knowledge. Under conditions of shortage, realistic production schedules also require a cutting-back of delivery schedules to the limit imposed by the availability of materials. There was a general lack of precise knowledge and none of the willingness to cut back programs which scheduling required. The WPB industry divisions responsible for the allotment of materials with few exceptions were never able to set quantitative or even dollar production schedules for the manufacturers of B products. They allotted steel, copper, and aluminum; the production schedule was the maximum output which could be supported by the allotment of controlled materials.

Under the CMP rules, the manufacturer of an A product who received an authorized production schedule was not permitted to accept an additional order and allotment of controlled materials, regardless of the preference rating assigned,¹ unless the new order could be produced without interfering with the authorized production schedule already on hand. However, manufacturers of B products, and of products not containing controlled materials and therefore outside the CMP system, were

¹ Except an order bearing an AAA emergency rating.

subject to the preference sequence established by Priorities Regulation No. 1. In general, this meant that lower-rated orders were deferred in favor of orders bearing higher preference ratings.

For selected key components in critically short supply and in an area of procurement competition between two or more claimant agencies, M-293 overrode these general scheduling rules; certain other scheduling orders (such as E-1-b for machine tools) performed the same function for a few other products. Class X components in the M-293 system were produced and shipped under frozen schedules as filed and approved or changed by the War Production Board, regardless of preference ratings accompanying orders arriving after the filing of production schedules and notwithstanding the provisions of other WPB directives, rules, or regulations. Orders for Class Y components could be entered in manufacturers' production schedules *only after the customers had received specific authorizations from WPB*. The acceptance of authorized orders was mandatory, as was delivery in accordance with schedule, regardless of preference ratings. In addition to the scheduling procedures created for X and Y components, the War Production Board retained reserve scheduling authority over all critical components, including the power to direct the cancellation of accepted orders, make adjustments in production and delivery schedules, *shift orders among manufacturers*, or take any other action deemed necessary.

The scheduling authority sketched above was reinforced by Priorities Regulation No. 18, issued early in May, 1943. This regulation listed more than twenty WPB orders under which approved production and delivery schedules were defined as "frozen schedules."

Notwithstanding any contrary provisions of any other regulation, order or other instrument issued by or under authority of the War Production Board (including AAA's and other preference rating instruments and CMP allotments), no producer shall interfere with any frozen schedule by eliminating, displacing or altering the precedence of any purchase order listed for production or delivery thereon in favor of any other purchase order unless he is specifically authorized or directed to do so by an order or direction of the War Production Board which identifies the frozen schedule and states on its face that it is an amendment of that schedule.

The issuance of M-293 did not make an immediately significant contribution to the solution of the scheduling difficulties. It provided instru-

ments, but not a procedure governing their application. In the hands of a group of administrators of a certain type, it could readily have degenerated into a superexpediting scheme. Relatively little was done in the early months of 1943 toward clarification of the overload of orders for components, while the debate proceeded over ways and means. As in all other periods preceding the arbitrament of important issues of technique and procedure, there were more proposals than could be appraised intelligently; the arguments about techniques often cloaked unrecognized but deep-rooted disagreements about fundamental philosophies of control; experts fresh from industry fought with government experts (*most of them also from industry, but somewhat less fresh*); and the special interests of certain industries or even of individual companies—unusually powerful or unusually vocal—frequently twisted decisions into paths for which the great stakes of the nation at war could provide no rational justification.

At the heart of the controversy was the identical disagreement which had been fought out in 1941 and 1942: piecemeal uncoordinated expediting and solution of individual problems vs. over-all integrated allocation. In 1941 and 1942, the contrasting issues had been presented in terms of priority actions and metal-mill order-board review on one side, and the allotment program of the Production Requirements Plan on the other. That controversy had been resolved finally for the most important production metals by the institution of the Controlled Materials Plan. The issues presented by the debate over the administration of the overload of orders for key components were in their fundamental logic the same issues, although the argument was clouded by the belief held by some of the management personnel that the order-board review procedure could not be made to function effectively from a Washington desk, but had to be undertaken in the individual plant.

Review of the schemes then current makes it clear that there were two principal ways to accomplish scheduling of the production and distribution of critical components. The first was to review within the responsible WPB divisions all orders placed with component manufacturers, and to remove the overload by the elimination of those orders which for one reason or another appeared to be less essential in the war economy. Enough orders would be removed from production schedules in this way to assure the scheduled production and delivery of the more essen-

tial orders. This was precisely the same procedure as that in use in 1941 and 1942 by the materials branches to clear the order boards of copper, brass, and aluminum mills. And for the same reasons hammered out by experience in the earlier period, this type of review and elimination could not be founded on any over-all appraisal of related requirements in terms of either claimant programs or end products. The second method was to compile total requirements by calendar periods for each category of critical components, measure the aggregates against anticipated supply, cut back to the extent necessary to secure approximate supply-demand equilibrium, and *reduce programs to the limits of feasibility supported by allocations of items in shortest supply*. This would be a follow-through on the philosophy of control given expression in both PRP and CMP and would pick up the abortive attempt to authorize quantitative purchase authority for fabricated products, components, and subassemblies in Section F of form PD-25A under the Production Requirements Plan.

In regard to the order-board review, the most detailed proposal for handling the scheduling assignment, using the basic procedures established under Order M-293, was brought forward in the late spring of 1943 under the title of "Components Scheduling Plan." This procedure used as its foundation Form PD-903 (later WPB-3003), a detailed scheduling instrument similar to the technique used for internal scheduling of production and procurement by a number of large producers as part of their normal operating routine. Probably the most formidable looking data request ever issued by the War Production Board, the form could be used as either a shipping schedule prepared by a component manufacturer or a requirements and requested shipping schedule prepared by the purchaser of a controlled component. On twin spread sheets it provided space for complete identification of purchase orders for components, including CMP allotment number, government contract number, customer's name and purchase order number, component manufacturer's shop order number, specific use to be made of each component, detailed specifications of component ordered, total quantity on order, brief description of the program or project identified by each government contract number, and twenty-four months' projection of orders, shipments and schedules for each item reported.

The announced purpose of the Components Scheduling Plan was to

inform each manufacturer in the contracting chain of the time and quantity relation between the requirements for components represented by orders placed with him and the completion of the end-product programs in which they would be absorbed. In this way, it was anticipated that the rate of production and delivery of components would be determined by the schedule of requirements of the prime contractors in each war program. To carry out this proposal, critical components were divided into two categories: control components and subcomponents. The first category included such items as turbines and turbo generators, internal combustion engines, compressors, heat exchangers, pumps, stokers, and transformers. The second listed, among other items, crankshafts, carburetors, fuel injectors, electric motors, and generators. It was proposed that requirements for the control components of a program be reviewed in terms of prime-contractor schedules. It was not contemplated that subcontractors' orders for control components be reviewed by WPB, or that any review be attempted of orders for subcomponents.

Under the proposed Components Scheduling Plan, claimant agencies would be responsible for furnishing to the War Production Board monthly requirements for control components for their key programs, represented by orders placed directly by the claimant agencies or by their prime contractors. Prime contractors would file with their claimant agencies statements of their requested deliveries of control components for submission to the War Production Board, projected for twenty-four months on Form PD-903. After approval, the PD-903's would be returned to the prime contractors for transmission to their suppliers in order to obtain delivery promises. A component manufacturer receiving a PD-903 would indicate on the form his promised delivery schedule against the required delivery schedule presented to him. If this required his own procurement of one or more subcomponents from other manufacturers in order to carry out his own delivery schedule, he would prepare and send PD-903 forms to each of his suppliers (1) to carry the program identification down the manufacturing chain, (2) to inform his suppliers of his required delivery schedule, and (3) to obtain promised delivery schedules.

Under the terms of general scheduling order M-293, orders for components designated as Class Y had to be approved before being placed with the manufacturer. When orders for such components had been ap-

proved by WPB on form PD-903, it was declared unnecessary under the Components Scheduling Plan to file the form required by Order M-293 for the specified component. In the case of Class X components for which manufacturers were required by the order to report to the appropriate WPB industry division their proposed schedules of deliveries, a manufacturer operating under the Components Scheduling Plan would be permitted to submit copies of PD-903 forms as a proposed schedule of deliveries instead of the form listed in Order M-293.

An alternative proposal, stemming from consideration of the importance of securing a total supply-requirements balance, argued that effective scheduling of critical components must be based on a balancing of requirements and supply item by item before orders could be scheduled within individual plants. The data necessary to balance requirements and supply and to establish a foundation for scheduling could be accumulated through a mechanism similar to that used under the Controlled Materials Plan for steel, copper, and aluminum. Adoption of this procedure would also make it possible to integrate the allocation of controlled materials and critical components by using the same form to accumulate requirements and make allotments of both materials and components. This could be accomplished by adding to the standard CMP application forms—CMP-4A and CMP-4B—a schedule of critical components. Statements of requirements would move up the secondary and prime consumer chains to the claimant agencies. The accumulation by each prime consumer on his CMP-4A submission to the claimant agency would include all the critical common components required by the prime consumer and his suppliers. The same procedure would be used in that area of industry served under the Controlled Materials Plan by the CMP-4B system. Total requirements for critical common components would be presented to the WPB Requirements Committee concurrently with the submission of controlled material requirements. Supply data for the components would be available from a summarization of information provided by manufacturers of components.

The Requirements Committee would compare requirements with estimated production and make such cutbacks as were necessary to effect a balance with supply. It would then divide the supply by making allotments to the claimant agencies separately for each listed component. Each claimant agency would reallocate components to its prime consumers

who would in turn reallocate to their suppliers to the extent necessary to maintain production schedules. In making allotments, each claimant agency would make such adjustments as were necessary to bring the total allotments to prime consumers within the quantities of components made available to the agency by the Requirements Committee. In short, component classifications would be added to the controlled materials list and be treated in the same way.

It was recognized that two difficulties must be resolved in putting this proposal into operation. First, broad categories of critical common components must be established without regard for classification problems traceable to varieties of sizes and specifications. Second, a common unit of measure must be provided for each broad component class; minor variations must be ignored in setting up these common units of measure.

It was argued that balancing of requirements and estimated production and the allotment of components by items and by programs in this manner was the essential first step in any scheduling plan. Once this had been done, it would then be possible to review the orders placed and orders scheduled for production, as reported by manufacturers of components, and on this basis set up a rational order board for each component class. It was also recognized, however, that if requirements were carefully reviewed by the claimant agencies, with particular attention directed toward the adjustment of lead times, if over-all requirements were cut back to the full extent necessary to balance estimated production, and if classifications and units were reasonably determined, many of the existing or potential lags in the production of critical components would disappear. It should not be necessary in these circumstances to schedule production of all components plant by plant. All that would be required would be the establishment of the equivalent of production directives and the review and expediting of rejected orders.

For those critical components which could not be scheduled in this way, it was suggested that a more detailed control might be established. Examination of requirements statements would reveal the limited number of companies which reported the bulk of total consumption of critical components. It would then be possible to concentrate control in those companies and plants in which the aggregate usage of critical components would be in excess of 80 percent of the total usage by all companies. This would simplify the paper problem within the War Production

Board, since detailed scheduling of orders placed by consumers and orders put into production by manufacturers would be attempted for only a small proportion of the total quantity of components for which orders were placed.

The determining operating decision inclined toward the order-board concept, although significantly modified from the Components Scheduling Plan proposal. The key to the character of the decision lay in the abandonment of the CSP title and the implicit recognition that what was projected was neither scheduling nor an integrated plan, but a species of formalized expediting. Form PD-903 (renumbered WPB-3003 in the new series) became an all-purpose instrument for transmitting order board information to the War Production Board and the claimant agencies. Throughout most of the industrial system, however, the major end product of the M-293 system was the "freezing" of shipping schedules, thereby protecting them from frequent reshuffling resulting from the impact of high-rated orders.

This most ambitious and complex undertaking turned out to be one more example of the gap between plan and reality. The scheduling program was introduced shortly after CMP had been announced and was designed to supplement the scheduling philosophy embodied in the Controlled Materials Plan, projected as a method for distributing material in terms of authorized production schedules. It was assumed that if a fundamental limitation on the total of production was imposed through the CMP-authorized schedule, (1) adequate capacity existed for the production of the necessary components, and (2) the inventory limitations of CMP Regulation 2 would preclude components from being ordered in a manner that would jam up deliveries. It was assumed that M-293 would deal only with critical common components and that even in these cases detailed scheduling would be required only in rare instances.

In actual practice, CMP-authorized schedules did not reduce military end-item schedules, and component shortages haunted production throughout the war. Although the M-293 technique was continuously supplemented and revised, it never provided an effective tool except when implemented by expeditors tracking orders from plant to plant.

The violently critical reaction of large segments of industry to the intricate and detailed reporting systems required under M-293 led to active examination of other techniques for directing the scheduling of

production and shipments by the manufacturers of key components. One proposal which received serious attention was to place carefully selected WPB representatives in the principal plants of the larger producers. This proposal looked to a personalized control over scheduling at selected key points in the industrial system, which would eliminate the confused and often ineffective processing of information submitted to Washington on data requests, and also utilize a more intimate knowledge of the individual manufacturing enterprises and their schedules to secure the most effective mobilization of production resources. It was pointed out that most production problems can be clearly appreciated only in the individual plant, and only at this point could the method of control over components (as well as materials) be related to the schedule of production. Further, only with the kind of knowledge that a WPB representative stationed in the individual plant could accumulate would it be possible to determine the extent to which the authorized schedule was the one that would permit the plant involved to play its most effective part in the over-all production program.

Support for this proposal was found in the studies of concentration of consumption of materials and components in a small number of large plants. These studies, based on analysis of information reported on Form PD-25A under the Production Requirements Plan, indicated that less than 400 companies accounted for from 55 to 85 percent of the direct consumption of the most critical production materials. These same companies also consumed the bulk of the components and subassemblies. Over-all, it was estimated that their total authorized schedules controlled more than 70 percent of the nation's consumption of materials, components, and subassemblies. It was pointed out that if the problem of administration was decentralized to these companies, the War Production Board would obtain not only a more accurate knowledge of the problems toward which policy decisions were directed, but also a significant economy of time, personnel, and administrative machinery. If control were centralized in these larger enterprises, it appeared that little would be lost in releasing and simplifying controls imposed on many thousands of smaller manufacturing establishments. This proposal was reviewed and discussed, but never adopted.

In retrospect, it seems obvious that completely effective use of resources requires the development of more adequate scheduling techniques than

were promised by any of the piecemeal efforts introduced from 1940 to 1945. Perhaps the task of engineering production on a national scale outstrips the administrative abilities of individual human beings operating from a single coordination center. If this is so, then an all-out effort requires that we devise some method of splintering the totality of production into pieces which can be adequately scheduled from materials and components through facilities and labor into delivery of the finished end items. It is possible that the World War II failures in scheduling resulted more from the fact that we got off on the wrong foot than from the inability of individuals to deal with the problem. Since there was always a desire to avoid detailed control and precise instruction to manufacturers, it was inevitable that the first efforts provided no techniques on which the expanding war effort could be developed in an orderly fashion.

CHAPTER XIV

CONSTRUCTION

PROBABLY no phase of industrial and civilian mobilization for war was the subject of as extended discussion and as consistently bad administration as was construction. The problem first presented itself at the outset of the defense program in 1940. In 1948, under the impact of the veterans' housing program, it was still struggling with the burden of mismanagement. If the several phases of industrial mobilization could be compared by preparing input-output ratios designed to yield a quantum measuring over-all efficiency of performance—giving appropriate weight to economy, intelligence, consistency, and flexibility of management, as well as to material, labor, and power input factors—it is certain that construction would trail all others.

The reasons for this record are not simple. There can be little doubt that important sources of difficulty were inherent in the essentially local character of the construction industry, the absence of an organized current statistical reporting system providing basic information on the structure of the pre-war industry, the considerations which govern the decision to undertake construction, and the urgency and magnitude of wartime requirements for expansion of industrial plant, military installations, workers' housing, and related utility and service facilities. The managers of industrial mobilization could never escape the inexorable scissors pressure created by the need for a rapid expansion of plant capacity to meet the gargantuan requirements of global battle, on one side, and, on the other, the fact that the materials of construction were also the materials of current production. There was always the choice to be made between directing finished steel to the construction of a steel mill which would add to the nation's steel-making capacity a year later, and assigning the same steel (or its equivalent steel-making capacity) to desperately needed munitions.

The resolution of this conflict demanded a single administrative authority with power to integrate all construction with the rest of the

munitions, export, and domestic civilian programs; to determine the construction claim on supplies of scarce materials in total and in its composite parts; to approve or deny every significant project; and to enforce such conservation measures as it held necessary and feasible. This authority would have to strike through the organizational maze of conflicting interests and power-centers of the military agencies, special-interest federal agencies, WPB industry divisions, WPB materials divisions, and regional and local pressure groups concerned about war and postwar repercussions. The cold logic of the situation demanded such a concentration of responsibility and authority. But the historical fact is that at no time during the period of the national emergency was control over construction integrated with the other parts of the administration of war production. At no time was a comprehensive construction "program" prepared for critical appraisal. At no time was authority centered at a single point. Beyond these fundamental difficulties, and related to them in the status of both cause and effect, there were the continual turnover of officials few of whom had any direct connection with or experience in the construction industry; the determination of the military agencies not to yield control over the magnitude, location, and character of the construction they sponsored; conflicting or obscure policy directives with respect to the priority of competing top-urgency plant expansions, such as that between the high octane gasoline and the synthetic rubber programs, both directed by specially appointed, aggressive administrators; and the absence of forceful initiative at the top layer of War Production Board management, which permitted an unceasing debate over ways and means and fostered a search for solution in continual reshuffling of organizational lines and personnel assignments, rather than in command over the key factors of effective administrative control.

The size of the construction problem is best measured by the statistics of growth and composition. When Germany attacked Poland, construction activity in this country was still far below the peaks of the nineteen twenties. Under the impetus of war needs, the value of construction in 1941 equaled the earlier record and moved up another 30 percent in 1942, the year of the wartime high. Even higher levels would have been reached had not controls been imposed which permitted only war and war-related building activity. After 1943, most of the military installa-

tions and war plants were complete or nearing completion and construction activity slumped sharply, with critical materials still withheld from non-essential construction in order to maximize munitions production. From 1940 to 1945 the value of industrial construction, exclusive of the cost of tools and other equipment for industrial plants, was 10 billion dollars out of the total of 40 billion dollars of new construction. Direct military construction—camps, barracks, air bases, and so on—represented a slightly larger investment. Other major components were housing (all war-connected after the spring of 1942), highways (almost entirely war-related), and utilities. The story of the financing of this concentrated and explosive expansion presents its own collection of special problems which cannot be reviewed in this volume.

The early history of priorities in construction paralleled the developing use of priorities in other phases of defense production. It is a familiar story, complicated only by the maze of organizational lines of responsibility and authority which plagued the administration of construction from the start. The priority system at the beginning of the national defense program placed responsibility for the assignment of preference-giving assistance to essential construction projects first in the military agencies, next in the National Defense Advisory Commission, and finally in the Office of Production Management. The philosophy of fledgling priorities was oriented toward assistance rather than control. It was founded on the assumption of availability of adequate supplies of all materials and products except a small number of special items. From this stemmed the belief that almost everything required for a construction project could be obtained in the open market without priority assistance. Over-all planning hung the cloudy concept of the limited emergency with its attendant drag on any action which looked to more stringent conditions of supply six months in the future rather than to the relatively easy supply-demand balance of the contemporary market.

The early efforts to facilitate construction other than that under prime contract for the military were similar to those used in connection with machine tools. The proposed project would be submitted through the appropriate military department and, after the agreement to begin construction, would be supported by a so-called "letter of intent" issued to the company responsible for the project. This letter could be used by the contractor to establish for his suppliers the importance of the project.

By late spring of 1941, this type of assistance had become inadequate to generate the quick deliveries required to meet the early completion dates imposed on war-related projects. Contractors were then advised to file PD-1 applications for the items for which they required preference-rating assistance. Contractors quickly grasped this opportunity and were soon filing PD-1 applications for every item they were procuring. Although there were only two or three major projects using this device in May, 1941, the physical burden of typing the PD-2 certificates issued in response to the applications overwhelmed the stenographic service then available in the Priorities Division of OPM. To overcome this problem, and recognizing that practically all applications would be granted, the contractors were advised late in May to file PD-2's which would then require only the Priorities Division countersignature for their issuance.

By early June, a large number of the projects which had been planned in late 1940 and early 1941 reached the stage at which construction was beginning. By the end of that month applications for priority assistance, even though filed with accompanying packing boxes of prepared PD-2's, represented a volume of paper which swamped the capacity of the priorities personnel. In June and July, repeated efforts were made to add clerks and analysts, but the additional personnel were so many grains of sand in the path of a raging torrent.

By this time, also, the tangled lines of administrative authority were raising problems of organizational alignment. Preliminary review of plants for the production of military end products was the responsibility of the Construction Section of the Production Division; general industrial construction was assigned to the Priorities Division; plants for materials production (aluminum- and steel-making capacity) to the Materials Division; defense housing to the Priorities Division; local government construction to the State and Local Government Requirements Branch of the Division of Civilian Supply; federal works, public buildings, and roads were unassigned. The proposal was made to clarify the muddle and eliminate conflicting policies and procedures by routing all construction activity to only two sections, one for military construction, the other for all other construction. Policies and procedures for the two sections would be coordinated and harmonized. Within each section a project unit would appraise the relative importance of project applications in consultation with the appropriate end-product industry sections. The

Conservation Division would be responsible for the development for general use of construction standards and lists of critical materials. Following screening, the approved projects would be reviewed by the material sections and then submitted to the Director of Priorities for issuance of preference ratings. *This proposal was reworked in a variety of forms, but no significant action was taken and the complex of responsibility and authority continued.*

As the flow of projects increased, the administrative situation was at the same time grotesque and tragic. The assigned personnel were unable even to maintain an adequate control over the receipt and dispatch of the individual project applications. Under the existing procedure, which required a review of each application by the branch responsible for the end product to be made in the facility and by the other branches concerned with supplying the major items to be used in its construction, the application paper and supporting documents had to be routed to a large number of offices within the OPM organization. *Since administrative control procedures were either non-existent or woefully inefficient, the result was misrouting, mislaying, and actual loss of many of the key documents requesting authorization for projects. It was not uncommon for a request to be filed once, lost, filed again, lost again, and on a third filing seen through from receipt to actual issuance only when each piece of paper was personally carried by a representative of the contractor to each of the desks where signature was required.*

Because most of the projects represented obviously war-related work, and also desirable and profitable business, it became the practice for leading officials of the companies involved to "hand process" their applications through OPM. This meant that a vice president of a large corporation would bring in an application, supported by a staff of two or three assistants. The vice president came to insure that the paper would be presented in a reasonable period of time to the authorities whose approval was required. The assistants came along to provide the messenger and control clerk service to avoid the loss of their paper, or the delays which otherwise inevitably would occur. It was obvious that if a substantial addition was to be made to America's productive capacity this was the hard way to do it.

By mid-July, 1941, another scheme had been drafted in the form of Order P-19 which called for a descriptive application for the project in

response to which a single serialized preference order in the P-19 series would be granted to the applicant. The sponsoring firm or contractor would then use this serial number in assigning preference ratings to purchases made in the execution of the contract. At the time the order was issued, it was still assumed that most construction could be executed without priority assistance, and as a result an effort was made to limit the over-all priorities granted to construction to a small number of projects. Lettered series under P-19 were set up, each giving different preference ratings and each identifying a specific area of construction, such as public roads, housing, industrial projects, and public utility projects.

Interest in curbing non-essential, as opposed to assisting essential, construction projects was stimulated toward the end of the summer of 1941 by the growing pressures on supplies of key materials resulting from the rapid expansion of the defense program and heightened activity in the non-defense segment of the economy under the impact of general prosperity. On August 28, the Supply, Priorities and Allocations Board was created to determine total requirements for materials and commodities for defense and civilian purposes, establish policies designed to satisfy essential requirements, and lay down policies and regulations governing allocations and priorities for the distribution of materials among the competing demands of the defense program. SPAB quickly turned its attention to the curtailment of plant expansion which would claim large quantities of materials in short supply needed for more important defense requirements. On October 9, SPAB announced a policy of prohibiting the start of any non-essential construction, public or private, requiring appreciable quantities of critical materials. Objections were prompt and vigorous, with attention directed particularly to unemployment of construction labor. In the common pattern of failure to provide machinery to translate policy into action, no definition was provided for "essential" construction, with the result that the general impact of the policy was diffused and of little consequence in its effect.

Pearl Harbor, the enormous expansion of military programs, and the squeeze on all material supplies combined to maximize the seriousness of the construction situation. Again the search began for a fundamental construction policy which could be executed by an effective administrative organization and integrated with the other aspects of industrial production for war. Another review was made of the construction organiza-

tion (now in the War Production Board which replaced the Office of Production Management on January 16, 1942) and the assignment of functions, authority, and responsibility. The conclusions were familiar and reasonable: (1) project ratings were not uniform since Army and Navy ratings were not reviewed by WPB; (2) there was a total lack of statistical information on both the rate and progress of construction activity and supplies of materials used in construction; (3) there was little coordination between the industrial branches and the special construction sections; and (4) within the industrial branches there was an alarming duplication of responsibility and action. Proposals for solution ranged from general continuance of the *status quo* with minor procedural adjustments to complete centralization of all authority in a Construction Branch responsible for all types of construction, with sections assigned to military, essential industrial, essential civilian, government, and defense housing construction. Of greater significance, for the first time it was urged that proposals for administrative reorganization and policy formulation be tied to the issuance of a construction order complete with suitable machinery to carry it out.

Like every other basic WPB order which was at once the frame and the technique for execution of fundamental policy in a broad area of industrial activity, the construction order issued on April 9, 1942, was the product of fierce disagreement. Arguments ranged over every aspect of the order, but they centered on two issues: the low-value cut-off point below which construction work would be uncontrolled, and the treatment of construction under way at the time of issuance of the order. Those in favor of a low dollar limitation were driving for absolute control over all materials entering construction, even in small quantities. The proponents of a stop order on all non-essential construction were worried about large-scale diversion of scarce materials and the possible weakening of public confidence in the integrity of WPB's announced policies. The opposition argued that an absolute cessation of current construction would create difficult administrative problems in handling appeals, waste materials already on site or ordered, and feed black markets with critical materials.

The order stopped new non-essential construction. It announced that construction already under way might be stopped if it claimed labor, material, and equipment with competing war requirements. It prohibited

unauthorized residential construction, except maintenance and repair work, costing more than \$500; unauthorized agricultural construction valued over \$1,000; and all other unauthorized construction (commercial, industrial, institutional, utilities) valued at more than \$5,000. The order did not extend to military construction, or construction for mining or the production of petroleum. Applications for authorization to construct under the order, and for assignment of priority assistance, were made on Form PD-200 (later re-numbered WPB-617) which called for a statement of scarce material and product requirements. Applications were accompanied by a complete set of engineering drawings. Later editions of the order amended a number of its details, but effected no major change in purpose or procedures.

From the outset, L-41 was a fertile breeder of management problems. The character of the construction industry defied close supervision except by an army of compliance agents of whom the War Production Board never employed more than a full-size regiment. The business practices of contractors had rarely resulted in the maintenance of stock and procurement records that reflected their operations. There were wholesale violations of the order, and not always on a relatively modest scale. (The Compliance Division of the War Production Board reported that almost one-fourth of all docketed cases of violations of WPB orders and regulations grew out of L-41.) Nevertheless, the order made a significant contribution to the conservation of scarce materials. After its issuance, the volume of non-essential construction turned sharply down. It was far from an outstanding success; but it was also far from abysmal failure.

As badly handled as were the administrative aspects of the construction job, its programing was equally unsatisfactory. Awards were made without regard to specific needs, because there was at that time no program of military requirements, or plant production plan to meet them, against which a rational program for new facilities could be made. As each new problem arose, it set in motion a series of awards of new construction. From the beginning, those who devoted themselves to the economic aspects of the defense program attempted to include the potential volume of construction in their estimates of demands for materials and the ability of our resources to supply the anticipated needs. Construction boomed in 1941 and early 1942 in direct response to the need for additional facilities growing out of the war and the general prosperity which

resulted from growing expenditures for war. Shortly after WPB was established, there was a strong demand for a determined, measurable military program. There was also pressure to establish a fixed level of military and industrial construction within this program.

Off-the-cuff estimates of the size of 1942's projected military and industrial construction ranged up to 20 billion dollars, clearly far beyond the limits of feasibility except at the cost of dangerous inroads into current war production. This ridiculous situation was the grand climax of planlessness and maladministration. The failure to consolidate the total requirements for the war production job could result only in building plants for which machine tools could not be supplied, planes without their essential equipment, guns without fire control devices, tanks without treads, ships without propulsion equipment, and similarly through the panorama of programing and scheduling failure. Critics of the *status quo* noted that plant expansions for high octane gasoline, TNT, and synthetic rubber had been given simultaneous starts without investigating the ability of the compressor industry to provide equipment for all three undertakings. Any rational appraisal of the realities of the problem could not escape the conclusion that the control of materials in the war economy was indivisible. The presentation of sharply critical reports which supported this policy touched off a prolonged and bitter debate.

The opposition to rationalization of control over construction had many sources. In the spring of 1942, it must be remembered, the battle for rationalization of control over the distribution of materials for production had not yet been won. The Production Requirements Plan was not officially issued until June 10. Even after that date the most important production materials continued to be subject to mill order-board review, with its potential veto of top Requirements Committee policy decisions. Military opposition to civilian control over material distribution was matched by their opposition to civilian control over military construction. The several seats of construction authority within the War Production Board were opposed to any consolidation of functions which would inevitably minimize their power. The water was further muddied by controversy over the location of power and responsibility as between the Vice Chairman responsible for operations and the Vice Chairman responsible for programing, and their respective staffs. Impediments to a rational decision found support from local builders, construction firms,

their political representatives, and the industries which supplied the building trades, all of which were opposed to the restrictions of Order L-41 and, therefore, to any administrative move which promised to strengthen the bite of the order and utilize its powers more effectively.

Beyond the difficulties inherent in any attempt to convince the military that the best interests of the total war effort would be served by a unified civilian control over construction (which was itself tied to a unified civilian control over all material distribution) and by resolving the conflicts of lines of authority within WPB, there was the major problem of setting up and running machinery for programing. In the absence of a solid background of construction statistics and a history of operating experience, this was a difficult and complex assignment. The magnitude of the task, undertaken as a strike into the blue, is suggested by a listing of some of the more important questions which would have to be answered. At the beginning, a general policy would have to be framed defining the types of construction eligible for consideration. This would look to agreement on criteria with respect to purpose, use, design, and conservation of critical materials; relation to complementary service construction (access roads, transportation facilities, power facilities and so on, for each project); and similar questions. After adoption, the criteria would become the seat of judgment for appraising programs and projects in terms of urgency of need, availability of existing facilities "as is" or through conversion, economy of utilization of materials and installed equipment, efficiency of project location with reference to complementary services and utilities, and balance of capacity of proposed projects with existing and planned capacity for related products. The approved segment of the total construction demand, translated into critical materials, would have to be integrated with the over-all programing of the war economy for uniform calendar periods. At the end of September, 1942, this general assignment was undertaken by the new Facilities and Construction Program Branch in the Office of the Vice Chairman for Program Determination. It acted entirely as a staff organization. Two administrative units on the operations side of WPB—the Facilities Division and the Bureau of Construction—continued their respective responsibilities for certification as to non-availability and non-convertibility of existing plant and review for compliance with limitation orders, standards of design simplification, and minimum use of scarce materials.

This was a first step, although a tiny one. The issue remained of independent action by the Army and Navy. This was forced with more boldness than had been anticipated with the issuance of a joint military-WPB directive establishing a Facility Clearance Board within WPB

to centralize responsibility, eliminate duplication and delay, and provide for a single comprehensive review and clearance of each project or program for industrial expansion involving construction or building equipment costing one million dollars or more which is found to be essential to war production by the War Production Board, War Department, Navy Department, or Maritime Commission whether financed by the Government or privately.

Chairmanship of the Board reposed in WPB, with representation for the Army, Navy, and Maritime Commission. But while bringing military projects within the scope of civilian review was a gain, the creation of a new Board (which was soon accoutered with the customary "working" subcommittee, staffs, and the rest) added to the congeries of administrative units with various levels of responsibility for construction. One more effort to clear a path through this organizational jungle was made in November with the establishment of a Facilities Bureau as an aggregation of the Facilities and Construction Program Branch, the Facilities Branch, the Bureau of Construction, and the Tax Amortization Unit. The Bureau was given responsibility for collecting and analyzing data for new construction, presenting construction programs to the Requirements Committee, reviewing construction specifications, eliminating non-essential critical materials, securing greater utilization of existing facilities, and related matters.

At about the same time, the War Production Board made an all-out effort to match on the operating level its gains in the integration of clearance and programing. Review of current and projected 1943 construction indicated that it was claiming so large a share of materials, components, and labor that it threatened the satisfaction of current military, export, and essential civilian production demands. Beyond this, the most urgent construction projects, such as those for high octane gasoline, synthetic rubber, and basic steel-making facilities were being delayed. To resolve a difficulty which promised to grow rapidly worse, the chairman of the War Production Board addressed letters to the important constructing government agencies informing them that all non-essential construction must be stopped immediately. The order applied to mili-

tary as well as civilian construction. The War and Navy Departments and the Maritime Commission were asked to review current and planned construction and to submit lists of projects, both military and industrial, which could be stopped or abandoned without directly and seriously harming the war program. The Tennessee Valley Authority was directed to stop all but a few named projects. The Federal Works Agency was informed that orders would be issued revoking outstanding preference ratings and stopping further construction on and deliveries of materials to a list of FWA projects. The Secretary of the Interior was directed to halt all projects except Alaska Railroad and Alaska Road Commission construction.

In its broad sweep the order was unique; the reaction was on a comparable scale. The Army response indicated that review to clear out non-essential construction was constant and current; therefore it had little to contribute to the drive. The Navy submitted detailed lists of impressive length, although the official WPB history noted that "many of the projects which the Navy agreed to stop were in territory then occupied by the Japanese." The Department of the Interior, Tennessee Valley Authority, and Federal Works Agency entered violent briefs in defense of the military importance of their undertakings.

While the struggle with the non-war agencies had a special interest because of the unusual talent for aggressive correspondence and backstage maneuvering of the heads of these organizations, the more important issue was that involved in the almost unprecedented instance of the War Production Board issuing a direct order to the military services, and the response elicited. The failure of the civilian agencies to control the military is probably best illustrated in this battle of construction, and the "Eberstadt bridge" will always remain as a monument to the manner in which the military flaunted the controls which were imposed upon them. The "Eberstadt bridge" was part of the program for access roads to the Pentagon Building. With the completion of the Pentagon, the Army Engineers laid out an alfresco labyrinth by means of which the building was reached from surrounding points. As part of this program of roads, a bridge was planned across the Tidal Basin in the area between the Lincoln Memorial and the Bureau of Engraving and Printing. The bridge required substantial quantities of structural steel and reinforcing bars, both in short supply. It was difficult to convince many people that

materials were in fact so short when each day they saw steel by the ton being put into construction of roads which most people regarded as a dream inflation. In an effort to stay this criticism, Ferdinand Eberstadt, then Vice Chairman of WPB and formerly head of the Army and Navy Munitions Board, issued a far-reaching edict to stop construction or at least stop the use of steel in the building of the bridge. The bridge, however, proceeded as planned and the specified girders and reinforcing bars of iron and steel went into its construction.

The mechanics of construction priorities were always simpler, although not necessarily more effective, than the procedures of administration. Under the Production Requirements Plan, the preference-rating machinery in use prior to the issuance of the plan was continued, although an effort was made to recognize the materials claim of construction projects in the total division of materials supplies. Direct military construction was assigned priority assistance through the PD-3A mechanism. All other construction except defense housing made application on PD-200 and received preference ratings under project order P-19. Defense housing projects were covered by special procedures. The change from the Production Requirements Plan to the *Controlled Materials Plan* required only relatively minor procedural adaptations to accommodate material distribution techniques to the new allocation methods for steel, copper, and aluminum.

Organization-wise, however, the painful struggle, the imperceptible progress, continued. Late in the fall of 1942 the new Facilities Bureau—the phoenix newborn from unproductive predecessors—was designated claimant agency for the key facilities expansion programs for steel, aluminum, synthetic rubber, and aviation gasoline. For the Bureau's top staff, this assignment had many of the characteristics of a time bomb with a lighted fuse. One of the most acrimonious wartime debates, on an issue of undisputed importance, was already well under way. This was the conflict between the synthetic rubber and aviation gasoline programs, both of which required the same type of equipment made in the same plants. The general extension of equal priorities to both programs encouraged competitive expediting, which often delayed plans in both programs. Placing either program on a preferred level delayed completion of the other. The only rational solution appeared to lie in a careful scheduling of the delivery of critical component parts to indi-

vidual projects. The resolution of conflicting interests, bringing into the forum, as they did, two such aggressive and articulate administrators as Harold Ickes and William Jeffers, occupied many months.

By the spring of 1943 the crisis in materials was yielding to the crisis in components. The appearance of this new problem in the construction industry set in motion one more effort to bring order from chaos by an act of administrative reorganization. At each step in the history of this disordered function, the interplay of conflicting interests and personalities appeared to be capable of negating with terrifying thoroughness the potential benefits to be derived from the last in the sequence of advances toward rationalization of management. Now the responsible Vice Chairman¹ reported to the War Production Board that the line of attack was a drive for maximum use of existing facilities, rather than more rigid screening of project applications.

He pointed out that the total estimated value of construction and facilities within the Continental United States from 1940 to 1942 aggregated almost 38 billion dollars. During the same period the total value of the output of munitions was something less than 43 billion dollars. In other words, during the first three years of the war program almost 90 percent as much effort was devoted to expanding construction and facilities as upon the production of end items that were needed to defeat the enemy. Yet the authorizations for construction and facilities for 1943 called for the expenditure of an additional 11 billion dollars. There were authorizations for additional facilities to carry out the aircraft, ship, rubber, high-octane gasoline, utilities, and Governmental programs, such as water, sewer, health, and community facilities. Construction for the ammunition program was already largely completed; but only a small part of the facilities for aircraft, metals, and chemicals, including rubber and gasoline, were completed. . . . In general the facilities expansion was from 60 to 90 days behind schedule. Furthermore, it was estimated that in the first quarter of 1943 the facilities expansion program would require between 10 and 12 percent of the total supply of critical materials. A limit should be placed upon the construction of new facilities and more emphasis put upon the utilization of existing facilities. We were not yet using our machinery and existing facilities for fabricating products to reasonable limits. In the metal producing industries, general plant utilization was only a little over 60 hours a week compared with a theoretical maximum of 168 hours. But the current supply of metals appeared to be insufficient to keep the machine tool industry operating two full shifts.²

¹ At this point, Ralph J. Cordiner.

² *The Facilities and Construction Program* (Historical Reports on War Administration, Special Study No. 19), pp. 174-175.

Again the source of the difficulty was traced to "lack of adequate programming." The prescribed remedy was a procedure for more intensive review of all construction projects under way to recertify their essentiality, and of proposed projects to justify their needs against idle and underutilized facilities. To carry out these policies, the Facilities Bureau went through another face-lifting. Its assigned functions included the analysis of supply-requirements balance for construction and facilities, determination of relative essentiality of proposed programs and projects, screening of unfinished projects, participation in claimant agency and industry division efforts to maximize utilization of existing facilities, reduction of use of critical materials in construction, and directing the scheduling of programs and projects.

On September 25, 1943, another attempt was made to restrict the construction of new facilities and reduce facilities under construction to the minimum necessary to the war program and for essential civilian needs. The Facilities Bureau was reorganized. . . .³ On December 29, 1943, the Facilities Bureau was reorganized again. . . .⁴ Meanwhile, a number of organizational changes had been made which affected the construction field. On July 12, 1944, the Facilities Bureau, the Facilities Committee, and all other facility functions were transferred to the Vice Chairman for Field Operations. Finally in order to provide a centralized point of control for construction required for war and essential civilian needs, the War Production Board, on October 11, 1944, established a *Construction Bureau*. . . . The functions of the *Construction Bureau* were to: (1) coordinate construction programs; (2) determine programs and develop estimates of requirements of materials and equipment.⁵

Just as WPB had its difficulties in imposing its construction policy on the military and never quite succeeded in attaining its objectives, there were similar problems and similar failures throughout the area of construction. No order was violated as frequently as was L-41. No industry throughout the war so completely thwarted controls as did construction. At no time did WPB ever manage to get a firm grasp on this problem. As a result, there was always the attendant problem of getting construction materials for projects, such as housing, that were essential to the maintenance of the labor resources necessary for the execution of the production program. For reasons of strategic security, many of the new plants were located in out-of-the-way places. In addition, many of them were located in previously unpopulated areas because land could be ob-

³ *Ibid.*, p. 182.

⁴ *Ibid.*, p. 192.

⁵ *Ibid.*, pp. 216-217.

tained more readily there. As a consequence, many of the new facilities required the rapid development of housing and community facilities for thousands of workers and their families in places where no community existed or around a town of a few thousand souls. In the very beginning, there was a spartan attitude which assumed that as their part of the war effort the workers could be expected to live in tents and shanties. There was no recognition of the fact that the war might continue for years and that the workers could not be expected to remain at their jobs unless provision was made for their families and for the recreation and other facilities which both they and their families required.

This problem was finally recognized when it became difficult to get the workers and to keep the staffs required to man the factories. By late 1943, when the problem was fully appraised, shortages of material and labor had become so acute that it was extremely difficult to develop programs which met the housing need and did not cut across military requirements of critical urgency. But even when approved, the programs frequently failed because an effort was made to execute them with a minimum of interference with local real estate and building contractor operations. Finally, by 1944, the lumber supply which was the key to the construction program dwindled to a point where even authorized construction with the highest priority assistance could not obtain the materials essential for its completion.

In this atmosphere the construction program muddled through to the end of the war. Again, just as the planning authorities had failed to recognize the early importance of construction in the war program, they again failed to grasp and deal with the postwar aspects of the construction problem. Although this volume is concerned fundamentally with wartime problems, reference is made to the postwar aspects of construction because it was inevitable that the stopping of construction which accompanied the husbanding of the resources for war created a serious deficiency in the years immediately following the end of war. In spite of the continuous wartime decline in the production of such building-essential materials as lumber and brick, no effort was made to plan a postwar program that would direct the available supplies of these materials to the most essential uses.

CHAPTER XV

MAINTENANCE, REPAIR, AND OPERATING SUPPLIES

THE RESOLUTION of the problems involved in providing an adequate and balanced flow of maintenance, repair, and operating supplies was one of the more successful segments of the administrative record in mobilizing our resources for war. The significance of effective performance in this area is not readily seen or easily dramatized. Maintenance and repair activities cannot be related directly to the production of ships, tanks, planes, and guns. They provide no tie of material input to product output. Moreover, a substantial part of material consumption for maintenance and repair purposes is in areas of economic activity far removed from any obvious connection with war production. And yet it is fair to conclude that failure to distribute these materials to all parts of our economy would have caused widespread breakdowns in production and such dislocation of civilian life that war output would have been seriously hampered. In this unspectacular part of the war production job, the management performance was effective, rational, and efficient.

When the history of the control of material distribution for maintenance and repair from 1941 to 1945 is brought under review, there appears no situation in which the methods used were not adequate. There were inconveniences and delays, but for the most part these were not significantly more numerous or dangerous than in the normal peacetime economy. The solution of maintenance and repair problems could have swamped both the Washington agencies and the managerial staff of industrial plants, public utilities, transportation, and other parts of the economy. It could have generated a paralyzing paper load because the need for such materials extended from mines and factories through the public utilities and agencies of transportation and communication, public institutions and services of all types, and even to individual homes. If the control philosophy which dominated other parts of wartime produc-

tion and distribution had been encouraged in this area, every business enterprise, every service unit, and almost every individual citizen might have been required at one time or another to submit the reports and applications necessary to maintain detailed control over the distribution of the items needed.

The early preference-rating system was developed with the sole objective of assuring priority of delivery of finished items to a few carefully selected needs. For this reason, the first certificates made no provision for the maintenance and repair requirements even of factories directly engaged in war work. The problem completely escaped attention at the start of the defense effort, because there was a generally adequate supply of most materials for fabricated products required for MRO purposes. It was not until the spring of 1941, when *spot shortages began to develop*, that the MRO situation was brought to the attention of the administrative authorities. At that time, it was dismissed as unimportant. But within a relatively few weeks it returned in a form that required action.

The first recognition of the reality of the problem and some of its difficulties occurred in connection with the administration of the Defense Supplies Rating Plan. The application filed by a manufacturer operating under the plan required a detailed accounting for all of his production requirements. Applicants, therefore, properly questioned the provisions to be made for their maintenance, repair, and operating supply needs. Review of the problem at that time was followed by the acceptance by the administering group of the principle that MRO was an integral part of defense production, and that ratings for MRO should be given to manufacturers under the plan. This was *not a completely satisfactory decision*. The Defense Supplies Rating Plan operated through the principle of granting assistance to producers who could show a proportion of their shipments allocated to defense purposes as evidenced by preference ratings received. But many of the most important MRO requirements were developed by such activities as mines, smelters, public utilities, railroads, and communications agencies which could not establish a stated percentage of their business as defense. Under the projected operating procedure, therefore, no provision could be made for the MRO requirements of these important segments of the economy, other than granting them the right to apply for individual requirements on PD-1's.

By late spring of 1941, applicants of this type, in addition to individual householders, building operators, and others, were finding it necessary to request priority assistance in obtaining such items as fractional horsepower motors and brass tubing. This situation in part reflected the impact of the Defense Supplies Rating Plan, which was then being widely adopted by suppliers of the kinds of products most important for maintenance and repair purposes. Under DSRP a manufacturer was given priority assistance in procuring materials required for the production of that portion of his activity which was defense-connected and, therefore, rated. This principle of action had been accepted for two reasons: (1) to limit priority assistance to defense business, and (2) to force manufacturers to convert from non-defense to defense work by granting preference to those engaged in military production. When this pressure acted on manufacturers of supply items as a limitation on their own ability to secure preference-rating assistance from Washington, they in turn sought ratings from their customers in order to strengthen their own case. The customers applied to the Office of Production Management for priority assistance, stating with absolute truth that they had been informed by their suppliers that various items required for MRO purposes could be procured only with preference-rated orders. A secondary feature of the Defense Supplies Rating Plan which caused difficulties in the MRO area was the fact that under the plan preference ratings were granted to cover only the A-rated portion of an applicant's business. Ratings in the B bands, assigned by some of the earlier conservation orders and also issued by the priorities branches in response to individual applications, were not regarded as worthwhile by an operating manufacturer, because he knew that he could not get assistance for that portion of his business when he submitted his DSRP application.

As a result of these circumstances, by June, 1941, large and frequent delegations were visiting the Priorities Division of OPM, requesting special MRO assistance for mining (both coal and metal); public utilities; railroads; local public services (sewers, water, transit, and power); federal agencies (the Mint, Public Buildings Administration, and Public Roads Administration); hospitals, schools, and other miscellaneous groups of building operators; and non-manufacturing industries.

Analysis indicated that two aspects of MRO were of such outstanding importance that they must dominate any action taken to resolve the

problem. The first was the universality of MRO needs. Administrative machinery which contemplated detailed control must prepare to handle applications in quantities that could easily mount into the millions. The second was the relatively small share of total material supplies claimed for MRO purposes. Although the paucity of statistical data on the subject prevented absolute proof, all available evidence suggested that MRO consumption did not represent more than 5 percent of the cost of sales of American industry.

The recommendations advanced by the DSRP management group were built on these twin observations and followed the logic which they made inevitable: (1) the maintenance and repair of all of the economy, including homes, apartment houses, and theaters, was essential to the maintenance of the war effort; (2) to the extent that a manufacturer obtained production materials, his output should not be curtailed by a limitation on operating supplies; (3) MRO requirements were frequently unpredictable as to quantity and incidence; (4) purchases for MRO needs were usually in small lots; (5) the handling of individual pieces of paper to satisfy this requirement would impose an unwarranted burden on those needing MRO assistance; and (6) the processing of the paper would impose an unwieldy load on the administrative authority. The recommendations that followed from this logic were: (1) MRO assistance should be made available freely; (2) the burden of processing individual pieces of paper should not be assumed, in view of the relatively small quantities of material involved; (3) those requiring MRO assistance should be permitted to assign themselves a rating in the lowest defense category, A-10; and (4) no effort should be made to obtain reports from individuals on their use of the rating. It was believed that this program would not jeopardize the war effort because most people would be honest in their use of the assigned rating. Such quantities as might be diverted by the few persons who misused the authority would be insignificant in relation to the total national production and the man-hours required to prevent the diversion.

These recommendations received a hostile reception from most of the individuals responsible for defense requirements for individual materials or components. There was a general fear that no one could be trusted. In addition, since the statement that less than 5 percent of all material went to MRO was based on only the roughest of estimates, there was a fear on

the part of the administrators of materials like aluminum and copper, and fabricated products like bearings and motors, that the estimates were too low and that there might result an unwarranted drain on the supplies which they were so carefully husbanding.

The first draft of the tentative thinking and planning was presented in July, 1941, under the title "Maintenance and Repairs Rating Plan." The proposal was aimed directly at providing "for maintenance and repairs in cases where the defense effort will be hampered and normal civilian life will be seriously restricted if industry is not immediately provided with the means of effecting necessary maintenance and repairs." The original statement of the proposal acknowledged an obligation to carry out all demands for maintenance and repair, but indicated a recognition that some industries and activities were of greater importance to national defense than others. An initial list was made of the most essential of these. It was noted that the maintenance and repair problem would be subject to continuing study, and additional industries and economic activities would be added to the list as the available evidence supported their claims to such status. Among the industries on the initial list were: railroads, shipyards, public utilities, commercial transportation, pipe lines, highway maintenance, commercial radio communication, mining, metallurgical plants, petroleum production and refining, civilian protective services, public institutions and buildings, chemicals and explosives, and ice.

Companies or other organizations in any of these fields were invited to apply to OPM, describing the nature of their activities and asking assistance under the Maintenance and Repairs Rating Plan. Applicants receiving an affirmative response would be issued an order granting authority to use the preference rating A-10 in the procurement of necessary materials. In addition, it was proposed that certain applicants be assigned a higher rating to be used only to obtain material to make repairs in an actual emergency. The rating granted for emergency use would be A-1-a.

Operations under the proposed order would follow this procedure. Upon receipt of a maintenance and repair order, the applicant would execute the acceptance of the order on an attached form and return the acceptance to OPM. Thereafter, he would execute one copy of the order for each of his suppliers against whose deliveries the maintenance and repair preference rating was to be applied. The copies served on

suppliers would indicate the serial number assigned by OPM. Producers qualified under the order would be required to maintain accurate records of their uses of the preference rating under the order. Any use of the emergency rating would require immediate notification to OPM describing all the circumstances of the emergency.

The proposal was brought under immediate attack as overliberal, particularly in its grant of authority to use an A-1-a preference rating for emergency repairs without application to Washington. A revision of the proposal, compromising the conflicting attitudes, was prepared in August. This eliminated certain activities from the scope of the plan at its initiation—commercial trucking, petroleum production and refining, public institutions and buildings, and the chemical, food, and ice industries—noting that “the other industries included in the June 30 list as well as others deemed essential to the Program will have the plan made available to them as rapidly as administrative facilities will permit.” Of greater importance was the new procedure for the A-1-a preference rating for emergency repairs. The principle of self-assignment was dropped and a specific application substituted. Any unit in one of the listed industries and services which experienced an emergency¹ was directed to make application to OPM by telegram, describing the date, nature, and cause of the emergency; the property or equipment to be repaired and its operating importance; the quantities and kinds of material required for the emergency repair; the applicant’s inventory of these materials; and the names and addresses of suppliers from whom materials would be obtained. “The telegraphic application for emergency rating will be immediately reviewed and the applicant promptly notified of the permissibility of applying an A-1-a rating to all the suppliers of materials required for the emergency repair.”

When the administrator established in the Priorities Division appraised personnel and space requirements to carry out the terms of this plan, he asked for several hundred assistants and space equivalent to a small building. Since there was no budget provision to cover either of his requests, the order was not immediately issued nor was any real effort made to establish the administrative organization.

¹ Described as “a situation arising out of fire, flood, explosion, wreck, hurricane, lightning, or major breakdown, which requires immediate action in order to prevent a serious interruption in the functioning, or a serious lessening in the efficiency, of a Producer’s property or equipment or an important part thereof.”

Donald Nelson succeeded E. R. Stettinius, Jr., as Director of Priorities on September 5, 1941. The first problem with which he was confronted were the thousands of unprocessed PD-1 applications for priorities assistance. It was recognized that a substantial portion of the applications on hand and the thousands that were arriving daily were the result of MRO requirements. The pressure for assistance which had started in June had intensified all during the summer and by this time was almost *overpowering*. The result of these two forces was the decision to junk the first draft of P-22, the maintenance and repair order, and to substitute a new order which followed more closely the logic of the original recommendations.

On September 9, the Office of Production Management announced "a new and streamlined plan to grant priority assistance for repair work in certain essential industries. . . . The new plan takes the place of the *Maintenance and Repair Order* which was announced August 8, but which was never actually issued because of administrative difficulties in handling the paper work it would have involved."

The plan returned, in most of its essential details, to the first proposed procedures identified two months earlier under the title *Maintenance and Repairs Rating Plan*. The order, P-22, contained a list of essential industries and services which might be supplemented from time to time. The industries and services listed were *substantially identical* with those proposed in the first draft, with certain significant additions, such as farm machinery and equipment, newspapers, and rubber and rubber products. The order assigned the preference rating *A-10* to *deliveries to a participating producer of materials required by him for repairs or for his "emergency inventory,"* defined as "the minimum inventory of material required to provide for repairs to meet an actual or imminent breakdown, from whatever cause, of a producer's property or equipment." Producers in the listed industries and services were not required to make special application to OPM for authority to operate under the order. They were directed to place on purchase orders for maintenance and repair materials an appropriate certification identifying the rating as originating in order P-22. Suppliers were authorized to extend the A-10 rating with a similar certification. Only a general restriction was imposed on the use of the A-10 rating. Producers were prohibited from applying it to obtain materials in excess of actual requirements for repairs or emergency in-

ventory, and suppliers were prohibited from using the rating to obtain materials in excess of the amount necessary to make rated deliveries.

During the autumn of 1941, P-22 was repeatedly amended to extend its benefits to an ever-widening group of needs. Finally, a revised and more comprehensive order was issued in December as P-100. Maintenance and repair assistance was extended to all potential applicants, practically without exception. The A-10 preference rating was self-assigned, except for materials covered by other ratings specifically assigned in an E or M order. The rating was applied by certification on purchase orders. Restrictions were placed on withdrawals from inventory for MRO use. In general terms, a producer's inventory and withdrawals during a calendar quarter were restricted to not more than 110 percent of the corresponding figures for the same calendar quarter of the preceding year. At his option, a producer might in any quarter withdraw up to 27½ percent of the amount withdrawn during the preceding calendar year. These restrictions were not applicable when less than \$5,000 worth of materials was bought and withdrawn during a quarter.

Both P-22 and P-100 gave priority assistance only in terms of a lowest rating (A-10). By the time of Pearl Harbor this rating was no longer effective in obtaining many of the more critical items. The industry group pressures, therefore, forced the development by WPB's industry divisions of a series of specialized industry MRO orders. Typical of these were P-56 covering the mines and P-88 covering the railroads. These orders differed from P-22 and P-100 in two respects: (1) they provided a higher rating for general assistance; and (2) they also provided for emergency requirements for which the highest rating, A-1-a, could be used. Some of the detail of these orders is instructive as an indication of trends in contemporary policy for maintenance and repair supplies. P-56 (mines) assigned the following preference ratings to operators: A-1-a (only on specific application and approval) for repair and replacement when actual breakdown caused suspension of operations; A-1-c (also on application and approval) for minimum material required for advance provision to avert breakdowns; A-3 for certain listed essential equipment and materials; and A-8 for other equipment and materials.

The introduction of the Production Requirements Plan in June, 1942, made possible a simplification of controls over MRO materials for the metal-working industries. Only the early decision to replace PRP with a

vertical material allocation system inhibited the War Production Board from initiating wholesale revisions, which would have had the effect of releasing maintenance and repair consumption in the important industries from all but the most general restrictions.

The artificial distinction between production and MRO materials was wiped out for plants operating under the Production Requirements Plan. Assignment of procurement authorization and assistance for production materials was accompanied by parallel authorization and assistance for maintenance, repair, and operating supplies. Applicants filing form PD-25A were instructed to combine production and repair and maintenance requirements for all materials appearing on Materials List No. 1, Revised. In this way, past material consumption, inventories, and anticipated requirements represented the aggregate of production and MRO performance, and authorizations were made on the same basis. In the language of the plan,

where maintenance, repair and operating supplies are purchased in the form listed on Materials List No. 1 Revised, they must be included in Section E. Where maintenance, repair and operating supplies are purchased in the forms shown in the printed Fabricated Items List in Section F, they should be included in the totals for these items. Other maintenance, repair materials and operating supplies not included elsewhere should be shown in Section F as a separate item.

Concurrently, a number of other control mechanisms were in operation. Special industry P orders had not been revoked for such activities as public utilities, air transport facilities, mines, dairies, and communication systems. To the extent that plants or departments of plants were assigned to prime contracts of the Army and Navy, they were free to use PD-3A certificates in procuring MRO supplies. Finally, the War Production Board operated a telegraphic authorization system offering emergency assistance in cases of actual breakdown.

The transition from PRP to CMP presented intricate control problems in the maintenance and repair area. As in every transition period in the history of the War Production Board, issues which had been debated and settled in earlier periods were raised anew and the shopworn arguments over logic and methods were repeated. The divisions responsible for individual materials and products restated their fears that any type of comprehensive, self-administered authorization for the purchase of MRO

materials would dissipate or divert resources for which they were responsible. The group charged with general administrative responsibility for the framing of control techniques, on the other hand, believed that any proposal to create a detailed administrative control over MRO would impose a management burden of intolerable proportions and secure material savings entirely too small to justify the expense and effort involved.

In the end, the machinery established under CMP Regulation No. 5 was not unlike the first draft of P-22, in that each manufacturer was required to establish his own level of MRO needs on the basis of his historical experience. He was then permitted to procure for MRO purposes specified percentages of his quota with specified preference ratings which were established in accordance with an over-all appraisal of the relative war need for the product or service of the economic activity he was carrying on. Similar treatment was accorded commercial establishments, apartment houses, and all other consumers of material for MRO purposes except individual householders. CMP Regulation No. 5 divided all industries and economic activities into three groups. The first was assigned an AA-1 preference rating to be used in purchasing MRO materials. The second was assigned an AA-2x preference rating. The third, in the first projection of the regulation, received an A-10 rating, which amounted to nominal recognition of their existence, but no practical help in purchasing materials. This was changed subsequently to AA-5. Among the industries included in the AA-1 schedule were those producing unfabricated and semifabricated metal products, chemical products, industrial machinery and equipment, special industry machinery, military type products, electrical products, engines and turbines, communication equipment, transportation equipment, and a variety of miscellaneous products of mixed military, industrial, and civilian use such as tractors, tires and tubes, and glass containers. In the AA-2x schedule appeared industries producing a variety of iron and steel finished products, most of which were distributed to the civilian economy; nonferrous metal industries; nonmetallic product industries (lumber, textiles, clothing, and so on); transportation equipment; drugs and medicinals; and a variety of services used by both the war and civilian economy, such as printing and publishing and radio communication. All

other industries and activities not listed in these schedules automatically received the AA-5 preference rating.

Under the early projection of CMP Regulation No. 5, users of MRO materials were generally restricted to the dollar value of their 1942 consumption for this purpose, accumulated on a quarterly basis with appropriate adjustments for seasonal operations. The special industry P orders, for the most part, were continued in effect with a substitution of a CMP preference rating for the ratings formerly carried in the P orders.

One additional feature of the regulation was the provision that minor capital additions could be obtained under the regular MRO procedure in all cases in which the cost for a single complete capital addition was not in excess of \$500, including labor. This provision enabled manufacturers to carry on a large part of routine plant adaptation which would otherwise have been forced under the much more cumbersome project procedures of L-41, the construction order.

One restriction on the use of the self-assigned rating authority is also significant for the indication it gives of the success attained by those segments of the War Production Board which were concerned about the dangers of unlimited procurement under the self-assigned MRO procedure. The regulation, as originally issued, included a list of items for which the self-assigned preference ratings could not be applied. The initial list was composed of such items as fabricated containers; molded pulp, paper, and paperboard products; leather and textile items; safety clothing; medical, surgical, and dental equipment; and a variety of hospital equipment items and supplies. This list was considerably extended in the following months, with the general effect of forcing users of such products for MRO purposes to make specific application for authorization of each purchase order to one of the industry divisions of the War Production Board, which was controlling the production under a limitation or conservation order.

The problem of maintenance and repair supplies for the individual householder was handled differently. Here the underlying policy was to assure the production of limited quantities of selected essential items, and, by the issuance of L orders, to prohibit their use for other than MRO needs. To the extent that householders could not satisfy their require-

ments within this framework, they were forced back to the original method of priority application on individual PD-1A's.

A special procedure was established under CMP Regulation No. 9, when it was found that an unusually large volume of PD-1A applications were being filed by individual householders who needed short pieces of wire to replace extension cords for refrigerators, vacuum cleaners, or other household electrical appliances, or to replace wiring in household electrical systems. CMP Regulation No. 9 gave a preference rating to retail electrical dealers and repair shops to be used in purchasing copper wire for sale at retail for household, farm, and small commercial repairs. Retailers were authorized to use the rating up to a specified quota and were directed to sell their wire free of ratings. Reasonable use of the authority granted retailers under the regulation was assumed with the thought that when repair shops were limited to a small quantity of wire, relative to the demands made upon them, they would operate a voluntary rationing system, disposing of the wire only to customers who could demonstrate real need.

Although there were instances of flagrant violations of this regulation, in general the quantities assumed to have been diverted probably required less manpower in their production than would have been used in processing the PD-1A's submitted by individual applicants receiving assistance through CMP Regulation No. 9.

The internal administration of maintenance and repair activities by the War Production Board was economical and generally rational. At no time was an unreasonably large number of persons engaged in receiving, tabulating, and processing individual applications. The wisdom of the basic philosophy of control laid down in the summer of 1941 in the first draft of the Maintenance and Repairs Rating Plan found its proof in the statistics of shipments of controlled materials under CMP. Through the allotment symbol system it was possible for the first time to derive accurate data on the MRO claim. The quantities of basic materials purchased for this use were consistently smaller than the estimates of the liability.

The principal weakness of the MRO administration was the failure to compel universal adherence to the logic which found its clear expression in such orders as P-22 and P-100, in form PD-25A under the Production Requirements Plan, and in CMP Regulation No. 5. The list of items

which were not permitted to be procured with MRO ratings grew steadily longer after the spring of 1943, despite the critical review to which every request for extension of the list was subjected. The reasons for this constant pressure were the same ones that had supported opposition to a non-restrictive management of maintenance and repair consumption throughout the war. Those responsible for the wartime production and distribution of single products naturally became deeply concerned about, at times almost obsessed by, the fear of the possibility of an uncontrolled demand swamping the limited available supply and destroying orderly distribution to competing uses in the proper sequence of essentiality. After two years of war, the urgency of MRO requirements through the economy was generally conceded. But the fear of unrestricted procurement could not easily be removed. This was fed by the widespread belief that a substantial part of the procurement of fabricated products for use as minor capital equipment or for maintenance or repair purposes was not completely essential to the prosecution of the war and would benefit from order-by-order review against criteria of end use, urgency, need, and so on. For these reasons, the personnel of the various industry divisions urged continually that products for which they were responsible be added to the list of items closed to MRO ratings.

The exempt list would have been much longer had it not been for pressure in the other direction. A series of task committees served at various times during the war to spearhead drives to abolish special applications for approval to purchase fabricated products for use as minor capital equipment or for MRO purposes. At one time it was hoped that it might be possible to develop a procedure which would permit manufacturers to file a single consolidated application on a quarterly basis, listing all their requirements for these purposes. This was, in effect, an extension of Section F of form PD-25A, the section used for reporting fabricated product consumption and requirements. It was finally agreed that it would be impossible to secure cooperation from all the industry divisions in accepting such a procedure, and the efforts of the task committees turned toward the raising of small order exemption ceilings under various limitation orders, restricting the general classifications of equipment for which individual applications must be filed to only the specific types which were most critical, and revising the special MRO

orders affecting specific industries so that they would fit into the CMP pattern and philosophy.

The effect of lowering small order exemptions in limitation and conservation orders was to free from the cumbersome specific application procedure the great bulk of manufacturing purchases of the products covered by the orders. Here, as everywhere else in wartime material and product distribution, it was found that a relatively small percentage of the total number of consumers accounted for an overwhelmingly large proportion of the total volume of consumption. Unremitting pressure on both fronts had the effect of reducing the volume of paper submitted in application procedures by more than 40 percent, but the principle of unrestricted MRO procurement authority up to historically determined quotas for all materials and products never got universal acceptance.

Efforts to revise the application-authorization procedure for the orders affecting special industries met with success. These industries had been exempted from the provisions of CMP Regulation No. 5 because they used relatively large quantities of critical materials for maintenance and repair purposes. By the end of 1944 these orders had been rewritten to provide safeguards *over and above those established under CMP* and set up procedures which met the problems peculiar to each industry, but at the same time to permit the smooth procurement of materials without the necessity for going through the cumbersome and almost meaningless application procedure.

This general rewriting of the MRO orders and regulations provided the final chapter in a sound approach to a serious and potentially dangerous problem. For the war period as a whole, the only blot on a consistently good record was the effort made by some of the equipment and component branches to interfere with the orderly procurement of their products for MRO use by insisting on the use of special applications.

CHAPTER XVI

INVENTORIES

IN NO PHASE of industrial mobilization were the significant parallels between management's job in an individual business enterprise and its functions in the integrated war economy of the United States more illuminating and instructive than in the control of manufacturers' and distributors' inventories. In the private company, policies and problems of inventory control lie at the heart of the procurement function. After the determination of projected production schedules and the selection (so far as there are alternative choices) of the materials from which the final product will be made, the responsible administrator must resolve a series of issues arising from the fixing of rates of procurement, delivery, and entry into production. The questions for which answers must be framed include at least the following: What is a "minimum practicable working inventory"? To what extent does "minimum practicable" vary among different materials? To what extent, under what circumstances, and precisely when should inventories be accumulated beyond predetermined minimum levels? What is the most economical or feasible quantity for each single purchase? How should deliveries be scheduled through successive time periods? To what extent should determinations of minimum practicable working levels make provisions for contingency reserves?

In the private company, failure to understand these issues thoroughly in their relation to the formulation of inventory control policies and procedures may make an important contribution to higher-than-necessary costs of operation and lower-than-potential profits. Errors of judgment with respect to forward commitments may introduce serious risks. In general, inventories maintained at or near minimum operating levels are likely to make a greater contribution toward the efficiency of over-all performance than are inventories which reflect a substantial proportion of fat.

Most of these considerations were found to be applicable to the govern-

ment's efforts to control manufacturers' and distributors' inventories in the war economy from 1940 to 1945. In place of the profit concept, there was substituted the overriding criterion of maximum output from available material supplies. In place of the cost-of-production concept, there was substituted the criterion of material waste resulting from accumulations in excess of minimum current needs. For the economy as a whole, the reasons for securing the most efficient possible utilization of materials supplies through scientific inventory control were of the same character as, although infinitely more compelling than, those which ordinarily influence administration in an individual enterprise. More important than any other motive was the fact that the requirements of global war were on such a scale that they could not be satisfied except through the utilization of the entire available supply of all the materials of production, without waste and without excess accumulation in dead stocks. On the other hand, it would have been disastrous to have forced the issue of inventory control to such lengths as to threaten serious interruption of production as a result of the failure to maintain necessary working stocks in the hands of producers of all sizes and at all levels of industrial operation.

The inventory control problem of the early war period can be fully understood only in terms of the contemporary economic climate. Business managers were under the influence of the twin driving forces of rising prices and increasing material scarcities. Financially, it was almost impossible to make a mistake through forward buying. Every economic indicator supported the forecast that it was profitable to buy and pay for as much material as could be absorbed. Later, impelled by patriotic motives, the encouragement of the military services, and professional pride in doing a good job, management tried to assure a supply of the dwindling stream of scarce materials by stocking to the limit of capacity. These motives clashed head-on with the government's interest in spreading the supply of critical materials as thin and as equitably as possible.

Almost from the beginning of the use of the priority power, the importance of inventory control was recognized in its relation to the efficient utilization of resources for defense and war production. What was far from clear to those responsible for industrial mobilization, however, was the best technique to achieve the generally recognized objectives. As a result, the first efforts toward inventory control were of an admonitory

character, not adapted to rigorous compliance follow-up. The first material control order, M-1, issued March 21, 1941, stated:

Deliveries shall not be in an amount in excess of the amount currently required for the production which justifies the preference rating assigned, after making full use of the inventory of metal previously received, including all scrap that may be resmelted or refabricated for individual customers. Beginning twenty days after the effective date of this Order, no deliveries by any producer to any customer shall be made until such customer shall have furnished such producer with a sworn statement that (a) such customer has filed with the Priorities Division a report of such customer's entire inventory of all aluminum, in the form received by him (including scrap) and that (b) such customer has not placed an order for aluminum with some other producer to be used for the same specific purpose.

Similar provisions were incorporated in other early conservation orders for magnesium, ferro-tungsten, nickel bearing steel, and zinc.

As material shortages spread through the industrial system and the possibility was recognized of even greater deficiencies in the future, an initial effort was made to deal with inventories on a comprehensive basis. General Metals Order No. 1, issued May 1, 1941, covered a list of metals starting with antimony and cadmium and extending through iron and steel to tin and vanadium. The order covered metals in primary and secondary form as well as scrap. It was addressed to all producers, smelters, refiners, distributors (including warehouses), processors, and fabricators, and all customers of these suppliers. The occasion for the order was described as "overbuying for unnecessary inventories, and increased manufacturing for unnecessary stocks." The following method was chosen to deal with the problem:

No supplier shall make to any customer any delivery which the supplier knows, or has reason to believe, will effect an increase . . . in inventories . . . in excess of the quantity necessary . . . efficiently to meet required deliveries of such customer's products. Commencing June 10, 1941, no supplier shall make any delivery . . . unless supplier shall receive from such customer a sworn statement covering inventories. No customer shall accept any delivery (which would result in excess inventory). . . .

Suppliers were required to present sworn statements to the Priorities Division testifying that they had in fact obtained such evidence from their customers, and that they themselves did not have stocks greater than those required to fabricate the metals which were scheduled for de-

livery. Under General Metals Order No. 1, thousands of copies of the affidavit form PD-19A were filed with the Priorities Division, OPM. Since the administration of the order was entrusted to only two men and a secretary, the PD-19A's were never removed from the original bundles in which they were received, and no effort was made to determine whether all metal users had filed this required report. This ineffectual attempt at "psychological" control was typical of the naïveté which characterized administrative techniques in the early defense period.

Following recognition of the administrative burden of General Metals Order No. 1, and the inability of OPM to provide administrative machinery, it was abandoned and a parallel effort to control inventories was incorporated in Priorities Regulation No. 1, originally issued August 27, 1941. The inventory provisions of this regulation were first stated in the following language: "Unless specifically authorized by the Director of Priorities, no person shall . . . knowingly make delivery of any material whatever and no person shall accept delivery . . . which will increase . . . inventory . . . in excess of the amount, quantity or number necessary to meet required deliveries . . . on the basis of current method and rate of operation." This inventory restriction was amended in December; the following language is indicative of the character of the change: ". . . In excess of a practicable minimum working inventory . . . to be strictly construed. The mere fact that the rate of turn-over has increased or that materials are difficult to obtain does not justify maintaining inventories above the minimum with which operations can be continued."

The philosophic concept of "minimum practicable working inventory" underlay most control policies (although not necessarily control practices) during the war period. For some commodities, the actual legal phraseology remained substantially unchanged. For others, an attempt was made to develop more precise definitions in special orders and regulations for individual commodities or industries. In most cases, these took the shape of limitations expressed in terms of 30, 60, or 90 days' consumption at current or scheduled rates of production.

One of the more important lines of special treatment for material inventories was worked out in the early defense period in connection with the administrative practices of the Defense Supplies Rating Plan. Manufacturers filing the plan's application form, PD-25, were required to re-

port their inventories of listed scarce materials at the beginning of a quarterly accounting period, estimate both receipts and rate of use in the current or application quarter, and, on the basis of these estimates, project the inventories which would be on hand at the end of the period. With the administrators of DSRP accepting as bench mark the thirteen weeks' basic inventory then regarded as normal in most metal-working trades, the quantities of metals for which priority assistance was authorized were those which would result in a thirteen weeks' inventory of each critical material at the close of the period covered, based on inventory required for "defense" products only.

Data reported by applicants indicated that many manufacturers held inventories substantially larger than the thirteen weeks' stock which was the pre-war normal. In some instances, this resulted from a determined policy adopted by many producers following the outbreak of the European war in September, 1939. Recalling their experience in the 1914-18 period, officers of these companies selected the materials which were most essential to continued operation and converted substantial portions of their capital resources into reserve stocks of raw materials. In some cases, the policy adopted was simply to invest all idle funds. In others, the goal was to obtain reserve stocks equivalent to calculated requirements for pre-determined calendar periods ranging up to five years, if necessary borrowing to finance the expansion. As a result of these practices, by the summer of 1941 some companies, including many of the largest industrial concerns in this country, had acquired inventories of such critical materials as magnesium, nickel, and tin ranging up to five, ten, or even twenty years' supply at current rates of consumption.

The fact that they held such stocks did not discourage industrial consumers of critical materials from requesting priority assistance from OPM or the military services in procuring their requirements for materials to be used in the fabrication of military orders. This attitude reflected the belief that inventories on hand had been acquired as a result of the exercise of commercial foresight, and that the use to which they were put was a prerogative of the company and not of the nation. It was reasoned that these reserves should be free for use by their owners in the manufacture of their normal products to be delivered to non-military customers. For orders originating either with the armed services or through the machinery of "assistance to countries whose defense was es-

essential to the defense of the United States," it was believed that manufacturers were justly entitled to priority assistance in procuring additional quantities of critical materials. Efforts to revise this underlying philosophy of inventory utilization contributed to long debates and continuous confusion during the summer of 1941. It was their objection to the entire concept of "nationalized inventories" which induced a number of manufacturers to reject the possibility of participating, first in the Defense Supplies Rating Plan, and later in the voluntary phase of the Production Requirements Plan. This rejection made its appearance in two forms. Discovering the principle of "nationalized inventories," a number of manufacturers in a logical position to participate in the integrated priority procedure refused to file applications. Others, after filing applications, learned that the total procurement for which priority assistance would be extended was limited in terms of inventories on hand, and immediately withdrew their applications. Although the other priority restrictions on inventory accumulation should have had results similar to those which followed the policies and procedures guiding the DSRP administrators, this did not occur. Inventory reports for individual materials and products did not provide a basis for either evaluation or administration of a plant's total inventory position. It was only when a manufacturer detailed his plant inventory holdings of either one material or all materials in a single report that his over-all position could be known and subjected to administrative treatment.

Recognizing the need for developing more adequate knowledge of use and inventories of critical metals, the Office of Production Management introduced a general metals questionnaire in the summer of 1941. Manufacturers were required to report their inventory of each listed critical metal as of August 31, 1941, together with the quantities used during the month of August. As part of the same program, two related questionnaires were addressed to owners of warehouses and to financial institutions holding title to inventories, in the effort to determine the locations of idle stocks. These turned out to be extremely valuable reports. The questionnaire addressed to manufacturers provided a background of experience on the basis of which later comprehensive efforts to control stocks and use of metals (PD-275 and PD-25A) could progress more rapidly. The questionnaire returned by owners of warehouses and finan-

cial institutions actually uncovered substantial quantities of critical metals, such as copper held for the account of the Yugoslav government and rails held for railroads no longer in effective operation. Such sources of surplus stocks made significant one-time contributions in a number of critical short-supply situations.

The two PD-275 reports on consumption and inventory of critical materials, covering the fourth quarter of 1941 and the first quarter of 1942, were directly responsible for much of the drive to curtail or prohibit the production of civilian-type products, and to force the producers of consumers' durable goods to convert to war production. They also provided concrete evidence of inventory accumulation in the hands of producers already partially or wholly committed to war work, and in the possession of such government work-centers as Army arsenals, Navy yards, and Maritime shipyards. The combination of speculative profits, riskless inventory accumulation, and the desire to permit nothing to interfere with war work led to wasteful policies and procedures with respect to individual plant holdings of materials in short supply. If this had been permitted to continue, it would have had a serious impact on the output of war goods. Instead of being spread equitably throughout the production complex, inventories of critical materials would have been trapped by a small number of shrewd or fortunate producers, thereby causing interruptions and delays in other plants and inhibiting any possibility of achieving a smooth and scheduled output from the nation's resources.

The discoveries of the PD-275 reports added to the developing consciousness of the importance of tying material allocations to inventory controls in the management of the war economy. From the beginning of the Defense Supplies Rating Plan, an attempt had been made to relate procurement authorizations to inventories and current and anticipated rates of consumption. This line of approach to administrative control was continued in the voluntary stage of the Production Requirements Plan and was solidly lodged in the mandatory Production Requirements Plan introduced on June 10, 1942. In the language of the official instructions,

Applicants submitting Form PD-25A should report information on the basis of the smallest breakdown of their operations which existing raw material inventory records permit. If records are not maintained for each separate class

of products, the form may be submitted for a department, division or plant. . . . *Existing raw material inventory records determine the number of separate applications which should be submitted.* For example, if one inventory is maintained and one class of products is manufactured, one application should be submitted. If one inventory is maintained and two classes of products are manufactured, one application should be submitted. If two inventories are maintained and two or more classes of products are manufactured, two applications should be submitted, etc.

The importance attached to the inventory unit as the fundamental operating entity under PRP was carried directly to the method of processing applications on PD-25A. For each of the critical materials for which the plan served as an integrated quarterly application and authorization procedure, the applicant was directed to report receipts and consumption during the preceding calendar quarter and end-of-quarter inventory, in addition to his projected requirements. WPB processing officials adjusted authorizations in terms of each applicant's inventory position. In this way, within one or at the most two calendar quarters, excess inventories previously accumulated by producers operating under the plan would be driven down to minimum operating levels through the process of review and authorization. The general objective was to authorize the procurement of enough of each critical material to leave only a minimum practicable working inventory at the end of the quarterly production period, after meeting the quarter's production requirements. Recognizing that inflexible application of this principle would interfere with the normal operation of seasonal industries, WPB issued a special interpretation of the inventory restrictions of Priorities Regulation No. 1, which permitted the acceptance of material in excess of minimum practicable working levels provided that "the deliveries accepted are no greater and no further in advance than those which he would normally accept in the ordinary course of his business to meet reasonably anticipated requirements."

The effectiveness of the effort to adjust material authorizations in accordance with applicants' inventory positions remained a subject for debate throughout the war period. The desirability of this approach to inventory control probably lies somewhere between the most extravagant claims made for it and the opposition's argument that it did more harm than good to interfere in the complexity of problems of size and alloy

specifications which remained substantially outside the scope of a reviewing officer's knowledge.

Tying material authorization to inventory position was neither good nor bad in itself—it had to be evaluated in terms of the conditions under which it was undertaken. It was the fastest method for correcting serious unbalances when many plants were in such strong inventory positions that they could operate for months without purchasing a pound of material. This characterized the early war period, and the PD-25A device was both appropriate and effective. On the other hand, when inventories had been adjusted, any effort to deal with an individual plant's inventory position, with the objective, for example, of reducing over-all holdings from 70 to 60 days' supply, without knowledge of bottleneck items, long and short sizes, and similar problems, *could not be successful*.

As efforts were broadened to control inventory accumulation and spread the existing insufficient supplies of scarce materials evenly among all producers, there arose questions about the non-usable and obsolete segments of manufacturers' stocks. Some of these accumulations resulted from the application of limitation orders late in 1941 and in the first half of 1942. Others reflected sudden changes in military specifications or adjustments in military contracts. To some extent, these inventories were only temporarily non-usable, since a change from one model to another would bring them in or out of the current use pattern. Most of the stocks, however, represented long-period accumulations aggravated by the special conditions of war production and controls, and were worth little to their owners. To deal with this problem early in 1942 there was introduced the concept of idle and obsolete stocks as part of the general system of inventory control and reporting.

The first administrative action to establish machinery through which non-usable inventories could be directed into current production was the issuance of Priorities Regulation No. 13, early in July, 1942. This regulation set up the conditions governing the sale of materials by persons not regularly engaged in the business of selling materials in the form in which they were offered. Through these procedures, holders of obsolete stocks were permitted to dispose of them subject to WPB control and for permitted uses and users only. The regulation covered a long list of materials, and applied not only to frozen, idle, or excess stocks, but also to

liquidation, bankruptcy, and all other sales not carried on as part of the regular course of business. A few selected materials in particularly critical supply position continued to be governed by special WPB orders. From time to time, the terms of Priorities Regulation No. 13 were revised to tighten or release the restrictions governing the sale of idle and excess stocks, reflecting shifts in the current supply position of the controlled materials. During the early war period, the general tendency was toward the application of more restrictive controls. By the summer of 1944, with the achievement of peak war production and the easing of many supply-demand balances, a number of the restrictions in the order were relaxed so that the disposition of surplus stocks was more responsive to normal market flow patterns and less to government direction.

In contrast to the general trend toward the tightening of inventory controls, there was issued in September, 1942, General Inventory Order M-161 which released from the restrictions of Priorities Regulation No. 1 certain materials which were in easy supply. The purpose of the order was to encourage the purchase of bulky materials at a time when transportation facilities permitted their movement. Such materials could move freely into inventory in quantities in excess of practicable working minimums. Among the items governed by the terms of this order were feldspar, soda ash, caustic soda, boric acid, and other miscellaneous materials. As shortages developed for some of the listed materials, they were dropped from the order; and as other materials came into easier supply balances, they were added.

The transition from the *Production Requirements Plan to the Controlled Materials Plan* was not accompanied by sweeping changes in the policies and procedures governing the control of industrial inventories. CMP Regulation No. 2 limited the inventories of "controlled materials" under the plan. In general, it prohibited acceptance of delivery of these materials if the user's inventory was, or would by virtue of the receipt become, in excess of his requirements for the succeeding 60 days. From time to time, in response to temporary conditions, the restrictions were tightened. For example, in the spring of 1945, in response to increased aircraft requirements following the military reverses in the Battle of the Bulge, the regulation was amended to reduce aluminum inventories to 45 days. The regulation did not apply to other materials which continued to be governed by the general rules of Priorities Regulation No. 1—

“practicable working minimum”—and by the more detailed and specific restrictions of certain M orders.

The Controlled Materials Plan abandoned as part of its operating machinery the direct relationship of material allocations to applicant's inventories. Under PRP the size of an applicant's inventory of each critical material modified his procurement authorization, and it was part of the objective of the plan to force companies operating under it to reduce their inventories to minimum working levels. The vertical allocation procedure of CMP made this type of processing impossible, since the applications received through both the A and B-product chains represented the accumulated requirements of all contractors in each chain. As a result, it was necessary to shift the impact of inventory control, which could no longer be exercised directly through the operation of the allocation procedure. To accomplish this, the plan provided for a standard form on which inventories could be reported—CMP-7. This report was filed on a plant basis, and provided for information on inventories and use of critical materials similar to that reported earlier on PD-275 and PD-25A. Soon after the inauguration of the Controlled Materials Plan, CMP-7 was combined with the existing plant report on labor and machine utilization—WPB-732—and the joint report continued to be collected on a quarterly basis through the remaining war period. Manufacturers operating under the plan by regulation were compelled to take their current inventory position into consideration in calculating their controlled materials requirements. This self-application of inventory restrictions was checked, first on an over-all basis for the aggregate of metal working plants through the quarterly report on CMP-7 and WPB-732, and second on an individual basis through direct plant visits by the War Production Board's compliance staff.

Non-industrial inventories were also brought under control during the war period through the special orders L-63 and L-219. The former, directed at stocks held by mill warehouses and dealers in mill supplies, was issued in April, 1942. Products such as hand tools, bearings, automotive supplies, builders' supplies, textile mill supplies, and similar types of equipment and supplies, which normally moved through distributor channels, were becoming increasingly scarce. The order was designed to limit the inventories held by individual dealers, and to identify for the War Production Board the location of excess stocks. As first drafted, the

order required the filing of monthly reports, providing a record of distributors' receipts, sales, and stocks on hand. As more than 10,000 distributors were required to file such reports, it soon proved impossible to bring the individual returns under critical examination, and the reporting provisions of the order were abandoned in mid-1943. The limitation features, however, were continued until the conclusion of the war in the effort to provide a more equitable distribution of items in short supply.

Control over retail and wholesale stocks of consumers' goods was initiated in December, 1942, with the issuance of Order L-219. The order was designed to restrict stocks of the larger dealers in consumers' goods and assist equitable distribution of the available supplies. In general, the objective was to maintain inventories in the same relation to projected sales that actual inventories bore to actual sales during the three years before the war. Recognizing that it would be difficult, if not impossible, to review reports filed by retailers and wholesalers covered by the order, the War Production Board provided that reports would flow to Washington only from wholesalers and retailers holding inventories in excess of their permitted levels. If on calculating his inventory at the end of a calendar quarter a wholesaler or retailer found that he was in violation of the inventory limitation, he filed a report showing his previous quarterly sales and closing inventory. He then continued to inform the War Production Board of his current inventory position by reporting monthly as long as his inventory was in excess of the permitted level. In general, the order was reasonably successful in preventing unusual accumulations of stocks by a few wholesale or retail dealers in strategic buying positions. It did not impose rigorous restrictions, however, and the buying pressures of the war period were such that there was little incentive for dealers to attempt evasion.

Industrial inventories ceased to be a serious problem after the third quarter of 1942. This was a development of the greatest significance for the successful administration of war production. It was a striking change from the situation up to that time. The definition of the prime and proximate causes for such an important development cannot help but prelude to debate. Should the major share of the credit go to the control techniques employed? Were they effective in themselves, so that they can be recommended for adoption in any comparable future emergency?

Were there important factors other than the control techniques? If so, what were they and what was the character of their influence?

Review of the inventory-control techniques used during the war period makes it clear that a significant fundamental policy determined the framework and application of all controls. This policy was expressed in various terms, but most often and most directly as "minimum practicable working inventory." For some materials, the War Production Board undertook to define minimum practicable working inventory in terms of stock sufficient to continue operations for a stipulated number of days at the current rate of consumption. For others, the language remained general. There were two good reasons why adherence to this policy was the course of wisdom. In the first place, the determination of appropriate inventory levels for any plant must be made in terms of factors present in that plant alone. It must consider stocks on hand, anticipated receipts of materials, scheduled production, and projected rates of consumption. Consideration of these factors must extend to questions of available suppliers and their geographical location, their ability and willingness to ship on schedule, customary lines of business relationships, and many similar matters which are inextricably bound up with the peacetime operation of the plant. These decisions cannot be made centrally without incurring the most serious risk of arbitrary interference with scheduled production in individual plants. Second, any attempt to dictate the levels of industrial inventories from Washington would have required the creation and operation of a set of controls separate and distinct from the control machinery established to accomplish the direction of industrial output. It was only through the machinery of the Production Requirements Plan that it was possible to combine production and inventory control within the same series of administrative decisions. With the abandonment of PRP and the acceptance of the vertical type of control inherent in CMP, production and inventory controls were divorced and could not thereafter be integrated. Since there were a number of excellent reasons favoring the adoption of the vertical type of control, the promise of integrating inventory and production controls held out by PRP was not an overriding consideration.

There is good reason to believe, therefore, that the successful administration of industrial inventories after the third quarter of 1942 was not so much the product of effective control techniques—since these were

general rather than specific in character—as it was of other factors. Among these, probably the most important were (1) the removal of pressures to accumulate materials for the production of non-war goods, following the issuance of the L orders in the first half of 1942; and (2) the driving expansion of war production schedules which were pitched on so steep a slope and pressed so hard on available supplies of critical materials that they left little slack for inventory accumulation. The first deprived industry of the incentive to acquire materials with the expectation that they could be used in the manufacture of civilian-type products for which there was a tremendous market, and the added incentive of manufacturers' desire to maintain distributor organizations. The second made it generally difficult for manufacturers to build stocks for war production, despite the risk-free character of the investment and the incentive of removing one potential obstacle to record production. It has been argued that a share of the credit for inventory performance should go to the development of material controls which worked. This line of analysis suggests that the assurance to industry that procurement authorizations for scarce materials would be held within the limits of available supply removed part of the pressure to build inventories beyond current needs. The record of experience is in general opposition to this thesis, although there can be no doubt that some manufacturers responded to it. It may be concluded that the disappearance of the inventory problem was rather more the result of the removal of the incentives to acquire inventories above minimum levels than it was of the control techniques employed. It may also be concluded that the character of the inventory control problem in a complex industrial economy defies detailed administration from a central point, such as Washington, and requires the type of influence which was effective after the middle of 1942.

CHAPTER XVII

SPECIAL PROBLEMS OF INDUSTRIAL CONTROL

ONE OF THE MOST important discoveries in the administration of industrial mobilization for war was the similarity of successful control techniques in all industries and for all materials. As the need for controls spread to each new industrial area, representatives of the principal companies urged the special character and unique problems of their trade. Almost invariably they were supported by the staff of the responsible WPB industry or material division. This chauvinism was responsible for much of the opposition to the free transmission of the lessons of experience among industries and materials. The refusal to recognize what was at times the obviously common character of their control problems was rooted in the same source.

Earlier chapters have directed attention repeatedly to the universal application of many of the fundamentals of industrial control techniques. Their organization around common cores of individual commodities or integrated management plans, however, has partially obscured the methods developed for dealing with a number of administrative problems encountered in all materials and industries. A selected group of the more important of these special problems of industrial control are reviewed in this chapter.

A. SMALL BUSINESS

Almost from the first days of the drive to mobilize industry for the national defense program, a running debate proceeded over the question of how to deal with small business. On one side, it was argued that in the application of control procedures a distinction should be made between large and small plants, or, in a closely related thesis, between large and small individual purchase orders, or large and small procurement during a determined period of time such as a month or a quarter-year. Most of the proponents of this argument were concerned with ways and

means of reducing the management job in the war economy to reasonable proportions. They were appalled by the magnitude, diversity, and complexity of the American production system—the 1939 Census of Manufactures counted 185,000 establishments in manufacturing industries alone. Fearing administrative breakdown if the attempt were made to bring each unit in the whole economy under centralized control through identical procedures, they were attracted by the implications of the array of establishments by size groups, as reported in the same Census. Plants employing more than 250 wage earners accounted for only 3 percent of the total number of manufacturing establishment. Yet they provided jobs for more than 50 percent of all manufacturing labor and their output was more than half the total value of manufacturing production. At the small end of the scale, establishments with less than 50 wage earners accounted for 85 percent of the total number of manufacturing establishments and employed only 19 percent of the wage earners who produced 21 percent of the total value of product. The argument founded on these statistics favored leaving small business (defined in various terms and by various standards) outside the control system, with the possible exception of general restrictions of a self-administered character. The thesis was supported by three principal considerations. First, such action would eliminate from the administrative process the greatest part of the individual requests for priority assistance, allocations, and other types of public action. This would reduce the management job to workable proportions. Second, the elimination of small business (or small orders) would not be accompanied by any weakening of government authority over the bulk of material input and industrial output. It was suggested that the administration of small business would require more people, time, and effort than would be employed in production equivalent to the potential savings from subjecting small business to detailed control. Finally, it would remove from small establishments the burden of staying abreast of complicated government regulations, preparing multitudinous applications and reports, and maintaining extra records.

Those who objected to the proposal based their case largely on the premise that most people were uninformed or dishonest, and that a self-administered exemption for small business or small orders would invite widespread dissipation of scarce resources. Much of the support for this position was the result of ignorance about the relative importance of large

and small business or a refusal to admit the wartime significance of peacetime industrial patterns. Throughout the war years the group holding this view included most of the responsible policy-making officials in WPB's industry and material divisions.

At the beginning of the materials conservation program the debate was conducted in an atmosphere of surmise and ignorance. Little information was available with respect to the quantities of individual materials or components that were consumed in the production of end items. There was neither precise knowledge about, nor any reliable basis for estimating, the extent to which the exemption from the administrative impact of a conservation or allocation order of certain industrial uses or purchase orders below a defined cut-off point would yield significant material savings or dilute the effectiveness of the control. At the same time, a widespread sense of urgent need impelled each administrative official toward the belief that every pound of material and every dollar's worth of product had to be controlled. In large measure this feeling stemmed from the belief that this country must fight a total war and that all our resources must be committed to the military effort. Unfortunately, there was no way to appraise the importance of committing everything to the war effort—and enforcing the commitment by detailed administrative controls on large and small business alike—against either the administrative burden or the benefits to be gained. In such a mental climate there was an unusually intensive drive to make everything subject to administrative control.

It was not until the volume of paper submitted by individual applicants reached unmanageable quantities that there was an opportunity to argue the case for exempting small orders on rational grounds and from concrete evidence. When the volume of incoming PD-1 applications mounted to 25,000 per week in the summer of 1941, the problem of reviewing and acting on them became critical. When as a result of personnel shortages, the backlog of unprocessed applications passed the 100,000 mark at the end of the summer, the problem had reached a stage requiring immediate action. The measures taken in September to escape from the trap were (1) the rubber-stamp approval of the bulk of the applications, and (2) the introduction of a general maintenance, repair, and operating supplies order, P-22. This experience strengthened the thesis of special exemptions for small orders, but in the absence of a firm policy

laid down by the top management no significant progress could be made.

The growth of the Defense Supplies Rating Plan and its successor, the voluntary Production Requirements Plan, renewed interest in the development of special procedures for small business. Shortly after the introduction of PRP, a simplified application form, PD-25X, was designed and recommended for use by manufacturers with annual sales valued at less than \$100,000. The adjustment of policy was recommended in the following language.

Priority assistance will not be granted to small business just because it is small. Policies of the Small Business Section will conform to those established for the Production Requirements Plan and will be consistent with all regulations of the Division of Priorities. Recognizing that a greater proportion of Small Business may be engaged in manufacturing products for civilian use than is true of the companies operating under the Production Requirements Plan, consideration will be given to the following:

- (a) that the end product or end use is essential to the national well-being;
- (b) that the certification of a small quantity of the critical materials will help stabilize a relatively large amount of employment, or will free a relatively large amount of available materials otherwise frozen;
- (c) that a small producer, by reason of his smallness, is at a disadvantage with respect to "buying power";
- (d) that the small producer is located in an area which is certified as a distressed area by the Office of Production Management.

This general approach to the special problems of enterprise of limited size continued to be explored through the first months of 1942. In the summer, following the issuance of Priorities Regulation No. 11 establishing the mandatory Production Requirements Plan for plants with quarterly consumption of more than \$5,000 worth of critical materials, the matured thinking was again formally presented for adoption under the title of Limited Users of Metals Plan, which was quickly telescoped to "LUMP." In justifying LUMP, it was pointed out that primary attention in the past had been given to the development of procedures for the large producers of military products, who were also the large consumers of critical materials. The Production Requirements Plan had been adopted as the basic control mechanism for those manufacturers whose consumption of critical materials was estimated to be 90-95 percent of the total manufacturing use. "A Governmental Requirements Plan facilitates the procurement of materials for specified government or-

ganizations; and special P orders provide for maintenance and repair materials for certain key industries having substantial requirements. The forgotten group up to the present time are the small users of critical materials whose operations may be equally as important to the war effort or vital civilian economy as are the larger producers." Potential candidates for LUMP were classified in three categories: (1) small establishments using relatively substantial quantities of critical materials; (2) both large and small enterprises consuming principally non-critical materials, but requiring relatively small quantities of critical materials for production and maintenance and repair; and (3) a miscellaneous group of business enterprises and educational and public institutions requiring scarce materials for maintenance and repair only.

Current procedures used by these establishments are (1) extension of ratings received on sales orders, (2) specially assigned ratings obtained on war contracts (PD-3A) or on specific applications (PD-1A), and (3) for maintenance and repair materials, either the general A-10 rating under P-100 or more favorable treatment for special industries under other P orders. What is needed is a consolidation and simplification of these procedures into a comprehensive system adapted to the special problems of the small users of scarce materials.

From the applicant's point of view, there were a number of difficulties and deficiencies in the existing procedures. As long as they had to depend on either extension of preference ratings received or on individual PD-1A's, small enterprises were forced to operate on a risky hand-to-mouth basis in getting production materials. Delays and uncertainties interfered with efficient plant operation and constantly threatened to interrupt production. The variety of forms and applications required for materials under individual conservation orders complicated the operation of small enterprises out of all proportion to the quantities of critical materials involved. Maintenance and repair requirements were not adequately serviced under P-100 because of the low preference rating assigned, and supplementary assistance through the PD-1A approach was slow and uncertain. Finally, "the lack of an integrated priority procedure for small business equivalent to the Production Requirements Plan for large business placed the small units at a serious disadvantage in planning their work in the war effort." On the WPB side it was noted that existing procedures created an excessive number of PD-1A applications,

most of which were for small quantities of materials. Beyond this, there were the familiar disadvantages of non-integrated controls: non-uniform treatment of parallel applications and meaningless approval of production schedules. Attention was also directed to the absence of control over the consumption of critical materials for maintenance, repair, and operating supplies by plants operating under P-100. "A liberal policy towards maintenance and repair of plants and equipment has always been assumed on the principle that it is good business to keep production facilities in order. Except for PRP units the provisions for maintenance and repair are hopelessly lacking in facilitating the expressed policy."

The Limited Users of Metals Plan incorporated the basic principles of the Production Requirements Plan, simplified for small-scale operation. Special attention was directed to the development of a procedure for comprehensive, integrated priority coverage. It was noted that even after the adoption of PRP, manufacturers operating under the plan were compelled to file a multiplicity of separate applications for permission to receive allocated materials after their procurement had been authorized on PD-25A. This burden fell even more heavily on small establishments. Recognizing that not more than 5 percent of the supply of critical materials would be consumed by establishments operating under LUMP, a special distribution system was proposed.

Such a system . . . would serve the two-fold purpose of relieving the materials control organizations of the problem of examining large numbers of minor applications, and of enabling the applicant to get quicker "one-stop," integrated service on his application from a single centralized source rather than have clearance of his request delayed while the several materials control units ponder the problem individually for each of the materials required.

To accomplish this, it was proposed that the WPB Requirements Committee allocate a quantity of each critical material for authorizations to LUMP applicants. Full control over the distribution of these materials would be exercised by the central authority for LUMP.

The simplified PRP-type application form provided for: (1) identification of articles produced or services rendered during the previous three months, split between war contracts and other sales, and a forecast of total sales or services for the next three months; (2) statement of critical material consumption during the preceding three months, anticipated consumption for the next three months (divided between production and

MRO), and current inventories; (3) analysis of critical material consumption for each class of products produced; and (4) explanation of the use of certain listed critical materials. In supplying materials information, no shape, alloy, or form detail was required. It was recommended that responsibility for processing LUMP applications be placed in the WPB regional offices operating in conformity with broad directions for assignment of preference ratings and within quantitative material allotments to each office.

The kind of establishments and institutions which may use the plan, subject to the exceptions stated in the following paragraph, include a wide range of enterprises such as manufacturers, repair shops, laboratories and the like. Other establishments such as contractors, distributors, retailers, building operators, hospitals, educational or charitable institutions, etc. whose primary need is for maintenance, repair and operating supplies may also use this plan.

The Limited Users of Metals Plan is not available to establishments or institutions requiring, in a three month period, \$5,000 or more of basic metals as defined in Priority Regulation No. 11, nor is it applicable to any sub-division of a business, other parts of which are operating under the Production Requirements Plan. This plan may not be used for maintenance, repair and operating supplies by any enterprise which has qualified and is operating under a currently effective preference rating order (P Order). The plan may not be used by individuals, home owners, farmers or others having only occasional need for priority assistance. Government agencies except those engaged in manufacturing operations are excluded from the Plan. In no case shall the plan be used for the procurement of articles or materials for resale in the form in which they are purchased.

The plan made slow headway against the entrenched opposition, and the early decision to abandon PRP in favor of a vertical allocation scheme cancelled the eligibility of LUMP. The original public description of the Controlled Materials Plan (November 2, 1942) held the door open for a simplified procedure for small business: "special provision may be made . . . for the relief of any undue burden on small manufacturers or manufacturers using small amounts of controlled materials." The assistance actually made available was both minuscule and complicated; few businessmen used it. As originally issued, CMP Regulation 1 defined a "small order" as

a delivery order for a Class A product placed with the manufacturer thereof by a consumer, where the aggregate amounts of controlled materials required to fill such order, together with all delivery orders for the same Class A prod-

uct placed by the same consumer with the same manufacturer calling for delivery during the same month, do not exceed the following: carbon steel—1 ton; alloy steel—400 pounds; copper and copper base alloys—100 pounds; aluminum—20 pounds.

A manufacturer placing a small order, as so defined, was released from the necessity of making an allotment of controlled materials, and his supplier was free to order from warehouses or mills under the symbol SO. In later editions, the small-order procedure was somewhat liberalized. "Small order" was redefined with limits of 10 tons of carbon and alloy steel combined, 100 pounds of copper-wire mill and brass-mill products, 300 pounds of copper and copper-base alloy foundry products, and 2,000 pounds of aluminum. The procedure was one of the least significant parts of the Controlled Materials Plan. Its use was inconsequential and its application was generally misunderstood.

Despite its announced objective, the "small order" provision of CMP made no significant concessions to users of limited quantities of controlled materials. Compliance with its procedures did not simplify either procurement or record-keeping. Substantially the same requirements as to accountability for receipt and disbursement of material allotments were imposed upon small and large users. Almost the only distinction was the privilege of identifying purchase orders by the special symbol "SO" rather than by the regular claimant agency symbols.

Outside the CMP system, the opposition of the administrators to the relaxation of controls over small-scale operations continued. As each new control order was developed, or each old one revised, the argument for the small-order exemption was raised, but in only a few instances was the established policy moderated. Most WPB controls at the end of the war contained special provisions for small orders. In almost every case, however, the exemption was accepted late in the history of the control and usually over strong opposition by the responsible administrator. Widespread adoption of special provisions for small orders did not occur until late in 1943 when the War Production Board undertook an energetic "paper saving" drive under the impetus of universal business objection to the filing of a snowstorm of applications.

During the spring and summer of 1943 a special WPB task committee met with every division to discuss ways and means of reducing the number of forms filed by industry to secure authorization to buy materials

and equipment for production and MRO. Among the committee's recommendations was one supporting an increase in small-order exemptions in all orders "to not less than 10% of supply unless conclusive evidence is given justifying a lower percentage." This was supported by the top officials of the Board as part of a drive to achieve at least a 40 percent reduction in the number of applications required of industry. As a result of intensive order-by-order review, small-order exemptions were introduced in almost every WPB order and where they already existed their ceilings were substantially raised. Much of the success of this drive can be attributed to the determined cross-examination of industry division personnel by the task committee staff who were able to establish to their own satisfaction and finally to impress upon the division personnel the fact that most of the application paper generated by requests from small business was not subjected to detailed review and judicial decision. To keep the mass of paper moving, the common practice was to substitute *cursory examination and routine approval for complete analysis.*

The lessons of the wartime experience with small-scale operations are clear and simple. In most cases detailed regulation of material and product consumption was not worth the effort it required. Although small establishments make up the bulk of all concerns engaged in manufacturing in the United States, in most industries they account for a very small part of the total consumption of materials and products and the employment of wage earners. They are poorly equipped to cope with the administrative detail imposed by central control procedures. For the controlling agency they are an unnecessary burden; they become the principal source of incoming applications (at the peak of the war effort, applications to WPB were in excess of one million per calendar quarter), yet their economic significance is limited.

A general approach to the problem, untried by WPB although it had much to recommend it, would have been the issuance of a regulation amending all orders (with certain listed exceptions for materials in desperately short supply, such as natural rubber and tin) to relieve small manufacturing establishments *from their regulatory features.* Such a regulation would have defined small establishments in terms of two limiting criteria: number of employees and dollar volume of annual sales. One definition, recommended on the basis of fragmentary evidence, was

50 employees and \$250,000 annual sales, with the requirement that an establishment must qualify under both ceilings to be treated as "small." So defined, small establishments would have been authorized to certify on each purchase order that they were within the limits of the definition and therefore were entitled to the general exemption from control. This type of broadscale exemption was attempted in only one important control plan, that established for lumber under L-335. Here the right to place authorized orders without application to WPB was granted to all industrial consumers of lumber using less than 50,000 board feet per calendar quarter.

B. DECENTRALIZATION

A related group of problems in internal administration was encountered in the management of the field organization of the War Production Board and its predecessor agencies. A thorough discussion of the functions, responsibilities, and operations of the war agency field organization is beyond the scope of this book.¹ The complexity of the subject requires an intensive investigation and a careful analysis of the facts. However, a few observations on the major difficulties and problems are presented with the hope of encouraging further exploration of this important subject.

The War Production Board never attempted full-scale decentralization. Only limited efforts were made to establish responsibility and authority for the handling of material or product programs at any location other than Washington, D.C. In each subject-matter area the division director and technical personnel were located in Washington, with assisting personnel housed in the same city in the temporary buildings to which the War Production Board could gain access.

There was only one major exception to these arrangements. The Automotive Division was quartered in Detroit for a limited time. The fact that it did not remain there can scarcely be regarded as a sign of success. While the subject of decentralizing on program bases was discussed at length, little else was done. The development of the atomic bomb would seem to add importantly to the advantages of decentralization on a major

¹ See War Production Board Special Study No. 25, "Field Organization and Administration of the War Production Board and Predecessor Agencies, May 1940 to November 1945."

scale. Possibly this fact alone would promise sufficient gain to warrant further study of the merits of administrative and organizational decentralization.

The history of the field offices as they were actually established in the War Production Board was not a happy one. Much of the difficulty in achieving effective utilization of field facilities was explicable in terms of major differences of opinion regarding objectives and functions. Clearly the kind of organization to be established, the caliber and training of persons to be employed, and the lines of administration to be developed had to grow out of a general agreement on the character of the job to be done. There was no general agreement on this point.

The degree of responsibility to be given field personnel in a government agency is a difficult determination at best. Field office personnel must be responsible to a staff executive charged with administration. Not uncommonly, men responsible for a particular program are reluctant to permit a portion of it to be carried out by persons not under their own administrative control. This general disinclination to delegate authority is, of course, exaggerated in the case of field activities, which are not even located in the same city. In the War Production Board the problem was further aggravated because many of the Board executives were convinced that proper administration required technical people with an intimate knowledge of the operations in plants actually engaged in various phases of the war production effort. Regardless of the validity of this position, its wide acceptance hindered growth in the dispersal of many responsibilities to the field offices.

A second major difficulty which discouraged extensive use of field offices was the nature of the assignment which faced the War Production Board. The job was new and unfamiliar. For a long time, the tools for carrying it out had to be forged almost on a daily basis. As is amply illustrated in the chapters of this book, complete industrial management by the government is an uncharted course in the United States. This situation was aggravated by rapidly shifting objectives. Developments in a war result in less spectacular but equally deep changes in production goals. The climate in which controls are administered changes rapidly under these conditions. When administration is remote from the center from which emanate decisions respecting the kind of tools to be used and the program objectives for which they are to be employed, lack of

comprehensive and general understanding on the part of peripheral personnel can be anticipated.

These considerations serve as background to explain why the field liaison personnel found it hard to fill in the gaps as well as might have been expected. The successive war production agencies were not smooth-running, well-ordered organizations carrying out repetitive or routine operations. The newness of the job was also reflected in a series of "realignments" and internal shake-ups. For these reasons the inherent subject-matter difficulty in field liaison work was increased by shifts in internal organization and administrative relationships.

Rounding out the list of major obstacles to rapid progress in the establishment of field offices with responsibility for a definitive and important role in the war management effort was a lack of methods for controlling the aggregate effect of their actions. The absence of adequate accounting records in the early war years created an atmosphere which added one more impediment to the delegation of authority. There is an obvious relationship between this condition and the reluctance of executives with responsibility for programs to delegate authority to personnel not under their own administrative control.

Meanwhile, a number of forces were operating almost on a cumulative basis to drive the War Production Board toward greater utilization of field facilities in the production and material-control programs. Of prime importance was the fact that the agency was maturing and growing more familiar with its job. This was reflected in the application of common patterns of control to a gradually lengthening list of critical materials. In addition to the reappearance of common control techniques in various situations, the drive toward a master material-control mechanism to which subsidiary controls could be related ended with the adoption of CMP. These developments permitted field personnel to gain the comprehension of their jobs needed for efficient operation. Physical evidence of this solidification was provided by the Board's ability to prepare and issue a field operating manual toward the end of 1943.

Beyond this, convincing evidence was accumulating and gaining credence that the consumption of critical materials was heavily concentrated in a relatively small number of plants. The converse of this, namely, that the great bulk of applications for allocation or priority as-

sistance could be handled on a routine basis without serious damage, strengthened the argument in favor of decentralized processing of such paper. The development of adequate accounting controls made it almost irrelevant whether the handling of paper was accomplished in Chicago or in Wing 4 of the Railroad Retirement Building in Washington. In either case, the aggregate effect of actions performed to implement policy decisions was under control. Finally, the field personnel was more accessible to the small manufacturer whose staff was not augmented by a Vice President in Charge of Priorities, and was better able to handle his special problems on the spot.

The erosive effect of the continuing efforts of the staunch advocates of decentralization should not be minimized. The developments mentioned in the preceding paragraphs provided the ammunition needed to carry on the campaign. All of these factors combined to permit some genuine progress in the utilization of field facilities in 1943. A series of orders with this objective were issued that year.

Not the least of these was a special memorandum issued to all Bureau and Division Directors by the Operations Vice Chairman and the Program Vice Chairman in the latter part of 1943.² While this memorandum dealt primarily with the reduction of the reporting burden on manufacturers, it contained the following significant paragraph:

When it can be clearly demonstrated that an application must be continued in use, the Divisions will be expected to recommend the processing of all possible applications in the Field Offices, in accordance with the decentralization policy as covered in General Operations Circular No. 158.

It should not be concluded that the potentialities of decentralized field operations were ever fully exploited by the War Production Board, even after this development. But at least a definitive place in the scheme of operations was outlined. PD-1A applications not exceeding \$100 were delegated to the field offices for handling beginning in March, 1943. A succession of increases in this ceiling was authorized in succeeding months so that a year later it had risen to \$2,500, and in April, 1944, the maximum value for field processing of applications on form WPB-541 (formerly PD-1A) was lifted to \$25,000. Similarly, applications for

² Memorandum JM-1, dated September 30, 1943: Establishment of Policy and Program Governing the Reduction of Special Applications and Reports.

limited quantities of controlled material allotments or for limited allocation or priority assistance in other programs were handled in the field offices under general accounting restrictions.

What finally emerged in the latter part of the war was a recognition that the field offices could lighten the administrative and paper-handling burden in Washington by processing the smaller and relatively less important cases on a decentralized basis. While this is a different concept than the program decentralization discussed in the first few paragraphs of this section, an increase in the individual case ceiling establishing the limit of field-office processing authority was not without significance in permitting the Washington headquarters staff to concentrate on policy and program development and appraisal.

C. LIMITATION AND CONSERVATION ORDERS

As in the case of the small-order provision, the desire to secure maximum use of the nation's resources for war, coupled with the absence of detailed information about the extent to which individual end products made actual demands on supplies of materials, facilities, and manpower, led to the drastic curtailment or total prohibition of the production of certain items, or the use of specified materials in the manufacture of these items. The motivation of such action was completely understandable. Under the impact of the reverses suffered by this country and its allies in the spring of 1942, patriotic citizens wanted to do all they could to stem the enemy tide. In such an atmosphere two classes of orders were hastily written and issued in the spring and summer of 1942. The first prohibited the production of selected products not considered essential in the war economy. The second extended the conservation principle by prohibiting the manufacture of specified products when made from any of a long list of critical materials. For the most part, the conservation programs were well conceived and through the use of the L and M order technique many months were gained in converting American industry to all-out war production. Inevitably, however, the issuance of limitation and conservation orders on the basis of inadequate information often accomplished ultimate savings of materials, facilities, or labor of such insignificant proportions as not to justify the disruption of established business operation and consumer satisfaction for which they were responsible. Post-facto review of the record uncovers errors of this kind

which provided no war-essential advantages in return for the dislocations which they occasioned.

Among the more bizarre specimens of this disease of hyper-zealotry might be cited L-36, Umbrella Frames:

- (2) On and after November 12, 1942, no manufacturer shall produce any group I (man's umbrella) frame:
 - (i) the weight of which, exclusive of the weight of the shafts and handles, is more than 5 pounds per dozen frames;
 - (ii) which contains more than 8 ribs;
 - (iii) which contains any rib exceeding 25 inches in length.

The superfluous character of those instructions on how to make an umbrella is marked by the preceding paragraph of the order which limited each manufacturer's total production of frames to a percentage of his production in 1941. L-104, Metal Hairpins and Metal Bob Pins, was another horrible example:

- (2) During the period of three months beginning October 1, 1942, and during each three months' period thereafter, no manufacturer shall produce more metal hairpins and metal bob pins, in the aggregate, than $6\frac{1}{2}\%$ of the pounds of metal hairpins and metal bob pins, in the aggregate, produced by him during the calendar year 1941.

- (3) On and after May 6, 1942, no manufacturer shall produce any metal hairpins or metal bob pins of a length greater than two inches.

- (4) On and after September 25, 1942, no manufacturer shall sell any metal hairpins or metal bob pins except in packages or on cards containing 100 metal hairpins or metal bob pins or less.

M-126 will serve to illustrate the second type of order, prohibiting the manufacture of listed products from certain critical materials. This conservation measure prohibited the *manufacture from iron and steel* of a long list of products including such items as asparagus tongs, bird cages, cake cutters, crochet hooks, menu holders, and parallel uses consuming "large" quantities of steel.

The measures cited above have little real significance. They point clearly to a relevant conclusion, however: in any similar emergency, provision should be made for the collection and use of information which will permit rational decisions with respect to the point at which limitations on production fail to provide compensating advantages, and orders directed at conservation of material cause deterioration of products disproportionate to the advantages gained from materials saved.

D. CONCENTRATION IN PRODUCTION OF END ITEMS AND IN CONSUMPTION OF MATERIALS

Statistics collected in connection with WPB operations provide the most complete documentation ever available on the extent of industrial concentration in this country. One of the more serious deficiencies in the wartime management performance was the failure to recognize in the demonstrated concentration of both material consumption and end-item production a tool of the greatest significance for the application of industrial controls. If effective use had been made of the patterns of industrial organization many of the more complex problems would have been simplified and the impact of war-created dislocations for medium and small business would have been lightened.

Evidence on the extent and magnitude of industrial concentration in the metal-fabricating industries was accumulated under both the Production Requirements Plan and the Controlled Materials Plan. Analysis of applications on PD-25A under PRP indicated that in the third quarter of 1942 the 100 largest company consumers of each basic metal used the following percentages of the metal consumed by all manufacturing companies: carbon steel, 49 percent; alloy steel, 70 percent; copper, 79 percent; copper-base alloy, 66 percent; and aluminum, 81 percent. A combined listing of the 100 largest company consumers for each of these metals (eliminating duplication of names resulting from the appearance of a company in the first 100 group for more than one metal) yielded a total of 391 different companies. In the third quarter of 1942 these 391 companies (approximately 2,000 plants) used 56 percent of the carbon steel consumed by all manufacturing companies; 75 percent of the alloy steel; 82 percent of the copper; 71 percent of the copper-base alloy; and 85 percent of the aluminum. In appraising the significance of these data it should be noted that they reflect consumption of basic metal-mill shapes and forms. They do not include the metal content of component parts purchased by these companies and included in their finished products.

The same 391 companies shipped more than three-quarters of the total dollar value of all direct military-type products. They accounted for practically all the output of such items as combat, auxiliary, and merchant vessels; military aircraft, engines, and parts; track-laying tractors; combat tanks and parts; ammunition under 20 mm.; anti-aircraft

searchlights; and explosives. In addition, these companies were responsible for practically all the shipments of such products as marine steam engines, steam and gas turbines, motor generator sets, ship elevators, marine heat exchangers, fractional horsepower electric motors, and insulated wire and cable. Although the 391 companies did not themselves dominate the production of critical common components, by virtue of their position in the production of direct military products they were the ultimate consumers of the bulk of such items. Only components used by railroads, public utilities, manufacturers for their maintenance and repair operations, and those destined for export did not eventually pass through the production processes of these companies.

An equally striking pattern of concentration was revealed under the Controlled Materials Plan. The total carbon steel put into production in the second quarter of 1943, as reported by approximately 30,000 CMP-4B applications, was almost 6 million tons. The 25 largest applications reported total consumption of 1 million tons, 18 percent of the total. The 100 largest applications pushed the consumption figure up to almost 1.9 million tons, 31 percent of the total. At 3.4 million tons, the 500 largest applications accounted for 56 percent of the total. Since many applicants submitted more than one application, the number of plants or companies is substantially smaller than the figures shown.

This record of concentration demonstrated the desirability of focusing management attention and administrative controls on the distribution of critical metals to the largest companies. As a first step, it would have been desirable to locate a representative of the War Production Board in each company's main office. Wartime experience showed that the larger companies had the best records and other resources necessary to compile the most complete and useful reports. Without straining their facilities, it would have been possible to secure more detailed and more frequent reports from these companies. By concentrating its energies on the tabulation and analysis of a relatively small number of reports, the War Production Board could have exercised more effective control than was possible through the mass of paper which flowed into Washington each day. Through this small number of dominant producers, a closer relationship could have been established between (a) scheduled production of military end items and critical common components, (b) critical component plant capacity limitations and the distribution of the avail-

able component supply, and (c) production of components and utilization of basic materials in short supply.

A plan for assigning WPB representatives to the principal plants of the largest companies was prepared and reviewed in the late spring and summer of 1943, but never adopted. As outlined in the proposal, the responsibilities of the representative would have extended to (1) general information moving to and from the company regarding all production and material controls, (2) participation in preparation of regular reports and applications, (3) participation in preparation of special reports, and (4) preparation of personal and informal reports. The representative accredited to a large company, or to one or several of its plants, would have general responsibility for serving as the channel for all reports and information from the company to WPB and other war agencies and from the war agencies to the company. He would assist in the preparation of reports and applications and in the interpretation of instructions and regulations. He would help WPB and other agencies to get vital information quickly, accurately, and uniformly, serving as the eyes of the war agencies in noting the effect of regulations on industrial operation, forestalling production difficulties, and suggesting changes in reporting forms and control techniques so as to speed production and eliminate unnecessary paper work in Washington and the plants under his jurisdiction.

To carry out these responsibilities, the WPB representative would have had to be of high calibre with a substantial experience in the industry to which he was assigned and with the ability to work closely and in confidence with company and Washington officials. To support him, the proposal recommended creating within WPB a central office to serve as reception center for all correspondence and reports received from and directed to the large companies.

Through the office of the WPB representative would be channeled all correspondence, directives, regulations, and reports originating in Washington and pertaining to critical materials and components. It would be a prime responsibility of the representative to direct these documents to the proper company officials, to offer such interpretation as seemed necessary, and to answer or to secure an answer to all questions. The representative would also serve as the channel through which would pass all reports, applications, and correspondence from the company to

Washington on matters pertaining to critical materials and components. He would work closely with responsible company officials who prepared all WPB claimant agency reports, applications, allotments, production schedules, and so on. To fulfill this responsibility, the representative and his staff must be familiar with the nature and location of all company records, basic data, and the functions of record-keeping officials. The representative would participate in the preparation of all applications and reports and be familiar with the basic data and the manner in which they were assembled. To do this and to be of full service to the company, he must be thoroughly cognizant of the purposes of each request for information and how it would be used. He should be in a position to insure compliance with instructions on reporting forms and accuracy and uniformity of data submitted.

The representative would also be able to supply to WPB and the claimant agencies *spot information not covered by regular data requests*. This might include analyses of controlled material allotments, extensions, and balances; bottlenecks in procurement and production of critical components; progress of end-product output; company reaction to prospective regulations and changes in broad operating policies, and *similar matters*. In addition to satisfying special requests for information, he would serve as an informal information center for WPB and claimant agencies on all matters pertaining to war production. This should not be regarded as compliance work, but rather as a continuous reporting service covering the following and similar subjects:

- 1) development of new techniques for production scheduling;
- 2) suggestions for revision of regulations and reporting forms;
- 3) appraisal of the burden on the company of contemplated reports and orders;
- 4) difficulties in obtaining materials and components and suggestions for relief;
- 5) effects of changing production schedules;
- 6) production difficulties arising from regulations sponsored by other agencies.

Behind this proposal was the thought that the extraordinary concentration of wartime material consumption and end-item production provided an opportunity for a kind of personalized administration which could be used to increase the effectiveness of controls, lessen their burden

to both industry and government, and generally secure maximum use of resources with minimum disruption of established business methods and distribution patterns. Supported by careful use of an expanded small-order procedure and strategically defined limitation and conservation orders, it might have been possible to create an over-all administrative apparatus of the following character: (1) self-administration for small users and small producers, subject to carefully drawn permissions and prohibitions; (2) application-authorization techniques for consumers and producers of medium size; and (3) personalized, on-the-spot administration for the largest users of material and largest producers of end products.

Failure to move in this direction reflected the same obstinate attachment to the "total control" principle which was marked in the refusal to liberalize restrictions for small orders. The controls to which WPB was committed were of larger magnitude; they generated more paper and occupied the time and talents of a larger staff; they created an infinity of burdens for medium and small concerns. But they were certainly less rather than more efficient, and probably less rather than more effective.

E. CONCENTRATION OF CIVILIAN PRODUCTION

One effort at wartime industrial control was brought forward so timidly, lived so short a time and was interred in such haste and secrecy that it was forgotten long before the defeat of the Axis. This was the program for securing a concentration of production in a selected group of civilian industries by determining maximum permitted levels of output, scheduling that production in a small number of plants, and forcing all other plants in the controlled industries to convert to war work. The shaping of plans in this direction was a natural outcome of the issuance of limitation orders curtailing the manufacture of civilian products. Under output ceilings, manufacturing activity in controlled industries was forced down to uneconomic levels. But the competitive pressures of the free market, together with the incentive of maintaining dealer organizations and consumer brand consciousness, impelled continued production by all pre-war plants. The inevitable line of development was foreseen early in the defense period, with the accompanying waste of plants, tools, and labor. Extreme measures were projected, even before

Pearl Harbor, for intervening by the application of controls designed to prevent the execution of the natural decisions of management in the free enterprise economy. Those responsible for the making of policy had no illusions about the drastic character of their plans, the opposition which would boil up out of the affected industries, or the technical difficulties which would frustrate any but the most determined application of the rules of compulsory cartelization. This country prepared for and fought the war in an economic climate which insisted on minimum interference with free enterprise. Compulsory concentration—the selection by the war control authority of certain plants for continued civilian output and others for conversion or shutdown—could be accepted only in time of crisis. The first intimations of the coming victory, in the late fall of 1942, began the dissipation of the sense of desperate urgency which alone would have permitted the ruthless industrial dictatorship required to carry through the concentration program.

The stage was set for the projection of a concentration program by the step-by-step development of limitation orders. From the beginning of the defense effort through the first half of 1941, the philosophy of industrial control was committed to the assistance of military production in an economy which would superimpose the manufacture of weapons on the output of civilian goods. In this period, the principal instrument of control was the priorities system. As the defense program expanded, the total drain against the supplies of critical resources became so great that it was necessary to curtail civilian production to release materials and labor and to exert pressure toward the conversion of industrial facilities from civilian to military assignments. The conservation and limitation orders were the instruments chosen to execute these policies. The typical order to curtail civilian items operated through a horizontal limitation of output with a ceiling expressed as a percentage of production (or material consumption) in a selected pre-war base period. This was effective as long as the principal objective of the control was to conserve materials. But when the other factors of production—labor, plant, and machinery—were needed for war work, curtailment moved toward prohibition. There were no serious administrative difficulties in accomplishing this for those products the manufacture of which was completely stopped, as in the case of refrigerators and automobiles. Some other products, however, were so essential to the basic civilian economy, even in time of war,

that some production had to be continued. These industries presented complex administrative problems that pointed toward concentration as a possible solution.

Farm machinery will serve to illustrate the character of these problems. Although the industry was dominated by a few large companies, some 1,600 smaller concerns also were manufacturing agricultural equipment. The large companies had the kind of installations that could be converted to the manufacture of such military products as tanks and gun mounts. When these companies were hit by horizontal curtailment of output of their civilian product, they were in a position to assign the released labor and machinery to war work. Most of the small companies could not do this. If their operations were seriously curtailed, they would be forced below their break-even points and might be compelled to shut their plants. But the wartime food goals could be achieved only with the support of some continued output of farm implements which could not be secured if many of the smaller plants went out of business. Beyond this extreme illustration, there were less dramatic but equally serious problems of uneconomical use of labor and facilities in plants operating at fractions of capacity.

Both Germany and Great Britain had had experience with concentration techniques, and this was reviewed in the early stages of the discussions in Washington. Germany had achieved a substantial measure of concentration before 1940 as part of the national war program to rationalize industry for military purposes. England with its free enterprise economy did not accept an official policy of concentration until the spring of 1941. By the end of the year, concentration programs were being developed for 50 industries. In general, the British used the concentration technique to achieve one of two objectives. The first was to obtain the most economic production in convertible resources of an item such as bicycles the unrestricted manufacture of which could not be permitted, although limited production was necessary for essential civilian transportation. The second objective was to obtain the most efficient use of non-convertible resources so that only the minimum of facilities and men would be required for the fabrication of materials into permitted end products. The second objective was sought in industries such as textiles.

The fundamental questions were clear from both the British experience and our own considerations *in vacuo*:

Since certain plants had to be selected for operations at the expense of the rest of the industry, who should make the choice: the Government, industry alone, or joint Government-industry groups? What criteria should be applied in selecting the nucleus plants? What was concentration to conserve: materials, facilities, manpower, transportation, power, storage space, or a combination of all six? What of competitive relations, and treatment of closed firms? How could the Government avoid giving unfair advantage to nucleus plants over their closed competitors, and thus avoid sowing the seeds of postwar monopolies? Should the Government subsidize the closed firms or should they receive compensation from the operating plants, and if so, on what basis? Should the operating firms contribute to a pool from which the closed firms could draw what might be called unemployment compensation? Should this compensation cover only maintenance and repair costs for the closed firms, or should it contain some element of profit? If the latter, on what basis could the profit element be determined? What about good will and distribution? Should a manufacturer be forced to relinquish his hard-won market position, or should the nucleus firm produce a standardized product at cost, which product could then be distributed by the closed firm through its own channels and under its own trade name or the trade names of all firms formerly producing similar products? And above all, how could conflicting war requirements be reconciled and new strains on the transportation system be avoided?⁸

As this statement suggests, the problem was intricate and touched on a variety of interests in industry, labor, and government. In these circumstances, it was difficult to avoid the technical obstacles to a thoroughgoing movement toward industrial concentration. Those most familiar with an industry and in the best position to direct its concentration were always the ones most impressed by the reasons why such a program could not be carried through. This intellectual background helps to explain why the early history of the debate over concentration was more concerned with the advisability of adopting the policy than with the technique of putting it into effect. The most outspoken proponents of a rigorous drive toward concentration were on the staff of the Division of Civilian Supply. The incentive for their view lay in the fear that without such a policy there would be serious danger that certain basic requirements of the wartime civilian economy would not be met. This view was sponsored at the highest policy level by Leon Henderson in the spring of 1942. He recommended that in industries susceptible to conversion, but in which it was essential to continue some civilian production, con-

⁸ *Concentration of Civilian Production by the War Production Board* (Historical Reports on War Administration, War Production Board, Special Study No. 14), pp. 7-8.

centration should be mandatory. He proposed that the larger plants with convertible facilities should be forced into war work, with civilian production continuing under predetermined schedules in the smaller plants operated at or near capacity. Permitting manufacture of only a small number of simplified models under a special "Victory" brand would remove many of the technical problems of competitive status. The opposition to immediate mandatory concentration was strongest in WPB's industry branches which argued that a voluntary concentration would occur in many industries as production rates declined, while tooling-up for a "Victory" model might be as costly in materials and labor as continuation of a low level of activity in many plants.

The first limitation order containing clauses that looked toward concentration of the controlled industry was L-23-c, Domestic Cooking Appliances and Heating Stoves. Sales of this industry of almost 250 plants were 215 million dollars in 1941. Order L-23, issued in December, 1941, had cut total production back to 1939 levels, but permitted all plants to continue producing their civilian items. Unlike the curtailment restrictions of most limitation orders, the curtailment of L-23 was a graduated one. Plants with base-period sales in excess of 3 million dollars were cut 42 percent in their consumption of iron and steel. Plants with shipments of from 1 to 3 million dollars were cut 36 percent. Smaller plants had their use of iron and steel reduced only 30 percent. This scale reflected the belief that the larger plants in the industry could convert more readily to war production, while many of the smaller plants were located in communities of limited size, without war work, in which serious unemployment would be created by massive curtailment of stove production. A revised order L-23-c was proposed in May, 1942. It projected an industry-wide cutback of 80 percent from the base period. A production quota of 1,800,000 domestic cooking appliances and 1,750,000 domestic heating stoves was established as the total necessary to meet essential requirements from April, 1942, to March, 1943. In the opinion of the industry branch, this would force the industry below the break-even point and necessitate concentration in order to insure the requisite output. Two criteria were used in determining the impact of the concentration order: size of plant and labor area. The order therefore provided that producers with base-period sales in excess of 2 million dollars must stop manu-

facturing by July 31, 1942. Producers in tight labor areas were also directed to halt operations. The joint criteria excluded 92 plants. The order made no attempt to deal with problems of brand names, "Victory" models, financial arrangements between plants, distributors' organizations, or any of the other problems connected with a concentration program.

At this time studies were in progress in the Division of Civilian Supply on a number of other industries selected as candidates for concentration. Opposition in the industry branches continued strong, and there was a natural inclination on the part of top WPB officials to rely on the counsel of the industry-experienced personnel in these branches rather than on that of the Civilian Supply staff, which was weighted more heavily with economists without specific backgrounds in the industries for which they were formulating programs. The opposition of the industry branches was reinforced by a rather pessimistic early report on the impact of the stove concentration order, which directed attention to inequities resulting from blanket concentration and the failure to consider factors other than size and labor supply. On the other side of the debate, interest in concentration had mounted in the Chairman's Planning Committee, which submitted a report dealing with questions of criteria and administration and recommended 19 industries for concentration: agricultural equipment, warm air furnaces, boilers, bicycles, cutlery, dairy machinery, typewriters, enamel kitchen utensils, flatware and hollow-ware, pulp, paper, furniture, portable conveyors, construction and road equipment, milk cans, railroad cars, sugar refining, cork products, and unit heaters. Pressures for concentration were considerably assisted by unfavorable military developments and lagging progress in war production. In these circumstances at the end of July the War Production Board announced to the public its approval of a general program of concentration. This program included acceptance of (1) the necessity for considering the special problems of each concentrating industry, (2) government initiation of and industry consultation on concentration programs, (3) "Victory" brands to eliminate problems of competitive status, and (4) self-compensation schemes organized within concentrated industries. A Committee on Concentration of Production was established at the end of August. It was authorized to select industries to be concentrated and to

review concentration programs of the industry branches. But responsibility for preparing and executing the programs was left with the industry branches.

Two additional concentration orders were issued in the summer of 1942. L-52, Amendment 2, Bicycles, concentrated production in two plants. L-54-a, Typewriters, concentrated production of non-portable typewriters in one plant and portable machines in another. Further activity bogged down in arguments about general feasibility, methods of compensating non-participating plants, equitable treatment for distributor organizations, and similar matters. These dragged through the last five months of the year. In the meantime, the war picture slowly improved and military production began to rise. The sense of urgency lessened and with it any possibility of driving through the jungle of objections and difficulties.

The record of industrial control through concentration was brief, unsuccessful, and inconclusive. An appraisal of the stove order concluded that its objectives were not accomplished for a number of reasons. A prime difficulty on the production side was the failure to assure to authorized manufacturers a flow of critical materials sufficient to support production at determined minimum levels. A second difficulty was the failure to set up machinery for rationing stoves to essential users. A third was the added transportation burden resulting from the closing of almost all stove plants in the tight labor areas of the Pacific coast. The typewriter order did not face many of the more complex problems of concentration because permitted production was exclusively for military and government use, and the other plants in the industry were able to effect a rapid conversion to war production. The bicycle order had a particularly unfortunate history. The two plants selected for nucleus production were not small, non-convertible, or located in loose labor areas; because of the insistence of the military agencies in guiding the selection, they were large, already substantially engaged in war work, and located in tight labor areas. The experience can be used only to illustrate the familiar problem of conflicting interests and failure to insist on the civilian right to make civilian decisions.

The pulp and paper industry was one of those singled out by the Planning Committee for concentration. In September, 1942, this recommendation was reiterated by the Committee on Concentration of Pro-

duction and shortly afterwards the Pulp and Paper Branch presented a program for the Pacific Northwest area where the labor shortage was particularly serious. This ran headlong into the unresolved issue of compensation to closed plants. On the rebound, it aggravated the critical pulp and paper shortage by upsetting the industrial balance between Pacific producers of woodpulp and Eastern Seaboard manufacturers of paper.

The farm machinery industry was among the first to be recommended for the concentration treatment. The industry branch was reluctant to go along with the repeated recommendations of the Civilian Supply and Labor Divisions. Problems of providing for the manufacture and distribution of repair parts for equipment on the farms were exhibited as conclusive factors making concentration of production in the smaller plants of the industry impossible of achievement without disrupting vital service to farmers. Issues of feasibility and alternate proposals for securing concentration delayed action from the beginning of 1942 until almost the end of the year. The concentration order, L-170, was not issued until mid-October. It divided producers of farm machinery and equipment into three categories based on sales volume in 1941: Class A producers, with total net sales in excess of 10 million dollars; Class B producers, with sales from \$750,000 to 10 million dollars; and Class C producers, with sales under \$750,000. Quotas were established for each classification of equipment produced by manufacturers in each of the three categories, with a general pattern of concentration of production in the smaller plants.

Appraisal of the effect of the concentration order by the Director of the Department of Agriculture's Food Production Division reached a negative conclusion. It pointed out that the benefits to war production would be derived from a conversion of most of the adaptable machinery of the industry to military orders and a shift of farm implement production from areas of labor shortage to other areas with a labor surplus. Contrary to desired objectives, the greatest quantity of precision machinery was in plants producing tractors and harvesting machinery. Little concentration could be accomplished in this sector of the industry because the smaller plants were not equipped to manufacture tractors. The greatest concentration effected by the order was among plants manufacturing tillage and planting equipment. These facilities, the appraisal

indicated, were least adaptable to war contracts. The result of the concentration order was to delay production and distribution to such an extent that much of the allocated equipment would not reach the farms in time to help 1943 production. In June, 1943, L-270 was replaced by L-257 which eliminated the concentration provisions and replaced them with a horizontal percentage cutback from a pre-war base.

The history of concentration efforts affords little basis for a critique of control techniques, since debate over policy and inability to resolve policy issues crippled all but rudimentary action. The best summary of the experience appears in one of the volumes on the history of wartime administration.⁴

Why did concentration, after having looked so attractive in the seed catalogues of England and Germany, wither on the stem in the United States? The reasons are many and varied. In the first place, there were certain basic dissimilarities between conditions abroad and those prevailing in the United States that seriously limited the applicability of foreign experience. Germany's simpler objective was to increase production; ours was both to increase production and to maintain competitive conditions and assure the continuance of private enterprise and private property.

Concentration in the United States was therefore approached with a complex of objectives, not all of them compatible, and with considerable difference of opinion as to the relative importance to be attached to each. The original impetus for concentration of production came from the need for: (a) forcing conversion of facilities to war production, and (b) assuring production of essential civilian supplies in industries where drastic curtailments threatened to make production dangerously uneconomical. In approving concentration, the War Production Board established six criteria to be used in the selection of nucleus plants: suitability of the plants for conversion to war production, condition of local labor markets, economy of transport, power supply, requirements for warehouse accommodation, and efficiency of plant operations. The Smaller War Plants Act emphasized still another objective, the protection of the nation's small business and avoidance of post-war monopolies. By the time the concentration program was fairly well under way, however, the manpower problem had achieved paramount importance, so that releasing labor for use in war production became the chief aim of the concentration program.

It was in the matter of compensation, the principal specific factor in the failure of the concentration program in the United States, that American re-

⁴ *Concentration of Civilian Production by the War Production Board* (Historical Reports on War Administration: War Production Board, Special Study No. 14), pp. 125-127.

spect for competitive business forced consideration of the most difficult, and in the end unanswerable questions. While most of those intimately concerned with concentration "agreed that if governmental action resulted in forcing a particular firm out of business (while some of its competitors were benefited) compensation for that firm should be arranged somehow"; there was "great difference of opinion as to how and by whom and when." This difference became the major reason for delaying, and finally *stopping*, the concentration program.

Implementation of even the few approved concentration programs revealed at least two problems that were certain to be more acute in the United States than abroad. In the United States procurement was a function of the Armed Services and, as in the case of stoves and bicycles, might be so conducted as to nullify the objectives of concentration. In England, on the other hand, procurement was centered in the hands of the civilian agencies, and could therefore be better harmonized with the concentration objectives. This country was also distinguished by great complexity and interdependence of industry and by great distances. These were principal factors in the failure of concentration in the stove and the pulp and paper industries, failures which served to strengthen the conviction of concentration's lack of feasibility.

But the major causes both of concentration's difficulties and of its eventual failure . . . must be sought in the background of the time and events against which it was projected. Concentration entails a ruthless dislocation of long-standing trade practices and production and distribution mechanisms. . . . To secure the support that might make it succeed in this country a general conviction of its need would have to exist. The early proposals for concentration came during one of the blackest periods of the entire war, when it appeared that the strategic schedules could not be met without drastic changes in the civilian economy and the stripping of civilian production to the bone. . . . The most imperative need for concentration had passed . . . by the time the program was officially adopted. Absence of a wholehearted belief in the necessity of concentration accounts for much of the industry division opposition and the resultant antagonism between the industry divisions and the advocates of the program.

Put more bluntly, concentration of industrial production is a control technique in a "hard" war. We fought a "soft" war. Brief as it was, the experience yields some indication that in any future emergency a well-developed concentration program could serve a variety of purposes and could extend even beyond the objectives sought in 1942. Beyond the advantages of securing a determined volume of production with the most efficient use of facilities and labor, it could be extended to minimize cross-hauling of materials and finished products. Finally it is clear

that if a concentration program is to realize its full potentialities outside the factory, it must look to rationalization of wholesale and retail distribution.

F. USES AND LIMITATIONS OF STATISTICAL DATA

Mobilization of the nation's resources for war requires the precise coordination of all factors of production and the distribution of their product in accordance with the essential needs of the military, export, industrial, and civilian segments of the economy. To accomplish this assignment, the agency which bears responsibility for the administration of production and distribution must have as the basis for all its actions accurate information on the magnitude of resources, production capacity, supplies of materials, distribution of materials, distribution of end products, and all similar economic activities. It is only through the intelligent use and interpretation of such information that the nation's resources can be allocated so as to maximize the effective contribution of both the military and civilian sectors of the war economy.

This fundamental responsibility for the collection, tabulation, and interpretation of statistical information was central to the successful execution of the entire war program. Since WPB and its predecessor agencies were assigned the principal responsibility for the administration of the nation's resources, the statistical research organization of the agency became, in effect, the bearers of light in the dark complex of the operations of the War Production Board, and through it, of the whole industrial program in the war years.

The principal assignment of the Bureau of Program and Statistics and its predecessors was to measure the productive capacity of the American economy in total and in detail, and to relate this capacity to all the military, civilian, and foreign needs that might arise at the several stages of the war effort. This meant determining supply and requirements for particular critical resources and indicating just what distribution of these resources among conflicting requirements would serve to maximize our war potential. In practice, this involved a complicated meshing of research activities on a scale never before approximated.

The two main sources of the information with which the Bureau was concerned were the procurement services, mainly for information about end-item military requirements, and the war industries, mainly for in-

formation about operating requirements, supplies, and productive capacities. Dealing with each of these involved special problems.

The difficulties with the procurement services arose largely from a certain reserve, amounting in a great many instances to secretiveness, regarding matters with which they were concerned. The procurement offices of the Army, Navy, and Maritime Commission were frequently reluctant to give WPB information about end-item requirements, about munitions inventories available in the continental United States and in the various theaters of operation, about prospective changes in programs, especially downward changes, and about a great many other things. Frequently the Bureau had to make its own guesses about these matters. Sometimes these guesses were mistaken, or for other reasons resented by the services, and this led to further difficulties and sometimes to even greater reluctance to release information to WPB.

Even when the services were, in principle, willing to release data at their disposal, other difficulties arose. During the early stages of the war effort, there were no realistic military programs. In order to obtain appropriations from Congress with a minimum of difficulty, the services would often list quantities of end munitions items in their budgetary statements. But these quantities were not necessarily related to what the services actually intended to buy, much less to realistic requirements or to the country's productive capacity. The requirements estimates received by WPB were inaccurate and without firmness; bills of materials were slow in forthcoming and when they did arrive, not only were out of date, but generally proved to be sketchy and inaccurate; there was only a rudimentary effort to schedule requirements so that they complemented each other in production.

As a consequence, when the attempt was made, in 1941, to correlate data on requirements and production of critical raw materials, it was not possible to use the figures submitted by the War and Navy Departments. So unreasonable were the "guesses" submitted that an endless series of adjustments and corrections had to be made to bring them into some sort of rapport with reality. It became necessary, in fact, to ignore the "official" estimates. It was later decided, however, that the Combined Army and Navy Board was to have responsibility for preparing estimates of material requirements, and that WPB was to base its own estimates on the figures received from that source. Gradually, as a result of prod-

ding and the ironing out of kinks in the management of military procurement, the services began to program, schedule, keep records, and attempt to make their goals firm and realistic.

The problems of getting needed information from industry were different, but hardly less difficult. The progressive tightening of the supply-requirements position of many materials and products made it necessary to get precise data from industry about its needs, inventories, productive capacities, and similar information, as a counterpart of the steady extension and tightening of the priority system. This meant that industry had to fill out and submit an endless series of forms and questionnaires. Questionnaires are a nuisance to businessmen, but this could not be helped. However, business resentment was intensified by inquiries that were poorly organized and non-integrated, that requested information not available to respondents, and duplicated each other. In a period of rapid and unexpected change, a certain amount of this hardly could be avoided. But this did not lessen the annoyance of business and therefore the bitter criticism to which OPM and WPB were subjected. There was some justice in the criticism, since each WPB expert, in his preoccupation with his special task and with his convictions as to information indispensable to its performance, broadcast inquiries to his own taste and specifications.

There were, from the beginning, attempts to keep the questionnaire-formulators in check. But it was not until the reviewing and screening of all forms was systematized in the Survey Standards Division that they became effective. Even then, as might have been expected, information received from industry was never as complete and as reliable as it was intended to be; and the inadequacy of the data, particularly as regards inventories and future requirements, frequently made it impossible to do the sort of research job required, or to make controls as effective as they should have been.

The War Production Board and its predecessor agencies were faced with the task of assembling an unprecedented volume of information in order to administer the war production program. Literally thousands of questionnaires were used. In retrospect the need is obvious for centralized review to avoid duplication, to coordinate reports, and to maintain standards.

The reporting problem of the entire federal government had become increasingly involved before the war, and steps were being taken through the Bureau of the Budget to improve the situation. Authority delegated by the President in 1940 required that data requests issued by any government agency be approved by that Bureau. The authority was indefinite, however, and the reporting problems continued to grow. On December 24, 1942, the President signed the Federal Reports Act which formalized the review functions of the Bureau of the Budget and provided a basis on which the Bureau could take the initiative in planning improvements in the data collecting activities of the federal agencies. The Act directed the Bureau of the Budget (1) to investigate the needs of the various agencies for information from business enterprises and other sources, (2) to investigate the methods used in obtaining such information, and (3) to coordinate information collecting services in order to reduce the cost to the government, minimize the burden upon business and industry, and utilize, as far as practicable, files of available information and existing facilities of the established federal departments and independent agencies.

Before the first questionnaire of the National Defense Advisory Commission was issued, a study made of the War Industries Board's experience during 1917 and 1918 pointed to the need for a questionnaire clearance system within the Commission. In the summer of 1940 the NDAC Division of Statistics recommended that a central clearance point be established. This was done on an informal basis, but the growing number of reports led to the issuance of OPM Administrative Order No. 4 in April, 1941, requiring clearance by the Division of Statistics of all inquiries to business and industry. The procedure was continued by WPB. The order prescribed the following criteria for reviewing proposed questionnaires:

1. Information requested must be needed at the time it is filed, and the need must justify the effort and expense on the part of both industry and government required to obtain it.
2. The data must not duplicate information collected by any other unit of the War Production Board or any other federal agency.
3. The request must include clear and specific definitions of the required data

4. The required report must be adapted as closely as possible to the types of records ordinarily maintained by business concerns or available to them.

5. Staff and equipment must be available to tabulate or otherwise process the returns when received.

The Office of Survey Standards was established in the Division of Statistics to carry out the provisions of the order. When the Federal Reports Act was signed ten months later, the Office of Survey Standards continued to screen the data requests from the various divisions of the Board. The only required change in WPB procedure, in order to conform with the act, consisted of placing on each report form an approval number assigned by the Bureau of the Budget. The act, however, provided a legal basis for holding the number of report forms in check. "The Law" was a final argument to use in convincing doubtful divisions of the need for simplified reports.

Comments of Industry Advisory Committees were useful in improving reports, and discussions with these committees helped to develop in industry an understanding of the need for accurate reporting. Nevertheless, in 1942 the weight of criticism from industry was sufficient to warrant a general review of all reports. After a survey of the criticisms and suggestions received, the Chairman of the War Production Board appointed a Committee for the Review of Data Requests from Industry to correct any abuses from ill-advised or outworn reporting forms. This committee was composed of representatives from business, Army, Navy, and the Bureau of the Budget. During the summer it made a review of all existing report forms, and passed on all new data requests that were initiated. The committee invited the cooperation of over 1,000 trade associations which canvassed their members, soliciting criticism and suggestions. Representatives of industry came to Washington by invitation to make surveys in the branches at first hand, in collaboration with the committee. Each form in use was reviewed and agreement was reached as to continuance, revision, or elimination. On the whole, the committee was ineffective. Staffed largely by outsiders unfamiliar with subject matter and procedural techniques, its greatest contribution lay in its unchallenged demonstration of the futility of trying to accomplish the announced objectives by working from outside the WPB organization. This performance was never repeated.

To carry on the work of the Committee for the Review of Data Requests from Industry, the permanent position of "Industry Advocate" on War Production Board questionnaires was established in the fall of 1942, and filled by a businessman. He was charged with the responsibility of seeing that industry was adequately represented in the preparation of WPB forms, and that an active liaison was maintained with the Business Advisory Committee on Government Questionnaires recently established by the Bureau of the Budget. In 1944, when the number of new reports and complaints had sharply decreased, the position was abolished.

The difficulties reflected in the organization of the Committee for the Review of Data Requests from Industry can be traced to the changed reporting problem that arose in 1942. Prior to that year NDAC and OPM confined reporting chiefly to the development of data on the supply of raw materials, preliminary explorations to serve as the basis for subsequent L and M orders, and determining the areas within which expansion of facilities was most needed. After Pearl Harbor, the controls adopted required a much larger volume of questionnaires—many of them rather searching application forms. The reaction might have been expected. Although the committee was able to eliminate some reports which might otherwise have continued, and certainly lent impetus to the careful review of forms, the basic objections involved controls placed on the economy through the orders and regulations of the War Production Board. If controls were continued, detailed reports would be necessary. In the end, to meet the war program controls and necessary reports continued in effect.

The relation of reporting to policy, as reflected in the work of the Committee for the Review of Data Requests, presented a number of problems. Among the more important were those connected with end-use data and listing of individual orders (order boards). The problem in obtaining end-use data was primarily one of the availability of information. The processes from raw materials, or even components, to end use involved a number of subcontractors through whom the information on end use had to flow. Furthermore, each contractor frequently ordered from his supplier material or components to cover a number of orders, thus involving several end uses in one order. There was gradual acceptance of the proposal that requests for end-use information should be limited to those cases in which the required information was available

to the respondent without the necessity for rechecking with his customers. Many so-called "end use" reporting systems became "use" systems.

Fairly early in the war various divisions requested approval of reports requiring a listing of individual orders. With few exceptions such reports were disapproved. It was evident that the only justification for such a report was to permit a rearrangement of the order sequence. Most of the forms first presented were disapproved because no delegation of authority had been given to override the arrangement of orders as prescribed by the priority system, or because the necessary staff was not available to process the reports. By 1943, the Board became convinced that the effect of the priority system on some items, particularly certain common components, was such that scheduling of individual orders was required. A production scheduling office was established to apply the adopted scheduling policy throughout the Board under Order M-293. Probably more paper was associated with M-293 than with any other single order, and in general the reporting experience had to be considered unsatisfactory, in spite of the fact that there was relatively little objection by industry to filing the detailed order listings required on scores of products. It was unsatisfactory simply because a good share of the order boards were received and filed without change. The scheduling plan allowed manufacturers to retain their order boards for varying specified lengths of time in a frozen condition unaffected by the priority system. The price for this privilege, filing of order boards at monthly intervals, seemed reasonable to almost all producers. The services and some authorities in the War Production Board took the position that they would not set aside the priority system (freeze an order board) for any length of time unless the order board was on file for review in case of emergency. Opponents argued unsuccessfully that it would have been better to freeze the boards for at least a minimum period of time and call for detailed reports only in case of a specific problem.

It was through this institutional apparatus and with these instruments that wartime statistics were collected and organized. Not until mid-1942 did their inadequacies for administrative purposes become clearly recognized. In the early period of industrial mobilization it had been widely assumed that the defense program would not seriously tax the resources of the country. Fortunately, the statisticians who formed the first staff

of the NDAC recognized that the impact of war production would sharply expand gross national product and consumer income, with the result that defense needs plus expanded consumer demand would outrun capacity in some areas. Viewed in the light of subsequent developments, the data available for projecting or evaluating the national supply-demand picture were of the most rudimentary character. Nevertheless, statistical projections were undertaken and it was fortunate that the men who made them had the courage and vigor to demand that the government take the steps necessary to meet the problems indicated by the data. These were, first, that the country's capacity would be taxed to satisfy both war and expanded consumer demand, and, later, that properly controlled and directed the country's resources would permit the introduction of a greater-than-projected military program.

The earliest statistical estimates were made from the best data available. In 1940 and 1941 these projections were an extremely significant tool for policy formation and the development of public opinion on issues bearing on the economic aspects of the war. By mid-1941, when the impact of the growing war program started to strain the nation's resources, repeated efforts were made to use these same statistical techniques as tools of administration. The results were unfortunate.

As any cost engineer knows, there is usually a substantial difference between early estimates of costs, preliminary budget costs based on trial experience, and actual costs developed after extended production experience. In the use of statistical estimates for administering the nation's resources for war, the first estimates for the most part had less validity than even the calculated cost of a new item of production. When undertaking the manufacture of a new item, the producer has the substantial background of his own experience or can get access to the results of fairly complete actual experience of others. Unfortunately, the statistical data available to those projecting the early economic estimates for war did not have the benefit of the background usually available to specialized manufacturers.

Although every effort is made by the statistician to establish the validity of his estimates, he must in the end rely upon the principle of compensated error. In magnitudes as great as those of national resources and production, the aggregate results of statistical methods may be adequate

without proof of the validity of detailed figures. For over-all policy purposes in which statistical data are largely used for measuring and projecting trends, such data are adequate. For administrative purposes, however, the accuracy of the detailed figures becomes much more important. Administration rests on specific actions. Specific instructions must be issued to a multitude of individual agents of production, subject to control. If there is over- or undercalculation, the result may be the undertaking of an impracticably large program or one which is too small in relation to the resources available. Major errors on either side lead to confusion and waste. In the policy-making and administrative experience of the war agencies, the lesson was finally learned that if a policy is to be made the subject of detailed administrative action and control, both the original making of the program and the final development of reports on performance must be developed from records in terms of specific actions.

Errors in calculating bills of materials might have ended in unnecessary restriction of individual programs. In actual practice, programs were never limited except in the over-all sense, with the result that an error in a calculation, such as that for extrusions for airframes or airplane engines, was never in practice made a specific limitation on the number of airplanes to be built. If more accurate calculations had been available, however, the production of planes could have gone forward more efficiently and there is every reason to believe that the total program would have been accomplished more successfully and economically. Similarly, it was learned that when reports on actual performance against calculated programs were not made from an auditable record of individual actions, the statistical statements of performance actually varied by as much as 100 percent from the actions taken as ultimately developed through records of account.

In the early stages of the war, there was no alternative to statistical projection. Throughout the war period, estimates continued to be used in lieu of records of account in most areas because there was a hesitancy to impose the assumed burden of more adequate record keeping. The actual demands for administrative personnel were diminished and there was great improvement in both the quality and timing of the development of the needed information when records of account replaced the earlier statistical estimates.

The foregoing review suggests that the problems of industrial mobilization change during the prosecution of a war. Such changes must be reflected in the extent and type of industrial control instruments. Not only does the type of control depend on psychological and other factors which make up the climate in which the control is to operate, but the shifting character of the problems which require solution demands revision both in the objectives and procedures of control.

During the initial phase of the industrial mobilization effort, when materials were disappearing into uses which the war had suddenly made undesirable, when the philosophy of replacing peacetime objectives with military objectives had not been accepted over a wide front, and when displaced labor was regarded as a result to be assiduously avoided, efforts to carry administrative controls deep into the industrial organism had a rationale not easy to attack.

Peacetime thinking and values had to be replaced and new goals and habits geared to military objectives established in their place. Once the country had matured in its unfamiliar role as a militant nation, those industrial areas in which the new objectives had been accepted could be handled more efficiently by generalized controls and regulations and by a greater concentration of detailed industrial control procedures on important material consumption units. A conscious adaptation of control machinery to the requirements of component and material shortages and the related elements of industrial labor and management demands, as well as government administrative load, was a concept only vaguely understood and scarcely ever acted upon in the management of the industrial mobilization machinery.

CHAPTER XVIII

WHAT WE LEARNED

PROBABLY the most important lesson to be learned from the record of the administration of industrial mobilization from 1940 through 1945 is that experience neither compels learning nor guarantees that subsequent administrators in a comparable national emergency will not repeat the documented errors. The management control problems of World War I reappeared in World War II. In a few instances, the administrators of 1917 were called in for counsel in handling the same problems in 1941 and 1942. Yet little of the earlier experience was used. As each problem arose there was an apparently irresistible drive to treat it as if it were unique. Men were unwilling to regard their area of specialty as having any management control characteristics in common with the areas of other men's specialties. When an administrator who had developed a successful technique for handling the production or distribution problems of one material was transferred to another material, he usually began his tour of office by abandoning completely the record of his personal experience. In most such cases, he would not even try to trace the lines of potential similarity. Each assignment was undertaken in a frame of reference from which the record of experience was excluded.

The human mind perversely refuses to recognize old characteristics in a new environment. There is a reluctance bordering on complete unwillingness to accept and use past experience in the social sciences. This disposition seems to be endemic in the area of government administration and it is not difficult to blueprint its causal structure. It appears to be related closely to the absence of quantitative measures of performance. A policy is framed and executed. Was it good or bad? Were the results worthwhile? Was the technique of implementation efficient? How are these questions to be answered in objective terms? Private business has its dollar accounting, yielding quantitative, additive, and comparable measures of profit and loss. But most applications of government policy

do not make a specific record of achievement in common units of measure. There is no evidence of the appropriateness of a particular administrative procedure which carries the conviction of positive achievement in dollars and cents. No standard has been developed as an alternative to dollar profits. There is no yardstick of demonstrable proof other than logic and the voice of the individual proponent of a particular practice in a specific situation.

The peculiar quirk which makes human beings unwilling to learn from past experience in the field of government administration has doomed every effort at preparing in peace for the industrial problems of war. The Nye Committee report, the National Defense Act of 1920, Mr. Bernard M. Baruch's testimony before the War Policies Commission in 1937, all of these not only pleaded for the peacetime establishment of industrial mobilization machinery, but to some extent actually advanced into the field of action. Nevertheless, those charged with specific responsibility for mobilizing our resources for war forgot, discounted, or purposefully abandoned the body of experience which had been accumulated.

To be more hopeful for the future, one must assume that there is a real lesson to be learned from the fact that the earlier efforts at preparedness were not used when the possibility of war became a reality. The lesson, it would appear, lies in the fact that nothing short of a complete plan can offer sufficient promise of success to make it a tool for those called upon to act in time of crisis. We now have a living historical record still fresh in the minds of the men who shared it, from which we can start to trace the lessons of experience and what they mean in terms of a program which might hold out hope for success in any comparable future emergency.

We have learned a few things about broad principles and we have learned a great many things about the details of operations. As a matter of basic principle, we have learned, first, that an emergency organization cannot be thrown together hurriedly with any great promise of rapid, efficient action. Perhaps the second most important principle which we have learned is that it is suicidal to assume that administrative action is automatic or that there exists in the normal peacetime experience of government and business a body of knowledge, procedures, and machinery which readily permits the translation of policy decisions into

effective action. Beyond this, we have also learned that community adherence to government policy can be secured only if the techniques for executing policy have been planned and tested and are non-disruptive of industrial routines. If these major lessons can be carried forward into the structure of future action, we shall have provided a foundation upon which we can build the nation's safety in any national emergency which requires a transfer of economic authority inward to a central control. If we have learned these lessons, we will begin to build now in terms of organization, personnel, method, and procedure. If we have fully learned these lessons, we cannot fail to make effective use of the other lessons learned in the details of administrative experience.

Most of the difficulties of 1917-18 and 1940-45 had their roots in the absence of an organization in place and a methodology by means of which an emergency organization could function to make and execute policy. The usual procedure of government provides for a slow and evolutionary development of administrative machinery. There is, first, a piece of legislation which customarily provides only the broad statement of national policy objectives. Subsequently, money is appropriated under the terms of this legislation to provide for the administrative organization to carry out stated policy. Over a period of time, usually years, the administrative organization by trial and error hits upon some way of executing the policy. Rarely, if ever, is there any adequate test of the extent to which its objectives are being achieved. Practically never is there any real appraisal of the administrative efficiency of the method used.

In the peacetime administration of an economy in which the organic law and the political philosophy both segregate public and private business, this slow and haphazard method of translating policy into action is irksome but not disastrous. The government, for the most part, is a research and service organization. Only in the most limited areas does it intrude into the field of direct administration. Even then, it is usually concerned with administration either for the purpose of obtaining revenue or for the execution of related policies through the taxing machinery. In the more than a century-and-a-half in which this government has been engaged in raising revenues, a large and strongly established organization has grown up in this area. Whether or not their methods of administration are the most efficient, there resides in the Bureau of Internal

Revenue, the Bureau of Customs, and the other fiscal agencies of government a continuing organization and body of practice which can absorb new legislation and new policy without disruption.

War or national emergencies of equal magnitude require that government controls move beyond this established field of fiscal experience where slow administrative development is not fatal. To organize our resources for most effective use, new policies are framed requiring the rapid introduction of practices and procedures which do not fall into the established money accounting pattern of government or business. Under such conditions, the functioning of the massive national economy must be directed as if it were a single productive unit, and, under the impact of the emergency, without benefit of the profit or loss, pain or pleasure, tests which might otherwise be adopted. To administer its policies, the government must hurriedly establish new methods comparable to those developed in its revenue departments or in any large industrial enterprise over a period of years of operation; it must find a new set of standard tests for measuring administrative efficiency which can be used in lieu of money costs. It is precisely here that direct and profitable use can be made of the experience of two world wars. The price of failure to apply this body of knowledge is likely to be the termination of the society we know.

The historical record may be divided into questions of organization, on the one hand, and administrative control techniques, on the other. Some of the following discussion may seem less than serious because it would seem impossible that such obvious and petty details of organization could be overlooked. Nevertheless, these details, however petty, were not obvious to those charged with administrative responsibility during World War II and were persistently overlooked as a part of required administrative practice. If we are to build a sound machine, we must avoid treating any detail as "petty or obvious" and the method by which we build for a future emergency can at no point take such details for granted.

The most obvious lessons are in the field of direct administrative action. These relate to questions of space, personnel, equipment, and internal administrative procedure. At all times during the war, the administrative process was hamstrung between a shortage of personnel and the recognition that if adequate personnel was obtained there were

no buildings to house them, desks for them to work at, chairs for them to sit in, or telephones, typewriters, adding machines, and other necessary items of equipment. A plan must be prepared in advance to deal with these household aspects of emergency management. It would be impossible to estimate how many millions of manhours were wasted, how many tons of materials and freight misdirected, because people literally did not have places in which to work, or conditions under which effective work could be done. Frank L. Walton, wartime director of the Textile Bureau, has provided a tragically entertaining description of the physical working conditions under which the early defense administration carried on its job.¹

On March 1st, 1941, the Textile Unit, as it was called at that time, was using one office and one telephone and two people. For a month it was largely a matter of discussing and planning for the future. It was not long, however, before these plans began to take shape and business "picked up" with a bang as the problems began to multiply. At that time we were in rather comfortable quarters in a large modern building, covering a city block, known as the Social Security Building. It had just been completed for the Social Security Board when it was turned over to this war agency. Most of the regular Government Departments are very well and comfortably housed but there was no place for these new war agencies. Many programs developed overnight and the entire agency began to expand. In no time it seemed the building was too small and the space problem became the most "talked of" problem in the agency. Everyone was all over everyone else. No chairs, desks or telephones were available. The first expansion of the Textile Unit was to add four more people and to secure two offices. When we had nine people crowded into this small space, with two at a desk, we finally secured three offices by moving to another floor. These moves were difficult. Papers, documents, and files were upset and generally no telephone connections could be secured for two or three days.

Within a month we had twenty-five employees and nowhere to put them and finally moved to another floor into what we called the broad open spaces. That floor had no partitions, having just been completed. If you can imagine a room a block long and a hundred feet wide jammed with desks so close you could scarcely move among them, you can realize the conditions under which the people were working. The Textile Unit expanded into the Textile and Fiber Section, and we finally secured desk space for these people with no room to spare except just enough space for a large table around which to hold meetings with the many committees from industry.

¹ *Thread of Victory* (Fairchild Publishing Company, New York, 1945), pp. 15-20.

This rather large table with 12 chairs became famous as the Textile Round Table. Many people will remember the difficulty of holding these meetings amid the ringing of hundreds of telephones. It is no exaggeration to say that many times an industry committee would be meeting around one desk and another committee around the adjoining desk with the members sitting so close together they would sometimes get into the wrong discussion. Several times one meeting would be discussing a problem that concerned the other meeting, and they could not concentrate on either meeting. Even more confusing were these close-quarter meetings when competitive groups were involved.

The Textile Round Table really got its name from an incident which happened to 14 important textile mill executives who agreed to come to Washington to help. Each was to organize a new unit in the section to handle a segment of the industry from which he came.

We were expanding rapidly. Programs were developing and production problems arising and we were completely understaffed to handle the production for such a large and complicated industry. These 14 men arrived on a Monday knowing they were facing a big job but ready to help the government. At home they all had important jobs and comfortable offices. They had heard of the fine government offices and buildings in Washington and they expected to begin promptly with a nice office, a secretary, and a telephone or two.

After the usual formalities of filling out Government forms and signing as Dollar-a-Year men, they were sworn in and told that as usual the FBI would later investigate them thoroughly. They then reported to our space in the wide open spaces to go to work. One at a time they were told that we had no office or desk or secretary or even a telephone for them but that we were promised all of these things shortly. Each was asked to have a seat at the large table temporarily. When they looked for a place to hang their hats and coats they found that the only place was on the window sill where it was necessary to put one on top of the other. It was not even amusing to watch the expressions on their faces as they came to rest at the table. They would look around at all the things which were going on in our open spaces and would keep very quiet. Not one of them has ever disclosed what he really thought that first day he worked for the government.

By noon that day the 12 chairs were filled and we had the round table in operation. They began to get acquainted and to sympathize with each other. By four o'clock that day the last two of this famous 14 had been sworn in and reported. We not only had to explain the situation but to add that all we could give them now was a chair which would be in the second row from the table as soon as we could get the chair, which we hoped would be the next day. Keep in mind that the 25 others in this section, as it was then called, were swamped trying to carry on the work. Some of them had been there several

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weeks and working two on a desk with about one telephone among four people. That night we stayed late, as we did every night from then on, to go over the problems as a whole and to discuss their work and why we were in such a predicament for space. It was difficult for any newcomer to understand why it was necessary to work under these trying conditions or how he could get the work done. Yet the fact was that all sections of the agency were expanding and adding new employees. There were no vacant buildings in Washington. Eventually many temporary buildings were built which helped relieve the space problem, though these temporary buildings were not very desirable places in which to work.

But to go on with the story of the 14 men with 12 chairs at the table, it soon developed that the man who got there first and put his brief case on the table in front of a chair and sat down had a seat for the day. If he moved, he did not dare move his brief case. That brief case represented his right to the seat. The two men who had no chairs just sat around or stood around. Surprising as it may seem, this went on for three weeks or more before we could get desks and crowd them in, two or more men to a desk. During this time we could get no more telephones and all were trying to use one telephone sitting on a window sill nearby. Secretaries were difficult to secure but we had nowhere to put them ever if we could have gotten them. These men, who had not written a long-hand letter in years, were trying to answer urgent letters or telegrams from the industry with a pencil and paper, being careful to make a carbon copy. Or they would go to outside telephones to put in calls in answer to telegrams and letters. They would even pay for the calls themselves.

While our round table crew were doing the best they could, one morning the chief of another branch from another part of the building stopped by and asked if his new man could sit at one of our empty desks until the next day. When told we had none, he pointed out two desks in the aisle that had been there only 10 minutes and could not be crowded into our jammed space. This man sat down to rest and said he had never seen anything like it. He was an official of a very large oil company who had agreed to help the government in another branch. He found himself sitting in the aisle, but only for a few minutes, for the two extras at the round table were soon occupying the aisle seats. A fitting climax to the round table story is that while these 12 men were trying to work at this table, we would at times have to ask all 12 to stand up somewhere or sit on a desk so we could hold some special meeting around the table, which might go on for hours.

Internal operating procedures such as those relating to the enrollment of new employees, the routing of mail, the development of payrolls, the issuance of checks, and the handling of administrative orders would appear at first glance to be part of any operating unit. The assumption that such procedures existed and could be used intact was a serious handi-

cap in the early work of the National Defense Advisory Commission and the Office of Production Management. Although Civil Service procedures for recruitment existed, they were so slow and cumbersome that the Civil Service Commission could not handle the wartime recruiting job. The Commission found itself unable even to perform the clearance function without seriously interfering with the hiring of needed workers. Trained personnel for the administration of payrolls and the moving of equipment should have been available, but they were not. Standard routing procedures should have been developed, but they were not. During the early defense and war years there was continuous improvisation, shifting from central to decentralized administrative services and back again, but none of the arrangements was effective. The unhappy experience was less an indictment of those charged with responsibility for the functioning of the normal administrative processes in government than it was of the unwillingness or inability of anyone in the emergency agencies to recognize the size of the task and the magnitude of the organization that would be required to administer the household needs. Any sound plan for the future, therefore, must include a realistic recognition of the housekeeping assignment and provide machinery by means of which space, personnel, and internal administrative problems can be handled with dispatch.

In the development of the early control techniques, it was assumed that statements of policy would provide the framework within which industry would automatically mobilize to do the job. It is apparent from hindsight that in the tug of war which grips business in a time of national emergency the pull of the regular customer will always divert a substantial part of production from war assignments unless the statement of government policy is supported by simple, understandable, complete, and foolproof administrative techniques designed to execute policy as determined and measure achievement against original objectives. Mere statement of policy will not provide guns, planes, and atom bombs when the manufacturers who supply the materials of war are at the same time free to engage in the production of automobiles, refrigerators, cosmetics, and other items which can make more profitable use of materials, facilities, and labor. Effective execution of policy requires well-developed methods and procedures which are readily adapted to the existing methods of private business and backed by an organization

skilled in their use. To be fully effective, these methods and procedures must at the same time provide the information required for determination of policy and the instruments through which the decision, once made, can be translated into the detailed instruction necessary to secure coordinated effort at every level of action. Unless there is an established body of knowledge and a functioning *network of administrative method*, it is impossible to develop policy in effective terms because there is no way of realistically prejudging the possibility of attaining the desired objectives. When administrative machinery exists, it is possible to translate policy decisions into the network of actions to be taken by large numbers of people at various levels of responsibility. Effective administrative method (1) translates the *specific operating responsibility* to each person required to act, (2) provides machinery for limiting the use of authority, and (3) obtains a full accounting for the manner in which authority is used. Effective administrative machinery provides the methods and procedures by means of which information essential for policy decisions is obtained and mandates are *transmitted for specific action* to carry out determined decisions. It also provides precise and definite accountability for and reporting of the execution of each policy determination.

Basic to such procedure is the *recognition* that policy can be determined only on a foundation of complete and detailed information. Since the problems of industrial mobilization are those of translating available supplies of labor, machines, and materials into the maximum quantities of goods required for military and war-supporting activities, the control authority must have complete knowledge of the nation's resources and the military and war-supporting demands which they must serve. Knowledge of resources requires a reporting system which will present in integrated detail the actual and potential production of the mines, forests, and farms; the smelters, refineries, and other primary fabricators; the industrial plants engaged in all phases of manufacturing activity; the power companies, railroads, and other public utilities; and all other factors of production. There must be a *detailed military program*, complete in terms of the items needed directly by the armed forces and the materials and components which enter into their production, and spaced in terms of required, balanced deliveries by calendar periods. There must be a *rationally determined war-supporting activity*

program developed in the comparable full detail of its demands on labor, machines, and materials. Such a reporting system can be useful in time of war only if it exists continuously in time of peace. Statistics are significant only as related to a continuous historical record, and the techniques for collecting them must be tried, tested, and revised before usable data can be assembled. If properly developed, such a continuous reporting system need not be burdensome for industry or government.

Effective decisions can be made on the basis of this information only when all of the important conditions affecting each specific issue are presented fully. This requires a policy-making group which is judicial in its ability to evaluate the specific segments of the economy and their competing claims, and which has available to it a staff skilled in the preparation of factual data. No one can become thoroughly familiar overnight with all aspects of the nation's wartime production needs for steel, power, or transportation. It is important, therefore, not only that there be a continuing staff engaged in the compilation and analysis of the appropriate information, but that those charged with the making of the final decisions have a broad and continuing experience in the process of appraisal.

Once a decision has been made, it should be possible through the basic reporting system to set up the machinery for transmitting its precise terms. The system should provide for determining: (1) the production of specific quantities of "widgets" needed for the manufacture of tanks, automobiles, hospital beds, and every other permitted product; and (2) the direction of the requisite quantities of materials in specified periods of time for the production of the determined output of widgets. In addition, the administrative machinery may as well accept, from the start, responsibility for the operation of a detailed and complete control scheme. It cannot treat widgets alone; it must cover all products made from the same materials. One of the most striking lessons of the 1940-45 experience is that the breaking of one bottleneck usually means the creation of several new ones. It would be wiser in time of emergency to forego wishful thinking and hopeful action, and introduce at the outset a system of complete controls without which orderly action is impossible.

Perhaps the greatest lesson to be learned from the succession of administrative and executive orders and the stacks of organization charts which were developed during the war years is that orders and charts of

themselves cannot create effective method or action. In the end, the problems of *policy and administration are problems of men*. To do the job, there must be able men, trained men and, above all, men in sufficient numbers to embrace the task assigned. Practically no man, however broad his background, can come to grips quickly with a mass of strange problems. To some extent his ignorance can be offset by the existence of adequate administrative machinery, but it is unlikely that any man plunged into a responsible job can quickly acquire the new knowledge and experience which he must have in order to discharge his responsibility. There must be at least a nucleus organization which has knowledge of the problems and established methods for dealing with them and, in addition, a basis of personal relationships which will permit the responsible individuals to work as a group. If there is a nucleus organization in place, it is likely that a substantial addition can be digested quickly.

The human aspects of an expanding emergency control organization have been thoroughly explored during two wars. No organization which is compelled to recruit a staff of several thousand men and women within the space of a few months can avoid a high incidence of incompetents, ineffectives, intellectual ne'er-do-wells, and dilettante technicians. The War Production Board had its share. But the real lesson of the war experience is not in the field of improved personnel selection based on more rigorous screening of aptitudes and experience. Rather it is in the conclusive demonstration that the fundamental need is for a reexamination and redefinition of the functions performed by the staff of the control agency, and the recruitment of individuals with specific experience related to these functions.

Without entering into an invidious and unprofitable commentary on personalities participating in the management of industrial mobilization, it is possible to indicate some general characteristics of the human requirements of the job and the sources from which they might be met. The nature of the assignment can be described both negatively and positively. *The administration of wartime industrial mobilization is not a production job*. Some of the tasks essential to the execution of determined policies call for knowledge of production techniques, as, for example, in the implementation of the decision to shift loom assignments in cotton mills in order to secure increased production of utility fabrics at the ex-

pense of less essential constructions. But the performance of such tasks is not a top-level staff operation; it is a detail of operation well down the line. Neither the making of policy nor the planning for its execution has any relation to the knowledge, aptitudes, and experience required for managing industrial production in the factory. *Neither is the administration of wartime industrial mobilization a sales job.* Some of the lower-level functions—the inculcation of cooperative attitudes in private industry, the encouragement of subcontracting, the enlistment and propagandizing of management-labor teams, and similar undertakings—call for the skills of the salesman. But again these are not top-staff operations.

The critical functions in the administration of the war economy might be freely described as those concerned with “paper pushing.” The term is a bad one; it has disparaging overtones which cheapen it. In the giant organization “paper pushing” is the motor impulse of administrative action. It is the technique by means of which policy decisions are translated into action under controlled conditions which insure performance within predetermined limits and provide the informational basis for testing the adequacy of implementation and laying out the course of future decisions. It requires the performance of functions of technical organization which are similar in private and public administration.

In private industry, however, the “paper pushing” job is often taken for granted by the top management, its importance tends to be minimized because the organization to do it and the procedures that are used have been built up over a period of years. Many of the industrialists who served their country in the war agencies brought this attitude with them and never discovered that much of their ineffectiveness could be traced to the fact that the agencies were new entities with neither organization nor procedures.

It is the purpose of this discussion to distinguish between the policy making functions performed by a small group at the pinnacle of a giant organization and the policy execution functions performed by the mass staff of the organization. The first group is composed of a kind of board of directors which operates on the same level as, and makes decisions comparable to those performed by, the board of directors of a large corporation. In essence these decisions are concerned almost entirely with the disposal of major resources among competing uses. In

the private organization, these decisions may be concerned with the allocation of funds, labor or wage policy, utilization of plants and facilities, and the selection of relative rates of expansion or contraction of the corporation's activities in its contemporary economic setting. In the public agency operating in a national emergency the decisions are concerned with the allocation of scarce resources among military, export, and essential civilian uses, and the over-all scheduling of competing claims. The policy execution function, on the other hand, embraces everything which is done from this point forward. Probably the greatest difficulty encountered in the early days of the war agencies was the failure of the top administration to recognize that they did not have at their disposal a policy execution group complete with operating procedures. They acted as if this group was in existence, and the disparity between what they thought they were doing and what they actually were able to accomplish under this handicap was the measure of malperformance in the first years of the war.

The second major line of administrative experience follows the record of applied control techniques. Here the lessons to be learned are many and diverse, drawn from the web of efforts—good, bad, and indifferent—to apply controls in specific emergency situations. The balance of this chapter is devoted to the discussion of the more important of these lessons. The detailed record is preserved in the review of individual control techniques summarized in the pages of this volume. It may be useful, however, to brief these observations, which, in most cases, are interwoven among the separate materials and industrial activities described in the preceding pages.

By far the most important lesson is that the power to contract is the power to control. Optimum use of national resources for war purposes requires a planned integration of materials, facilities, labor, and management. Even if we assume that the nation is willing and prepared to make every sacrifice for war at the price of bankruptcy for the national economy, there is no assurance that undirected military procurement will provide the most effective and the largest war output. The secret of maximum war production lies in balanced output. There must be a balance between men and weapons, between munitions production and national resources, and between munitions production and non-munitions pro-

duction. All these factors must be brought into the most effective relationship and maintained in that status.

Unlimited and undirected procurement by the military services has proved to result not only in an unbalanced assignment of the factors of production, but also in wasteful duplication of effort. In World War I the War Industries Board was created to resolve this precise difficulty. Subsequently the Army and Navy Munitions Board was established as a continuing agency to minimize duplication in the procurement activities of the two agencies. With the approach of World War II, the National Defense Advisory Commission and the Office of Production Management were successively established to mesh defense procurement into the national economy. The War Production Board took up this assignment early in 1942. At later dates, the Joint Chiefs of Staff, the Munitions Assignment Board, and other agencies were created to help attain optimum balance among competing war demands and available resources.

Although efforts to coordinate military requirements and national resources during the first World War were far from a complete success, one basic idea in the system of control had greater promise of effective administration than any of the methods adopted in the years from 1940 to 1945. This was the fundamental concept of clearance of procurement contracts by the War Industries Board.² Whether the action was taken under the grant of authority of the original Clearance Committee, the Requirements Division, or the Clearance Division, in every case the action contemplated imposing a control on a purchase that was yet to be made, rather than on the flow of materials resulting from a contract which had already been let.

The same authority with respect to contract clearance was lodged

² "Before negotiations are instituted, clearance must be obtained on proposed purchases" (War Industries Board, Clearance Committee, Clearance List, June 24, 1918). "Under the present plan of operation of the Requirements Division, the Army has requested that when clearances are offered for consideration upon which negotiations have been started or completed prior to consideration by Commodity Sections, these should be summarily turned down and General Johnson notified in a letter giving the specific instance" (War Industries Board, Requirements Division, Advice Sheet Number 29, July 25, 1918). "Before negotiations are instituted, either by requesting quotations from the trade or by interviewing prospective producers, clearance must be obtained on proposed purchases of articles or commodities" (War Industries Board, Clearance Office, Clearance List, October 25, 1918).

in the National Defense Advisory Commission in 1940. On May 24, 1940, the President directed the Secretary of the Treasury to review all supply contracts for airplanes and engines with the objective of coordinating the activities of the War, Navy, and Treasury Departments. On June 6 this power was transferred to William S. Knudsen as part of a general authority to review all important purchase contracts of the War and Navy Departments. At the same time, a committee under Edward R. Stettinius, Jr., was directed to study the existing procurement efforts of the federal government through the Procurement Division of the United States Treasury, of which Donald Nelson had been appointed acting director. On June 20 Nelson was named coordinator of national defense purchases. Although the authority to clear all contracts was not specifically mentioned among Nelson's functions, his general responsibility for insuring coordination, economy, and efficiency in government purchasing could not have been accomplished if it had omitted the review of military procurement contracts. The responsibility for contract review was divided between Knudsen and Nelson, with the former clearing ordnance and similar "hard goods" contracts, and the latter quartermaster contracts and other "soft goods" supplies.

On June 26, legislative support was secured for contract clearance by the National Defense Advisory Commission, when Congress authorized the Secretaries of War and Navy to "enter into contracts" only "upon the recommendation of the Council of National Defense, and the Advisory Commission thereof, and with the approval of the President." The appropriation acts of September and October restated this grant of authority. Because of disagreement within the Commission itself as to the limitations of its responsibility, the question was referred to the Attorney General of the United States. In February, 1941, he ruled that the Commission was responsible for making available its experience and advice and for checking on expenditures of large sums.

The history of legislation, opinion, and actual practice combine to make it clear that the power to review and therefore to control military procurement was placed in the hands of the civilian authorities at the outset of the national defense program. It was given away by the civilian group in a deliberate, conscious policy which could have been formulated only as a result of the failure to grasp the fundamental importance of the power. The specific abdication of direct authority over military pro-

curement was formally embodied in War Production Board General Administrative Orders No. 2-23 and 2-33,³ which outlined agreements covering the relationships of the War Production Board and the War and Navy Departments.

Following this concordat, the military was relatively unrestrained in the placement of contracts. Review by the War Production Board was an evaluation after the fact, with efforts at direction and control therefore limited in their effectiveness. *Although the review dealt with total military demand, control was exercised over only a portion of it.* For example, the Army and Navy originally issued contracts and priorities without limitation for the manufacture of airplanes. Later, to facilitate the assignment of priorities by manufacturers engaged in a multiplicity of contracts, general preference or P orders were issued. Subsequently, as the pressure of demand for airplanes exceeded the supply of materials, an effort was made to cut back. This was done not by reducing the volume of airplanes contracted for, but rather by dividing up the materials among manufacturers engaged in making either finished airplanes or parts. The first efforts of this type were allocations of individual materials under the conservation or M orders and the comprehensive allocation of all the materials required for a certain phase of production under the Production Requirements Plan. When these measures proved inadequate to provide the proper flow of materials to end items, CMP was introduced. The Controlled Materials Plan allocated to a procuring service all materials required to make the components of a given set of end items. The service in turn reallocated materials to contractors. But even in this final development no effort was made to cut back contracts. As a result, the contracts outstanding for airplanes were usually substantially greater than the quantities of materials allotted for airplanes. Although CMP provided for the direction of given quantities of material to the production of certain air frames and parts, the fact that the contracts called for a larger volume than could be supported by material allotments permitted the continuing procurement of items which were not directly controlled. This resulted in unbalances not only between competing aircraft demands, but, in the case of universal components such as motors, between programs—as motors for planes competed with motors for tanks. There was nothing in any of the efforts

³ March 16, 1942, and April 22, 1942.

at programing and control attempted during World War II which placed the control at the most effective point—procurement. We had completely forgotten one of the major lessons learned from the experience of World War I.

The placement of contracts is the force which sets the economic machine in motion. In "normal" times the desires of individuals as evidenced by their willingness to pay certain prices determines whether certain products are made and certain resources used. In wartime, reliance is placed on control in the form of priority, allocation, or some other method of direction. Nevertheless, the impact of procurement, the placing of a contract which requires certain materials, facilities, management, and labor, is still the primary force determining the rate of operation of the economic machine.

When a contract is let, certain forces are set in motion. Business attempts to carry out the terms of the obligation contracted for. To the extent that the required items are controlled, priority and other assistance is used. To the extent that the items are not controlled, they are procured in the normal way. When a contract is made, the manufacturer initiates his procurement by going as far as he can without priority assistance and by completing his procurement in the tighter items to the extent possible with priority assistance. He obtains some items up to the maximum of his needs without resort to priority. He obtains all that he needs of some other items by virtue of priority or allocation assistance. In a few cases even with maximum priority assistance he obtains either a smaller quantity of the items than he requires, or he gets his requirements at later dates than called for by his schedule.

It is important to recognize that the letting of the contract or the establishment of the schedule is the basic force which sets demand in motion. Once the contracts are let, review of the program can attempt only to give priority or allocation assistance to the most important segments of a demand which inevitably is in excess of supply for most production materials. Even when balance is created for one item through the allocation machinery, many other demands which can be satisfied without priority continue to be effective. This causes a dissipation of resources.

Throughout World War II we initiated priority, allocation, or programing to deal only with the items in tightest supply. Determinations

of shortage were translated into administrative action only when critical needs were not being met. This meant that we were always "dividing up the shortages" rather than making plans which recognized that a program had to be cut, or that production of the short items had to be expanded in relation to a specific time schedule. Planning *after* a shortage exists can never be fully effective and is always wasteful of resources. If we had realized at the outset that resources would be short and that once procurement was initiated the drain on resources had been started, we would have adopted a procedure which would have made plans and programs effective *before* they were translated into actual procurement contracts. This would have established the control at the beginning of the operation rather than midway.

From 1940 to 1945, the civilian war agencies quite properly took the position that their staffs were not strategists and could not determine the number of tanks required as contrasted with the number of planes or battleships. They reserved for themselves only the function of determining whether the aggregate program could be given the economic assistance necessary for its execution. There is nothing wrong with this philosophy, since those who are trained in the art of war are best fitted to determine the types of weapons needed. On the other hand, since procurement was actually executed on the basis of plans as drawn, the machinery did not exist by means of which the civilian agency could shrink the procurement demand of the armed services to the actual measure of output that could be supplied by the economy.

A military contract mortgages production, facilities, material, and labor for months ahead. Once let, contracts establish a movement in the total economy which, if the original award is determined to have been out of line with subsequent policy, can be modified but cannot be changed. The civilian war agencies from 1940 to 1945 therefore were always in the unfortunate position of being presented with a reality, not a plan. If the reality called for 12 million tons of steel and the actual portion of supply that could be devoted to it was only 9 million tons, the civilian agency could limit the delivery of steel to 9 million tons, but it could not change the direction of indirect demands on men, materials, and facilities involved in the outstanding contracts for which 3 million tons of steel had not been provided.

The policy followed in the field of civilian procurement was of a

related nature. Here, WPB took the position that it would not interfere with the commercial negotiation of contracts and would interject a control only when the effective fulfillment of an undirected civilian contract would work against the war needs for the same item. Consequently, in addition to the military pressure on resources, there was non-military pressure in the form of purchase orders for items which could not be delivered within the framework of total military and war-related civilian requirements. In its development the Board did in some measure change this policy as applied to commercial procurement. It finally said that certain products could not be made, and that other items could not be made or delivered except against specified types of priorities or allocations. By the time the war ended, unwarranted commercial orders could no longer be placed in the more critical areas. Unfilled military orders continued to the very end, however, and no real effort was ever made to control them.

To be fully effective any plan requires adequate knowledge and control at every stage of its development. It is important, therefore, that the procurement control experience of World War I, forgotten in World War II, be made a part of the authority of the agency charged with responsibility for future industrial mobilization. This means that the new agency at all times must have responsibility for reviewing the totality of military programs to determine their economic feasibility, and that before the military are permitted to engage in procurement there must be a specific determination of the extent to which all or a part of the program can be fulfilled by the nation's resources. If any cuts must be made, the curtailment in demand should be incorporated by the military in the form of revised procurement plans so that there is no award of contracts which result in an artificial pressure on the country's resources. In summary, it is hardly too much to say that the power to place contracts is the most important force in determining the pattern of industrial mobilization. When this force is not integrated with material, product, and labor controls, conflict and friction can be anticipated as one of the more important results. Since the actions associated with military procurement preceded the imposition of material and other controls during the war, the civilian agencies were constantly in the position of a fire department trying to put out a series of conflagrations with an inadequate supply of water.

Since there are different types of shortages, we also should have learned that all economic demands must be evaluated at the same time. At the outset of World War II, the greatest shortage was in facilities—the buildings and machines needed to make weapons. When this shortage was alleviated by the construction of new plants or the conversion of old ones, an acute shortage of materials developed as the new facilities added their chew-up to that of the existing plants. Just as 1942 marked the transition from facility to material shortages, so 1943 saw a shift from material to component shortages. The component shortage was in large measure a management problem. A substantial part of the responsibility was the failure of the planning agencies to evaluate their component requirements. Nevertheless, particularly in such industries as bearings, management refused to make the required adjustments even when apprised of critical needs. By mid-1944 the worst of the component shortages had been resolved and the major problem became manpower. As soon as one shortage factor in the production equation was corrected, another was created. This indicates rather clearly that just as an individual company must plan its operations with adequate recognition of facility, material, component, labor, and management requirements, so an over-all economic effort can be carried out only with adequate evaluation of the importance of each of these elements in the summary of total production requirements.

The heart of the control problem is in the contracting function. Demonstration of this prime fact probably is the most important single lesson to be learned from a review of the administration of wartime industrial mobilization. But it is not the only lesson. The contracting function is central to the management of the economy as seen from the inside by the responsible administrators. Almost as important for the successful operation of any control system are its external relationships with the industries subject to control. Throughout the war period, the men responsible for the administration of the economy had to deal with allegations that individual firms subject to control were violating orders and regulations, and that there was a general inclination on the part of American industry to stretch the industrial law to its elastic limits and even to operate outside the limits. *Review of operating history—material by material and control by control—*makes it clear that these charges were gross exaggerations. The major part of American industry

cooperated and acted in accordance with the rules of the control administration. With few exceptions, violations were confined to a small percentage of total activity in each industrial area. The history makes one more point clear, however. The degree of compliance secured in any industrial area tended to reflect the extent to which the controlled companies: (1) understood the rules and regulations under which they were asked to operate; (2) could comply with these rules and regulations without any major changes in their methods of doing business; and (3) could produce for the war effort under the rules and regulations without serious interruptions.

The external relationships of control machinery, therefore, become a function of two factors. The first is the skill with which the specific control is developed. This might be referred to as the organizational efficiency of the control. The second is the understanding of the necessity, the objectives, and the procedures of the control built up among those who represent its audience. In many cases during the war this public relations aspect of industrial control was scant. The price which the war effort paid for this failure to give adequate attention to an important aspect of wartime economic administration cannot be measured quantitatively. But the number of specific instances which could be cited to illustrate the failure serve as proof that it was a significant handicap.

Analysis of the public relations aspects of control systems suggests that there was a common tendency for industry to confuse a specific control system with the causes which required its creation. This disposition may be illustrated from a more familiar and personal experience. There was rather widespread objection among consumers to the rationing system in effect during the war years. It was criticized because it was "cumbersome," "full of red tape," "ineffective," and a variety of other unpleasant adjectives. Actually, what consumers were objecting to, although in most cases they were not conscious of it, was the shortage of sugar, the shortage of butter, and the shortage of meat. Their irritation at being limited in ability to procure was diverted from the over-all unbalance of supply and demand, with which most of them had only a remote familiarity, to the specific mechanics created to distribute the impact of the shortage as equitably as possible. The same confusion as to the operation of a control system and the reasons for its existence was encountered in connection with many industrial controls in effect during

the war years. It was responsible for most of the early objections to the institution of individual material allocations, the Production Requirements Plan, the Lumber Control under Order L-335 and the Tire Allotment Plan. In so far as some of these controls created unnecessary operating burdens for industry, criticism was justified. On the other hand, in so far as they were effectively designed to serve the dual purpose of directing the assignment of resources for maximum war production and minimizing interference with private industrial procedures, criticism was not justified. In a surprising number of cases the criticism represented irritation at the circumstances which required the establishment of a control, transferred by a process of mental confusion to the technicalities of the control itself. Repeated interviews with business managers prior to and immediately after the introduction of new control systems made it abundantly clear that this confusion was the source of much of the criticism. In most of the cases in which criticism was sharp at the outset, six months' operating experience under a rational and simple control was sufficient to wipe out the major part of the critical attack, and to create an understanding of the objectives and a willingness to operate within its rules and regulations.

The lesson from this history stresses the importance of devoting attention to the public relations of a control. As a matter of policy, this phase should be treated as equal in importance to the internal structure of a new control system. Even under the compulsions of a national emergency, the horsepower of the private industry economy can be harnessed most effectively by a combination of inductive and coercive measures; by securing willing cooperation through simplicity, understanding, and operating effectiveness; and by retaining to the greatest possible extent the motives, incentives, and procedures of normal business.

The next constructive lesson of the War Production Board's wartime experience straddles the line of demarcation between the internal and external aspects of control. This is the observation that a "little" control does not work. In material after material and for various segments of industry, it was conclusively demonstrated that attempts to soften the impact and limit the coverage of controls universally failed. Minimum controls did not even attain their limited objectives; invariably, they had to be extended. In almost every case, forces inherent in the attempt to minimize controls were responsible for delays in the application of

extended controls. The conclusion is inescapable: "little" controls are inadequate in themselves and become significant contributors to inadequacies and delays in the introduction of more effective controls.

The reasons for this conclusion can be found in both the War Production Board's own administrative experience and the operations of private industry in the war economy. Within WPB there was a natural inclination on the part of the personnel of the industry and materials branches to delay the inauguration of control systems. This tendency was particularly marked when a prospective control was of the allocation type. Largely drawn from private industry and without experience in the technical application of allocation-type controls, the industry and materials branch personnel hesitated to institute what they regarded as extreme measures and always preferred to use such techniques of assistance as the preference-rating system made available. Beyond this, in the defense and early war period operating personnel leaned heavily on the philosophy that their prime obligation was to fulfill direct military requirements. There was a general disinclination to accept responsibility for the administration of the entire economy, including military, indirect military, export, and essential civilian needs. Even when the thinking of the staff, impelled by the urgency of the atmosphere in which they were operating and the recognition of the inadequacy of priority instruments, moved beyond preference ratings to the concept of total allocation, it continued to be confined to the individual material for which each staff group was responsible. It took more than two years of continued debate to force the acceptance of the administrative principle that single material allocation systems were inadequate for the war production assignment, and interfered with one another to such an extent as to constitute a dangerous drag on war output.

The use of preference ratings rather than allocations represented the first step in the attempt to keep controls "little." Adoption of separate allocation systems for each material in short supply represented the next step in keeping controls "little." In each of these phases of control, the desire to minimize the administrative impact resulted in the imposition of controls inadequate to resolve the management problems for which they were designed, and intolerable delays in the extensions and additions required to make them adequate for the problems they faced. The best illustration of this administrative impasse may be found in some

of the allocation systems established for the basic production materials. An elaborate control system was constructed to govern the distribution of copper, based on a mill order-board review which developed into a detailed end-use analysis of each order placed with the producers of basic copper and brass mill shapes. This authority was rooted in the Copper Division of the War Production Board. When the fight to erect an integrated production and material control system was finally successful in June of 1942 with the adoption of the compulsory Production Requirements Plan, the authority for the copper control had become so deeply embedded that it was impossible to force its surrender immediately. In the third quarter of 1942, therefore, the War Production Board presented the completely illogical spectacle of two separate control systems operating simultaneously for the same segments of the industrial economy. Users of copper and copper-base alloy mill shapes received their basic procurement authorization in response to application on Form PD-25A. These authorizations to procure copper products were directly correlated with authorizations for all the other production material requirements of the applicants. These authorizations were not immediately translatable into the procurement of copper products, however. Actual procurement of copper and copper-base alloy shapes could be authorized only through the existing Copper Division allocation machinery. This meant, in effect, that the decisions of the WPB Requirements Committee and the end-product division operating staffs were made all over again in the office of the Copper Division. This second line of decision often overruled the first line of decision and thereby resulted in unbalanced allocations to individual producers, frequently in the form of smaller allotments of copper than were necessary to support the production schedules established by allocations granted for other materials.

The moral in this history, which was not unique in the Copper Division, is that a "little" control tends to grow into the administrative machinery so deeply that it resists removal and prolongs the period of confusion before a rational integrated control can be instituted. The difficulty is not entirely due to the control authority, however. The history of economic development in the United States has supported an attachment to free enterprise in its practice and theory. American businessmen lack familiarity with the background and techniques of govern-

ment control. This is in many ways an even greater handicap to the imposition of controls in a national emergency than the inherent objection to government interference with the conduct of private business. Its effect on the management of wartime industrial mobilization is twofold: it influences the judgment of individuals drawn from industry to serve in the emergency government agencies; it also influences the attitude of the business community toward the imposition and extension of controls. Moreover, it resists the institution of a control when no control exists, and resists the extension of a control when a minimum control exists. In these circumstances it is difficult to carry into effect the product of logical analysis and appraisal of the full impact of emergency requirements, when such an analysis might force the decision to establish control before it is absolutely essential for effective administration and adequate to serve the needs of the emergency. The intellectual climate of the business community with its internal and external delaying factors was a serious handicap in the emergency just past, and justifies critical analysis as a prime lesson of wartime administrative experience.

Closely related to these conclusions is the lesson that material allocations must be correlated. The early war experience of multiple, non-correlated allocations was a tragic record of administrative malperformance which should not be repeated in any future emergency. Perhaps the best illustration of the ludicrous character of such activity can be drawn from an imaginary reconstruction of its parallel in private business. After the board of directors of a great corporation has framed fundamental policy decisions with respect to the scope of operations during the ensuing calendar period, we might imagine the production division making its own plans as to the rate at which the plants will operate, regardless of prior decisions by the board of directors and its executive officer, the company's president. But even beyond this, we might imagine the purchasing division of the corporation carrying on a separate planning function with respect to how much and what materials will be bought and on what schedule of delivery. These decisions might or might not bear any relation to the separate decisions of the production division and of the board of directors. Next, the sales division might be imagined as ignoring all these plans and projects and undertaking to lay out promotional campaigns, sales and advertising budgets, and to determine price policies, as if in a vacuum. Finally, the personnel division may be

imagined as operating its own activities without reference to any of the foregoing decisions, and determining by itself the size of the work force, hourly wage rates, and related matters affecting the corporation's staff.

No company, large or small, could endure the industrial anarchy sketched in these terms. The picture is ludicrous. Yet without exaggeration it can be said that these general conditions prevailed in the Office of Production Management and the War Production Board throughout 1941 and most of 1942. Literally dozens of separate individual allocation systems were in simultaneous operation. Each gave effect to policy and operating decisions independent of the policy and operating decisions framed under all other allocation systems. There were the inevitable contradictions and unbalances which such administrative chaos could not help but create. The total impact of this system, or lack of system, was to permit the remaking of fundamental policy decisions at every successive administrative level from the War Production Board's Requirements Committee at the top to a lowly industrial analyst or processing clerk at the bottom.

It was not until the Production Requirements Plan had been in operation for more than a calendar quarter, and the decision had been made to adopt the Controlled Materials Plan as soon as it could be installed, that the first major victory for a correlated, integrated material allocation system was won. Even at this time, however, although the allocations of the three basic production materials—steel, copper, and aluminum—were correlated, there still existed dozens of separate allocation systems for other materials as well as for components. As the early chapters of this book have pointed out repeatedly, most of these independent allocations continued in effect throughout 1943 and much of 1944. Although a continued critical attack was directed toward this type of administrative anarchy, it was not possible by the end of the war to accomplish a total eradication of its evil effects. After the installation of CMP, it is true, many of the independent material allocations were abandoned or were forced into lines of operation correlated with the basic decisions made under the Controlled Materials Plan. Some, however, were so stubbornly entrenched that they resisted attack to the end of the war.

The application of material and production controls yielded another lesson of sound industrial management. Through a peculiarly blind enthusiasm, once convinced of the necessity for the imposition of a con-

trol, the proponents of minimum governmental interference with the operations of private industry also became the advocates of maximum control coverage. In the early material allocation systems, for example, it became a *prime objective of the staffs of the responsible material branches to extend control over the distribution of every pound of critical materials*. From the beginning they opposed all efforts to exempt users of small quantities from order-by-order review and the cumbersome application-authorization procedure. Adherence to this policy of total coverage compelled the Office of Production Management and later the War Production Board to handle a volume of applications on individual pieces of paper which soon reached such magnitudes that the responsible personnel were swamped and could not process and issue the paper as fast as it arrived. Opposition to the type of rationalization of the administration of controls represented by small order exemptions continued until 1944. Repeated attempts were made to demonstrate from the statistics of operations that the effort required to maintain a 100 percent control more than balanced the minor savings in the utilization of critical materials. In almost every instance, the pragmatics of the data were ignored in favor of the universal application of the philosophy of total direction of all movement of all critical materials.

Toward the end of the war, mounting business criticism of the volume of repetitive applications required by WPB rules and regulations, together with the intolerable pressures on the staff of the War Production Board built up by the need to process and issue paper at a rate equivalent to that maintained in the incoming-mail room, compelled belated recognition of the desirability of concentrating control on the more significant segments of material distribution. Even at this point, however, it took the most determined drive, fostered by directives issued by the top echelon of WPB management, to secure the cooperation of a number of the industry and materials divisions in providing for specific exemptions for small orders and small users.

Again the lesson of experience is abundantly clear. It is entirely possible with the best of motives to extend the concept of centralized industrial control beyond the margin of utility. The effort to control small orders or consumption by small users exacts an enormous price in return for relatively small increments of effective administration. The statistics of industrial concentration yielded by an analysis of operations under the

Production Requirements Plan, the Controlled Materials Plan, the lumber distribution scheme, and other wartime management techniques are unanimous in their support of the logic and practicality of concentrating control on the relatively small number of large users and uses of critical materials. Through such concentration, a small staff is in a position to impose a realistic, effective administration on the great bulk of material flow and consumption; the impact on the controlled areas of industry is relatively slight, and rests most heavily on those best able to bear the burden; when limitations are carefully defined on the basis of operating experience, the uncontrolled segment of consumption and use does not contribute to serious waste of materials in short supply.

The dangers inherent in the blind extension of administrative control, as well as the other risks resident in a continuing bureaucracy (even an emergency wartime agency may be susceptible to hardening of the management arteries), call for a continuing evaluation and criticism of the techniques of operation. It was one of the tragic mistakes of the first two years of defense and war production that provision was not made within the operating mechanism of the war agency for this type of current appraisal of control techniques.

The instruments of appraisal should include: (1) accounting data on the actual implementation of determined policies in the terms in which the policies have been announced; (2) statistical data reflecting general economic relationships and sketching supply-demand balances projected forward, which largely determine the need for and the area of a continuing control; (3) procedural review revealing the price and the logic of internal administrative techniques within the controlling agency and illuminating the extent to which each control provides a measure of essential flexibility in adapting to the rapidly changing conditions of wartime industrial mobilization; and (4) the painstaking reading of the realities of operating experience drawn from the daily record of the performance of third and fourth-level administrators within the control agency and the functioning of private business under the administrative direction of the war agency.

Such continuing evaluation and criticism is painful. It is altogether too easy for an administrative agency, even in a national emergency, to become attached to fixed routines. Once established, a control tends to be continued for the duration of the emergency without regard for the

changing character of supply-demand relationships; the changing circumstances of industrial production; shifts in direct and indirect military, export, and essential civilian requirements; and the possibility of working out new and improved techniques for getting the wartime management task done.

Painful as it may be, the appraisal function must be performed. The War Production Board learned this the hard way, by enduring the administrative ineptitudes which followed the failure to install budgetary accounting controls over the execution of policy decisions and to develop the kind of administrative statistics which are the bread-and-butter diet of top management in private industry. The practical value of this organization of facts and figures as a management tool was not widely recognized within the Board until the summer of 1942. Thereafter, the concepts of budgetary accounting controls and administrative statistics were extended to almost all areas of war production activity. A better informed management was the prime result, and policy decisions based on fact rather than rumor the end product.

The technical problems involved in the development of a governmental equivalent of private industry's profit-and-loss accounting in standard dollars are not simple. During the last three war years, WPB constructed a rough-hewn structure which met some of the emergency needs. Beginning with the *Production Requirements Plan* in the summer of 1942 and following through with the *Controlled Materials Plan* in the next year there was developed a systematic technique for controlling through budgetary accounting methods the distribution of steel, copper, and aluminum by the claimant agencies and WPB industry divisions, in accordance with the policy decisions of the Requirements Committee, and for measuring actual performance against target determinations by relating shipments by metal mills to allotments to prime consumers in each major program. The foundation of the system was a simple balancing of deposits and withdrawals. Common units of measure were adopted for the selected controlled materials. Once the Requirements Committee decisions had been formulated for each calendar quarter, responsibility for living within assigned quotas was fixed on each disbursing organization. By regulation, the same budgetary responsibility was imposed on each consumer of controlled materials. Within the claimant agency and WPB industry division systems provision was

made for periodic reports on allotments received, disbursed, and balances. The basic accounting records were subject to independent audit by the WPB Controller Division. Among industrial consumers of controlled materials, audit was performed by spot checks carried out by the WPB compliance staff. Aggregate audit machinery for the entire controlled material system was provided by mill reports of shipments identified by major claimant program symbols. Over all, the system provided a tri-part record serving as (1) a log of actions taken, (2) a budgetary control, and (3) a source of administrative statistics measuring performance against objectives and charting the course for future policy determinations.

A similar pattern of budgetary accounting controls was developed for the lumber distribution structure under Order L-335 and the Tire Allotment Plan under Appendix IV to Order R-1. Building on the foundation of lessons learned in the installation of the CMP accounting system, the lumber and tire systems functioned effectively in assuring the execution of policy decisions and maintaining a current flow of administrative statistics. An attempt, rather late in the war, to extend the same accounting controls to the distribution of cotton fabrics was much less successful. The impediments encountered here illustrate some of the problems which beset those who tried to equip the makers of policy with realistic techniques for carrying out their decisions and operational data for charting the course ahead. As noted in Chapter XII, broad-woven cotton fabrics were distributed under a multiple-control system which defied rationalization to the end of the war. The failure to knit these tangled lines of procurement authority into an integrated distribution technique was in itself enough of a handicap to make the maintenance of budgetary controls a complex assignment. Added to this were pedestrian problems of quantitative measurement. The services procured both cloth and finished products made from cloth. Their finished product purchases ranged from garments (one manufacturing step from cloth) to prime movers in which fabric components were of negligible yardage but substantial operational significance. From mills through finishing plants there were important differences in product classes that made it difficult to establish and secure adherence to universally acceptable control categories. The presence of such variables as length, breadth, weight, and thread count created problems in the selection of common units of

measure. These technical problems were enough in themselves to delay the application of uniform accounting techniques. They were probably a less serious handicap than the absence of an integrated control system.

Efforts to build a record, a control, and a flow of administrative statistics for the distribution of end products were even later in starting, encountered comparable problems of standard measuring units and fixed points of discharging responsibility, and by the end of the war had accomplished only rudimentary progress toward the standards achieved under the Controlled Materials Plan. The inevitable result was, of course, that administrative performance was at a low level. For some products, particularly in 1942 and 1943 when the policies and techniques for directing the distribution of fabricated products among military, export, and civilian claimants were being worked out through improvisation, the chasm between plan and operation was wide and deep.

Techniques for assembling administrative statistics on the daily operations of the Board were equally slow in development. The net accomplishment in this area in 1940, 1941, and the first half of 1942 was close to zero. Thereafter, under a persistent criticism that the Board could not direct its affairs in a rational manner unless it had a continuing flow of organized information, a drive was undertaken to translate actions on incoming applications into meaningful statistics which could be brought under analysis to reveal the extent to which broad policies were being followed in practice. It was from this statistical apparatus that was derived much of the information which supported the decisions to establish small order provisions for many materials and products, to transfer responsibility for segments of the Board's operation from Washington to the field offices, to replace specific application techniques for certain products with self-administering rules embodied in orders and regulations, and to consolidate many of the special application forms into a small number of all-purpose instruments. This phase of the Board's work never commanded the attention of its top-level officers to the extent necessary to throw the weight of their authority behind the staff efforts to impose quantitative disciplines on the operating divisions and draw therefrom the raw materials of administrative analysis. A minor but not insignificant share of the responsibility for this situation was traceable to the character of the training and experience of most of the professional statisticians in positions of influence. In general terms, their

background was in the use and manipulation of data rather than in the arts of collecting and tabulating. As a result, their thinking—and their traditional patterns of presentation—was along the lines of staff reports best understood by other statisticians. They were seriously handicapped in presenting materials to operating officials without professional statistical training. This failure to bridge the gap was the cause of underutilization of statistics and a source of irritation and distrust.

It is impossible to measure the cost to war production of the failure to compel from the start a bold experimentation with techniques of applied accounting controls throughout the war agencies. The number of policy decisions made in an atmosphere of twilight information, however, and the even greater number of such decisions only partially implemented and often even contradicted by the operating staffs, suggest the magnitude of the loss in terms of maladministration and non-performance. Reviewed with hindsight, it takes on the appearance of one of the most serious, although least conspicuous, management failures.

The impress of these major operating lessons is clear in the War Production Board's record of experience.

1). The power to contract is the power to control, and recognition of this economic force should be reflected by lodging clearance authority for at least the substantial contracts in the responsible civilian war agency.

2). The most effective controls are simple, adapted to existing industrial procedures and records, and call for a large measure of business cooperation with and understanding of the announced objectives.

3). Attempts to limit the impact of a control by compromising its maximum operating requirements tend to foster a step-by-step expansion which lags behind real needs.

4). Material allocation methods must be correlated with respect to both broad programs and individual plants.

5). Concentration of industrial production and material consumption makes it possible to reinforce effective administration by intensive direction of the activities of large users, thereby minimizing the burden of control on small business and releasing the agency staff from inconsequential detail.

6). All control systems benefit from continual reappraisal based on the application in public business of the accounting and administrative

statistics techniques which are prime *management tools in private business*.

More important than any conclusions drawn from the daily operating record of the War Production Board, however, is the lesson driven home in two wars that national preparedness is an industrial and civilian as well as a military responsibility. No nation is armed for its own protection until it is prepared in any emergency with a plan and an operating program for integrating the individualistic industrial economy into a unified mechanism under national control. The armed forces in being must stand the first shock. But they are a puny defense unless the industrial strength of the country can be swiftly organized to back them up and equip the expanding military establishment.

Blueprints of organization and over-all policies are the first step. They are not adequate in themselves, however. The organization will not function without trained, experienced personnel, and the policies will not be executed without efficient administrative techniques. It is through the combination of these factors that national preparedness finds the backing in the industrial economy for the fleet which guards the sea lanes, the planes which patrol the skies, and the ground troops which are the defensive shock force and the nucleus of the emergency expansion. The United Nations may in time remove the causes of war or, by police action, prevent its outbreak. If this fails, atomic fission may so change the character of war as to make defense impossible. In the intervening period, however, as long as world security and national preparedness demand the maintenance of an American Army, Navy, and Air Force, it would be a criminal omission to fail to support them with the nucleus organization and the machinery for rational, swift industrial mobilization for military production, which is the real source of strength of the armed forces. The experience of two wars clearly marks the course which future policy should follow.

CHAPTER XIX

WHAT WE SHOULD DO

THIS REVIEW of wartime controls over production and materials indicates clearly that crisis organization of our economy by trial-and-error fumbling is slow, costly, and dangerous. We have survived the experience twice. On both occasions, however, the time required for the transition from peace to war, and for the delays attached to our mistakes, was gained for us by the *courage and sacrifices of our allies* and the strategic errors of our enemies. There is no reason to believe that we will be so protected in any future emergency. In fact, consideration of the swinging balance of international power and the development of new weapons and techniques of offensive war leads to the conclusion that if this country is again in peril, the time in which to prepare will be shorter, the drain on our resources heavier, and the conditions of industrial production more complex.

Our recent history has also made it clear that even in favorable circumstances the development of the management skills, the organized use of experience in applying techniques of industrial control to specific situations under conditions of war emergency, cannot be expected to occur rapidly. In time of crisis there is *no leisure to consult experience*. Impelled by urgent current pressures, administrators hardly have the time to plan today what they will do tomorrow/Every force is toward immediate action. Every criticism is of delay. But without a fund of experience studied creatively, without a current plan which comprehends the necessities of the emergency, without the management skills—the “know-how”—headlong action inevitably drives into error. And once the direction has been established and the administrative machine has begun to move, it is difficult to change the course and impossible to make a fresh start.

One illustration of the urgency of the pressures for action, even blind action, can be found in recent War Production Board history. The fact that 1940 learned nothing from 1918 has already been noted. Much more

striking is the extent to which in the period 1940-45 each month found WPB executive personnel encountering new control problems which demanded and got immediate action without reference to the pattern of related experience within the same agency. The quantitative and qualitative sum of experience analyzed and transferred from one part of the Board to another was strikingly limited. Even when functional specialists in the creation and application of production and material controls attempted to capitalize on past successes and failures, they were frequently met with stubborn opposition. There were many reasons for this blind refusal to examine the record. Industry specialists were convinced that years of experience in a particular industry were the sole qualification for devising a scheme to harness that industry's resources for the national emergency. There were frictions of personality and power jealousies. But above these and all other considerations was the overwhelming urgency of each control crisis. The heroine always had to be snatched from the villain's arms at the very edge of the precipice.

Probably more important than these human failures in planning and execution was the fact that even the methods of control which were developed failed to provide within each scheme the procedures required for their most effective implementation. Inadequacies of this kind were principally the result of the failure to take into account the methods and procedures of private industry and of the military agencies. These deficiencies were less the fault of those charged with meeting the immediate crises as they developed than they were the product of our collective failure to recognize the need for preparing in peace for the problems of war. The record of our military unpreparedness has been established and accepted. But our industrial unpreparedness was at least as great. We had no guns or tanks or planes or ships. But even more dangerous was the fact that we had not worked out the plans and detailed procedures for mobilizing our magnificent resources rapidly and effectively to build guns, tanks, planes, and ships for the burdens of global war.

The sum of this experience demonstrates clearly the minimum preparation which should be made now if we are to be ready for any future emergency of equal magnitude. We need a plan for industrial mobilization which includes carefully designed and experience-tested methods for controlling material distribution, industrial production, and the allocation of both materials and finished products to the needs which are

most essential to the furtherance of the national ends. This should be more than a paper plan. Even as a paper plan, it should be realistic, built upon the practices of industry and government. If the methods and procedures exist and are realistic and adequate, the mobilization plan would have greater assurance of protection for this country than the efforts reviewed in this book. But methods and procedures, however perfect, cannot be made effective unless there exists the core of an administrative organization with the trained personnel necessary to introduce them quickly and to serve as the professional nucleus of an expanded crisis organization.

This problem was partially recognized after the last war in the creation of the Army and Navy Munitions Board. A crude attempt was made to provide for handling wartime industrial problems. But in 1940 we were without the plans, methods, procedures, administrative organization, and trained personnel required to deal with the problems of industrial mobilization. We cannot afford to be caught in this position again. We must be sure that an administrative organization is established for handling this phase of the national defense job, and we must be equally sure that it is an organization prepared to operate effectively right from the start. Perhaps the major cause of the failure of the Army and Navy Munitions Board was the fact that we did not as a nation recognize the threat of war as a reality. The Defense Council was dormant for many years and was not revived until May of 1940. When an attempt was made in 1939 to vitalize the organization, neither Congress nor the public was sufficiently aware of the magnitude of the problems which would have to be resolved or the nearness of the crisis to permit even the suggested program of this organization to become effective. In 1939 the Army and Navy Munitions Board developed a program for stockpiling critical materials imported from abroad, such as rubber, copper, and mica, and asked for 200 million dollars to put this program into effect. The final result was an appropriation of some 40 million dollars, too little and too late. Perhaps equally important, within the budget that was provided, the top salary that ANMB could pay an "expert" was \$3,200, with a few administrative positions carrying salaries of \$3,800 and \$4,600. In terms of either budget available for the program or salaries available for the personnel it is apparent that Congress and the people were not prepared to provide the funds required for effective implementation.

Even if Congress had been willing to provide the necessary funds, it is improbable that ANMB could have worked out the over-all and detailed plans and procedures for total industrial mobilization for a global war. The Board was set up in the Office of the Secretary of War on the assumption that the Navy, following the London conference, would be a continuing but small organization of a size necessary to carry out the naval operations which might be required as a part of any conflict in which we might become involved. It was recognized that we would not maintain a standing Army large enough to provide an adequate defense force. The thinking adopted in the early twenties favored the maintenance of a nucleus around which an expanded force could be built in time of emergency. A Board was therefore created under the Secretary of War which was to provide continuous plans for the mobilization of men and material necessary for actual war. When this office was created in 1922, the Secretary of War recognized that cooperation with the Navy was an integral part of a military program. The Board therefore became a joint effort of the Army and Navy. It was also hoped that the Board would eliminate rivalry and competition in procurement between the two military services. Although the chairman and some of the experts and staff were civilians, the top staff was drawn from the two services. There was an inevitable conflict of ambitions between the admirals and generals and, perhaps more important, a conflict between the military and civilian personnel. No administrative organization can be better than the men who staff it; the plans and procedures they prepare reflect their skills, experience, freedom from inhibiting controls, and disinterested approach to their assignments. An organization which is recruited almost entirely from the military services and is under their domination is not likely to provide either the breadth of vision or the freedom of action essential to effective industrial mobilization planning and operation.

This is from first to last a civilian job. It is a civilian assignment to reconcile the conflicting and competitive interests of the services. It is a civilian assignment to provide the objective and disinterested staff. Only a civilian group can reconcile the interests of direct war needs with *support of our allies* and with the requirements of a sound war economy for our civilian population. The natural military tendency is to concentrate on the immediate fulfillment of direct military requirements

and to black out of the picture all other needs, many of which must be satisfied if military production is to be kept on schedule.

To deal with the problem, therefore, we must first recognize the need for plans and for the methods and procedures required to make them effective. Next, we must develop an adequate concept of the administrative organization and personnel necessary to make plans, to develop methods and procedures, and, above all, to provide the organization which can translate plans into operations at the time of crisis. This calls for the establishment of a permanent civilian agency charged with responsibility for continuously making and executing plans for:

- 1) adequate reserve stores of critical materials;
- 2) adequate stand-by domestic production of both materials which are known to be critical in wartime and materials which are likely to become critical in view of military, export, and essential civilian demands at the time the plans are drawn;
- 3) effective methods for allocating materials to the economic system for military, export, and essential civilian purposes;
- 4) organizing procurement, production, and delivery methods which will permit and assist the industrial system to satisfy first needs first, whether by means of priority, allocation, or other scheduling devices;
- 5) evaluating military as against export and essential civilian demands;
- 6) controlling the military, export, and civilian portions of the authorized programs so that plans once made will be executed in the terms in which they are stated;
- 7) developing the plans and methods required in steps (1) to (6) in a way which will permit maximum reliance upon established industrial methods and procedures so as to assure the quickest and fullest satisfaction of the demands of the emergency.

To carry out this program, the administrative organization must in time of peace develop the plans, methods, and procedures for war. It must train men for its own staff and also for the military and industrial segments of the program in business and the armed services.

Without actual experience, the plans, the methods, and the trained manpower cannot be expected to be fully effective for the sudden introduction of the new program at the time of crisis. If the work is to be

carried on realistically, the program must have the benefit of frequent field experience in the form of both continuous contact with the military and industrial activities involved, and actual test runs which should from time to time demonstrate the adequacy or inadequacy of a given set of plans in relation to existing practice. To assure that the proposed methods will stand up under test, the organization must have not only the authority for organizing, planning, and developing the program, but also the right to require the cooperation of the military procurement services and the essential producing factors in the United States. This calls for a broad educational program which reaches every segment of business, including mining, manufacturing, agriculture, construction, and services such as transportation, warehousing, and the public utilities. Such an educational program must be complete enough to permit actual work in the factories, mines, or government offices for which the emergency methodology must be adapted. It also requires periodic test runs under which crisis conditions are assumed to exist.

When the emergency arises, the authority of the industrial mobilization agency must be complete as it relates to all phases of the national economy. Experience during World War II indicates that this requires substantial planning by the military. Above all, it makes it necessary that the military keep the civilian industrial agency informed about current plans and that these plans be reviewed and agreed upon before the actual process of procurement for the military is started.

If we assume the possibility of future war, we must have an adequate defense program. Wars are won by the country which has the preponderant weight of armament. Supplying weapons on this scale makes demands upon the economy of a magnitude that cannot be met without substantial sacrifice of the supplies which otherwise would go to the civilian population. Total war requires the organization of the national economy not only to supply the weapons but also to provide the war-supporting goods without which the civilian part of the war effort might collapse.

It is improbable that this country will again have the time to meet these needs by hastily assembling an organization for an undertaking of this magnitude, as we attempted to do in 1917 and 1940. For the nation's safety we should undertake now the measures necessary to provide an

effective method for dealing with the industrial aspects of war as part of the defense program and before the next crisis is upon us.

It is therefore urged that we now undertake:

1) To create a civilian organization charged with responsibility for industrial mobilization.

2) To lodge in this agency authority for determining the magnitude of both the military and essential civilian portions of the war program. The agency must be in a position to determine the portion of our economic resources to be devoted to the military and the portion to be assigned to the essential civilian economy. Within these two broad categories, it must have authority to establish the extent to which specific programs can be given the economic assistance which they seek.

3) To give the civilian agency responsibility not only for planning in the policy sense, but also for the continuous development of methods and procedures by means of which the plans will be executed. These methods must be continuously revised as paper plans and as a vital adjunct to the procurement policy of the military services and the methods used by all segments of the producing economy.

4) To maintain in the civilian agency a nucleus staff which will work continuously on these problems, and an organization large enough to provide the key personnel necessary for rapid expansion in time of crisis. The staff should carry on educational programs, practice field work, and make periodic test runs which will permit the military and industrial portions of the nation to be familiar with and trained in the methods and procedures which will be adopted in a national emergency.

5) To provide for a permanent civilian organization large enough to carry out the planning portion of the task and to serve as a nucleus in time of emergency, backed by a civilian reserve similar to the military reserve. This would mean that individuals in time of peace would receive training and assume responsibility for specific assignments. If mobilization should become necessary, they would be called upon to assume their specific stations in the industrial mobilization scheme just as the trained reserves are given specific assignments by the military.

There is nothing new in the recommendation that a permanent civilian agency be established charged with responsibility for planning for war-time industrial mobilization. In the final report of the War Industries

Board submitted in March, 1921, Bernard M. Baruch outlined three lines of industrial preparedness in time of peace.

First. There should be established a peace-time skeleton organization following the lines of the War Industries Board. It should be headed by a Chairman who should have associated with him the chiefs of the centralized purchasing bureaus of the Army, of the Navy, and of any other Government department which might be called upon to make large purchases in case of war. Other members of the Board should be selected to take charge of (1) raw materials, (2) finished products, (3) facilities, (4) price controls, (5) labor, (6) priority, (7) conservation, and (8) planning and statistics. There should be a vice chairman, a general counsel, and a secretary. To function under the several principal divisions there should be selected about 50 chiefs of commodity sections. Each chief of a commodity section would name a committee to represent the industry under his charge. The committee of the different industries could meet separately as occasion required for the purpose of keeping acquainted with the general growth of the industry and the demands which a war would make upon it. The main organization should meet in general conference at least once a year. . . . The office of the secretary should be permanent and salaried, and the division of planning and statistics ought to be a moderately large permanent organization. . . .

Third. Under the supervision of the proper departments of the Government, certain war industries should be encouraged to maintain skeleton organizations through which they could develop the rapid manufacture of guns, munitions, airplanes, and other direct military equipment. This might be done in some cases through Government purchases of factories, in others through the placing of sufficient orders to permit the owners to keep the plants in existence. . . .

These measures are suggested as direct methods of insuring against some of the heavy losses and unfortunate delays which the country experienced in the process of converting its industries from a peace to a war basis.¹

This advice was not followed. Responsibility for planning for industrial mobilization was assigned to the Assistant Secretary of War and a considerable amount of work was carried in the next two decades, of substantial potential but slight actual use in 1940. In a memorandum prepared for the War Policies Commission in 1931, Mr. Baruch repeated the substance of his earlier recommendation:

Industrial mobilization requires the creation of a central control agency charged with the entire problem of industrial mobilization. It must:

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- (a) provide an immediate and effective organization of both supply and demand;
- (b) insure proper functioning of the interior control of each such organization and constantly regulate them both;
- (c) bring them together, compose their differences, and insure the uninterrupted flow of goods from one to the other.

It is impracticable to maintain in peace any such powerful agency as is necessary in war to administer the gigantic effort of national economic mobilization. We should prepare a complete plan for such an organization but even that must be in the broadest of terms. It is impossible to foresee the precise circumstances and requirements of any future war. Perhaps a skeleton organization might be provided formally to insure the development of a personnel. The Congress has attempted to do this by making the Assistant Secretary of War responsible for making plans for industrial mobilization. Devoted work has been done in the War Department but there is some danger in this method. It is absolutely impracticable for the War Department to control industrial mobilization because:

- (a) It is an economic problem requiring the ablest leadership in industry and utterly unsuited to military administration.
- (b) The central control agency must act as arbiter of conflicting demands—the greatest of which is that of the civilian population. No single competitor such as the War Department should be entrusted with such arbitration.
- (c) The job of the War Department is our armed forces. That is a big job. To pile on top of it the task of economic mobilization would insure the failure of both.²

Others have advanced similar proposals and the concept is so congenial to the tradition of public planning in this country that it passes as legal tender in all circles, industrial and governmental, military and civilian. This climate of opinion is a source of both strength and weakness. It assures a ready reception for the general project and fosters an easy enthusiasm for setting up an agency, or a joint undertaking of existing agencies, with a staff busy laying out organization charts, drawing up plans, and doing other absorbing, time-consuming things which are impressive in their aura of importance. It is an atmosphere filled with extreme danger, however. It cultivates the same kind of shallow judgment which during two wars has been so charmed with organization charts and plans for policy-making that it delayed coming to grips with

² Reprinted by permission of Prentice-Hall, Inc., from *American Industry in the War* by Bernard M. Baruch, pp. 386-387. Copyright 1941 by Prentice-Hall, Inc.

the hard fact that organization charts have relatively little significance and policies without implementation have none.

This was the major weakness of the preparatory work carried on in the decades between the wars. It was absorbed with ways and means of determining *what to do* and *how much to do* in any national emergency. It devoted almost no attention to *how to do it*. The result was that when the time came to carry out the determined policies the operating mistakes of 1917-18 were repeated in some areas, and in others a new series were hatched.

A similar rudimentary program has been initiated in the immediate postwar period. Under the National Security Act of 1947 there was created the National Security Resources Board to "advise the President concerning the coordination of military, industrial, and civilian mobilization." This is a permanent civilian agency under a chairman appointed by the President, other members of the Board including the Secretaries of the Treasury, Defense, Interior, Agriculture, Commerce, and Labor. Specific duties assigned to the Board by law are to formulate for the President's consideration the following plans and policies:

- 1) policies concerning industrial and civilian mobilization in order to assure the most effective mobilization and maximum utilization of the nation's manpower in the event of war;
- 2) programs for the effective use in time of war of the nation's natural and industrial resources for military and civilian needs;
- 3) policies for unifying in time of war the activities of federal agencies or departments engaged in or concerned with production, procurement, distribution, or transportation of military or civilian supplies, materials, and products;
- 4) the relationship between potential supplies of, and potential requirements for, manpower, resources, and productive facilities in time of war;
- 5) policies for establishing adequate reserves of strategic and critical materials;
- 6) the strategic relocation of industries, services, government, and economic activities.

In a statement to a Senate Committee late in 1947, Arthur M. Hill, Chairman of the Board, said that there were three major problems facing the Board:

1. To determine the status of national resources in terms of materials, industrial plant, manpower, and other essential factors of our economic life. Beyond this, to determine the essential wartime civilian requirements, divided as between minimum civilian needs and the requirements of the industrial system, total requirements, both civilian and military, to be compared with total potential supply.
2. To bring under continuous review current problems in the light of our economic readiness for war.
3. To develop comprehensive and detailed plans to cover the administrative machinery that would be necessary in case of war to channel and control production for the war effort.

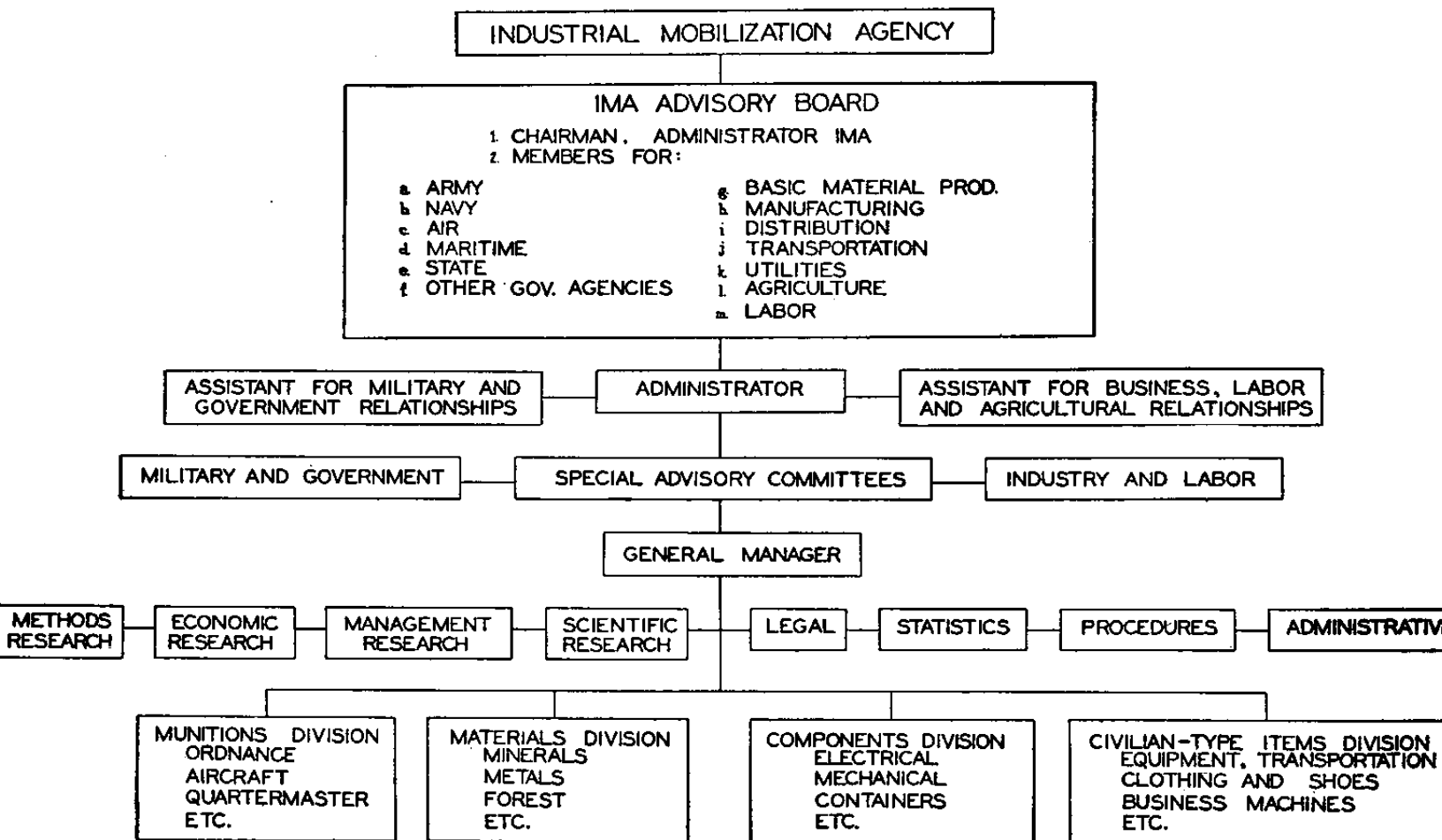
If this assignment could be carried out as framed, with special emphasis on administrative methods and procedures, there would be little point, beyond emphasis, in the recommendations laid down in this chapter. But there is an inherent contradiction in the tasks of the National Security Resources Board and the revised Army-Navy Munitions Board, which promises to create anew the paralyzing stalemate of the 1920s. Beyond this, the activities of the Board to date and the outlook and interests of many of its personnel suggest a continuance of the relatively unprofitable preoccupation with policies and programs to the exclusion of study of, experiment with, and agreement on the methods and procedures required to carry out the determined plans, policies, and programs. It cannot be too forcefully stated that the great weakness in the control of the mobilized resources of this nation in World War I and World War II was in policy implementation, not in policy formulation. As of August 1, 1948, there was no indication that the organization in being would make adequate provision for the essential industrial planning, organization, or methodology which the authors of this volume believe to be pre-requisites of effective industrial mobilization for national defense.

It is for this reason that the recommendations framed in this chapter move beyond a blueprint of organization and a skeleton permanent structure supported by periodic conferences, unpaid part-time consultants, and limited statistical staffs. Recommendations with respect to the organization of a government control agency are relatively easy to prepare, but the War Production Board's experience indicates that men and methods are incomparably more important than administrative relationships. Therefore, although one possible organizational structure

for a permanent industrial mobilization agency is presented in the following pages, it is not argued that this is either the only or the best arrangement of responsibility and authority. Of much greater significance are the recommendations on ways and means of recruiting, training, and retaining a group of competent and experienced men who will be prepared to assume responsibility in a national emergency, and of developing, testing, and revising techniques of applied control.

With this prefatory warning that the organizational structure of the recommended permanent industrial mobilization agency is one of the least important aspects of the program outlined in this chapter, the following blueprint is presented simply as a basis for the more important recommendations with respect to the functioning of the peacetime agency. The suggested model would operate under the general policy direction of a top Advisory Board. The Chairman of this Board would also serve as permanent fulltime Administrator of the Industrial Mobilization Agency. The military services and the principal segments of the American economy should be represented on the Board. Specifically, there should be top-ranking officers sitting for the Army, Navy, Air Force, Maritime Commission, and State Department; and civilian members appointed by the President, representing (1) mining, basic metal, and other materials producers, (2) manufacturing, (3) transportation, (4) wholesale and retail trade, (5) utilities, (6) agriculture, (7) labor, and (8) a public member representing the general interests of economic stabilization and price control. The Board should serve in an advisory capacity only, with general responsibility for counseling the Administrator in the shaping of broad policies for IMA (Industrial Mobilization Agency). The Administrator should have the only vote and his line of responsibility should be direct to the President. The Advisory Board should meet once each calendar quarter and more often on call of the Administrator.

The Administrator of IMA should have three permanent assistants fulfilling liaison functions, one with the military agencies, the second with industry, and the third with labor. These assistants should serve as two-way channels of information. It should be the special responsibility of the Assistant Administrator for Military Relations to maintain a current flow of information relative to the strategic and logistic plans of the Army, Navy, and Air Force; to work with the services and



IMA's technical research units in developing translations of these war plans and materiel requirements into the common units of supply-demand measurement for basic production materials; and to keep the proper divisions of the military services informed about current information, research activities, adaptations in industrial mobilization projections, and *pro forma* balance sheets for the crisis economy, as developed by the operating sections of IMA. The Assistant Administrators for Industry and Labor should perform parallel functions for their respective areas.

Reporting to the Administrator on a line basis should be a permanent General Manager of Operations. This officer should be the firing-line executive with responsibility for translating the policy directives handed down by the Administrator into operating instructions for the staff research and commodity units under his control.

Under the immediate supervision of the General Manager should be a number of specialized research units, each devoting its attention to both planning and current operations. The character of the work of the special units is best suggested by a listing: (1) four groups devoting their attention to theoretical and applied research in production and material control methods, economics, management, and scientific developments for wartime industry; (2) four groups devoting their attention to current and projected developments in the areas of law, statistics, IMA internal procedures, and IMA internal administrative management; and (3) four groups of materials and products sections responsible for planning and testing production-control techniques for (a) munitions items (ordnance, aircraft, quartermaster, Navy, and Maritime ships), (b) materials (minerals, metals, forest products, agricultural, chemicals, etc.), (c) components (electrical, mechanical, packaging, etc.), and (d) civilian-type end items (transportation, agricultural and manufacturing equipment, textile and leather products, etc.).

The terms of reference for the Industrial Mobilization Agency have been sketched in the foregoing pages. If it is to be an effective instrument its authority should be coterminous with its responsibility. The fundamental recommendations follow.

1. To create now a civilian agency charged with responsibility for industrial mobilization.

The directive to IMA should define its responsibility and authority as planning and operating agency and should clearly determine its superior cognizance with reference to all phases of industrial mobilization. Although the principle of civilian control was accepted as the basic approach to the organization of our economy in two great wars, in the spirit of Clemenceau's observation that war is too serious a matter to be left solely to the military, on both occasions there was an inevitable resistance by the military and a powerful disposition to act in such a way that the civilian production authority was "compelled to follow" rather than "assisted in directing." The dangers inherent in such a course were illuminated beyond all dispute in the years 1941-45. The presence of this lodestar in the military mind must be accepted as a datum. It should be laid down as an incontrovertible operating instruction to the military services, therefore, that the authority of IMA is paramount, and that their own mobilization plans and procedures must be integrated with the over-all industrial mobilization plans and procedures developed by IMA. The creation of a single Cabinet Department of National Defense makes a significant contribution to a rationalization of all mobilization activity.

The most effective frame of reference is one which recognizes the functions of IMA as part of the national defense of the United States, as vital to its protection as the standing Army, Navy, and Air Force. The personnel and the weapons in being at the onset of an emergency which threatens the security of this country are the first line of protection and must be able to withstand the shock of any aggression directed against us. But it is the ability to strengthen, expand, and supply the force in being—*rapidly*—which measures the capacity to move from defense to offense to victory.

2. To lodge in this agency authority for determining the magnitude of the military and civilian portions of the war program.

Policy making and policy execution are the two sides of the job of managing industrial mobilization. They therefore become the twin responsibilities of IMA. On the policy making side the principal function is the quasi-judicial one performed by the War Production Board Re-

quirements Committee from 1942 to 1945. The heart of this function is the accumulation of supply and requirements aggregates in common units for each critical material, the creation of a balance by calculated cutbacks of selected requirements areas, and the distribution of the available supply to programed areas. This is the nucleus of an extremely complicated statistical structure and, if given effective implementation, carries the authority to determine (a) the disposition of the resources of the economy as among direct and indirect military, export, and civilian programs; and (b) within each broad program the division into such detail as the administrators believe their competence permits. The nature of authority for execution which is implied in this grant of power rests in the phrase "determine the magnitude"—the experience of two wars has demonstrated that effective determination requires lodging the contracting (or contract clearance) power firmly in the civilian control agency.

The statistical apparatus involved in supply-requirements analysis must be carefully constructed by experienced professional personnel, and operated by such a staff as a periodic functioning reality. In scope, as the quantitative foundation for the planning and execution of a comprehensive production program for American industry, it includes: (a) the assembly of information on total requirements and their translation into basic material equivalents with appropriate lead times; (b) the assembly of complementary data on supply; and (c) the periodic review of the supply-requirements balance in terms of changing strategies, programs, and industrial potentials. The techniques of collecting, tabulating, and evaluating these data must be the subject of careful study and experiment, and demand a course of education and indoctrination in the military agencies and in private industry as well as in IMA.

The wartime statistical experience in the collection of a body of factual knowledge necessary for both broad policy decisions and daily operations points directly to the conclusion that the type of reporting system required to support a directed mobilization of industry must have a close relationship with the government's peacetime statistical collection structure. This means that the IMA statistical staff must be in a position to cooperate closely with the principal federal data collecting organizations, such as the Bureau of the Census, the Bureau of Foreign and Domestic Commerce, and the Bureau of Labor Statistics. Beyond this, however, it

means that the IMA staff must participate in the shaping of peacetime industrial statistical reporting in order to give effect to the special requirements of the mobilization agency.

A substantial beginning on the statistical problems, particularly as revealed in data on plant operations, can be made with the data collected by the War Production Board. More factual information on industrial production was collected by WPB in the war years than was ever before assembled in this nation's history. To mobilize our production resources for war, to insure that our resources were used fully and efficiently, to integrate materials and components in such manner as to secure maximum output of end products, and to direct the distribution of end products to the military and export agencies and to the domestic civilian population in the manner most conducive to winning the war, the War Production Board acquired data about industrial production in greater detail and at more frequent intervals than was ever before thought necessary. The mass of statistical information covered all aspects of production from basic metals to the uses of end items. Detailed information was assembled concerning basic material supplies; metal mill capacities; basic material consumption by fabricators; the integration of fabricating processes from basic materials through semifabrication and subassemblies to finished products; the types of products made by metal fabricating plants; the types and quantities of basic materials consumed in the manufacture of specified end products; the flow of intermediate products; and a host of related material. In sum, the data constitute an unsurpassed record of the operations of the nation's industrial plant in time of war and, by extension, in time of peace.

Analysis of the wartime reporting problems faced by the War Production Board and private industry should make an important contribution toward the establishment of the data-collection framework upon which any future agency with comparable responsibilities could build swiftly and efficiently.³ This assignment might properly become a prime responsibility of the statistical nucleus of IMA. In particular, the analysis should be directed toward the more fundamental lessons to be learned from the wartime statistical reporting experience. Some of the more

³ A start toward this analysis is available in *Wartime Industrial Statistics*, by David Novick and George A. Steiner (Urbana, Illinois, 1947). Also, "Industrial Reporting in Wartime," a series of four articles by David Novick and George A. Steiner, *Journal of the American Statistical Association*, June, 1948, et. seq.

important problem areas for special study might include the following:

1. How accurately did the industrial data collected by WPB reflect industrial resources, capacity, production, and performance?
2. What record-keeping systems were established by industry to comply with WPB reporting requirements?
3. Would the administration of wartime industrial production have been assisted by the use of sampling techniques in the collection of production statistics?
4. What was the statistical reporting burden imposed by WPB on representative large, medium, and small plants?
5. How useful to WPB would have been an industrial classification system based on production processes performed rather than end products shipped?

A statistical assignment of equal significance is presented by the task of translating end-item schedules into material equivalents to permit their aggregation into common industrial load totals. The greatest difficulties were encountered by the responsible staffs of the War Production Board and its predecessor agencies in accomplishing this translation and in calculating the proper lead time allowances necessary to build metal mill schedules which would feed materials and components into end-product assembly lines in proper sequence and in time to secure performance of end-item contracts. Even in the latter stages of the war, requirements calculated from bills of material were far from accurate reflections of actual "chew-up" in production.

3. *To give the agency responsibility for the continuous development of methods and procedures for executing determined policies.*

The experience of the past war demonstrated beyond all doubt that the greatest failure of public management was in policy execution. We cannot afford to enter a comparable emergency as ignorant of the techniques of administration, as dependent on improvisation, and as poorly equipped with methods and standards for measuring operating efficiency. The first step toward preventing a repetition of the failure is the specific assignment of responsibility to IMA.

As this analysis has already noted, the management job in a publicly directed industrial mobilization of a free enterprise economy presents problems of organization, method, and procedure which are unique in

government administration. It departs from the statistical and research functions which are the traditional area of responsibility of federal agencies (outside the revenue collection and disbursement field), and enters directly into a private industry type of operation. Because there are no parallels in the experience of the federal agencies, the major source of reference for the continuing research units of IMA must be the record of the War Production Board. This must be subjected to detailed critical review as the only living guinea pig of federal direction of this economy in action. The assignment is one that will not be accomplished unless an IMA staff undertakes it. Against the magnitude of the task, the present volume represents only a broad survey and staking out of areas for more painstaking appraisal. It is of the utmost importance that the work be started promptly while the records are still available and the men who shared the experience are still in a position to transfer their knowledge from their personal files and from their minds. It should be noted that the official WPB histories do not strike deeply into this body of knowledge. Policy-making is more exciting, more public, and, in its superficial aspects, seemingly more important than policy execution. The official histories tell how the policies were made; they preserve little of the methods and procedures by means of which they were executed or permitted to fall short of their goals.

What was done in the field of public administration by the War Production Board, however, is an incomplete and to some extent a misleading record. In the first place, much that was attempted was not successful, and the record of ineptitude is clear beyond any but personal dispute—as in the case of broad-woven cotton textiles. From such instances government and industry can learn what not to do; derivation of a positive program will require unaided affirmative exploration, experimentation, and adaptation. A second and more subtle difficulty will be encountered in those aspects of industrial control in which the results of operation can be added up to a summary of reasonable success, yet in which it is almost impossible to reconstruct the standards of performance required to gauge the efficiency of management, in terms of number of people employed, burden on controlled industry, or alternate and more economical ways of achieving the same results. Finally, there is the problem of adaptation to the procedures, records, and business practices of the industrial community, which are continually in flux. What may

have worked rather well in the economy of 1944 may be totally unsuited to the economy of the immediate and problematic future.

For these reasons the research units of IMA assigned to the development of methods and procedures of control must move beyond the record of WPB experience as the only source of positive and negative lessons. They must be in the position of living general staffs in the logistics of public administration. They must draw up in concrete detail plans for executing all current and potential lines of policy formation. But of far greater importance, they must be in a position to appraise these devices of policy execution in their successful adaptation to the techniques of military procurement and the practice of the industrial economy.

It should be recognized at the outset that this is a far greater responsibility than has ever been assigned to or exercised by any military planning agency in this country. In the uneasy years between the two great wars mobilization planning was largely in the field of policy. Where it moved into phases of methods and procedures of implementing policy, it was largely in terms of general lines of administrative operation, such as agreement on the use of priorities to facilitate military procurement. But the grubby problems of detail—which make or break a public administrative agency—were not studied and tested. The dominant issues are matters of hard practicality. What is the most efficient, economical, and effective way to direct this diverse and complex industrial system as if it were a single integrated production unit? How can the contracting power and material allocations be tied together? Can a single allocation system be used to supply the means to all production? If so, precisely how will it work? If not, why not, what alternatives are there, and where and how will they function? Can effective control be confined to a small number of key plants, with the rest of the economy governed by general operating rules? What statistics are required to illuminate administrative problems and how can they be collected with the least burden on industry? The answers to these and many related problems will be evolved only through the most intensive and detailed study. They will require going into industrial plants and studying procurement, scheduling, record keeping, and production methods. They will require analysis of military requirements and military procurement methods. And they will require practical testing on sample contracts and contractors.

4. *To maintain in the civilian agency a nucleus staff which will work continuously on these problems.*

The objective of this assignment should be the evolution of a body of knowledge and of a group of experienced personnel trained in the application and use of the knowledge. This staff should be the nucleus of the permanent research organization of IMA. If a large measure of responsibility is handed over to the staff—of the general dimensions sketched in the foregoing pages—it can reasonably be expected that personnel of skill can be recruited and retained. This will in itself overcome part of the handicap under which mobilization planning was carried forward in the decades between the wars. The maintenance of a permanent cadre of high quality will have a double advantage. First, it should contribute directly to the fulfillment of the major assignments of IMA. Second, in any future emergency the permanent staff will provide key men around whom a rapid expansion of the organization can be projected.

The work of the research staff should lie much more completely in action than in planning. As methods and procedures for executing administrative policy are developed, they should be tested in actual operations through periodic dry runs. These field trials should be directed toward *familiarizing the military agencies and their potential contractors* with the techniques of industrial control which will be employed in a national emergency. Under experimental conditions, the placing of educational orders and current military procurement should be accompanied by the forms, applications, allotment paper, and all the other apparatus of federal administration of the economy for national defense. From this controlled experimentation will come a larger measure of understanding of the strength and weakness of the mobilization plans and a growing awareness by the military and industrial personnel of capacities and limitations. The minimum gain should be the resolution of problems that were a serious impediment to the defense and war programs from 1940 to mid-1943.

5. *To provide for a trained civilian reserve.*

However effectively the permanent IMA staff carries out its assignments under this program, it will still be necessary in any national emergency to undertake a rapid expansion of personnel responsible for the

administration of the economy. One of the most serious handicaps in the War Production Board's operations was the absorption of inexperienced individuals with no background in public administration and no familiarity with the special problems of production control and material distribution. A comprehensive program for industrial preparedness should make provision for the supply of this essential staff.

Probably the simplest and most acceptable method for doing this would be the establishment of a civilian corps parallel to the ROTC organization of the military services. Under such a scheme, selected individuals from industry, the universities, and the federal agencies would accept temporary appointments to the IMA staff during which they would participate actively in the planning, experimenting, field tests, and methodological analyses carried on by the mobilization agency. After completing their terms, these individuals would be enrolled in a civilian reserve from which they could be summoned to active duty in the event of a national emergency requiring the directed mobilization of this economy for defense.

Adoption of such a proposal would insure to the crisis successor to IMA a group of individuals familiar with the problems of industrial control and fortified by a background of experience in tested techniques of managing the economy for national ends. It would have immediate benefits to industry in time of peace. The industrial point of view and the existing methods and procedures of private enterprise would be thrust forcefully into the shaping of plans and operating techniques. This should make a direct contribution toward realistic thinking in terms of current industrial practice and minimize the inevitable tendency of planning groups to direct their work toward theoretically complete and perfect systems, rather than toward the most effective compromise between the real needs of the administrative agency and the real ability of the economy to function efficiently and without interruption. Returning to their own companies, the civilian industrial reserve would take back a new understanding of the problems and techniques of public administration. Over a period of time, it could be anticipated that this interflow of private and public thinking, methods, and objectives would ameliorate business-government relationships in time of peace, make a significant contribution to the federal statistical reporting program, and assist significantly a rational and orderly transition from

private to public direction of the economy in any future national emergency.

One final word. The proposals of this book grow from the hard experience of public administration of the economy for national survival. They are directed toward more effective preparation of a program of national defense. And they are framed in the world atmosphere in which we now live. They are not "militaristic" and they are not "warmongering." Rather they are offered in the belief that in a disturbed and disorganized world society the practical pursuers and supporters of peace are those who are concerned about the protection of national interests without aggressive aims. Under an effective world government these proposals would be unnecessary. But we do not have such a world government, and it appears unlikely that we shall be able to move far toward such a social regroupment in the years immediately ahead.

The circumstances in which this country must conduct its affairs were well described three hundred years ago by Thomas Hobbes as a period of "war weather." "For war consisteth not in battle only but in a tract of time wherein the will to contend by battle is sufficiently known. . . . For as the nature of foul weather lieth not in a shower of rain but in an inclination thereto of many days together; so the nature of war consisteth not in actual fighting but in the known disposition thereto during all the time there is no assurance to the contrary."

In such a world climate this book is an appeal to read the record of experience, to understand it, and to build on it for survival.

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