SUPB: "Review of 1942 + Prospects for 1943"

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File

WAR PRODUCTION BOARD
WASHINGTON, D. C.
May 31, 1943

OFFICE OF
DONALD M. NELSON
CHAIRMAN

C. F.
War Production Board

THE WHITE HOUSE
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My dear Mr. President:

The attached report, reviewing United States war production in 1942 and summarizing its prospects for 1943 is, I believe, of considerable significance.

The essence of the report is that, in the main, the productive achievement of the American war economy in 1942 met the requirements of our war strategy; and that the prospects for 1943 are for a quantity and quality of production that will realize to the full the tremendous potential of American industry.

I need not tell you that we have met with some disappointments and have made some errors in achieving the results with which this report deals. But the record certainly makes it clear that the American industrial system can be justifiably proud of an astonishing display of economic muscle.

In this production effort, the position of the War Production Board has gradually evolved into the relationship of chief of staff to the civilian army of American producers. After December 7, 1941, a flexible productive system, geared to the needs of total war, had to be improvised almost overnight. All of our efforts had to be concentrated on the conversion of existing facilities, the development of new facilities, and their integration with the sources of raw materials.

There was no time for an adequate appraisal of existing procurement facilities, or for detailed programming and the setting up of tight production controls; and I found it expedient to make use, wherever possible, of organizations already in operation. For example, procurement functions were delegated to the armed services and other agencies whose personnel and experience in this field were powerful factors in helping us get started rapidly on the shift from a peacetime to a wartime economy.

By making use of working organizations, the War Production Board was enabled to focus its creative energies on two primary tasks: (1) the coordination and balancing of production objectives for military and essential civilian supplies; (2) the regulation of productive resources to assure that the right material would reach the right place at the right time.

Specifically, we had to evaluate the demands of the claimant agencies of the War Production Board - to ration materials and equipment in order to attain balanced production goals - to foresee shortages and find ways of adding to our reserve of scarce materials - to take the

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initiative in telling American industry what to produce, when, where, and sometimes, how - to work closely with industry in bringing about rapid conversion and increased production - to regulate the civilian economy within the limits prescribed by considerations of morale and social welfare.

Under the manifold pressures of the emergency, some dislocations and production imbalances were inevitable; and the cost of our munitions output in 1942 was greater than it would have been had we been able to take the time to develop an ideal wartime economic organization. The important point, in my judgment, is that an unprecedented and, on the whole, a balanced output was achieved. Today, we are turning out nearly as much material for war, measured in dollar value, as we ever produced for our peacetime needs - and we have enough industrial power left over to keep civilian standards of living at a level higher than many of us dared hope for. This record could not have been achieved in so short a time had we not taken some short cuts, made some compromises, and assumed some risks.

Once the major goal of immediate quantity production of war material was attained the policies of the War Production Board began to evolve steadily toward closer programming and control of the productive system. It is now clear that in 1943 the character of the decisions which we will have to make will differ, in many respects, from the decisions of 1942.

The competition for materials between essential and non-essential uses has largely given way to the competition between competing essential uses. Major determinations of policy must now grow out of detailed scrutiny of the relative claims of one urgent military need as against another. As the number of productive resources has multiplied, the scarcity of materials and manpower has become more acute in many areas of production. Increasingly, the economic aspects of every production problem are bound up with far-reaching strategic and social considerations. As a result, we are finding it necessary to delve deeper into the factual foundations of our economy, and to exercise greater exactness of judgment than was possible in 1942.

I am personally confident that in the months ahead the productive record of American labor, management, agriculture and Government, working together, will fully meet the demands of the armed services in pressing home the attack on every front.

I trust, Mr. President, that you will find an opportunity to examine the attached report in detail.

Sincerely yours,

Donald M. Nelson

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The President
The White House

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OFFICE OF WAR INFORMATION

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The United States over-all war program set early this year amounted to $106,000,000,000 — 80 percent more than the $59,000,000,000 total for 1942.

This statement is made in a formal report on war production progress for 1942 and 1943 prospects made to President Roosevelt by Donald M. Nelson, Chairman of the War Production Board, and summarized today in a report by the Office of War Information. The two figures cover the total war program — including munitions, construction, and non-munitions such as pay, subsistence and other items.

In his letter of transmittal to the President, Mr. Nelson said: "The record certainly makes it clear that the American industrial system can be justifiably proud of an astonishing display of economic muscle.

"In the main, the productive achievement of the American war economy in 1942 met the requirements of our war strategy; and the prospects for 1943 are for a quantity and quality of production that will realize to the full the tremendous potential of American industry.

"We have met with some disappointments and have made some errors in achieving the results. The important point, in my judgment, is that an unprecedented and, on the whole, a balanced output was achieved.

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"Today, we are turning out nearly as much material for war, measured in dollar value, as we ever produced for our peacetime needs -- and we have enough industrial power left over to keep civilian standards of living at a level higher than many of us dared hope for.

"This record could not have been achieved in so short a time had we not taken some short cuts, made some compromises, and assumed some risks.

"I am personally confident that in the months ahead the productive record of American labor, management, agriculture and Government, working together, will fully meet the demands of the armed services in pressing home the attack on every front."

The report itself (secret, for security reasons) stresses the fact that "the task posed for the industrial system by the 1943 military production program is most formidable."

Among difficulties are the continued tightness of many materials, increasing manpower problems, and, in general, the fuller impact of the production program on the civilian economy. The report also mentions the growing need to give thought to post-war considerations.

The OWI summary follows:-

PART I

Review of 1942

The 1942 total war program of $59,000,000,000 (billion) equalled

three and a half times the 1941 figure of $16,500,000,000 (billion) and almost twenty times the second-half 1940 total of $3,000,000,000 (billion), These figures are based for the most part on constant standard prices, which adequately reflect the actual differences in program figures.

During 1942 the sharpest monthly increase occurred in April -- 20 percent above March. March and June witnessed the next largest monthly increases, 16 percent each. The rate of increase tapered off sharply after the second quarter of 1942; in September and October the rate of increase was only 4 and 3 percent, respectively, in November 7 percent and in December 8 percent.

During 1942 munitions (weapons and all other military equipment) formed 55 percent of the total war program. Construction (publicly financed) formed 24 percent of the total, as contrasted with 21 percent in the last half of 1940 and 29 percent in 1941. The proportion of construction to the total reached a peak in the second half of 1942, and has been falling off sharply since that time as our war plants approached completion.

Munitions in 1942

The output of munitions in 1942 was $32,500,000,000 (billion), a dramatic increase over the $8,400,000,000 (billion) recorded in 1941 and the $1,800,000,000 (billion) in the second half of 1940. The principal components of the 1942 total were aircraft, ships, ground ordnance and miscellaneous (military automobiles, clothing, and other equipment.)

The value of aircraft and related munitions increased from $2,200,000,000 (billion) in 1941 to $9,200,000,000 (billion) in 1942. A total of 47,694 airplanes was built during 1942 as contrasted with 19,403 during 1941. The attempt to fulfill the original 1942 program for military planes — the early objective called for 60,000 — ran into difficulties. Shortages developed in machine tools and several critical parts and accessories. Some fabricated materials — types of aluminum products and alloy-steel forgings, for example, — were bottlenecks, and there were some shortages of skilled workers.

The output of Navy, Army and Merchant vessels, including Naval ordnance and other Naval equipment, increased at about the same rate as aircraft, the sharpest rise being in the production of merchant vessels. A total of 8,027,000 (million) deadweight tons of merchant vessels of all types was built during 1942, as contrasted with 1,166,000 (million) in 1941. Dry cargo ships (about 600 Liberty ships were delivered) comprised the great bulk of this total; about 1,000,000 (million) deadweight tons of tankers were produced.

The 1942 figure for completion of new naval vessels, exclusive of conversion, was about 900,000 standard displacement tons, almost three times as much as was delivered during the preceding 18 months. Combat vessels constituted about a half of this tonnage, while landing craft (the output of which jumped sharply in the middle of the year) made up the largest segment of the balance.

The combined output of battleships, cruisers, destroyers and submarines surpassed that of any previous year in our history.

Munitions in 1942 - Cont'd

The increase in ground ordnance over 1941 figures was less sharp than in the case of the other munition items already mentioned, but during the last quarter of 1942 ground ordnance and signal equipment formed 23 percent of total munitions production, as contrasted with 17 percent in the first quarter.

Throughout 1942 aircraft and related equipment comprised about 30 percent of total munitions. During the year certain types of aircraft (bombers) took precedence over others as the result of war needs. During the year the output of spares, aircraft ordnance, and other equipment and maintenance items increased more rapidly than production of planes.

Construction and Non-munitions

During 1942 not only did the proportion of construction with relation to the entire war output decline, but the proportion of industrial facilities (plants, machinery, etc.) construction declined with relation to other construction (direct military, war housing and public works).

Non-munitions (military pay, subsistence, and travel; civilian pay; agricultural exports and miscellaneous expenditures) increased in 1942 along with munitions and construction output. Two of the key factors accounting for this increase in non-munitions were the boost in military pay rates in June, 1942 and the growth in the size of the armed forces.

International Aid in 1942

During the period from July 1, 1940 to December 31, 1942, approximately two out of every five bomber and pursuit planes off our production lines went to the other United Nations to fight our common battle against the enemy; one out of every ten service combat planes was so exported; one out of every six trainers; one out of every three medium tanks and two out of every five light tanks.

These exports of munitions to our Allies increased sharply during 1942. But they did not increase as fast as munition production. In two major categories of munitions -- aircraft and related munitions and ground ordnance -- the share of total output exported to foreign governments was nearly cut in half during the year.

In addition to export of munitions, international aid is of course afforded by this country to its Allies in two other forms: export of non-munitions (machinery and tools, petroleum products, other industrial commodities including miscellaneous manufactures, and agricultural products); and goods and services transferred but not reported as actually exported — servicing and repair of ships and other defense articles, rental of ships, ferrying of aircraft, production facilities made available in the U.S. etc.

Actual vs. Scheduled Output in 1942

In addition to constant shifts of emphasis within the program, dictated by changing war needs, total objectives (in the field of munitions and war construction only) for 1942 were revised downwards during the year. Originally aggregating about $68,000,000,000 (billion), they were lowered to $51,000,000,000 (billion). For, impressive as the foregoing production record is, actual war production in most categories fell short of scheduled production throughout most of 1942, and increasingly so as the year advanced. For example, during the first quarter of the year actual production of two-engine medium bombers was 137 percent of the forecast for the first quarter made on January 1; the corresponding percentage for the second quarter was 95; for the third 84; and for the fourth 72. However, the actual production increased almost constantly. The same was true of many other items. There are several explanations for this:

1. The objectives were too high.
2. As critical resources became scarcer, schedules were boosted in order to strengthen the claim of the competing services on such resources.
3. The coordination of the country's resources in an attempt to meet these schedules was insufficiently rigorous.
4. The schedules were not subjected to a centralized review and control. This decentralization existed not only among, but also within, agencies.

Had schedules been prepared realistically, it would have been obvious early in 1942 that the objectives were out of line with resources and the goals could have been brought down to the limits of feasibility, thereby requiring early in the year a complete review of the entire program. Schedules were seriously defective as analytically useful predictions of war output.

Late in 1942 a major step forward in the solution of this problem was made with the introduction of the Controlled Materials Plan and of a centralized WPB review of schedules. The two innovations go hand in hand, and are expected to result not only in a more rigorous coordination of the country's resources but also in the determination of more realistic and meaningful production schedules. The major outlines of the production task before us are now sufficiently firm to permit us to do the more specific type of production planning that will assure the maximum utilization of resources.

Materials in 1942

In 1942 military consumption and export of strategic materials rose sharply. For example, at the end of 1941 about one quarter of total steel consumption was in direct military use; at the end of 1942 direct military use and export to our allies accounted for over two- thirds of steel consumption. Direct military consumption of aluminum in 1942 was 1,177,000,000 (billion) pounds, or 168 percent higher than in 1941. In 1941 about two-thirds of military consumption of aluminum was for aircraft; in 1942 the ratio had risen to almost 80 percent. Exports

of aluminum rose by 336 percent. The story for other materials is similar.

This increased flow of materials into direct military production and exports came chiefly from the expansion of domestic supply and the reduction of certain civilian uses. The domestic output of many key materials increased substantially in 1942. Production of chromite rose by almost 700 percent during the year; magnesium by 220 percent; aluminum by 77 percent; alloy steel by 38 percent; molybdenum, tungsten and vanadium by 40 percent.

Due to lack of shipping space and the cutting off of many sources of supply, chief increases in imports of materials were of materials which normally came in large volume from other American countries--copper, nickel, aluminum, bauxite and nitrates. The shipping shortage interfered severely even with shipments from nearby sources, such as molasses from Cuba for the production of alcohol.

In 1942 the beginnings of a joint control of the international flow of raw materials by the United States and British governments appeared, with the creation of the Combined Raw Materials Board. By joint agreement of these two countries, the United States was allotted all rubber exports from South America and Liberia, plus a portion of Ceylonese exports. A similar arrangement has been made in the case of tin.

Reduction or elimination of production of consumers' durable goods, and limitation of civilian construction, were progressively accomplished during 1942, although probably less rapidly than the situation

warranted. Substantial savings have been achieved, particularly by means of conservation programs and through the use of orders limiting the manufacture of certain products and directly controlling the uses to which scarce materials may be put.

Toward the end of the year, the Controlled Materials Plan was adopted, providing overall controls extending throughout the production process. Complete and planned determination of the flow of all resources in a complex war economy is undoubtedly unattainable. However, important steps were made toward this objective in the control of materials in 1942.

Facilities in 1942

The total value of industrial plant construction and installations of equipment during 1942 is estimated at more than $8,000,000,000 (billion), — more than the total of civilian plant and equipment construction in any previous year. About four-fifths of this was in Federally financed projects.

However, most of the new construction and equipment went into plants that were not yet producing finished munitions by the end of the year. By November 30, 1942, only about every fourth plant for which a contract had been let since the middle of 1940, had been completed.

The ratio was particularly low for aircraft and combat vehicle factories and the plants for increasing the supply of basic metals and chemicals; but relatively high -- between 20 and 35 percent of final outlay under

the program -- for ammunition, explosive and gun plants. Most of the raw materials, manpower and equipment that were devoted in 1942 to the construction and equipment of new plants will begin repaying the investment only in 1943, and in some cases not until 1944.

Nearly three-quarters of the total 1942 outlay for war industrial facilities went for plants to produce combat munitions (including merchant ships), while about one-quarter was used to expand facilities for raw materials and machine tools. Among munitions facilities those for ordnance bulked largest, about one half the total. Aircraft plants accounted for another quarter and shipyards for about one-fifth. This distribution differed little from that in 1941.

The bulk of the war plant expenditure program is concentrated in a small number of large projects. Fifty-five giant plants, costing over $50,000,000 (Million) each, alone represented nearly one-third of the total program. This concentration in large projects is considerably greater than that in industry before 1940.

War Employment in 1942

WPB estimates indicated, early in 1943, that war production was absorbing the labor of 11,300,000 workers at the end of 1942, or about 6,500,000 more than a year earlier. At the same time the armed forces were increased by 4,500,000 (million).

Of these 11,000,000 additional war workers and fighters, 4,000,000 were shifted from non-war employment. Many of these were merely changed over from non-war to war production within the same plants. In addition, 2,000,000 unemployed workers were absorbed; 1,000,000 domestic servants and self-employed persons were drawn into employment, and 4,000,000 new workers -- women, oldsters, and youngsters -- were drawn into the labor force.

Impact on Civilian Economy in 1942

In 1939, only 1.5 percent of the nation's product was devoted to preparation for defense and war. In the last quarter of 1942, the war program's share of the national product was just short of 40 percent.

Although the consumer's share of the total output declined so drastically from 1939 figures, the volume of goods and services going to consumers did not fall during 1942. Indeed, so rapid was the rise of total output that the smaller share going to consumers brought them, through 1942, a far greater quantity of goods than they received in 1939. So

great were the country's unused resources in 1941 that the civilian economy was able both to replace the resources diverted to the war effort and also to find additional men and materials to meet a war-stimulated consumer demand. The favorable effects of expanding war production still outweighed the unfavorable. In 1942, however, the balance began to swing. As the war effort grew, it became more and more difficult to replace the resources diverted from civilian production. As a result, the volume of commodities and services going to consumers in 1942 remained almost exactly at 1941 levels.

This amount of goods and services going to the consumer was higher than this country has ever seen -- 8.5 percent greater than in prosperous 1940 and 15 percent greater than in pre-war 1939. But by the end of 1942 the rise had almost stopped.

Even earlier, beginning in the second half of 1941, output of consumers' durable goods — automobiles, furniture, radios, etc. — began to drop sharply. By the end of 1942 they had dropped 60 percent below the level of 1939. Well stocked with such goods, however, it is doubtful that American consumers during 1942 yet seriously felt their inability to purchase new goods of this kind.

The curtailment of gasoline and household fuel consumption was more serious. By the end of 1942, gasoline purchases had fallen perhaps 50 percent below 1941 and 30 percent below 1939. But these areas were the exceptions. Consumption in the main remained very high in 1942.

The story is different for 1943.

PART II

Prospects for 1943

The military program for 1943, including pay, subsistence and other non-munitions, was set at $106,000,000,000 (billion) as compared with $59,000,000,000 (billion) for 1942. This 80 percent increase is not as great as the relative rise in the program from 1941 to 1942, which amounted to over 250 percent; but the absolute increase scheduled is greater — $47,000,000,000 (billion) from 1942 to 1943 as compared with $42,000,000,000 (billion) from 1941 to 1942 -- although the available supply of manpower and materials is tighter than it was at the beginning of last year. Furthermore, the rates of increase in the program had a natural tendency to decline during 1942 as total production went up. Everything clearly suggests that the task posed for the industrial system by the 1943 military production program is most formidable.

Munitions and Construction in 1943

Of the $106,000,000,000 (billion) total, the munitions and construction portion of the 1943 program as it stood at the beginning of the year, amounted to $84,000,000,000 (billion), again an 80 percent increase over comparable 1942 output.

Of this, in turn, the volume of construction projected, while still fairly large - over $11,000,000,000 (billion) - forms a much smaller proportion of the total than in 1942; 13 percent as compared with 30 percent - an obvious reflection of the fact that the preparatory

phases of the war production program - the tooling up for munitions output and the construction of bases, barracks, hospitals, etc., for the training and maintenance of the armed forces - are already substantially completed.

The situation for munitions alone is quite different. Their programmed value for 1943, $72,300,000,000 (billion), represents an increase of nearly 125 per cent over output in 1942. And for significant and large categories of munitions the relative rise called for in 1943 over 1942 is much larger.

Thus, in combat planes the programmed value of 1943 output is 3.5 times that of actual output during the last year; in spare propellers, engines and parts, 2.7 times; in other plane equipment and maintenance, almost 4 times; in ground signal and related equipment, over 3 times; and in minor combat vessels, nearly 4 times.

These categories are obviously the ones in which attainment of the 1943 goals is likely to present the greatest difficulties. Their predominance reflects changes in the importance attached to various categories of fighting equipment in the light of the shifting fortunes and strategy of military conflict.

Materials in 1943

On the basis of programs envisaged in December, 1942, the needs of military production during 1943 call for substantially greater quantities of almost all critical materials than in 1942. Direct

military requirements for steel are up 31 percent. Aluminum, mainly for airplane manufacture, and nitrogen, for explosive production, are up over 100 percent. Phenol and toluene, also essential for the production of explosives, are likewise up over 100 percent. Magnesium is up considerably over 200 percent.

An even larger increase -- 450 percent -- is expected in the direct military use of ethyl alcohol, principally for the synthetic rubber program and for making smokeless powder. Copper, almost alone among the leading industrial materials, shows less than a 10 percent increase from 1942 to 1943, reflecting the great difficulty of increasing supplies of that metal.

Exports were also scheduled to advance substantially for most materials, copper again constituting an important exception. Outstanding is a seven-fold expansion in magnesium shipments, principally for the United Kingdom airplane and incendiary bomb programs. Exports of toluene, for the production of explosives abroad, are expected to rise about 70 percent. On the other hand, a sharp drop in the scheduled shipments of manila fiber reflects the impossibility of replenishing supplies since the loss of the Philippines.

With few exceptions, these increased requirements for materials for military use and for export during 1943 must be met through corresponding increases in new supply during the year, that is, from added domestic production and higher imports.

Unlike the situation which prevailed at the start of 1942, only limited quantities of most scarce materials can be rendered available by further reduction in the civilian economy. Nor is it possible, for most materials, to deplete stocks further without endangering the production program itself.

By the end of 1942, restrictions on non-essential uses of most metals had become so rigid that virtually no further diversion to military production can be expected from this source. The restrictions in effect at the beginning of 1943 were severe. Allotments for such uses as railroad equipment and maintenance, agricultural tools and machinery, and industrial repairs and maintenance are being increased above estimates made last December.

Outside the field of metals, the situation appears to be more flexible. Sharp reductions can still be made in the non-military use of imported cordage fibers, lumber, and other commodities.

On the basis of programs and expectations as formulated in December, 1942, the balance between supply and requirements for most critical materials should apparently improve somewhat during 1943 as increased supplies become available, but there are many uncertainties that may well affect hoped-for importation and production of materials.

The scarcity of vital materials will remain a critical limiting factor on war production during 1943. The tightness of steel, copper and aluminum, especially, necessitates prompt and decisive shifts if we are to avoid cut-backs in projected programs, attain balanced output, keep stocks at a level adequate to insure continued production, and prevent impairment of essential supporting services.

Facilities in 1943

Our war plants are, for the most part, well on the way to completion. The peak was reached in the Fall of 1942 and by the end of 1943 construction will be down to almost the 1941 level. A relatively small part -- about $500,000,000 worth -- of the projects now planned will not be finished until 1944. Very few facilities remain to be built for ordnance, or for machinery and machine tool plants.

Past experience, however, leads to doubt that the war industrial facilities, now under construction, will progress in exact accordance with present schedules. Indeed, it may be assumed that their completion will be delayed from two to three months, on the average. The main reason for probable delays and for the relatively late scheduled completion dates for a number of projects is the inability of the machinery industries, as now organized, to produce certain critical types of machinery and equipment as rapidly as the plants are completed. Bottlenecks exist among some machine tools (particularly the larger and more specialized types) and among certain critical types of equipment.

A certain number of facilities may have to be added. It would appear that considerably more facilities than were envisaged at the beginning of this year will be required for certain parts of the aircraft program, for high octane gasoline, and a few other programs.

Additional demands for machinery, particularly certain machine tools, may also be expected if radical changes are made in models of armaments, since such changes often require extensive retooling. Both

British and German experience indicate that this demand for equipment is considerable and it would appear that there has not yet been sufficient allowance for it in our own programs. However, such unanticipated retooling requirements are not likely to arise in significant volume before the end of 1943.

In general it may be said that any failure to reach 1943 objectives would be due to shortages of material and labor and to shortcomings in scheduling and organization of production, rather than to insufficiency of plant and equipment.

No information has been compiled to show an over-capacity of facilities, although it may be said that certain facilities existing or building could be utilized somewhat more intensively and efficiently. There does seem to exist in many lines definite overcapacity in fabricating facilities compared with the facilities for producing raw materials, particularly certain basic metals and chemicals. This lack of balance, which will be particularly pronounced in 1943, is due to the relatively late start of the program for expanding raw material facilities.

Manpower in 1943

The manpower situation is now in a serious phase, the report said. The increase in manpower requirements for war production and the armed services is only slightly smaller than for 1942, while some of the sources from which last year's requirements were met are rapidly approaching exhaustion. Substantial curtailment of employment in many of the less

essential consumer goods and service industries will be necessary this year to permit the withdrawal of manpower for war industries and the armed services. To an increasing extent, the success of our war production program will depend upon our skill in allocating and transferring labor to the activities where it will contribute most effectively to the war effort, and in maintaining the productive efficiency of the workers so employed.

It is estimated that 2,700,000 more men and women will be needed for essential and war industries. The gross drain on civilian manpower by the armed forces during 1943 is expected to reach 5,200,000. This makes a total of 7,900,000 additional men required by industry and the armed forces this year. Of these, approximately 600,000 will be furnished to industry by discharge from the armed services, 500,000 to the labor force by reduction of unemployment, and 3,000,000 by the recruitment of women and others not now employed. The remaining 3,800,000 must be drawn from other industries.

Not all of the non-war industries, however, can be permitted to suffer reductions in employment. Some, like agriculture and transportation, are no less important to the war effort than the war industries themselves. But in others, like construction, curtailment already planned for other reasons will release substantial numbers of workers.

It seems inevitable that labor shortages will impede the fulfillment of the war production program to an increasing degree in 1943. In general, war production is more likely to be impeded indirectly by labor shortages

in essential civilian industries, resulting in high turnover, absenteeism, and lowered efficiency of war workers, than by an outright numerical deficiency in the supply of workers for war industries themselves.

Impact on Civilian Consumption in 1943

In 1942 the economy barely maintained the level of civilian consumption while absorbing a great increase in war production and a great drain of manpower to the armed forces. The present indication is that it cannot repeat its performance in 1943. The expansion of output to be absorbed is greater and the unused resources of the economy are now far smaller than they were at the beginning of 1942. Labor shortages in 1943 will cut into the volume of services that consumers can obtain.

Some forecasts have indicated that the supply of goods and services available to civilians in 1943 is likely to be between 10 and 15 percent lower than in 1942. In the fourth quarter of 1943 civilian supply, restricted by mounting military demands, may by some estimates, be as much as 20 percent below the level of the same quarter of 1942.

Indications at the beginning of 1943 were that consumption per capita would fall 23 percent between 1942 and the second half of 1943 for clothing and textile products; household fuels, 20 percent; furniture, 40 percent; transportation, 12 percent; and medical care, due to extensive plans for the induction of physicians and nurses into the army, 7 percent.

Serious as are these declines, however, per capita consumption will

in most areas remain at a level higher than in 1939. Consumers' durable goods and clothing consumption are the most significant exceptions. There are a few items, however, that will be scarce even by comparison with minimum requirements. One is household fuels; another is transportation both by private automobile and by common carrier. A third shortage, of high importance, is in medical care.

Unlike the United Kingdom, where standards of living have by now been pushed far below prewar levels, the United States has thus far enjoyed higher standards than before the war, and we shall only reach prewar levels during this year. It should be kept in mind, however, that there will be unavoidable inequalities in the reductions of various commodities and services among various population groups and areas -- inequalities which will aggravate the burden on consumers.

PART III

Basic Policy Problems for 1943

History may well write down the 1942 war production performance of the United States as a miraculous achievement. It was in 1942 that the first mass output of fighting equipment was achieved, following enlargement in 1940 and 1941 of basic resources and initiation of large-scale fabricating facilities. The year 1943 is seeing the big impact upon the enemy of the product of America's mines and factories.

The results attained by this vast increase in the total output of the nation should serve to make us appreciate the tremendous losses and waste of available resources permitted in peacetime; and they should serve as an indication of what can be

accomplished when peace has once again been won.

The year 1942 had major inadequacies, however, and they are still with us: the slowness with which some objectives were developed, the somewhat chaotic and prodigal way in which the programs were translated into specific assignments to the industrial system, the failure to develop promptly tight and well coordinated controls over the resources. These reveal most emphatically the vital importance of looking ahead and planning the use of resources. Only such planning will minimize costs, in terms of strain and dislocation produced in the economy, and maximize the returns, in terms of fighting equipment to win the war.

By now, there is little slack in the economic system. The relatively painless methods of mobilizing resources by bringing them out of idleness or out of clearly non-essential uses have been pretty much exhausted. The way towards increased output is now much more difficult since it will call for a more intensive utilization of resources already employed and since it will involve choices not between essential and non-essential uses but among uses all of which are essential. This year, increasing the production of one weapon of war will generally mean reducing the output of another.

Comprehensive, nationwide programming must be abhieved in the widest sense of the word, comprising basic decisions as among military, indirect military, and civilian production; and within each of these areas among the major categories production controls must be coordinated. The Controlled Materials Plan, adopted late in 1942, should permit a much closer coordination between the flow of materials and a given set of scheduled end-product objectives. Even so, it will be necessary constantly to review objectives in relation to resources, so that the entire burden of programming is not placed upon the mechanism for distributing materials. The successful evolution and implementation of this plan is one of the most challenging tasks for 1943.

Increasing tightness, coordination, and intensity of government controls over production (as well as other aspects of the economy) are unavoidable in 1943. There are many who feel that this trend, required to bring about the quickest possible victory, represents a giving-up on the home front of what is being fought for on the battlefront. Certainly the decision to intensify government controls can be successful and compatible with our democratic system only if the controls are developed and frequently reappraised through a process of consultation with the people, and are administered in such a manner as to assure equality of sacrifice.

If the imposition of more severe controls earlier in the war will bring about a more immediate victory, it may be highly desirable to subject ourselves to greater group discipline in order that we may more promptly dispose of the entire war problem and return to peacetime pursuits.

The year 1943 will be one in which there is certain to be much discussion of and conflict over the extent of government direction, regulation, and control of the economy. Whatever controls and regulations are considered should be carefully appraised in relation to their contribution toward the earliest winning of the war.

The United Nations

Greater integration of production must be secured among the United Nations. Each of them, by the very fact of its being an integrated nation, presents obstacles to integration with the others which can be overcome only by gradual and carefully planned joint efforts. It is important that there be a clear and common understanding of united strategy in order that all of the United Nations can bend their efforts toward a common set of objectives -- objectives which must be spelled out in some detail if production scheduling and programming on a combined basis are to be practicable.

Integration of United Nations production requires a knowledge also of the basic demands of a sound civilian economy in wartime in

each of the various countries. The need for more explicit policies directed toward integrating the production of the United Nations will be greatly increased in 1943. The difficulties of implementing such policies will also increase because, as all-out mobilization is approached in all the nations, there is less flexibility in the production structure and less prospect for making rapid adjustments in favor of combined efficiency.

Information is needed to provide a rational basis for these international decisions. It is difficult enough to secure reliable data on supply and requirements, programs and schedules for the United States itself. It is even more difficult to secure such information on a comparable basis for the several countries whose resources and needs are to be taken into consideration. The important functions that the combined boards perform in accumulating such information should be encouraged and strengthened.

The Civilian Economy

In the realm of our civilian economy, problems and policies may be summed up in several main points:

1. Eliminate civilian manufacturing and as much wholesaling as possible from critical labor shortage areas.

2. Increase productivity of retail trades and service industries, especially in localities where labor is short.

3. Curtail less essential goods and services and simplify

and standardize the more essential.

4. Protect the consumers' minimum requirements in every important field.

5. Give the public a better understanding of the war production problem.

This program is far-reaching, but it is not comprehensive. It does not touch many vital problems in the fields of taxation, price control, wage control and manpower. It does, however, set forth the main lines along which the production agencies will have to move in order to adjust the civilian economy to the necessities of the war program in 1943. The success of this adjustment is to be measured, it need hardly be added, by the effectiveness of our impact on the enemy.

The problem of securing more effective central leadership and more adequate liaison among the agencies in the field of the civilian economy calls for closest attention.

War and Post-War

Three lines of positive action appear advisable to counteract any retarding effects upon the war effort caused by widespread concern over our eventual post-war economic future — as for example concern over the possibly uneven distribution of additional capacity among various regions in the country or among different industries, or concern over

the frequent contentions that concentration of war contracts in the hands of large firms has served to accelerate concentration of economic power in the hands of large units, and rob the smaller and medium-sized firms of a substantial proportion of their former share in the country's business.

1. The first and most obvious step is to secure adequate data on the effect of war production developments upon the structure of our economy. We need reliable information on the distribution of new capacity and resources among various industries, regions, and firms of different sizes; this information should serve to reveal the extent to which additions to our resources are of the type that constitute economic power in the immediate post-war future. So long as maximizing war production was our only overwhelming concern, we were naturally not greatly interested in costs in terms of effects upon the enduring structure of the economy. But if the situation changes so that more attention may be devoted to the post-war future, reliable information should be available to reduce any controversial issues to conformity with firm data rather than with guesses and conjectures that necessarily permit bias and prejudice.

2. Secondly, such information would be needed immediately, if, as it seems reasonable to suggest, greater attention were to be paid henceforth in the procurement and other aspects of war production to the impact of war orders and war output upon the structure of the economy. The recent pressure for the awarding of a larger share of war contracts to smaller firms is a clear indication of the greater

attention that should be paid to what might be called the "structural" aspects of war production costs. While the military production task ahead is still huge, there seems nevertheless to be more room in the immediate future than there was during 1942, for a more careful weighing of alternatives in placing contracts; and in seeing to it that the distortion of the peacetime structure of the economy be as small as feasible.

3. Finally, it is time to consider plans for the eventual post-war future, not so much in the sense of discussing sweeping alternatives that may never confront us, but in the sense of specific planning as to how the transition from the war to the peacetime economy is to be made. Numerous questions arise when such specific planning is considered: how to proceed with the necessary reductions in the output of munitions; what disposition to make of the government inventories of peace-type products; what arrangements should be made for gradual cancellation of outstanding contracts; what policy is to be adopted for government-owned industrial facilities erected during war time; and a host of similar important policy decisions. The price of unpreparedness for war has been rather high; the costs of unpreparedness for orderly transition from war to peace may not be so dramatic, but can be extremely high nevertheless.

It is recognized that diversion of attention and energy to problems that do not directly concern the immediate war effort may distract from it. But, on the other hand, the cost to this effort of mounting and widespread concern with regard to post-war implications of our war production achievements may also be large. It is, therefore,

possible that devoting some energy and attention to the factors that underlie such concern may be of net benefit to the accomplishment of the war production task proper. At any rate, serious thought should be given during 1943 to the proper balance of war and post-war considerations, to achieve the greatest net yield to the present and prospective welfare of the country.

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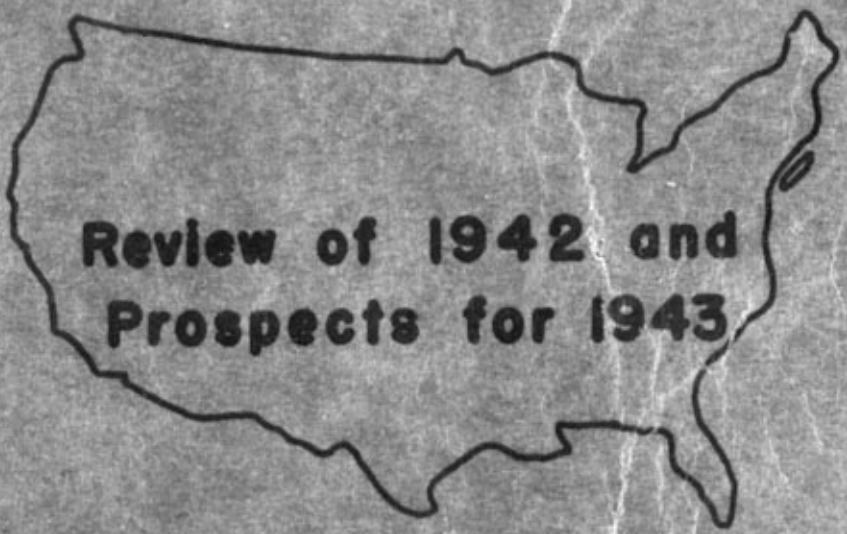
UNITED STATES WAR PRODUCTIO



Review of 1942 and Prospects for 1943

War Production Board

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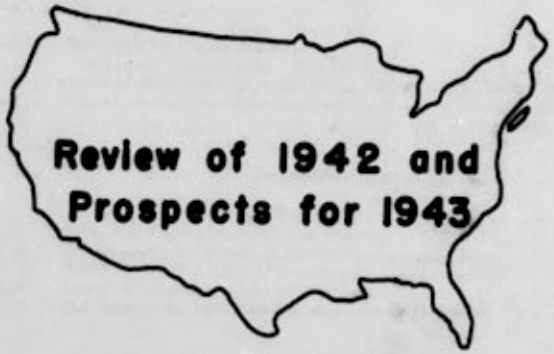
UNITED STATES WAR PRODUCTION



War Production Board

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This bunching of financing and commitments in early 1942 stemmed from a desire to develop as quickly as possible mass production of munitions and overcome the lag in developing our war potential as against that of Axis countries. The result was a torrential flow of contracts, placed into those channels of the industrial system that were in best position to undertake responsibility for the new and huge production tasks.

Early production schedules showed a steep climb to the first quarter of 1943, and a levelling off thereafter. Schedules, however, were continuously revised in the direction of moving peaks forward, as production difficulties made it impossible to attain the increases originally expected. Thus the schedules at the end of 1942 indicated rapid climb to the second quarter of 1943 and a peak in the third quarter.

For various reasons, the 1942 schedules were unreliable indications of actual output. In general they tended to be over-optimistic, since for most of the year they were geared to too high a set of objectives; and were naturally subject to upward bias being used as claims for scarce resources or as incentives to bring out maximum effort. An attempt to make the schedules more realistic could be made only the end of the year, as military production objectives were reduced to feasible limits, and as methods of allocating scarce resources were tightened up.

I-3. Output of war materiel in 1942 increased throughout the year: the cumulative annual total for munitions was four times as great as output in 1941 and over three times the total of munitions produced since the inception of the defense program. War construction also expanded, so that of the total of $47 billion in munitions and construction, $14 billion was construction of military installations or of war industrial facilities. Output of both Army and Navy munitions was large enough not only to replace whatever losses had been sustained during the year in most categories, but also to increase manifold the inventory of fighting equipment available to the armed forces of this country.

More important than the totals were the rates of output attained by the end of 1942. Even discounting the record for December as magnified by an attempt to make a good end-year showing, we find a tremendous flow of munitions, at an annual rate of over $50 billion. Even with no increase in 1943 over December 1942 rates, 1943 output of munitions would be almost 60 percent above the total produced in 1942.

I-4. The larger output of munitions and war construction in 1942 meant a greatly increased consumption of basic raw materials. For steel, copper, aluminum, magnesium, alloy metals, alcohol, nitrogen materials, rubber, lumber -- direct military consumption in 1942 was either double or more than double the consumption levels in 1941.

This increased consumption came from different sources. In some materials, such as aluminum and magnesium, alcohol, nitrogen materials, the main source of increase was additions to domestic output. In others, such as rubber and chromite, in which foreign sources were cut off and domestic production could not be developed immediately in large volume, increased military consumption meant sharply decreased consumption for civilian uses. In still others, such as steel and copper, increased military consumption was made possible both by the increase in domestic supply and by reduction in civilian consumption.

The increasing tightness of basic metals and other widely used materials meant prompt introduction and development of measures designed to restrict civilian consumption and assure flow to essential military uses. The controls added to the operation of the free-market mechanism had to be made increasingly tight during the year.

I-5. In addition to a large volume of new war industrial plant construction and equipment in 1942, two other significant trends in the facilities area were observed. The first was a rise in the rate of utilization of plants already devoted to munitions output or to output of components and materials that go primarily into munitions. The second was conversion, largely of metal fabricating plants, from peacetime to war uses. This conversion took partly the form of continuing the output of customary product, the latter going to the armed services rather than to the civilian economy. More significant was conversion in which output of customary products was discontinued and a shift was made to munitions or their components.

The increase in war production during 1942 was largely due to increased utilization of plants in war industries and to conversion; and only relatively little to the new plants.

I-6. War employment in 1942 increased from roughly 5 million to over 11 million, thus more than doubling during the year. This addition of well over 6 million to the working force in war employment was also accompanied by an increase in armed forces of 4½ million.

The increase in the use of labor for war purposes was accomplished largely by increasing the labor force (4 million), decreasing unemployment (2 million), a decrease in self-employed (1 million) and a net decline in non-war employment (4 million). But of the net decline in non-war employment, the major part was due to conversion, that is to workers shifting from non-war into war production largely within the same plants. There was, therefore, little decline in non-war employment in the sense of contraction in the numbers of workers attached to civilian industries that remained civilian.

I-7. In general, the flow of consumers' goods to civilian consumers did not decline during 1942 as compared with 1941. A sharp reduction in durable goods was offset by an increase in the flow of non-durable goods and services. It was thus possible to attain the tremendous increase of war output in this country, while retaining the flow of commodities and services to consumers at the peak levels of 1941.

While the flow of goods to consumers failed to decline there was some decline in the output of commodities for civilian uses.

Prospects for 1943

II-1. The 1943 military production program (including nonmunitions) is valued at $106 billion, compared with a $59 billion actual level for 1942. The percentage increase in the program from 1942 to 1943 is less than that in actual war outlay from 1941 to 1942, but the absolute increase in the former case is greater than that in the latter.

The composition of the 1943 munitions and construction program is significantly different from that of 1942 war output. The most obvious of these is the lower relative share of construction in 1943, and the greater share of munitions. Within the munitions the proportion of ships (except anti-submarine vessels) is lower, and that of aircraft higher, than in 1942. This latter shift is brought out clearly in a comparison of the composition of the munitions schedules for the last quarter of 1943 with that for the two-year period 1942-43.

The scheduled increase in 1943 over 1942 is relatively steep for a number of munitions items. Judging by these rates, the attainment of 1943 goals is likely to present the greatest difficulties in production of combat planes and anti-submarine vessels.

The quarterly schedules reveal rates of increase whose feasibility may be questioned. Frequently the rate of increase in the first and second quarter of 1943 is far above that actually attained in the closing quarters of 1942. In most cases there is a distinct break between the rates of increase shown for the 1942 actuals and those shown for the 1943 schedules.

II-2. Materials requirements for war production and exports in 1943 are well above corresponding 1942 levels. These increased requirements will be met in large part by increased production and imports, since civilian domestic consumption of most scarce materials is already cut to the bone. There is also the possibility that further conservation and substitution measures, not only in civilian but also in military uses, will ease substantially the critical supply positions of several materials.

The balance of supply and requirements of the critical materials is tight. While many uncertainties remain in requirements as well as in supply, materials will continue as a critical limiting factor on war output in 1943. In fact, the overall dimensions of the program that can be attained in 1943 will almost certainly be determined in good part by the supplies of steel, copper, and aluminum that become available.

II-3. Five billion dollars measure the facilities program for 1943 and 1944 (negligible in amount): this includes about $2 billion of construction and $3 billion of equipment to be installed. This compares with a total of $6.6 billion put in place during 1942. Some

additions may be made to this program as the year progresses, particularly in connection with the aircraft, high octane gasoline, and escort vessel programs; but there is at present no indication that these will be substantial.

Only time will reveal the adequacy of the facilities program, but the following observations may be ventured: (a) The actual completion dates of many facilities will probably be several months later than scheduled, but this delay will be compensated for by an apparent underrating of the capacity of the new units and by a fuller utilization of existing facilities. (b) In some fields there will probably be too many facilities relative to those in complementary lines, for example, in fabricating plants as against materials plants. (c) The present program is well within the bounds of feasibility, but in providing the needed machinery and equipment the output of certain types of machine tools may require some speeding up. (d) Possibilities for reducing the facilities program include increased utilization of existing plants, increasing hours of work, increasing the efficiency of production, increasing the conversion from civilian production, and a continued screening of existing projects. (e) The facilities program could be speeded up by a more intensive utilization of equipment in the machine tool and machine industries and by a further concentration of our machine tool building capacity on the production of certain critical types of machines. (f) Finally, as the year 1943 progresses, more and more possibilities will occur for the conversion of the machine tool industries to munitions manufacture. Thus far such conversion has been negligible; but by the second half of the current year the present facilities of the machine tool and some factory machinery industries will not be fully utilized unless the war industrial facilities program is greatly enlarged, machinery exports increase sharply, requirements for civilian industries rise, or parts of the industry are converted to the production of munitions.

II-4. The problem of manpower will be far more critical in 1943 than in 1942. Labor requirements in the munitions industries are expected to increase 26 percent in 1943 at the same time that munitions output rises 60 percent. The differential is explained by conversion of plants from peacetime to war work, increased productivity of labor, rise in the hours of work, and a more efficient utilization of labor through cutting down on overstaffing and the like. Not only are labor requirements in the munitions industries increasing but those in certain other industries (for example, Federal government) will also increase and those in some industries (such as public utilities) cannot be decreased. A tentative balance sheet of labor demand and supply (in millions of persons) shapes up like this for 1943.

Increase in Requirements		Increase in Supply	
Munitions Industries	1.85	Increase in Labor Force . . .	3.00
Metal & Chemical Industries.	.11	Decline in Construction . . .	1.39
Federal War Agencies	.60	Army Discharges	.60
Transportation & Utilities .	.22	Decline in Unemployment . . .	.50
Subtotal	2.68	Decline in Domestic Service and Self-Employed	.70
Armed Forces (gross)	5.19	Decline in Other Nonagricultural Industries	1.68
Grand Total . . .	7.87	Grand Total	7.87

The impact of manpower shortages on the war economy takes the form not only of a lack of easy supply but also of indirect influences such as labor turnover. In fact, indirect hindrances to war production will probably be more pronounced than the direct ones.

II-5. The great expansion of war output in 1943 will not be achieved without a serious curtailment of civilian consumption. According to present indications, purchases of consumers in 1943 will fall 10 to 15 percent below the 1942 level. The estimated declines vary widely among categories: on a per capita basis food consumption will be down 10 percent, clothing 23 percent, household fuels 20 percent, and furniture 40 percent.

Consumption in 1942 was at record levels, however, and relative to 1939, consumption in 1943 will be at a higher level in most areas. Durable consumers' goods and clothing are the significant exceptions, but the latter will be only moderately below 1939: in fact, the supply of clothing per person in the last half of 1943 should not be more than 10 percent under the 1939 level. Nevertheless, the fact that consumption in 1943 will decrease considerably from levels prevailing in 1942 raises problems of organization and planning that must not be minimized.

Consumption in 1943 will be above "bedrock" minimum requirements in almost every area. For consumption as a whole, the excess even in the last half of 1943 will be in the neighborhood of 25 percent. In three areas, however, expected consumption approaches the "bedrock" closely: household fuels, transportation, and medical care.

Basic Policy Problems for 1943

III-1. In spite of impressive accomplishments, faults can be found in many sectors of the war production effort in 1942. It may be argued that (a) A year of programming was required to achieve objectives consonant with feasibility considerations and strategic requirements; (b) The translation of objectives into appropriations and contracts was too lavish and careless; (c) Generosity in appropriations led to an unreasonably large flow of purchasing power to the procurement agencies and resulted in waste; (d) The rapidity of contract placement led to unwarranted concentration of war work in the bigger firms; (e) The 1942 production schedules were unnecessarily optimistic and misleading and aggravated the lack of balance in munitions output; and (f) The mobilization of productive resources was too slow (conversion was needlessly delayed) and too lavish (resource-employments were insufficiently screened to eliminate low-yield uses).

Regardless of the validity of such contentions, their post hoc discussion can be useful only if it suggests a lesson; and this lesson appears to be the vital importance of looking ahead and of planning the use of resources. Such forethought is required to minimize costs (by reducing strains and dislocations in the economy) and maximize the returns in terms of fighting equipment.

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The 1943 program calls for an increase in war production in 1943 over 1942 that is larger absolutely, though not relatively, than the increase in actual production from 1941 to 1942. Yet in 1942 there was considerable slack in the economic system which has by now been pretty well taken up. The way to increased output now is more difficult than in 1942 since it will call for more intensive utilization of resources already employed. As a consequence, choices to be made during 1943 will be much more difficult and the production controls introduced in 1942 must be tightened and elaborated into a more closely coordinated framework. The increasing stringency of these controls is in itself an additional cost that must be reckoned.

III-2. The broad determination of objectives at the top levels may for present purposes be defined as programming. The more detailed spelling out of these decisions into narrower categories may be defined as scheduling.

Even though programming involves decisions in terms of broad categories, comparison of returns and costs, no matter how approximate, cannot be avoided. These decisions must take into full consideration a wide variety of economic, technical, and broadly social factors. Responsibility for these top programming choices is clearly at the highest levels of executive and legislative authority, but there is no such clarity of organization, procedures, and authority at somewhat lower levels. The need for consistent programming in the light of all factors involved is steadily being accentuated by two factors: (a) The distinction between military and civilian production is growing vague as the less essential portions of the latter disappear entirely; and (b) There has occurred, under pressure of growing problems, a conspicuous decentralization of responsibility for requirements and production control in several commodity or resource areas.

Programming and scheduling are interdependent in the sense that realistic schedules depend on a feasible program and a firm allocation of resources while at the same time proof of the feasibility of a program and the firm allocation of resources requires realistic schedules. The logical circle is broken, in reality, by successive approximations and the corollary process of trial and error. But such a procedure requires a central review of schedules. This review should serve to establish the common, basic criteria for the several procurement agencies or areas; and select the critical resources with reference to which scheduling is to be emphasized. The War Production Board has an increasingly major responsibility in 1943 for a central review and validation of production schedules.

III-3. Monetary incentives and a limited use of priorities were the two basic methods by which, prior to 1942, the government induced expansion of war production. In 1942 the flow of money swelled to finance the greatly increased war production program and the area covered by priorities was extended. But voluntary and preferential controls on production proved inadequate and had to be supplemented by such compulsory controls as the Production Requirements Plan and a

closer supervision of critical items of industrial equipment. In 1943 the compulsory regulation of production is being further extended by the Controlled Materials Plan; but as a practical matter the interregnum between P.R.P. and C.M.P. may well leave the control of materials less tightly regulated in 1943 than it was in 1942.

Perhaps the two most important controls needed in 1943 to supplement the system for the distribution of materials are (a) Aggressive and continuous programming and scheduling plus strict inventory control, and (b) Better intra-plant control of men and materials through better management guidance. Materials and components are only some of the limiting factors in 1943 production; there are several others. The coordination of the controls over all these limiting factors--controls that are now the responsibility of different agencies--urgently needs to be consummated in 1943. Complete coordination is, of course, not feasible; but more needs to be done in this direction, and the indicated task appears to be among the most important of the year.

The actual implementation of these controls in our productive system occurs at the procurement and management levels. The big procurement task is behind us, but at this level several problems still exist: (a) Adjustments may be needed to realign production geographically, by size of firm, and for the purpose of more closely integrating the production of the United Nations; (b) The period of commitment of contracts might well be shortened to introduce the flexibility in procurement required by the possible redistribution of contracts; and (c) Past and future contracts should perhaps be reviewed to eliminate or avoid undue laxity of financial checks. Finally, as resources become increasingly scarce, it will be necessary for some happy medium to be attained whereby truly incompetent management is improved or replaced, at the same time that the government interference with the internal running of private enterprises is kept to the minimum.

III-4. Both military and economic integration among the United Nations runs into numerous practical difficulties because each nation tends to foster its own independence, maintain normal channels of supply and distribution, and rely as far as possible on its own productive capacity. In this field, a clear and common understanding of united strategy is the principal goal ahead. This united strategy, moreover, should encompass not only strategic and tactical military plans but also economic factors and especially such a difficult determinant as shipping.

In making decisions in this field, however, it must be remembered that doing so will a) raise problems charged with important political implications, b) require interrelation of decisions made in allocation of different resources, and c) pose serious data problems. In consequence, decisions should, as far as possible, be made at the highest level cognizant of the broader political implications; closer integration of the activities of various combined and other bodies in the field is to be continuously developed; and full and free exchange and cumulation of information encouraged.

III-5. An adequate economic policy for the civilian economy in wartime should: (a) seek to free resources needed for the production of munitions; (b) protect the basic minimum requirements of civilians; (c) see to it that resources left to the civilian economy are used to provide maximum satisfaction of our primary needs; and (d) assure a distribution of civilian products adequate for the minimum needs of every family and generally recognized as equitable.

In 1943 the necessity for transferring labor from non-war to war employment is becoming urgent. A major migration of workers is required, and to minimize the magnitude of this migration it is encumbent on us to reduce non-war employment in labor-shortage areas as far as possible.

For reducing the impact on domestic civilian consumers of these necessary transfers of resources and labor from civilian to military uses the following six-point program is suggested: (a) Eliminate civilian manufacturing and as much of wholesaling as possible from labor-shortage areas; (b) Increase the productivity of retail trade and service industries with emphasis upon localities where labor is short; (c) Curtail less essential goods and services, and simplify and standardize the more essential; (d) Extend consumer rationing as far as staff and experience permit; (e) Protect the consumer's minimum requirements in every important area; and (f) Educate the public to an understanding of the program.

The pressing problems of the civilian economy raise questions not only of policy but also of administration; the nub of the latter difficulty is excessive decentralization. No single agency is responsible for every important area of civilian goods and services, and even within areas the control functions may be split between two or more agencies. It is not necessarily a single civilian economic agency that is needed, but rather more adequate cooperation among the existing agencies now in this field.

III-6. The post-war impact of the present production program on the economy raises several questions. These may be subsumed under problems of a) utilizing the increased stock of our productive resources (not only industrial capacity but also labor force) at a satisfactory rate after the war, and b) the possibly uneven distribution of these additional resources among various regions, different industries, and firms of various size.

These lines of positive action appear advisable as means to counteract any retarding effects upon the war effort that may be caused by a widespread concern over our post-war economic future: (a) Secure adequate data on the impact of war production developments upon the structure of our economy; (b) Use such information to force greater attention, in the procurement and other aspects of war production, to the impact of war orders and war output upon the structure of the economy; and (c) Initiate preparation of specific plans for the transition from a war to a peacetime economy.

PART ONE:

REVIEW OF 1942

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I-1. Development of the Military Production Programs

Military production programs are key blueprints for the mobilization of a country's economy in time of war. They indicate the amounts of various commodities and services that are to be contributed, at specified dates, by the country's productive system to the training, equipment, transportation, and maintenance of the armed forces of the producing country or of its allies. In addition to specifying products needed directly for the fighting forces, these programs also include special equipment and other resources that must be secured, usually by the government, to assure the required output of munitions.

An effective military production program is forged by the pressure of strategic needs, which determine what is wanted; and of economic and social considerations, which determine what is feasible. But this is a misleadingly simple statement of a complex process. Neither strategic, nor production considerations can be applied independently of each other; and each yields answers that reflect in a sensitive fashion rapidly changing circumstances of pre-war and war years. The demands of a war cannot emerge fully, especially in a non-aggressor country, until the conflict has passed the stage of initial surprises and rapid changes in the technique of warfare. The productive capacity of an economy cannot be clearly seen, especially in a country accustomed to peaceful and comfortable life, until the threat of aggression spurs productive efforts to the utmost and until the sense of danger leads to a willing renunciation of peace-time comforts.

It is therefore not surprising that, in looking back over the developments in 1942, one is struck by the rapid evolution from a situation in which there was no program in the sense described above to one in which we can be guided by a set of objectives related to strategic needs and production possibilities. It is not surprising that in this complex process of program formulation effective relations had to be evolved gradually between the military and economic organs of the government: the military agencies responsible for taking into account the continuously shifting fortunes of war and corresponding changes in the demands for fighting equipment; and the economic agencies charged with the coordination of our production efforts and required to respond to ever changing needs for military materiel, to secure the long range supply of basic resources, and to provide for the fundamental needs of a sound civilian economy.

Before considering military production programs as they emerged during 1942, it may be of interest to look back to the time before Pearl Harbor. The Annual Review for fiscal 1941, published in August of that year by the Bureau of Research and Statistics of OPM,

indicates that at that time there existed no military production objectives spelled out as to amounts, categories, and time, and geared to the specific needs of a defined military conflict. There was realization of the imminence of such conflict; of the need for increasing the defensive power and fighting strength of this country; and a commonly agreed upon decision to direct substantial resources to that task. But there was no program that could be translated into a specific set of objectives assigned to well demarcated time periods. The program as then understood was the sum total of funds appropriated to finance production of munitions, military construction, and other items related to the maintenance of the armed forces. It also included the cumulative total of foreign orders; so that in that day our allies-to-be determined in part the military production of this country just as our allies are doing at present.

The pre-1942 military programs as reflected by appropriations and foreign orders are summarized in Table 1. The story foreshadows, on a much smaller scale, the development of the program during 1942. The six-fold increase in total magnitude, from $14 to over $80 billion, within the short span of less than a year and a half, foretells the rise to breath-taking levels in 1942. The upward trend of the share to be devoted to aircraft and merchant ships is a forecast of the emphasis that was to be placed upon these categories, especially the former, in the production objectives as they emerged in 1942. Finally, it is significant that as the program grew and entrance into war became more and more imminent, greater attention and resources had to be devoted to construction and stockpiling--to assure facilities and resources for the expanded output and use of munitions. As a result, the share of appropriations for construction and stockpile in total appropriations rose from about 10 percent in July 31, 1940 to over 20 percent in December 31, 1941.

The Victory Program

It is not quite true that before 1942 there was no indication of the physical items of fighting equipment that were needed for the imminent conflict and that were financed to the amounts shown in Table 1. It is accurate, however, to state that not until the second half of 1941 was an attempt made to survey the requirements essential to an all-out effort against the Axis powers. This attempt followed the President's request to the Armed Services for estimates of requirements over the next two years based on military objectives. This information, with further details secured in response to an inquiry by Mr. Donald Nelson in September to the Army, Navy, Maritime Commission, and the Lend Lease Administrator, constituted what is commonly referred to as the Victory Program.

At this time a detailed analysis of the contents of this Program is a difficult task; nor is it of importance, since with the entrance of this country into the war new objectives promptly replaced the Victory Program objectives. However, it is of interest to compare the rough magnitude of the Victory Program with the appropriations at the time the former was determined, i.e., September 30, 1941. This rough analysis will be helpful in indicating how rapidly the level of war production objectives was raised when actual participation in the conflict became imminent.

A comparison of requirements of the Victory Program with the financed program (including foreign orders) and deliveries, as of September 30, 1941 is presented in Table 2. The Victory Program was a task assigned to a two-year period, extending from September 30, 1941, to September 30, 1943. The time span of the production plans represented by the appropriations and foreign orders is not easily determinable. But it is not far wrong to say that, with the possible exception of the Navy program, the financed objectives were expected to be attained within a period ending around September 30, 1943.

The Victory Program represented objectives 2½ times the magnitude of the program financed prior to the last quarter of 1941. A significant aspect of the comparison is that the raising of the sights was comparatively moderate in the area of construction and shipbuilding, but was extraordinary for Army-type equipment, i.e., largely aircraft and ordnance. An even more striking picture results when we compare the total magnitude of the Victory Program with the cumulative actual production over the year and a quarter that elapsed from the beginning of the defense program in the middle of 1940 to the end of the third quarter of 1941. The objective was twelve times as great as the dollar value of military production and disbursements during the year and a quarter preceding the program's formulation; and in the case of munitions (i.e., Army and Navy-type equipment and merchant ships), the ratio of the program to cumulative total performance at the date of its formation was as 19 to 1. For Army and Navy-type equipment alone, the corresponding proportion was even higher: 28 to 1. Clearly, if the objectives were to be attained within the two-year period indicated, an unparalleled stepping up of military production was called for.

This conclusion is reinforced by an analysis of how long it would take to attain the objectives for selected Army-type items under the Victory Program, on the basis of production schedules in force in the last quarter of 1941. For such crucial items as heavy bombers, medium tanks, anti-tank guns, 30-caliber rifles, A.P. ammunition, demolition bombs, and many others, the Victory Program under the then existing schedules could not be attained until 1946 or later. In some special cases, such as 3" A.P. ammunition, the

objective at the then prevailing schedules could not be reached before March of the 2044. These figures have a fictitious element, for many important categories of fighting equipment production and schedules were at that time still only in the planning stages. But they lead inevitably to the conclusion that the economic system had not yet advanced materially in the basic production job for the conflict that was coming; and that an extraordinary effort was needed to give the country the equipment necessary within a time period short enough to prevent catastrophic developments in the first months of active warfare.

The Presidential Objectives

The articulation and evaluation of more important parts of the Victory Program was completed just a few days before December 7. When Pearl Harbor ushered in a new phase, it was inevitable that the objectives would be promptly changed to meet the emergency that was upon us. There was, therefore, little time for the Victory Program as such to exercise a direct influence upon production plans. Yet one cannot help but recognize that the effort spent upon the preparation of that Program was of immense value in making clear the broad magnitudes of the military production effort that would be needed; and in providing a more adequate basis than would otherwise have been available for setting the production goals announced by the President in January 1942. These goals, based largely upon the Victory Program and the information gathered in connection with it, were then spelled out and implemented in the first detailed set of war production objectives for 1942.

A comparison of the dollar values of military production objectives as of selected dates during 1942 is given in Table 3. In interpreting these estimates it must be remembered that the determination of objectives can be done with varying degree of precision for the different programs; and that any set of specific figures necessarily conveys an impression of greater definiteness than is actually the case. For example, programs for war construction have to be inferred from contract schedules, contract commitments, and appropriations rather than from detailed and authorized statements as to objectives. And in other areas there may be vagueness as to precise level of objectives that may be considered authoritatively set.

In spite of these qualifications the figures in Table 3 are of significance as indicating first, how the military production goals were set with the entrance of the country into the war; and second, how they changed under pressure of dynamic demands and the need to bring the total program within feasible limits.

Total objectives in the field of munitions and construction for 1942 and 1943 combined ranged from $178 billion in the early part of 1942 to $133 billion at the end of the year. Since the valuation basis used here is not quite comparable with that employed in the evaluation of the Victory Program--the unit costs used in Table 3 are somewhat lower than those employed in arriving at the dollar value of the Victory Program--the raising of the goals in early 1942 is all the more impressive, yet the high goals of early 1942 could not be achieved. In the Victory Program the munitions and construction goals amounted to $134 billion for the two years from October 1, 1941 to October 1, 1943. It was to this level that the production goals were reduced by the end of 1942 in a process of successive revisions (Charts I and II).

The changes in the production objectives were not of the same direction or magnitude in the various parts of the program. The first major downward revision occurred in April. The material reduction in dollar values between the February and the April evaluations is due primarily to the reductions in ground ordnance and signal equipment and in miscellaneous munitions. In the other important areas, such as aircraft and related equipment, Naval and Army vessels, merchant vessels, and construction, the objectives on the whole were kept at the same level until well into the second half of the year. Indeed, in some of these areas there was a distinct tendency, which became especially apparent in the late summer of 1942, for the objectives to rise. Between June and October, the Navy vessel program, including related equipment, was raised by roughly $5 billion, or 30 percent, and the merchant vessel program was raised by over $1 billion, or somewhat over 25 percent. As a result the total value of objectives for the two years combined rose from June to October in spite of the fact that between these two dates some further minor reductions took place in ground ordnance and signal equipment, miscellaneous munitions, and aircraft and related equipment.

Goals Reduced Again

A second major reduction in the goals took place in the latter part of the year. Between October and late November, the total value of the programs for the two years was reduced by roughly $20 billion or almost 15 percent. The reduction was about the same, proportionately, in the objectives for 1942 and those for 1943. In this last revision most of the important categories were affected, but here again the relative reduction differed appreciably from one group to the next. The aircraft and related equipment totals were brought down by about 25 percent, ground ordnance and signal equipment by almost 20 percent. The Naval program, on the other hand, was cut by less than 5 percent, and the merchant vessel objectives were actually increased by 10 percent (Chart III).

The magnitude of the changes in the objectives, in physical units, for the selected dates in 1942 is presented for important catetories in Table 4. This table reveals clearly the character of the changes that occurred in the objectives during 1942 and suggests by the very nature of these changes some of the reasons that have led to the revision of the program. It will be seen from this table that the significant reduction from February to April resulted largely from a marked decrease in the tank program, including tanks, tank guns, and machine guns for ground and combat vehicles. Striking reductions were also called for, necessarily, in tank gun ammunition, but these extended beyond that to small-arms ammunition and rifles. On the other hand, the increases that occurred during the year in the Navy and merchant building program clearly reflect an elevation of goals for destroyers, submarines, destroyer escorts, corvettes, subchasers, mine craft, and other small craft and auxiliaries connected either with the problem of merchant marine losses or the extensive landing operations that emerged as tasks for the near future. Likewise, in the merchant vessel program the increases were incurred in order to raise the tonnage goals for the year 1943 to almost double that estimated in the beginning of the year.

Reasons for Revisions

This review of the changing military production objectives for the year suggests a number of implications and questions. The changes have obviously been due to factors of different character. On the one hand, there were the fluctuating fortunes of war which led to the prompt revision of pre-war ideas as to the type of weapon that would be most needed for the successful prosecution of the conflict. The revision in the tank program, and in Ground Army equipment in general, that took place in the early part of 1942 has obviously been due to the lessons of the campaigns that developed. These necessitated reconsideration of the customary relationships of fighting equipment and ammunition for troops in the theater of operation, and placed emphasis upon the danger of concentrating production on tanks in view of their vulnerability to self-propelled large caliber artillery. The upward revisions in the Naval program and in the merchant shipbuilding program were obvious attempts to cope with the great problem posed by submarine attacks upon merchant shipping. Emphasis upon anti-submarine units as well as acceleration of the merchant shipbuilding program were urgently required to prevent a dangerous impairment of ocean-going cargo and tanker freights. These are only a few of the broader shifts in emphasis produced by the experience of the conflict.

On the other hand, there were factors that led to revisions of the total set of objectives,--factors that were brought to the surface primarily by the question of the feasibility of attaining these goals. It was apparent that the agency responsible for the coordination of the production system to serve war production purposes was necessarily forced to view the production programs as a whole and to prevent the objectives from being set either too high or too low. The danger of objectives being set too low, of under-estimating the justified needs of the fighting forces for equipment, is too obvious to merit recital. But there is also danger in setting the goals too high,--the danger of lack of balance in production.

One obvious element of lack of balance is that if a program is not fully achieved, many kinds of goods which are urgently wanted will not be produced in sufficient amount because less important goods secure more than a due quantity of raw materials and other resources. There are other examples of lack of balance produced by a program which fails of full achievement: facilities that can not be run at adequate levels of utilization because of lack of such complementary factors as raw materials or labor; end products that can not be adequately used because spare parts or supplementary and complementary types of equipment are lacking.

There were two marked changes in the total objectives that resulted largely from considerations of feasibility. One was the reduction between February and April, which was spurred largely by the direct realization on the part of the planning agency in the Army of the necessity of bringing the program downwards. The second was the reduction in the program made late in 1942 when it became apparent that the objectives originally set for 1942 were unlikely to be attained by a fairly significant margin and that the deficit carried over to 1943, added to the already very high goals for that year, would put the program well above a level that could be considered feasible.

Naturally the ascertainment of levels of feasibility is hardly a precise process. But in a situation where a decision had to be made, it appeared best to utilize whatever information was available and arrive at approximate answers. In this process the mechanism had to be established by which military production programs evolved by the several branches of the Armed services, and by the other agencies that had responsibility for areas comprised under the war program, could be assembled, coordinated, and fitted into a comprehensive set of objectives, to be evaluated by the War Production Board as the total task set for the economic system of the country. This war production program, given in Table 3, (exclusive of certain of the less important and less critical parts such as agricultural exports, maintenance and subsistence, and similar items) is only one part of the picture that had to be kept

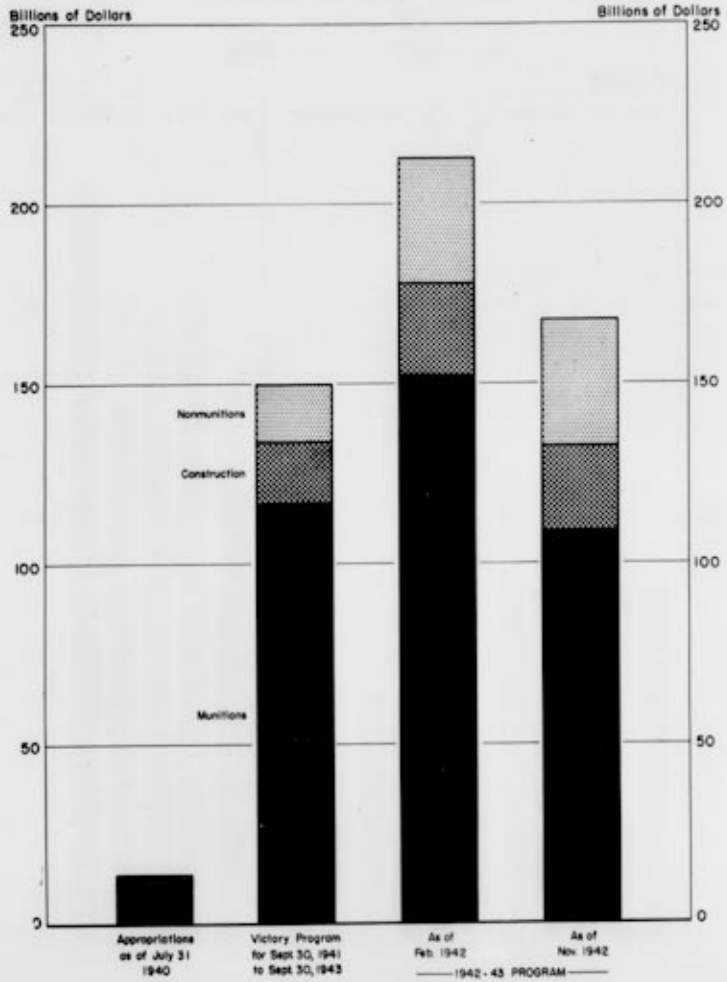
in mind in evaluating the feasibility of the military production goals. The production system was also the fount from which the essential civilian needs were to be satisfied and the indispensable maintenance of the country's productive plant assured. The process of gradual forming and elaboration of the military production program required, therefore, on the part of the military agencies a prompt response to the changing needs for the military conflict, and placed upon them the very difficult task of translating the broad lines of strategic planning into the wide variety of end products needed at various times and at various places in the future. On the part of the War Production Board, it required a continuous attempt to evaluate the needs both of the fighting forces, the civilian population and of the productive system in relation to the total resources that could be mobilized for these various tasks.

It was natural, as it appears now in retrospect, that in the early stages of this process of evolving a strategically sound and economically feasible war production program the tendency would be to set the goals too high. The tendency is easily explainable in terms of the pressing needs of the military conflict; in terms of the attempts by independent agencies separately responsible for the different parts of the production program to set goals as high as possible in order to assure adequate supplies of scarce resources; and in terms of an easily accepted belief that there existed a vast production reserve in the economy and that civilian production could be reduced readily to free resources for military production. On the other hand, as time passes, the limits to the expansibility of the production system within a short period of time become more readily apparent, the danger of gearing the economy to too high a set of goals becomes manifest in shortages of various bottleneck types of resources, and it becomes apparent that only a limited part of the resources that have been employed in civilian production can be readily and effectively transferred to military production. As a consequence, there is a natural tendency to bring objectives down within the range of the possible, although still above the levels that could be attained without the intense effort that our situation requires.

Questions as to the feasibility of the present objectives; the demands they make upon the resources of the country; the problems that are likely to arise in the attempt to attain these objectives will be discussed in greater detail in Parts II and III. Without doubt there will be further changes in the objectives, necessitated either by recent or prospective changes in the problems posed by the military conflict, or by some specific difficulties that are not now readily apparent. It is safe to say, however, that the development and formulation of the war production program during 1942 have already passed the phase in which they were based upon only tentative knowledge of the needs of the conflict and of the limits of the country's productive potentialities. The major outlines of the production task before us are now sufficiently firm to permit us to do the more specific type of production planning that will assure the maximum utilization of resources.

CHART 1

GROWTH OF UNITED STATES WAR PROGRAM



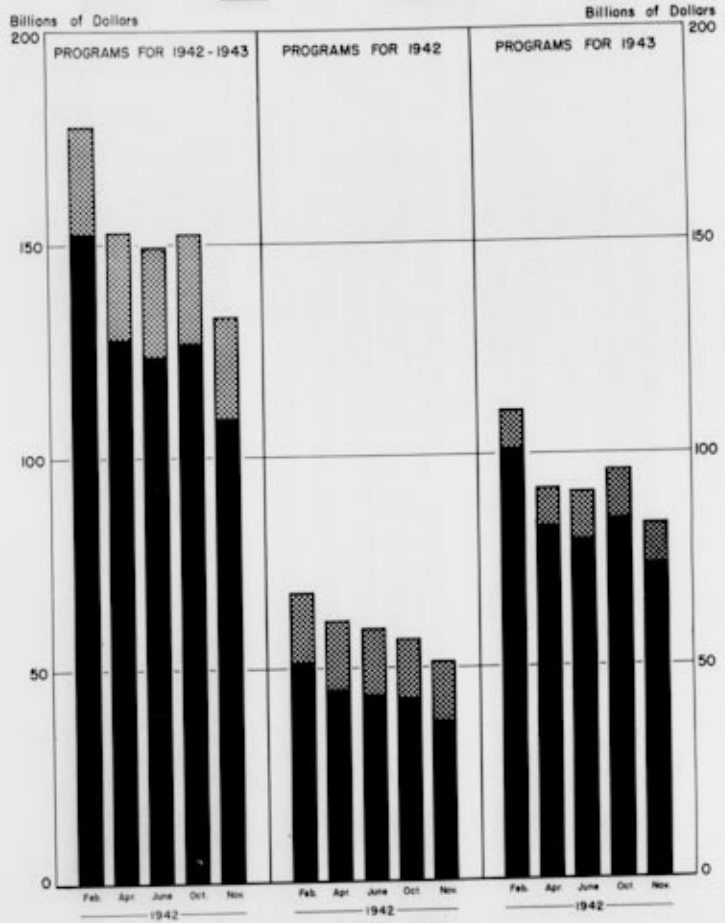
WAR PRODUCTION BOARD
Statistics Division

CHART II

SHIFTS IN 1942 - 1943 UNITED STATES WAR PROGRAM

MUNITIONS AND CONSTRUCTION ONLY

By Revision Date



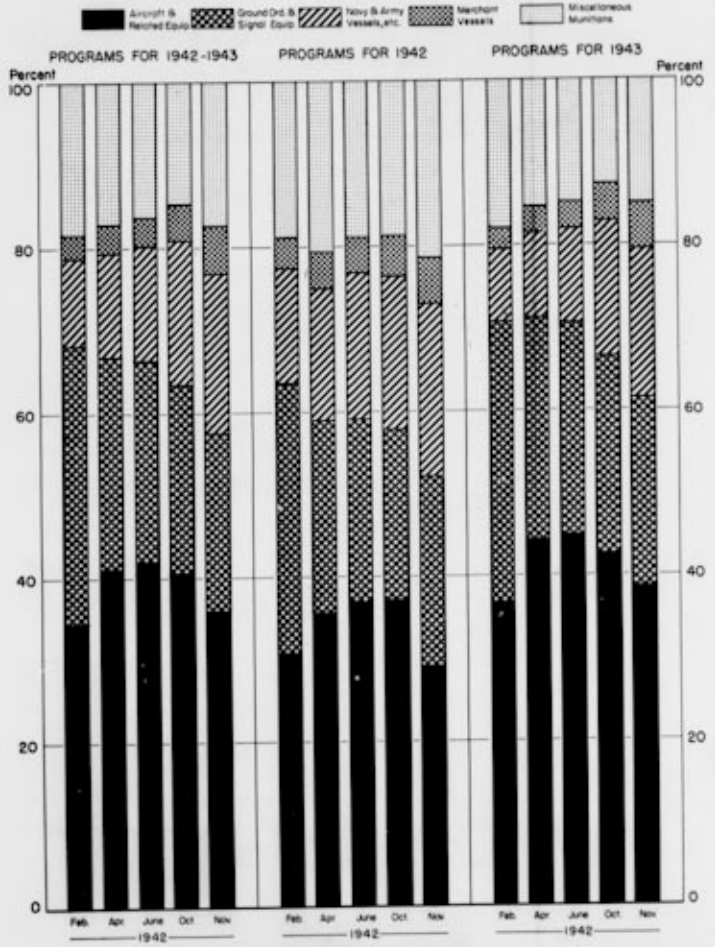
WAR PRODUCTION BOARD
Statistics Division

CHART III

CHANGES IN COMPOSITION OF MUNITIONS PROGRAM

PERCENTAGE DISTRIBUTION

By Revision Date



WAR PRODUCTION BOARD
Statistics Division

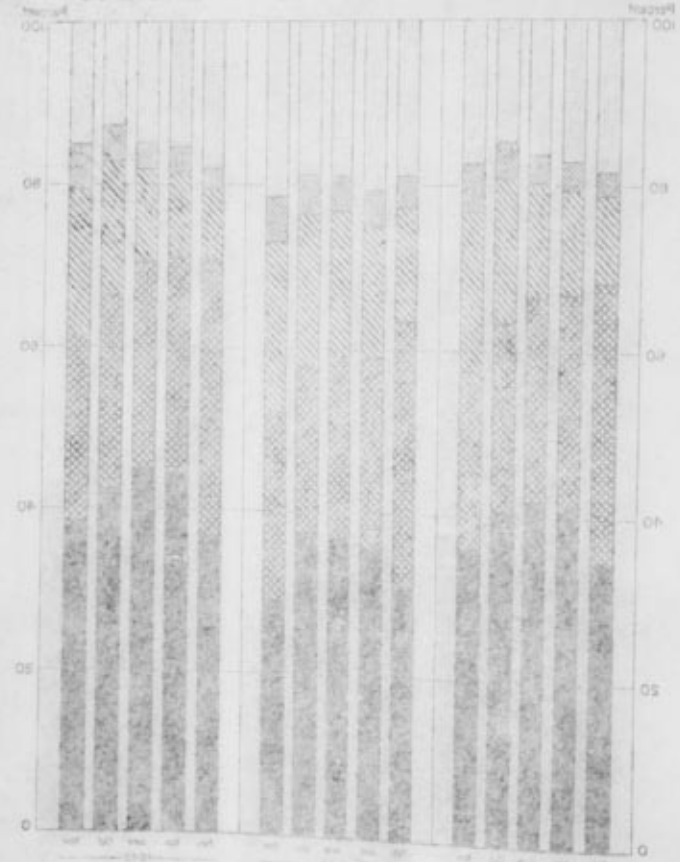


TABLE 1

Military Program as Measured by Appropriations *

(Billions of Dollars)

	July 31 1940	Dec. 31 1940	Dec. 31 1941
Munitions			
1. Airplanes, Parts and Accessories	1.7	4.7	15.1
2. Ordnance	2.4	4.4	17.5
3. Naval Ships	5.8	6.1	9.6
4. Merchant Ships	0.4	0.5	3.3
5. Other Munitions and Supplies	1.0	2.4	8.3
6. Total for Munitions (Lines 1 through 5)	11.2	18.0	53.7
Construction			
7. Direct Military and Defense Housing	0.7	1.8	7.5
8. Industrial Facilities	0.6	1.7	8.1
9. Total Construction (Lines 7 plus 8)	1.3	3.5	15.5
10. Total Munitions and Construction (Lines 6 plus 9)	12.5	21.2	69.3
Non-Munitions			
11. Stockpile	0.1	0.5	2.4
12. Pay, Subsistence, and Transportation	0.8	1.3	4.2
13. Miscellaneous Non-Munitions (Including Agricultural Lend-Lease)	0.4	0.5	4.6
14. Total Non-Munitions (Lines 11 through 13)	1.2	2.4	11.3
TOTAL PROGRAM (Lines 10 plus 14)	13.7	23.8	80.5

* Includes also foreign orders placed in this country, amounting to roughly $1½ billion as of July 31, 1940, $3 billion as of December 31, 1940, and $4 billion as of December 31, 1941.

TABLE 2

Comparison of Requirements of the Victory Program with the Financed Program (Including Foreign Orders) and Deliveries as of September 30, 1941

(Dollar figures in billions)

	Victory Program	Financed Program Sept. 30 1941	Ratio of (1) to (2)	Cumulated Deliveries As Of Sept. 30, 1941	Ratio of (1) to (4)
	(1)	(2)	(3)	(4)	(5)
Army-Type Equipment	$ 94	$ 23	4.1)	$ 4.1	27.6
Navy-Type Equipment	19	14	1.4)		
Merchant Ships	4	3	1.3	2.1	1.9
Direct Military Construction and Defense Housing	7	5	1.4	2.2	3.2
War Industrial Facilities	10	7	1.4	1.7	5.9
All Other	16	9	1.8	2.7	6.0
TOTAL	150	61	2.5	12.8	11.7

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TABLE 3

Development of Military Production Programs, 1942 - 1943 1/

(In billions of dollars)

	1942 - 1943 Programs as of:				
	Feb.	Apr.	June	Oct.	Nov. 2/
Total Munitions and War Construction	177.8	153.0	150.0	152.8	132.8
Total Munitions	152.5	127.7	123.8	127.0	108.9
Aircraft and Related Equipment - Total	52.7	52.6	51.9	51.6	39.1
Planes - Total	22.7	22.7	22.7	22.6	17.1
Combat	19.3	19.3	19.3	19.0	14.6
Service	2.1	2.1	2.1	2.4	1.3
Trainer	1.3	1.3	1.3	1.2	1.2
Gliders and Lighter-Than-Air Ships	.1	*	*	.8	.6
Aircraft Ordnance	4.6	5.0	4.6	4.6	3.3
Spares	13.0	12.9	12.9	12.1	9.0
Other Equipment, Maint. and Operations	12.3	11.9	11.6	11.5	9.1
Signal Equipment	3.5	3.1	2.8	2.8	2.6
Other	8.8	8.8	8.8	8.7	6.5
Ground Ordnance and Signal Equipment	51.5	32.8	30.4	29.1	23.6
Combat Vehicles	14.4	10.1	9.7	9.2	5.9
Guns and Fire Control	10.4	7.9	7.4	7.1	5.6
Ammunition	22.6	11.4	10.3	10.0	9.0
Signal and Related Equipment	4.1	3.4	3.0	2.8	3.1
Naval and Army Vessels, incl. Ordnance and Equipment	15.9	15.8	16.9	21.9	21.0
Naval Vessels - Total	8.7	8.5	8.9	11.8	11.0
Major Combat	4.4	4.3	4.5	5.1	4.7
Minor Combat	3.5	3.3	3.3	5.1	4.8
Auxiliaries and Conversions	.8	.9	1.1	1.6	1.5
Naval Equipment and Maintenance	2.7	2.7	2.9	3.7	3.6
Naval Ordnance	3.2	3.2	3.3	4.4	4.4
Transports, Landing Vessels and Army Auxiliaries	1.3	1.4	1.8	2.0	2.0
Merchant Vessels - Total	4.5	4.5	4.5	5.7	6.3
Ocean-going				5.5	6.1
Other				.2	.2
Miscellaneous Munitions - Total	27.9	22.0	20.1	18.7	18.9
Automotive Vehicles	8.2	5.5	4.7	4.7	4.7
Other	19.7	16.5	15.4	14.0	14.2
Total War Construction	25.3	25.3	26.2	25.8	23.9
Industrial Facilities	12.0	12.0	10.9	11.0	10.6
Other	13.3	13.3	15.3	14.8	13.3

1/ Evaluations are based on August, 1942, unit cost data.

2/ To avoid duplication, unfulfilled 1942 objectives for Ground Ordnance and Signal Equipment, which are carried as part of 1943 program, have been excluded from 1943 program in arriving at total for 1942 and 1943 programs.

* Less than 50 million dollars.

TABLE 1
(Continued)

Development of Military Production Programs, 1942 - 1943

(In billions of dollars)

	1942 Program as of:				
	Feb.	Apr.	June	Oct.	Nov.
Total Munitions and War Construction	67.7	61.3	59.2	57.0	51.3
Total Munitions	51.4	45.0	44.0	42.9	37.1
Aircraft and Related Equipment - Total	15.8	16.0	16.1	15.9	10.8
Planes - Total	6.0	6.0	6.0	5.8	3.9
Combat	5.2	5.2	5.2	4.9	3.2
Service	.3	.3	.3	.4	.2
Trainer	.5	.5	.5	.5	.5
Gliders and Lighter-than-Air Ships	.1	.1	.1	.2	.1
Aircraft Ordnance	1.7	1.6	1.5	1.6	1.2
Spares	3.6	3.6	3.6	3.5	2.4
Other Equip. Maint. and Operations	4.4	4.7	4.9	4.8	3.2
Signal Equipment	.9	1.2	1.4	1.4	.9
Other	3.5	3.5	3.5	3.4	2.3
Ground Ordnance and Signal Equipment	16.9	10.6	9.9	9.0	8.6
Combat Vehicles	5.2	2.6	2.5	2.5	2.3
Guns and Fire Control	3.3	2.9	2.8	2.5	2.2
Ammunition	7.0	3.6	3.5	3.0	3.0
Signal and Related Equipment	1.4	1.5	1.1	1.0	1.1
Naval and Army Vessels, incl. Ordnance and Equipment	7.1	7.2	7.8	7.9	7.8
Naval Vessels - Total	3.8	3.8	4.0	4.0	3.9
Major Combat	2.1	2.1	2.2	2.1	2.1
Minor Combat	1.1	1.1	1.1	1.2	1.2
Auxiliaries and Conversions	.6	.6	.7	.7	.6
Naval Equipment and Maintenance	1.4	1.4	1.5	1.5	1.5
Naval Ordnance	1.3	1.4	1.4	1.4	1.4
Transports, Landing Vessels and Army Auxiliaries	.6	.6	.9	1.0	1.0
Merchant Vessels - Total	1.9	1.9	1.9	2.1	2.1
Ocean-going				2.0	2.0
Other				.1	.1
Miscellaneous Munitions - Total	9.7	9.1	8.3	8.0	8.0
Automotive Vehicles	2.3	2.4	2.1	2.1	2.1
Other	7.4	6.9	6.2	5.9	5.9
Total War Construction	16.3	16.3	15.2	14.1	14.0
Industrial Facilities	8.0	8.0	7.0	6.5	6.6
Other	8.3	8.3	8.2	7.6	7.4

* Less than 50 million dollars

January 13, 1943

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TABLE 1
(Concluded)

Development of Military Production Programs, 1942 - 1943

(In billions of dollars)

	1943 Program as of:				
	Feb.	Apr.	June	Oct.	Nov.
Total Munitions and War Construction	110.1	91.7	90.8	95.8	83.3
Total Munitions	101.1	82.7	79.8	84.1	73.4
Aircraft and Related Equipment - Total	36.9	36.6	35.8	35.7	28.3
Planes - Total	16.7	16.7	16.7	16.8	11.2
Combat	14.1	14.1	14.1	14.1	11.4
Service	1.8	1.8	1.8	2.0	1.1
Trainer	.8	.8	.8	.7	.7
Gliders and Lighter-than-Air Ships	*	*	*	.6	.5
Aircraft Ordnance	2.9	3.4	3.1	3.0	2.1
Spares	9.4	9.3	9.3	8.6	6.6
Other Equipment, Maint. and Operations	7.9	7.2	6.7	6.7	5.9
Signal Equipment	2.6	1.9	1.4	1.4	1.7
Other	5.3	5.3	5.3	5.3	4.2
Ground Ordnance and Signal Equipment	34.6	22.2	20.5	20.1	16.8
Combat Vehicles	9.2	7.5	7.2	6.7	3.9
Guns and Fire Control	7.1	5.0	4.6	4.6	4.0
Ammunition	15.6	7.8	6.8	7.0	6.4
Signal and Related Equipment	2.7	1.9	1.9	1.8	2.5
Naval and Army Vessels, incl. Ordnance and Equipment	8.8	8.6	9.1	14.0	13.2
Naval Vessels, Total	4.9	4.7	4.9	7.8	7.1
Major Combat	2.3	2.2	2.3	3.0	2.6
Minor Combat	2.4	2.2	2.2	3.9	3.6
Auxiliaries and Conversions	.2	.3	.4	.9	.9
Naval Equipment and Maintenance	1.3	1.3	1.4	2.2	2.1
Naval Ordnance	1.9	1.8	1.9	3.0	3.0
Transports, Landing Vessels and Army Auxiliaries	.7	.8	.9	1.0	1.0
Merchant Vessels - Total	2.6	2.6	2.6	1.6	4.2
Ocean-going				3.5	4.1
Other				.1	.1
Miscellaneous Munitions - Total	16.2	12.7	11.6	10.7	10.9
Automotive Vehicles	5.9	3.1	2.6	2.6	2.6
Other	12.3	9.6	9.2	8.1	8.3
Total War Construction	9.0	9.0	11.0	11.7	9.9
Industrial Facilities	4.0	4.0	3.9	4.5	4.0
Other	5.0	5.0	7.1	7.2	5.9

* Less than 50 million dollars

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TABLE 4

Development of Military Production Programs 1942 and 1943 - Major Items

AIRPLANES

(Unit - Each)

Group	1942 - 1943 Objective as of: Feb. a/	April b/	June b/	Sept. c/	Nov. d/
	- - - - - 1942 - 1943 Objective - - - - -				
TOTAL PLANES	185,000	193,482	193,482	189,638	159,554
Long Range, Heavy, Medium, and Patrol Bombers	41,300	41,300	41,300	38,644	29,081
Light, Dive, Torpedo, and Scout Bombers	28,000	28,000	28,000	30,555	24,766
Pursuits	54,000	54,000	54,000	53,135	42,786
Observation & Transport	21,700	21,700	21,700	22,466	20,634
Trainers	40,000	48,482	48,482	44,638	42,087
	- - - - - 1942 Objective - - - - -				
TOTAL PLANES	60,000	64,465	64,465	61,665	47,417
Long Range, Heavy, Medium, and Patrol Bombers	11,300	11,300	11,300	10,786	6,667
Light, Dive, Torpedo, and Scout Bombers	11,000	11,000	11,000	10,110	6,140
Pursuits	16,000	16,000	16,000	14,337	10,818
Observation & Transport	6,700	6,700	6,700	6,353	6,579
Trainers	15,000	19,465	19,465	18,079	17,213
	- - - - - 1943 Objective - - - - -				
TOTAL PLANES	125,000	129,017	129,017	127,973	112,137
Long Range, Heavy, Medium, and Patrol Bombers	30,000	30,000	30,000	28,058	22,414
Light, Dive, Torpedo, and Scout Bombers	17,000	17,000	17,000	20,445	18,626
Pursuits	38,000	38,000	38,000	38,798	31,968
Observation & Transport	15,000	15,000	15,000	14,113	14,255
Trainers	25,000	29,017	29,017	26,559	24,874

a/ President's directive of January 3, 1942.
b/ W.P.B. Report 8-J Ultimate, April 15, 1942.
c/ W.P.B. Report 8-K Ultimate, August 7, 1942.
d/ W.P.B. Report 8-L for November and December plus Actual Production Jan.-Oct.

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TABLE 4
(Continued)

Development of Military Production Programs
1942 and 1943 - Major Items

ITEMS PROCURED BY ARMY SERVICES OF SUPPLY - 1

GROUP	1942 and 1943 Objectives as of: Feb. 9.4 Tabulation	Apr. A.S.F. Sec. I Apr. 6 Sec. II Apr. 9	June A.S.F. Sec. I May 29 Sec. II June 1	Oct. A.S.F. Sec. I Sept. 1 Sec. II June 1	Nov. A.S.F. Sec. I Nov. 12 Sec. II Oct. 21*	Unit
Aircraft Bombs						
Army Procured	3,019	3,267	3,220	3,220	2,138	Thousand Short Tons
Combat Vehicles (w/o armament)	414.1	295.2	256.0	252.1	179.5	Thousand
Tanks	126.5	94.0	92.7	97.7	61.6	"
Heavy	2,162	115	115	230	230	Each
Medium	76.9	60.5	60.5	68.9	36.6	Thousand
Light	47.5	33.4	32.1	28.8	24.8	"
Armored Cars	52.1	39.0	31.6	21.7	19.2	"
Scout Cars and Carriers	172.7	126.9	98.0	99.0	73.6	"
Self-propelled Artillery (Excl. A.A. Guns)	62.8	39.2	33.6	33.6	23.0	"
Artillery - Aircraft & Ground	642.7	604.4	607.8	592.4	659.4	"
Aircraft Guns (Excl. Machine Guns)	347.7	391.1	375.2	375.2	488.2	"
Tank Guns	214.9	107.0	112.1	113.2	81.3	"
Wheeled Artillery (Excl. A.T. Guns)	18.6	15.3	15.1	15.6	13.8	"
Antitank Guns	0.4	49.7	51.9	35.6	31.7	"
Antiaircraft Guns (Excl. Machine Guns)	61.2	41.2	53.4	52.8	39.4	"
Machine Guns - Aircraft & Ground	2,083.9	1,482.7	1,880.0	1,647.2	1,532.2	"
Aircraft	902.7	759.9	1,077.2	1,077.2	889.9	"
Antiaircraft	84.6	93.2	76.7	66.3	69.3	"
Ground & Combat Vehicles	1,496.6	629.6	726.2	703.4	573.0	"
Submachine Guns	3,760.6	2,726.0	1,578.2	1,380.6	1,367.7	"
Rifles	11.7	8.0	8.3	8.5	8.3	
Mortars	67.2	36.8	33.5	42.8	37.5	Thousand
Ammunition						
Artillery	1,063.1	392.5	409.8	349.3	297.7	Million
Small Arms	79.4	50.3	45.6	38.9	37.0	Billion
Mortar Bombs	93.4	54.5	34.0	36.4	35.7	Million
Hand Grenades	56.0	10.1	10.3	15.6	16.5	"
Aircraft Gun Ammunition	182.4	505.9	252.1	252.1	295.1	"
Motor Transport						
Tank Transporters	12.4	45.2	22.6	11.5	6.6	Thousand
Trucks	3,658.6	1,995.6	1,358.7	1,255.8	1,248.6	"
Trailers & Semi-trailers	279.7	137.5	121.1	241.8	273.8	"
Ambulances	42.8	23.1	18.2	24.4	21.3	"
Motorcycles	260.1	171.5	103.6	74.3	74.3	"

* As modified by Signal Corps on October 31.

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TABLE 4
(Continued)

Development of Military Production Programs 1942 and 1941 - Major Items

ITEMS PROCURED BY ARMY SERVICES OF SUPPLY - 2

GROUP	1942 Objectives as of: Feb. 4 Tabulation	Apr. A.S.F. Sec. I Apr. 6 Sec. II Apr. 9	June A.S.F. Sec. I May 29 Sec. II June 1	Sept. A.S.F. Sec. I Sept. 1 Sec. II June 1	Nov. A.S.F. Sec. I Nov. 12 Sec. II Oct. 21*	Unit
Aircraft Bombs						
Army Procured	1,261	1,124	1,139	1,139	633	Thousands Short Tons
Combat Vehicles (W/o armament)	126.2	87.4	77.8	81.1	75.1	Thousands
Tanks	48.4	25.5	25.5	25.5	25.5	Thousands
Heavy	500	115	115	115	115	Each
Medium	25.8	14.0	14.0	14.0	14.0	Thousands
Light	22.1	11.4	11.4	11.4	11.4	Thousands
Armored Cars	26.3	11.9	11.4	11.9	8.9	*
Scout Cars & Carriers	37.6	35.4	26.4	30.7	30.7	*
Self-propelled Artillery (Excl. of A.A. Guns)	13.9	14.6	14.4	13.0	10.1	*
Artillery - Aircraft & Ground	254.7	192.0	183.7	188.2	159.5	*
Aircraft Guns (Excl. Mach. Guns)	152.7	119.9	108.3	108.3	84.0	*
Tank Guns	68.4	35.2	35.1	40.3	40.0	*
Wheeled Artillery (Excl. A.T. Guns)	9.8	6.2	6.5	5.9	6.0	*
Antitank Guns	0.4	15.9	15.9	17.5	15.5	*
Antiaircraft Guns (Excl. Machine Guns)	23.4	15.0	18.0	16.2	14.0	*
Machine Guns - Aircraft & Ground	770.6	499.1	585.9	585.0	504.0	*
Aircraft	279.1	238.7	322.7	322.7	252.0	*
Antiaircraft	59.3	36.5	36.5	35.1	35.1	*
Ground & Combat Vehicles	432.1	223.9	226.7	227.1	216.8	*
Submachine Guns	1,027.3	979.0	979.3	1,009.1	1,009.1	*
Rifles	4.6	3.3	3.3	3.8	3.8	Millions
Mortars	18.0	7.6	7.6	10.7	10.7	Thousands
Ammunition - Aircraft & Ground						
Artillery	237.4	114.7	141.2	107.5	99.3	Millions
Small Arms	24.4	16.8	16.2	13.4	13.6	Billions
Mortar Bombs	21.2	16.7	15.2	16.2	17.6	Millions
Hand Grenades	9.3	3.0	3.0	3.9	3.9	*
Aircraft Gun Ammunition	107.8	138.1	110.7	110.7	127.6	*
Motor Transport (1942	1,492.0	981.9	720.3	761.1	762.0	Thousands
Tank Transporters	12.4	22.6	15.1	6.7	4.6	*
Trucks	1,261.8	718.7	599.7	598.9	586.9	*
Trailers & Semi-trailers	106.3	52.2	54.2	115.7	128.8	*
Ambulances	16.3	11.3	8.4	11.2	11.1	*
Motorcycles	95.2	77.1	42.9	28.6	30.6	*

* As modified by Signal Corps on October 31.

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TABLE 4
(Continued)

Development of Military Production Programs 1942 and 1943 - Major Items

ITEMS PROCURED BY ARMY SERVICES OF SUPPLY - 3

GROUP	1943 Objectives as of: Feb. 9, 4 Tabulation	Apr. A.S.F. Sec. I Apr. 6 Sec. II Apr. 9	June A.S.F. Sec. I May 29 Sec. II June 1	Sept. A.S.F. Sec. I Sept.1 Sec. II June 1	Nov.** A.S.F. Sec. I Nov. 12 Sec. II Oct. 21*	Unit
Aircraft Bombs Army Procured	1,758	2,143	2,081	2,081	1,705	Thousand Short Tons
Combat Vehicles (w/o Armament)	287.8	207.8	178.2	171.0	104.4	Thousands
Tanks	78.1	68.6	67.3	72.3	38.1	"
Heavy	1,662	0	0	115	115	Each
Medium	51.1	46.5	46.5	54.9	24.6	Thousands
Light	25.3	22.1	20.8	17.3	13.4	"
Armored Cars	25.8	23.1	20.1	9.8	10.3	"
Scout Cars & Carriers	135.1	91.5	71.6	68.3	43.0	"
Self-propelled Artillery (Excl. of A.A. Guns)	48.9	24.6	19.2	20.6	13.0	"
Artillery - Aircraft & Ground	415.0	412.3[4]	424.1[0]	404.2'	494.9	"
Aircraft Guns (Excl. Mach. Guns)	195.0	271.2	266.9	266.9	404.1	"
Tank Guns	173.5	71.8	77.1	72.9	41.3	"
Wheeled Artillery (Excl. A.T. Guns)	8.8	9.2	8.6	9.7	7.8	"
Antitank Guns	0	33.9	36.0	18.1	16.2	"
Antiaircraft Guns (Excl. Machine Guns)	37.7	26.3	35.4	36.5	25.5	"
Machine Guns - Aircraft & Ground	1,313.3	983.6	1,294.2	1,262.3	1,028.2	"
Aircraft	223.6	521.1	754.5	754.5	637.9	"
Antiaircraft	25.2	56.8	40.3	31.2	34.2	"
Ground & Combat Vehicles	1,064.5	405.7	499.4	476.6	356.1	"
Submachine Guns	2,733.3	1,747.0	598.8	371.5	358.6	"
Rifles	7.1	4.7	5.0	4.6	4.4	Millions
Mortars	49.1	29.3	26.0	32.1	26.8	Thousands
Ammunition - Aircraft & Ground						
Artillery	825.6	277.8	268.6	241.8	198.4	Millions
Small Arms	55.0	33.5	29.5	25.6	23.3	Billions
Mortar Bombs	72.2	37.7	18.8	20.2	18.1	Millions
Hand Grenades	46.7	7.1	7.3	11.7	12.6	"
Aircraft Gun Ammunition	74.5	367.8	141.4	141.4	167.5	"
Motor Transport (1943)	2,761.6	1,091.0	903.9	846.7	866.6	Thousands
Tank Transporters	0	22.6	7.5	4.8	4.0	"
Trucks	2,396.8	876.9	799.0	656.9	661.7	"
Trailers & Semi-trailers	173.4	85.3	66.9	126.1	145.0	"
Ambulances	26.5	11.8	9.8	13.2	12.2	"
Motorcycles	164.9	94.4	60.7	45.7	43.7	"

* As modified by Signal Corps on October 31.
** Does not include unfulfilled 1942 objectives.

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TABLE 4
(Continued)

Development of Military Production Programs 1942 and 1943 - Major Items

NAVAL VESSELS - CONSTRUCTIONS

(Unit - Each)

Group	1942 and 1943			1 9 4 2		
	June	Sept.	Nov.	June	Sept.	Nov.
Battleships	6	6	6	4	4	4
Aircraft Carriers	15	14	13	2	1	0
Cruisers	22	21	21	9	9	8
Destroyers	177	214	202	80	85	83
Submarines	80	92	94	32	37	35
Aircraft Escorts	24	24	24	0	0	0
Destroyer Escorts	181	246	260	0	4	0
Corvettes a/	0	0	69	0	0	0
Subchasers	618	856	928	359	327	334
Mosquito Craft	240	365	387	152	165	144
Minecraft	657	712	701	348	308	264
Landing Craft	7,210	9,365	13,785	6,588	8,313	7,218
Auxiliaries	358	1,149	1,133	173	480	355

a/ Reported by the Maritime Commission.

Development of Military Production Programs 1942 and 1943 - Major Items

NAVAL VESSELS - CONSTRUCTIONS

(Unit - Each)

Group	1 9 4 3			1944 and Later		
	June	Sept.	Nov.	June	Sept.	Nov.
Battleships	2	2	2	4	4	4
Aircraft Carriers	13	13	13	7	24	27
Cruisers	13	12	13	20	61	67
Destroyers	97	129	119	51	186	188
Submarines	48	55	59	141	233	228
Aircraft Escorts	24	24	24	0	63	63
Destroyer Escorts	181	242	260	119	620	717
Corvettes	0	0	69			
Subchasers	259	529	594	121	498	479
Mosquito	88	200	243	0	0	0
Minecraft	309	404	437	89	270	270
Landing Craft	622	1,052	6,567	10	0	4
Auxiliaries	185	669	778	44	38	97

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TABLE 4
(Continued)

Development of Military Production Programs
1942 and 1943 - Major Items

NAVAL ORDNANCE

Group	1942 - 1943 April	June	September	November	Unit
			- - - - - 1942 and 1943 - - - - -		
Naval Antiaircraft and Dual Purpose Guns	61,766	74,610	88,366	100,364	Each
Naval Ammunition					
Surface Fire	1,859.0	3,321.7	3,507.4	3,097.3	Thousand
Antiaircraft	760.6	841.4	801.0	746.3	Million
Torpedoes (Incl. aircraft)	21,447	23,497	22,993	22,673	Each
Depth Charges	391.7	336.5	339.4	339.0	Thousand
Mines (Including aircraft)	114.3	118.1	117.3	96.4	Thousand
Aircraft Bombs					
Navy Procured	270	300	322	195	Thousand Short Tons
			- - - - - 1942 - - - - -		
Naval Antiaircraft and Dual Purpose Guns	32,108	34,599	35,058	35,105	Each
Naval Ammunition					
Surface Fire	555.8	1,163.0	1,047.0	611.5	Thousand
Antiaircraft	230.9	224.5	187.4	177.2	Million
Torpedoes (Incl. aircraft)	5,644	5,681	4,800	4,661	Each
Depth Charges	139.7	150.5	153.4	141.0	Thousand
Mines (Including aircraft)	51.1	43.5	40.8	39.7	Thousand
Aircraft Bombs					
Navy Procured	113	123	108	121	Thousand Short Tons
			- - - - - 1943 - - - - -		
Naval Antiaircraft and Dual Purpose Guns	31,658	40,011	53,308	65,259	Each
Naval Ammunition					
Surface Fire	1,033.3	2,158.8	2,460.4	2,285.8	Thousand
Antiaircraft	529.7	616.9	613.6	569.1	Million
Torpedoes (Incl. aircraft)	15,803	17,816	18,193	18,012	Each
Depth Charges	162.0	186.0	186.0	198.0	Thousand
Mines (Including aircraft)	63.2	74.6	76.4	56.6	Thousand
Aircraft Bombs					
Navy Procured	157	177	214	74	Thousand Short Tons

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TABLE 4
(Concluded)

Development of Military Production Programs
1942 and 1943 - Major Items

MERCHANT VESSELS

(Unit - Thousand DWT)

Group	1942 - 1943 April	June	September	November	December
			- - - - - 1942 and 1943 - - - - -		
Tankers			4,101	4,114	4,464
Dry Cargo Types			19,901	19,893	22,426
Minor Types			1,360	1,252	1,128
TOTAL - '42 and '43	19,000	19,000	25,362	25,259	28,018
			- - - - - 1942 - - - - -		
Tankers			1,100	996	1,015
Dry Cargo Types			6,816	7,001	6,970
Minor Types			380	205	109
TOTAL - 1942	8,000	8,000	8,296	8,202	8,094
			- - - - - 1943 - - - - -		
Tankers			3,001	3,118	3,449
Dry Cargo Types			13,085	12,892	15,456
Minor Types			980	1,047	1,019
TOTAL - 1943	11,000	11,000	17,066	17,057	19,924

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I-2. Appropriations, Contracts and Schedules.

Flow of Appropriations

No matter how urgent the need for munitions and military construction, how complete the plans, blueprints and specifications for turning out the fighting equipment, in a democratic society such plans cannot be implemented until the representatives of the people have had an opportunity to review them and to sanction the outlays required. The procuring agencies cannot place orders or purchase materiel until Congress approves their programs and appropriates the necessary funds. In the sequence from the military production programs to the output of munitions and to military construction the passage of appropriations is an indispensable sanctioning step.

The urgency of the military situation meant naturally a quick response by Congress to the requests placed before it. By the beginning of 1942, total appropriations and authorizations, excluding those for RFC and its subsidiaries, amounted to roughly $66 billion (Table 5).1/ During the first quarter of 1942, in but six Acts, Congress authorized $72 billion. An additional total of $85 billion was voted during the following three quarters, bringing the total appropriations during the year to somewhat in excess of $150 billion.

Two characteristics of this flow of appropriations deserve note. First is their concentration in the early part of the year. During the first quarter of 1942 almost one half of the total for the year was passed, thus creating possibilities and pressure for an early flood of orders for both finished munitions and military construction. This was in response to a natural desire to harness without delay the country's productive system to the enormous task of turning out fighting and other equipment needed for our armed forces and for our Allies in the conflict thrust upon us. Second was the relatively greater flow of appropriations to the Army and the Navy than to the other agencies concerned with the military program. Appropriations to the Army and the Navy more than quadrupled during the year; those to other agencies, such as the Maritime Commission were raised only somewhat more than twofold; and those for Lend Lease purposes including allocations to war agencies not segregated in Table 5, increased threefold from $21 to $64 billion.

1/ The total used and discussed in Section I-1 of $80 billion by the end of 1941 included RFC appropriations and foreign orders.

Including RFC appropriations and foreign orders, the latter a relatively small item, the cumulative total of war funds by the end of 1942 reached the astounding total of $242 billion, (Table 6). Actual outlays, chargeable to these funds, amounted by the beginning of 1942 to somewhat short of $20 billion. There was thus available about $220 billion for financing war production in 1942 and later years. This total may be compared with the overall value of the program for calendar 1942 and 1943 (including non-munitions) of roughly $170 billion. While this comparison suggests at first blush an adequate provision of appropriations, it does not mean that there will be no need for additional appropriations in 1943. There are some areas in the programs whose recent expansion call for additional financing. Besides, appropriations must precede commitments and do precede actual output by a substantial period--so that appropriations during 1943 must take adequate cognizance of the military production programs beyond 1943.

Distribution of the cumulative total of appropriations at the end of 1942 among the major end-product categories (aircraft and related munitions, ground ordnance and signal equipment, etc.) is quite similar to that of the total value of the present production programs for 1942 and 1943, although some funds will not be expended until 1944 and 1945, (Chart IV). Authorizations for naval ships and equipment constitute a higher proportion of the total than is programmed for 1942 and 1943, since it is necessary to provide early for the financing of naval ships with long building periods. By contrast, funds available for non-munitions understate the importance of this category since financing does not have to be provided far in advance for the items carried in this category--food, pay, travel and the like.

Commitments and Contracts

In the sequence from appropriations to the placing of a final and firm order by the procuring agency with the manufacturer there are several stages, varying in number and the time consumed from one category of goods to another and from one procuring agency to another. An appropriation made to a big agency like the Army and the Navy may be allocated to the various bureaus or divisions within each; these allocations may then be subject to requisition by these units; letters of intent may be issued, after preliminary verbal discussion and agreements; finally, a prime contract is placed with a producer, who in turn may subcontract to various suppliers.

The term commitments as used here covers contracts, letters of intent, Navy Bureau requisitions, interdepartmental orders--in short all the steps that may be construed to represent an assignment of funds as obligations for specific items in the military production program. It thus encompasses much more then the prime contract record which does not cover food, transportation costs, military pay and operating expenses of war agencies; and which, even for the categories to which they apply, represent a stage considerably beyond the commitment of funds for specific end-products.

Commitments thus defined amounted by the end of 1942 to $182 billion, leaving $60 billion in appropriated but uncommitted balances (Table 7).

The distribution of these commitments by major categories repeats the pattern made familiar in the distribution of the program and of the appropriations among various classes of munitions, war construction and non-munitions (Chart IV).

Prime contract data are available in somewhat more detail, even though they cover an area significantly smaller than commitments (Table 8). The totals discussed here exclude contracts less than $50,000 and all contracts for foodstuffs; are qualified somewhat by the lag with which placement of contracts is reported; and exclude areas for which prime contracts are not needed. 1/ These limitations account for the fact that the cumulative total of prime contracts by the end of November 1942 is about $100 billion, as compared with commitments of $182 billion.

Of this total of prime contracts about one-seventh is for federally financed war industrial facilities and six-sevenths for finished munitions, other equipment for the armed forces or Allies, and intermediate products (Chart V). It is of interest to note that the distribution of prime contracts among various end-product categories is fairly similar for the supply contracts and for the facility contracts: the categories that loom large in the former--aircraft, ships, guns, ammunition and explosives--stand out also in the proportional distribution of facility contracts. There is, however, a natural and significant difference in that in facility contracts expansion of raw material production (iron and steel, non-ferrous products, chemicals, etc.) occupies a more prominent place than the corresponding intermediate products can and do among the supply contracts.

Whether we consider commitments or contracts, the magnitude of the task imposed upon the productive system of the country was enormous. With only $20 billions worth of munitions, construction and non-munitions attained before 1942, a program of output amounting to some $170 billion in two years is enormous--considering that the gross national product, i.e., the value of all commodities and services turned out by our economy (without deduction of depreciation of capital goods and treating all government outlays as representing finished products) was less than $100 billion in a prosperous year like 1940. The assumption of such a task by the economic system had, therefore, numerous effects, some of which can be at least suggested by seeing how prime contracts flowed into the various parts of our productive system.

1/ Direct military construction is omitted from this table. Also, owing to the practice of adding supplements to the original contracts and exercising options to increase the contract, the total for 1941 is overstated and the total for 1942 is understated by about $3½ billion.

Distribution of Prime Contracts:
Timing, Place, Size of Firm

The first characteristics of the contract record during 1942 to be noted is one that might have been inferred from the concentration of appropriations in the early part of the year, viz. a similar concentration of contract placements. Monthly data are available only for Army and Navy supply contracts; and complete data for facility contracts; but Army and Navy account for bulk of the supply contracts, so that the picture revealed is quite comprehensive. 1/

The concentration of contracts in the early part of the year is apparent (Chart VI). In supply contracts, January was peak month for clearances, with one-sixth of the year's total cleared in that single month. In aircraft over one-half of the year's contracts were cleared during the first quarter of 1942; in ordnance about four-tenths of the year's total. Only in ships was the major part of contracts cleared during the second half of the year, August being the peak month with about four-tenths of the year's total cleared in that single month--a reflection of the late start and consequent pressure upon the escort vessels program and of the expansion of the aircraft carrier, destroyer and cruiser programs.

An even greater concentration of contract placements in the early part of the year is true of the facility contracts--and for the obvious reason that an early start was even more indispensable there if the facilities were to be completed in time to be used for turning out the needed munitions and components. In the first quarter of 1942 one-half of the year's total contract value was placed; during the first half of the year slightly less than 90 percent of the total; with contract placements during the second half of the year falling to quite low levels.

This torrential flow of commitments and contracts, superimposed upon a large backlog of unfilled orders that many plants already had, aggravated the problem of adjusting the country's productive system to the task imposed upon it by exigencies of the war. Were it possible to proceed more slowly, to regulate the stream of contracts and orders so as to accelerate it more gradually and direct it more carefully into the various channels of the productive system--a considerable part of the dislocation could have been spared; a more economical utilization of the country's productive plant secured; and the distorting effects on the structure of economy reduced. But in view of the urgency of the situation and the extreme need to secure a large scale output of munitions and military construction promptly, it may be argued that such accelerated flow of commitments and contracts was indispensable;

1/ Clearances are reported more promptly than contracts and include contracts which may never go into operation. For these reasons the total cumulative, Table 9, is larger than the total addition to supply contracts in Table 8. However, clearances may be used to indicate the rate of flow of contracts into placement.

that it would have been too dangerous to retard it and thus possibly delay the tremendous increase in military output that was actually attained during 1942; and that the dislocation and waste that such sudden acceleration of war orders brought in its wake was the price that had to be paid for the possibility of making up quickly for our past delay in building up the country's fighting equipment to the magnitudes required by the armed conflict.

The aircraft and shipbuilding programs dominate the war production plans in dollar terms and it is not surprising that the geographic distribution of war-agency procurement reflects this predominance. In table 10 cumulative supply contracts and industrial facilities are shown by state and the supply contracts are compared with 1939 state totals of value of manufactured products. States having the largest volume of contracts relative to their 1939 production hold this position, because in almost every case, they have major centers for the assembly of aircraft or ships or both.

The importance of aircraft and ships in determining the rank of states as regards prime-contract work is accentuated by two features of procurement policy. Aircraft and ships are contracted further in advance than are most other products. As a result, an airplane assembly state may already have under contract all of its 1943 and some of its 1944 output, whereas a state that is producing shells and shoes for the Army and Navy will have received only a portion of its 1943 contracts. Moreover, airplane and ship builders are usually made responsible for manufacture or procurement of many or even all parts and subassemblies, as well as for the assembly operation itself, and this is, of course, reflected in the value of the contract award. The power plant is generally furnished by the government to the assembly contractor for airplanes, and often is in the case of ships and sometimes other integral parts of the ship or plane are procured by the government; but the major part of the cost of the completed plane or ship is the responsibility of the assembly contractor. Thus on the basis of prime contracts the value of the huge aircraft and ship programs tends to pile up at the assembly plants; so plants fabricating parts and subassemblies, to say nothing of those manufacturing materials, are very much underrepresented in relation to their contribution to the war effort.

The prime contract data do not measure the war work being done in a state or other area for the reason that subcontracts are not covered at all, and contracts for the production of materials, capital equipment, and essential civilian goods are inadequately covered. Data on the geographic distribution of subcontracts are not available, but it is probable that in general subcontracts go to the plants that have the appropriate facilities and are not engaged on prime contract war work; they thus would tend to offset the concentration in certain states of most prime contracts.

The states having the lowest ratios of supply contracts to 1939 value of products are relatively unindustrialized--the Rocky Mountain area and many of the Southern states. Some of the manufacturing industry that these areas had in 1939--textiles and timber products, for example--is not as weighty in the war economy as it was in the pre-war economy. Other types of manufacturing--such as smelting and refining of metals--are fully engaged in the war effort but their products are not subject to prime contracts to any important extent.

Some of the relatively unindustrialized states rank high in the table by virtue of one or two major new war plants. Whether these plants form the basis for permanent expansion of industrial activity in the area or become ghost towns is one of the problems of the post-war economy.

Great interest also attaches to a distribution of contracts by size of firm, in comparison with the share which the firms of various size had of total volume of business before the war. Unfortunately data at present are not directly available to permit such comparison. But it is possible to study concentration in the distribution of supply contracts, in the sense of seeing what proportion goes to the firms that have secured the largest cumulative total of prime contracts. To some extent the largest contract holders are also the largest firms in the country. But the overlapping is far from complete; and the analysis in(Table 11 and Chart VII) can be used safely only as reflecting changes in the degree of concentration of contracts, not in the relative distribution of war work as compared with the distribution of pre-war business.

Supply contracts are heavily concentrated in that a small number of firms hold a large proportion of total value. Thus the ten firms with largest contract totals held, in September 1941, over 40 percent of all supply contracts then outstanding. 1/ And 100 firms even now hold contracts amounting to 70 percent of total value of all contracts (including those completed), or close to $60 billion worth. It is quite possible that this concentration of contracts contributes to increasing concentration of economic power in the hands of large firms; although such conclusion could be firmly established only upon further study.

The encouraging aspect of this analysis is that the degree of concentration in the distribution of prime contracts is declining. Thus the percentage of total value held by the 100 firms with largest contract totals declined from 79 at the end of 1941 to 70 at the end of 1942; with similar declines observed in the relative shares of the categories ranging from the largest 10 contract holders downward. With recent emphasis on greater participation of the smaller war plants in the prime contract distribution, this decline in the degree of concentration may be expected to continue.

1/ While the figures relate to contracts of over $50,000 each, the results would be affected but little by the inclusion of the smaller contracts.

Production Schedules

Of the various commodities and services on the military production programs, only a limited proportion can be secured by direct purchases out of existing inventories. For most, orders have to be placed far in advance of the possible date of delivery; and the total wanted must, therefore, be scheduled out so that the flow of the finished end products can be attained at the rates desired and at the time at which these end products are needed. Insofar as this need of scheduling affects most categories on the military production program, it also extends even to the items that can be purchased off the shelf; since the latter are to be used necessarily in conjunction with items whose production period is long and whose production, therefore, must be carefully planned in advance.

The production schedules, like the production program itself, are determined by the interplay of needs and of feasibility. The military need is to secure the maximum flow of military products in the shortest possible time. How quickly one can secure these products and in what quantities is determined by the capacity of the productive system. Production schedules reflect this compromise between needs and feasibility. But they differ from the programs in that they spell out with much greater detail the categories of end products; the time of production or delivery; and the productive units responsible for turning out the end products or components. In short, production schedules are the translation of the program into more specific plans for delivery of the numerous end-items or components, by short-time intervals through the period during which the program is to be attained.

Schedules of this character are vital in several ways. They represent the orders given to the productive system; constitute estimates of the time at which the various groups of end products called for are to be expected; provide the basis for plans for allocation of resources that are indispensable for the production of the end-items.

Production schedules have been available since early 1942 for most of the important categories in the military production program. It would be of little interest to trace their successive modifications, since for most items they have changed from month to month to take account of the changed situation with respect to both the supply of resources and the relative urgency of need. As will be indicated in Section I-3, the schedules that have actually evolved during 1942 contained a substantial margin of error in comparison with actual output attained--due to many factors than can be subsumed under the fluidity of military objectives when translated into specific items and the constant changes in the supply and availability of specific resources.

Here it might be of interest only to review one set of such production schedules;--the last one available for the military production program before its major revision at the end of the year. (Table 12 and Chart VIII) presents the schedules for the major categories in the form of index numbers, in which actual output in the first quarter of 1942 is taken as 100.

Several interesting features appear in these production schedules. For total munitions they call for a rise to a level in the last quarter of 1943 four and a half times as high as that attained in the first quarter of 1942. At the same time, the major increases were scheduled to be attained by the second quarter of 1943, the rise from that point to the last quarter being only about 5 percent. For several categories under munitions a much greater and more continuous increase was called for: in planes to a level in the last quarter of 1943 six times as high as the output in the first quarter of 1942, with large rates of increase continuing through 1943; in ground ordnance and signal equipment to a level in the last quarter of 1943 over seven times as high as the actual output in the first quarter of 1942, although the schedules were to attain their peak in the third quarter of 1943. In Navy and Army vessels, as well as in merchant vessels, the level in the last quarter of 1943 was to be only somewhat over three times that of the first quarter of 1942, with the peaks of the schedules being in the second quarter of 1943. In construction, as might be expected, the schedules attained their peak in the third quarter of 1942 with declines following thereafter so that by the last quarter of 1943 the output called for was back to a level not much higher than in the first quarter of 1942.

Another important feature of the schedules in Table 8 is the large and almost impossible increase that they indicate in the last quarter of 1942 as compared with the actual output in the preceding third quarter of the year. In total munitions the schedules called for a 50 percent increase over that single quarter; and in some of the munitions categories the schedules called for doubling or almost doubling of the third quarter production by the fourth quarter (signal equipment for planes, guns and fire control in ground ordnance, ground signal equipment, minor combat naval vessels. It was the realization of the improbability of attaining these schedules that provided an impetus for a revision of the program which took place in the last quarter of 1942. With this change made, the schedules shown in Table 12 retain only an historical interest. They have been replaced by new schedules geared to the objectives presented by the revised program, which will be discussed in Part II of this report.

CHART 32

UNITED STATES WAR PROGRAM:

1942 AND 1943 PRODUCTION PROGRAMS FUNDS AND COMMITMENTS

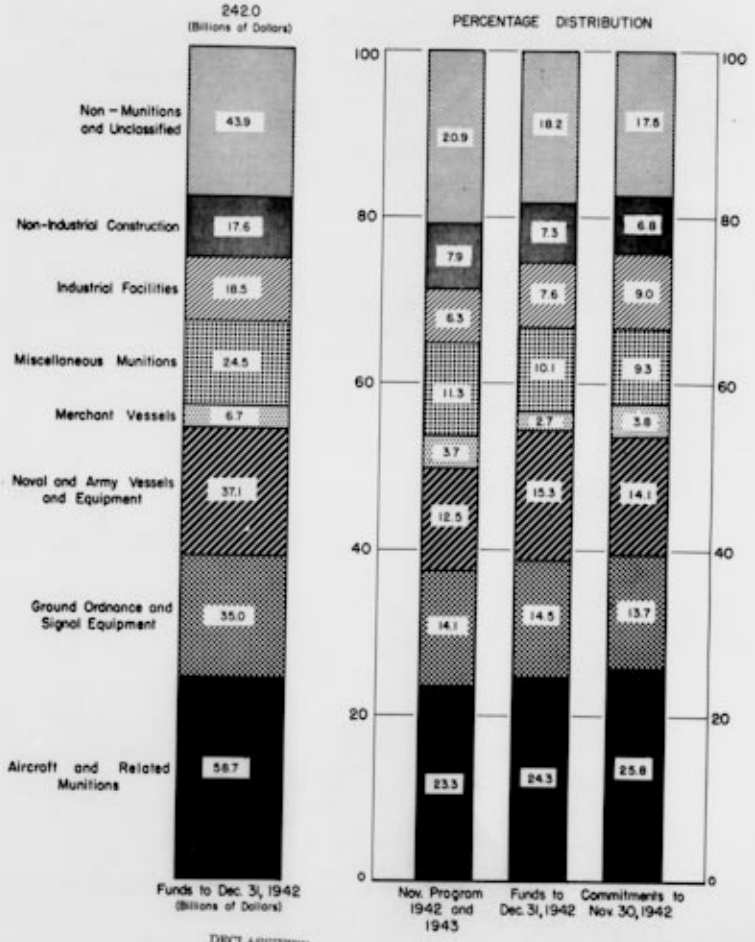
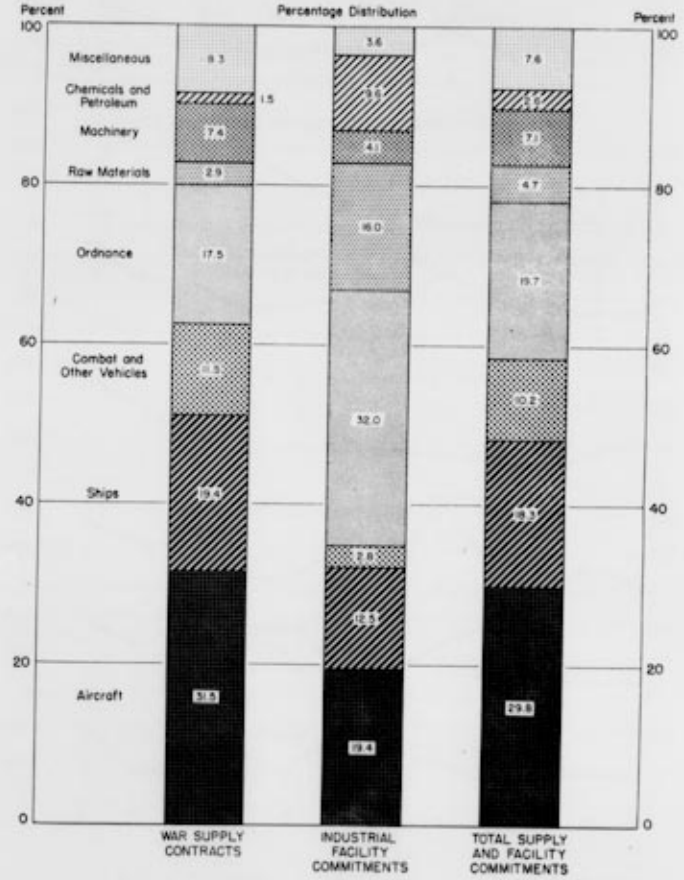


CHART 2

WAR SUPPLY CONTRACTS AND FEDERALLY FINANCED INDUSTRIAL FACILITY COMMITMENTS

BY TYPE OF PRODUCT

CUMULATIVE THROUGH NOVEMBER 1942



WAR PRODUCTION BOARD
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CHART 12

INDEX OF ARMY AND NAVY SUPPLY CONTRACT CLEARANCES AND FEDERALLY FINANCED INDUSTRIAL FACILITY COMMITMENTS

BY MONTHS, 1942

1942 AVERAGE = 100

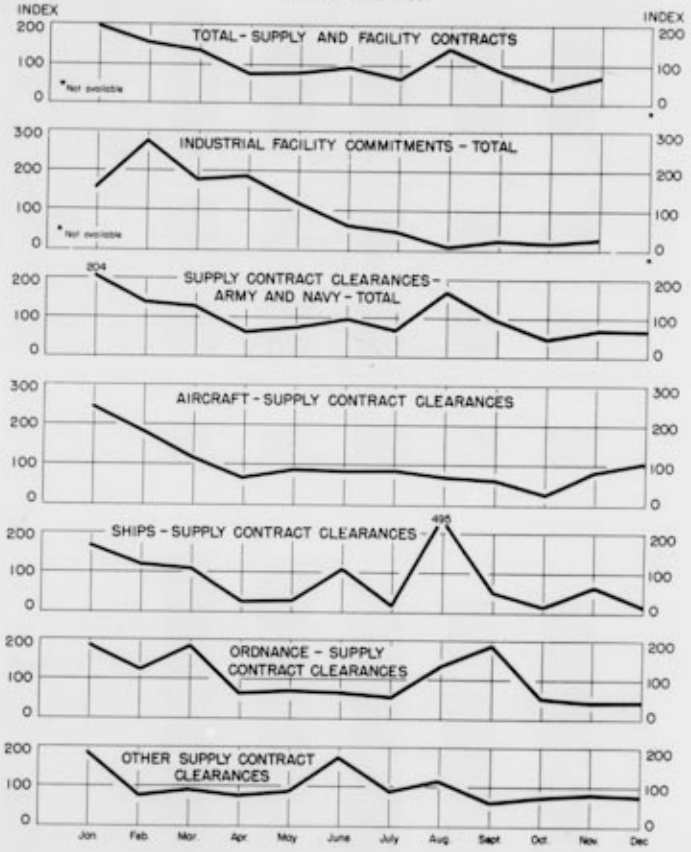

CHART 22

PERCENT OF ALL WAR SUPPLY CONTRACTS HELD BY 100 CORPORATIONS WITH LARGEST TOTAL OF CONTRACTS

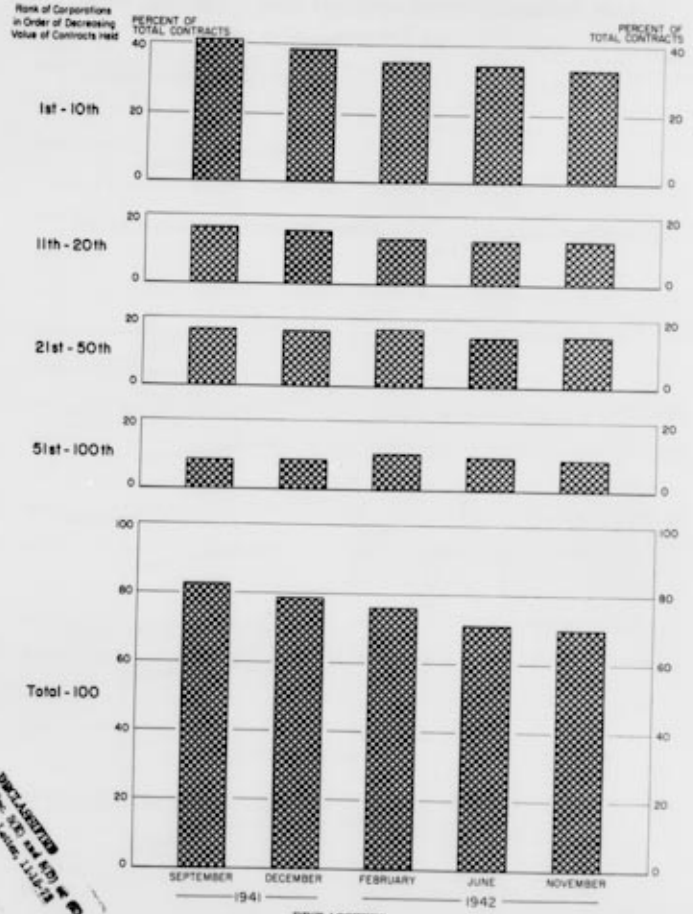

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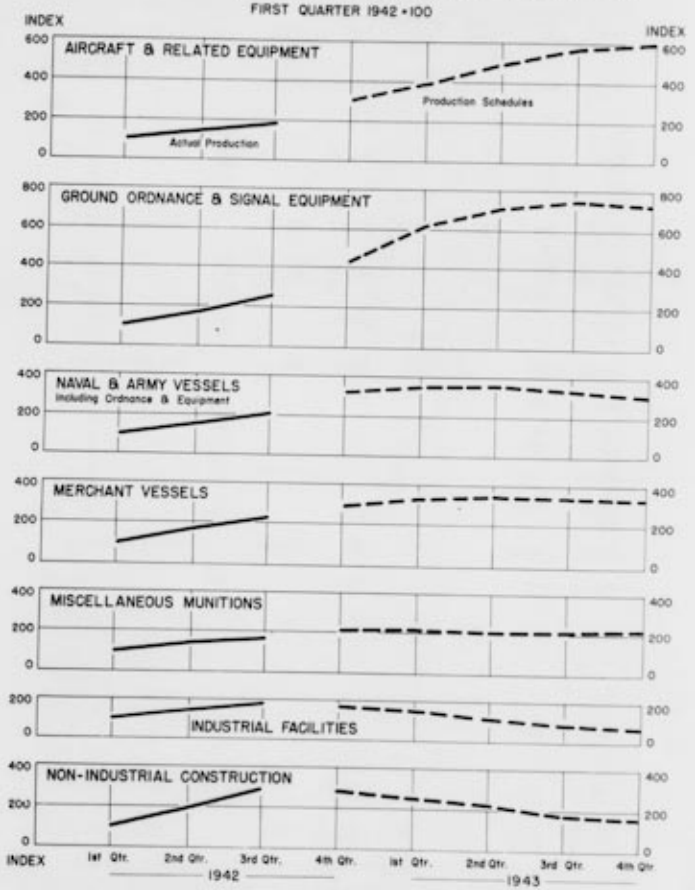
CHART III

INDEX OF ACTUAL PRODUCTION OF MUNITIONS & WAR CONSTRUCTION THROUGH THIRD QUARTER, 1942, & OF PRODUCTION SCHEDULES AS OF OCTOBER 1, 1942 THROUGH FOURTH QUARTER, 1943

FIRST QUARTER 1942 = 100



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E.O. 11652, Sec. 5(E) and 5(D) or (E)
Commerce Dept. Letter, 11-15-72
By RHP, Date

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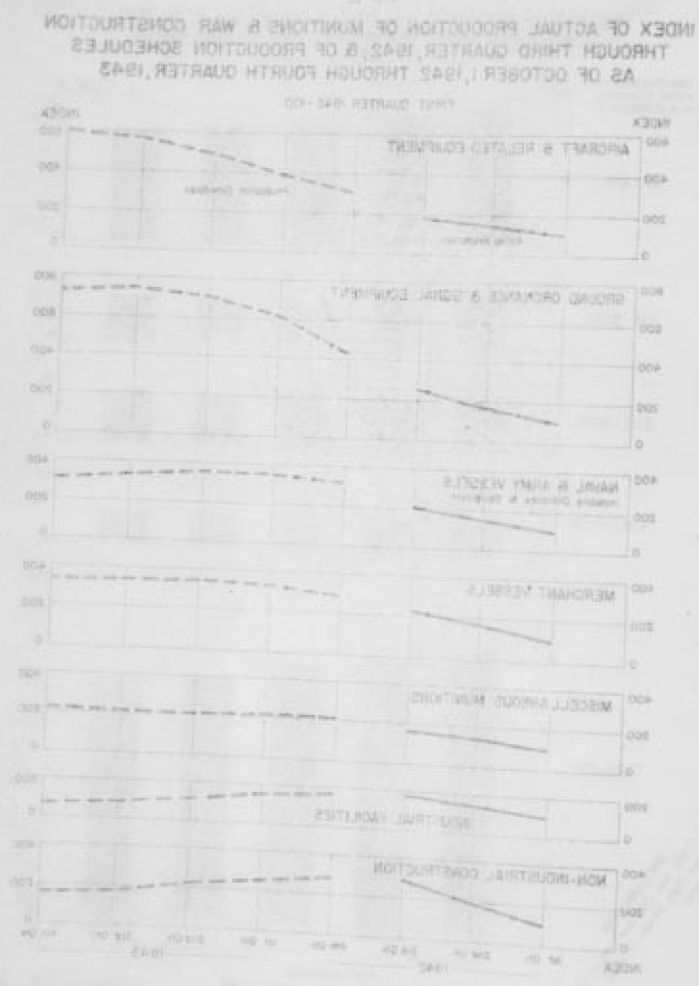

TABLE 5

Cash Appropriations and Net Contract Authorizations for The U. S. War Program by Agency and Date of Legislation a/
June 1940 Through December 1942

(Millions of Dollars)

Date	Acc't No.	Army	Navy	Maritime Comm.	Lend-Lease	Other Agencies	Total
June, 1940 to Dec. 31, 1941		32,033	15,279	2,412	12,985	3,108	65,817
1942							
Jan. 26	1676		28				28
30	422	12,526					12,526
Feb. 7	441		27,669				27,669
12	452					500	500
21	463	1	1			132	134
Mar. 5	474	22,566		2,932	5,425		30,923
Subtotal 1st Qtr.		35,093	27,698	2,932	5,425	632	71,780
Apr. 28	527	1				14	15
28	528	17,395	1,552			53	19,000
June 5	572					210	210
19	616					10	10
23	626		3,767				3,767
27	630			644 b/		47	691
Subtotal 2nd Qtr.		17,396	5,319	644 b/		334	23,693
July 2	644		3			259	262
2	645					9	9
2	646					110	110
2	647					228	228
2	648	1	1			9	11
2	649	42,090					42,090
2	650					32	32
25	676					1,842	1,842
Aug. 26	700		975				975
Subtotal 3rd Qtr.		42,091	979			2,489	45,559
Oct. 26	763		15,106			703	15,809
Permanent Appropriation		35	4				39
Transferred from Lend-Lease			13				13
Transferred from Commerce			1				1
Transferred to Navy					-13		-13
Defense Aid Special Fund						30	30
War Contributions and Deposits						8	8
Subtotal 4th Qtr.		35	15,124		-13	741	15,887
Total - June, 1940 through Dec., 1942		126,648	64,399	5,988	18,397	7,304	222,736

a/ Excludes authorizations for RFC and Subsidiaries.
b/ Includes liquidations as reported by the Bureau of the Budget as of Nov. 30, 1942.

TABLE 6

United States War Program: Funds
(Including RFC Authorizations and Foreign Contracts)
June 1940 Through December 1942

(Billions of Dollars)

	Cumulative: June 11, 1940 to:			Percent Distribution Cumulative Total to 12-31-42
	6-30-41	6-30-42	12-31-42 p/	
Total War Program	40.7	179.0	242.0	100.0
Total Munitions & War Construction	36.8	152.5	198.0	81.8
Total Munitions	28.6	119.7	162.0	66.9
Aircraft and Related Munitions	9.3	43.3	58.7	24.3
Ground Ordnance and Signal Equipment	4.6	25.3	35.0	14.5
Naval & Army Vessels and Equipment	8.9	27.2	37.1	15.3
Merchant Vessels	1.4	6.8	6.7	2.7
Miscellaneous Munitions	4.4	17.1	24.5	10.1
Total War Construction	8.2	32.8	36.0	14.9
Industrial Facilities	5.0	18.6	18.5	7.6
Non-Industrial	3.2	14.2	17.6	7.3
Non-Munitions	2.7	18.3	34.2	14.2
Unclassified	1.2	8.1	9.7	4.0

p/ Preliminary

TABLE 7

United States War Program: Commitments (Including RFC Authorizations and Foreign Contracts) June 1940 Through November 1942

(Billions of Dollars)

	Cumulative: June 11, 1940 to:			Percent Distribution Cumulative Total to 11-30-42
	6-30-41	6-30-42	12-31-42 P/	
Total War Program	32.6	137.4	181.9	100.0
Total Munitions & War Construction	29.2	116.7	150.0	82.5
Total Munitions	23.1	91.1	121.2	66.7
Aircraft and Related Munitions	7.9	37.8	47.0	25.8
Ground Ordnance and Signal Equipment	3.1	17.7	24.8	13.7
Naval & Army Vessels & Equipment	7.9	17.6	25.6	14.1
Merchant Vessels	1.4	6.5	6.9	3.8
Miscellaneous Munitions	2.8	11.5	16.9	9.3
Total War Construction	6.1	25.6	28.8	15.8
Industrial Facilities	3.5	16.1	16.4	9.0
Non-Industrial	2.6	9.5	12.4	6.8
Non-Munitions	2.2	12.7	22.1	12.2
Unclassified	1.2	8.0	9.8	5.3

P/ Preliminary

TABLE 6

Supply and Facility Commitments Cumulative Through December, 1941 and November, 1942

(Millions of Dollars)

	Cumulative Total Through December 1941	Cumulative Total Through November 1942	Increase in 1942	Percent Dist. of Cumulative Total Through Nov. 1942
Total-Supply and Facility Commitments	38,710	99,614	60,904	
Supply Contracts 1/ - Total	12,670	64,978	52,308	100.0
Aircraft	13,312	26,762	13,450	31.5
Ships	5,748	16,454	10,706	19.4
Combat Vehicles	734	4,601	3,867	5.4
Vehicles, except combat	1,802	5,213	3,411	6.1
Guns	2,884	6,919	4,035	8.1
Ammunition	2,023	6,544	4,521	7.7
Explosives and loading	1,119	1,481	362	1.7
Iron and steel products	628	2,131	1,503	2.5
Non-ferrous metals and products	129	342	213	.4
Machine tools	361	873	512	1.0
Machinery and electrical equip.	1,566	5,432	3,866	6.4
Chemicals	63	412	349	.5
Petroleum and coal products	313	805	492	1.0
Textiles and clothing	1,004	3,754	2,750	4.4
Miscellaneous manufactures	884	2,895	2,011	3.4
Non-manufactures	100	360	260	.5
Facility Contracts 2/ - Federally Financed - Total	6,040	14,636 3/	8,596	100.0
Aircraft, aircraft engines, parts and accessories	961	2,838	1,877	19.4
Ship construction and repair	909	1,828	919	12.5
Combat, transportation and other motor vehicles	155	408	253	2.8
Guns	383	818	435	5.5
Ammunition, shells, bombs, etc.	457	1,073	616	7.3
Explosives, ammunition loading and assembling	1,524	2,806	1,282	19.2
Iron and steel products	658	1,288	630	8.8
Non-ferrous metals and their products	462	1,048	586	7.2
Machine tools and other metal working equipment	31	154	123	1.0
Machinery and electrical equip.	108	450	342	3.1
Chemicals	243	1,177	934	8.0
Petroleum and coal products	37	230	193	1.6
Miscellaneous manufacturing	74	245	171	1.7
Non-manufacturing (power lines, etc.)	38	273	235	1.9

(Footnotes on following page.)

Footnotes for Table 8

1/ Includes all awards of $50,000 or more of Army, Navy, Maritime Commission, Treasury (defense aid only), and foreign purchasing missions reported by the procurement agencies through November 1941. Awards of U.S. War Agencies have been reported since June, 1940 and of foreign purchasing missions since September, 1939. Awards for foodstuffs and project orders to government operated establishments are excluded. Contracts awarded by these establishments to private industry are covered by the data.

The contract data for 1940 and 1941 are distributed by months according to the dates of the award differing in this respect from the data presented in Table 11 which are distributed by months according to the dates the awards were reported to the contract record. As there is a considerable lag in the reporting of awards to the contract record this distinction is important. Owing to the practice of adding supplements to the original contract and exercising options to increase the contract, the total for 1941 is overstated and the total for 1942 understated by about three and one-half billions. This practice is particularly important in the aircraft group. The 1942 data are subject to further understatement of a substantial character in view of the lag in reporting awards to the contract record.

2/ Includes commitments, letters of intent, and contract awards of $25,000 and over approved by the War Department, Navy Department, Maritime Commission, Defense Plant Corporation, Reconstruction Finance Corporation, and British Ministry of Supply Mission. Excluded are commitments for pilot training, Reconstruction Finance Corporation loans for working capital, and commitments for the purchase of machine tools by the War Department, Navy Department, and Defense Plant Corporation.

3/ Includes projects estimated to cost $453 millions which have been deferred.

TABLE 9

Army and Navy Supply Contract Clearances and Industrial Facilities Commitments, by Type of Product and by Months, 1942

(Millions of dollars)

	1942												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Supply Contract Clearances - Army & Navy - Total 1/	10,448	5,978	6,489	3,050	3,738	5,058	3,415	8,137	4,857	2,143	3,287	3,430	61,450
Aircraft	4,595	3,456	7,114	1,306	1,541	1,571	1,622	1,531	1,175	529	1,610	1,571	22,796
Ships	1,351	944	853	183	230	853	133	4,005	400	141	502	85	9,771
Ordnance	2,644	1,812	2,612	877	971	916	742	1,492	2,690	742	571	586	17,077
Other	1,858	788	910	784	896	1,718	898	1,119	600	738	804	785	11,858
													Jan.-Nov.
Industrial Facilities Commitments - Total 2/	1,738	2,158	1,396	1,454	927	488	367	38	168	131	231	3/	8,536
Aircraft, engines, parts & accessories	201	156	349	489	129	301	47	69	73	5	52		1,877
Ship construction & repair	109	276	157	85	70	12	56	12	52	17	78		944
Combat transportation & other motor vehicles	80	65	29	4	41	12	18	3	5/	2	-1		253
Guns	133	113	59	94	-13	8	18	-14	15	15	9		437
Ammunition, shells, bombs, etc.	120	44	265	60	55	33	55	-29	4	5	4		616
Explosives, ammunitions loading & assembling	200	671	37	199	247	52	-39	-85	-7	3	4		1,282
Iron and steel products	176	119	182	28	87	-18	77	39	-14	-3	17		690
Non-ferrous metals and their products	43	286	39	111	-14	11	46	26	-8	16	30		586
Machine tools and other metalworking equip.	26	28	16	34	16	2	1	-5	-	5/	9		127
Machinery and electrical equipment	55	71	107	65	4	19	14	-19	16	3	2		337
Chemicals	98	212	81	218	266	19	30	-27	7	16	14		934
Petroleum and coal products	4	77	34	-2	12	27	1	38	1	-2	3		193
Miscellaneous manufacturing	8	20	36	27	15	26	8	27	-2	1	5		171
Nonmanufacturing (power lines, etc.)	17	20	10	42	7	4	40	5	25	63	4		237

1/ Since June, 1940, WPB (or predecessor agency) pre-approval has been required before award of major Army and Navy contracts. Generally speaking, letters of intent and other letter awards have been cleared if of specified dollar size. During 1942, all Navy contracts of $500,000 or more have been cleared. During January, February, and March, 1942, the clearance minimum for Army was $1 million and for the remainder of the year $5,000,000. This change in the clearance minimum means that for the first three months of 1942 Army clearance totals are higher by 10 or 15 percent as compared with the remainder of 1942. The planning of procurement is reflected in the record of contracts approved for award. The clearance record cannot, however, be used as an exact measure of procurement. Some approvals do not result in a commitment to industry for a considerable time after clearance and in other cases plans are changed and no award is executed; sometimes the award as made differs substantially from the award as cleared. Contract cancellations, moreover, are generally not reported to the clearance records. The monthly record of clearances, therefore, differs substantially from the contract data presented in Table 8. Despite these limitations, the clearance data are a reliable indicator of the overall trends in procurement.

2/ Includes commitments approved by the War Department, Navy Department, Maritime Commission, Defense Plant Corp., Reconstruction Finance Corp. and British Ministry of Supply Mission. Excluded are commitments for pilot training, RFC loans for working capital and commitments for the purchase of machine tools by the War Department, Navy Department and Defense Plant Corp. Included are projects estimated to cost $453 million which have been deferred. Deferments by months were as follows: July, $129 million; August, $90 million; September, $35 million; October, $20 million; November, $173 million.

3/ Not available.

5/ Less than $500,000.

TABLE 10

State Distribution of Prime War Supply Contracts and Federally Financed Industrial Facility Contracts Compared with Value of Manufactures

(Millions of Dollars)

States 1/	War Supply Contracts 2/	Industrial Facility Contracts 3/	Value of Manufactures in 1939	Ratio - Value of Supply Contracts to Value of Mfgs. (1) ÷ (3)
	(1)	(2)	(3)	(4)
Washington	2,801	239	637	4.40
Connecticut	4,446	213	1,230	3.62
Kansas	1,524	273	464	3.28
California	8,252	690	2,798	2.95
Delaware	248	22	115	2.16
Maryland	2,175	202	1,027	2.12
Maine	680	29	345	1.97
Michigan	8,268	1,077	4,348	1.90
New Jersey	6,440	425	3,429	1.88
Mississippi	280	59	175	1.60
Massachusetts	3,772	295	2,460	1.53
Oklahoma	454	186	312	1.46
Florida	346	52	242	1.43
Ohio	6,224	1,162	4,585	1.36
Oregon	486	71	365	1.33
Indiana	2,799	910	2,228	1.26
Texas	1,879	856	1,530	1.23
Wisconsin	1,847	375	1,605	1.15
Virginia	1,118	204	989	1.13
New York	7,752	894	7,134	1.09
Alabama	548	380	575	0.95
Pennsylvania	5,035	1,129	5,476	0.92
Illinois	4,332	1,048	4,795	0.90
Nebraska	244	88	273	0.89
Missouri	1,150	505	1,388	0.83
Rhode Island	361	56	516	0.70
Minnesota	580	268	846	0.69
Colorado	136	135	222	0.61
Vermont	61	4	103	0.59
Georgia	384	98	677	0.57
West Virginia	238	249	442	0.54
Iowa	371	152	718	0.52
Tennessee	364	262	728	0.50
Louisiana	272	338	565	0.48
South Carolina	158	40	398	0.40

TABLE 10
(Concluded)

State Distribution of Prime War Supply Contracts and Federally Financed Industrial Facility Contracts Compared with Value of Manufactures

(Millions of Dollars)

States 1/	War Supply Contracts 2/	Industrial Facility Contracts 3/	Value of Manufactures in 1939	Ratio - Value of Supply Contracts to Value of Mfrs. (1) ÷ (3)
	(1)	(2)	(3)	(4)
New Hampshire	93	31	237	0.39
Utah	62	228	167	0.37
Arkansas	52	220	160	0.33
Arizona	28	93	98	0.29
Kentucky	130	198	481	0.27
North Carolina	373	41	1,421	0.26
District of Columbia	5	19	80	0.06
New Mexico	1	3	25	0.04
Idaho	3	14	91	0.03
South Dakota	2	--*	81	0.03
Montana	3	17	152	0.02
Wyoming	1	7	46	0.02
North Dakota	--*	--*	44	0.01
Nevada	--*	106	21	--
Total	76,778	13,962	56,944	1.35

1/ States are ranked in the order of ratio of value of supply contracts to value of manufactures.

2/ Includes all awards of $50,000 or more of Army, Navy, Maritime Commission, Treasury (defense aid only), and foreign purchasing missions reported by the procurement agencies thru November, 1942 Awards of U. S. War Agencies have been reported since June, 1940 and of foreign purchasing missions since September, 1939. Contracts of $7,865 millions are not distributed by States and off-continent contracts come to $338 millions.

3/ Includes facilities estimated to cost more than $25,000 which are direct obligations of the War and Navy Departments (including financing through Government Supply and Emergency Plant Facility Contracts), Maritime Commission, Defense Plant Corporation, United Kingdom, and loans of the Reconstruction Finance Corporation; and also includes 11 projects totaling $146,161 thousand deferred by the War Department and 33 projects totaling $307,128 thousand deferred by other agencies. Contracts of $569 million are not distributed by states, and off-continent contracts come to $105 million.

* Less than $500,000.

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TABLE 11

Percent of All War Supply Contracts Held By One Hundred Corporations With Largest Total of Contracts As of Selected Months
Sept., 1941 Through Nov., 1942 1/

Rank of Corporations In Order of Decreasing Value of Contracts Held	1941		1942		
	Sept.	Dec.	Feb.	June	Nov.
1st - 10th	41.2	38.6	35.4	34.3	33.4
11th - 20th	16.3	15.4	13.4	12.8	12.9
21st - 30th	7.9	7.4	7.3	6.6	7.0
31st - 40th	5.1	5.0	5.5	4.6	4.7
41st - 50th	3.7	3.7	4.0	3.3	3.2
51st - 75th	5.0	5.2	6.5	5.8	5.4
76th -100th	3.4	3.5	3.9	3.6	3.5
Cumulative					
1st - 10th	41.2	38.6	35.4	34.3	33.4
1st - 20th	57.5	54.0	48.8	47.1	46.3
1st - 30th	65.4	61.4	56.1	53.7	53.3
1st - 40th	70.5	66.4	61.6	58.3	58.0
1st - 50th	74.2	70.1	65.6	61.6	61.2
1st - 75th	79.2	75.3	72.1	67.4	66.6
1st -100th	82.6	78.8	76.0	71.0	70.1
Value of All Contracts (Billions of Dollars)	16.4	21.5	30.9	55.4	85.0

1/ Based on all supply contracts of $50,000 or more reported through the specified month. Includes awards of Army, Navy and Maritime Commission and defense aid awards of Treasury since June 1, 1940 and awards of British and other foreign purchasing missions since September 1, 1939. The figures previously prepared as of the end of September, 1941, have been revised to include contracts of Maritime Commission. Contracts of Treasury and of foreign countries are not included in the data for September and December, 1941 and February, 1942; these awards represent a relatively small proportion of the total. For each period, the 100 corporations is the group having the largest contract holdings cumulative through the terminal month of the period.

TABLE 12

Index of Production Schedules as of October 1, 1942 1/

(First Quarter, 1942 = 100)

	1942				1943			
	1st Quarter 2/	2nd Quarter 2/	3rd Quarter 2/	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Total Munitions and War Construction	100	155	207	276	315	337	344	340
Total Munitions	100	150	198	300	366	413	437	438
Aircraft and Related Equip. - Total	100	143	185	301	388	491	567	600
Planes - Total	100	128	163	247	338	466	477	535
Combat	100	129	184	253	348	582	615	666
Service	100	159	248	417	566	803	1,034	1,424
Trainer	100	114	136	154	175	203	220	199
Gliders and Lighter-than-Air Ships	100	150	1,000	250	2,775	3,000	3,000	3,025
Aircraft Ordnance	100	145	173	284	395	453	510	497
Spares	100	158	196	274	343	453	543	609
Other Equipment, Maintenance, and Operations	100	164	231	500	607	624	570	497
Signal Equipment	100	271	424	867	1,196	1,111	796	429
Other	100	131	173	391	430	477	502	518
Ground Ordnance and Signal Equip.	100	168	252	427	616	707	745	726
Combat Vehicles	100	140	200	307	538	670	736	734
Guns and Fire Control	100	178	278	589	746	792	826	806
Ammunition	100	179	241	362	524	611	628	619
Signal and Related Equipment	100	245	633	1,188	1,467	1,506	1,536	1,254
Naval and Army Vessels, including Ordnance and Equipment	100	153	210	316	348	354	333	306
Naval Vessels - Total	100	128	145	215	262	275	260	246
Major Combat	100	113	114	156	177	168	157	156
Minor Combat	100	176	222	419	552	652	660	634
Auxiliaries and Conversions	100	133	177	208	256	251	188	135
Naval Equipment and Maintenance	100	240	282	378	350	369	350	337
Naval Ordnance	100	162	246	385	532	561	564	503
Transports, Landing Vessels and Army Auxiliaries	100	270	1,422	2,543	1,674	1,235	826	556
Merchant Vessels - Total	100	170	228	288	327	339	332	326
Ocean-going	100	168	223	272	314	334	331	326
Other	100	267	450	983	883	550	383	350
Miscellaneous Munitions - Total	100	140	161	205	206	201	205	209
Automotive Vehicles	100	135	154	158	166	158	158	156
Other	100	142	164	227	223	221	227	232
Total War Construction	100	166	229	218	194	161	126	110
Industrial Facilities	100	144	179	162	143	112	82	69
Other	100	194	290	286	249	220	179	160

1/ Indexes based on summation of schedules for individual items weighted by dollar value.
2/ Based on actual productions.

I-3 Output of Munitions and Military Construction

War production forged ahead mightily in 1942, the $58.7 billion total of munitions, construction, and non-munitions equalling three and a half times the 1941 figure of $16.5 billion and almost twenty times the second-half 1940 level of $3.0 billion (Table 13 and Chart IX). The rapid growth in total war output started after Pearl Harbor, and the sharpest monthly increase occurred in April, 20 percent above the preceding month. March and June witnessed the next largest monthly increases, 16 percent each. The rate of increase in the total tapered off sharply after the second quarter of 1942; in September and October the rate of increase was only 4 and 3 percent, respectively, in November 7 percent, and in December 8 percent.

The three major components of this war output - munitions, construction (publicly financed), and nonmunitions - have constituted shifting proportions of the total (Chart X). In the last half of 1940 munitions comprised 59 percent of the total; in 1941, this proportion fell to 51 percent, but in the next year it rose back to 55 percent. Since nonmunitions have been comprising a fairly constant proportion of the total, about one fifth, the changes in the munitions proportion have been offset by corresponding changes in the construction proportion. This latter rose from 21 percent in last half of 1940 to 29 percent in 1941 and then fell to 24 percent in 1942. The proportion of construction to the total reached a peak in the second and third quarters of 1942, and has been falling off sharply since that time. Beginning in September, 1942, even the absolute total of construction declined in every month except December; and the construction program is scheduled to fall off both absolutely and relative to the total in 1943.

Munitions Output

The output of munitions in 1942 has been evaluated at $32.5 billions, a dramatic increase over the $8.4 billion recorded in 1941 and the $1.8 billion in the second half of 1940. The principal components of this total are aircraft, ships, ground ordnance, and miscellaneous. The value of aircraft and related munitions increased from $414 million in the last half of 1940 to $2.2 billion in 1941 and $9.2 billion in 1942. The output of Navy, Army, and merchant vessels, including Naval ordnance and other Naval equipment, followed closely the rising trend of aircraft production, and at about the same level. The merchant ship component of this total, however, increased somewhat more rapidly than did the output of Army and Navy vessels. The increase in ground ordnance (including signal equipment) was not quite as sharp from 1941 to 1942 as that in aircraft and vessels, but the rise from 1940 to 1941 was considerably steeper. Miscellaneous munitions, including such items as automobiles, clothing, and other equipment, reached almost the same level in 1942 as the other three major items--aircraft, ground ordnance, and ships--but started at a level in the last half of 1940 considerably higher than any of these three.

The monthly rate of increase during 1942 in munitions output, as in total war production, showed signs of slackening as the year progressed. The peak monthly increase occurred in April, in which munitions output was 19 percent above March. Thereafter, the rate of increase fell off to a low point of 4 percent in October. In the next two months, however, the gains in munitions output were considerable 13 percent in November and 14 percent in December. 1/

The monthly rate of change in the principal components of munitions follows a course roughly similar to that for the total. Some aberrations occur, such as April and October declines in plane output, March and October declines in merchant vessel output, and the February decline in Naval vessels; but these may be partly a result of reporting methods. In general the monthly rate of increase was high in the forepart of the year, fell off in the summer, and,for everything except Naval and Army vessels, shot back up again in the last months of the year. This last-mentioned component, after starting off the year with a decline in February, maintained thereafter a high rate of increase through September; in the last quarter of the year, however, the monthly increases were quite moderate.

For most types of munitions, the output in the fourth-quarter of 1942 was three or four times that in the last quarter of 1941, in dollar terms. Some groups of items, however, showed considerably larger increases: output of ground signal and related equipment and service planes increased 7 times, aircraft ordnance 6 times, and ground ordnance and signal equipment as a whole, 6½ times. Combat munitions, covering all munitions except miscellaneous, made up 36 percent of the total war output (including nonmunitions) in 1941, 43 percent in the full year 1942, and 47 percent in the last quarter of 1942. This upward trend in the proportion of combat to total war output is scheduled to continue in 1943.

Throughout 1942 aircraft and related equipment comprised about 30 percent of total munitions, the proportion being the same at the end of the year as at the beginning (Chart X). The proportion of planes to other aircraft and equipment declined from 49 percent in the first quarter to 39 in the second, the output of spares, aircraft ordnance, and especially "other equipment, maintenance and operations" increasing more rapidly than that of planes. Naval and Army vessels and merchant ships, like aircraft, maintained a steady proportion - slightly less than 30 percent - of total munitions output during 1942. Moreover, the ratio of 4 to 1 between Naval and Army vessels and merchant ships persisted through the year. The major shifts in 1942 in the composition of the munitions output was in ground ordnance and signal equipment, which increased from 17 percent of the total in the first quarter to 23 percent in the last, and in miscellaneous munitions (automotive vehicles, clothing, etc.), which decreased from 26 to 19 percent of total munitions over the same period.

1/ December output has been exaggerated somewhat by attempts to "clean up" and make a good showing for the year.

Aircraft and Ships

In any survey of munitions output in 1942, chief interest centers naturally on the aircraft and shipbuilding accomplishments. In both of these fields, rapid strides forward were made in 1942.

The output of military airplanes totalled nearly 48,000, about 2½ times the number produced in 1941 (Table 14). Almost 24,000 of these planes were bombers and pursuits, the production of which was almost three times that of the year before. Moreover, these fighting planes accounted for a larger proportion of the total in 1942 than in 1941.

The increase during the year was particularly marked in the case of bombers, whose final quarter acceptances were almost 2½ times those of the first quarter. The 140 percent gain contrasts with an increase of two-fifths over the same period in pursuits, and an even smaller gain in other types of planes.

Combat planes received principal emphasis during the year, but the output of air transports also moved forward. Moreover, while it is true that most of the year's output consisted of models already in production at the first of the year, several new models were coming into large-scale production at the end of the year and a marked trend toward heavier fire power could be observed.

The attempt to fulfill the 1942 program for military planes--the Presidential objective called for 60,000--encountered difficulties at several points. Shortages developed in machine tools and several critical parts and accessories. Some fabricated materials--aluminum, alloy-steel forgings--were bottlenecks and shortages of skilled workers were encountered.

Naval vessels completed during the year reached a total of 900,000 standard displacement tons, almost three times as much as was delivered during the preceding eighteen months. Combat vessels constituted about a half of this tonnage, while landing vessels (the output of which jumped sharply in the middle of the year) made up the largest segment of the balance.

The combined output of battleships, cruisers, destroyers and submarines surpassed that of any previous year in our history. Four battleships were added to the fleet, an aircraft carrier, 8 cruisers, and 81 destroyers. Losses more than offset production of aircraft carriers and heavy cruisers, however, and deficiencies in these lines, as well as in escort vessels, have yet to be made good.

Merchant ship production in 1942 totalled more than 8 million deadweight tons of all types. Dry cargo ships (about 600 Liberty ships were delivered) comprised the great bulk of this total; about 1 million deadweight tons of tankers were produced. Total merchant ship production

in 1942 was almost 7 times 1941 output, the annual rate increasing from 3 million deadweight tons in the first quarter to 12 in the final quarter.

The North African offensive and the submarine menace pointed up during 1942 the importance of the landing craft and subchaser building programs. Production of landing craft in 1942 jumped ahead strongly in May and continued to increase steadily until August when output became stabilized at about 1,000 craft a month. Production for the year of 6,932 was about 8 times 1941 output. Although the relative increase during 1942 in subchasers was even greater than that of landing craft, the absolute output is more modest and seems to have become stabilized in August at about 35 subchasers per month. Only six were produced in all of 1941 compared with 298 in 1942; even in the first quarter of 1942 less than 15 were commissioned. No destroyer escorts and corvettes--also important in the submarine warfare - were produced in 1942.

It is more difficult to summarize in physical terms the output of Army ordnance and signal equipment, but the details for the important items are shown in Table 14.

Construction and Nonmunitions

The decline in war construction, both absolute and relative to total war production, has already been noted. Like the munitions items, the monthly gain in war construction was greatest in the forepart of 1942, the peak gain occurring in April (Table 13). Thereafter the monthly rate of gain decreased, becoming negative in September. By the year-end the rate of decrease had become sizable - 8 percent in November and 7 in December. The rate of increase in early 1942 for other construction (direct military, war housing and public works) was sharper, and more persistent than that for industrial facility construction (including machinery and equipment). Hence, even though other construction's rate of decline in late 1942 was greater than that of industrial facilities, the proportion of the former to total construction rose from 47 percent in the first quarter to 51 percent in the last, while the proportion of industrial facilities to the total declined commensurately over the same period. This shifting composition of total war construction in 1942 reverses a tendency, established in the earlier years, for industrial facility construction to outrun other construction. In the last half of 1940 industrial facilities were 35 percent of the total and in 1941 they were 46 percent; the proportion of other construction to the total declined commensurately over the same period.

Nonmunitions (military pay, subsistence, and travel; civilian pay; agricultural and miscellaneous expenditures) increased in 1942 pari passu with munitions and construction output. Two of the key factors accounting for this increase in nonmunitions are the boost in military pay rates in June, 1942 and the growth in the size of the armed forces. The total number of officers and men (including Navy nurses) increased from half a million at the end of July 1940 to over

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2 million at the end of 1941 and up to 7 million at the end of 1942 (Table 15). The expansion in 1942 was sharpest in the Fall and early Winter months: 2 1/3 million men were added to the armed forces in the last four months of the year. Although the largest additions to the armed forces in 1942 occurred in the Army, which increased from 1.9 million men in January to 3.1 in June and then to 5.4 in December, larger relative increases were registered by the other services. The Navy increased from 435 thousand men in January to 1,221 in December; the Marine Corps from 98 to 238; and the Coast Guard from 34 to 140.

International Aid

Not all of United States war production was assigned to this country: a significant proportion was allocated to our Allies either under Lend-Lease or direct purchase.

Exports of military items rose sharply in 1942 and in several categories more than tripled their 1941 level (Table 16). The most spectacular increase occurred in tanks and parts, exports of which rose from $4 million in the first quarter of 1941 to $94 million in the corresponding quarter of 1942 and continued on up to $168 million in the closing quarter of the year. Exports of ordnance and ammunition also rose sharply, from $45 million in the first quarter of 1941 to $136 in the first quarter of 1942 and $375 in the final quarter of 1942. Aircraft and parts (exclusive of fly-aways), even though exported in sizable volume in 1941 - mainly through direct purchase - nevertheless showed almost a 100 percent increase in 1942. Finally, exports of motor vehicles and parts (excluding tanks) remained at an even keel in 1941 but doubled in 1942.

Even though exports of munitions increased sharply to our Allies in 1942, they did not keep pace with the increasing rate of our munitions production (Chart XI). For example, the relative decline from the first to the fourth quarter was about 10 percent for two major categories of munitions--aircraft and related munitions, and ground ordnance (including combat vehicles and all ground signal equipment). The proportion of Lend-Lease exports to production in 1942 remained fairly steady, but with the completion of foreign direct contracts the level of cash purchase exports was not maintained.

Approximately two out of every five bomber and pursuit planes off our production lines went to the other United Nations during the period July 1, 1940 to December 31, 1942; at the same time, we sent one out of every ten service combat planes produced and one out of every six trainers. In this period, moreover, one out of every three medium tanks and two out of every five light tanks produced by the United States went to the other United Nations. Nevertheless, a comparison of the complete planes and tanks transferred under Lend-Lease and delivered under direct foreign contracts with the volume of our production reveals the same downward tendency in the proportion of munitions being sent to our Allies as is evident in the distribution of total munitions.

Not all the International Aid afforded by this country to its Allies consisted of munitions exports: two other forms of Aid were given in sizable quantities. In the first place, exports of non-munitions (machinery and tools, petroleum products, other industrial commodities including miscellaneous manufactures, and agricultural products) rose from $3.7 billion in 1941 to $4.5 in 1942: the corresponding totals for munitions exports were $1.5 and $3.3 (Table 16). The greatest increase in nonmunitions occurred in agricultural exports which aggregated $1.3 billion in 1942, more than 50 percent above the 1941 level. Industrial and other commodities increased 13 percent from $2.8 billion in 1941 to $3.2 billion in 1942; the largest gain in this group, 28 percent, took place in metals which totalled nearly $940 million in 1942.

In the second place, some of this country's aid to allies consisted of goods transferred but not reported as exported; servicing and repair of ships and other defense articles; rental of ships, ferrying of aircraft, etc.; production facilities in the U.S.; and miscellaneous expenses (Table 17). The first of these, goods transferred but not reported as exported, totalled $169 million in 1941 and $953 million in 1942. The remaining four items, termed "other Lend-Lease aid", aggregated $334 million in 1941 and $1,371 million in 1942.

A summary of the growth and magnitude of total International Aid authorized by the Congress appears on Chart XII. In 1942 transfer authorizations to war agencies of $37 billion and direct appropriations to the President of $5.4 billion raised to $59.5 billion the maximum international aid that Congress has made available since March, 1941. Additional direct orders for war materiel by foreign government amounted to less than $250 million in 1942 and increased the total of foreign direct orders placed in this country since the start of the war to $4 billion. This makes a grand total of authorized International Aid at the end of 1942 of about $64 billion.

Actual vs Scheduled Output

An outstanding characteristic of the war production program in 1942 was the persistence with which actual output differed from scheduled or forecast output month by month. In general, production predicted at the first of each month was increasingly optimistic, and actual performance against the schedules became increasingly wide of the mark. As a consequence, the first-of-the-month schedules offered by the Services had limited validity, and grew worse rather than better.

The record over the four quarters of 1942 is given in Table 18 for 50 selected munitions items. The decline over the year in the percentage of actual production in a given quarter to the first-of-the-quarter forecast is evident for a majority of the items. For example, the first quarter production of 2-engine medium bombers was 137 percent of the first quarter forecast made on January 1; the corresponding percentage for the second quarter was 95, for the third 84, and for the fourth 72.

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The details of Table 18 are summarized in the following tabulation, which shows for each quarter the number and percent of total munitions items for which the comparison of actual against forecast output was made, the number and percent of total for which actual output fell more than 10 percent below the forecast, the number and percent of total for which actual output was more than 10 percent above the forecast, and, finally, the number and percent of total for which actual output neither exceeded nor fell short of scheduled output by more than 10 percent:

Number and Percent of Total Items in Table 18 For Which -

1942	Comparison of Actual With Scheduled Output Was Made		Actual Fell Short of Schedule by More Than 10%		Actual Exceeded Schedule By More Than 10 Percent		Actual Was 10 Percent or Less of Schedule	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
1st Quarter	34	100	9	27	14	41	11	32
2nd Quarter	43	100	14	33	13	30	16	37
3rd Quarter	47	100	22	47	13	28	12	25
4th Quarter	50	100	27	54	7	14	16	32

The percentages in the foregoing table are plotted on Chart XIII and illustrate clearly that the proportion of items seriously over-estimated (the solid part of the bar) increased from quarter to quarter, at the same time that the proportion seriously under-estimated (the cross-hatched part) fell steadily. Moreover, the proportion of items over-estimated exceeded that underestimated in every quarter save the first; in the last quarter the former was almost four times the latter. Finally, the proportion of the items in the sample for which actual output fell within the 10 percent tolerance limits of the schedule remained fairly constant at about one-third throughout the year.

This picture prompts two questions: Why were the schedules so wide of the mark? And what were the implications of such forecasts? With reference to the first question, several explanations present themselves: 1. The objectives were too high, and there was pressure so to construct the schedules that "on paper" the goals would be met; 2. As critical resources became scarcer, schedules were boosted in order to strengthen the claim of the competing Services on such resources; 3. The coordination of the country's resources in an attempt to meet these schedules was insufficiently rigorous; and 4. The schedules were not subjected to a centralized review and control. This decentralization existed not only among, but also within, agencies; so that even for a given Service the least important items were pushed as vigorously as the most important.

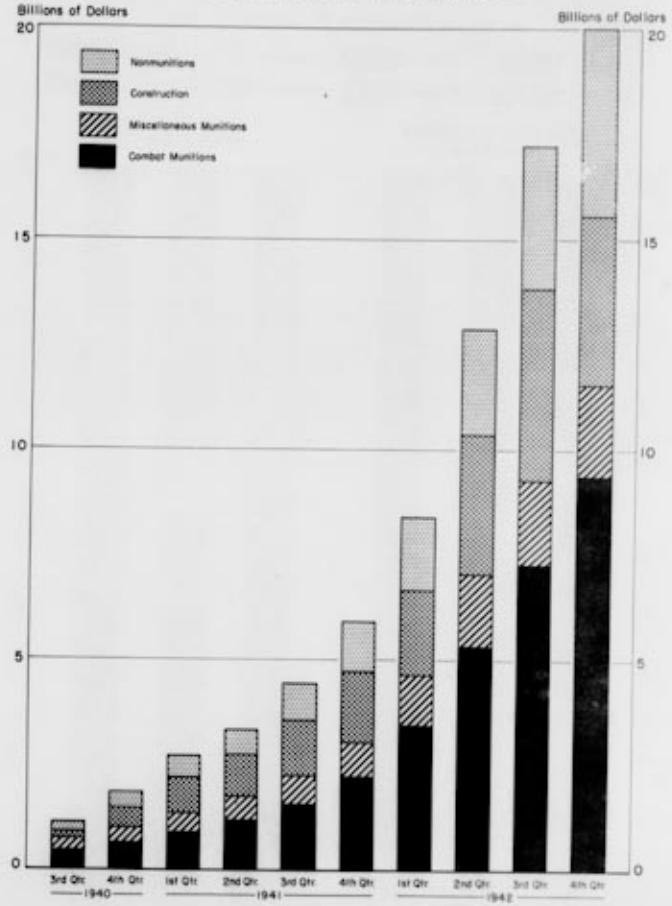
The implications of such consistently optimistic forecasts became serious, when, as in 1942, the pressure upon our means of production became so great that unutilized resources were simply not available to lend flexibility to our production plans. When there are not enough resources to go around, the lack of balance in munitions end-products resulting from poor scheduling means an inefficient use of labor and materials: large inventories of temporarily-unusable equipment and components exist at that same time that the output of other critical items is wanting materials, labor, and facilities. Furthermore, had the schedules been prepared realistically, it would have been obvious early in 1942 that the objectives were out of line with resources and the goals could have been brought down to the limits of feasibility, thereby requiring early in the year a complete review of the entire program. In addition, the incorrect schedules pointed up some problems that, once program and resources are brought into line, disappeared; and they glossed over other problems whose import is revealed only as the entire program is reviewed within the framework of general feasibility. Finally, as pointed out above, optimistic schedules that were used as a basis for claiming scarce materials and other resources were necessarily destined to become more optimistic as these resources became more scarce. As analytically useful predictions of war output, therefore, the schedules were seriously defective.

Late in 1942 a major step forward in the resolution of this problem was made with the introduction of the Controlled Materials Plan and of a centralized W.P.B. review of schedules. The two innovations go hand in hand, and are expected to result not only in a more rigorous coordination of the country's resources but also in the determination of more realistic and meaningful production schedules. There is considerable prospect, therefore, that the problem of actual vs. scheduled output will be largely eliminated in 1943.

CHART IX

THE GROWTH IN THE VALUE OF UNITED STATES WAR OUTPUT

THIRD QUARTER 1940 – FOURTH QUARTER 1942



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Statistical Division

CHART X

PERCENTAGE DISTRIBUTION OF WAR OUTPUT BY OBJECT

THIRD QUARTER 1940, FOURTH QUARTER 1941 AND 1942

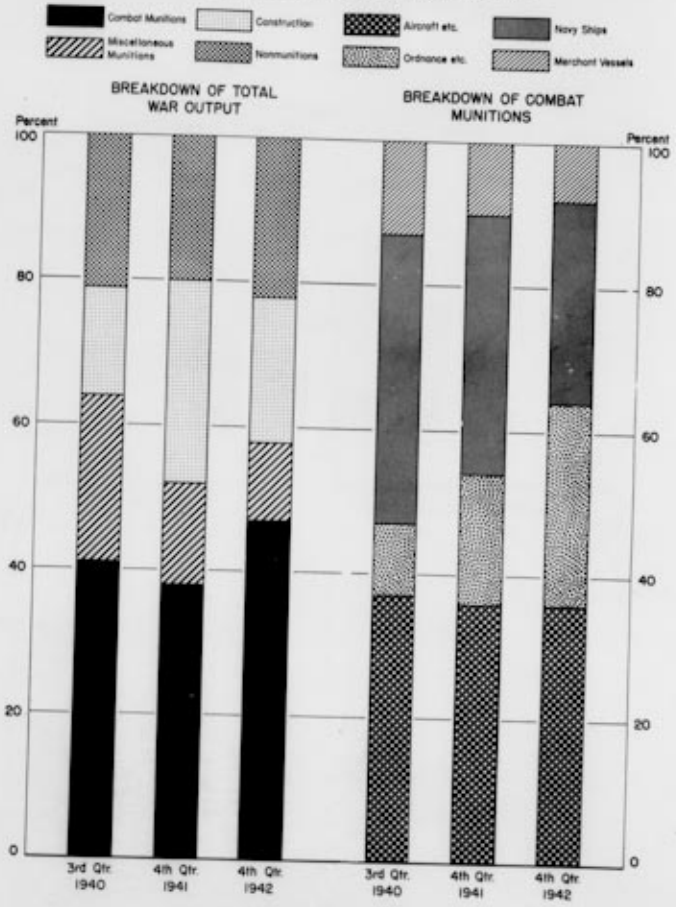

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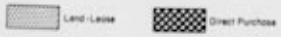
CHART XI

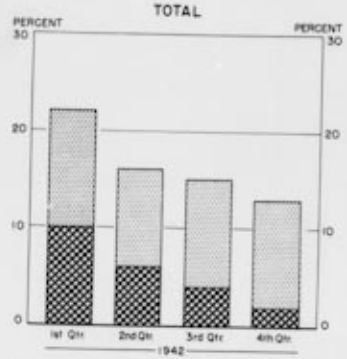
PERCENTAGE OF SELECTED MUNITIONS PRODUCTION EXPORTED TO FOREIGN GOVERNMENTS

LEND-LEASE AND DIRECT PURCHASE

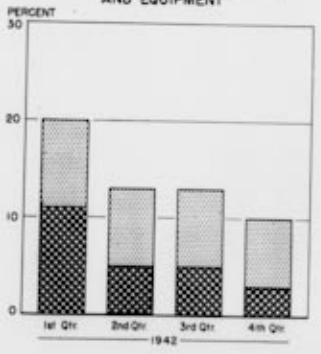
U.S. Production = 100 Percent



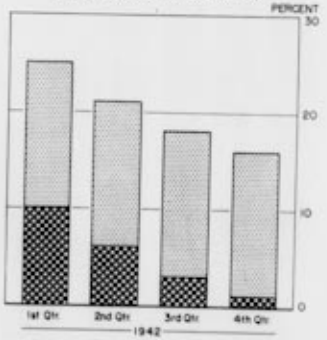
TOTAL



AIRCRAFT, RELATED MUNITIONS, AND EQUIPMENT*



GROUND ORDNANCE AND SIGNAL EQUIP (INCLUDING COMBAT VEHICLES)



* Exports do not include approximately 250 million dollars in flyaways. To this extent the percentages are low.

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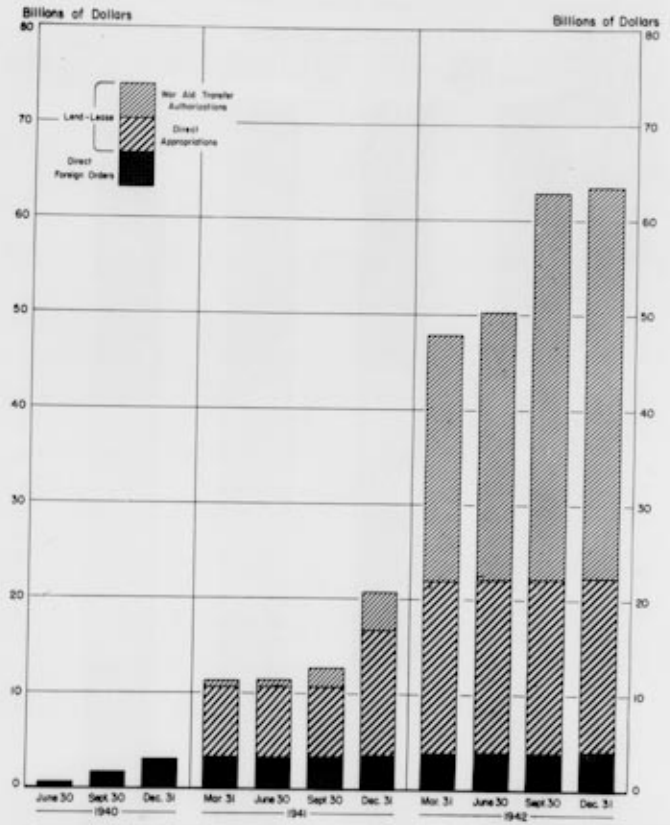
CHART XII

INTERNATIONAL AID FINANCIAL PROGRAM *

CUMULATIVE THROUGH DECEMBER 1942



* Figures are adjusted in accordance with supplementary Acts of Congress. Excluded is the value of ships which may be leased by the Navy for the duration of the emergency, 158 million dollars of capital assistance rendered to U.S. industry by the British Government, and deposits by foreign governments (468 million dollars as of Nov 30, 1942) under the Land-Lease Act.

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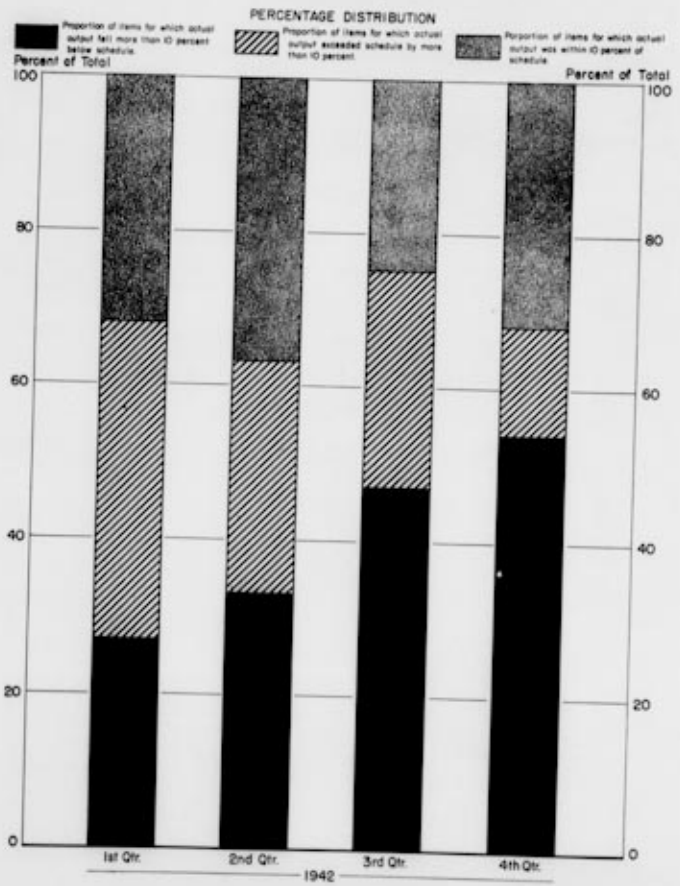
CHART XIII

COMPARISON OF ACTUAL WITH SCHEDULED OUTPUT FOR SAMPLE OF 50 SELECTED MUNITIONS ITEMS

BY QUARTERS, 1942



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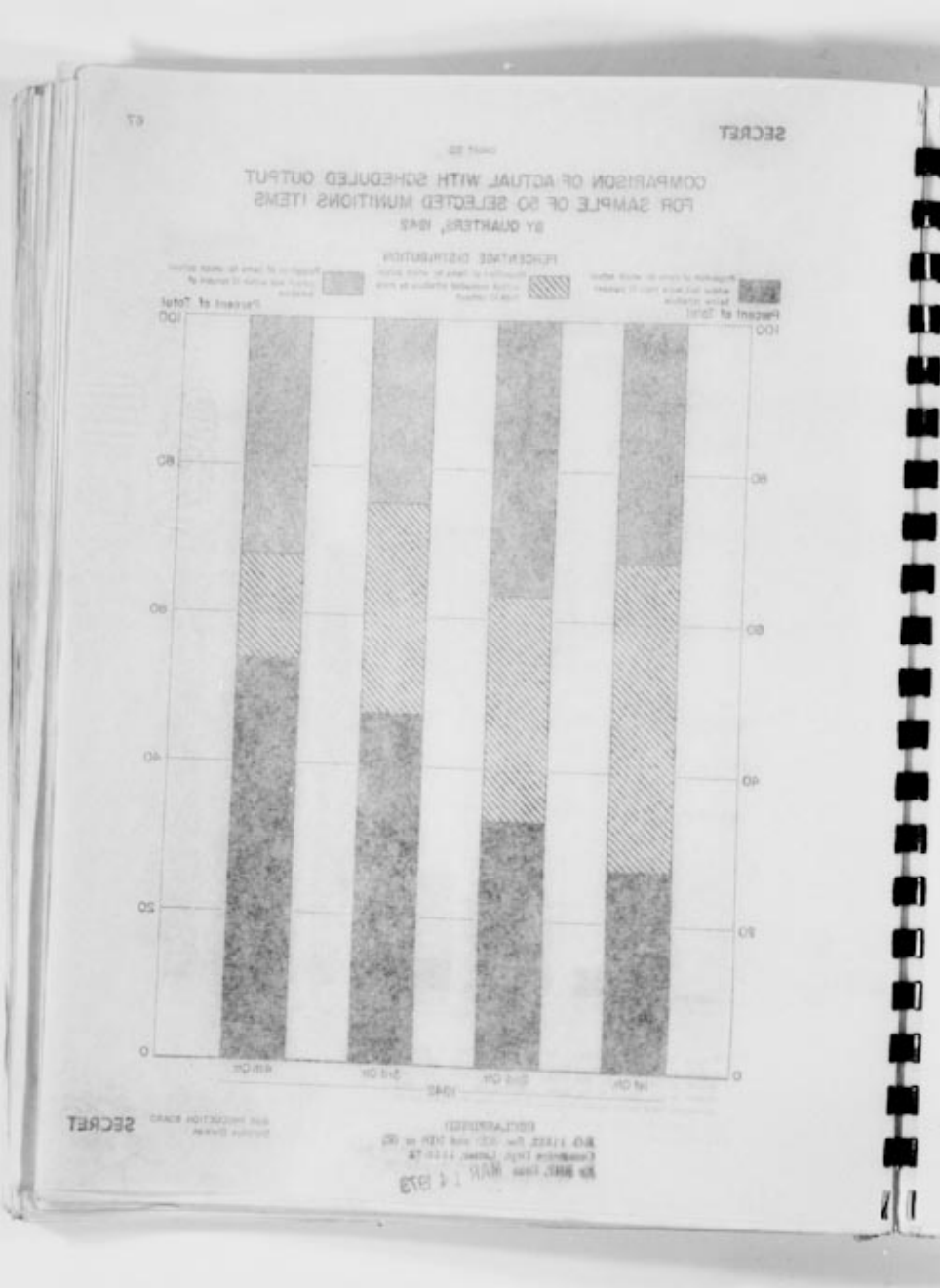

TABLE 13

Value of War Output:
Munitions, Construction, and Nonmunitions, 1940-1942

(Millions of Dollars)

Period		Total War Production Program						
		Grand Total	Munitions and War Construction					Non-Munitions
			Total	Munitions	Construction			
					Total	Industrial Facilities	Other	
1940:	Third Quarter	1,152	908	737	171			244
	Fourth Quarter	1,840	1,490	1,015	475			350
	Total	2,992	2,398	1,752	646	225	421	594
1941:	First Quarter	2,705	2,221	1,367	854			484
	Second Quarter	3,388	2,714	1,767	947			674
	Third Quarter	4,462	3,566	2,225	1,341			896
	Fourth Quarter	5,916	4,741	3,064	1,677			1,175
	Total	16,471	13,242	8,423	4,819	2,200	2,619	3,229
1942:	January	2,540	2,043	1,423	620	339	281	497
	February	2,741	2,138	1,496	642	356	286	603
	March	3,176	2,544	1,750	794	386	408	632
	April	3,817	3,069	2,074	995	480	515	748
	May	4,196	3,435	2,340	1,095	520	575	761
	June	4,868	3,871	2,608	1,263	571	692	997
	July	5,415	4,367	2,874	1,493	624	869	1,048
	August	5,835	4,699	3,109	1,590	675	915	1,136
	September	6,064	4,813	3,258	1,555	687	868	1,251
	October	6,217	4,834	3,385	1,449	684	765	1,383
	November	6,638	5,162	3,831	1,331	649	682	1,476
	December	7,191	5,617	4,372	1,245	635	610	1,574
	Total	58,698	46,592	32,520	14,072	6,606	7,466	12,106
	First Quarter	8,457	6,725	4,669	2,056	1,081	975	1,732
	Second Quarter	12,681	10,375	7,022	2,353	1,571	1,782	2,506
	Third Quarter	17,314	13,879	9,241	4,638	1,986	2,652	3,435
	Fourth Quarter	20,046	15,613	11,588	4,025	1,968	2,057	4,433

TABLE 13
(Continued)

Value of War Output:
Munitions, Construction, and Nonmunitions, 1940-1942

(Millions of Dollars)

	Period	Grand Total	Munitions Production				
			Aircraft and Related Equipment	Ground Ordnance and Signal Equipment	Naval and Army Vessels Including Ordnance and Equipment	Merchant Vessels	Miscellaneous Munitions
1940:	Third Quarter	737	173	47	192	60	265
	Fourth Quarter	1,015	241	56	275	75	368
	Total	1,752	414	103	467	135	633
1941:	First Quarter	1,367	344	100	348	105	470
	Second Quarter	1,767	462	145	484	120	556
	Third Quarter	2,225	592	239	587	150	657
	Fourth Quarter	3,064	804	411	804	203	842
	Total	8,423	2,202	895	2,223	578	2,525
1942:	January	1,423	383	236	335	79	390
	February	1,496	446	241	310	98	401
	March	1,750	530	313	374	94	439
	April	2,074	567	397	460	129	521
	May	2,340	656	444	536	147	557
	June	2,608	722	490	568	186	642
	July	2,874	758	629	623	197	667
	August	3,109	875	658	688	209	679
	September	3,258	884	700	824	211	639
	October	3,385	936	759	836	191	663
	November	3,831	1,113	857	898	240	723
	December	4,372	1,338	1,068	903	261	802
	Total	32,520	9,208	6,792	7,355	2,042	7,123
	First Quarter	4,669	1,359	790	1,019	271	1,230
	Second Quarter	7,022	1,945	1,331	1,564	462	1,720
	Third Quarter	9,241	2,517	1,987	2,135	617	1,985
	Fourth Quarter	11,588	3,387	2,684	2,637	692	2,188

TABLE 13
(Continued)

Value of War Output:
Munitions, Construction, and Nonmunitions, 1940-1942

(Millions of Dollars)

Period		Grand Total	Aircraft And Related Equipment						
			Planes				Gliders and Lighter Than-Air Ships	Aircraft Ordnance	Spare props, engines and parts
			Total	Combat	Service Combat	Trainer			
1940:	Third Quarter	173	91	71	8	12	-	7	52
	Fourth Quarter	241	128	103	7	18	-	7	74
	Total	414	219	174	15	30	-	14	126
1941:	First Quarter	344	186	146	12	28	-	15	98
	Second Quarter	462	257	202	13	42	-	21	123
	Third Quarter	592	308	242	16	50	-	40	166
	Fourth Quarter	804	435	359	11	65	-	59	204
	Total	2,202	1,186	949	52	185	-	135	591
1942:	January	383	190	151	8	31	1	42	106
	February	446	218	179	10	29	1	44	107
	March	530	262	210	11	31	2	63	138
	April	567	248	197	17	34	2	61	168
	May	656	295	241	15	39	2	76	182
	June	722	305	260	14	31	2	79	206
	July	758	337	276	26	35	1	85	219
	August	875	353	286	22	45	32	88	235
	September	884	389	321	24	44	7	85	235
	October	936	369	313	22	34	11	99	260
	November	1,113	436	368	25	43	23	113	262
	December	1,338	514	425	32	57	11	141	326
	Total	9,208	3,906	3,227	226	453	95	976	2,444
	First Quarter	1,359	660	540	29	91	4	149	331
	Second Quarter	1,945	848	698	46	104	6	216	556
	Third Quarter	2,517	1,079	883	72	124	40	258	689
	Fourth Quarter	3,387	1,319	1,106	79	134	45	353	848

TABLE 11
(Continued)

Value of War Output:
Munitions, Construction, and Nonmunitions, 1940-1942

(Millions of Dollars)

Period		Aircraft And Related Equipment (Concluded)			Ground Ordnance And Signal Equipment				
		Other Equipment, Maintenance, and Operations			Grand Total	Combat Vehicles	Guns and Fire Control Equipment	Ammunition	Signal and Related Equipment
		Total	Signal	Other					
1940:	Third Quarter	23			47	9	15	12	11
	Fourth Quarter	32			56	11	16	15	14
	Total	55			103	20	31	27	25
1941:	First Quarter	45			100	16	34	35	18
	Second Quarter	61			145	34	43	43	25
	Third Quarter	78			239	89	54	67	29
	Fourth Quarter	106			411	200	71	100	40
	Total	290			895	339	202	242	112
1942:	January	44	4	40	236	87	46	91	12
	February	76	24	52	241	89	47	97	8
	March	75	17	58	313	89	77	134	13
	April	88	30	58	397	111	91	174	21
	May	101	34	67	444	123	99	193	29
	June	130	58	72	490	137	113	209	31
	July	116	38	78	629	171	141	263	54
	August	167	80	87	658	177	163	243	75
	September	168	73	95	700	181	169	270	80
	October	197	99	98	759	212	206	257	84
	November	279	129	150	857	239	240	281	97
	December	346	128	218	1,068	398	285	298	87
	Total	1,787	714	1,073	6,792	2,014	1,677	2,510	591
	First Quarter	195	45	150	790	265	170	322	33
	Second Quarter	319	122	197	1,331	371	303	576	81
	Third Quarter	451	191	260	1,987	529	473	776	209
	Fourth Quarter	822	356	466	2,684	849	731	836	268

TABLE 13
(Continued)

Value of War Output:
Munitions, Construction, and Nonmunitions, 1940-1945

(Millions of Dollars)

	Naval and Army Vessels, including Ordnance and Equipment									
		Naval Vessels						Naval Equipment and Maintenance	Transports, Landing Vessels, Army Auxiliaries	Ordnance
	Grand Total	Total	Major Combat	Minor Combat			Auxiliaries and Conversions			
				Total	Anti-Submarine	Other				
1940:										
Third Quarter	192				176					16
Fourth Quarter	275				256					19
Total	467				432					35
1941:										
First Quarter	348				317					31
Second Quarter	484				441					43
Third Quarter	587				525					62
Fourth Quarter	804				712					92
Total	2,223				1,995					228
1942:										
January	335	235	165	43	42	1	27	48	8	44
February	310	212	135	41	40	1	36	47	7	44
March	374	241	148	50	49	1	43	58	8	67
April	460	266	158	63	62	1	45	108	13	73
May	536	312	171	80	79	1	61	130	15	79
June	568	304	176	93	91	2	35	130	34	100
July	623	298	170	88	86	2	40	138	68	119
August	688	327	169	110	108	2	48	132	108	121
September	824	370	171	99	96	3	100	162	151	141
October	836	366	189	132	130	2	45	165	172	133
November	898	369	187	130	127	3	52	165	187	177
December	903	354	174	127	124	3	53	158	186	205
Total	7,355	3,654	2,013	1,056	1,034	22	585	1,441	957	1,303
First Quarter	1,019	688	448	134	131	3	106	153	23	155
Second Quarter	1,564	882	505	236	232	4	141	368	62	252
Third Quarter	2,135	995	510	297	290	7	188	432	327	381
Fourth Quarter	2,637	1,089	550	389	381	8	150	488	545	515

TABLE 13
(Concluded)

Value of War Output:
Munitions, Construction, and Nonmunitions, 1940-1942

(Millions of Dollars)

	Period	Merchant Vessels			Total Combat Munitions	Miscellaneous Munitions		
		Total	Ocean-Going	Other		Total	Automotive Vehicles	Other
1940:	Third Quarter	60			472	265		
	Fourth Quarter	75			647	368		
	Total	135			1,119	633		
1941:	First Quarter	105			897	470		
	Second Quarter	120			1,211	556		
	Third Quarter	150			1,568	657		
	Fourth Quarter	203			2,222	842		
	Total	578			5,898	2,525		
1942:	January	79	78	1	1,033	390	126	264
	February	98	96	2	1,095	401	126	275
	March	94	91	3	1,311	439	129	310
	April	129	124	5	1,553	521	170	351
	May	147	142	5	1,783	557	161	396
	June	186	180	6	1,966	642	183	459
	July	197	188	9	2,207	667	195	472
	August	209	199	10	2,430	679	204	475
	September	211	203	8	2,619	639	190	449
	October	191	180	11	2,722	663	174	489
	November	240	230	10	3,108	723	179	544
	December	261	250	11	3,570	802	207	595
	Total	2,042	1,961	81	25,397	7,123	2,044	5,079
	First Quarter	271	265	6	3,439	1,230	381	849
	Second Quarter	462	446	16	5,302	1,720	514	1,206
	Third Quarter	617	590	27	7,256	1,985	589	1,396
	Fourth Quarter	692	660	32	9,400	2,188	560	1,628

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TABLE 14

Actual Munitions Production July 1, 1940 - December 31, 1942

AIRPLANES

Major Group	1940 Second Half	1941 First Half	1941 Second Half	1941 Total Year	1942 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Year
Long Range, Heavy, Medium, and Patrol Bombers	104	408	767	1,175	169	305	472	455	501	577	611	641	712	622	752	930	6,747
Light, Dive, Scout, and Torpedo Bombers	521	1,322	1,626	2,948	323	324	308	266	520	430	440	509	604	698	718	792	5,932
Pursuits	1,163	1,454	2,969	4,423	843	768	776	747	773	954	1,008	895	912	894	1,164	1,260	10,994
Observation and Transport	199	407	1,095	1,502	306	531	559	614	508	504	691	622	503	467	572	545	6,422
Trainers	1,805	3,721	5,634	9,355	1,331	1,157	1,357	1,413	1,617	1,234	1,345	1,617	1,578	1,382	1,606	1,962	17,599
Total Planes	3,792	7,312	12,091	19,403	2,972	3,085	3,472	3,495	3,919	3,699	4,095	4,284	4,309	4,063	4,812	5,489	47,694

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TABLE 13
(Continued)

Actual Munitions Production July 1, 1940 - December 31, 1942

ARMY ORDNANCE

	Unit	1940 2nd Half	1941 1st Half	1941 2nd Half	1941 Total	1942 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Aircraft Bombs Army Procured	000 sh. tons	1.3	9.6	15.8	25.4	28.0	20.4	26.6	26.7	28.0	29.4	33.4	41.2	44.7	56.4	58.3	51.5	487.4
Combat Vehicles (w/o armament)	1,000	1.0	2.8	8.8	11.6	2.5	2.6	2.5	3.2	3.2	4.2	5.5	5.0	4.5	5.1	6.6	5.9	51.1
Tanks		0.3	0.6	3.4	4.0	1.0	1.0	1.1	1.4	1.6	1.8	2.2	2.2	2.5	2.7	2.6	4.3	25.1
Heavy	Each	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	3.0
Medium	1,000	0.0	a/	1.4	1.4	0.4	0.6	0.6	0.8	1.0	1.0	1.2	1.3	1.4	1.8	1.8	2.5	14.0
Light	1,000	0.3	0.6	2.0	2.8	0.6	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.9	0.8	0.7	11.0
Armored Cars	1,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	a/	0.3	0.2	0.5
Scout Cars & Carriers	1,000	0.6	2.2	5.2	7.4	1.5	1.5	1.0	1.3	1.2	1.8	1.9	2.2	1.8	1.9	2.5	2.5	21.5
Self-Prop. Art. (Excl. A.A. Guns)	1,000	0.0	0.0	0.0	0.0	0.0	a/	0.3	0.5	0.4	0.7	1.2	0.7	0.7	0.9	1.2	1.4	7.6
Artillery - Aircraft & Ground																		
Aircraft Guns (Excl. M.G.)	1,000	0.0	a/	1.7	1.7	2.6	3.1	4.3	5.1	6.7	6.7	6.5	4.3	8.2	7.0	8.2	8.8	68.5
Tank Guns	1,000	0.5	1.8	4.5	6.5	1.3	1.5	2.3	2.7	3.2	4.4	4.5	4.5	4.4	5.1	4.7	5.1	44.5
Wheeled Art. (Excl. A.T. Guns)	1,000	a/	0.1	1.6	2.3	0.4	0.5	0.6	0.6	0.5	0.3	0.6	0.3	0.4	0.8	0.4	0.6	6.3
Antitank Guns	1,000	0.3	0.8	2.1	2.3	0.7	0.8	0.4	0.9	1.5	1.3	1.2	1.0	1.0	2.3	2.0	2.4	16.7
Antiaircraft Guns (Excl. M.G.)	1,000	0.2	0.4	0.2	0.6	a/	0.1	0.2	0.3	0.8	1.0	1.4	1.7	2.1	2.2	2.2	2.4	14.4
Machine Guns - Aircraft & Ground																		
Aircraft	1,000	5.8	7.5	48.1	53.6	15.2	19.7	21.6	25.0	30.2	30.8	33.1	34.7	31.3	33.0	38.8	40.6	371.0
Antiaircraft	1,000	0.5	1.9	4.3	6.2	1.2	1.6	2.0	3.8	4.3	5.2	4.8	6.0	3.7	4.5	2.8	1.0	41.5
Ground & Combat Vehicles		Not available				7.7	7.2	13.2	13.9	16.8	20.3	18.1	34.3	37.0	36.9	35.3	39.1	282.5
Submachine Guns	1,000	4.2	15.0	197.3	212.3	35.7	45.8	48.1	54.3	56.4	57.2	37.5	39.0	57.2	60.1	51.7	53.4	600.4
Rifles	1,000	56.4	119.8	195.0	314.8	59.4	61.4	82.0	100.5	121.0	130.2	151.8	171.0	164.2	139.6	212.0	265.4	1,616.2
Mortars	1,000	1.2	3.7	4.6	8.3	0.6	0.6	0.7	0.6	0.5	1.3	1.0	0.7	0.4	1.0	0.6	2.0	10.2
Ammunition - Aircraft & Ground																		
Artillery	Millions	a/	0.5	5.3	5.8	3.4	3.7	5.2	7.4	8.4	8.7	10.5	10.1	11.8	11.0	11.6	11.0	102.0
Small Arms	Millions	0.1	0.4	0.6	1.0	0.3	0.3	0.5	0.6	0.8	0.9	1.1	1.1	1.1	1.1	1.0	1.3	10.0
Mortar Bombs	Millions	a/	0.1	0.6	0.7	0.3	0.6	1.0	1.6	1.3	0.6	0.9	0.7	1.1	1.0	0.7	1.2	11.0
Hand Grenades	Millions	0.5	a/	0.9	0.9	a/	0.2	0.0	0.0	0.0	0.0	0.4	0.6	1.1	1.0	0.9	1.2	5.4
Aircraft Gun Ammunition	Millions	a/	0.0	7.2	7.2	6.2	3.2	4.0	6.2	5.7	4.3	4.9	4.8	2.9	7.7	9.4	9.8	69.0
Motor Transport								325.5				75.6	72.2	70.7	62.2	55.7	67.4	737.3
Tank Transporters	1,000	Not available				0.4	0.4	0.2	0.3	0.5	0.6	0.7	1.0	0.8	0.9	0.4	0.3	6.0
Trucks	1,000	"	"					282.0				59.3	57.4	54.3	48.2	44.3	50.9	601.0
Trailers & Semi-Trailers	1,000	"	"			0.2	0.4	2.7	6.1	9.1	9.1	8.4	7.8	10.0	8.8	7.7	10.3	80.2
Ambulances	1,000	"	"			0.4	0.1	0.8	0.5	0.8	0.4	1.5	2.0	2.1	1.8	1.1	1.1	11.0
Motorcycles	1,000	"	"			2.8	2.7	2.4	0.5	3.5	5.0	5.0	4.1	3.5	2.7	2.0	4.1	38.4

a/ Less than the unit.

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TABLE 14
(Continued)

Actual Munitions Production July 1, 1940 Through December 31, 1942

SIGNAL AND CHEMICAL WARFARE EQUIPMENT

Group	Unit	July 1940 Through December 1941	1942 Actual Production												
			Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
ARMY SIGNAL EQUIPMENT															
Aircraft (including Ground-to-air)															
Radios	Each	14,448			28,192				7,501	14,114	15,024	18,997	23,843	27,001	134,672
Radar	Each	572	104	176	332	1,042	1,512	4,332	5,098	4,915	4,609	7,014	14,562	10,904	56,680
Ground Radios	Each	15,390		10,804		4,076	8,705	9,808	12,178	25,812	16,113	16,736	22,894	15,061	141,307
CHEMICAL WARFARE EQUIPMENT															
Mustard Gas	Ton	4,711			8,661				5,105	4,583	5,822	5,370	5,519	8,479	43,539
Screening Smoke	Ton	480			1,358				954	1,189	870	1,004	1,014	680	7,069
Gas Masks	Thousand	3,863			1,189				309	439	631	546	525	635	4,27[illegible]
Airplane Spray Tanks	Each	0			4,709				1,157	2,115	3,497	3,409	3,887	8,417	26,55[illegible]

Actual Munitions Production July 1, 1940 Through December 31, 1942

NAVAL VESSELS

	2nd Half 1940	1941 1st Half	1941 2nd Half	1941 Total	1942 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Battleships	0	0	2	2	0	0	1	1	1	0	0	0	0	0	1	0	4
Aircraft Carriers	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Cruisers	0	0	1	1	1	2	0	0	0	1	1	0	1	1	1	0	8
Destroyers	11	5	7	16	2	0	4	7	5	6	5	5	8	10	5	12	[illegible]
Submarines	5	8	3	11	1	1	0	3	2	3	4	1	2	4	2	4	[illegible]
Aircraft Escorts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Destroyers Escorts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corvettes a/	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subchasers	3	0	6	6	1	3	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mosquito Craft	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Minecraft	0	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Landing Craft	7	342	533	875	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,038	[illegible]	[illegible]	1,097	[illegible]	[illegible]
Auxiliaries	b/	b/	b/	b/	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

a/ Constructed only by Maritime Commission.
b/ The number of deliveries from July 1, 1940 to December, 1941 is 146.

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TABLE 14
(Concluded)

Actual Munitions Production July 1, 1940 - December 31, 1942

NAVAL ORDNANCE

Major Group	July 1940 Through December 1941 a/	1942 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total 1942
Naval Antiaircraft and Dual Purpose Guns (Each)	1,195	794	970	1,640	2,456	2,928	3,386	3,586	3,642	3,730	3,784	4,037	4,046	34,999
Naval Ammunition														
Surface Fire (Each)	76,595	24,002	54,692	45,2[illegible]	38,160	70,942	57,102	75,077	49,736	92,879	63,928	71,745	96,105	759,217
Antiaircraft (Thousand)	10,615	3,058	4,193	4,738	6,239	5,431	8,916	14,981	17,450	20,796	23,393	31,692	34,608	175,461
Torpedoes (Incl. aircraft) (Each)	2,324	214	187	175	288	392	427	448	401	393	520	562	518	4,525
Depth Charges (Each)	26,450	5,092	6,973	12,736	15,460	10,596	14,935	18,932	8,666	8,168	8,429	16,788	14,091	140,886
Mines (Incl. aircraft) (Each)	1,900				26,031 b/					398	4,990	1,791	920	34,130
Aircraft Bombs														
Navy Procured (Thous. Short Tons)	14	4	4	5	6	6	8	9	10	12	13	11	12	102

a/ July 1, 1940 to December 31, 1941 only breakdown available.
b/ Monthly breakdown unavailable.

MERCHANT VESSELS

DWT (000)

Major Group	1940 2nd Half	1941 1st Half	1941 2nd Half	1941 Total	1942 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total 1942
Tankers	134	185	248	433	111	66	62	48	46	81	96	62	109	68	85	165	999
Dry Cargo Types	223	353	380	733	87	224	229	353	574	650	677	672	882	796	786	991	6,921
Minor Types	0	0	0	0	0	0	0	0	0	19	19	18	18	19	3	11	107
Merchant Vessels, Total	357	538	628	1,166	198	290	291	401	620	750	792	752	1,009	883	874	1,167	8,027

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TABLE 15

Size of the Armed Forces, 1940-42 a/

(Unit - Thousand Men)
(End of Period Figures)

	1940		1941		1942											
	July	Dec.	June	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
ARMY																
Officers	21	48	99	121	127	137	148	162	181	207	232	263	297	331	361	397
Men	270	573	1,361	1,534	1,730	1,976	2,208	2,469	2,655	2,868	3,040	3,322	3,674	4,084	4,581	4,971
Total	291	621	1,460	1,655	1,857	2,113	2,356	2,631	2,836	3,074	3,272	3,585	3,971	4,415	4,942	5,368
NAVY																
Officers	14	18	26	36	41	42	46	52	61	68	75	83	89	95	111	118
Men	151	192	247	310	393	419	442	482	512	556	621	694	800	931	1,034	1,100
Nurses	b/	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3
Total	165	211	277	349	435	462	490	536	574	626	697	779	891	1,028	1,147	1,221
MARINE CORPS																
Officers	2	2	3	4	5	5	5	6	6	7	8	9	10	11	12	13
Men	29	45	51	71	93	105	112	118	127	136	149	163	181	195	209	225
Total	31	48	54	75	98	110	117	124	133	144	157	172	191	206	221	238
COAST GUARD																
Officers	1	1	1	2	2	2	2	3	3	4	4	4	5	5	5	5
Men	13	15	18	26	32	36	40	43	48	55	66	80	94	111	125	135
Total	14	17	19	27	34	38	42	46	51	59	70	84	99	116	129	140
TOTAL	501	897	1,810	2,106	2,424	2,723	3,005	3,337	3,594	3,903	4,196	4,620	5,152	5,765	6,439	6,967

a/ Figures will not necessarily add to totals due to rounding.
b/ Less than 500.

SECRET

TABLE 16

Dollar Value of U. S. Exports, Lend-Lease and Direct Purchase By Commodity and Quarter, 1941 - 1942 *

(In millions of dollars)

Commodity	1941 1st Quarter	1941 2nd Quarter	1941 3rd Quarter	1941 4th Quarter	1942 1st Quarter	1942 2nd Quarter	1942 3rd Quarter	1942 4th Quarter**
TOTAL, ALL EXPORTS	980	1,102	1,251	1,814	1,568	1,839	2,049	2,342
Lend-Lease	1	57	224	459	678	1,073	1,273	1,661
Direct Purchase	979	1,045	1,027	1,355	890	766	776	681
Ordnance and Ammunition	45	55	86	106	136	212	247	375
Lend-Lease	1	10	38	32	76	171	228	361
Direct Purchase	44	45	48	74	60	41	19	14
Aircraft and Parts	137	159	150	193	268	249	310	314
Lend-Lease	0	2	7	17	126	139	196	213
Direct Purchase	137	157	143	176	142	110	114	101
Tanks and Parts	4	12	17	46	94	114	166	168
Lend-Lease	0	8	15	20	53	65	131	144
Direct Purchase	4	4	2	26	41	49	35	24
Motor Vehicles and Parts (Excluding tanks)	105	109	91	150	121	150	149	222
Lend-Lease	0	5	8	31	61	104	93	162
Direct Purchase	105	104	83	119	60	46	56	60
Agricultural Products	123	145	235	367	253	373	334	367
Lend-Lease	0	26	106	213	155	282	251	294
Direct Purchase	123	119	129	154	98	91	83	73
Machinery and Tools	145	145	144	202	162	156	168	193
Lend-Lease	0	0	4	14	41	64	80	105
Direct Purchase	145	145	140	188	121	92	88	88
Metals	148	168	177	239	200	228	249	363
Lend-Lease	0	1	15	45	82	137	156	187
Direct Purchase	148	167	162	194	118	91	93	76
Petroleum Products	68	95	110	178	97	123	147	166
Lend-Lease	0	0	9	55	43	50	52	66
Direct Purchase	68	95	101	123	54	73	95	100
All Other **	205	214	241	333	237	234	279	274
Lend-Lease	0	5	22	32	41	61	86	129
Direct Purchase	205	209	219	301	196	173	193	145

* Excludes flyaways.

** Miscellaneous manufactures, watercraft, and other commodities, n.e.c.

*** Estimated in part.

SECRET

TABLE 17

Total United States Aid (Goods and Services) to Foreign Countries
By Type of Aid, Including Total Exports a/
1941 - 1942

(In millions of dollars)

	Cumulative Total 1941-1942	1942 Total	1942 1st Quar.	1942 2nd Quar.	1942 3rd Quar.	1942 4th b/ Quar.	1941 Total	1941 1st Half	1941 3rd Quar.	1941 4th Quar.
Total Goods and Services	15,772	10,122	2,069	2,316	2,574	3,163	5,650	2,170	1,435	2,045
Lend-Lease Aid	8,253	7,009	1,179	1,550	1,798	2,482	1,244	146	408	690
Cash Purchase Exports	7,519	3,113	890	766	776	681	4,406	2,024	1,027	1,355
Goods Exported	12,945	7,798	1,568	1,839	2,049	2,342	5,147	2,082	1,251	1,814
Lend-Lease	5,426	4,685	578	1,073	1,273	1,661	741	58	224	459
Cash Purchase	7,519	3,113	890	766	776	681	4,406	2,024	1,027	1,355
Goods Transferred but Not Reported as Exported (Lend-Lease)	1,122	953	164	235	221	333	169	47	84	38
Other Lend-Lease Aid	1,705	1,371	337	242	304	488	334	41	100	193
Servicing and Repair of Ships and Other Defense Articles	266	181	53	42	48	38	85	12	35	38
Rental of Ships, Ferrying of Aircraft, etc.	835	685	136	130	143	276	150	*	45	105
Production Facilities in U.S.	554	457	143	57	113	144	97	29	19	49
Miscellaneous Expenses	50	48	5	13	-	30	2	-	1	1

a/ Excludes value of flyaways estimated at 250 million dollars and transfers of water-craft at 285 million dollars not reported to the Department of Commerce as exported.

b/ Exports in December estimated.

* Less than $500,000

WAR PRODUCTION BOARD
Statistics Division

TABLE 16

Comparison of Actual Production
With 1st-of-Quarter Schedules - 1942 For

Selected Munitions Items

ITEM	First Quarter			Second Quarter		
	Actual	Forecast	Actual as % of Forecast	Actual	Forecast	Actual as % of Forecast
MILITARY AIRPLANES		(Unit - Each)				
Heavy Bomber, 4-eng.	376	330	114	545	493	111
Flying Boat, 4-eng.						
Flying Boat, 2-eng.	165	187	88	188	196	96
Medium Bomber, 2-eng.	405	296	137	799	839	95
Light Bomber, 2-eng.	879	959	92	716	982	73
Light Bomber, 1-eng.	76	128	59	500	649	77
Pursuit, 2-eng.	344	351	98	339	320	106
Pursuit, 1-eng.	1,798	1,945	92	1,789	1,891	95
Navy Fighter, 1-eng.	245	230	107	346	350	99
Heavy Transport, 4-eng.						
Heavy Transport, 2-eng.						
Medium Transport, 2-eng.	141	105	134	266	245	109
COMBAT VEHICLES		(Unit - Each)				
Tanks						
Medium - Total	1,878	1,990	94	2,685	3,089	87
Light - Total	1,179	1,143	103	2,174	1,950	111
Armored Cars						
Medium						
TANK GUNS						
75-mm, M2 and M3	1,806	1,480	122	4,625	3,894	119
SELF-PROPELLED GUNS						
105-mm Howitzer	177	150	118	272	479	57
3-inch Gun on						
Motor Carriage, M10						
(Med. Tank Chassis)						
WHEELED ARTILLERY						
Medium Artillery						
155-mm Field Howitzer, M1						
Light Artillery						
105-mm Field Howitzer, M2A1	1,121	776	144	949	642	148
Antitank Guns						
57-mm Gun	2	200	1	548	575	95

TABLE 18
(Continued)

Comparison of Actual Production
With 1st-of-Quarter Schedules - 1942 For

Selected Munitions Items

ITEM	Third Quarter			Fourth Quarter		
	Actual	Forecast	Actual as % of Forecast	Actual	Forecast	Actual as % of Forecast
MILITARY AIRPLANES		(Unit - Each)				
Heavy Bomber, 4-eng.	696	793	88	962	1,014	95
Flying Boat, 4-eng.	14	21	67	24	60	40
Flying Boat, 2-eng.	216	254	85	289	332	87
Medium Bomber, 2-eng.	1,038	1,232	84	1,029	1,438	72
Light Bomber, 2-eng.	743	1,296	57	821	1,103	74
Light Bomber, 1-eng.	805	1,217	66	1,387	2,016	69
Pursuit, 2-eng.	408	341	120	449	481	93
Pursuit, 1-eng.	2,020	2,447	83	2,169	2,802	77
Navy Fighter, 1-eng.	387	466	83	700	674	104
Heavy Transport, 4-eng.	20	12	167	39	48	81
Heavy Transport, 2-eng.	21	18	117	24	80	30
Medium Transport, 2-eng.	358	389	92	300	430	70
COMBAT VEHICLES		(Unit - Each)				
Tanks						
Medium - Total	3,961	5,132	77	5,521	4,542	122
Light - Total	2,928	3,353	87	4,665	5,075	92
Armored Cars						
Medium				189	475	40
TANK GUNS						
75-mm, M2 & M3	6,677	6,191	108	5,777	5,016	115
SELF-PROPELLED GUNS						
105-mm Howitzer	721	975	74	1,058	992	107
3-inch Gun on Motor Carriage, M10 (Med. Tank Chassis)	105	70	150	534	1,233	43
WHEELED ARTILLERY						
Medium Artillery						
155-mm Field How., M1	0	110	0	19	100	19
Light Artillery						
105-mm Field How., M2A1	831	817	102	424	455	93
Antitank Guns						
57-mm Gun	1,313	1,372	96	2,014	1,755	115

TABLE 18
(Continued)

Comparison of Actual Production
With 1st-of-Quarter Schedules - 1942 For
Selected Munitions Items

ITEM	First Quarter			Second Quarter		
	Actual	Forecast	Actual as % of Forecast	Actual	Forecast	Actual as % of Forecast
AMMUNITION FOR ARTILLERY & TANK GUNS		(Unit - Thousand)				
High Explosive Shells						
Medium						
155-mm Howitzer, M107 & 102	816	666	122	1,047	977	107
Light						
105-mm Howitzer, M1	1,819	1,647	110	2,012	2,418	83
Armor Piercing Shot						
Light						
75-mm Gun A.P.C., M61 & A.P., M72	565	230	246	1,827	1,535	119
ANTIAIRCRAFT GUNS AND EQUIPMENT		(Unit - Each)				
Antiaircraft Guns						
Heavy						
90-mm, Mobile	233	266	88	494	426	116
Light						
40-mm Bofors, Single-Mount	65	100	65	1,082	1,350	80
Directors						
M7 and M9 (for 90-mm Gun)	71	95	75	90	93	97
ANTIAIRCRAFT AMMUNITION		(Unit - Thousand)				
High Explosive Shells						
Heavy						
90-mm Gun, M71, A.A.	328	455	72	769	394	195
Light						
40-mm Gun, Mk. 11	258	200	129	970	1,592	61
Small Arms						
Rifles		(Unit - Each)				
.30 Caliber						
M1 Garand	129,770	89,052	146	170,741	163,500	104
Small Arms Ammunition						
Ball Cartridge		(Unit - Thousand)				
.30 Caliber, M2, Ground & A.C.	556	498	112	1,170	1,067	110

TABLE 15
(Continued)

Comparison of Actual Production
With 1st-of-Quarter Schedules - 1942 For

Selected Munitions Items

ITEM	Third Quarter			Fourth Quarter		
	Actual	Forecast	Actual as % of Forecast	Actual	Forecast	Actual as % of Forecast
AMMUNITION FOR ARTILLERY & TANK GUNS		(Unit - Thousand)				
High Explosive Shells						
Medium						
155-mm Howitzer, M107 & 102	807	945	85	974	1,275	76
Light						
105-mm Howitzer, M1	2,522	2,400	105	2,477	3,300	75
Armor Piercing Shot						
Light						
75-mm Gun A.P.C., M61 & A.P., M72	1,749	2,135	82	1,232	2,073	59
ANTIAIRCRAFT GUNS AND EQUIPMENT		(Unit - Each)				
Antiaircraft Guns						
Heavy						
90-mm, Mobile	1,043	840	124	1,456	1,033	141
Light						
40-mm Bofors, Single-Mount	3,198	3,400	94	4,567	4,597	99
Directors						
M7 & M9 (for 90-mm Gun)	102	132	77	104	245	42
ANTIAIRCRAFT AMMUNITION		(Unit - Thousand)				
High Explosive Shells						
Heavy						
90-mm Gun, M71, A.A.	1,782	1,580	113	178	510	35
Light						
40-mm Gun, Mk. 11	1,259	1,100	114	4,238	7,013	60
Small Arms		(Unit - Each)				
Rifles						
.30 Caliber						
M1 Garand	207,500	182,500	114	250,900	261,000	96
Small Arms Ammunition		(Unit - Thousand)				
Ball Cartridge						
.30 Caliber, M2, Ground & A.C.	1,557	1,438	108	1,339	1,899	71

TABLE 18
(Continued)

Comparison of Actual Production
With 1st-of-Quarter Schedules - 1942 For

Selected Munitions Items

ITEM	First Quarter			Second Quarter		
	Actual	Fore-cast	Actual as % of Forecast	Actual	Fore-cast	Actual as % of Forecast
ANTIAIRCRAFT AMMUNITION (CONTINUED)						
Armor Piercing Cartridge .50 Cal., M1, Ground and Aircraft	78	71	110	207	205	101
SIGNAL CORPS			(Unit - Each)			
SCR-274		4,358		11,041 1/	10,858 1/	102 1/
SCR-287	1,036	631	164	3,165	1,800	176
SCR-522				1,635	4,900	33
SCR-268	118	92	128	99	189	52
SCR-269	3,433	3,575	96	4,612	5,700	81
SCR-528	432	293	147	1,716	2,548	67
Destroyer, 1620 & 1630 tons, DD	6	*		15	14	107
Battleship, 35,000 tons, BB	1	*		2	2	100
Destroyer, 2100 tons, DD	0	*		3	5	60
Submarine, SS	6	*		10	7	143
Subchaser, 173 feet, PC	9	*		36	42	86
Landing Ship Tank, LST						
			(Unit - Each)			
Tankers	15	*		11	12	92
Liberty Vessels (U.S. & British)	42	*		142	118	120
NAVAL ORDNANCE						
Naval Guns, 5-inch/ .38 Caliber	118	118	100	244	215	113
Naval Guns, 3-inch/ .50 Caliber, dry type	382	372	103	627	455	138
Naval Guns, 20-mm	2,790	2,790	100	7,734	6,564	118
Naval Ammunition, 20-mm	9,198	9,500	97	17,316	24,000	72

*No forecast available before April 1, 1942.
1/ Figures represent 1st Half of 1942.

TABLE 16
(Concluded)

Comparison of Actual Production
With 1st-of-Quarter Schedules - 1942 For

Selected Munitions Items

ITEM	Third Quarter			Fourth Quarter		
	Actual	Forecast	Actual as % of Forecast	Actual	Forecast	Actual as % of Forecast
ANTIAIRCRAFT AMMUNITION (CONTINUED)						
Armor Piercing Cartridge .50 Cal., M1, Ground and Aircraft	342	363	94	379	687	55
SIGNAL CORPS			(Unit - Each)			
SCR-274	15,060	12,200	123	25,039	23,500	106
SCR-287	4,295	3,100	138	7,535	9,000	84
SCR-522	4,391	11,500	38	12,681	7,000	181
SCR-268	304	450	68	412	360	114
SCR-269	8,680	12,000	72	7,915	11,000	72
SCR-528	4,982	7,187	69	8,677	7,300	119
Destroyer, 1620 & 1630 tons, DD	17	14	121	14	17	82
Battleship, 35,000 tons, BB	0	0	-	1	1	100
Destroyer, 2100 tons, DD	9	7	128	17	18	94
Submarine, SS	7	7	100	11	12	92
Subchaser, 173 feet, PC	41	47	87	23	40	58
Landing Ship Tank, LST				62	77	80
			(Unit - Each)			
Tankers	17	20	85	19	19	100
Liberty Vessels (U.S. & British)	193	196	98	220	211	104
NAVAL ORDNANCE						
Naval Guns, 5-inch/ .38 Caliber	279	233	120	275	445	62
Naval Guns, 3-inch/ .50 Caliber, dry type	702	851	82	692	786	88
Naval Guns, 20-mm	9,689	9,300	104	10,427	10,435	100
Naval Ammunition, 20-mm	47,007	45,000	104	79,664	88,000	91

I-4. The Flow of Resources into Military Production: Materials

Military Use and Exports Increase

The rise in war output described above demanded a constantly increasing flow of materials into military production (Table 19 and Chart XIV). Increases were pronounced for almost all industrial raw materials; metals, lumber, rubber, chemicals, and textiles. Of particularly crucial importance was the constantly rising demand for metals which, as a group, constituted the most critical single factor limiting war production during the year. Thus the direct military consumption of steel rose from 4.6 million net ingot tons in the last quarter of 1941 to 12.3 million tons in the last quarter of 1942, an increase of 166 percent. The percentage increase in the output of alloy steel and the consumption of alloy metals such as chromium and molybdenum were even greater. Chiefly to meet the needs of the airplane program, consumption of aluminum rose from 163 million pounds in the final quarter of 1941 to 283 million pounds in the corresponding period of 1942, an increase of 235 percent. During 1942, 1,900,000 tons of copper were consumed for direct military use, as compared with less than 700,000 tons in 1941.

Increases in the consumption of materials other than metals were also very pronounced, though in most cases these constituted less of a limiting factor upon the armament program. Among chemicals, for example, the direct military consumption of fixed nitrogen, principally for making explosives, rose more than 500 percent from 1941 to 1942. At the same time, increases of more than 300 percent were recorded in the military consumption of crude and general purpose synthetic rubber and of lumber, and there was an increase of nearly 300 percent for fats and oils.

In addition to this increase in direct domestic military consumption there were in most cases substantial, though generally smaller, increases in the exports of materials from the United States, (Table 20 and Chart XV). The bulk of these exports went to the United Kingdom and U.S.S.R. for the production of military materiel. In addition, substantial quantities of raw materials were sent abroad to sustain the civilian economies of our Allies or of non-belligerent Latin American Republics. Materials were also exported for the purpose of rendering available the resources of foreign countries; for example, to provide transportation facilities for Brazilian rubber and copper in the Belgian Congo. Thus exports of steel in the fourth quarter 1942 were about 15 percent higher than in the last three months of 1941 and exports of aluminum more than 140 percent higher. In interpreting these statistics, it should be borne in mind that exports of fabricated products during 1942, which are not included in these figures, rose much more sharply than did those of raw materials.

Sources of Materials for War and Export

The increased flow of material into direct military production and exports came chiefly from two sources – the expansion of domestic supply and the reduction of certain civilian uses. The increase of imports, where it occurred, was in most cases small, and for a number of materials of Far-Eastern origin there were serious decreases. The small visible stockpiles existing at the beginning of the year were not significantly reduced, with a few important exceptions such as rubber and manila fibre.

New Facilities. That part of increased domestic output which came from new facilities in 1942 was almost entirely the product of facilities quite fully planned in 1941. This means that in general we secured the facilities expansion appropriate to the war program and supply conditions envisaged before Pearl Harbor. Apparently the nature of the domestic war program in 1942 was more clearly foreseen or more vigorously acted upon than were the consequences of war in the Pacific. Aluminum and magnesium for the aircraft program, anhydrous ammonia for explosives, were forthcoming from new facilities in large, if not always adequate, volume. The loss of rubber and fibers from the Far East found us with no alternative sources sufficiently developed to provide substitutes in 1942, although steps were taken during the year to assure supplies at least for minimum essential uses in 1943 and 1944.

In many cases, even though raw material facilities were considerably expanded, capacity for producing particular types, sizes and shapes proved inadequate in the light of the developing program. Thus, the most intensely felt shortages during the year were not of steel as such, but of cold finished alloy bars, particularly in the larger sizes, of steel plate, and of heavy castings. Facilities for making aluminum extrusions constituted a more serious limiting factor than those for aluminum ingot. Some lack of balance of this kind is, of course, inevitable in any rapidly growing program.

The rate at which facilities were expanded during 1942 could have been substantially greater had it not been for the rapidly growing direct military demand for certain key materials themselves—particularly steel. The flow of steel to war plants for consumption necessarily limited the amount that could be spared to create new plants for making more steel or other vital materials. Projects for expanding materials facilities to increase future munitions output—such as copper and molybdenum facilities—came into sharpening conflict with the needs of present munitions output and were sometimes rejected on that score.

Increased Output of Old Facilities. Even the maintenance or immediate increase of materials supply was at times made difficult by conflict with the requirements of finished munitions output. The most striking case was the threat to copper, lumber and aluminum

production in the Northwest which resulted from the loss of labor to airplane factories and shipyards. This particular problem was at least temporarily alleviated by restrictions on the movement of labor in this region.

In spite of handicaps such as these, the combination of new facilities and a more intensive use of existing capacity resulted in substantial increases in the domestic output of many key materials during 1942 (Table 21). Thus, production of chromite rose almost 700 percent during the year, production of magnesium 220 percent, and of aluminum 77 percent. Smaller, but still substantial, increases were achieved for alloy steel, whose output expanded by 38 percent, and for molybdenum, tungsten and vanadium, all of which increased more than 40 percent. Production of fixed nitrogen for use in making explosives rose 29 percent. Finally, despite the labor difficulties just referred to, the amount of domestic copper available for use rose by 22 percent.

Imports. The extent to which the increased flow of materials into military production could be met by imports depended chiefly upon the source of origin of the required materials. Rubber, tin, manila hemp and coconut oil from Malaya, the Netherlands East Indies, and the Philippines were cut off very early in 1942. The lack of shipping space forced a reduction in imports from distant sources--such as burlap and shellac from India. Despite United States efforts to expand near-by sources, the loss of Far Eastern supplies was offset only to a very limited extent by increased imports of rubber, tin and fibers from Latin America and Africa during 1942. The big increases in imports were of materials which normally came in large volume from other American Countries--copper, nickel, aluminum, bauxite and nitrates. Thus, copper imports rose 16.7 percent from 1941 to 1942, nickel 8.3 percent and aluminum 89% percent (from a relatively low initial level). However, the shipping shortage interferred severely even with shipments from nearoy sources, such as molasses from Cuba for the production of alcohol.

In 1942 the beginnings of joint control of the international flow of raw materials by the United States and British Governments appeared, with the creation of the Combined Raw Materials Board. By joint agreement of these two countries, the United States was allotted all rubber exports from South American and Liberia, plus a portion of Ceylonese exports. A similar arrangement has been made in the case of tin.

Cutting Civilian Uses. With the expansion of new supply thus limited, and available stocks at the beginning of the year generally small, the rising military demand for most raw materials could be met only by a rapid and progressive curtailment of less essential uses. It would be inaccurate to describe this simply as a curtailment in "civilian" consumption, since that category covers a wide range of uses including many of vital importance to the war effort. Thus materials used to make civilian type products for military use (e.g. typewriters for naval vessels), materials for the construction of war plants and facilities

not operated by the Armed Forces, and materials for the maintenance of railroad facilities used to transport munitions, are all classified as civilian. Raw materials must be provided for the maintenance of essential services for the home front, such as to take war workers to factories and to supply food, heat and power. Consequently, the diversion of materials from civilian to military use had to be selective; some uses could be eliminated and some cut drastically, but others had to be more or less fully retained. The most difficult problems arose with respect to such large uses of materials as railroad maintenance, industrial repairs and maintenance, and farm implements and machinery where the utmost economy was essential, but where too sharp a cut could readily endanger the future war potential.

On the other hand, it was relatively clear the production of most consumers' durable goods could and should be greatly reduced or eliminated, and that civilian construction should be limited to that essential to the prosecution of the war. This was progressively accomplished during 1942, although probably less rapidly than the situation warranted.

Statistics regarding the extent of the reduction in civilian use of materials must therefore be interpreted carefully, (Table 20). However, a crude measure can be obtained by noting that domestic consumption of steel for other than direct military uses dropped about 50 percent from the last quarter of 1941 to the last quarter of 1942, and that for nickel and tungsten civilian use was virtually eliminated during the year.

Selected Materials

Steel. Steel is the basic material of the ordnance, merchant vessel, naval vessel and construction programs, both in the tonnage used and in the absence of acceptable substitutes. The increase in direct military consumption of steel has roughly paralleled the growth in the output of those programs. From the fourth quarter of 1941 direct military consumption rose by successive quarterly increments of 45 percent, 43 percent, 17 percent, and 9 percent for a gain over the year of 165 percent. At the end of 1941 about one-quarter of total steel consumption was in direct military uses; a year later this proportion had risen to 57 percent. This makes no allowance for so-called civilian uses of steel directly affecting the War Program, such as the expansion of war plants not operated directly by the armed services.

Exports of steel rose by about 12 percent for the full year of 1942 as compared with 1941. Exports rose to 2.80 million net ingot tons in the fourth quarter of 1942 as compared with 2.45 million for the fourth quarter of 1941, an increase of about 15 percent. Third quarter exports were even higher, but they declined subsequently partly as a result of modification in the steel agreement with England, and partly because of shipping difficulties. The increase during the year was accounted for by a very sharp increase in shipment to Russia and by smaller increases in exports to British Empire countries other than the United Kingdom.

From the final quarter of 1941 to the final quarter of 1942 direct military consumption and exports together rose by 8 million net ingot tons, or about 115 percent. At the end of 1942 these two uses accounted for over two-thirds of total consumption.

This tremendous rise of military consumption and exports was accompanied by an increase of only 3.5 percent in total output, from 82.8 million net ingot tons in 1941 to 86 million in 1942, (Table 22 and Chart XVI). The added tonnage reflected improvement of production methods and settled labor conditions as well as newly built facilities. While the expansion program undertaken during the year will add 9,750,000 tons of steel-making capacity to that which was in operation January 1, 1942, only about one-third of this new capacity had been installed by the end of the year.

During the year there was a shortage of metallics - pig iron, scrap, and alloying metals - which for a time threatened to limit the use of capacity. However, iron ore shipments from the Great Lakes were in record volume during the year, 15 percent above the 1941 rate. Increased scrap collection averted any considerable loss of tonnage for lack of scrap, and the situation was relatively comfortable in the latter part of the year. Another and perhaps more difficult problem was the shift in the distribution of demand, by grades of steel and types of product.

The proportion of alloy to carbon steel required in 1942 was much greater than the normal proportions of peacetime, and the supply of alloy steel was increased by over 50 percent from the beginning to the end of the year. This increase was made possible by the conversion of open-hearth furnaces to alloy production and by the installation of new electric furnace capacity. In addition, steelsof drastically reduced alloy content - the so-called national emergency types - were substituted for the standard SAE grades in many military and civilian uses. Although they were not introduced until the second quarter of 1942, these steels now constitute 25 percent of the total alloy tonnage melted.

In the autumn of 1941 it became clear that the capacity of shipyards and other military users to consume steel plate was or soon would be in excess of the current supply of plate. The wholesale conversion of continuous strip mills to the manufacture of light plate greatly eased the situation and important potential bottlenecks have been overcome in the supply of this product.

A number of other important changes in the steel making process were instituted in order to adapt the industry to the requirements of the war program. The railway specialty castings industry was successfully converted to the production of tank armament, and a number of iron foundries were converted to steel production in order to meet the requirements for steel castings. Furnaces were rebuilt and auxiliary equipment adapted to facilitate the handling of the light bulky scrap collected in large volume through the popular campaign.

However, despite increases in capacity and utilization, and the alteration of processes, chief reliance for the greatly expanded flow of steel into military uses had to be placed upon the reduction of less essential civilian consumption. The cessation of civilian automobile

production, reduction in new residential and commercial construction, and in the production of containers, as well as a number of other cuts spread over the whole field of durable good output succeeded in reducing civilian consumption by over 50 percent for the fourth quarter of 1941 as compared to the fourth quarter of 1942. The civilian consumption remaining at the end of the year was itself very largely directly related to the war effort, as in the case of construction and maintenance of industrial plants, and railroad maintenance and equipment.

Aluminum. Direct military consumption of aluminum in 1942 was 1,177 million pounds, or 168 percent higher than in 1941. In 1941 about two-thirds of military consumption was for aircraft; in 1942 the ratio had risen to almost 80 percent.

Exports of aluminum, although much smaller than military use, rose even more sharply, by 336%. Combined military use and exports rose by 821 million pounds, and in 1942 accounted for over 90 percent of total use.

Domestic production rose about 75 percent and provided about three-quarters of the total increase in supply. All of this expansion was the result of plans made before Pearl Harbor. On January 4, 1942, the President called for a great increase in aircraft production and shortly thereafter a new expansion program was adopted to raise primary aluminum capacity by 640 million pounds per year. However, no part of this program was produced in 1942, although initial output was scheduled for December. Bauxite imports were substantially below expectations, and serious technical difficulties were encountered in the use of domestic ores.

Shortages of aluminum, as of most other metals, were revealed first and most intensively in scarcities of particular shapes. In the late summer a shortage of rod and bar, partly the result of original understatement of requirements, became acute. Projects to expand fabricating capacity encountered substantial obstacles, principally in obtaining heavy tools, steel plate early in the year, and extrusion presses in the later months.

While the use of aluminum for products utilized by civilian consumers - such as kitchen utensils - was cut off almost entirely during the year, consumption for indirect military uses such as war plant machinery expanded. Consequently "civilian use" in the technical sense remained fairly stable, and only 5 percent of the use in direct military consumption and exports came from curtailment of this category.

Copper. Military consumption of copper rose from 686 thousand tons in 1941 to 1,927 thousand tons in 1942. About 70 percent of this increase came from a reduction in civilian use and most of the remainder from an increase in new supply.

The bulk of the increase in copper supply during 1942 was the result of a 50 percent rise in the production of secondary metal. This rise was made possible by the reduction of scrap dealers' stocks, forced by WPB

order M-9-b, by the recovery of stocks frozen in the hands of manufacturers as a result of limitations on output, by the general scrap collection campaign and by the increased supply of process scrap that resulted from increased fabricating activity. The copper supply was further augmented substantially by and increase of 17 percent in imports, mainly from Chile, despite the shipping shortage. On the other hand, domestic primary production increased by less than four percent over 1941 and was somewhat below expectations as a result of labor shortage in the northwest copper region. Migration of skilled miners to the Pacific coast aircraft and shipbuilding industries reduced mine output and was threatening further reduction when miners were "frozen" in their jobs by order of the WMC. This order not only prevented efflux of miners but also discouraged influx. However, together with the furlough of about 4,000 soldiers to work in the mines, the order did effect a substantial recovery in mine output. Although projects for increasing copper production capacity, largely initiated in 1941, were under way, only a small amount of copper was actually available from these projects in 1942. All domestic copper expansion projects presented to the Requirements Committee in the last four months of the year were rejected.

Military consumption of copper was retarded by insufficient melting capacity at brass mills and by insufficient capacity for rolling strip. Expansion of both melting and rolling capacity was in process at the end of 1942.

Rubber, Crude and General-Purpose Synthetic. The year 1942 opened with the imminent prospect of loss of normal source of over 90 percent of the United States rubber supply, with stocks on hand equal to about 70 percent of 1941 consumption, with urgent need for increasing military consumption, and with synthetic rubber facilities largely in the discussion stage. We managed to triple military use - from 74,000 tons in 1941 to 244,000 in 1942 - while retaining 80 percent of our stocks, primarily by a very sharp cut in civilian use and by securing some rubber from the Far East before the Japanese closed in. Civilian use was reduced by close control of rubber allocations from 701,000 tons in 1941, or 90 percent of total use, to 131,000 tons in 1942, or one-third of total use. Of 275,000 tons imported during the year, 221,000 came from areas now in enemy control.

The Government facilities program for synthetic rubber production has been under way since late 1941, but the production to date has slight. Synthetic output during 1941 was entirely, and during 1942 predominantly, of special-purpose types manufactured in privately-owned plants. Total production in 1941 was only 8,700 tons and for the first 11 months of 1942, 17,800 tons. Of this 1942 output, less than 2,000 tons was so-called general-purpose rubber from government-owned plants.

Conservation

The hugely expanded demand for materials for the war program and the virtual impossibility of increasing supplies correspondingly made it essential to achieve every possible economy in requirements. This meant the elimination or drastic curtailment of every non-essential use of materials in short supply, and the careful and systematic scrutiny of all other uses with reference both to the urgency of the requirement and the possibility of conservation or substitution.

During 1942 the War Production Board rapidly extended its control over the flow of commodities in order to achieve these objectives. The system of priority ratings, which had been relied upon heavily in the early stages of the defense effort to divert materials to military production, proved increasingly inadequate. Every passing month made clearer the need for a systematic approach that would define clearly the uses to which scarce materials could be put and the extent to which competing needs for materials could be met. Great strides were made in this direction during 1942, but many problems and difficulties remained unsolved at the end of the year.

A considerable number of approaches to the problem of reducing requirements in line with supply has been used by the War Production Board (as well as by its predecessor agencies). The most important of these may be classed under the following heads which should be regarded as related rather than distinct programs:

A. The complete elimination of certain uses of scarce materials. This has been accomplished by 1. Completely prohibiting the manufacture of certain kinds of products (e.g. passenger automobiles); and 2. Prohibiting the use of scarce materials in the manufacture of specific articles, but permitting the use of substitute materials.

B. Curtailing less important uses of scarce materials. This has been accomplished by 1. Reducing the supplies of materials available for such production; and 2. Limiting the quantity of the finished product which could be manufactured.

C. Stretching supplies to the utmost by 1. Standardization and simplification programs intended to achieve, among other aims, a one-time reduction in finished product inventories and a continuing curtailment of work in process; and 2. Conservation programs. Some of these limit the amount of critical materials which can be used in the production of certain articles; others require changes in the grade of materials used or in the proportion of materials included in alloys; still others approach the problem by limiting the use of the end products and thus reducing the demand for replacement.

While the primary impact of these programs has fallen upon the civilian economy, military production has also been considerably affected. In particular, conservation measures of various kinds involving substantial changes in military specifications have been adopted during 1942. As the scope for further civilian curtailment constantly narrows, increasing emphasis must necessarily be placed upon the achievement of material economies in direct and indirect military production as the principal means of avoiding curtailment of the military program itself.

L & M Orders. The principal administrative method for restricting the use of scarce materials in civilian production has been the issuance of L and M orders; the former limiting the manufacture of certain end products, the latter directly controlling the uses to which materials can be put. Many such orders were issued during 1941, but their scope and number increased rapidly after Pearl Harbor. Even so, the actual stoppage of production of many kinds of consumers' durable goods using large quantities of metals and other critical materials was delayed considerably. Thus manufacture of domestic vacuum cleaners was not finally halted until April 1942 and similar delays occurred for domestic mechanical refrigerators, laundry equipment, metal office furniture and the like. It was not until the end of May 1942 -- 6 months after the U. S. entered the war -- that any very broad restrictions were imposed upon the use of steel for a wide range of civilian products.

By the turn of the year, the combined effect of all these orders had virtually prohibited the use of most metals in consumers' durable goods, and had severely restricted their employment in other products, such as food and industrial containers, office and commercial equipment, industrial machinery for other than war plants, construction and transportation. Uses of rubber were severely circumscribed, and silk and nylon almost entirely reserved for direct military production. The use of 100 percent virgin wool for civilian products was prohibited, and a mixture of stated percentages of other fibers required. Styles for woolen garments were simplified to achieve savings in consumption. The use of plastics was considerably restricted and a considerable range of such uses prohibited.

It is exceedingly difficult to obtain an accurate quantitative measure of the extent to which these L and M orders have actually conserved materials. One of the principal difficulties in the way of any such estimate arises from the fact that these orders represent merely one of a considerable range of related mechanisms for achieving the same end. Nevertheless, it is estimated that 30,500,000 tons of steel were used in 1941 for purposes which were under restriction by L and M orders at the end of 1942. On the basis of these orders, the maximum permissible annual consumption for these purposes now totals only 11,400,000 tons, a reduction of more than 60 percent. In the case of copper the corresponding reduction was from 1,021,000 tons

in 1941 to a maximum of 464,000 tons on the present basis, a cut of about 55 percent. For tin the reduction was from 91,000 tons in 1940 (no 1941 comparison available), to 28,000 tons at present permitted, or almost 70 percent. Most of the saving in each of these materials traces to the orders affecting automotive transportation, consumers' durable goods and metal containers; in addition sizable reductions were also effected for farm machinery and for construction.

In the case of aluminum the most important saving achieved through L and M orders has resulted from the virtual elimination of this metal for construction, for passenger air transportation and for cooking utensils; uses which took a total of almost 250 million pounds in 1940. For rubber, the principal saving has been in connection with tires for passenger automobiles and trucks; crude rubber requirements for these purposes are estimated at 79,000 tons in 1943 as contrasted with 484,000 tons in 1940.

While substantial savings have thus been achieved, there has been a pronounced lack of adequate criteria in the issuance of these L and M orders. Until recently they have been initiated almost entirely at the discretion of the individual industry and commodity branches. The industry branches in particular were often reluctant to issue orders curtailing production, giving probably undue weight to their desire to avoid business dislocations and insufficient emphasis to the need for conserving materials, machines, and manpower. On the other hand, information was often lacking for an intelligent appraisal of civilian and military requirements for products whose curtailment was proposed. As a result, orders were frequently issued on the basis of inadequate rule-of-thumb judgment and allowed either too much production in the light of competing demands for men and materials, or too little production in the light of minimum essential needs. The Standard Products Committee, which was established to provide a better basis for measuring the need for various kinds of end-products, provided only a partial solution, largely because it proved almost impossible to tie properly the work of that Committee to any general program for materials control.

Conservation Programs. In addition to restricting the flow of scarce materials into less essential end-uses directly, the WPB has placed considerable emphasis upon programs designed to stretch the available supply of materials as far as possible. In general, these programs have received emphasis where the mere abandonment or drastic curtailment of the end-use in question was not readily feasible, and where the amounts of critical materials involved were fairly substantial. For example, direct prohibition afforded an adequate means of saving the steel that used to go into baby carriage wheels but other means were clearly necessary for dealing with tin cans or

construction. Moreover, conservation measures can and have been applied to military as well as to civilian goods, a field in which restrictions of the kind which have been described earlier were obviously inapplicable.

There have been a number of different approaches to the problem of saving scrap materials without corresponding curtailment of the end-products involved. These may be classified as follows:

1. Altering specifications or standards to permit the use of less of the scarce material in each unit of the finished product. Examples of such action include the reduction of the thickness of the coating on tinplate, and the increase of permissible stresses for structural steel.

2. Provision for the substitution of less critical for more critical materials. This may include the substitution of lower grades of the same material, which are usually in easier supply than the better grades. Such programs have received considerable attention, both for civilian and military goods. In the former field, for example, the substitution of glass for metal food containers has resulted in very substantial economies of both steel and tin. The reduction of the copper content of alloys is estimated to have achieved a saving of 24,000 tons of copper during 1942 in bronze alloys for industrial use alone.

The Armed Services have also cooperated in the program to shift to less critical materials. Steel has been substituted for aluminum in ship construction, basketweave cable, mess gear, tank and gun parts, air force ground equipment, and many other items, resulting in a minimum net saving of 45,000 tons of aluminum for 1942 and a probable saving of several times that amount. Steel has also been substituted for copper in such items as cartridge cases, bullet jackets and belt buckles, thus saving at least 40,000 tons of copper for 1942 in the manufacture of these items. The composition of cartridge case brass was changed to permit the use of less copper and more zinc, and resulted in an estimated saving of 20,000 pounds of copper in 1942. Steel, while serving in many cases as a substitute for copper and aluminum, is in itself a critical metal, and efforts to conserve it have resulted in the substitution of plywood for steel in life boats, of wood for steel in truck bodies, cots, army food carts, etc. Cattle hair has been substituted for foam rubber in the interior padding of tanks, and in jeep seat cushions, resulting in a saving estimated at nearly 3,000,000 pounds of crude rubber.

Programs of this kind must, of course, be subjected to constant scrutiny because of the possibility that the relative scarcity of the materials involved may alter. Thus, the proportion of zinc in copper alloys has been increased because of the greater relative scarcity of copper; if the zinc situation becomes tighter in the future, it may prove necessary to reverse the procedure.

3. Standardization of end-products through reduction in the number of varieties, styles, and sizes affords another important method of cutting materials requirements. It achieves an immediate reduction in the necessary inventories of the end-products in the hands of manufacturers, distributors, and consumers and a continuing reduction in the amount of material tied up in work-in-process. However, unlike the programs referred to earlier, the effort to achieve standardization is still in its early stages and many further economies should be obtainable from this source.

This is particularly true of military products. Thus, the amount of material needed for spare parts for airplane engines is actually in excess of the requirements for the original units. Greater standardization, particularly for transmissions, should achieve substantial savings in this field. Similarly, military requirements for rubber could probably be reduced considerably by cutting down on the present large number of tire sizes and types. It seems clear that such avenues of economy should be explored much more intensively.

4. In addition to the savings achieved by programs administered directly by WPB, the savings effected by civilian rationing programs should not be neglected. In some cases these lessen requirements directly for the commodity rationed. In others, as in the case of gasoline mileage rationing in the Midwest, the saving is indirect, affecting replacement requirements for rubber, and incidentally for other spare parts.

Coordinated Controls

The methods so far described were reasonably effective in dealing with the particular problems to which they were directed. They could curtail specific uses of scarce materials or achieve specific economies. They were not, however, capable of providing a coordinated program for balancing requirements against supply and for appraising competing needs for materials so as to achieve a balanced and feasible production program.

It is clear that any adequate system for directing the flow of resources in war time must approach the problem as a whole; it must permit the analysis of alternative claims upon resources in terms of the relative importance of each to the war program and must provide for the enforcement of these determinations. Such decisions cannot be made by segments. This means that materials requirements for all

the different segments of the program - military, civilian and foreign - must be estimated, compiled and evaluated in terms of available supplies, that allocations must be made on the basis of this information, and that mechanisms must be established for insuring the flow of materials in accordance with such allocations.

During the year 1942 efforts were made to transform the system of materials controls from one which at the beginning of the year was unintegrated, uninformed as to war uses, and in many respects unenforceable toward one which could provide a coordinated and enforceable basis for action. The first effort toward such a transition was the Production Requirements Plan which was put into effect on a full scale in July, 1942. As conceived, it was intended to achieve a consolidated statement of all claims on materials for consideration by a single authority. Its principal emphasis, however, was upon the initial stage of the production process - upon the prime users of materials - and it failed to provide any adequate tie with end-use. In addition many important areas of materials consumption were exempt from its scope.

Whether or not these defects were inherent in the system, it was decided near the end of the year to abandon it in favor of the Controlled Materials Plan which is based directly upon end-use and which provides for vertical controls extended throughout the production process. At the end of the year preparations were under way to introduce this plan on a limited scale in the second quarter of 1943 and on a full scale in the third quarter. While many problems and difficulties remained unresolved, the need for an integrated plan of control based upon adequate knowledge of requirements and supply had at last come to be fully appreciated. Complete, simultaneous, planned determination of all the flows of resources in a complex economy is undoubtedly unattainable. However, important steps were made toward this objective in the control of materials in 1942.

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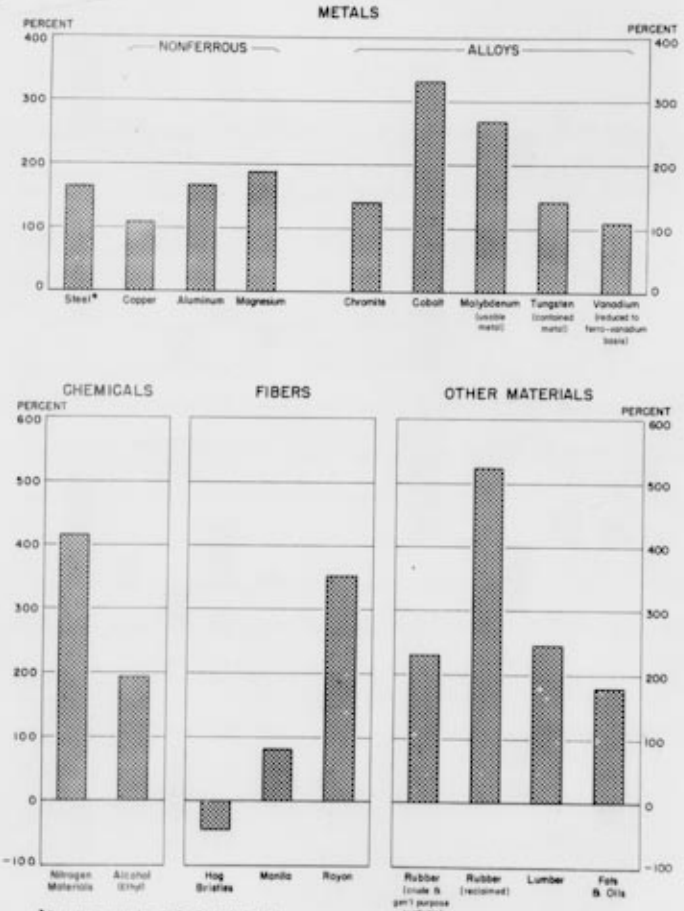
CHART XII

PERCENTAGE CHANGE FROM 1941 TO 1942 IN DIRECT MILITARY CONSUMPTION OF SELECTED MATERIALS



* Percentage increase from 4th Qtr. 1941 to 4th Qtr. 1942

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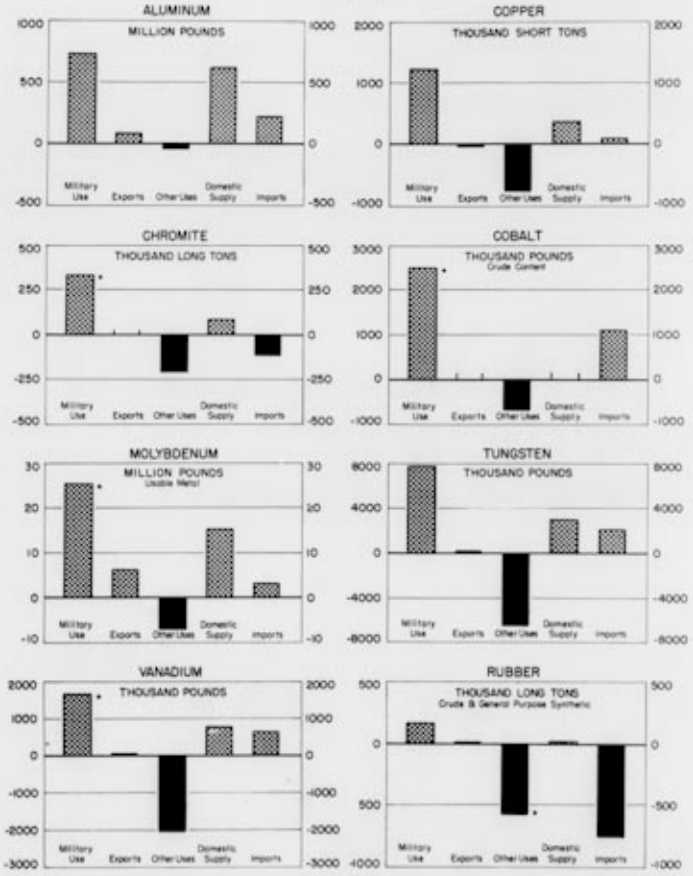
CHART XX

CHANGE IN THE FLOW OF MATERIALS

1941 TO 1942



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E.O. 11652, Sec. 3(E) and 5(D) or (E)
Commerce Dept. Letter, 11-18-74
By RHP, Date

*Includes estimated indirect military uses.

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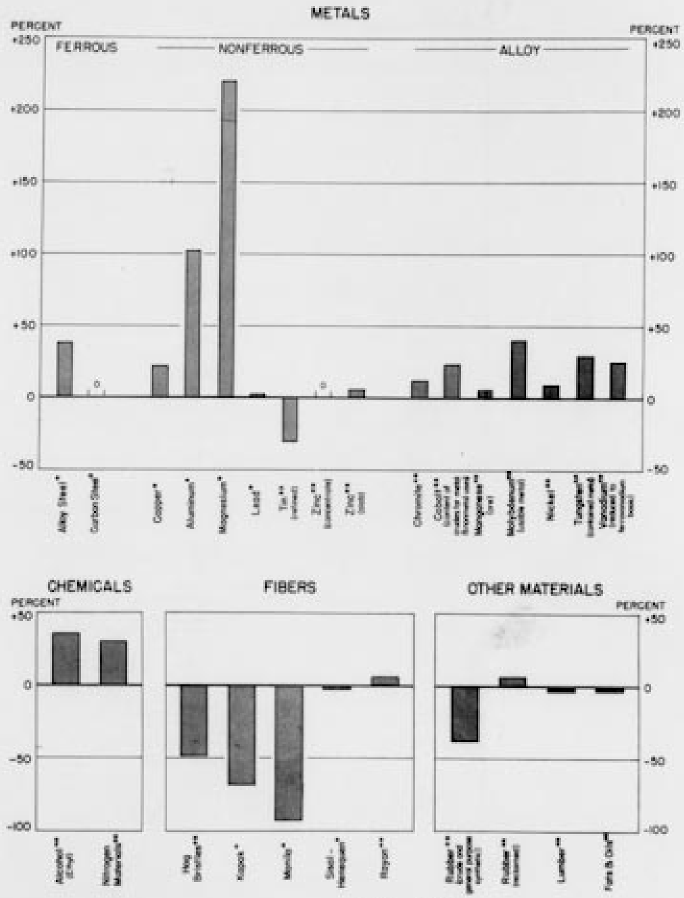
CHART 335

PERCENTAGE CHANGE FROM 1941 TO 1942 IN SUPPLY OF SELECTED MATERIALS



* Percentage change in total new supply only.

** Percentage change in total new supply including beginning of year stocks.

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Commerce Dept. Letter, 11-18-73
By RHP, Date

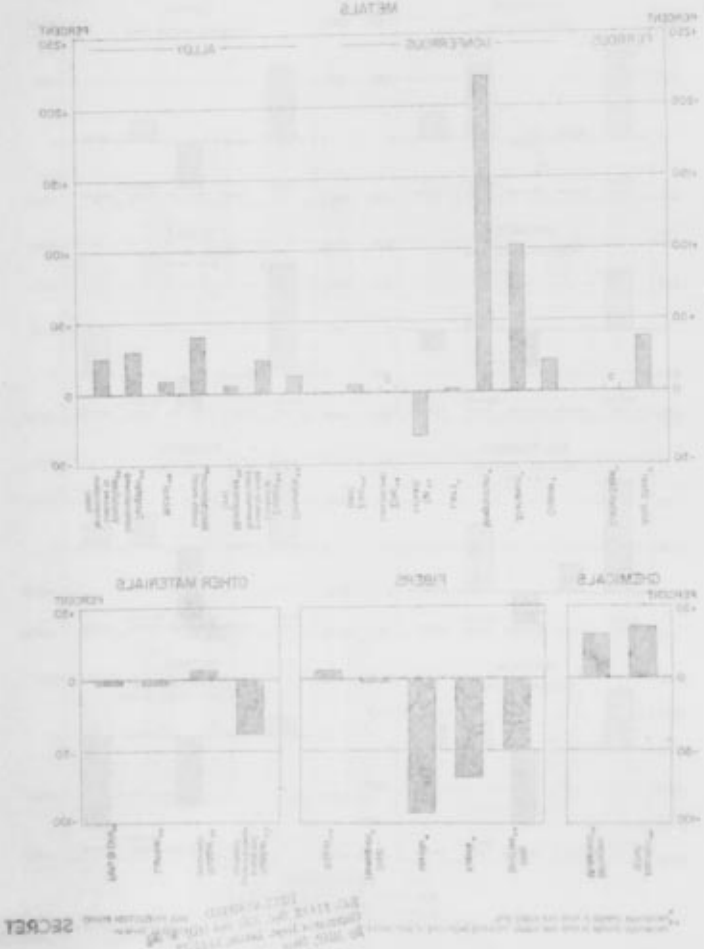


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TABLE 19

Direct Military Consumption of Selected Materials
1941 - 1942

Material	Unit	1941	1942	1942 as % of 1941	4th Quarter 1941	4th Quarter 1942	4th Quarter 1942 As % of 4th Quarter 1941
I. Metals							
1. Ferrous							
1. Steel Total	Net Ingot Tons				4,643,158	12,332,431	266
2. Non-Ferrous							
1. Copper	Thous. of S.T.	686	1,927	280			
2. Aluminum	Thous. of lbs.	440,000	1,177,376	268	162,413	382,000	235
3. Magnesium	Thous. of lbs.	26,785	77,428	289	9,231	34,103	369
3. Alloys							
1. Chromite	L.T.	143,000	344,000	241			
2. Cobalt	Thous. of lbs.	445	1,920	432			
3. Molybdenum (Metal in Usable Form)	Thous. of lbs.	7,600	28,925	371			
4. Tungsten (Contained Metal)	Thous. of lbs.	1,647	4,004	243			
5. Vanadium (Reduced to Ferro.Vanadium Basis)	Thous. of lbs.	1,008	2,115	210			
II. Chemicals							
1. Alcohol (Ethyl)	Mil. of Wine Gals.	18	53	294			
2. Nitrogen Materials	Thous. of S.T.	85	438	515			
III. Fibers							
1. Hog Bristles	Thous. of lbs.	1,155	760	66	252	178	71
2. Manila	Mil. of lbs.	22	40	182			
3. Rayon 2/	Mil. of lbs.	15	68	453			
IV. Other Materials							
1. Rubber - Crude and General Purpose Synthetic 1/	Thous. of L.T.	74	244	330			
2. Rubber - Reclaimed	Thous. of L.T.	12	74	624	6	28	444
3. Lumber	Bil. of Bd. Ft.	4	15	348			
4. Fats and Oils	Mil. of lbs.	189	530	280			

1/ Includes Buna-S, butyl, Neoprene and thiokol; excludes Buna-N special purpose types.
2/ Includes filament yarn and staple fiber.

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TABLE 20

Change in the Flow of Materials
1941 to 1942

	Change In Military Use	Change In Exports	Change In Other Uses	Change In Domestic Supply	Change In Imports
Aluminum (000 lbs)	+737,376	+83,879	-39,698	+622,762	+226,439
Magnesium (000 lbs)	+50,645	+8,157	+14,920	72,888	-
Copper (000 short tons)	+1,241	-20	-754	+383	+90
Chromite (long tons)	+345,000 1/	negl.	-200,000	+87,269	-114,276
Cobalt (crude content 000 lbs)	+2,504 1/	-	-673	-	+1,107
Molybdenum (usable metal, 000 lbs)	+25,375 1/	+6,113	-6,875	+15,149	+3,170
Tungsten (000 lbs)	+7,775	+123	-6,531	+2,993	+2,047
Vanadium (000 lbs)	+1,693 1/	+60	-2,033	+782	+646
Alcohol (Ethyl) (Mill. wine Gals, 190 proof)	+35	+19	-15 1/	+78	-
Nitrogen Materials (Ammonia equivalent) (000 short tons)	+353 1/	-21	-2	+224	+96
Hog Bristles (000 lbs	-745 1/	-596	-2,000	+10	-4,580
Kapok (000 lbs)	+2,500	-1,600 3/	-16,000	-	-25,700 2/
Manila (000 lbs)	+15,500 1/	-11,200	-95,500	-	-231,000
Rayon (000 lbs) 5/	+53,000 1/	-7,500 4/	-29,600	+48,800	-11,600
Rubber (long tons) Crude and General purpose synthetic	+170,000	+5,600	-570,000 1/	+11,000	-754,000
Rubber (long tons) Reclaimed	+62,400	+14,100	-58,800	+8,600	-
Lumber (Mill. bd. feet)	+10,900	-400	-3,100	-2,700	+200
Fats and Oils (Mill. lbs)	+341	+410	-948	+750	-902

1/ Includes estimated Indirect Military Uses
2/ 1942 Import figure through November only
3/ 1942 export figure through October only, but no additional exports anticipated
4/ 1942 export figure through October only
5/ Includes filament yarn and staple fiber. Export figure also includes piece goods and fabrics but not finished garments or hosiery.

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TABLE 21

Total New Supply of Selected Materials - 1941 - 1942

Material	Unit	Domestic 1941	Domestic 1942	Domestic 1942 as % of 1941	Imports 1941	Imports 1942	Imports 1942 as % of 1941	Total New Supply 1941	Total New Supply 1942	Total New Supply 1942 as % of 1941
I. Metals										
1. Ferrous:										
1. Steel - Alloy	Net ingot tons	8,056,128	11,351,988	138	0	0		8,056,128	11,351,988	138
2. Steel - Carbon	Net tons	74,830,817	74,688,013	100	0	0		74,830,817	74,688,013	100
2. Non-Ferrous:										
1. Copper	Short tons	1,740,999a/	2,121,610a/	122	543,856	574,500	111	2,285,155a/	2,717,910a/	121
2. Aluminum	Thous. of lbs.	808,675	1,405,938	177	25,258	251,717	996	873,982	1,685,151	202
3. Magnesium	Thous. of lbs.	33,060	176,580	520				33,060	176,580	530
4. Lead	Short tons	479,118	495,170b/	93				[illegible]	[illegible]	[illegible]
5. Tin (Refined)	Long tons				274,399	333,400b/	121	1,054,517	1,293,170b/	[illegible]
6. Zinc (Concentrates)	Thous. of tons, metal/content)				108,593	90,683b/	85	108,593	90,683b/	75
7. Zinc (Slab)	Thous. of short tons	835	909	109	250	580	110	1,180	1,389	118
		888	946	107	40	39	98	928	985	106
3. Alloy:										
1. Chromite	Long tons	18,731	100,000	585	895,776	881,500	85	1,008,507	981,500	97
2. Cobalt (Content of cobalt, for metal and non-metal uses combined)	Thous. of lbs.	500	900	180	4,353	5,500	126	4,853	6,000	123
3. Manganese (Ore)	Thous. of long tons	73	175	240	1,395	1,185	85	1,468	1,360	93
4. Molybdenum (Total in usable form	Th. lbs.	37,751	50,900	141	80	1,250	4,063	37,931	55,750	146
5. Nickel	Mill. of lbs.				180	195	108	180	195	108
6. Tungsten (contained metal)	Thous. of lbs.	6,221	9,212	148	13,153	15,200	116	19,576	24,412	125
7. Vanadium (Reduced to Ferro-Vanadium basis)	Thous. of lbs.	1,858	2,862	152	1,604	2,250	140	3,472	4,900	[illegible]
II. Chemicals										
1. Alcohol (Ethyl)	Millions of wine gals. 190 proof	217	299	138	0	0		217	299	138
2. Nitrogen Materials	Thous. of short tons	783	1,027	131	179	273	153	962	1,300	135
III. Fibers										
1. Hog Bristles	Thous. of lbs.	2	10		5,484	1,191c/	22	5,486	1,201c/	22
2. Kapok	Thous. of lbs.	0	0		17,000	11,500d/	51	17,000	11,500d/	51
3. Manila	Thous. of lbs.	0	0		290,000	18,000e/	7	290,000	18,000e/	7
4. Sisal-Henequen	Thous. of lbs.	0	0		241,000	150,000	67	241,000	150,000	67
5. Rayon f/	Thous. of lbs.	573,000	620,500	108	11,000	negl.	0	584,000	620,000	106
IV. Other Materials										
1. Rubber - Crude & General Purpose Synthetic g/	Thous. of long tons	negl.	22		1,029	275	27	1,029	288	28
2. Rubber - Reclaimed	Long tons	274,250	288,400	105	0	0		274,250	288,400	105
3. Lumber	Millions of bd. ft.	35,700	33,000	92	1,300	1,500	115	37,000	34,500	93
4. Fats and Oils	Millions of lbs.	9,385	10,131	108	1,900	1,000	53	11,285	11,131	99

* Secondary only.
a/ Includes purchased scrap.
b/ Estimated on basis of 10-month actual figures available for production and 11 months for imports.
c/ 11 months.
d/ Actual arrivals, Jan.-Nov. 17.9 million pounds; balance of 0.6 million pounds expected from Ecuador and Brazil.
e/ Actual arrivals, Jan. - Nov. 1942.
f/ Includes filament yarn and staple fiber.
g/ Includes Buna-S, butyl neoprene and thiokol; excludes Buna-N. Special Purpose Types.

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Commerce Dept. Letter 11-15-72
By RHP, Date

TABLE [illegible]

Total Supply of Selected Materials - 1941-1942

Material	Unit	Total New Supply 1941	Total New Supply 1942	Total New Supply 1942 as % of '41	Beginning Stocks 1941	Beginning Stocks 1942	Beginning Stocks 1942 as % of '41	Total Supply Including Stocks 1941	Total Supply Including Stocks 1942	Total Supply Including Stocks 1942 as % of '41
I Metals										
A. Ferrous:										
1. Steel - Alloy	Net Ingot Tons	8,206,149	11,341,982	138						
2. Steel - Carbon	Net Ingot Tons	74,630,817	74,648,510	100						
B. Non-Ferrous:										
1. Copper	Short Tons	2,084,196 1/	2,757,000 2/	131						
2. Aluminum	Thous. of lbs.	851,946	1,585,153	868						
3. Magnesium	Thous. of lbs.	33,092	105,985	320	n.a. 3/	n.a. 3/				
4. Lead	Short Tons	1,268,507	1,285,159 2/	101						
5. Tin (Refined)	Long Tons	105,543	90,683 2/	85	78,290	132,309	169	247,833	182,058 2/	74
6. Zinc (Recoverable) Metal Content	Thous. of Tons	1,180	1,209	106	350	300	82	1,550	1,549	100
7. Zinc (slab)	Thous. of Sh. Tons	968	981	106	104	102	96	1,030	1,083	105
C. Alloy:										
1. Bauxite	Long Tons	1,008,507	981,500	97	105,000	967,806	133	1,754,507	1,946,306	113
2. Cobalt (Content of Grades for Metal & Non-Metal Uses)	Thous. of lbs.	4,893	6,000	123	3,000	3,700	123	7,893	9,700	123
3. Manganese (Ore)	Thous. of L. Tons	1,468	1,500	95	1,661	1,956	118	3,149	3,316	105
4. Molybdenum (Metal in Usable Form)	Thous. of lbs.	37,631	55,750	148	15,000	17,611	117	52,631	73,361	140
5. Nickel	Millions of lbs.	180	195	108	5	5	100	185	200	108
6. Tungsten (Contained Metal)	Thous. of lbs.	19,376	24,416	126	9,402	12,862	137	28,778	37,278	130
7. Vanadium (Reduced to Ferro-Vanadium Basis)	Thous. of lbs.	3,452	4,900	141	1,010	700	70	4,452	5,600	125
II Chemicals										
1. Alcohol (Ethyl)	Millions of Wine Gals. 190 Proof	217	295	136	negl.	negl.		217	295	136
2. Nitrogen Materials	Thous. of Sh. Tons	962	1,282	133	61	62	102	1,023	1,343	131
III Fibers										
1. Hog Bristles	Thous. of lbs.	5,861	1,751	30	3,000	3,200	107	8,861	4,951	51
2. Kapok	Millions of lbs.	37	12 5/	31						
3. Manila	Millions of lbs.	259	18 5/	7						
4. Sisal & Henequen	Millions of lbs.	341	330	97						
5. Rayon 9/	Millions of lbs.	585	620	106	negl.	negl.		585	620	106
IV Other Materials										
1. Rubber-Crude and General Purpose Synthetic 6/	Thous. of L. Tons	1,029	396	38	289 7/	533 7/	184	1,318	819	62
2. Rubber-Reclaimed	Thous. of L. Tons	274	283	103	33	42	128	307	325	106
3. Lumber	Billions of Bd. Ft.	37	35	95	14	15	102	51	49	96
4. Fats and Oils	Millions of lbs.	11,085	11,131	95	2,540	2,260	89	13,625	13,391	97

1/ Includes purchased scrap.
2/ Estimated on basis of 10 month actual figures available for production and 11 months for imports.
3/ 11 months.
4/ Actual arrivals, Jan.-Dec. 10.5 million pounds; balance of 0.8 million pounds expected from Ecuador and Brazil.
5/ Actual arrivals Jan.-Nov. 1942.
6/ Includes Buna S; butyl neoprene and thiokol; excludes Buna N, special purpose types.
7/ Total Stocks, government and industry held, all under government control.
8/ As of June 30, 1942, a stock of 708,798 pounds was in hands of foundries, fabricators, users, distributors, primary and secondary producers. Stocks on June 30, 1941, in hands of producers, fabricators, and all consumers of 5 pounds or more, excluding aircraft companies and smelters, totaled 842,155 pounds.
9/ Includes filament yarn and staple fiber.

I-5. The Flow of Resources into Military Production: Facilities

The flow of resources, through facilities, into military production takes three forms: the construction of new facilities; the utilization of facilities already engaged in military production; and the conversion to armaments manufacture of facilities hitherto engaged in civilian production.

New War Plant Facilities

Size of Program. The most significant part of the war construction program -- both from the point of view of military production and the long range effect on the American economy -- is the construction, enlargement and equipping of a large number of factories now making military products or components and raw materials for them -- plant which, in most cases, will be readily convertible, to civilian production when hostilities have ceased.

The total value of industrial plant construction and installations of equipment during 1942 is estimated at more than $8 billion, about twice its 1941 level (Table 23 and Chart XVII). This is more than the total of civilian plant and equipment construction in any previous year. The immense volume of war plant construction reduced the amount of new industrial equipment available for civilian use considerably below the pre-war level and caused a marked expansion in the total of plant and equipment built in the U. S. Investments in railroads, power plants and other public utilities were also at high levels, although somewhat below those of 1941.

For a correct evaluation of the progress of the war plant facilities program during 1942, it is necessary to bear in mind that most of the new construction and equipment went into plants that were not yet producing finished munitions by the end of the year. Indeed, it may be estimated that by November 30, 1942 only about every fourth plant (with about one-sixth of total ultimate expenditure) for which a contract had been let since the middle of 1940, had been completed.[1/] The value ratio was particularly low for aircraft and combat vehicle factories and the plants for increasing the supply of basic metals and chemicals, but relatively high -- between 20 and 35 percent of final outlay under the program -- for ammunition, explosive and gun plants. Some of the unfinished plants started partial operation during the year, but only a small part of the large input of raw materials, manpower and equipment that was devoted in 1942 to the construction and equipment of new plants paid dividends in the form of munitions received during the ye . Most of this input will begin repaying the investment only in 1943, and in some cases not until 1944.

1/ The low level of these ratios can be partly explained by continued enlargement of the production programs.

Type of Projects. Nearly three-quarters of the total 1942 outlay for war industrial facilities went for plants to produce combat munitions (including merchant ships), while about one-quarter was used to expand facilities for raw materials and machine tools (Table 24).

Among munitions facilities those for ordnance bulked largest, the value of work done during the year amounting to $2.4 billion or about one-half of the total. Aircraft plants accounted for another quarter and shipyards for about one-fifth. This distribution differed little from that in 1941.

Expansion of non-munitions facilities was concentrated in plants for non-ferrous metals (chiefly aluminum and magnesium) on which over $600 million was spent during the year; iron and steel, over $500 million; chemicals, more than $400 million; and machinery (including machine tools), $600 million. Very little progress had been made by the end of 1942 on synthetic rubber and 100-octane gasoline plants.

Size of Projects. No data have been compiled on the distribution, among plants of different size, of the work done during 1942 on new war plants. The size distribution of the publicly financed war facilities program as of November 30, 1942 — when some plants were already in operation, others not yet started and the majority in various stages of completion — may, however, be used as a substitute (Table 25 and Chart XVIII).

The bulk of the war plant expenditure program - and hence presumably most of the work done during 1942 — is concentrated in a small number of large projects. The 337 largest projects, each with an estimated final cost of $10 million or more, accounted for $10.6 billion or nearly three-quarters, of all publicly financed war plant expansions. Fifty-five giant plants, costing over $50 million each, alone represented nearly one-third of the total program. At the other end of the scale, 1845 projects with values of less than $1 million were estimated to cost only 4 percent of the total outlay on publicly financed war facilities. This concentration in large projects is considerably greater than that prevailing in industry before 1940.

The proportion of large projects varied considerably among industries. It was noticeably above the average among explosive and loading plants and considerably below it in several of the civilian type plants, such as machinery and machine tools, but also among plants for producing guns.

Financing the War Plant Expansion Program. By 1942 the war production program had grown so large requiring so many specially-constructed facilities, that the great bulk of the projects required financing by the federal government. During 1942, $6.6 billion or 81 percent of total value put in place in war facilities was in federally financed projects. Privately financed facilities have accounted for only about $1.6 billion or 19 percent of the total (Table 23).

Publicly and privately financed war facilities differed in type. In the absence of adequate data on value put in place during 1942, the estimated total cost (i.e., the total program) of facilities as of December 31, 1941 and November 30, 1942 must suffice for illustration (Table 26 and Chart XIX).1/ Privately financed facilities were concentrated almost exclusively in raw material industries (particularly iron and steel, non-ferrous metals and petroleum), in electric power plants, and in manufacturing industries (machine tools, machinery, electrical equipment, chemicals) easily convertible to civilian production. In these fields, privately financed facilities are about two-thirds as large as publicly financed projects. Private financing of facilities for munitions production, on the other hand, is very small and is completely dwarfed -- in about the ratio of 1 to 20 -- by similar facilities financed by the Federal Government.

Progress of Program. The work on industrial plant facilities expanded rapidly throughout the year. Starting at about $425 million in January, value put in place rose to about $700 million a month by mid-year and reached a high point of over $800 million in August and September. The ensuing decline has been moderate, value in place for December still totaling about $750 million or nearly twice the level of a year ago (Table 23). While construction work and equipment installations each totaled about $4 billion for the year, construction work rose more rapidly than did the installation of equipment, in the earlier phases of the program and began to decline while installations of new equipment were still rising.

Specifically, war plant construction, increasing from slightly over $200 million in January to a high of well over $400 million in August, fell to not much more than $300 million in December. The value of equipment being installed in industrial plants, on the other hand, increased from about $200 million in January to fully $400 million in December and had not yet begun to decline at the end of the year.

The Supply of Machine Tools. As in 1940 and 1941 the production of new machine tools constituted probably the most important bottleneck in the expansion of facilities for war production. Although the output of the machine tool industry again increased sharply and shipments to domestic civilian users were sharply curtailed supply continued insufficient to satisfy all demands for equipment for new war plants and exports to our Allies.

Deliveries of machine tools during the year aggregated slightly over $1.3 billion, an increase of about 70 percent over 1941 and more than three times 1940 production. Since exports, amounting to about $160 million, were slightly below the 1940 and 1941 levels, sales to domestic consumers increased even more sharply than total shipments, rising from only a little over $0.6 billion in 1941 to $1.16 billion in 1942 (Table 27). Production expanded in almost all types of machine tools, but particularly in grinding, drilling and milling machines (Table 28).

1/ The total cost of the war industrial facilities program as shown in Table 26 and Chart XIX includes a relatively small group of non-manufacturing facilities, mostly electric power plants and lines and railroad equipment (amounting to an aggregate cost of $1.5 billion by November 30, 1942); on the other hand, the total value put in place as shown in Table 24 covers only manufacturing plants, leaving out the non-manufacturing

The machine tool industry's sharp increase in total output was achieved to a large extent by enlarging its own facilities. (Most of these expansions, of course, had been begun in 1940 and 1941.) The value of plant expansions in the machine tool industry, about half financed by the U. S. Government, amounted to about $50 million in 1941 and about $150 million in 1942 compared with about $20 million in 1939. The 1942 amount was probably not much smaller than the entire pre-war investment in the industry.

Increased plant utilization made only a small contribution to increased output of machine tools. The average rate of plant utilization rose from 82 hours in December 1941 to about 90 hours in May 1942 and thereafter remained at that level. Increase in productivity per worker, however, was a major factor in stepping up output. The number of man-hours worked increased only 27 percent between December 1941 and December 1942, while shipments rose more than 60 percent.

During the first half year the backlog of orders continued to increase as large orders were placed, reflecting the rapid expansion of the war production program then taking shape. Unfilled orders shot up from $0.6 billion at the end of 1941 to nearly $1.4 billion in May 1942. After a few months in which current shipments were about equal to new orders, the backlog began to decline, falling to $1.1 billion by the end of the year.

There is no direct information on the proportion of domestic shipments of new machine tools that went into war plants. However, W.P.B. order No. M-1-b, effective May 1, 1942, reserved 75 percent of current shipments for war plants leaving the remaining 25 percent to be divided between exports and domestic civilian demands. Since export shipments ran to somewhat over 10 percent of total, it may be assumed that during the second half of the year not more than 15 percent went to domestic civilian plants; this percentage, however, was probably higher during the first half of the year. On these assumptions, fully two-thirds of the total production of machine tools, with a value of about $0.9 billion, was installed in war plants. This is equivalent to between one-fifth and one-quarter of total estimated machinery and equipment installations in such plants.

The Supply of Other Types of Machinery and Equipment. The production of machinery and equipment, other than machine tools, also increased sharply during 1942. For the group as a whole, the increase amounted to about one-eighth if motor trucks and farm machinery are included, and about one-quarter, excluding these two types (Table 29.) Increases were greatest in engines and turbines, pumps and pumping equipment, and construction machinery, all items needed for new war plants or for direct military construction. Those branches of the machinery industry producing largely for civilian use (such as general and miscellaneous machinery, electrical equipment, office machinery, farm machinery and locomotives and railroad cars) showed little or no increase. Even within these groups, of course, the production of items needed by the military increased while the output of civilian-type equipment declined.

Expansion of facilities apparently accounted for a considerably smaller part of the total increase in output than was the case in the machine tool industry. Greater output was achieved mainly through more intensive utilization of existing facilities and was accompanied by considerable conversion from civilian-type to military products.

During 1942 new war plants absorbed about $4 billion worth of equipment, of which a little less than $1 billion consisted of machine tools. The remaining $3 billion seems to have represented less than half of the total domestic absorption of these types of durable producers goods, (excluding motor vehicles, railroad equipment and farm machinery). The shift to war orders, therefore, was less pronounced in these industries than in the machine tool industry.

Utilization of Existing Facilities

In an economic system such as ours that ordinarily operates, with the relatively insignificant exception of continuous process industries, on a one-shift basis, it is always possible to step up production by increasing the degree of utilization of facilities provided the necessary labor reserve and raw materials are available. In 1942, as in the two preceding years, a considerable though diminishing portion of the contribution to the war effort made by existing facilities consisted of stepping up hours of work of machine tools and other equipment.

Changes in "utilization" are the result of three distinct factors: (a) number of men employed on the first shift (without addition of new equipment); (b) number of hours worked per week; and (c) use of second, third and Sunday shifts. There is no statistical information on the first factor, as no data have been collected differentiating employment in old and new facilities. The number of hours worked per man has increased about 8 percent in the munitions industries and somewhat less in civilian industries. The use of second and third shifts has risen very little, as will be detailed below. Since total hours worked in munitions industries increased by more than 50 percent and the amount of new facilities commencing operation in 1942 was relatively small, most of the contribution made by existing facilities must have been in the form of an increase in the number on first shift.

There is little doubt, even in the absence of comprehensive data, that in practically all sectors plant utilization increased, although in varying degrees. The railroads, for instance, carried one-third more ton miles of freight in 1942 than in 1941 with only a very small expansion of their facilities. The production of electrical energy in 1942 was about 15 percent higher than in the preceding year although capacity was expanded by less than 10 percent. The business of the American Telephone and Telegraph Company expanded by nearly one-tenth, without a significant increase in plant and equipment.

From the standpoint of war production, major importance attaches to changes in utilization of our manufacturing plant. Comparable figures are available for nine war industries which in the aggregate are responsible for the bulk of the output of combat munitions (Table 30 and Chart XI). These industries showed only a small increase in the rate of plant utilization after March 1942, (i.e. total hours worked divided by the number of men on first shift), viz. from 84 hours to 88 in December, or about 5 percent. It is likely, however that the March rate was considerably above that prevailing before Pearl Harbor, though not above that at the end of 1941. For the last nine months of 1942 the increase in utilization was large in airframe, propeller, shipbuilding, fire control equipment and small arms ammunition plants. It was small or non-existent in gun and artillery ammunition plants. In both airplane engine and tank plants the average rate of utilization declined by about five hours per week. No figures are available for non-war manufacturing industries, but it is unlikely that there utilization increased significantly during 1942. Fuller utilization of existing facilities in the sense of larger use of second, third and Sunday shifts, therefore, made only a small contribution to the increase in total manufacturing production and the production of munitions in 1942.

More comprehensive information is available for the end of 1942 (Table 31). In December plant utilization in all metal fabricating industries except aircraft and shipbuilding averaged 72 hours, considerably less than the 81 hours in the 5 major armament industries encompassed within the group. (Inclusion of the aircraft, shipbuilding and machine tool plants would increase the average to about 77 hours). Plant utilization ranged, among major groups, from 61 hours in transportation equipment and miscellaneous industries to 85 in the automobile and nearly 100 in the aircraft industries. In general, industries with a high share of direct war work also showed a relatively high degree of plant utilization, but the relationship was far from systematic.

Conversion of Facilities to War Production

In 1942, as in previous years, the bulk of the goods used by the Armed Services (and, of course, most of the raw materials and common components going into them) were produced in plants and by equipment already in existence at the beginning of the year. No comprehensive statistics are available on this point, but it has been estimated that even in a rapidly expanding industry like aircraft only about 10 percent of total production came from plants beginning delivery during 1942. Since, however, new war plants have been under construction on a large scale since mid-1940, the proportion of armaments coming from pre-war plants has fallen rapidly during 1942 while the share from facilities built originally for the production of munitions has increased correspondingly. In certain important sectors, such as aircraft, tanks, explosives and merchant ships, from 50 to almost 100 percent of 1942 production has been contributed by special-purpose plants built after 1939. In other sectors, however (e.g. quartermaster items, signal corps equipment, certain ordnance items and particularly, among parts or components) most of the 1942 output has come from pre-war plants in which more or less additional equipment has been installed.

There is no satisfactory overall measure of the extent to which our pre-war industrial plants have been converted to war production. An idea of the extent of conversion is given, however, by the fact that the volume of war output, as measured by the Federal Reserve Board Index of Industrial Production, rose by 56 points between December 1941 and December 1942 while total industrial production increased only 26 points. At least one-half of the total increase in industrial war output apparently resulted from the conversion of plants engaged in production for civilian use before 1942.

The process of conversion can be seen in some detail and measured with more confidence in the metal products industries. The share of combat materiel in the total shipments of these industries rose from 33 percent in June to 43 percent in November (Table 32 and Chart XII). If we assume that the process of conversion proceeded throughout the year at the average rate i.e. nearly 2 percent, for these six months, the proportion of combat materiel shipments should have risen from less than 25 percent in January to 45 percent in December.

During the half year for which detailed observation is at hand, the speed of conversion to combat materiel production did not vary much among major industries, although it was somewhat faster in the iron and steel and non-ferrous metal products industries than in the machinery, automobile and transportation equipment industries. The absolute share of combat materiel shipments, however, was considerably higher in the later group.

The full extent of conversion to war production is, however, not adequately reflected in the share of combat materiel shipments. Practically all shipments under prime contracts, even if not identifiable as combat materiel, are ultimately used for war purposes, as are large portions of other shipments, particularly parts and components manufactured by sub-contractors unaware of their ultimate destination. The sum of "combat materiel" and "other products, prime contracts" in Tables 33 and 37 as well as the figures for "war work" in Table 35 and 36 discussed below must, therefore, be regarded as the minimum share of products absorbed by the Armed Forces.

By the fall of 1942 conversion to war production had progressed farthest, for automobile, locomotive and railroad car, radio, and domestic laundry equipment makers among 38 metal product industries covered. In each of these industries identifiable military shipments accounted for at least three-quarters of total output (Table 33). The share was practically 100 percent in three important industries not included in these tabulations: aircraft, shipbuilding and explosives. At the other end of the scale, identifiable military shipments represented less than 40 percent of the total in the agricultural machinery, power boiler, power transmission equipment and a few minor industries.

A similar, but more detailed picture; is presented in Table 34 classifying plants by the share of war work (i.e., all combat materiel contracts and prime contracts for other items) in their total output. Of the 2790 reporting plants — mostly of large or medium size — 881, or 32 percent, reported no identifiable war work as late as November 1942. For another quarter of the plants war work represented less than 25 percent of total shipments. Only 30 percent of the plants produced more than half their output for the Armed Services, including 15 percent (424 plants) with a share of military shipments of between 75 and 99 percent and 4 percent (123 plants) which worked exclusively for the Armed Services.

There is a distinct tendency for the proportion of war work to total shipments to increase with the size of the plant (Table 35 and Chart XIII). In November 1942 war work accounted for 24 percent of total shipments of the smallest metal-working plants included in the survey (which did not cover the aircraft and shipbuilding industries) - those employing 21 to 50 wage earners. This share rose steadily to 70 percent for the plants with more than 2500 wage earners. Part of the apparent difference in the share of war work as between large and small plants is due to the larger importance for small plants of sub-contracts and other shipments not identified as war work. This fact, however, does not invalidate the relationship discussed here.

The correlation between the proportion of war work to total shipments and the size of plants can be observed in most of the 38 industries covered (Table 35). There were only a few industries in which the smaller plants did at least as much war work in relation to their aggregate shipments as the larger ones. Examples were the cutlery, communications equipment, internal combustion engine, mechanical stoker, and laundry equipment industries.

Another tabulation based on a narrower sample, but including small firms, shows the same tendency (Table 36). While over one-half of the small manufacturing firms reported no war-goods sales for the first half of 1942, only about 30 percent of medium-sized and large firms were in that situation. On the other hand, only about 20 percent of the small concerns, but again about 30 percent of the larger firms, were engaged in war work to the extent of at least three-quarters of their activities.

For all metal-working industries shipments in November 1942 that could be identified as going directly or indirectly to the Armed Forces represented 59 percent of their total output (Table 37). If allowance is made for a further rise of this percentage in December, for the omission of the aircraft and shipbuilding industries, and for the fact that part of the unidentified shipments ultimately were embodied in war products, it appears that by the end of 1942 at least three-quarters and possibly well over four-fifths of the total output of the metal industries consisted of products for military use. In these industries, accordingly the process of conversion was almost complete during 1942.

embodied in war products, it appears that by the end of 1942 at least three-quarters and possibly well over four-fifths of the total output of the metal industries consisted of products for military use. In these industries, accordingly the process of conversion was almost complete during 1942. There are only a few industries outside the metal products field in which conversion has progressed equally far. In the absence of satisfactory data it can only be assumed that a considerable part of the chemical, optical and building material industries belong in this category. In vast sectors, on the other hand, the bulk of output still consists of peace-time products. The textile, leather, paper and printing, and woodworking industries constitute some of the most important examples of industries in which the substitutfon of military for civilian demand is not yet decisive. In these fields conversion, in the sense of withdrawing equipment from peace-time goods and turning it after a more or less complete rearrangement to the manufacture of basically different military products, is as yet of minor importance.

Summary

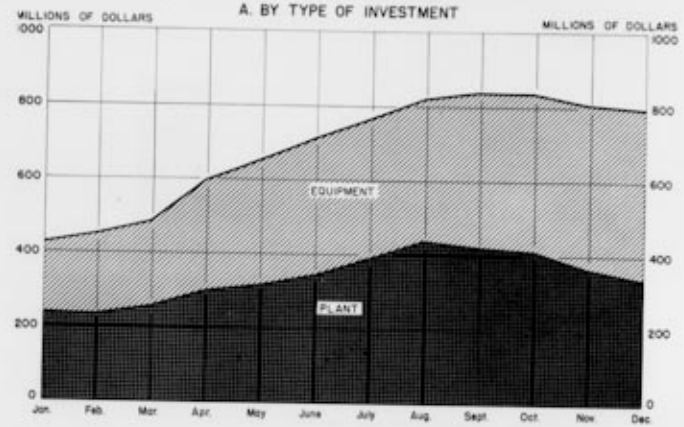
As in other sectors, the year 1942 witnessed decisive steps in the field of plant facilities in the transition to a full war footing. But for facilities 1942 was mainly a year of preparation. Large investments were made in new war plants, but only few had been completed by the end of the year. Expansion in the output of the machine tool and machinery industries contributed heavily to this progress. Though working longer and more intensively, however, these industries had not yet undertaken organisational changes that might have further increased or speeded up output. Plant utilization increased sharply in individual cases, but the bulk of the plants were still operating on standards differing not very much from pre-war days. Higher plant utilization and technical progress have increased output per man hour in most plants, often spectacularly: but the scope for further increases on productivity is still wide. Only with respect to conversion from peace time to military production had most of the way been traveled when 1942 closed, at least for the large and medium size firms in the metal working industries.

War production goals for 1943 are still far above actual production at the end of 1942. Whether these will be reached provides the crucial test for our industrial facilities. The problem involved in reaping in this field the harvest sown in 1941 and 1942 will be discussed in some detail in Section 3 of Part II.

CHART XIII

VALUE OF INDUSTRIAL PLANT EXPANSIONS

MONTHLY 1942



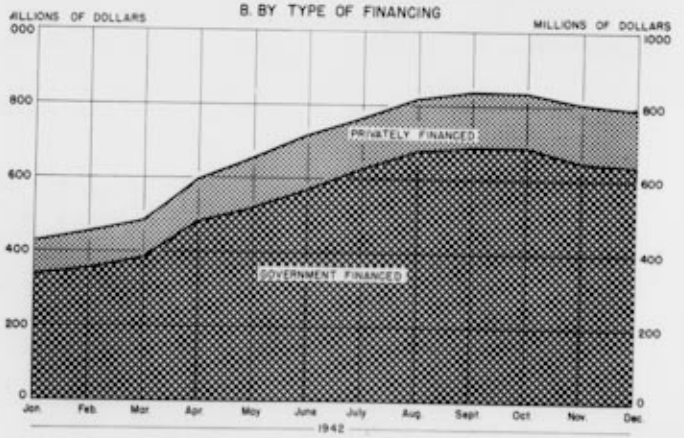
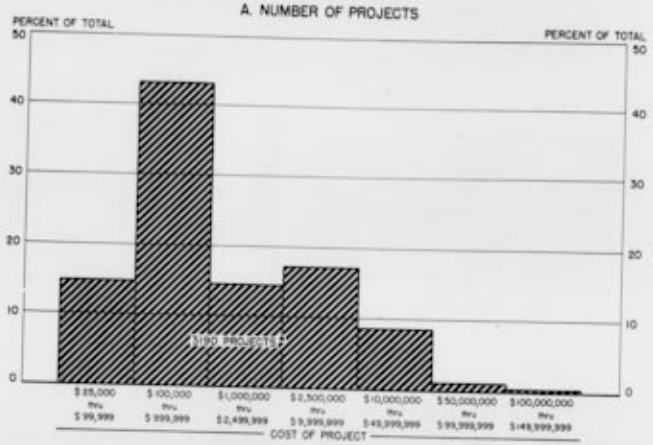


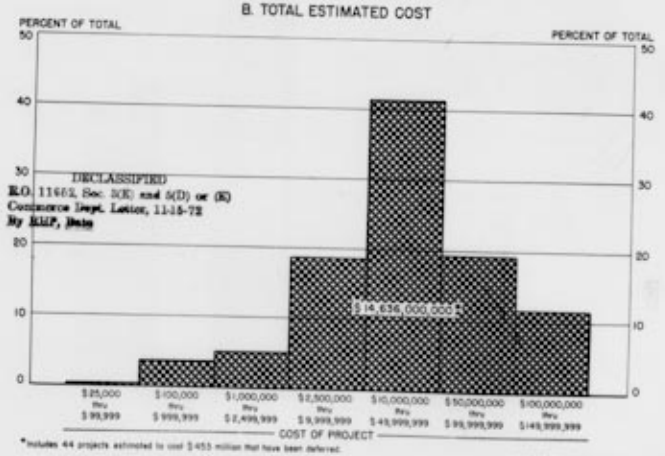
CHART XIII

INDUSTRIAL FACILITIES PROGRAM, GOVERNMENT-FINANCED THROUGH NOVEMBER 30, 1942 BY SIZE OF PROJECT

A. NUMBER OF PROJECTS



B. TOTAL ESTIMATED COST



*Includes 44 projects estimated to cost $455 million that have been deferred.

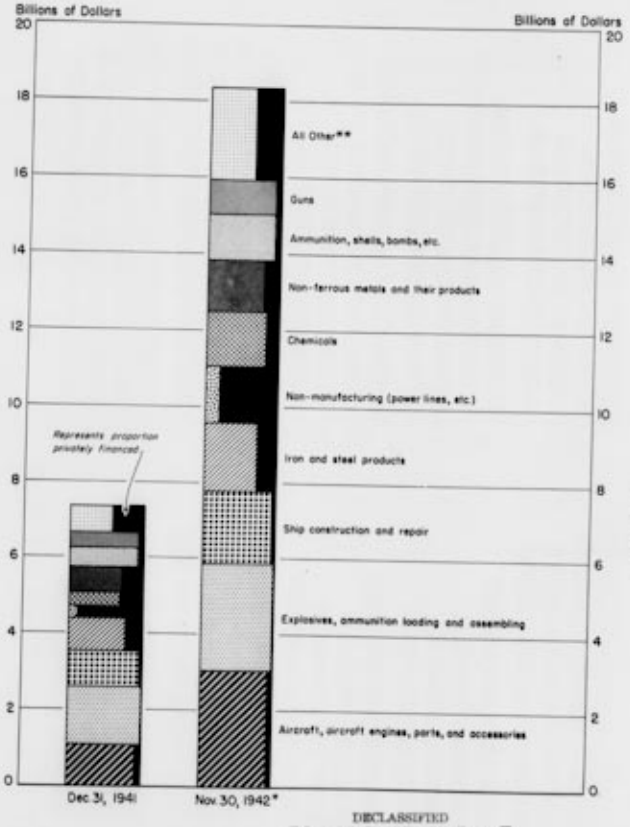
WAR PRODUCTION BOARD
Statistics Division

CHART XIX

WAR INDUSTRIAL FACILITIES PROGRAM FINANCED WITH PUBLIC AND PRIVATE FUNDS

BY TYPE OF PRODUCT

AS OF DECEMBER 31, 1941 AND NOVEMBER 30, 1942



* Includes deferred projects estimated to cost $453 million.

** Includes combat transportation and other motor vehicles, machine tools and other metalworking equipment, machinery and electrical equipment, petroleum and coal products, and miscellaneous manufacturing.

WAR PRODUCTION BOARD
Statistics Division

CHART XX

AVERAGE WEEKLY HOURS OF PLANT UTILIZATION IN NINE WAR INDUSTRIES

LAST MONTH OF EACH QUARTER OF 1942

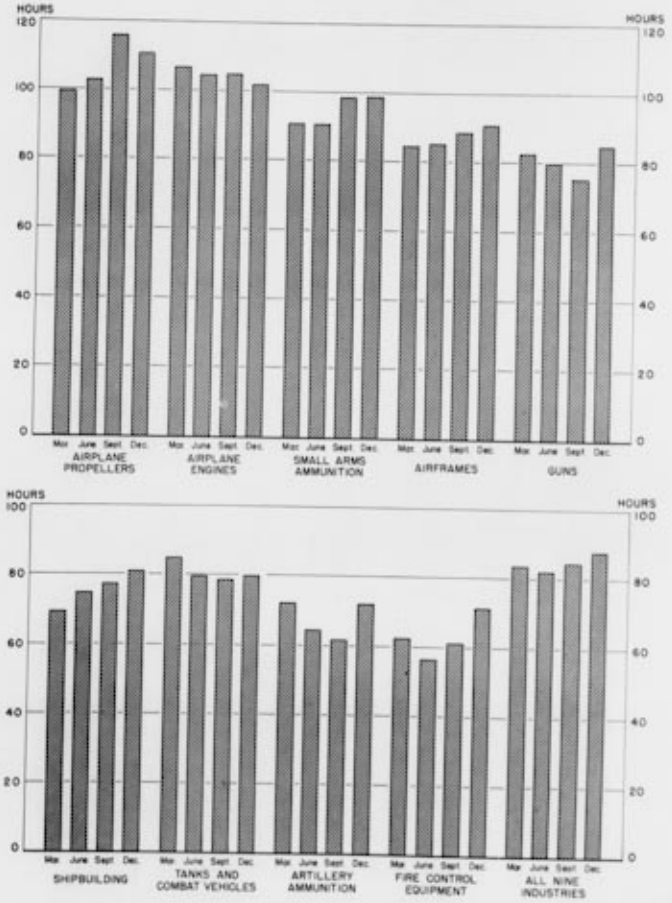
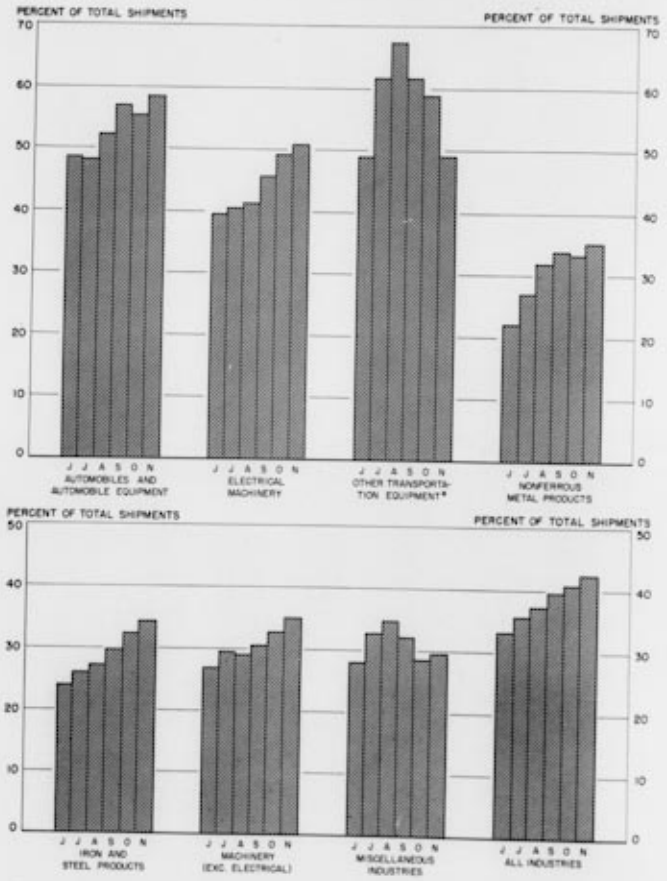


CHART XXX

PERCENT OF COMBAT MATERIEL SHIPMENTS TO TOTAL SHIPMENTS IN METAL-PRODUCTS INDUSTRIES

MONTHLY, JUNE-NOVEMBER 1942



*Does not include aircraft or shipbuilding.

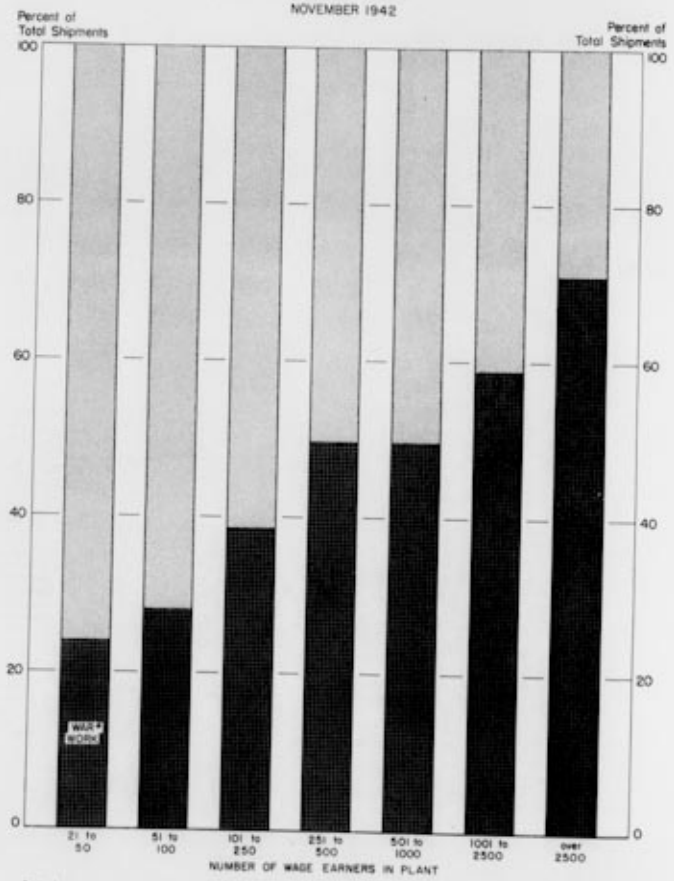
WAR PRODUCTION BOARD
Statistics Division

CHART XXII

PROPORTION OF WAR WORK TO TOTAL SHIPMENTS IN 38 METAL WORKING INDUSTRIES

BY SIZE OF PLANT

NOVEMBER 1942



* All prime contracts and all contracts for combat material

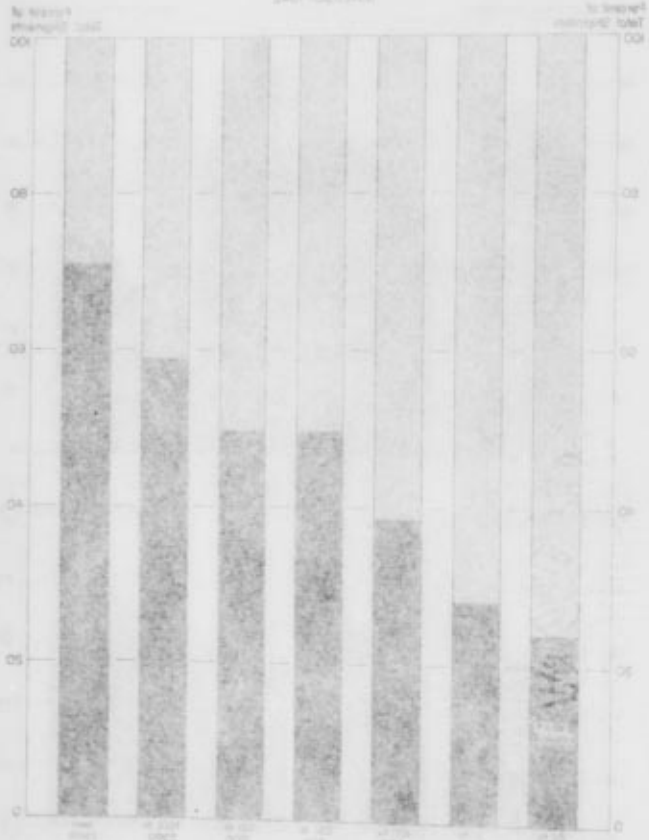


TABLE 23

Estimated Value of Construction and Equipment Installations in Industrial Plants - Monthly 1942

(Millions of Dollars)

Months 1942	Total Construction and Equipment	Total Construction	Total Equipment	Government Financed			Privately Financed		
				Total	Construction	Equipment	Total	Construction	Equipment
January	426	236	190	339	207	132	87	29	58
February	450	230	220	356	203	153	94	27	67
March	481	253	228	386	227	159	95	26	69
April	598	294	304	480	268	212	118	26	92
May	652	313	339	520	284	236	132	29	103
June	713	342	371	571	313	258	142	29	113
July	765	389	376	624	362	262	141	27	114
August	819	438	381	677	412	265	142	26	116
September	838	420	418	687	396	291	151	24	127
October	836	410	426	684	386	298	152	24	128
November	805	365	440	649	341	308	156	24	132
December	795	339	456	635	316	319	160	23	137
Total 1942	8,178	4,029	4,149	6,608	3,715	2,893	1,570	314	1,256

SOURCES: Government financed construction and equipment estimated by WPB, Statistics Division, Construction Research Section. Privately financed construction based on Department of Commerce total for 1942, distributed by months according to Statistics Division, Construction Research Section estimates. Equipment total based on estimate that 80 percent of private financing is for equipment; monthly installations based on trend in publicly financed plants.

TABLE 24

Estimated Value of Construction Put in Place, 1941-1942-1943
(Subject to Revision)
(In millions of dollars)

	Total 1941 1/	Total 1942 1/	1942 QUARTERS First	Second	Third	Fourth
I. Industrial Facilities (Government Financed)	2,200	6,608	1,081	1,571	1,988	1,968
Construction	1,350	3,715	637	865	1,170	1,043
Machinery and Equip.	850	2,893	444	706	818	925
Aircraft.	459	1,210	205	250	351	404
Construction	208	546	85	102	173	186
Machinery and Equip.	251	664	120	148	178	218
Ordnance	1,081	2,409	522	620	699	568
Construction	744	1,498	353	367	453	325
Machinery and Equip.	337	911	169	253	246	243
Shipyards	350	981	146	245	282	308
Construction	273	731	105	186	213	227
Machinery and Equip.	77	250	41	59	69	81
Steel, Synthetic Rubber, Chemicals and Other Raw Materials	167	1,368	126	300	452	490
Construction	81	714	66	158	250	240
Machinery and Equip.	86	654	60	142	202	250
Machinery and Machine Tools	66	446	58	115	139	134
Construction	20	127	16	34	45	32
Machinery and Equip.	46	319	42	81	94	102
Other Facilities	77	194	24	41	65	64
Construction	24	99	12	18	36	33
Machinery and Equip.	53	95	12	23	29	31
II. Industrial Facilities 2/ (Privately Financed)						
Construction	678	195 3/	51	52	48	44
III. Utilities (Privately and Publicly Financed)						
Construction	950	725	180	165	220	160

1/ Preliminary.
2/ Includes privately financed plant constructions not under certificates of necessity.
3/ Estimate of Construction Research Branch of Statistics Division of W.P.B., considerably lower than estimate of Department of Commerce as given on Table (I-5-1).

SECRET

TABLE 25

War Industrial Facilities Financed With Public Funds 1/
By Type Of Product And By Size Of Project 2/
As of November 30, 1942

Type of Product	Total	SIZE OF PROJECT: $25,000 Through $99,999	$100,000 Through $999,999	$1,000,000 Through $2,499,999	$2,500,000 Through $9,999,999	$10,000,000 Through $49,999,999	$50,000,000 Through $99,999,999	$100,000,000 Through $149,999,999
				A. Number of Projects				
TOTAL	3,190	469	1,376	461	547	282	42	13
Aircraft, aircraft engines, parts and accessories	455	49	148	94	93	61	7	3
Ship construction and repair	299	21	98	48	85	42	2	2
Combat transportation and other motor vehicles	83	11	24	18	22	6	2	-
Guns	296	38	111	50	77	20	-	-
Ammunition, shells, bombs, etc.	447	93	267	33	34	15	4	1
Explosives, and ammunition loading and assembling	91	8	15	10	6	29	17	6
Iron and steel products	293	34	130	44	54	27	3	1
Non-ferrous metals and their products	131	7	40	16	36	31	1	-
Machine tools and other metal working equipment	213	45	130	27	9	2	-	-
Machinery and electrical equipment	375	62	204	60	46	3	-	-
Chemicals	191	28	72	21	37	28	5	-
Petroleum and coal products	45	3	10	4	21	7	-	-
Miscellaneous manufacturing	193	58	97	22	9	7	-	-
Non-manufacturing (power lines, etc.)	78	12	30	14	17	4	1	-

1/ Includes projects estimated to cost $25,000 or more which have been approved by the War Department, Navy Department, Maritime Commission, Defense Plant Corporation, Reconstruction Finance Corporation and British Ministry of Supply Mission. Excluded are projects for pilot training, Reconstruction Finance Corporation loans for working capital, and commitments for the purchase of machine tools by the War Department, Navy Department, and Defense Plant Corporation.
2/ Includes 44 projects which have been deferred.

SECRET

TABLE 25
(Concluded)

War Industrial Facilities Financed With Public Funds 1/
By Type Of Product And By Size Of Project 2/
As Of November 30, 1942

Type of Product	Total	SIZE OF PROJECT: $25,000 Through $99,999	$100,000 Through $999,999	$1,000,000 Through $2,499,999	$2,500,000 Through $9,999,999	$10,000,000 Through $49,999,999	$50,000,000 Through $99,999,999	$100,000,000 Through $149,999,999
				B. Estimated Cost, in Millions of Dollars				
TOTAL	14,636	27	526	736	2,754	6,044	2,830	1,719
Aircraft, aircraft engines, parts and accessories	2,838	3	55	144	477	1,295	465	399
Ship construction and repair	1,828	1	34	81	462	838	136	276
Combat transportation and other motor vehicles	408	1	12	30	111	129	125	-
Guns	818	2	48	82	362	324	-	-
Ammunition, shells, bombs, etc.	1,073	5	91	90	166	341	279	141
Explosives, and ammunition loading and assembling	2,806	-	5	16	30	842	1,158	755
Iron and steel products	1,288	2	56	79	279	529	195	148
Non-ferrous metals and their products	1,048	-	20	26	204	736	62	-
Machine tools and other metal working equipment	154	3	49	39	30	33	-	-
Machinery and electrical equipment	450	4	80	90	203	73	-	-
Chemicals	1,177	2	29	34	196	601	315	-
Petroleum and coal products	230	-	3	7	108	112	-	-
Miscellaneous manufacturing	245	3	34	38	49	121	-	-
Non-manufacturing (power lines, etc.)	273	1	10	20	77	70	95	-

1/ Includes commitments, letters of intent, and contract awards of $25,000 and over. Excludes commitments for pilot training, Reconstruction Finance Corporation loans for working capital, and commitments for the purchase of machine tools by the War Department, Navy Department and Defense Plant Corporation.

2/ Includes 44 projects, estimated to cost $453 millions, which have been deferred.

TABLE 24

Estimated Value of Construction Put in Place, 1941-1942-1941
(Subject to Revision)
(In millions of dollars)

	Total 1941 1/	Total 1942 1/	1942 QUARTERS First	Second	Third	Fourth
I. Industrial Facilities (Government Financed)	2,200	6,608	1,081	1,571	1,988	1,968
Construction	1,350	3,715	637	865	1,170	1,043
Machinery and Equip.	850	2,893	444	706	818	925
Aircraft	459	1,210	205	250	351	404
Construction	208	546	85	102	173	186
Machinery and Equip.	251	664	120	148	178	218
Ordnance	1,081	2,409	522	620	699	568
Construction	744	1,498	353	367	453	325
Machinery and Equip.	337	911	169	253	246	243
Shipyards	350	981	146	245	282	308
Construction	273	731	105	186	213	227
Machinery and Equip.	77	250	41	59	69	81
Steel, Synthetic Rubber, Chemicals and Other Raw Materials	167	1,368	126	300	452	490
Construction	81	714	66	158	250	240
Machinery and Equip.	86	654	60	142	202	250
Machinery and Machine Tools	66	446	58	115	139	134
Construction	20	127	16	34	45	32
Machinery and Equip.	46	319	42	81	94	102
Other Facilities	77	194	24	41	65	64
Construction	24	99	12	18	36	33
Machinery and Equip.	53	95	12	23	29	31
II. Industrial Facilities 2/ (Privately Financed)						
Construction	678	195 3/	51	52	48	44
III. Utilities (Privately and Publicly Financed)						
Construction	950	725	180	165	220	160

1/ Preliminary.
2/ Includes privately financed plant constructions not under certificates of necessity.
3/ Estimate of Construction Research Branch of Statistics Division of W.P.B., considerably lower than estimate of Department of Commerce as given on Table (I-5-1).

SECRET

TABLE 25

War Industrial Facilities Financed With Public Funds 1/
By Type Of Product And By Size Of Project 2/
As of November 30, 1942

Type of Product	Total	SIZE OF PROJECT $25,000 Through $99,999	$100,000 Through $999,999	$1,000,000 Through $2,499,999	$2,500,000 Through $9,999,999	$10,000,000 Through $49,999,999	$50,000,000 Through $99,999,999	$100,000,000 Through $149,999,999
				A. Number of Projects				
TOTAL	3,190	469	1,376	461	547	282	42	13
Aircraft, aircraft engines, parts and accessories	455	49	148	94	93	61	7	3
Ship construction and repair	299	21	98	48	86	42	2	2
Combat transportation and other motor vehicles	83	11	24	18	22	6	2	-
Guns	296	38	111	50	77	20	-	-
Ammunition, shells, bombs, etc.	447	93	267	33	34	15	4	1
Explosives, and ammunition loading and assembling	91	8	15	10	6	29	17	6
Iron and steel products	293	34	130	44	54	27	3	1
Non-ferrous metals and their products	131	7	40	16	36	31	1	-
Machine tools and other metal working equipment	213	45	130	27	9	2	-	-
Machinery and electrical equipment	375	62	204	60	46	3	-	-
Chemicals	191	28	72	21	37	28	5	-
Petroleum and coal products	45	3	10	4	21	7	-	-
Miscellaneous manufacturing	193	58	97	22	9	7	-	-
Non-manufacturing (power lines, etc.)	78	12	30	14	17	4	1	-

1/ Includes projects estimated to cost $25,000 or more which have been approved by the War Department, Navy Department, Maritime Commission, Defense Plant Corporation, Reconstruction Finance Corporation and British Ministry of Supply Mission. Excluded are projects for pilot training, Reconstruction Finance Corporation loans for working capital, and commitments for the purchase of machine tools by the War Department, Navy Department, and Defense Plant Corporation.

2/ Includes 44 projects which have been deferred.

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TABLE 25
(Concluded)

War Industrial Facilities Financed With Public Funds 1/
By Type Of Product And By Size Of Project 2/
As Of November 30, 1942

Type of Product	Total	SIZE OF PROJECT: $25,000 Through $99,999	$100,000 Through $999,999	$1,000,000 Through $2,499,999	$2,500,000 Through $9,999,999	$10,000,000 Through $49,999,999	$50,000,000 Through $99,999,999	$100,000,000 Through $149,999,999
	B. Estimated Cost, in Millions of Dollars							
TOTAL	14,636	27	526	716	2,754	6,044	2,830	1,719
Aircraft, aircraft engines, parts and accessories	2,838	3	55	144	477	1,295	465	399
Ship construction and repair	1,828	1	34	81	462	838	136	276
Combat transportation and other motor vehicles	408	1	12	30	111	189	125	-
Guns	816	2	48	82	362	324	-	-
Ammunition, shells, bombs, etc.	1,073	5	91	50	166	341	279	141
Explosives, and ammunition loading and assembling	2,806	-	5	16	30	842	1,158	755
Iron and steel products	1,288	2	56	79	279	529	195	148
Non-ferrous metals and their products	1,048	-	20	26	204	736	62	-
Machine tools and other metal working equipment	154	1	49	39	30	33	-	-
Machinery and electrical equipment	450	4	80	90	203	73	-	-
Chemicals	1,177	2	29	34	196	601	315	-
Petroleum and coal products	230	-	3	7	108	112	-	-
Miscellaneous manufacturing	245	3	34	38	49	121	-	-
Non-manufacturing (power lines, etc.)	273	1	10	20	77	70	95	-

1/ Includes commitments, letters of intent, and contract awards of $25,000 and over. Excludes commitments for pilot training, Reconstruction Finance Corporation loans for working capital, and commitments for the purchase of machine tools by the War Department, Navy Department and Defense Plant Corporation.

2/ Includes 44 projects, estimated to cost $453 millions, which have been deferred.

SECRET

TABLE 26

Value of War Industrial Facilities Financed With Public and Private Funds 1/
By Type of Product, As Of December 31, 1941 and November 30, 1942

(Millions of Dollars)

Type of Product	Total		Publicly Financed		Privately Financed	
	December 31, 1941	November 30, 1942	December 31, 1941	November 30, 1942	December 31, 1941	November 30, 1942
TOTAL	7,366	18,358 2/	6,040	14,636 2/	1,326	1,722
Aircraft, aircraft engines, parts and accessories	1,067	3,047	961	2,838	106	209
Ship construction and repair	941	1,904	909	1,828	32	76
Combat transportation and other motor vehicles	182	473	155	408	27	65
Guns	419	905	383	818	36	87
Ammunition, shells, bombs, etc.	504	1,181	457	1,073	47	108
Explosives, ammunition loading and assembling	1,529	2,817	1,524	2,806	5	11
Iron and steel products	856	1,801	658	1,288	198	513
Non-ferrous metals and their products	660	1,337	462	1,048	198	289
Machine tools and other metal working equip.	95	276	31	154	64	122
Machinery and electrical equipment	222	722	108	450	114	272
Chemicals	357	1,444	243	1,177	114	267
Petroleum and coal products	63	558	37	230	26	328
Miscellaneous manufacturing	149	411	74	245	75	166
Non-manufacturing (power lines, railroads, etc.)	322	1,482	38	273	284	1,209

1/ Includes facilities estimated to cost $25,000 or more for which commitments, letters of intent, and contract awards have been approved by the War Department, Navy Department, Maritime Commission, Defense Plant Corporation, Reconstruction Finance Corporation, and the British Ministry of Supply Mission; and includes necessity certificates approved. Excluded are commitments for pilot training, Reconstruction Finance Corporation loans for working capital, and commitments for purchase of machine tools by the War Department, Navy Department and Defense Plant Corporation.

2/ Includes projects estimated to cost $453 millions which have been deferred.

TABLE 27

Machine Tool Shipments, Unfilled Firm Orders and Exports
1940 Through 1942

(Millions of Dollars)

Period	Total Shipments	Unfilled Firm Orders	Exports				
			Total	U.K.	Russia	Canada	All Other
1940 1/							
First Half	29.8	-	12.5	10.4	1.2	1.3	4.9
Second Half	40.8	-	22.2				
1941 1/							
First Half	62.7	-	17.0	8.7	.3	3.6	4.0
Second Half	75.8	601.3	16.3				
1942							
January	83.5	728.7	15.1	8.0	1.8	3.6	1.7
February	84.4	1,000.8	13.9	6.3	2.3	2.9	2.4
March	98.4	1,302.8	18.4	11.7	2.6	3.6	.5
April	103.4	1,367.3	16.0	6.7	4.6	2.9	1.8
May	107.3	1,386.4	11.7	5.3	2.2	1.8	2.4
June	111.1	1,389.4	10.2	5.2	2.5	1.5	1.0
July	113.6	1,374.7	8.9	4.6	1.3	1.2	1.8
August	117.3	1,315.3	10.8	5.5	2.1	2.0	1.2
September	119.9	1,249.0	11.3	4.4	1.8	3.6	1.5
October	130.0	1,168.8	13.8	5.9	4.0	2.0	1.9
November	120.9	1,132.6	15.2	3.7	7.1	2.2	2.2
December 2/	130.0	1,867.0	16.3 2/	4.0	7.6	2.4	2.3
Total - 1942	1,321.7	-	161.6	71.3	39.9	29.7	20.7

1/ Data for 1940 and 1941 represent monthly averages and are not strictly comparable with series beginning in 1942.

2/ Estimated.

SOURCE: Shipment data taken from WPB Tool Division reports.
Export data supplied by Bureau of Foreign and Domestic Commerce.

TABLE 28

Shipments of Machine Tools, By Major Types - Quarterly 1942

	1942				
	Jan.-Mar.	April-June	July-Sept.	Oct.-Dec. 1/	Total 1942
	(Millions of Dollars)				
Total	266.3	321.7	350.8	380.9	1,319.7
Boring Machines	24.1	33.1	40.0	43.4	140.6
Broaching Machines	1.5	2.5	2.4	2.5	8.9
Drilling Machines	20.7	26.4	27.5	29.0	103.6
Gear Cutting and Finishing Machines	10.1	12.7	12.8	14.8	50.4
Grinding Machines	42.0	50.1	55.1	59.7	206.9
Lathes (Including Automatic Screw)	94.4	111.7	116.9	129.4	452.4
Milling Machines	50.8	59.1	66.0	72.1	248.0
Planers	7.9	7.9	7.5	6.9	30.2
Other Types	14.8	16.2	22.6	23.1	78.7
	- Units -				
Total	63,252	74,211	83,688	85,860	307,011
Boring Machines	2,067	2,373	2,667	2,700	9,807
Broaching Machines	216	282	270	228	996
Drilling Machines	9,447	11,772	13,074	13,566	47,859
Gear Cutting and Finishing Machines	1,296	1,647	1,659	1,680	6,282
Grinding Machines	10,530	13,137	14,484	15,699	53,850
Lathes (Including Automatic Screws)	20,154	21,786	23,019	23,664	88,623
Milling Machines	9,882	11,577	12,924	13,740	48,123
Planers	267	282	243	195	987
Other Types	9,393	11,355	15,348	14,388	50,484

1/ December estimated.

TABLE 29

Domestic Sales of Producers' Durable Goods 1939-1942

Type of Equipment	Final Cost To Users, In Billions Of Dollars			
	1939 a/	1940 a/	1941 a/	1942 b/
1. Machine tools and accessories	0.25	0.45	0.81	1.41
2. Factory machinery	0.42	0.53	0.85	1.10
3. Mining machinery	0.08	0.09	0.16	0.28
4. Construction machinery	0.10	0.13	0.21	0.51
5. General & Miscellaneous machinery	0.48	0.61	0.96	0.97
6. Engines & Turbines	0.04	0.08	0.19	0.49
7. Pumps & pumping equipment	0.12	0.16	0.22	0.37
8. Electric apparatus & equipment	0.40	0.53	0.92	1.06
9. Hand tools	0.14	0.17	0.30	0.39
10. Office machinery	0.15	0.16	0.24	0.23
11. Non-residential furniture & equipment	0.31	0.40	0.66	0.52
12. Professional & scientific equipment	0.12	0.16	0.29	0.56
13. Durable containers	0.15	0.17	0.23	0.28
14. Motor vehicles, cycles, wagons & carts	1.29	1.70	2.44	2.00
15. Locomotive and railroad cars	0.17	0.31	0.41	0.36
16. Farm machinery and tractors	0.55	0.65	0.87	0.76
17. All other subsidiary durable goods	0.34	0.42	0.68	0.97

a/ Source: Department of Commerce.
b/ Estimate obtained by raising or reducing 1941 figures according to proportions shown in "Estimates of Durable Goods Production, January 1941 to September 1942," Table II, (Division of Research, O.P.A.), after adding estimates for October to December, 1942.

TABLE 30

Plant Utilization in War Industries, Last Month of Each Quarter in 1942 1/

(Average Weekly Hours)

War Industry	1942 First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Airframes	84.4	85.0	88.2	90.9 2/
Airplane engines	106.6	104.4	104.8	101.9 2/
Airplane propellers	99.6	102.9	115.6	110.9 2/
Shipbuilding	69.4	74.7	77.4	80.6
Tanks and combat vehicles	84.8	79.8	78.8	79.9
Guns	82.2	79.8	75.4	84.9
Fire control equipment	62.3	56.5	61.2	71.3
Small arms ammunition	90.6	90.5	98.5	98.7
Artillery ammunition	72.0	64.3	61.7	72.0
Average	83.5	82.0	84.6	87.9

1/ Calculated by dividing total manhours by number of wage earners on largest shift.
2/ November data.

TABLE 31

Plant and Facility Utilization in the Metal-Products Industries, by Major Industry Groups
December 1942

Industry Group	Number Wage Earners (Thousands)	Average Weekly Hours: Plant Utilization 1/	Average Weekly Hours: Machine Tool Utilization	Average Weekly Hours: Other Metal-Working Machine Utilization
Total	3,768	71.7	78.5	62.2
Iron and Steel Products (Except machinery) 2/	656	69.5	70.4	59.8
Nonferrous Metal Products 3/	269	63.0	66.6	52.6
Electrical Machinery	627	67.8	82.3	64.8
Machinery (Except electrical)	1,160	77.6	81.1	62.4
Automobiles and Automobile Equipment	659	84.7	90.4	73.4
Other Transportation Equipment 4/	141	60.9	73.0	58.3
Miscellaneous Industries	256	57.3	65.1	44.7

1/ Total man-hours in production and assembly departments divided by number of wage earners on first shift.
2/ Excludes blast furnaces, steel works, rolling mills and foundries.
3/ Excludes smelting and refining and alloying, rolling and drawing of nonferrous metals.
4/ Excludes aircraft and shipbuilding.

TABLE 52

Shipments of Metal-Products Industries, by Major Industry Groups
June through November, 1942

(Millions of Dollars)

Industry group and character of shipments	June Value	June Per cent	July Value	July Per cent	August Value	August Per cent	September Value	September Per cent	October Value	October Per cent	November Value	November Per cent
Total												
Total shipments	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	1,847	[illegible]	1,846	[illegible]	1,848	[illegible]	1,855	[illegible]	1,385	[illegible]	1,751	[illegible]
Iron and steel products (except machinery) 1/												
Total shipments	[illegible]	100.0	[illegible]	100.0	587	100.0	593	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	415	76.1	415	74.1	408	70.9	416	70.7	435	67.8	348	[illegible]
Nonferrous metal products 2/												
Total shipments	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	135	77.8	107	72.9	105	68.1	130	[illegible]	141	[illegible]	130	[illegible]
Electrical machinery												
Total shipments	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	200	[illegible]	251	[illegible]	246	[illegible]	247	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Machinery (except electrical)												
Total shipments	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	[illegible]	73.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Automobiles and automobile equipment												
Total shipments	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	245	[illegible]	270	[illegible]	263	47.7	252	[illegible]	254	[illegible]	257	[illegible]
Other transportation equipment 3/												
Total shipments	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	140	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	99	[illegible]	95	38.3	53	[illegible]	54	[illegible]	58	[illegible]	62	[illegible]
Miscellaneous industries												
Total shipments	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0	[illegible]	100.0
Combat material	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other	103	71.9	92	[illegible]	87	[illegible]	100	[illegible]	112	71.4	110	[illegible]

1/ Excludes blast furnaces, steel works, rolling mills, and foundries.
2/ Excludes smelting and refining and alloying, rolling, and drawing of nonferrous metals.
3/ Excludes aircraft and shipbuilding.

TABLE 33

Distribution of Shipments in 36
Metal Products Industries, October 1942

Industry	Value of Shipments Reported (Thousands)	Percent of Value of Shipments Represented By: Combat Material: Prime Contracts	Combat Material: Other Contracts	Other Products: Prime Contracts	Other Products: Other Contracts
Cutlery and Edge Tools	8,556	6.8	2.0	26.6	64.6
Power Boilers	42,847	11.2	5.4	18.5	64.9
Electric Generating and Distributing Apparatus	174,908	17.3	15.8	8.3	58.6
Electrical Appliances	17,838	38.5	12.7	10.3	38.5
Automotive Electrical Equipment	36,731	33.3	29.4	3.4	33.9
Radios, Radio Tubes, and Phonographs	92,710	53.1	26.5	6.0	14.4
Communication Equipment	94,271	58.2	11.1	5.8	24.9
Steam Engines, Turbines, and Water Wheels	12,857	15.3	22.4	13.2	49.1
Internal Combustion Engines	109,193	38.8	15.4	16.3	29.5
Tractors	51,906	11.5	8.2	41.7	38.6
Agricultural Machinery (Except Tractors)	20,187	19.4	12.9	4.0	63.7
Construction and Similar Machinery	50,220	13.5	5.0	32.3	49.2
Oilfield Machinery and Tools	14,507	25.3	27.8	8.5	38.4
Mining Machinery	7,090	13.9	2.4	3.9	79.8
Metalworking Machinery	32,616	1.2	13.1	15.6	70.1
Food Products Machinery	14,222	26.0	17.0	8.2	48.8
Textile Machinery	15,376	11.1	24.1	4.9	59.9
Woodworking Machinery	4,086	29.0	10.9	22.9	37.2
Paper Products Machinery	5,601	14.8	18.5	7.5	59.2
Printing Trades Machinery	16,021	54.2	15.1	3.0	27.7
Special Industrial Machinery, Not Elsewhere Classified	11,858	25.5	12.3	11.3	50.9
Pumping Equipment and Air Compressors	44,154	18.8	5.1	20.4	55.7
Elevators, Escalators, and Conveyors	15,419	15.9	16.0	11.0	57.1
Industrial Cars and Trucks	5,323	0.0	0.3	44.3	55.4
Blowers: Exhaust and Ventilating Fans	7,247	0.5	3.6	12.6	83.3
Mechanical Measuring Instruments	6,641	17.4	13.5	8.4	60.7
Mechanical Power Transmission Equipment	52,597	4.2	20.8	2.8	72.2
Mechanical Stokers	5,585	9.2	15.2	12.1	63.5
Machine Shop Products, Not Elsewhere Classified	112,555	17.5	26.8	8.5	47.2
General Industrial Machinery, Not Elsewhere Classified	45,402	14.9	19.9	12.4	52.8
Office and Store Machines, Not Elsewhere Classified	25,971	17.4	17.2	11.3	54.1
Domestic Laundry Equipment	8,154	62.1	20.9	0.4	16.6
Commercial Laundry Equipment	4,628	1.3	11.8	52.1	34.8
Refrigerators and Air Conditioning Units	35,370	32.9	19.1	10.3	37.7
Automobiles (Except Parts)	456,862	50.9	10.1	27.2	11.8
Automobile Parts	187,819	27.8	28.6	7.0	36.6
Locomotives	51,191	56.1	8.2	13.8	22.9
Railroad Cars and Street Cars	63,521	66.5	9.5	7.4	16.6

TABLE 34

Number of Plants in Selected Metal-Products Industries Distributed By Ratio of War Work 1/ to Total Shipments
November 1942

Industry	Number of plants reporting	Number of plants with following percentages of war work to total shipments in October					
		None	1-25%	26-50%	51-75%	76-99%	100%
Total - 36 industries	2,790	881	666	387	309	424	123
Cutlery and edge tools	93	27	24	23	10	6	3
Power boilers	162	71	35	18	13	19	6
Electric generating and distributing apparatus	187	60	64	24	23	12	4
Electrical appliances	48	10	7	7	8	14	2
Automotive electrical equipment	33	9	8	7	2	4	3
Radios, radio tubes, and phonographs	111	17	13	7	18	29	27
Communication equipment	98	23	19	9	11	19	17
Steam engines, turbines, and water wheels	12	2	1	1	3	4	1
Internal combustion engines	44	3	8	4	8	14	7
Tractors	24	2	3	5	5	7	2
Agricultural machinery (except tractors)	97	45	20	15	5	12	0
Construction and similar machinery	122	33	26	21	17	22	3
Oilfield machinery and tools	70	11	10	19	8	20	2
Mining machinery	33	17	9	3	2	2	0
Metalworking machinery	101	31	40	13	7	6	4
Food products machinery	103	25	21	21	12	22	2
Textile machinery	90	52	13	7	7	10	1
Woodworking machinery	31	3	10	5	3	9	1
Paper products machinery	45	13	11	13	5	3	0
Printing trades machinery	54	17	15	3	7	12	0
Special industrial machinery, not elsewhere classified	55	26	9	5	13	2	0
Pumping equipment and air compressors	113	28	41	11	12	15	6
Elevators, escalators, and conveyors	52	19	12	11	4	4	2
Industrial cars and trucks	23	8	5	5	2	3	0
Blowers: exhaust and ventilating fans	25	6	10	4	2	2	1
Mechanical measuring instruments	34	8	12	3	6	5	0
Mechanical power transmission equipment	89	32	27	15	5	6	4
Mechanical stokers	23	8	6	1	5	3	0
Machine shop products, not elsewhere classified	399	144	92	58	37	57	11
General industrial machinery, not elsewhere classified	167	61	46	17	14	24	5
Office and store machines, not elsewhere classified	57	8	16	12	8	13	0
Domestic laundry equipment	20	0	1	2	1	14	2
Commercial laundry equipment	23	6	4	2	2	9	0
Refrigerators and air conditioning units	80	17	20	13	15	12	3
Locomotives	8	0	3	0	2	3	0
Railroad cars and street cars	64	39	5	3	7	6	4

1/ All prime contracts and all contracts for combat materiel.

TABLE 35

Average Proportion of War Work 1/ to Total Shipments in 58 Metal Working Industries
November, 1942

Industry	All Plants	Plants Classified By Number of Wage Earners							
		21-50	51-100	101-250	251-500	501-1000	1001-2500	Over 2500	Un-Classified
Cutlery and Edge Tools	36.9%	58.3%	20.1%	38.1%	40.2%	38.1%	30.4%	- %	- %
Hardware	49.6	37.7	40.3	37.0	50.5	60.6	51.4	46.0	56.3
Power Boilers	34.9	11.2	16.9	32.1	36.9	46.6	54.9	-	13.6
Electrical Generating and Distributing Apparatus	35.7	6.0	26.1	19.5	22.4	13.2	24.8	46.5	36.7
Electrical Appliances	70.4	19.3	8.9	69.8	70.3	57.7	66.2	77.1	-
Automotive Electrical Equipment	58.5	7.6	26.3	67.4	7.4	22.5	100.0	58.9	-
Radios, Radio Tubes & Phonographs	82.5	48.9	55.8	78.3	92.6	80.1	84.2	80.3	83.7
Communication Equipment	76.5	70.0	54.1	37.9	62.1	58.8	65.6	82.7	44.7
Steam Engines, Turbines & Water Wheels	62.6	-	-	77.4	75.2	49.4	13.8	71.5	-
Internal Combustion Engines	72.1	95.3	83.0	21.1	93.9	67.6	53.7	65.6	98.3
Tractors	61.3	0.0	68.7	15.4	80.8	74.7	70.7	53.7	-
Agricultural Machinery (Exc. Tractors)	38.2	9.4	12.1	32.4	26.7	42.8	50.4	-	-
Construction & Similar Machinery	48.5	8.1	51.6	50.9	45.2	50.8	71.1	15.0	33.0
Oilfield Machinery & Tools	59.3	43.6	35.8	61.9	62.4	91.0	69.6	8.7	-
Mining Machinery	19.7	21.1	14.3	1.6	48.6	0.0	13.0	-	-
Metalworking Machinery	31.8	5.9	28.3	19.3	13.4	20.4	31.0	83.8	27.6
Food Products Machinery	52.4	42.5	32.1	56.2	58.8	63.5	48.7	-	55.4
Textile Machinery	40.4	2.2	11.1	49.0	66.1	66.8	9.6	35.4	83.0
Woodworking Machinery	62.8	31.7	13.4	67.9	61.9	-	-	-	90.3
Paper Products Machinery	41.4	10.7	14.9	26.4	51.6	53.8	-	-	-
Printing Trades Machinery	72.3	19.0	17.3	23.1	53.1	79.1	85.4	89.1	-
Special Industrial Machinery, n.e.c.	48.9	5.7	28.9	23.2	47.4	63.5	-	72.7	-
Pumping Equipment & Air Compressors	46.2	14.4	25.2	30.9	34.0	52.8	72.0	28.9	79.1
Elevators, Escalators & Conveyors	43.2	19.5	19.3	28.5	18.7	21.7	78.2	-	-
Industrial Cars & Trucks	43.3	16.0	15.2	38.6	61.7	46.9	32.4	-	-
Blowers: Exhaust & Ventilating Fans	21.2	20.9	0.0	15.1	12.7	24.4	37.1	-	4.3
Mechanical Measuring Instruments	39.6	23.5	15.8	36.2	46.5	40.1	-	-	56.4
Mechanical Power Transmission Equipment	28.4	0.0	11.7	22.3	38.1	25.0	51.4	1.3	16.3
Mechanical Stokers	34.8	58.7	29.3	9.5	36.3	43.3	-	-	-
Machine Shop Products n.e.c.	52.7	14.2	19.4	39.5	35.5	50.6	62.5	71.9	77.8
General Industrial Machinery n.e.c.	44.1	25.4	32.3	32.3	61.1	24.6	55.7	86.2	17.3
Office & Store Machines, n.e.c.	47.0	51.6	41.9	73.8	27.4	58.0	26.7	68.5	0.0
Domestic Laundry Equipment	82.1	84.2	98.0	95.5	93.2	66.4	76.0	-	-
Commercial Laundry Equipment	64.4	54.5	0.0	40.3	59.1	43.7	83.6	-	-
Refrigerators & Air Conditioning Units	57.1	13.4	26.0	58.2	47.4	67.0	41.7	63.0	71.7
Locomotives	72.8	86.5	-	12.3	62.2	37.2	-	78.1	-
Railroad Cars & Street Cars	61.7	11.2	14.1	17.0	34.8	58.8	55.0	98.3	-
Professional & Scientific Instruments	63.4	57.7	46.5	35.6	72.5	51.3	72.7	100.0	-
Total	55.7	23.9	28.0	38.4	49.7	49.7	56.8	70.3	47.7

1/ All prime contracts and all contracts for combat material.

TABLE 36

Manufacturers' Share of War Business by Size

1941 and 1942 a/

Per Cent of War Goods Sales to Total Sales	Small Concerns		Medium Concerns		Large Concerns	
	Year 1941	First Half 1942	Year 1941	First Half 1942	Year 1941	First Half 1942
	(Per Cent of Concerns Reporting 1/)					
0	64	53	44	31	41	28
1% - 25%	19	13	23	16	25	21
25% - 50%	5	6	10	11	12	12
50% - 75%	4	7	12	10	10	11
75% -100%	7	14	10	23	11	19
100%	1	7	1	9	1	9
Total	100	100	100	100	100	100

a/ Figures for 1941 are based on reports from 2,024 manufacturers; those for 1942, on 1,666 reports. The number of large and medium sized concerns was about the same in both surveys, but the number of small concerns which reported for the first half of 1942 was substantially smaller than the number reporting for 1941.

SOURCE: Dun's Review, December 1942, p. 17.

TABLE 37

Distribution of Shipments of Metal-Products Industries, by Major Industry Groups
November 1942

Industry Group	Total Value of shipments (Millions)	Percent of total value of Shipments represented by:			
		Combat Materiel		Other Products	
		Prime contracts	Other contracts	Prime contracts	Other contracts
Total	3,130	26.8	15.7	16.5	41.0
Iron and steel products (except machinery) 1/	587	18.2	16.1	12.4	53.3
Nonferrous metal products 2/	201	14.5	20.8	10.0	54.7
Electrical machinery	518	35.1	15.8	9.0	40.1
Machinery (except electrical)	923	18.7	16.3	16.4	48.6
Automobiles and automobile equipment	622	42.8	15.9	24.2	17.1
Other transportation equipment 3/	123	38.6	10.6	29.9	20.9
Miscellaneous industries	156	23.0	6.7	23.7	46.6

1/ Excludes blast furnaces, steel works, rolling mills and foundries.
2/ Excludes smelting and refining and alloying, rolling and drawing of nonferrous metals.
3/ Excludes aircraft and shipbuilding.

I-6. Flow of Resources into Military Production: Labor

The wealth of nations, in war even more than in peace, lies not in the treasure they have amassed but in the resources they can turn to the production of useful goods. It is this fact that makes it imperative to measure the application of our resources to war production. Viewed as such a resource, labor has two special characteristics. It is more nearly homogeneous than other productive factors, and it enters into the production of every commodity and service. The first quality makes it possible to consider the entire labor force as a single source of work; the second implies that a survey of labor - unlike critical materials or facilities - touches every part of our entire economy.

These facts enhance the importance of a review of labor applied to war production, but they also make such a survey very difficult. An estimate of the volume of labor absorbed by war production must take account not only of the labor used in industries that manufacture finished munitions exclusively, but also of an appropriate part of the labor used in other munitions industries and in the production of semi-finished and basic materials, transportation, power and other services contributing to munitions manufacture. Obviously, the apportionment of employment to war and non-war uses in industries which serve both, cannot be a neat or simple calculation. It is possible, however, to provide estimates that, though rough, are still illuminating.

Nonagricultural Employment

A first indication of the impact of the war effort on the use of labor is provided by a breakdown of employment in non-agricultural industries shown in Table 38. Total employment in these industries increased from about 36.1 million persons in December 1941 to nearly 38.8 million in December 1942, an increase of 2.7 million. This net change of 2.7 million results from an increase of 2.4 million persons in munitions industries and in basic metals and chemicals and of 1.0 millions in Federal war agencies while all other areas either declined or grew by very small amounts.

The significance of this finding is obvious from the definition of the munitions and basic metals and chemicals groups. The "munitions" group in this classification is composed of industries now primarily engaged in the manufacture of finished munitions or munitions components. It includes most of the metal fabricating industries (excluding only those that have not converted to war production to any significant degree), the explosives and ammunition industries, and government navy yards and manufacturing arsenals. The basic metals and chemicals group is composed of the mining and manufacturing industries that produce the raw and semi-fabricated materials for the munitions group. Thus the two categories together stand at the very center of the war production program and account for most of the increase in non-agricultural employment.

At the end of 1942, the munitions and basic metals and chemicals industries employed 8.3 million persons and accounted for 21.4 percent of all non-agricultural employment, an increase from 16.4 percent at the end of 1941. Employment in these industries had increased by 5 million persons since 1939, a growth of 155 percent. The only other group to register such an impressive change are the Federal war agencies which increased employment by nearly 1.4 millions since 1939, most of the increase occurring in 1942.

Construction and transportation and public utilities also reflect the influence of the war effort. By the end of 1942, the construction and construction materials industries employed 420 thousand more men than in 1939. This was an increase of 17 percent. But the decline of the war construction program was already becoming apparent. Towards the end of 1942, employment dropped markedly so that at the end of the year some 270 thousand fewer men were employed in building and in making building materials than were so engaged at the beginning of the year.

Transportation and other public utilities have borne a large share of the war production burden. During 1942, they added 130 thousand men to their payrolls - an increase of 3.5 percent. At the end of the year they were employing nearly 20 percent more men than in 1939.

By contrast with these changes, industries that largely serve the civilian area registered either small declines or very small increases in employment during 1942. And though all of them had added to their payrolls in the period between 1939 and 1942, they now account for a smaller portion of total employment.

This review provides a suggestive indication of the effect of the war effort on non-agricultural employment, but it shows only part of the picture. It indicates, among other things, the amount by which employment has increased in industries making munitions and in industries which serve the munitions makers. But it does not show the amount by which employment devoted to war work has grown. To make such a calculation we need to know not merely the number of men added to the payrolls of munitions and auxiliary industries, but also the number of men previously hired by these industries whose efforts have been diverted from the manufacture of civilian goods to the production of munitions and the support of such production. A rough estimate of this sort can be made.

Absorption of Labor in War Production

Basic to this calculation is an estimate of war employment within the munitions category itself. In 1939, the industries comprising this group were almost completely devoted to the production of civilian goods. In the two years which followed, the output of civilian goods grew rapidly. The peak of such output came in the middle of 1941, however, and thereafter sank rapidly under the impact of materials shortages and administrative restrictions. It is reasonable to suppose that by the end of 1941, workers devoted to the production of civilian type goods in these industries did not number more than they did in 1939. On this assumption, the workers engaged in munitions production in these industries, in December 1941 would come to 2.3 millions or 48 percent of their total labor roll. (Table 39).

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During 1942, employment in the munitions industries increased rapidly. At the same time, many more workers in the group were turned from the production of civilian goods to that of war goods. The WPB Plant Operation Survey indicated that in December 1942 at least 85 percent of the output of the munitions group (including aircraft and shipbuilding) consisted of military goods. This suggests a war employment within this category of 6 million persons, a gain of 3.7 million for the year.

The basic metals and chemicals industries produce raw and semi-fabricated materials to be used in the munitions industries. To gauge war employment in the former group, therefore, it is appropriate to use the ratios of war to non-war employment that were found in the munitions group. This gives us 560 thousand at the end of 1941 and 1 million a year later - a gain of 440 thousand persons.

War employment in the construction field and in areas producing construction materials may be estimated on the basis of the relation between Federally-financed war construction and total building activity. This calculation would put war employment in construction and its auxiliary industries at 1.04 million at the end of 1941 and 1.75 million at the end of 1942. Thus over the year some 700 thousand more men were put to war work in this area.

In the transportation, communications and fuel industries, we estimate that 570 thousand persons were employed in December 1941, in support of munitions production. By the end of 1942, this total had grown to 1.15 million, a gain of 580 thousand for the year. (See general notes to Table 39).

This leaves but one more important area of war employment - the Federal government. Navy yards and arsenals are included among the munitions industries, but other war agencies of the U. S. government increased their rolls from 350 thousand in December 1941 to 1.36 million at the end of 1942. Thus slightly over 1 million persons found war employment in this area in 1942.

This review covers all the major fields of war employment. Table 39 and Chart XXIII summarize the results. Within the groups discussed above we find that in December 1942 about 11.3 million persons were engaged either in the production of munitions or in the provision of materials and services to support the munitions industries. This represented a growth in such employment over the year 1942 of 6.5 million persons, or 135 percent.

This massive gain in labor devoted to war production represents not only a great absolute gain but also a large increase in the proportion of all workers absorbed in war employment. At the end of 1941, the total number of persons engaged in non-agricultural pursuits was just over 36 million. Of these we calculate that 13.4 percent were absorbed in war production. By the end of 1942, employment had increased to 38.8 million, and of this larger total 29 percent were producing munitions or supporting munitions production.

Other Areas of War Employment

Even this fairly comprehensive calculation, however, does not present a full story. Three omissions are noteworthy. Our estimates do not take account of the considerable number of workers in the textile, apparel and other non-munitions industries, the output of whose labor now takes the form of military goods or of lend-lease exports. The inclusion of these workers would tend to raise the share of war-work in total non-agricultural employment. In addition, we have neglected to include in our figures the numbers of agricultural workers whose output is now devoted to war and non-war purposes. Since the ratio of war work to total employment in this area would hardly be as great as in the non-agricultural fields, the over-all ratio would tend to be reduced.

The most important omission, however, consists of employment in the Armed Forces. At the end of 1941, the Services carried 2.1 million men on their rolls. By the end of 1942, some 4.5 million men had been added to our forces to bring their total strength to 6.6 million men. 1/ If we add these men to the group previously counted as non-agricultural war workers, we should have 7 million so employed at the end of 1941 and 18 million at the end of 1942, a gain of 11 million or nearly 160 percent for the year. The proportion of non-agricultural workers engaged in war production or in the fighting forces would have stood at 18 percent at the end of 1941. By the end of 1942, the share of this enlarged concept of war employment in total non-agricultural employment would have risen to nearly 40 percent.

Sources of Labor

Whence came the 11 million men drawn into the Armed Forces or into industrial war work during 1942?

The most important source was the increase in the labor force (Table 40 and Chart XXIV). This grew by 3.9 million persons between the end of 1941 and the end of 1942. And since employment in agriculture remained approximately constant over the year, all were available to meet the demands of the Armed Forces and of non-agricultural war production.

A second source, almost as important, was found in the diversion of workers within non-agricultural employment from civilian work to war work. This process of diversion yielded 3.75 million persons. Of these, no fewer than 1.76 million were secured by converting the output of the basic metal and chemicals group and of what are now the munitions industries. Nearly a million more were found by a combination of conversion to war work and of decline in employment in the construc-

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1/ These figures have been adjusted to refer to a date early in December, in order to be consistent with other data used in this analysis. The December 31 figures are 2.1 for 1941 and 7.0 for 1942.

tion industries.

Another 540 thousand were secured within the transportation, utilities and fuel industries. Their efforts are allocated to the war employment category because the proportion of materials and services furnished by their industries which went to support the output of munitions increased in 1942. The remainder of the workers secured by diversion came from other manufacturing industries making civilian-type goods, and from trade, services and government non-war work. Employment in these industries declined 470 thousand altogether and the men released entered war work or the Armed Forces.

Between the increase in the labor force and the diversion of employed workers from civilian to war work, 7.65 out of the 11 million new war workers were found. A third great source was our pool of unemployed. At the end of 1941, it is estimated that unemployed workers numbered 3.8 million. By the end of 1942, 2.3 million unemployed had been absorbed into industry or the Armed Forces, reducing the unemployed to 1.5 million. A final fund of war workers was found among previously self-employed persons - independent construction workers, retailers, handymen, and so forth. The number of self-employed declined 1 million and together with the first three sources yielded the 11 million men added to war work and the fighting forces in 1942.

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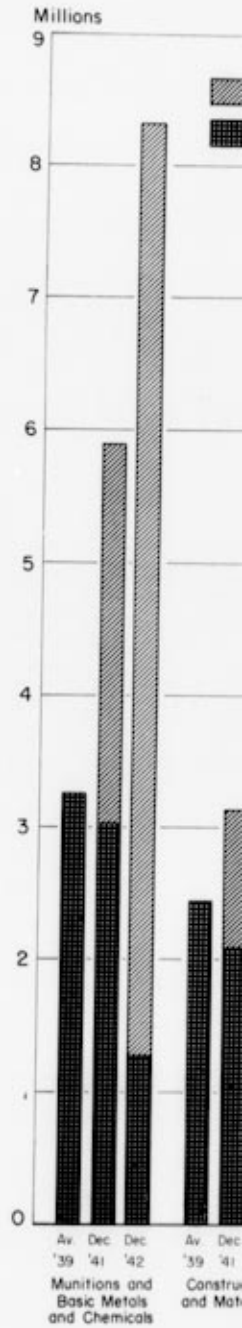
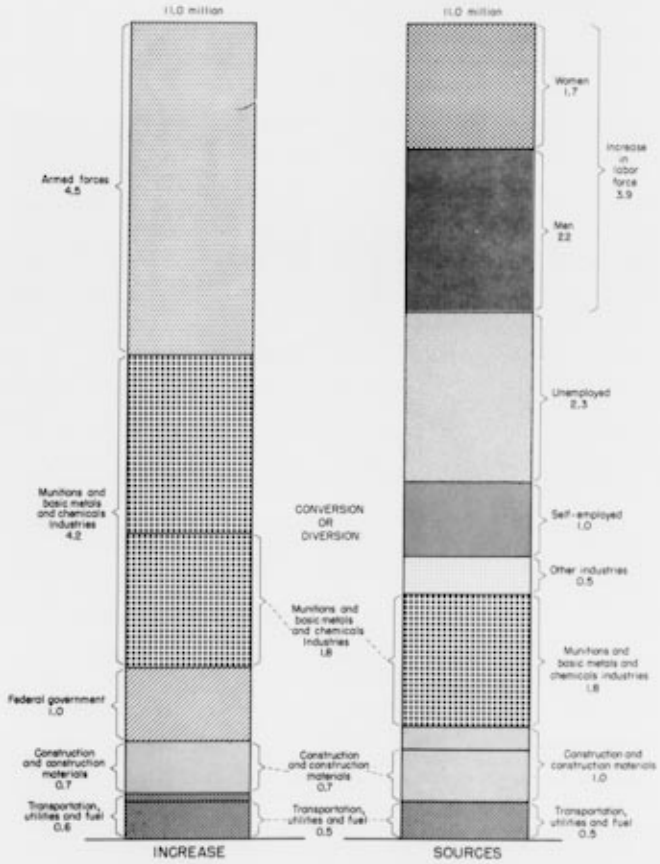


CHART XXXI

NET INCREASE IN WAR EMPLOYMENT AND SOURCES OF INCREASE

DECEMBER 1941 – DECEMBER 1942



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Statistics Division

TABLE 38

Nonagricultural Employment, by Economic Categories, 1939 - 1942

	Average 1939	December 1941	December 1942	Change to December 1942 from Average 1939	Change to December 1942 from December 1941
A. In Millions of Employees					
Munitions industries	2.44	4.75	7.14	+ 4.70	+ 2.39
Basic metal and chemical industries	.82	1.15	1.18	+.36	+.03
Construction & Construction materials	2.44	3.13	2.86	+.42	-.27
Transportation, utilities, and fuel	3.99	4.59	4.63	+.64	+.04
Other manufacturing	5.92	6.77	6.58	+.66	-.19
Trade	6.48	7.51	7.10	+.62	-.41
Service and miscellaneous	4.04	4.23	4.29	+.25	+.06
Federal war agencies	.11	.46	1.47	+1.36	+1.01
Other government	3.52	3.50	3.57	+.05	+ .07
Total	29.76	36.09	38.82	+ 9.06	+ 2.73
B. In Percent of Total					
Munitions industries	8.2	13.2	18.4		
Basic metal and chemical industries	2.8	3.2	3.0		
Construction and Construction materials	8.2	8.7	7.4		
Transportation, utilities, and fuel	13.4	12.7	11.9		
Other manufacturing	19.8	18.7	16.9		
Trade	21.8	20.8	18.3		
Service and miscellaneous	13.6	11.7	11.1		
Federal war agencies	.4	1.3	3.8		
Other government	11.8	9.7	9.2		
Total	100.0	100.0	100.0		

General Notes to Table 38

The totals shown in these tables are the standard nonagricultural employment estimates of the Bureau of Labor Statistics, except for December 1942, which is a forecast by the Planning Committee staff on the basis of B.L.S. preliminary November data.

Totals for "economic categories" have been obtained by recombining unpublished data for the component industries included in the B.L.S. estimates. The composition of these categories is as follows:

General Notes to Table 18 (Continued)

Munitions industries. This group includes ammunition, explosives, government manufacturing arsenals, navy yards, and most of the metal-fabricating industries, excluding only a few industries whose products are largely construction materials or household goods, and which do not appear to have converted to war production to any significant degree. It also includes the rubber products group, and the group of professional and scientific instruments, photographic equipment, and optical goods industries, usually classified under miscellaneous manufacturing.

Basic metal and chemical industries. This category includes the steel industry, smelting and refining of nonferrous metals, the basic industrial chemicals industries, and metal mining.

Construction and construction materials industries. In addition to the construction industry proper, this category includes such metal working industries as cast-iron pipe and sheet-metal work; the entire lumber and stone, clay, and glass products groups, and quarrying and mining of non-metallic minerals.

Transportation, utilities, and fuel. This category consists of the usual "transportation and public utilities" group, plus petroleum refining, crude petroleum producing, coal mining, and the postal service.

Other manufacturing industries. This category includes the remaining non-converted metal products industries, furniture, textiles, apparel, leather products, and the remaining miscellaneous manufacturing industries.

Trade. This is identical with the corresponding B.L.S. group.

Service and miscellaneous. This is also identical with the corresponding group in the B.L.S. estimates.

Federal war agencies. This category includes the War and Navy Departments, agencies under the Office for Emergency Management, the Maritime Commission, and a few minor war agencies. Employment in manufacturing arsenals and Navy Yards have been excluded, but civilian employees at military posts, depots, and stations, are included here.

Other government. This includes the remaining Federal agencies (except the Post Office Department), which employ currently about 450,000 persons. The bulk of the group consists of State and local government employees, including something over 1 million school employees.

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TABLE 39

War And Other Employment In Nonagricultural Industries
By Economic Categories 1939 - 1942

	Average 1939	December 1941	December 1942	Change Dec. 1941 to Dec. 1942
		(In Millions)		
War Employment				
Munitions industries	-	2.31	6.05	+3.74
Basic metal and chemical industries	-	.56	1.00	+.44
Construction & construction materials	-	1.04	1.75	+.71
Transportation, utilities, and fuel	-	.57	1.15	+.58
Federal Government	-	.35	1.36	+1.01
Total	-	4.83	11.31	+6.48
Other Employment				
Munitions industries	2.44	2.44	1.09	-1.35
Basic metal and chemical industries	.82	.59	.18	-.41
Construction & construction materials	2.44	2.09	1.11	-.98
Transportation, utilities, and fuel	3.99	4.02	3.48	-.54
Other manufacturing	5.92	6.77	6.58	-.19
Trade	6.48	7.51	7.10	-.41
Service and miscellaneous	4.04	4.23	4.29	+.06
Federal, State and local government	3.63	3.61	3.68	+.07
Total	29.76	31.26	27.51	-3.75
Nonagricultural Employment, total	29.76	36.09	38.82	+2.73
War Employment: Per Cent of total	0.0	13.4%	29.1%	-

(General Notes on next page).

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General Notes to Table 39

This table presents rough estimates of the amount of labor absorbed by war production in each of the economic categories distinguished in Table 38. It should be noted that these estimates of "war employment" cover only employment in the production of military-type goods, and that no account is taken of employment absorbed in the production of such items as food and textiles for military use. The derivation of the estimate for each category is indicated below:

Munitions. We may assume that all of the employees in these industries were producing civilian products in 1939. During the two following years, the output of civilian goods produced in these industries expanded rapidly, but by December 1941 had probably been curtailed to something approximating the 1939 level. Thus, the net increase of 2.31 million in employment in these industries from 1939 to the end of 1941 has been taken as a rough measure of the growth of employment attributable to war production. For December 1942, data from the WPB Plant Operations Survey suggest that for the munitions group as a whole (including aircraft and shipbuilding) only about 15 per cent of output consisted of civilian goods. Thus war employment in the group has been estimated as 85 per cent of total employment or 6.05 million.

Basic metals and chemicals. The estimate of war employment in the munitions category is 48.5 per cent of the total employment in this category in December 1941 and 85 per cent in December 1942. These same percentages have been applied to employment in the basic metals and chemicals category.

Construction and construction materials. Federally-financed war construction accounted for 33.5 per cent of total construction employment in December 1941, and 60.5 per cent a year later. We may apply these percentages to employment in the construction materials industries, obtaining estimates of war employment in the constructior and construction materials category of 1.04 and 1.75 million, respectively.

Transportation, utilities, and fuel. The products of these industries consist both of goods and services made available directly to consumers and goods and services contributing to the production of other industries. If we assume conservatively that half of the employment in this group of industries is attributable to goods and services in the latter category, we may then divide this half between war and non-war employment in the same proportion as aggregate employment in our other four industrial categories.

Federal war agencies. The 1939 level of employment in these agencies has been taken as representing the normal peace-time activities of these agencies. Only the excess over this amount has been regarded as war employment.

TABLE 40

Sources of Increase in
War Employment and Armed Forces During 1942

		(Millions)
A. Net increase in use of labor		
1. Nonagricultural war employment		6.48
2. Armed Forces		4.5
Total increase in use of labor		11.0
B. Sources of increase in labor employed		
1. Declines in non-war employment		
Munitions and basic metals and chemicals	1.76	
Construction and construction materials	.98	
Transportation, utilities, and fuel	.54	
Other nonagricultural	.47	
Total net declines in non-war employment		3.75
2. Self-employed: net decrease		1.0
3. Unemployed: net decrease		2.3
4. Increase in labor force		3.9
Total sources		11.0

I-7. Impact on the Civilian Economy

A first indication of both the scope of the war effort and of its impact upon the civilian economy may be found in the growing share of the total output of the economy going for war purposes and in the declining share devoted to other purposes. Chart XXV shows how the total output of the country has been divided among major groups of purchasers.

The most striking change is the growth of the share of total output going to war purposes. In 1939, only 1.5 percent of the nation's production was devoted to preparation for defense and war. Even if purchases by the British and French governments are taken into account, this figure would be but little greater. From this inconsequential level the war program grew -- slowly at first, then with rapid strides. In 1940, it took 2.8 percent; in 1941, 9 percent; in 1942, 31 percent of ever-growing totals. In the last quarter of 1942, the war program's relative share of the national product was just short of 40 percent.

Reflecting this development, the share of current output going to consumers declined from 72 percent in 1939 to 54 percent in the fourth quarter of 1942. For the year 1942 as a whole, consumers took about 56 percent of the total, 9 percentage points lower than the 1941 share of consumers.

Even more striking is the change in the proportion of total output taken by business for capital investment. In 1939, this category took about 12 percent. Then under the stimulus of rising business activity, investment rose so rapidly that in 1941 its share increased to 15.4 percent. In 1942, however, a sharp reversal set in. For the year as a whole, the share of investment was only 5.2 percent; in the fourth quarter of 1942, less than 1/2 of 1 percent. This drastic decline stems from a number of causes. Severe restrictions have been placed upon residential construction. Business investment for non-war purposes was placed virtually on a repair and maintenance basis. And inventories which in 1941 and early 1942 were built up rapidly were being liquidated at an equally rapid pace in the last part of 1942.

The Flow of Goods and Services to Consumers

The fact that the consumer's share of total output has declined so drastically since 1939 does not, of course, mean that the volume of goods and services going to consumers has fallen. Indeed, so rapid has been the rise of total output that the smaller share going to consumers has brought them a far greater quantity of goods than they received in 1939.

The key to this development lies in a grasp of the dual effect which an expansion of war production has upon civilian consumption. One effect is favorable: An expansion of war production, financed by government deficits, increases the disposable income of consumers. And the increase of consumer demand makes business men try to increase their output and sales of ordinary civilian products. The second effect is unfavorable: War production preempts the services of productive resources and makes the output of goods for civilians more difficult.

The impact of these two opposing forces upon the quantity of commodities and services flowing to consumers is vividly portrayed in Chart XXVI. Our war program got under way in 1940 and first reached substantial dimensions in 1941. This expansion of war expenditures was accompanied by a considerable increase in the quantity of goods and services going to consumers. In every quarter of 1941, commodities and services purchased by consumers were greater in quantity than they were on the average in 1940. For the year 1941 as a whole consumers' purchases were some 8.5 percent greater than in 1940 and some 15 percent greater than in 1939.

The reasons for this are not far to seek. The expanding war effort, it is true, absorbed large quantities of labor and materials. But so great were the country's unused resources in 1941 that the civilian economy was able both to replace the resources diverted and also to find additional men and materials to meet a war-stimulated consumer demand. The favorable effects of expanding war production still outweighed the unfavorable.

In 1942, however, the balance began to swing. As the war effort grew, it became more and more difficult to replace the resources diverted from civilian production: to increase them was not possible. As a result the volume of commodities and services going to consumers in 1942 failed to rise above 1941 levels. In 1942 as a whole, the flow to consumers was almost exactly as great as in 1941 -- a little over 75 billion dollars in 1939 prices. In the second half of both 1941 and 1942, consumers took 77.6 billion dollars worth of goods and services.

This level of consumer takings is higher than this country has ever seen -- 8.5 percent greater than in prosperous 1940 and 15 percent greater than in pre-war 1939. But the rise has now clearly stopped. From this time forward we may expect that the continued growth of output for war will gradually eat into the volume of goods flowing to consumers. In 1943, American civilians will actually begin to pay for the war in terms of reduced consumption. Indeed, in some areas the drop has already started.

Commodities and Services Compared

The total flow of civilian commodities and services in 1942 was as high as it has ever been. But this encouraging observation does not apply equally to every major portion of the flow. Purchases of services were higher in 1942 than in 1941, but purchases of commodities were probably lower. The decline in the flow of commodities to consumers was concentrated in consumers' durable goods and in automobile and household fuel. In other areas, consumers' purchases were as high or higher than they were in 1941.

As Chart XXVI indicates, purchases of both commodities and services have risen markedly since 1939. As is characteristic of periods of expanding consumption, commodities rose more rapidly than services. In 1941, purchases of commodities stood 17 percent higher than in 1939; services were up only 11.5 percent. But the restrictive effects of expanding war output have had a greater impact on the flow of commodities than on the flow of services. Purchases of goods were slightly lower in 1942 than in 1941. This is evident whether we compare the full year 1942 with 1941, or the second half of each year. Services on the contrary rose about 5 percent between 1941 and 1942.

These contrasts in trend are quite consistent with the character of the shortages which have developed. The year 1942 was one of raw materials shortage centering in metals. It was not, by and large, a year of labor shortage. It is not surprising, therefore, that the first declines in consumer purchases should have been in commodities, and that services should have grown.

Durable vs. Non-Durable Goods

The fact that 1942 shortages were concentrated in metals produced another contrast even more striking than the difference between goods and services. Purchases of durable consumers' goods, made in large part of metal, have followed a notably different trend than that pursued by non-durable goods.

As Chart XXVII indicates, however, the differences in trend antedated the developments of late 1941 and 1942. The percentage increase in durable goods from 1939 to 1941 was nearly 35 percent, that in non-durables only 13 percent. The conversion of the automobile industry and the developing shortages of metals brought this phase to a close in the first half of 1941. The decline of durable goods purchases began, the expansion of non-durables continued. In 1942, purchases of durable goods were some 30 percent below 1941, some 7 percent below 1939. In the case of non-durables, however, consumption was perhaps 3 percent higher than in 1941. Quarterly figures of non-durable goods consumption indicate that though the rate of expansion had become very mild in 1942, decline had not yet begun.

Table 41 provides greater detail. The two biggest categories of non-durable goods, food and apparel, moved much like the group as a whole. They stood about 5 percent higher in 1942 than in 1941 and a little less than 20 percent higher than in 1939 1/. The advance in tobacco consumption was even greater. In none of these groups did consumer purchases begin to decline in 1942.

Quite different has been the fate of two groups of commodities closely associated with the use of automobiles. The use of fuel and oil by passenger cars reached a peak in the second half of 1941 when the rate of consumption was 24 percent greater than in 1939. By the second half of 1942 gasoline and oil consumption by passenger cars had been cut about 40 percent and ran at a level some 20 percent below that of 1939. Purchases of automobile replacement parts and of tires and tubes suffered an even more drastic cut. At their peak rate of purchase in the second half of 1941, the volume of such goods bought was 20 percent greater than in 1939. In the second half of 1942, it was less than half as great. The reasons for the decline in the purchases of these commodities are, of course, to be found in the combined difficulties we have had with metals, and with fuel transportation. Metal shortages caused a curtailment of the production of automobile replacement parts. The cessation of rubber imports meant not only a sharp decline of sales of tires and tubes to ordinary consumers, but it also forced upon us a reduction of driving in order to conserve our stock of rubber. This situation was seriously aggravated by the difficulty of transporting fuel to the East Coast.

This latter difficulty affected not only gasoline consumption but the use of fuel for household heating as well. Although household fuels were consumed in the second half of 1942 at a rate only 5 percent lower than in 1939, this represented a cut of about 30 percent from the previous year.

Thus even non-durable goods had a mixed history in 1942. Foods, clothing, and some minor groups, paper and drugs, rose moderately above 1941 to new high levels of consumption. But the purchase of non-durable goods made of metal and rubber and the use of gasoline and other fuels fell sharply.

The difficulties inherent in metal shortages and in the scarcity of metal fabricating left their most serious mark upon the flow of durable goods. The most drastic cut of all is to be found in purchases of automobiles. This is because the sale of automobiles was placed under strict control when the output of passenger cars was eliminated. The rate of purchases in the second half of 1942 was only 9 percent as great as in 1939. Other groups also moved to consumers at greatly reduced rates. Electrical goods — big users of steel and copper — were down 16 percent in the second half of 1942 compared

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1/ There is some doubt about this finding so far as it affects foods. Alternative estimates of food consumption prepared by other methods suggest that 1942 food consumption was no greater than that of 1941.

with their 1939 rate of sales to consumers. This represented a drop of 45 percent from the peak sales of a year before. Furniture, too, was being sold in the second half of 1942 at a rate considerably lower than a year before; but sales were still some 16 percent greater than in 1939. Minor durable goods made in large part from materials not in short supply, however, were sold at peak rates. For the full year 1942, some 27 percent more such goods were purchased than in 1939. This was the same rate as prevailed during 1941. But in the second half of 1942, some evidence of a gain over the same period of 1941 was apparent.

These declines in the rate of purchase of durable goods are, of course, a very poor indication of the well-being of the ordinary consumer. It is true that consumers secured far smaller quantities of new durable goods in 1942 than they had in recent years. But the satisfaction received from durable commodities depends upon the stock of them in consumers' hands rather than upon their rate of flow to consumers. The high rate of purchase of all durable goods during 1940 and 1941 undoubtedly brought consumers' stocks of such goods to new high levels. And, automobiles excepted, it is highly likely that the rate of new sales in 1942 was sufficient to maintain consumers' inventories, perhaps to bring them to new high ground. Thus for most durable goods except automobiles, it is probably true that consumers' satisfaction from their use was as high as in any previous year -- much higher certainly than in pre-war 1939. For automobiles, a good measure of current use is gasoline consumption. As has been said above, a combination of difficulties forced a reduction in automobile use in the second half of 1942 to a rate which was only 80 percent of that which prevailed in 1939.

Output, Consumption and Inventories

The main emphasis of our review thus far has been upon the generally high rate at which goods flowed to consumers in 1942. Sales of durable goods were down and so were certain special classes of non-durables, but food and clothing which normally account for about 60 percent of all commodities purchases by consumers were taken at higher rates than ever before and so were many minor varieties of consumers' goods. It is necessary, however, to consider carefully the effect of the expansion of war production upon the output of all these goods. For if output, as distinct from sales, has begun to decline, we must expect a similar decline of sales to consumers in the not too distant future. This is the more true if output has fallen below the level of sales so that business inventories begin to decline. The information which is available makes possible such comparisons of output, consumers' purchases and inventories in three important areas: food, clothing and consumers' durable goods.

Foods

Because so great a proportion of all foods are highly perishable, we may be sure on general grounds that the trend of food output, after allowing for exports and military use, closely resembles that of domestic consumption. This common observation is supported by detailed estimates prepared by the Office of Price Administration (Table 42).

Two strong impressions are gained from these calculations. The first is that there was little change between 1941 and 1942 in the real value of total new food supply available for home consumption. Notable declines appeared, however, in the supply of pork, shortenings, sugar, coffee, tea and cocoa.

The second large impression is that total consumption also changed but little 1/, and in almost every instance was closely matched with new supply available. In a number of instances, however, this was not the case. Considerable declines appear to have occurred during 1942 in stocks of canned fish, butter, canned vegetables and fruits, shortenings, sugar, candy, coffee, tea and cocoa.

Clothing

It was pointed out earlier that clothing sales to consumers (measured in constant prices) had reached a level in 1941 some 15 percent higher than in 1939 and that this rise had continued in 1942, though at a very much reduced rate. Output available for domestic consumers, by contrast, rose more slowly between 1939 and 1941, and since that time has declined. Indications of the output of clothing (after adjustment for military takings and exports) are presented in Table 43, and in Table 44, we compare the movement of output and consumption between 1941 and 1942.

Clothing output, unlike the production of most other goods, appears to have been somewhat lower in 1940 than in 1939. After this slight recession, output rose in 1941 to a level some 12 percent higher than in 1939. The recession of 1940 is noteworthy, however, for it means that the rate of clothing output in the two years before we entered the war was little higher than it was in 1939.

1/ This finding differs somewhat from that shown in Table 41 which presented Department of Commerce estimates of food purchases. The Commerce figures indicate an increase in food consumption between 1941 and 1942 of about 7 percent. The disagreement is the result of a difference in methods of estimate. The OPA data used here are built up from a physical output data valued in 1941 prices, adjusted for farm-to-market losses, military takings, foreign trade and inventory changes. The Commerce data are based on retail sales of food adjusted for price changes. Table 42 presents the OPA estimates in detail.

From the peak levels reached in 1941, the output of clothing available for domestic civilian use has declined. It is not easy in the absence of data corrected for seasonal variations to measure the extent of the decline of output or to compare it accurately with the contrary movement of consumption. The data presented in Table 44, however, makes it clear that output and consumption followed markedly different courses in 1942.

In the third quarter of 1942 1/, clothing production available for domestic consumers was over 17 percent lower than in the same quarter of 1941. Clothing consumption was less than 1 percent lower. Men's clothing output suffered the severest drop -- nearly 27 percent -- from the previous year, but women's clothing was also down -- over 12 percent, and shoes were over 15 percent lower. The same sort of conclusion flows from a comparison of the first three quarters of 1942 with the same period of 1941. Clothing output as a whole was down 7 percent. Clothing purchases, on the other hand, had risen slightly. Again it is the output of men's clothing which was the worst sufferer, though all groups showed a decline.

Inventory Movements

These differences in the trends of consumers' purchases of clothing and of output available for domestic consumers has left its mark upon inventories. Sparse and unsatisfactory evidence about wholesalers' stocks in clothing and related lines indicate that average holdings in the three months, August through October, 1942 were about 5 percent smaller than in the same quarter of 1941. At this level stocks were probably some 10 percent or more below 1940 holdings.

More adequate data are available for stocks at the retail level. Table 45 shows the value of inventories (adjusted for price changes and seasonal variations) in four lines of trade: Department Stores, Variety Stores, Chain Men's Wear and Chain Shoe Stores. This is a considerable fraction of retail trade in lines selling textile goods and clothing. It is biased, however, in that it gives somewhat too great representation to the larger and more prosperous stores.

The movement of stocks in all four lines portrayed in Table 45 is roughly similar. Inventories in each reached a peak in July, 1942, after a virtually uninterrupted climb since 1939. By far the largest part of the increase occurred in the first half of 1942. At peak levels, Department Store stocks stood 61 percent above average 1939 levels. Variety Stores were 26 percent higher, Chain

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1/ Fourth quarter data for output are not yet available.

Men's Wear were 60 percent higher, and Chain Shoe Stores were 26 percent higher. The four lines taken together held stocks 52 percent greater in July, 1942 than in 1939. Most of these increases took place in the first half of 1942.

In the three months since July for which data are available, stocks in these stores have been dropping with alarming rapidity. Department Store stocks have fallen 20 percent, Variety Stores 21 percent, Chain Men's Wear 13 percent, and Chain Shoe Stores 12 percent. The total stocks of the four lines declined just short of 20 percent in the three months, August through October. This decline brought the level of stocks back to that which prevailed at the beginning of 1942. While this level of stocks was by no means low — it was about 25 percent higher than in 1939 — the rate of decline was alarming, the more so as the larger stores represented in the samples were probably better able to maintain their stocks than stores as a whole.

Consumers' Durable Goods

It is in the production of consumers' durable goods that the impact of expanding military output and of administrative restrictions has been most severely felt. This is understandable, for automobiles and refrigerators, vacuum cleaners, typewriters, kitchen utensils and other metal consumers' goods are very large users of both scarce materials and of scarce manufacturing facilities. From the beginning of 1942 -- in some cases earlier -- the expansion of military output began to drain resources from this area. Priorities and allocations created difficulties in securing raw materials. In some cases, manufacturers voluntarily converted their plants to war production in order to secure Federal contracts. In other cases, administrative restrictions on the output of particular goods and on the use of critical metals forced the curtailment of civilian output. The net result has been a severe contraction of production. The sharpness of this contraction far exceeds that in consumer purchases of durable goods. Hence, stocks of such goods are now falling rapidly and must soon be exhausted if purchases are not checked.

The peak rate of output of durable consumers goods was probably reached around the middle of 1941. Six important commodities in this group, which together account for over half its normal output, reached peak levels in either the second or third quarter of 1941 1/. In the second quarter of 1941 a weighted index of the output of these six commodities stood 70 percent higher than in 1939. From this time forward, output fell rapidly under the impact of profitable war orders

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1/ Wood and upholstered furniture, floor coverings, household mechanical refrigerators, passenger automobiles, heating and cooking stoves, radio receiving sets.

and of restrictions on output and the use of materials. By the last quarter of 1942, the weighted index for the six commodities had fallen over 80 percent from peak levels. At that time, the index stood at only 28 percent of its 1939 level. By contrast, consumers' purchases of all durable goods stood at 83 in the third quarter of 1942 (105 in the fourth quarter) a drop of less than 50 percent from the second quarter of 1941 and of only 17 percent from 1939 levels.

It may be, of course, that this sample, shown in Table 46, exaggerates the drop of production since five of the six commodities included are subject to sharp curtailments of output by administrative order. On the other hand, the production of other commodities not included in the index, with a 1939 value of over 250 million dollars, has been completely eliminated. And the production of many other kinds of goods has been hampered by restrictions on the use of materials, by shortages and by conversion of facilities. There can, therefore, be little doubt that the curtailment of output of goods in this group has been severe and that output in 1942 fell far below the rate of purchases. An inspection of inventory data throws additional light on the situation.

Table 47 indicates that the stocks of consumers' durable goods are now dropping rapidly. Adequate indications of retail stocks, except for new automobiles, are not available. At the wholesale level, however, the situation is quite clear.

At the end of October, 1942, the latest date for which data are available, inventories in four of the five wholesale lines shown were lower than those held at the end of 1939. In one line, furniture and furnishings, stocks were 40 percent lower. Still more important, however, is the evidence of the rate at which wholesalers' stocks are declining. Measured from the peak levels reached in 1942, stocks in each of the five lines have declined drastically and steadily. The percentage change in this short period varies from 19 percent for jewelry and optical goods firms to as much as 48 percent in electrical goods houses. It is clear, therefore, that the rate of sales of retailers must soon drop drastically and that retailers' stocks, too, must decline where this has not already occurred.

The only evidence of retailers' stocks that we have are inventories of new automobiles. These reached a peak level of 576 million dollars (measured in 1939 prices) in March, 1942. Since then stocks have declined by 245 million dollars or over 42 percent. Here, too, the rate of sales must soon be cut if the available stocks are to be spread adequately into the future.

Construction

To round out this picture of the trend of output for civilian purposes, we must look briefly at recent developments in construction activity. Residential building and other construction for the benefit of civilians have followed a course much like other consumers' durable goods. From 1939 to 1941, building activity for non-war purposes increased sharply as consumers' incomes rose. This increase in building was checked in 1941 and then rapidly reversed as prices rose and as government controls forced a halt in private construction for non-war purposes. The salient features of this development are displayed in Table 48.

Construction of civilian housing rose from 1939 to 1941 by approximately 50 percent. It then fell sharply with the beginning of active war in 1942. For the year 1942 as a whole, residential building of all types amounted to 1.9 billion dollars as compared with 2.1 billion dollars in 1939. In the fourth quarter of 1942, housing construction ran at the annual rate of 1.2 billion dollars, a drop of 62 percent from the same quarter of 1941. Since prices were rising over the entire period, the measures cited must be taken to exaggerate the rise from 1939 to 1941 and to understate the subsequent drop.

All residential building is now subject to stringent government control. More than half of total housing activity is now financed publicly. The remainder, privately financed, goes forward only under Federal permit. Additional selection is exercised through central control of the distribution of raw materials. The clear purpose of the control is to eliminate all residential building which is not urgently required for the accommodation of munitions workers in overcrowded areas of war industry.

Other non-war construction shown in Table 48 has suffered a somewhat similar fate. This category includes all construction except that for the direct use of the armed forces and for plant expansion. The value of building in this field rose from 3.9 billion dollars in 1939 to 4.1 billions in 1941 -- a rise which may represent no substantial real increase in building activity when allowance is made for price increases. From 4.1 billion dollars in 1941, the value of construction fell to roughly 2.0 billion dollars in 1942. In the fourth quarter of 1942, the value of construction in this category had dropped to 1.3 billion dollars, 67 percent lower than the level of the same period in 1941.

These declines in new construction for civilian purposes were very sharp. But it must be emphasized again that the welfare of consumers is but little affected by such curtailment of construction -- less so even than in the case of other consumers' durable goods. Only a very small fraction of the value of the great stock of residential buildings is used up annually and it would be possible to prohibit new residential building for several years without affecting seriously the standard of shelter in the country. Thus, though the cuts in construction have been far more drastic than in clothing output, we shall probably feel the effects of the latter sooner and more seriously than those of the former.

Summary

This review serves to emphasize how fortunate has been the position of the American consumer up to the present stage of the war. Not only has he not been forced to suffer a great reduction of his accustomed standard of living, he has actually benefited from a great rise in his level of consumption. This period of expanding consumption, directly traceable to the war effort itself, saw the volume of goods and services flowing to consumers rise some 15 percent between 1939 and 1941 to reach record levels. And this record level was maintained in 1942.

This conclusion, of course, refers only to total consumption. Beginning in the second half of 1941, sales of consumers' durable goods automobiles, furniture, radios, etc. began to drop sharply. By the end of 1942, they had dropped 60 percent below the level of 1939. Well stocked with such goods, however, it is doubtful that American consumers have yet seriously felt their inability to purchase new durables. Far more serious, without question, has been the curtailment of gasoline and household fuel consumption. By the end of 1942, gasoline purchases had fallen perhaps 50 percent below 1941 and 30 percent below 1939. But these areas were the exceptions. Consumption in the main remained very high in 1942.

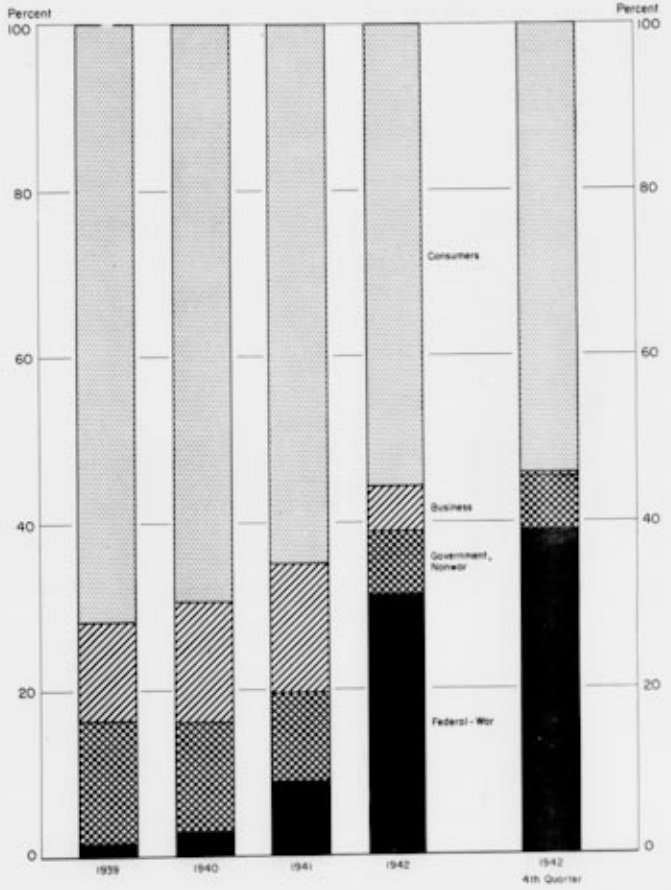
The beginnings of a decline, however, have become apparent. Even in 1942, purchases of goods were slightly lower than in 1941. Only services kept the total up. The expansion of war output in 1943 will certainly cause consumption to fall.

Other signs that consumption must decline in 1943 are to be found in a survey of production as distinct from consumption. In durable goods the decline of output between 1941 and 1942 was markedly greater than the decline of consumers' purchases. In clothing, output declined, though consumption rose slightly. In both cases inventories were falling rapidly in the second half of 1942. These are fairly dependable signs that clothing purchases must begin to fall and that consumers' takings of durable goods must fall further. In the case of food, consumption depends almost entirely on output available for domestic non-military use. And from present indications, such output will be lower in 1943 than in 1942.

Thus it appears that the period of consumer prosperity inaugurated by the war effort reached its zenith in 1941. It barely maintained itself in 1942. In 1943, the decline must begin and with it the American consumer will pay his first considerable installment against the cost of the war.

CHART 3302

PERCENTAGE DISTRIBUTION OF THE GROSS NATIONAL PRODUCT
1939 - 1942



Source: National Income Unit
Bureau of Foreign and Domestic Commerce
U.S. Department of Commerce

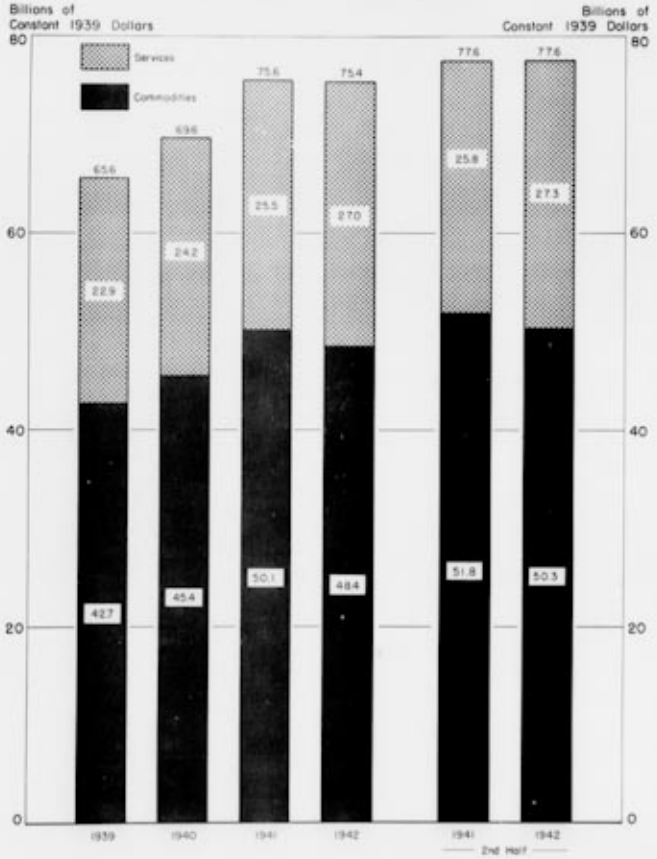
WAR PRODUCTION BOARD
Statistics Division

CHART XXII

COMMODITIES AND SERVICES BOUGHT BY CONSUMERS

1939 – 1942

ANNUAL RATES WITHOUT SEASONAL ADJUSTMENT
VALUES CORRECTED FOR PRICE CHANGES



Source: National Income Unit
Bureau of Foreign and Domestic Commerce
U.S. Department of Commerce

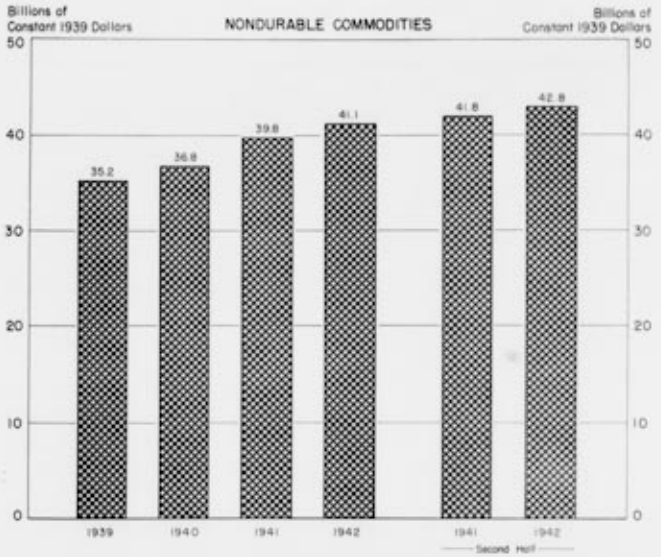
WAR PRODUCTION BOARD
Statistics Division

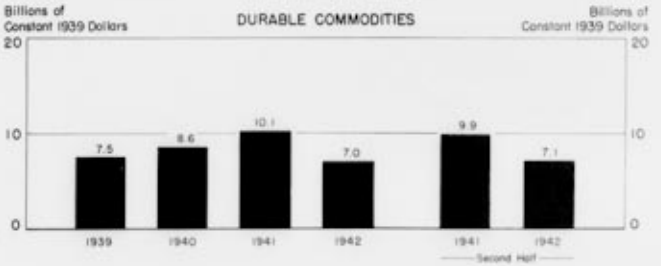
CHART [illegible]

PURCHASES OF DURABLE AND NONDURABLE COMMODITIES

1939-1942

ANNUAL RATES WITHOUT SEASONAL ADJUSTMENT
VALUES CORRECTED FOR PRICE CHANGES





Source: National Income Unit
Bureau of Foreign and Domestic Commerce
U.S. Department of Commerce

WAR PRODUCTION BOARD
Statistics Division

TABLE 41

Indexes of Consumer Purchases of Commodities Based on Values Adjusted for Price Changes 1940 - 1942

1939 = 100

	1940	1941	1942	1941 II Half	1942 II Half
Non-durable Goods					
Foods	105	111	118	115	124
Tobacco	102	113	124	116	131
Apparel	103	115	119	124	128
Household fuels	111	122	119	132	95
Passenger car fuel and oil	105	115	88	124	80
Automobile parts, accessories and tires	105	116	52	120	52
Others	104	113	125	122	136
Total, non-durable goods	104	113	117	118	122
Durable Goods					
Passenger cars	127	139	8	94	9
Furniture and furnishings	110	132	118	138	116
Electrical goods	118	149	109	154	84
Others	109	127	127	147	152
Total, durable goods	115	134	93	132	94
All Commodities	106	117	113	121	118

Source: National Income Unit
Bureau of Foreign and Domestic Commerce
U. S. Department of Commerce

TABLE 42

Consumption and Available New Supply of Foods, 1941 and 1942
(at 1941 retail prices - thousands of dollars)

	1941		1942	
	Consumption	New Supply	Consumption	New Supply
All Foods	**20,830.2**	**20,986.1**	**20,880.2**	**20,417.6**
Meats and Fish	**5,688**	**5,944**	**5,368**	**5,335**
Beef	1,838	1,844	1,865	1,685
Veal	272	272	263	263
Lamb and Mutton	264	264	262	261
Pork	2,186	2,140	1,879	1,912
Poultry	731	733	801	802
Canned Fish	213	205	131	47
Fresh and frozen fish	184	186	167	165
Dairy Products	**4,068**	**4,136**	**4,321**	**4,310**
Fluid milk and cream	2,282	2,288	2,453	2,449
Canned milk	242	258	235	286
Butter	745	771	775	735
Cheese	264	284	281	263
Ice Cream	535	535	577	577
Eggs	**893**	**905**	**899**	**918**
Vegetables	**2,714**	**2,698**	**2,866**	**2,821**
Potatoes	426	418	434	428
Tomatoes	253	253	285	285
Leafy green and yellow	613	613	663	664
Others	731	725	749	753
Canned	558	545	576	521
Dried	133	144	159	170
Fruits	**1,436**	**1,402**	**1,362**	**1,317**
Fresh	959	952	895	893
Citrus	377	377	362	362
Other	579	575	533	531
Canned	383	368	361	326
Dried	97	82	104	98
Grain Products	**1,970**	**1,970**	**2,010**	**2,010**
Bread	830	830	830	830
White Flour	380	380	385	385
Other baked products	340	340	355	355
Other cereals	420	420	440	440
Fats and Oils	**660**	**647**	**660**	**594**
Lard	239	226	239	221
Shortening	294	294	256	208
Oleomargarine	63	63	67	67
Other edibles	104	104	98	98
Sweets	**1,260**	**1,342**	**1,259**	**1,080**
Sugar	516	548	417	328
Syrup and Honey	65	65	79	79
Candy	575	625	605	555
Jams, jellies and preserves	104	104	118	118
Beverages and Others	**474.8**	**508.2**	**481.2**	**360.9**
Coffee	400	428	418	321
Tea	67	72	59	38
Cocoa	7.8	8.2	4.1	1.9
Miscellaneous	**1,726.4**	**1,734.1**	**1,692.0**	**1,671.7**
Carbonated beverages	858	858	825	825
Nuts	227	232	226	219
Other	641.4	644.1	641.0	627.7

Source: Office of Price Administration
December, 1942

TABLE 43

Indexes of the New Supply of Clothing Available For Domestic Consumers 1940 - 1942

1939 = 100

Year	Men's Clothing	Women's Clothing	Hats, Gloves and Hosiery	Shoes	All Clothing
1940	90.7	98.7	95.4	93.4	94.9
1941	117.4	111.5	102.8	111.5	112.1
1942 1/	106.2	110.9	90.4	104.8	105.7
1941					
First Quarter	109.6	118.5	106.1	107.3	112.1
Second Quarter	116.2	104.1	107.0	109.7	109.1
Third Quarter	124.7	121.1	97.8	118.2	118.5
Fourth Quarter	117.2	101.8	101.9	103.2	106.5
1942					
First Quarter	122.3	124.8	95.7	109.4	117.2
Second Quarter	100.4	102.0	88.9	104.8	100.3
Third Quarter	91.3	105.7	87.2	100.0	98.0

1/ For the period January - September, 1942.

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TABLE 44

Changes in Output 1/ and Consumers' Purchases of Clothing
1942 Compared With 1941

	Percentage Changes	
	III Quarter, 1941 to III Quarter, 1942	1st. 3 Quarters, 1941 to 1st. 3 Quarters, 1942
Output 1/		
Men's Clothing	- 26.6	- 9.0
Women's Clothing	- 12.6	- 3.2
Hats, gloves and hosiery	- 10.8	-12.6
Boots and shoes	- 15.4	- 6.2
All Clothing	- 17.4	- 6.6
Consumers' Purchases		
Apparel and related products	- 0.8	+ 1.0

1/ Adjusted for military takings and exports

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TABLE 45

Inventories of Retail Stores - Semi-Durable Goods Lines

1939 - 1942

Dollar values adjusted for price changes and seasonal variation

(millions of 1939 constant dollars)

	Dep't Stores	Variety Stores	Chain Men's Wear	Chain Shoe Stores	Total
1939 mo. av.	595.1	153.8	31.4	60.9	841.2
1940 mo. av.	590.8	161.3	29.7	58.1	839.9
1941 mo. av.	650.0	172.0	33.7	62.8	918.5
1942 end of mo.					
Jan.	687.2	185.8	43.0	67.6	983.6
Feb.	724.4	180.7	42.1	67.6	1,014.8
Mar.	764.9	167.4	42.5	67.0	1,041.8
Apr.	830.8	186.2	42.7	67.4	1,127.1
May	886.0	188.3	46.5	70.0	1,190.8
June	924.9	183.8	45.8	76.9	1,231.4
July	969.5	194.6	50.2	76.9	1,281.2
Aug.	924.2	182.1	49.6	74.0	1,229.9
Sept.	830.7	166.1	45.2	72.3	1,114.3
Oct.	770.6	153.3	43.4	67.6	1,034.9

Source: U. S. Dep't of Commerce

TABLE 46

Indexes of the New Supply of Consumers' Durable Goods Available for Domestic Civilian Consumption1/

	Manufacturers' Value, 1939 (mill. of dollars)	Peak Date 1941	Peak Level	IV Q. 1942
			(1939 = 100)	
Wood and Upholstered Furniture	434	II Q.	165	99
Floor Coverings	189	III Q. IV Q.	122	62
Household Mechanical Refrigeration	143	II Q.	368	0
Passenger Automobiles	1,199	II Q.	174	0
Stoves, Heating and Cooking	189	III Q.	133	46
Radio Receiving Sets	133	III Q.	147	8
Weighted Index	2,277	II Q.	171	38

1/ Excludes quantity sold for business use.

TABLE 47

Indexes of the Physical Volume of Wholesalers' Inventories of Consumers' Durable Goods, 1939 - 1942
(unadjusted for seasonal)

Dec. 31, 1939 = 100

	Total Hardware	Electrical Goods	Furniture and House-furnishings	Automotive Supplies	Jewelry and Optical Goods
12-31-40	112	108	82	107	114
12-31-41	122	175	97	118	116
1942					
Jan.	126	172	107	116	126
Feb.	125	165	103	115	140
Mar.	124	161	97	118	134
Apr.	120	146	87	116	129
May	115	141	79	112	126
June	109	132	76	106	127
July	106	122	78	103	124
Aug.	101	111	71	100	123
Sept.	94	96	66	96	119
Oct.	87	89	59	92	113
Percentage Change from 1942 peak	-31	-48	-45	-22	-19

Source: U. S. Dep't. of Commerce

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TABLE 48

New Construction in the United States

1939 - 1942

(Millions of current dollars)

Year	Housing			Other Non-War	Total Construction
	Public	Private	Total		
1939	76	2,046	2,122	3,885	6,367
1940	205	2,323	2,528	3,671	7,276
1941	489	2,675	3,164	4,115	11,415
1942	630	1,280	1,910	1,968	12,994
Annual Rates--Without Seasonal Adjustment					
1941					
I Quarter	300	2,012	2,312	3,168	9,212
II Quarter	472	2,784	3,256	4,068	10,564
III Quarter	632	3,260	3,892	5,148	13,280
IV Quarter	552	2,644	3,196	4,076	12,608
1942					
I Quarter	372	1,760	2,132	2,316	9,616
II Quarter	540	1,860	2,400	2,356	13,668
III Quarter	860	1,000	1,880	1,876	16,252
IV Quarter	728	500	1,228	1,324	12,440

Source: U.S. Dep't. of Commerce and WPB, Statistics Division.

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PART TWO:

PROSPECTS FOR 1943

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II-1. Size and Composition of the Program

Comprehensive measures of military production must necessarily be in dollar units, and consequently suffer from the weaknesses of a dollar approach in cases where it is real resources and output that count. Moreover the dollar unit values employed in the estimates here are somewhat higher than prospective actual payments, i.e. than the dollar magnitude of the output when the final disbursement and reckoning are made. Yet with all these qualifications, the monetary yardstick is the only one available that applies to all of the various categories in the military production area and that reflects all of the resources employed in such production. And so long as we use it, holding unit costs constant over time, it can serve usefully the basic purpose of the analysis--to indicate how much larger the military production programs for 1943 are than the output attained in 1942; and how this relative increase in programs over output already attained varies from one significant category of production objectives to another.

Size of the 1943 Program

The military production program for 1943, including pay, subsistence and other non-munitions is valued at $106 billion, as compared with $59 billion for 1942 (Table 49 and Chart XXVIII). This 80 percent increase is not as great as the relative rise in military production from 1941 to 1942, which amounted to over 250 percent; but the absolute increase scheduled is greater--$47 billion from 1942 to 1943 as compared with $42 billion from 1941 to 1942--and the situation with respect to the availability of slack resources in the economy is appreciably less favorable now than it was at the beginning of last year. In any industrial economy, no matter how rich in natural resources and ingenuity and efficiency of its people, growth of large volumes of output at constant percentage rates is not feasible over long periods of time. As will be shown below, the rates of increase in military production have already shown a distinct tendency to decline during 1942. The bare figures just cited above, and more detailed indications of the discussion below, clearly suggest that the task posed for the industrial system by the 1943 military production program is most formidable.

How formidable it is can be illustrated by a comparison with this country's gross national product, i.e. the value of all commodities and services produced during the year, without deduction of durable capital consumed and treating government outlays as all representing finished products. So defined, gross national product of the United States amounted in a prosperous year like 1940 to $97 billion. Even if we assume that in price levels comparable to those for 1940, the value of the military production program for 1943 should be scaled down by roughly 25 percent from its estimated total of $106 billion, the objectives would still amount to roughly $80 billion, or more than four-fifths of the total product of the economy in 1940.

Composition of the Program

More significant is the analysis of the program by important categories. Of primary concern here is the total for munitions and construction. The non-munitions category, consisting of military pay and subsistence, agricultural exports, funds for stockpiling, overhead expenses of the war agencies and the like, does not present the same type of critical production problems that are found in munitions and military construction. For the latter two categories, the program for 1943 is valued at $84 billion, again an 80 percent increase over 1942 output.

As between these two categories, significant shifts in relative importance are scheduled to occur. In construction, both direct military and war industrial facilities, the volume called for on the 1943 program is significantly below the level of output attained in 1942. This is obviously a reflection of the fact that the preparatory phases of the war production program--the tooling up for munitions output and the construction of bases, barracks, hospitals, etc. for the training and maintenance of the armed forces--are already substantially completed. As a result, while the volume of construction projected for 1943 is still fairly large--over $11 billion--it forms a much smaller proportion of the munitions and construction total in 1943 than in 1942: 13 as compared with 30 percent. Barring any critical bottlenecks that may arise in attaining this construction program (see Section II-3 below), the comparison of the dollar values alone does not suggest any difficulties in attaining the 1943 war construction objectives.

The situation for munitions is quite different. Their programmed value for 1943, $72.3 billion, represents an increase of nearly 125 percent over output in 1942. And for significant and large categories the relative rise called for in 1943 over 1942 is much larger (Chart XXIX). Thus, in combat planes the programmed value of 1943 output is 3½ times that of actual output during the last year; in spare propellers, engines and parts, 2.7 times; in other plane equipment and maintenance, almost 4 times; in ground signal and related equipment, over 3 times; and in minor combat vessels, nearly 4 times. These categories are obviously the ones in which attainment of the 1943 goals is likely to present the greatest difficulties.

A corollary to differences among categories of munitions in the expected rate of increase over 1942 levels of output is the fact that the composition of the 1943 munitions program differs significantly from the distribution of munitions output in 1942. Whereas in 1942 aircraft and related equipment accounted for somewhat less than 30 percent of total munitions output, the same category accounts for almost 40 percent of total munitions objectives for 1943. In 1942, minor combat craft, largely anti-submarine vessels, accounted for only 3 percent of total munitions output; on the 1943 program their share is nearly 6 percent.

There were, naturally, corresponding reductions in the shares of other munitions categories from their proportion in 1942 output. Especially notable are the declines in the relative proportions of major combat vessels, naval equipment and maintenance, transports and landing craft, and miscellaneous munitions. These various changes in the percentage distribution of munitions objectives in 1943, as compared with output in 1942, reflect changes in the importance attached to various categories of fighting equipment in the light of the shifting fortunes of military conflict and the correlated shifts in the weight of the several strategic problems to which the different categories of munitions relate.

Major Munition Items

A clearer comparison of the 1943 munitions program with actual 1942 output can be drawn from physical unit measures of the major items involved (Table 50). Such unit measurements necessarily overlook improvements in quality, weight and complexity of each unit type; but they lend greater reality to the portrayal of both objectives and output by permitting us to see the physical quantities involved.

Both the absolute numbers and their rate of increase over 1942 output are striking for a variety of the weapons listed. Among types of aircraft we find a somewhat greater rise over 1942 in the number of bombers than in pursuit planes and only a moderate increase in trainers. For combat vehicles, 1943 forecast production of heavy tanks is many times the small output in 1942 and armored car production in 1943 is planned at nearly 15,000 as compared with 500 produced in 1942.

Artillery, both aircraft and ground, is scheduled to increase only moderately except for anti-aircraft guns, production of which is scheduled at 65 percent above last year's output. The decline in anti-aircraft machine guns is attributable to the substitution of heavier calibre guns. The quadrupling of the 1942 output of rifles is due, in part, to the widespread substitution of carbines for automatic pistols and the continued replacement of most rifle types with the Garand. The production of all types of ammunition including bombs is planned to increase sharply over 1942, with extreme increases in the neighborhood of threefold in aircraft bombs and aircraft gun ammunition. Requirements in 1943 for various types of motor transport are approximately the same as production in 1942 except for the tank transport program, which drops off sharply, and trailer requirements, in which there is a substantial increase over 1942 output. In the signal equipment field an increase of more than two and a half times is scheduled for aircraft radar sets.

In Naval ordnance the major emphasis in 1943 will be on anti-aircraft and dual purpose guns and ammunition: guns are scheduled at nearly double the 1942 production, and ammunition at over three times 1942 output. Among the Naval vessels 12 aircraft carriers are scheduled for delivery in 1943 as compared with only one completed in 1942. Completions of cruisers, destroyers and submarines are estimated to exceed 1942 output by from 50 to 100 percent. Many escort vessels of new design—destroyer escorts and corvettes—are scheduled for delivery in 1943; none was completed in 1942. Deliveries of minor naval craft will more than double in 1943. However, the number of landing craft scheduled for delivery in 1943 is slightly under 1942 completions.

In merchant vessels, striking acceleration is observed in tankers and in minor types of craft such as coastal tankers and cargo vessels, barges and tugs. However, for the bulk of the program, that relating to dry cargo, the large tonnage scheduled for 1943, while over twice the volume completed during the last year, is only about 50 percent above the annual rate of construction attained during the last quarter of 1942.

Not all the items in which sharp rises in the objectives for 1943 over the output in 1942 are noted will necessarily present acute production problems; and conversely, some categories for which the increased goals for 1943 are only moderately larger than actual output in 1942 may prove difficult of attainment. But by and large it is true that munitions categories of sizable absolute volume, for which the objectives are greatly in excess of 1942 production rates, will call for major efforts and will require careful scrutiny to determine whether or not the objectives have been set at reasonably attainable levels. In these respects the 1943 programs for combat plane production and for anti-submarine vessels emerge as the most difficult categories in the 1943 objectives, and the utmost efforts will have to be made if attainment is not to fall short of the goals by a substantial margin for these items.

Quarterly Schedules for 1943

We turn now to consider how the objectives for the full year 1943 are scheduled over shorter time units within the year. This will permit us not only to ascertain at what time during the year peak levels of output are expected for the various categories in military production, but also to compare the scheduled movements with the patterns of increase by quarters during 1942 (Table 51).

There are disparities between the schedules shown in Table 51 and annual objectives for 1943, which suggest that revisions will probably be made in the former, to bring them into line with objectives.

The Army schedules as of February 1 are not geared to the production objectives given in the Army Supply Program issued in February and some downward revisions in schedules for ground ordnance and signal equipment and miscellaneous munitions are required. If the Joint Chiefs of Staff recommendations with respect to the Navy Program and the field of construction are carried out, cuts in both the programs and schedules for these areas may be expected. Adjustments of numerous individual schedules, not apparent from a comparison by such broad categories as are carried in Table 51 will also be required if production is to be kept in balance with objectives. But in spite of these qualifications, schedules used here can serve to convey the broad trends of timing of military production planned for 1943.

Two aspects of these schedules deserve note. The first is the difference among various categories of munitions and construction in the dating of the peak volume of scheduled output. In some there is a continuous and substantial rise throughout 1943 so that the peaks are shown in the last quarter of the year; combat and service planes, and spare propellers, engines and parts. In others, the peak is not reached until the fourth quarter of 1943 but the rise after the third quarter is only moderate; aircraft ordnance, other aircraft equipment and maintenance, combat vehicles, ground ammunition, major combatant naval vessels and naval ordnance. In still others, a peak is reached before the last quarter and scheduled output declines thereafter: trainer planes, gliders, aircraft and ground signal equipment and automotive equipment with peaks in the second quarter of 1943; minor combatant naval vessels and ground guns and ammunition with peaks in the third quarter and slight declines shown for the fourth quarter; and Naval auxiliaries and other merchant vessels with peaks in the first quarter of 1943. Finally, in construction and transport and landing vessels the peak in output is in 1942, and the schedules for 1943 suggest fairly continuous declines from quarter to quarter. Whether or not this time pattern of the schedules for 1943 is valid — there is considerable ground for doubting its validity and feasibility — differences in the date of peaks among the various categories of munitions and construction generally reflect differences in the extent to which cumulative output already attained falls short of or is close to the cumulative total objectives as of the end of 1943.

The second aspect of the quarterly schedules is the rate of increase which they predicate during the year over output actually attained during the last quarter of 1942 (Table 57). Analysis of these rates of increase casts considerable doubt on the feasibility of attaining the high levels forecast for munitions output during the first and second quarters of 1943. The quarterly rate of increase in 1942 dropped sharply from 50 percent from the first to the second quarters to 25 percent from the third to the fourth quarters. Yet the schedules as of January and February call for another 25 percent

rise from the fourth quarter of 1942 to the first quarter of 1943 and a 35 percent increase from the first to the second quarter. There are few grounds for belief that the decline in the rate of increase in munitions output will reverse itself. In fact, there are more weighty grounds for expecting a dropping off in the rates of increase as the upper limit of production capacity is approached. It seems probable, therefore, that the output scheduled for the first and second quarters of 1943 will not be realized until later in the year.

This conclusion is reenforced by an examination of the rates of increase for the individual categories distinguished in Table 57. In virtually every case we find a distinct break in the continuity of the rates of increase as the record shifts from actual to forecast output (Chart XXX). Striking examples are provided by the aircraft schedules which call for a 40 percent increase in value of output from the fourth quarter of 1942 to the first quarter of 1943, as compared with a 22 percent rise in the preceding quarter; ground ammunition with a 52 percent increase scheduled for the second quarter of 1943 and a rise of only 8 percent achieved in the fourth quarter of 1942 and a 5 percent increase scheduled for the first quarter; minor combat naval vessels with a 112 percent increase in value to be put in place in the first quarter of 1943 as against a 31 percent increase from the third to the fourth quarter of 1942; and merchant vessels with a 46 percent increase in value to be put in place in the first quarter of 1943 as compared with an actual increase of 12 percent in the preceding quarter.

Additional evidence lending support to the view that the present schedules are beyond attainment is provided by the record of January output. Preliminary data indicate that munitions production fell below the first-of-the month forecasts by 12 percent and, in fact, was 8 percent below the level reached in December. The marked increases in output registered last November and December apparently resulted from widespread efforts to end the year with a good showing and were achieved only at the expense of future production. The poor January performance was the inevitable consequence. It seems likely that not until February will total munitions output return to the December level. In appraising the possibility of accomplishing the present 1943 schedules, it is, therefore, clearly necessary to discount somewhat the exceptional year-end rise in output and this merely serves to add more weight to the conclusions, with respect to the feasibility of the 1943 schedules, set forth in the immediately preceding paragraphs.

It is of interest to note that the programs scheduled for the greatest increases show up most unfavorably in a comparison of actual with forecast production for January: the output of combat planes was 20 percent below forecast; ground signal equipment, nearly 20 percent below forecast; merchant vessels, 15 percent below forecast; and naval vessels and equipment, over 15 percent below forecast.

Indications are that we may look forward to downward revisions in the schedules for the first half of the year as we approach the individual months. Thus far there have been substantial changes between the December 1 munitions schedules and the January and February schedules carried in the appended tables. Whereas the December 1 schedules called for a 36 percent increase from the fourth quarter of 1942 to the first quarter of 1943 and a 16 percent rise from the first to the second quarter of 1943, the more recent schedules reduced the first quarter rise to 24 percent and increased the second quarter rise to 35 percent. It seems probable that a repetition of this pattern may be expected during the year.

Rates of percentage increase are not accurate guides to feasibility, but when measured for large product-categories over substantial periods of time, the trends in percentage rates of growth provide a rough summary of the changing balance of forces making for growth and retardation. In categories for which, in spite of continued efforts, the percentage rate of increase in output tends to slow down, it is not reasonable to expect sudden and marked accelerations such as are shown in Table 52.

Composition of Munitions Output at End of 1943

The rapid increase in munitions production scheduled during 1943 in order to achieve certain parts of the 1943 program raises the question as to whether the composition of output at the end of the year is properly balanced. The importance of this question cannot be over-emphasized. If there were good assurance that the war would be won during 1943, this matter might be disregarded and every effort expended in turning out the types of weapons called for by the 1943 program. However, the planning of war production cannot proceed on such an optimistic assumption and the effects on the structure of munitions industry resulting from concentration on the achievement of the 1943 goals must be given serious consideration.

The question of balance among various categories in munitions output is a highly technical one and no judgments can be advanced here. It is of interest to compare, however, the composition of the schedules for the last quarter of 1943 with that of the combined output in 1942 (actual) and 1943 (scheduled). This latter may be viewed as a balanced total of munitions production, against which we can set the production scheduled for the last quarter of 1943 (Table 53 and Chart XXXI).

The comparison indicates clearly the greater relative weight in the schedule of aircraft and related equipment, which accounts for nearly 44 percent of total munitions in fourth quarter, 1943 as compared with over 35 percent in the cumulative 1942-43 total. The relative share of ground ordnance and signal equipment in the fourth quarter schedules was slightly above the share in the cumulative total for the two years. The significant declines in the relative shares

occur in major combatant naval vessels and auxiliaries, naval equipment and maintenance, and transports and landing vessels. Other categories whose relative shares drop as between the cumulative total 1942-43 and the last quarter schedule for 1943 are merchant vessels and miscellaneous munitions (automotive vehicles and other).

This comparison suggests a significant question. Is the increasing shift in favor of aircraft and related equipment and towards relative reduction of the Navy construction program consonant with the longer term demands of the prolonged conflict? The importance of this question and the related need for considering at an early date the 1944 military production objectives appear clear. While preliminary information is already available on 1944 schedules for some munitions categories, the data are too incomplete and tentative to permit adequate analysis at present.

CHART XXXIII

1943 MILITARY PRODUCTION PROGRAM AND 1942 OUTPUT

ANNUAL TOTALS AND FOURTH QUARTERS

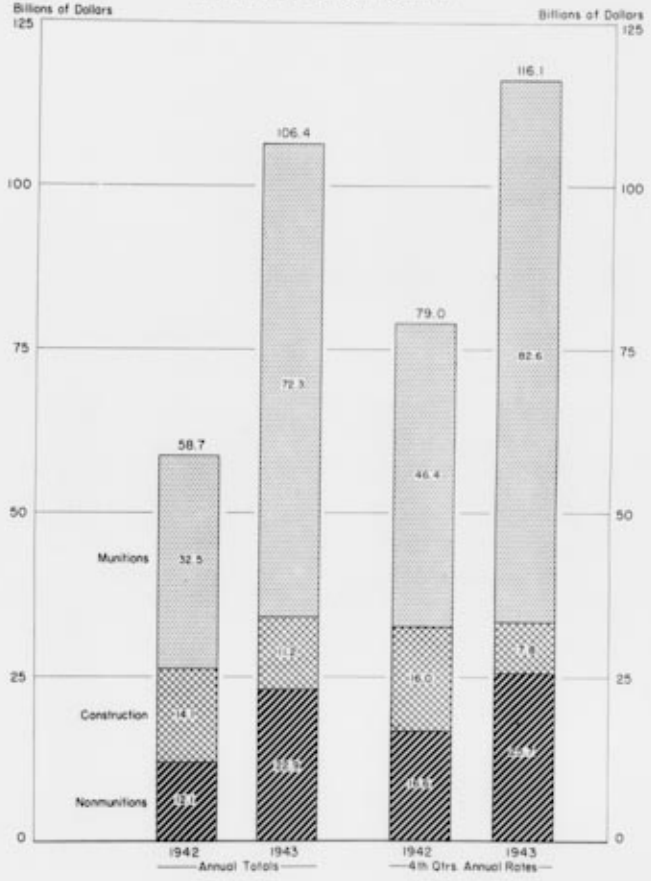

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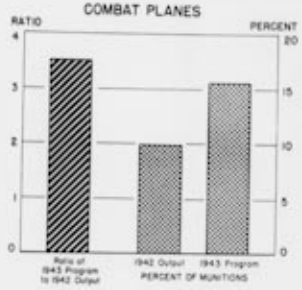
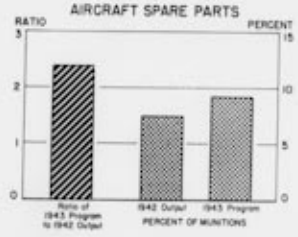
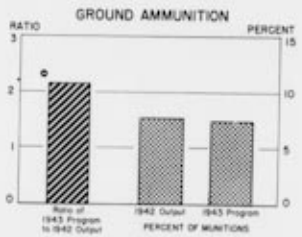
CHART XXX

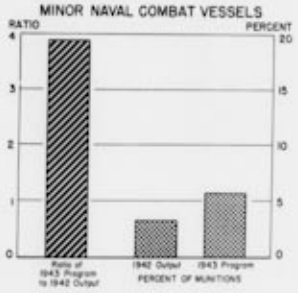
INCREASES IN SELECTED CATEGORIES OF MUNITIONS AND PERCENT OF TOTAL MUNITIONS

1942 OUTPUT AND 1943 PROGRAM









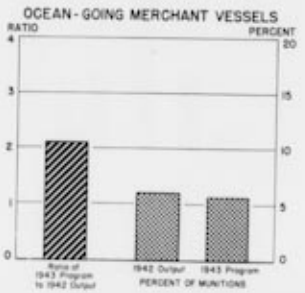


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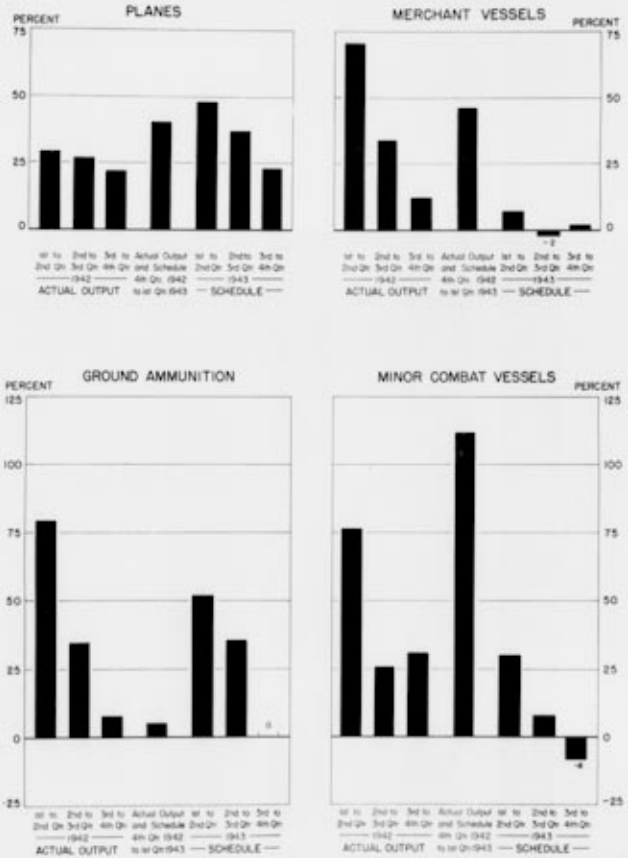
CHART XXX

PERCENTAGE CHANGE IN OUTPUT FOR SELECTED CATEGORIES OF MUNITIONS

BY QUARTERS, 1942 ACTUAL AND 1943 SCHEDULE*



*December 1 Schedules

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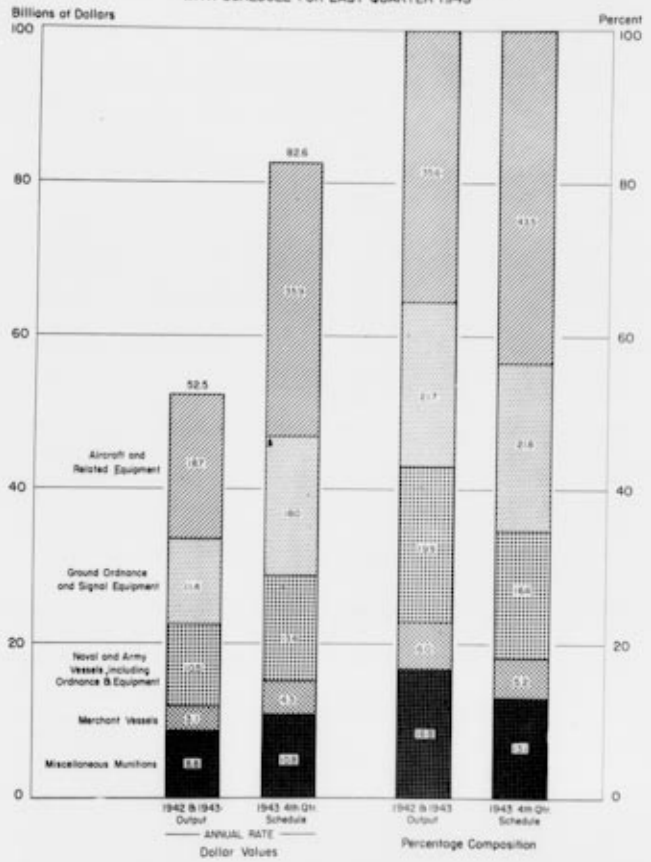
CHART XXXI

SIZE AND COMPOSITION OF MUNITIONS OUTPUT

COMPARISON OF CUMULATIVE 1942 AND 1943 OUTPUT
WITH SCHEDULE FOR LAST QUARTER 1943



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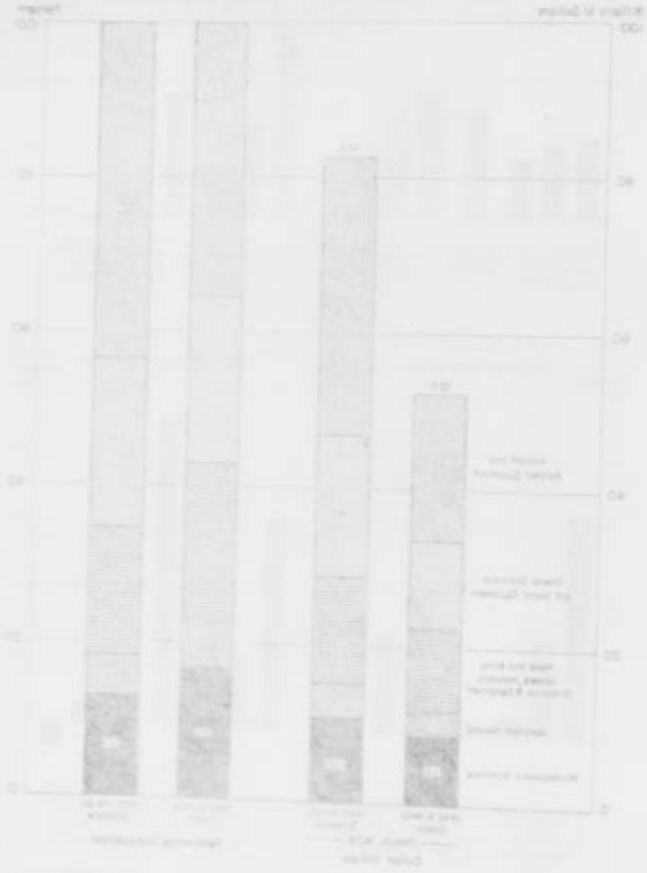

TABLE 49

Military Production Program For 1943*

(Dollar figures in billions)

	1943 Program	1942 Output	Ratio of '43 Program to '42 Output	Percentage Composition 1943 Program	Percentage Composition 1942 Output
Total Program	106.4	58.7	1.81	100.0	100.0
Total Munitions & Construction	83.5	46.6	1.79	78.5	79.4
Total Munitions	73.3	40.5	1.81	68.0	69.4
Aircraft & Related Equipment - Total	28.4	9.8	2.89	26.7	16.7
Planes - Total	18.9	3.9	4.38	17.8	6.7
Combat	11.3	3.2	3.50	10.6	5.5
Service	1.0	.2	4.57	1.0	.4
Trainer	.6	.5	1.40	.6	.8
Gliders & Lighter-than-Air Ships	.1	.1	2.83	.2	.2
Aircraft Ordnance	2.3	1.0	2.38	2.2	1.7
Spare Propellers, Engines & Parts	6.7	2.4	2.73	6.3	4.1
Other Equipment, Maintenance & Operations	6.7	1.8	3.68	6.4	3.0
Signal	1.9	.7	2.83	1.8	1.2
Other	4.3	1.1	4.00	4.0	1.8
Ground Ordnance & Signal Equipment	14.6	6.8	2.14	13.7	11.6
Combat Vehicles	3.6	2.0	1.77	3.3	3.4
Guns & Fire Control	3.5	1.7	2.07	3.3	2.9
Ammunition	5.4	2.5	2.15	5.1	4.3
Signal & Related Equipment	2.1	.6	3.60	2.0	1.0
Naval & Army Vessels, Incl. Ordnance Equipment	13.8	7.4	1.88	13.0	12.5
Naval Vessels - Total	7.3	3.7	2.00	6.9	6.2
Major Combat	2.5	2.0	1.24	2.4	3.4
Minor Combat	4.1	1.1	3.88	3.9	1.8
Auxiliaries & Conversions	.7	.6	1.21	.6	1.0
Naval Equip. & Maint.	2.1	1.4	1.49	2.0	2.5
Naval Ordnance	3.3	1.3	2.57	3.1	2.2
Transports, Landing Vessels & Army Auxiliaries	1.1	1.0	1.13	1.0	1.6
Merchant Vessels - Total	4.8	2.0	2.07	4.6	3.2
Ocean-going	4.1	1.9	2.09	3.9	3.4
Other	.1	.1	1.60	.1	.1
Miscellaneous Munitions - Total	11.2	7.1	1.58	10.6	10.1
Automotive Vehicles	2.9	2.0	1.43	2.8	3.5
Other	8.4	5.1	1.64	7.8	6.6
Construction - Total	11.2	14.1	0.80	10.5	24.0
Industrial Facilities	4.5	6.6	0.68	4.2	11.3
Other	6.7	7.5	0.90	6.3	12.7
Non-Munitions	33.0	12.1	1.89	31.5	20.6
Military Pay	11.6	4.9	2.36	10.9	8.4
Military Subsistence	3.0	1.4	2.14	2.8	2.4
Other	8.3	5.8	1.43	7.8	9.8

* As of February 1943. The military production program for 1943 as of February while approximately equal in total magnitude to the program as of November 1942 shown in Table 3, differs somewhat in detail. The major changes since November consist of a downward revision in ground ordnance and signal equipment from $16.8 to $14.6 billion; an increase in miscellaneous munitions from $10.9 to $11.3 billions; a rise of about $500 million in naval vessels and ordnance due to an acceleration of ship schedules; a slight reduction in scheduled aircraft output from $13.2 to $12.9 billion; and a cut of $200 million in the gliders and lighter-than air ships program. The Joint Chiefs of Staff recommendations with respect to the Navy program (deferments amounting to $600 million) and construction ($9.9 in place of $11.2 billion) which were incorporated in the November program are not shown in this table. Instead the programs submitted by the procuring agencies are given. Were the Joint Chiefs of Staff suggested revisions used, the present military production program would total $104.3 billion.

TABLE 50

Comparison of 1943 Schedules and 1942 Output
for Major Items Annual Totals and Fourth Quarters

	Unit	1943 Schedule	1942 Output	Ratio - 1943 Schedule to 1942 Output	Fourth Quarter 1943 Schedule Output	Fourth Quarter 1942 Output	Ratio - Fourth Quarter '43 Schedule to Fourth Quarter '42 Output
		AIRPLANES 1/					
Total Planes	Each	110,139	47,694	2.31	35,948	14,364	2.50
Long Range, Heavy, Medium and Patrol Bombers	Each	22,354	6,747	3.31	7,696	2,304	3.34
Light, Dive, Scout, and Torpedo Bombers	Each	18,013	5,932	3.04	5,885	2,208	2.67
Pursuits	Each	31,409	10,994	2.86	11,507	3,318	3.47
Observation and Transport	Each	13,701	6,422	2.13	4,734	1,584	2.99
Trainers	Each	24,665	17,599	1.40	6,122	4,950	1.24
		ARMY ORDNANCE 1/					
Aircraft Bombs, Army Procured	Thous. S. T.	1,814.9	467.4	3.89	539.2	206.2	2.61
Combat Vehicles (w/o armament)	Thous.	121.3	54.6	2.22	31.6	21.1	1.76
Tanks	Thous.	45.2	25.0	1.81	10.1	10.2	.99
Heavy	Each	18 2/	2.0	9.00	*	2.0	*
Medium	Thous.	26.4	14.0	1.89	6.8	5.5	1.24
Light	Thous.	13.8	11.0	1.25	3.3	4.7	.70
Armored Cars	Thous.	14.7	.5	29.4	5.8	.5	11.60
Scout Cars & Carriers	Thous.	51.5	21.5	2.40	17.7	7.3	2.42
Self-Propelled Artillery (Excl. A.A. Guns)	Thous.	14.9	7.6	1.96	3.6	3.1	1.16
Artillery - Aircraft and Ground	Thous.	174.7	149.6	1.17	56.1	54.1	.75
Aircraft Guns (Excl. Machine Guns)	Thous.	89.4	58.5	1.53	20.6	24.0	.86
Tank Guns	Thous.	37.5	44.5	.84	9.4	14.5	.63
Wheeled Artillery (Excl. A.T. Guns)	Thous.	10.1	5.9	1.71	2.5	1.7	1.47
Antitank Guns	Thous.	14.0	16.3	.86	2.9	6.7	.43
Antiaircraft Guns (Excl. Machine Guns)	Thous.	23.7	14.4	1.65	4.7	6.8	.69
Machine Guns - Aircraft and Ground	Thous.	864.0	676.9	1.28	213.8	275.6	.93
Aircraft	Thous.	544.9	353.0	1.54	150.8	112.4	1.34
Antiaircraft	Thous.	25.7	39.0	.66	5.0	8.0	.63
Ground and Combat Vehicles	Thous.	297.4	282.9	1.05	64.0	114.8	.56
Submachine Guns	Thous.	704.2	600.4	1.17	155.5	165.1	.94
Rifles	Mill.	7.0	1.7	4.23	2.1	.6	3.78
Mortars	Thous.	25.7	10.2	2.52	7.1	3.5	2.03
Ammunition - Aircraft and Ground							
Artillery	Mill.	200.2	102.9	1.95	57.8	33.6	1.72
Small Arms	Bill.	23.0	10.0	2.30	7.0	3.4	2.06
Mortar Bombs	Mill.	22.7	11.0	2.06	4.5	2.5	1.80
Hand Grenades	Mill.	10.8	5.4	2.00	3.8	3.2	1.19
Aircraft Gun Ammunition	Mill.	200.3	69.7	2.87	69.6	26.9	2.59
Motor Transport	Thous.	860.5	737.3	1.17	232.0	189.3	1.23
Tank Transporters	Thous.	2.5	6.0	.42	.5	1.1	.44
Trucks	Thous.	621.2	601.7	1.03	163.8	148.7	1.10
Trailers - Semi-trailers	Thous.	189.7	80.2	2.37	57.1	27.3	2.09
Ambulances	Thous.	12.3	11.0	1.12	3.2	3.4	.94
Motorcycles	Thous.	34.8	38.4	.91	7.4	8.8	.84

TABLE 90
(Concluded)

	Unit	1943 Schedule	1942 Output	Ratio - 1943 Schedule to 1942 Output	Fourth Quarter 1943 Schedule Output	Fourth Quarter 1942 Output	Ratio - Fourth Quarter '43 Schedule to Fourth Quarter '42 Output
ARMY SIGNAL AND CHEMICAL WARFARE EQUIPMENT 1/							
Signal Equipment							
Aircraft (Incl. ground-to-air)	Thous.						
Radios	Thous.	273	135	2.02	52	70	.74
Radar	Thous.	163	57	2.86	49	34	1.44
Ground Radios	Thous.	123	141	.87	24	55	.44
Chemical Warfare Equipment							
Mustard Gas	Thous. Tons	88.2	43.5	2.03	21.6	19.4	1.11
Screening Smoke	Tons	632	7,069	.09	0	2,698	0
Gas Masks	Thous.	7,398	4,274	1.73	154	1,706	.90
Airplane Spray Tanks	Each	15,523	26,531	.59	0	13,033	0
NAVAL ORDNANCE 1/							
Naval Antiaircraft and Dual Purpose Gun	Each	63,549	34,999	1.82	18,928	11,857	1.60
Naval Ammunition							
Surface Fire	Thous.	2,310	759	3.04	785	232	3.38
Antiaircraft	Mill.	561	175	3.21	144	90	1.60
Torpedoes (Including aircraft)	Thous.	20.6	4.5	4.58	3.8	1.6	2.38
Depth Charges	Thous.	259	141	1.84	69	39	1.77
Mines (Including aircraft)	Thous.	91.8	34.1	2.69	21.2	7.7	2.75
Aircraft Bombs, Navy Procured	Thous. S. T.	*	13		*	28	-
NAVAL VESSELS 3/ (completions)							
Battleships	Each	2	4	.50	0	1	0
Aircraft Carriers	Each	12	1	12.00	1	1	1.00
Cruisers	Each	12	8	1.50	3	2	1.50
Destroyers	Each	131	81	1.62	26	31	.84
Submarines	Each	65	34	1.91	22	11	2.00
Aircraft Escorts	Each	20	0	-	0	0	0
Destroyer Escorts	Each	254	0	-	127	0	-
Corvettes 3/	Each	69	0	-	32	0	-
Subchasers	Each	571	295	1.94	105	104	1.01
Mosquito Craft	Each	308	127	2.43	38	56	.68
Minecraft	Each	413	214	1.93	32	45	.71
Landing Craft	Each	5,320	6,932	.77	27	2,883	.01
Auxiliaries	Each	661	275	2.40	78	129	.60
MERCHANT VESSELS (Completions)							
Total Merchant Vessels	DWT. Thous.	19,939	8,027	2.48	5,125	2,925	1.75
Tankers	DWT. Thous.	3,459	999	3.46	1,085	318	3.41
Dry Cargo	DWT. Thous.	15,444	6,921	2.23	3,906	2,573	1.52
Minor Types	DWT. Thous.	1,036	107	9.68	134	33	4.06

1/ February 1 schedules, includes January actual production.
2/ Forecast not available after April 1943.
3/ January 1 schedules, excludes conversions.
4/ Maritime Commission Construction only.
* Not available.

TABLE 51

1943 Scheduled Output by Quarters 1/

(Dollar figures in billions)

	Output 4th Qtr. 1942	1943 SCHEDULES 1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Total 2/	Ratio - 4th Qtr. 1943 to 4th Qtr. 1942
Total Munitions & Construction	15.61	17.90	20.23	22.23	22.50	83.67	1.45
Total Munitions	11.53	14.37	17.66	19.73	20.65	72.46	1.78
Aircraft & Related Equipment - Total	3.39	4.85	6.47	7.88	8.99	28.19	2.65
Planes - Total	1.32	1.85	2.74	3.75	4.61	12.95	3.50
Combat	1.11	1.56	2.37	3.31	4.06	11.30	3.67
Service	.08	.14	.20	.28	.40	1.03	5.13
Trainer	.13	.15	.17	.16	.15	.63	1.15
Gliders & Lighter-than-Air Ships	.05	.06	.09	.08	.06	.28	1.20
Aircraft Ordnance	.35	.39	.56	.58	.60	2.14	1.71
Spare Propellers, Engines & Parts	.85	1.16	1.50	1.88	2.14	6.68	2.52
Other Equip., Maint. & Operations	.82	1.33	1.58	1.59	1.58	6.08	1.93
Signal	.36	.37	.52	.47	.43	1.79	1.20
Other	.46	.96	1.06	1.12	1.15	4.29	2.48
Ground Ordnance & Ground Signal Equipment	2.68	2.92	3.94	4.61	4.50	15.96	1.68
Combat Vehicles	.85	.79	1.09	1.08	1.13	4.09	1.33
Guns & Fire Control	.73	.84	1.01	1.20	1.09	4.13	1.49
Ammunition	.84	.88	1.32	1.81	1.80	5.81	2.14
Signal & Related Equipment	.26	.41	.52	.52	.48	1.93	1.79
Naval & Army Vessels including Ordnance Equipment	2.64	3.14	3.49	3.56	3.39	13.58	1.28
Naval Vessels - Total	1.09	1.63	1.85	1.97	1.86	7.31	1.72
Major Combat	.55	.57	.59	.66	.68	2.50	1.24
Minor Combat	.39	.82	1.07	1.15	1.06	4.10	2.71
Auxiliaries & Conversions	.15	.24	.19	.16	.12	.71	0.79
Naval Equipment & Maintenance	.49	.54	.56	.54	.53	2.15	1.06
Naval Ordnance	.52	.60	.76	.83	.86	3.05	1.68
Transports, Landing Vessels & Army Aux.	.54	.37	.32	.22	.16	1.07	0.29
Merchant Vessels - Total	.69	1.01	1.08	1.06	1.08	4.23	1.56
Ocean-going	.66	.95	1.05	1.03	1.07	4.10	1.62
Other	.03	.06	.03	.03	.01	.13	0.31
Misc. Munitions - Total	2.19	2.45	2.68	2.68	2.69	10.50	1.23
Automotive Vehicles	.56	.59	.69	.62	.68	2.58	1.21
Other	1.63	1.86	1.99	2.06	2.01	7.92	1.24
Construction - Total	4.08	3.53	3.27	2.44	1.85	11.21	0.46
Industrial Facilities	1.97	1.66	1.30	.85	.58	4.50	0.29
Other	2.05	1.87	1.97	1.59	1.26	6.71	0.61

1/ Schedules as of January 1 except for Ground Ordnance and Signal Equipment, and Miscellaneous Munitions in the Army portions of Aircraft Ordnance and Aircraft Signal Equipment. For these categories, February 1 schedules are shown and a preliminary estimate for January output is included in the data for the first quarter of 1943.

2/ Quarterly data will not always add to annual totals because of rounding.

TABLE 52

Quarterly Rates of Increase in Munitions Output: Actual Production in 1942 and Scheduled Output in 1943 1/

(Percentage Changes)

	1942 Production			4th Quarter '42 Production to 1st Quarter 1943 Schedule	1943 Schedules		
	1st to 2nd Quarter	2nd to 3rd Quarter	3rd to 4th Quarter		1st to 2nd Quarter	2nd to 3rd Quarter	3rd to 4th Quarter
Total Munitions	50	32	25	24	23	12	4
Aircraft and Related Equipment	43	30	35	43	33	22	14
Planes - Total	29	27	22	40	48	37	23
Combat	29	27	30	42	55	45	27
Service	59	57	16	77	46	38	43
Trainer	14	19	8	10	16	-7	-3
Gliders & Lighter-than-Air Ships	50	567	13	36	39	-8	-31
Aircraft Ordnance	45	19	37	11	41	6	7
Spare Propellers, Engines & Parts	58	24	23	36	30	25	14
Other Equipment, Maintenance and Operations - Total	63	41	82	69	13	1	0
Signal	171	57	86	22	19	-3	-10
Other	31	30	79	105	11	5	3
Ground Ordnance & Ground Signal Equipment - Total	69	49	35	9	35	12	-2
Combat Vehicles	40	43	61	-7	38	0	5
Guns and Fire Control	78	56	55	15	19	19	-5
Ammunition	79	35	8	5	52	36	0
Signal and Related Equipment	146	158	28	51	28	0	-8
Naval and Army Vessels, incl. Ordnance and Equipment - Total	54	37	24	19	11	2	-1
Naval Vessels - Total	28	13	2	30	14	6	-5
Major Combat	13	1	8	4	4	11	-6
Minor Combat	76	26	31	112	30	8	-8
Auxiliaries & Conversions	33	33	20	58	-20	-16	-25
Naval Equipment & Main.	141	17	13	10	5	-5	-4
Naval Ordnance	63	51	35	17	87	10	4
Transports, Landing Vessels and Army Auxiliaries	70	427	67	-32	-15	-29	-29
Merchant Vessels - Total	71	34	12	46	2	-8	7
Ocean-going	68	32	12	64	10	-1	4
Other	167	69	19	84	-39	-31	-61
Miscellaneous Munitions - Total	40	15	10	12	10	2	2
Automotive Vehicles	35	15	-5	8	16	-11	10
Other	42	16	17	14	7	4	-2

1/ Schedules as of January 1 except for Ground Ordnance and Signal Equipment and Miscellaneous Munitions in the Army portions of Aircraft Ordnance and Aircraft Signal Equipment. For these categories, February 1 schedules are shown and a preliminary estimate for January output is included in the data for the first quarter of 1943.

TABLE 53

Comparison of Fourth Quarter 1943 Scheduled Munitions Output With Production in 1942 Plus Schedules in 1943

	Billions of Dollars		Percentage Composition	
	1942 Output Plus 1943 Schedule	1943 Fourth Quarter Schedule Annual Rate	1942 Output And 1943 Schedule	1943 Fourth Quarter Schedule
Total Munitions	105.0	82.6	100.0	100.0
Aircraft & Related Equipment - Total	37.4	35.9	35.6	43.5
Planes - Total	16.9	18.4	16.1	22.3
Combat	14.5	16.2	13.8	19.6
Service	1.3	1.6	1.2	2.0
Trainer	1.1	.6	1.1	.7
Gliders and Lighter-than-Air Ships	.4	.2	.4	.2
Aircraft Ordnance	3.1	2.4	3.0	2.9
Spare Propellers, Engines & Parts	9.1	8.6	8.6	10.4
Other Equip., Maint. & Operations	7.9	6.3	7.5	7.7
Signal	2.6	1.7	2.5	2.1
Other	5.3	4.6	5.0	5.6
Ground Ordnance & Ground Signal Equip.	22.8	18.0	21.7	21.8
Combat Vehicles	6.1	4.5	5.8	5.5
Guns and Fire Control	5.8	4.4	5.6	5.3
Ammunition	8.4	7.2	7.9	8.7
Signal & Related Equipment	2.5	1.9	2.4	2.3
Naval & Army Vessels, incl. Ordnance Equipment	20.9	13.6	19.9	16.4
Naval Vessels - Total	11.0	7.4	10.4	9.0
Major Combat	4.5	2.7	4.3	3.3
Minor Combat	5.2	4.2	4.9	5.1
Auxiliaries & Conversions	1.3	.5	1.2	.6
Naval Equip. & Maint.	3.6	2.1	3.4	2.5
Naval Ordnance	4.3	3.5	4.2	4.2
Transports, Landing Vessels & Army Auxiliaries	2.0	.6	1.9	.7
Merchant Vessels - Total	6.3	4.3	6.0	5.2
Ocean-going	6.1	4.3	5.8	5.2
Other	.2	*	.2	*
Miscellaneous Munitions - Total	17.6	10.8	16.8	13.1
Automotive Vehicles	4.6	2.7	4.4	3.3
Other	13.0	8.1	12.4	9.8

* Less than $50 million and .05 percent.

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II-2. The Program in Terms of Materials

Requirements Continue to Expand

The demand for almost all critical materials will increase substantially during 1943. While the expanding military programs constitute by far the most important factor in these increases, exports, particularly for Lend-Lease, are also scheduled to grow substantially. Moreover, indications are multiplying that civilian domestic consumption of most scarce materials cannot be cut much below the rate now prevailing without impairing the maintenance of the war effort itself.

These increases in total requirements are shown clearly in estimates compiled during December 1942 from programs submitted by the various Claimant Agencies then recognized. At present, these estimates, upon which the tabular summaries shown here are principally based, already appear to have been conservative, to have substantially understated military, export and civilian needs for many critical materials. Claims for steel, copper and aluminum during the second quarter of 1943, submitted under the Controlled Materials Plan, are well in excess of the figures compiled earlier, and it now appears probable that claims for the last half of the year will also prove greater than those previously anticipated. Conversely, this may mean that programs now projected may have to be revised to fit within the limits of available material supplies.

Direct Military Consumption. Even on the basis of programs as envisaged at the turn of the year, the needs of military production during 1943 call for substantially greater quantities of almost all critical materials than in 1942 (Table 54 and Chart XXXII). Thus, direct military requirements for steel, then estimated, totaled more than 52 million net ingot tons as compared with consumption of 40 million tons during 1942 — an increase of 31 percent. Slightly smaller proportionate increases are shown for the principal alloying metals. Military consumption of aluminum during 1943, mainly for airplane manufacture, and of nitrogen for explosive production, were estimated at more than double their 1942 levels. Phenol and toluene, also essential for the production of explosives will similarly more than double their 1942 consumption figures. For magnesium, the anticipated expansion was considerably over 200 percent. An even larger increase - 450 percent - is expected in the direct military use of ethyl alcohol, principally for the synthetic rubber program and for making smokeless powder. Copper, almost alone among the leading industrial materials, shows less than a 10 percent increase from 1942 to 1943, reflecting the great difficulty of increasing supplies of that metal.

Exports. Export requirements as estimated near the end of 1942 were also scheduled to advance substantially for most materials, copper again constituting an important exception. Outstanding is a seven-fold expansion in magnesium shipments, principally for the United Kingdom airplane and incendiary bomb programs. Exports of toluene, for the production of explosives abroad, are expected to rise about 70 percent. On the other hand, a sharp drop in the scheduled shipments of manila fiber reflects the impossibility of replenishing supplies since the loss of the Philippines.

Sources of Supply

Increased Production and Imports. With few exceptions, the increased requirements for materials for military use and for export during 1943 must be met through corresponding increases in new supply during the year, that is, from added domestic production and higher imports. Unlike the situation which prevailed at the start of 1942, only limited quantities of most scarce materials can be rendered available by further reduction in the civilian economy. Nor is it possible, for most materials, to deplete stocks further without endangering the production program itself.

Domestic production of many materials essential to the war will continue to expand during 1943, and will furnish the principal source for meeting rising military requirements (Table 55 and Chart XXXIII). Thus steel production is expected to increase 7 percent during the year as compared with 1942 levels, aluminum to increase more than 50 percent, and magnesium almost to quadruple. New anhydrous ammonia plants will come into production, and large, though as yet undetermined, quantities of synthetic rubber will become available. On the other hand, little increase is expected during the year for such important metals as copper and molybdenum, probably fore-shadowing a tapering off of the expansion program that will become more general in 1944.

For some materials, such as cobalt and nickel, increased imports are chiefly depended upon to supply expanded military needs. Programs to expand Western Hemisphere sources, partially to replace lost Far-Eastern supplies of such vital materials as rubber, cordage fibers, and oilseeds, will also begin to bear fruit during the year; though in most cases fuller results will not be achieved till 1944.

Curtailed Civilian Consumption. Further reduction in 1943 domestic civilian consumption can be expected to contribute only moderately to military supply of most scarce materials because, by the end of 1942, relatively rigid restrictions on non-essential uses were in effect.

Comparisons of estimated 1943 requirements with consumption during the full year 1942 are somewhat misleading, since they reflect the delay in cutting off non-essential uses of materials in the first part of 1942, particularly in the production of consumers' durable goods. Thus December estimates show a 42 percent drop in non-military domestic use of steel between 1942 and 1943, a cut of 50 percent for nickel, of 30 percent for molybdenum, and of 21 percent for chromium. On the other hand, even on the basis of this year-to-year comparison, consumption of aluminum for domestic uses other than direct military will rise 73 percent while that of magnesium is scheduled to expand by more than 90 percent (Table 56 and Chart XXXIV). Vanadium and tungsten also show increases, reflecting requirements for high speed steel for tools and equipment in war plants. In the case of vanadium there has actually been an increase in the proportion of total supply going to this essential use, made possible by conservation measures applied to direct military consumption.

By the end of 1942, restrictions on non-essential uses of most metals had become so rigid that virtually no further diversion to military production can be expected from this source. While December estimates show a continued decline in other than direct military requirements for carbon steel from quarter to quarter during 1943, this largely represents the tapering off of war-plant expansion programs now under way rather than any further curtailment of the civilian economy as such. In fact, it appears very probable that the restrictions in effect at the beginning of 1943 were so severe as to endanger the maintenance of civilian services essential to the war effort itself. Allotments for such uses as railroad equipment and maintenance, agricultural tools and machinery, and industrial repairs and maintenance will have to be increased considerably above the estimates submitted by the Office of Civilian Supply in December. Consequently, military or export needs for steel, and for most other metals, cannot look to curtailing the civilian economy below current levels for substantial further accessions to supply.

Outside the field of metals, the situation appears to be more flexible. Sharp reductions will occur in the non-military use of imported cordage fibers--manila, sisal and henequen--largely as a result of strict conservation measures and the substitution of cotton. A reduction of about one-third in non-military use of lumber will be made possible by curtailment of civilian construction. While only a small reduction in non-military consumption of fixed nitrogen is now scheduled, a much greater saving could be achieved, if necessary, by reducing the amount of fertilizer available for crops now in excess supply, such as short staple cotton and corn; and probably by a careful scrutiny of industrial uses. Even for a few metals some further saving is possible, as in the use of bismuth in proprietary medicines.

Conservation. Although the volume of materials that can be released for military use by further curtailing the civilian economy

is steadily dwindling, there is every reason to believe that available supplies can be stretched considerably further by pushing conservation measures more vigorously. The general forms these measures can take have been described in Section I-4 of this report. They include both careful review of specifications to achieve every possible saving and substitution of less for more critical materials, and programs of standardization and simplification to reduce work in process, inventories of finished goods, and stocks of replacement parts. Such measures are, of course, applicable to military as well as to civilian production, but it is the former field that now affords most scope for such action and most promise of results.

Measures taken during 1942 in the line of constantly reviewing and revising specifications will, of course, be continued in 1943. The precarious balance of supply and requirements for alloying metals makes conservation in that field particularly vital. Some substitution of magnesium for aluminum in aircraft production may be indicated later in the year, despite the greater difficulty of fabricating the former metal. Plywood may also relieve the demand for aluminum, particularly for non-combat aircraft.

Conservation through standardization and simplification has been less explored, but affords considerable promise. Standardization of airplane engine parts, for example, or greater interchangeability of certain kinds of ordnance, might yield substantial savings in material requirements not only for the finished products themselves but also in the huge volume of spare parts now necessary.

The Balance Between Supply and Requirements

On the basis of programs and expectations as formulated in December, 1942, the balance between supply and requirements for most critical materials should apparently improve somewhat during 1943 as increased supplies become available (Table 57). In the case of carbon and alloy steel, aluminum, and magnesium, deficits during the first quarter are scheduled to be replaced by moderate surpluses during the final months of the year. A notable exception is molybdenum--an important alloying metal for which continuing deficits are anticipated and for which available stocks may be completely exhausted before the end of the year unless rigid conservation is adopted.

However, a statistical balance of this kind between supply and requirements must be interpreted with considerable reservations. With respect to supply there are many uncertainties ahead. Delays are bound to occur in bringing new facilities into production. Materials for the completion of these facilities may not be forthcoming in time in some cases--a probability suggested by the statistical deficits

now shown for carbon and alloy steel during the first quarter of 1943. Components essential for the completion of facilities, such as motors, valves, and bearings, are at present in critically short supply and may not be secured on schedule. Policy will have to be determined both as to the allotment of scarce materials and components as between current production and new facilities, and as among competing new facilities themselves. The problems involved are well illustrated by the current controversy involving the preference to be assigned to the synthetic rubber program.

There are many uncertainties, too, with reference to current import schedules, because of the scarcity of shipping and the risks of submarine warfare. Thus the ability to meet the anticipated schedule for aluminum production depends partly upon the import of sufficient bauxite; and the achievement of the balance shown between copper supply and requirements rests upon the receipt of anticipated supplies from South America.

On the requirements side the uncertainties are perhaps even greater. Requirements as shown in the estimates are based upon programs envisaged in December for military and civilian production and exports. These programs were themselves prepared with reference to the probable supply of materials, although this consideration has been neither precise nor fully coordinated. In this process of adjustment many uses of materials for war production or for the maintenance of essential civilian services were necessarily eliminated or cut deeply. Some of these cuts may prove to have been too sharp and to require subsequent reconsideration. Certainly, many unforeseen contingencies are likely to arise during the course of the year and create new demands upon the supply of scarce materials. On the other hand, certain requirements as then stated may prove to have been inflated.

The problem is clearly illustrated by the fact that claims for controlled materials--steel, copper and aluminum--as submitted by claimant agencies for the second quarter of 1943 were well in excess of the December estimates (Table 58). Thus carbon steel claims as reviewed by the Program Adjustment Committee on January 31 totalled 18 million product tons, as compared with the earlier estimate of 13.5 million, an increase of 33 percent. An increase of about the same proportions occurred for copper, while for alloy steel claims were 31 percent above the earlier figures. Only for aluminum was there fairly close correspondence between the claims as submitted under CMP and the earlier program translations.

Some of the materials, for which the balances as presented show a statistical surplus, may well prove to be more serious limiting factors than others now showing statistical deficits. All that can be said with assurance is that some use directly related to winning the war will be found for every pound of such materials as steel.

copper, aluminum, and fixed nitrogen produced, regardless of whether current balance sheets show a surplus or a deficit.

The statistical comparisons presented also fail to indicate the situation with respect to particular types, sizes, and shapes of materials. It may be expected that in 1943, as in 1942, the most critical limiting factor for many metals will not be the total supply in ingot form, but the ability to produce some particular size of bar or the capacity to make certain kinds of castings. From the point of view of the production programs for finished material, similarly, the capacity for fabricating critical components introduces a further limiting factor that must not be overlooked in interpreting raw material balance sheets.

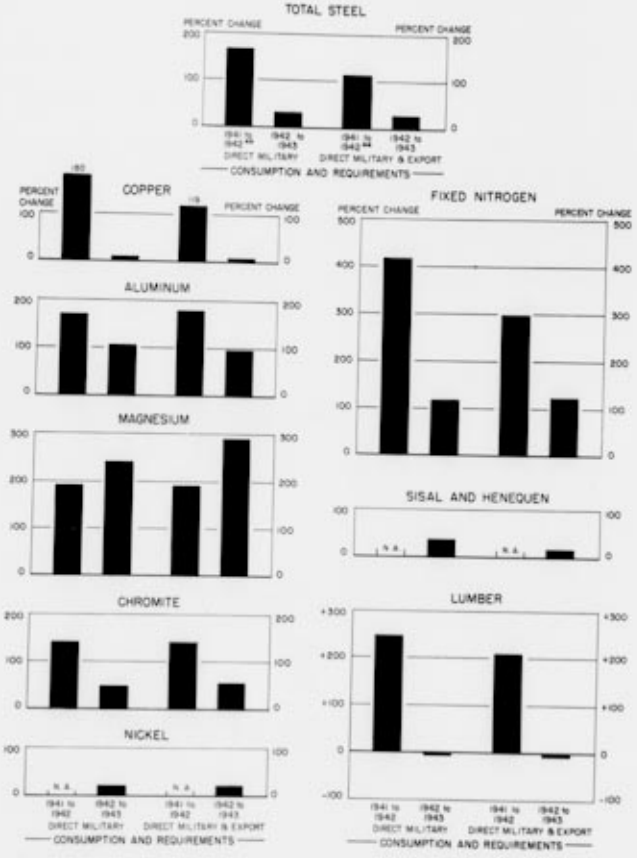
However, for some materials, such as rubber and molybdenum, the balance between supply and requirements assumes a substantial depletion of existing stocks. This may in turn adversely affect production schedules later in the year or in 1944. It is entirely possible that programs may have to be cut back to maintain adequate working stocks. This problem of stocks is in turn only one aspect of a general issue that will probably become increasingly acute in coming months--the problem of time preference. With respect to a large number of materials the decisions to be made will concern themselves less with choices between direct military and other needs and more with the alternative between meeting the military needs of 1943 and those of 1944.

Appraising all these problems and uncertainties in the light of the best information now available, it seems clear that the scarcity of vital materials will remain a critical limiting factor on war production during 1943. In particular, the dimensions of the program that can be achieved during the year will almost certainly be determined in good part by the supplies of steel, copper and aluminum which will be available. Even the very conservative December estimates show deficits for steel and aluminum in the first half of the year; and for the second half they indicate precarious balances for all these metals, which will probably be upset seriously as requirements are re-examined. The second quarter CMP claims point strongly in this direction. The tightness of these materials necessitates prompt and decisive shifts, if we are to avoid some cut-back in presently projected programs, attain balanced output, keep stocks at a level adequate to insure continued production, and prevent impairment of essential supporting services.

CHART XXXX

PERCENTAGE CHANGE IN DIRECT MILITARY CONSUMPTION AND EXPORTS OF NINE SELECTED MATERIALS

1941 TO 1942 AND 1942 TO 1943*



* 1943 Estimated
** Fourth Quarter comparison

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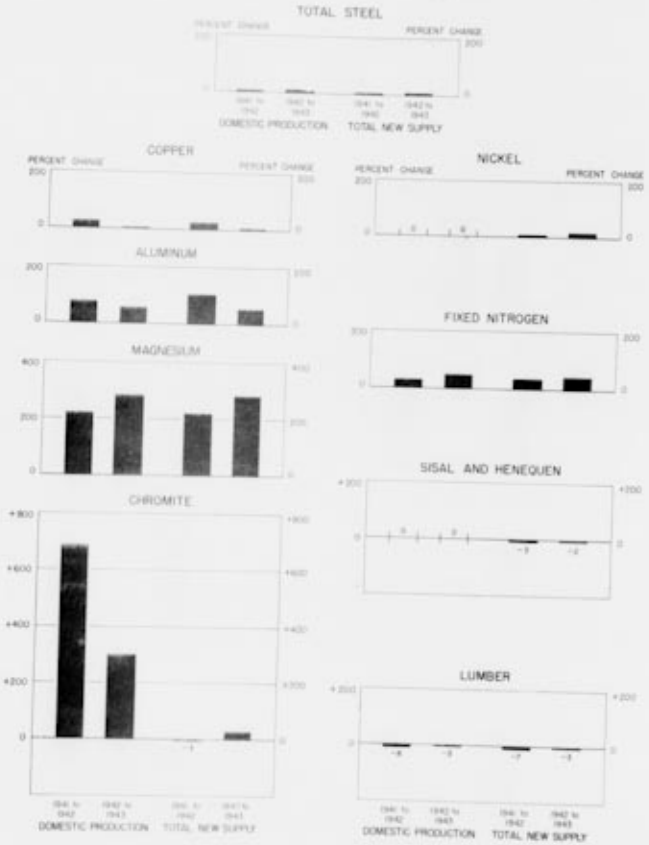
CHART XXXIII

PERCENTAGE CHANGE IN DOMESTIC PRODUCTION AND TOTAL NEW SUPPLY OF NINE SELECTED MATERIALS

1941 TO 1942 AND 1942 TO 1943 *



*1943 Estimated

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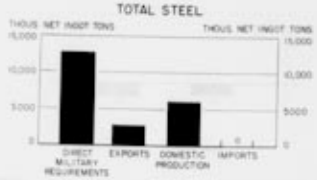
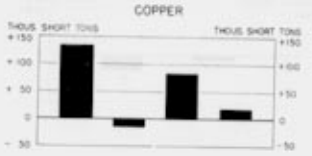
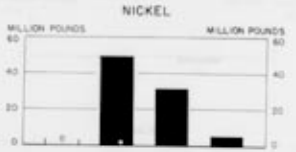
CHART [illegible]

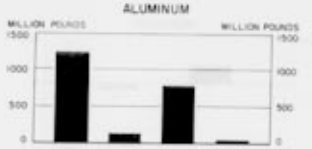
CHANGE IN DIRECT MILITARY REQUIREMENTS, EXPORTS, DOMESTIC PRODUCTION AND IMPORTS OF NINE SELECTED MATERIALS

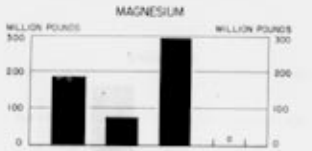
1942 TO 1943*

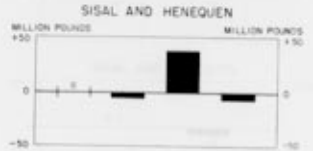


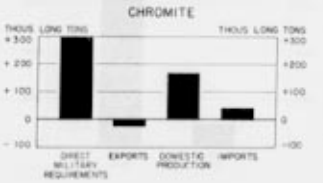


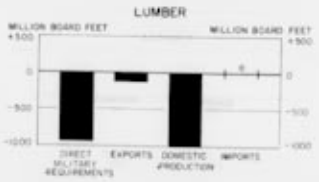












*1943 Estimate

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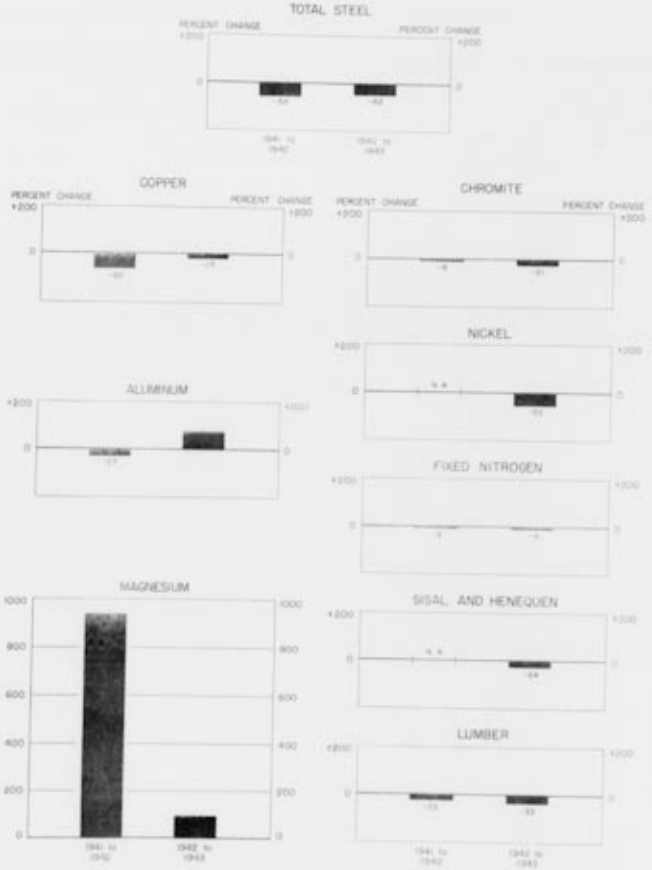
PERCENTAGE CHANGE IN DOMESTIC REQUIREMENTS AND CONSUMPTION OTHER THAN DIRECT MILITARY AND EXPORTS OF NINE SELECTED MATERIALS

1941 TO 1942 AND 1942 TO 1943*



*1943 Estimated

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TABLE 54

Comparison of Direct Military Requirements and Exports of Selected Materials, 1942-1943

	Material	Unit	Direct Military Requirements			Exports		
			1942 Actual Consumption	1943 Estimated Requirements	% Change '42 to '43	1942 Actual Exports	1943 Estimated Requirements	% Change '42 to '43
I	Metals:							
	Ferrous:							
	Total Steel	Million net ingot tons	40.1	52.4	31	12.1	14.7	21
	Non-ferrous:							
	Copper	1,000 short tons	1,927	2,063	7	320	306	-4
	Aluminum	Million lbs.	1,177.4	2,398.3	104	108.9	130.7	20
	Magnesium	Million lbs.	77.4	262.3	239	12.4	87.3	602
	Alloy:							
	Chromite	1,000 long tons	344	511	48	36	75	108
	Cobalt	1,000 lbs. recoverable from crude ore (Content of crudes for metal and non-metal uses combined)	1,920	2,449	27			
	Molybdenum	Million lbs.	28.9	36.2	25	14.8	15.2	3
	Nickel	Million lbs.	156.0	186.9	20	13.1	17.8	36
II	Chemicals:							
	Alcohol (Ethyl)	Million wine gals. 190% proof	53.0	291.8	450	28.0	33.0	18
	Fixed Nitrogen	1,000 short tons anhydrous ammonia equivalent	438	953	118	6	27	350
	Phenol	Million lbs.	12.6	24.1	91	26.1	29.5	13
	Toluene	Million gals.	71.3	164.0	130	10.2	17.2	69
III	Fibers:							
	Manila	Million lbs.	40.0	45.5	14	11.1	2.0	-82
	Sisal-Henequen	Million lbs.	100	137	37	85	79	-7
IV	Other Materials:							
	Lumber	Billion bd. ft.	15.3	14.4	-6	.3	.2	-41

TABLE 55

New Supply for Selected Materials, 1942 - 1943

Material	Unit	Domestic Production 1942 Actual	Domestic Production 1943 Estimate	Domestic Production $ Change '42 to '43	Imports 1942 Actual	Imports 1943 Estimate	Imports $ Change '42 to '43	Total New Supply 1942 Actual	Total New Supply 1943 Estimate	Total New Supply $ Change '42 to '43
I. Metals:										
Ferrous:										
Total Steel	Million net ingot tons	85.0	91.0	7	-	-	-	85.0	91.0	7
Non-ferrous:										
Copper	1000 Sh. tons	2,124 a/	2,207	4	634	653	3	2,758	2,860	4
Aluminum	Million lbs.	1,429	2,192 b/	53	252	399 c/ h/	58	1,681	2,591	54
Magnesium	Million lbs.	106.0	405.0	282	-	-	-	106.0	405.0 d/	282
Tin	1000 long tons				-	-	-			
Zinc slab e/	1000 sh. tons	995	1,041	10	56	54	50	981	1,095	11
Alloys:										
Cobalt (Content of crudes for metal and non-metal uses combined)	1000 lbs. recoverable from crude ore	500	500	0	5,500	7,045	28	6,000	7,545	26
Chromite	1000 long tons	100	400	300	882	860	-2	982	1,260	28
Molybdenum	Million lbs.	52.5	54.0 f/	3	3.2	3.0	-8	55.8	57.0	2
Nickel	Million lbs.	-	-	-	195.0	224.2	15	195.0	224.2	15
Tungsten	Million long tons	9.2	15.0	62	15.2	12.9	-15	24.4	27.9	14
Vanadium	1000 lbs.	2,550	3,400	28	2,250	2,500	11	4,900	5,900	20
II. Chemicals:										
Alcohol (Ethyl)	Million wine gals. 190$ proof	295.0	490.4	66	-	12.0	-	295.0	502.4	70
Fixed Nitrogen (Anhydrous ammonia equiv.)	1000 sh. tons	1,007	1,502	49	275	332 g/	21	1,282	1,834	43
Phenol	Million lbs.	153	236	54	-	-		153	236	54
Toluene	Million lbs.	92	185	101	-	-		92	185	101
III. Fibers:										
Manila	Million lbs.	-	-	-	18.0	2.0	-89	18.0	2.0	-89
Sisal-Henequen	Million lbs.	-	-	-	330	325	-2	330	325	-2
IV. Other Materials:										
Lumber	Billion bd. ft.	33.0	32.0 i/	-3	1.5	1.5	0	34.5	33.5	-3

a/ Includes purchased scrap.
b/ After pro-rated deduction for pipeline.
c/ Net imports after deduction of Lend Repayment.
d/ The supply estimates reflect the latest reduced estimates of the Aluminum-Magnesium Division and are believed to be conservative. This figure would be further reduced by an estimated 12,000 if additional work-in-process requirements at fabricating plants were to be deducted. Of this total secondary production equals 20,500 and is directly related to consumption by the aircraft industry.
e/ Does not include scrap used without being first re-distilled, nor brass scrap.
f/ Secondary metal recovered by consumers is deducted from requirements.
g/ Ammonia imports of 1,008,000 short tons Chilean nitrate of soda (equivalent to 203,000 tons of ammonia), upon which an A-4 shipping rating has been granted for 675,000 tons and a A-5 rating for 337,000 tons.
h/ The Forest Service (Department of Agriculture) does not believe conditions can be maintained as favorable as in 1942, and therefore predicts a drop in overall U. S. lumber output to 28,000 in 1943. Compensating factors introduced in recent months which are already serving to retard this fall-off in output are the more efficient cutting of logs under W.P.B. directives, and the channeling of logs to specific mills where the highest recoveries are obtainable; hence the present estimate.

TABLE 56

Domestic Requirements Other Than Direct Military and Exports
For Selected Materials, 1942-43

	Material	Unit	1942 Actual Consumption	1943 Estimated Requirements	% Change '42 to '43
I.	Metals				
	Ferrous:				
	Total Steel	Million net ingot tons	32.8	18.9	-42
	Non-ferrous:				
	Copper	1,000 short tons		420	
	Aluminum	Million lbs.	135.3	233.8	73
	Magnesium	Million lbs.	15.1	28.8	91
	Alloy:				
	Chromite	1,000 long tons	516	410	-21
	Cobalt	1,000 lbs. recoverable metal	2,880	2,466	-19
	Molybdenum	Million lbs. usable metal	15.6	11.9	-30
	Nickel	Million lbs.	39.0	19.6	-50
	Tungsten	Million lbs. contained metal	14.7	18.2	24
	Vanadium	1,000 lbs. (reduced to ferro-vanadium basis)	2,585	2,971	14
II.	Chemicals				
	Alcohol	Million wine gals. 190% proof	173.0	167.7	-3
	Fixed Nitrogen	1,000 short tons anhydrous ammonia equivalent	848	813	-4
	Phenol	Million lbs.	116	178	55
	Toluene	Million gals.	10.1	7.2	-33
III.	Fibers				
	Manila	Million lbs.	26	9	-67
	Sisal-henequen	Million lbs.	272	206	-24
IV.	Other				
	Lumber	Billion bd. ft.	25	17	-33

TABLE 57

Estimated 1943 Balance of Requirements and Supply of Selected Materials a/

Material and Unit	I	II	III	IV	Total
I Metals					
Ferrous					
1. Steel-Alloy-(1,000 Net Ingot Tons):					
New Supply b/	3,356	3,556	3,893	3,870	14,675
Total Requirements	3,501	3,526	3,550	3,408	13,985
Direct Military	2,779	2,824	2,823	2,687	11,113
Exports	344	298	318	320	1,280
Other	213	221	214	206	854
Reserve	165	183	195	195	738
Excess of New Supply over Requirements	-145	+30	+343	+462	+690
Beginning Stocks	n.a.				n.a.
Excess of Total Supply over Requirements					
2. Steel-Carbon-(1,000 Net Ingot Tons):					
New Supply b/	18,520	18,890	19,463	19,461	76,336
Total Requirements	20,863	19,646	18,527	17,625	76,661
Direct Military	11,413	10,487	9,820	9,541	41,261
Exports	2,742	3,511	3,626	3,562	13,441
Other	5,765	4,712	4,063	3,504	18,044
Reserve	943	936	1,018	1,018	3,915
Excess of New Supply over Requirements	-2,343	-756	+936	+1,838	-325
Beginning Stocks	n.a.				n.a.
Excess of Total Supply over Requirements					
3. Total Steel-(1,000 Net Ingot Tons):					
New Supply b/	21,876	22,446	23,356	23,333	91,011
Total Requirements	24,364	23,172	22,077	21,033	90,646
Direct Military	14,192	13,311	12,643	12,228	52,374
Exports	3,086	3,809	3,944	3,882	14,721
Other	5,978	4,933	4,277	3,710	18,898
Reserve	1,108	1,119	1,213	1,213	4,653
Excess of New Supply over Requirements	-2,488	-726	+1,279	+2,300	+365
Beginning Stocks	n.a.				n.a.
Excess of Total Supply over Requirements					

TABLE 57
(Continued)

Estimated 1943 Balance of Requirements and Supply of Selected Materials a/

Material and unit	I	II	III	IV	Total
Non-Ferrous					
4. Copper-(1,000 Short Tons):					
New Supply	13	714	714	719	2,860
Total Requirements	732	727	739	735	2,933
Direct Military	502	512	521	528	2,063
Exports	77	69	80	80	306
Other	117	110	102	91	420
Reserve	36	36	36	36	144
Excess of New Supply over Requirements	-19	-13	-25	-16	-73
Beginning Stocks b/	87	68	55	30	+87
Excess of Total Supply over Requirements	+68	+55	30	+14	+14
5. Aluminum-(1,000 lbs.):					
New Supply	522,307 c/	573,207	715,000	780,000	2,590,514
Total Requirements	564,541 d/	667,687	752,831	777,755	2,762,814
Direct Military	480,165	577,225	659,023	681,929	2,398,342
Exports	34,251	33,622	31,282	31,560	130,715
Other	50,125	56,840	62,526	64,266	233,757
Excess of New Supply over Requirements	-42,234	-94,480	-37,831	+2,245	-172,300 e/
Beginning Stocks	n.a.				n.a.
Excess of Total Supply over Requirements					
6. Magnesium-(1,000 lbs.):					
New Supply f/	65,660	89,250	117,260	133,220	405,390
Total Requirements	77,525	93,435	101,363	107,013	379,336
Direct Military	57,601	63,121	68,599	72,999	262,320
Exports	13,440	23,230	25,180	26,430	88,280
Other	6,484	7,084	7,584	7,584	28,736
Excess of New Supply over Requirements	-11,865	-4,185	+15,897	+26,207	+26,054
Beginning Stocks	n.a.				n.a.
Excess of Total Supply over Requirements					

TABLE 57
(Continued)

Estimated 1943 Balance of Requirements and Supply of Selected Materials a/

Material and unit	I	II	III	IV	Total
7. Lead (Short Tons):					
New Supply					1,045,000
Total Requirements					997,810
Excess of New Supply over Requirements					+47,190
Beginning Stocks	400,000				400,000
Excess of Total Supply over Requirements					+447,190
8. Tin (Refined) (Long Tons):					
New Supply					44,200
Total Requirements					46,365
Excess of New Supply over Requirements					-2,165
Beginning Stocks	127,300				127,300
Excess of Total Supply over Requirements					+125,135
9. Zinc (Concentrate) (1,000 Tons metal content):					
New Supply					1,305
Total Requirements					1,350
Excess of New Supply over Requirements					-45
Beginning Stocks	289				289
Excess of Total Supply over Requirements					+244
Zinc (Slab) (Excluding scrap used without redistilling, and brass scrap.) All grades- (1,000 Short Tons):					
New Supply					1,095
Total Requirements					1,055
Domestic					915
Export					140
Excess of New Supply over Requirements					40
Beginning Stocks					156
Excess of Total Supply over Requirements					196

TABLE 57
(Continued)

Estimated 1943 Balance of Requirements and Supply of Selected Materials a/

Material and unit	I	II	III	IV	Total
Alloy					
10. Chromite-(1,000 Long Tons):					
New Supply					1,260
Total Requirements					996
Direct Military					511
Exports					75
Other					410
Excess of New Supply over Requirements					+264
Beginning Stocks	1,140				1,140
Excess of Total Supply over Requirements					+1,404
11. Cobalt-(Content of crudes for Metal and Non-metal uses combined)-(Thous. of lbs. recoverable from crude ore):					
New Supply	1,660	1,810	1,965	2,110	7,545
Total Requirements	1,290	1,290	1,308	1,316	5,204
Excess of New Supply over Requirements	+370	+520	+657	+794	+2,341
Beginning Stocks	4,100	4,470	4,990	5,647	4,100
Excess of Total Supply over Requirements	+4,470	+4,990	+5,647	+6,441	+6,441
12. Manganese (Ore)-(1,000 Long Tons):					
New Supply					1,590
Total Requirements					1,370
Excess of New Supply over Requirements					+220
Beginning Stocks	2,300				2,300
Excess of Total Supply over Requirements					+2,520
13. Molybdenum (Metals in usable form) (1,000 lbs. of usable metal):					
New Supply	13,800	14,200	14,500	14,500	57,000
Total Requirements	16,751	16,946	17,047	16,664	67,398
Direct Military	8,801	9,198	9,301	8,940	36,240
Exports	4,972	4,759	4,749	4,732	19,212
Other	2,978	2,989	2,997	2,982	11,946
Excess of New Supply over Requirements	-2,951	-2,746	-2,547	-2,154	-10,398
Beginning Stocks	9,750	6,799	4,053	1,506	9,750
Excess of Total Supply over Requirements	+6,799	+4,053	+1,506	-648	-648

TABLE 57
(Continued)

Estimated 1943 Balance of Requirements and Supply of Selected Materials a/

Material and unit	I	II	III	IV	Total
14. Nickel-(1,000 lbs. metal):					
New Supply	53,665	55,000	57,000	58,500	224,165
Total Requirements	53,665	55,772	56,300	58,500	224,237
Direct Military	44,057	46,224	47,126	49,492	186,899
Exports	4,909	4,308	4,322	4,243	17,782
Other	4,699	5,240	4,852	4,765	19,556
Excess of New Supply over Requirements	-	-772	+700	-	-72
Beginning Stocks	5,300	5,300	4,528	5,228	5,300
Excess of Total Supply over Requirements	+5,300	+4,528	+5,228	+5,228	+5,228
15. Tungsten-(1,000 lbs. of contained metal):					
New Supply	5,475	6,625	7,475	8,325	27,900
Total Requirements	6,300	6,300	6,300	6,300	25,200
Excess of New Supply over Requirements	-825	+325	+1,175	+2,025	+2,700
Beginning Stocks	14,800	13,975	14,300	15,475	14,800
Excess of Total Supply over Requirements	+13,975	+14,300	+15,475	+17,500	+17,500
16. Vanadium (Reduced to Ferro-Vanadium Basis) (1,000 lbs.):					
New Supply	1,335	1,335	1,615	1,615	5,900
Total Requirements	1,385	1,446	1,481	1,476	5,788
Excess of New Supply over Requirements	-50	-111	+134	+139	+112
Beginning Stocks	2,450	2,400	2,289	2,423	2,450
Excess of Total Supply over Requirements	+2,400	+2,289	+2,423	+2,562	+2,562
II Chemicals					
17. Alcohol (Ethyl)-(1,000 wine gals. 190 proof):					
New Supply	109,200	128,100	127,300	137,800	502,400
Total Requirements	78,250	120,150	150,350	143,750	492,500
Excess of New Supply over Requirements	+30,950	+7,950	-23,050	-5,950	+9,900
Beginning Stocks	54,250	85,200	93,150	70,100	54,250
Excess of Total Supply over Requirements	+85,200	+93,150	+70,100	+64,150	+64,150

TABLE 57
(Continued)

Estimated 1943 Balance of Requirements and Supply of Selected Materials a/

Material and unit	I	II	III	IV	Total
18. Fixed Nitrogen g/(1,000 Short Tons of anhydrous ammonia equivalent):					
New Supply					1,775h/
Total Requirements					1,793
Excess of New Supply over Requirements					-18
Beginning Stocks	51				51
Excess of Total Supply over Requirements					+33
III Fibers					
19. Hog Bristles-(1,000 lbs.):					
New Supply					2,012
Total Requirements					2,241
Excess of New Supply over Requirements					-229
Beginning Stocks	1,775				1,775
Excess of Total Supply over Requirements					+1,546
20. Manila-(1,000 lbs.):					
New Supply					2,000
Total Requirements					50,000
Excess of New Supply over Requirements					-48,000
Beginning Stocks i/	70,500				70,500
Excess of Total Supply over Requirements					+22,500
21. Sisal - Henequen - (Million lbs.):					
New Supply					260
Total Requirements					350
Excess of New Supply over Requirements					-90
Beginning Stocks i/	105				105
Excess of Total Supply over Requirements					+15
IV Other Materials					
22. Rubber - Reclaimed k/ (Long Tons):					
New Supply	82,300	82,400	82,300	82,400	329,400
Total Requirements	82,400	84,300	83,800	81,600	332,100
Excess of New Supply over Requirements	-100	-1,900	-1,500	+800	-2,700
Beginning Stocks	49,000	48,900	47,000	45,500	49,000
Excess of Total Supply over Requirements	+48,900	+47,000	+45,500	+46,300	+46,300

TABLE 57
(Continued)

Estimated 1943 Balance of Requirements and Supply of Selected Materials a/

Material and unit	I	II	III	IV	Total
23. Lumber b/ - (Million Bd. Ft.):					
New Supply	7,700	8,700	9,000	8,100	33,500
Total Requirements	8,317	8,406	7,643	6,766	31,132
Direct Military	3,866	3,833	3,530	3,131	14,360
Exports	44	44	44	44	176
Other	4,407	4,529	4,069	3,591	16,596
Excess of New Supply over Requirements	-617	+294	+1,357	+1,334	+2,368
Beginning Stocks	8,900	8,283	8,577	9,934	8,900
Excess of Total Supply over Requirements	+8,283	+8,577	+9,934	+11,268	+11,268
24. Fats and Oils - (Million lbs.):					
New Supply					12,589
Total Requirements					11,768
Excess of New Supply over Requirements					+821
Beginning Stocks	2,025				2,025
Excess of Total Supply over Requirements					+2,846

a/ Data are as of January 9, 1943. Beginning Stocks, for each material, to the extent statistically possible, exclude stocks necessary for work-in-process needs.

b/ Based on Steel Division estimates for last three quarters, prorated for first quarter.

c/ Government stockpile only.

d/ The first quarter supply figure is before reduction of forging stock into forgings. After such reductions the supply might equal 499,503. The first quarter requirement estimate is comparable to the first quarter supply as shown. The reduced requirement would approximate 453,552 direct military, 33,728 exports, and 50,125 other or a total of 537,405. The lower figures in both cases are probably more comparable to the estimates of supply and requirements for 2nd, 3rd, and 4th quarters, but the quantitative status of pipeline estimates and other necessary deductions from ingot supply for these quarters is so definite that no great misinterpretation will result if the tabulated figures are used.

TABLE 57
(Concluded)

Footnotes
(Concluded)

e/ This figure might be increased by something like 30 million pounds, after deducting additional pipeline requirements, if the U.S. were not to repay ingot previously borrowed from United Kingdom.

f/ The supply estimates reflect the latest reduced estimates of the Aluminum-Magnesium Division and are believed to be conservative. This figure would be further reduced by an estimated 12,000 if additional work-in-process requirements of fabricating plants were to be deducted. Of this total secondary production equals 20,500 and is directly related to consumption by the aircraft industry.

g/ Table prepared jointly by Chemicals Division and Program Integration Section of Program Bureau. Requirements for 1943 estimated by claimant agencies.

h/ Assumes import of 672,000 short tons of Chilean nitrate upon which an A-4 shipping priority rating has been granted.

i/ Not including 5.5 million pounds due to United Kingdom on 1942 allocation, but does include Navy ropewalk.

j/ Includes stocks in transit in U.S.

k/ Figures are for U.S. and Canada combined.

l/ All species (hardwoods and softwoods combined); by definition this statement relates to the products of the saw and planning mill, hence does not include the forest products which are not marketed as lumber - e.g. cooperage, posts and piling, fuel wood, hewn cross-ties, shingles, mine-timbers, etc., nor such reconstructed woods as plywoods. Except for Army Air Forces, no claimant agency has as yet submitted its over-all lumber requirements for 1943. The above requirements estimate, prepared by W.P.B. and the Forest Service, assumes that present orders restricting use of lumber for non-military construction to the bare minimum will be rigidly enforced. On the otherhand, the estimate of new supply is probably a maximum figure since it assumes that labor, equipment and weather factors will be no more unfavorable to domestic production than in 1942.

TABLE 58

Allocations and Estimated Requirements for Steel, Copper, and Aluminum, Second Quarter 1943

Material	Unit	Requirements On Basis Of Agency Programs As Of 12/3/42	Claims As Submitted By Claimant Agencies Under CMP	Allotments As Recommended By Program Adjustment Committee
Carbon Steel	1,000 product tons	13,548	18,025	15,177
Alloy Steel	1,000 product tons	2,247	2,949	2,457
Copper	Million lbs. cubic content	1,382	1,846	1,414
Aluminum	Million lbs.	668	680	548

II-3. The Program for 1943 - Facilities

The War Industrial Facilities Program

If the term "program" is regarded as implying a coordinated and integrated whole of projects, balanced among themselves, closely adapted in their entirety to a definite set of munitions production objectives, and proportioned to the existing supply of raw materials and manpower with due regard to other military and civilian claims upon them, then we hardly had, at the end of 1942, a facilities program for 1943 or for any later period. All that existed was a host of separate projects adding up to about $18½ billion ($14-3/4 billion publicly, and $3-3/4 billion privately financed), of which about $500 million was in the status of temporary deferment. Value in place in the publicly financed projects, at the end of 1942, was about $9 billion, leaving about $4½ billion for 1943 and relatively small sums for 1944 (Table 59 and Chart XXXVI). Corresponding figures for privately financed war facilities are not available, but it appears that value to be put in place during 1943 is scarcely in excess of $1/2 billion. Thus $5 billion, consisting of less than $2 billion of construction work and somewhat over $3 billion of equipment to be installed, measure the facilities program for 1943 as it appeared at the beginning of the year.

It is estimated that under this program the value to be put in place on war industrial facilities will decrease from about $1-3/4 billion in the first quarter of 1943 to less than $1-1/2 billion in the second quarter, and will undergo further sharp declines to under $1 billion in the third quarter and about $3/4 billion in the final quarter of 1943. Even during the first quarter of 1943 work on war industrial facilities under present schedules will be about 20 percent below the level of work done in the last half of 1942. By the final quarter of 1943 it will be down to not more than one-third of the peak and to a level only slightly above the 1941 average. By that time the expansion of industrial plants will require about $4 billion less, on an annual basis, than in 1942 and about $5 billion less than at the peak in the fall of 1942. If present schedules are adhered to, only a relatively small amount of work will be done in 1944 on projects included in the program as of the beginning of 1943 -- probably not more than about $1/2 billion. The decline from the peak will be particularly sharp in facilities for the manufacture of ordnance (already declining in the fourth quarter of 1942), in shipyards, and in the machinery and machine tool plants. It is scheduled to be more moderate among aircraft facilities and plants designed for expansion of critical raw materials.

A more detailed picture of the part of the total facilities program that remained to be done at the beginning of 1943 is reflected in the completion status of about 3,200 publicly financed projects costing $25,000 or more (Table 60 and Chart XXXVII). About one-quarter of the projects, measured by total estimated cost at completion, was not yet started or less than 25 percent finished, including

projects on which progress was unknown. For about one-third the completion status ranged from 26 to 75 percent. Finally, about two-fifths of the project value was complete to the extent of 75 percent or more, although only about 15 percent were fully completed by the end of 1942. The proportion of projects in a low state of completion was particularly high for raw materials plants and relatively low among shipyards and ordnance plants. Comparable data are lacking for war facilities financed with private funds or for publicly financed projects to cost less than $25,000 each, but it is likely that those were, in general, nearer completion than the larger publicly financed facilities.

The tapering off in the construction of new war plants during 1943 is shown still more strikingly by the distribution of the scheduled completion dates of the program for publicly financed war industrial facilities (Table 61). Projects to be completed during the first half of 1943 are valued at about $4 billion for each quarter. (This represents the estimated total value at completion, irrespective of the period during which it was put in place.) This is more for each quarter than for all projects completed up to December 31, 1942. In the third quarter, however, only $1-3/4 worth of war industrial facilities are scheduled for completion and the figure will decline further to only $3/4 billion in the final quarter of the year. Only about $1/4 billion of government financed war industrial facilities now included in the program, mostly aircraft plants, are scheduled to be completed in 1944.

Past experience leads to doubt that the war industrial facilities, now under construction, will progress in exact accordance with present schedules. Indeed, it may be assumed that their completion will be delayed from two to three months, on the average. As a result the peak of completion may be shifted from the second to the third quarter of 1943. Even so, however, about four-fifths of all facilities projects included in the present program will have been completed by the end of 1943 and only about $1 billion worth would be carried over into 1944. The main reason for probable delays and for the relatively late scheduled completion dates for a number of projects is the inability of the machinery industries, as now organized, to produce certain critical types of machinery and equipment as rapidly as the plants are completed. Bottlenecks exist among machine tools (particularly the larger and more specialized types) and among certain critical types of equipment.

Possible Additions to Program

The first group of additions is the usual relatively small batch of projects coming along every month that represent minor adjustments in the facilities program as it is spelled out in detail. These "routine additions" seem to have averaged not less than $100 million a month, to judge by facilities contracts let in months during which no major programs were added or enlarged. We may, therefore, expect during 1943 at least $1 billion of such

routine additions to the facilities program. The value put in place during 1943 on these additional projects will, of course, amount to only a fraction of this total.

Much more important are changes in major war production programs that may require the construction of new fabricating facilities not now scheduled. Any significant enlargement of the total 1943 program beyond its present level is unlikely. It is possible, however, that shifts within the program may require additional facilities for certain categories of munitions. The concomitant reduction in the production program for other items may lead to a reduction in the degree of utilization of some existing facilities, rather than to the cancellation of new facilities for the type of armaments that are subject to curtailment.

Evaluation of the character and size of facilities additions due to major changes in the production program is obviously impossible at this time. It would appear, however, that the facilities required for certain parts of the aircraft program, for high octane gasoline, and a few other programs, will be considerably in excess of the amounts included in present schedules. Additional facilities may also be needed if the escort vessel program is materially enlarged, particularly if this expansion is not accompanied by a reduction in the merchant ship and combatant vessel programs.

Additional demands for machinery, particularly machine tools, may also be expected if radical changes are made in models of armaments, since such changes often require extensive retooling. Both British and German experience indicate that this demand for equipment is considerable and it would appear that there has not yet been sufficient allowance for it in our own programs. However, such unanticipated retooling requirements are not likely to arise in significant volume before the end of 1943.

The Sufficiency of the War Industrial Facilities Program

Whether the new industrial facilities, already built or now being constructed, are adequate for their task -- the production of the scheduled output of finished munitions -- is a question raised as often as any related to the war production program. It embraces two problems, that of sufficiency (are the facilities large enough?) and that of over-capacity (are they too large?). The meager information available on both problems is in marked contrast to the interest in them and to their intrinsic importance.

Only experience will show whether the facilities included in the program, as it stood at the end of 1942, will suffice for the 1943 munitions production program. In all but a few cases they did do so on paper, as each procurement agency was supposed to provide for sufficient facilities to make sure of fulfilling its

own production program. This paper equilibrium between requirements and supply, however, rests on several assumptions regarding new facilities.

The balance rests, first, on the completion on schedule of all new facilities included in the program. This assumption, as has been indicated above, is almost certain of not being fulfilled to the extent of an average delay of two to three months.

The equilibrium rests, secondly, on reaching in actual operation the output planned for the new facilities -- in the aggregate for important types of munitions, if not for each individual project. Here, fortunately, all indications are that the expected rate of output will not only be reached but will be surpassed, in many cases by a very considerable margin, if the necessary materials and labor can be found to keep these new facilities running for as many hours a week as the program anticipated. In most of the new plants completed and in operation the output per machine hour has been higher than calculated in the program. This extra output, in its effect on 1943 output of munitions, will offset the delay in completion of facilities scheduled to begin operations during the year. Whether the offset will be complete is beyond reliable estimation. It is likely to be so for some types of munitions, but not for others.

The third assumption underlying any paper equilibrium between requirements and supply of war industrial facilities concerns the utilization of facilities to commence operation in 1943 or operating before 1943. It is not known exactly what utilization was assumed when the present war industrial facilities program was drawn up and presumably dimensioned to match 1943 munitions production objectives. It would seem, however, that the assumed rate of utilization is generally that now common a rate that is certainly not excessive and is susceptible of increase. Thus no doubts need be entertained as to the overall sufficiency of the facilities program.

Balancing these diverse factors, one is inclined to suggest that higher-than-expected output per machine hour and higher-than-expected utilization of equipment will compensate, in most fields, for the later-than-expected completion of new facilities. This compensation will not suffice in a few critical components, and particularly not in the case of certain raw materials, for the attainment of 1943 production objectives. In most cases, however, failure to reach 1943 objectives will be due to shortages of material and labor and to shortcomings in scheduling and organization of production, rather than to insufficiency of plant and equipment.

The Problem of Over-Expansion of Facilities

The problem of overcapacity is pertinent here only in so far as it relates to war production. It is whether we now have, or will have, more facilities for the production of munitions than there are raw materials or workmen available to keep them fully utilized. The problem includes both overcapacity in the general sense just defined, and overcapacity in certain sectors due to a lack of balance of productive facilities among war industries.

Whether general overcapacity exists in munitions facilities, or will exist after all plants now under construction or contemplation are completed, is a moot question. If the test were the utilization of all facilities at the theoretical maximum of 168 hours a week, or even at a more practical maximum of 140 hours, there would be considerable overcapacity. This yardstick is obviously unrealistic, but, unfortunately, there is no other generally applicable test. We must, therefore, be content with the statement, to be amplified below, that certain facilities existing or building could be utilized somewhat more intensively and efficiently. To that extent overcapacity does exist, but it is doubtful whether it is a general phenomenon and its size is not known. A more concrete answer would require a detailed analysis, industry by industry, and possibly plant by plant, such as has not yet been undertaken.

The picture is somewhat more definite with regard to overcapacity in the sense of a lack of balance among the facilities in different sectors of the munitions industries. There seems to exist in many lines definite overcapacity in fabricating facilities compared with the facilities for producing raw materials, particularly certain basic metals and chemicals. This lack of balance, which will be particularly pronounced in 1943, is due to the relatively late start of the program for expanding raw material facilities. As a result, this group of facilities, as included in the program at the end of 1942, was in a much less advanced stage of completion than the fabricating plants (Table 60). Moreover, there is serious doubt whether the present program provides all the raw material facilities that will be needed to supply existing or planned munitions plants even at the present standard of utilization.

Not enough information is available on the lack of balance among facilities for producing components of specific items of munitions (e.g. among shell loading, shell turning, and TNT facilities) to justify any generalization.

The Feasibility of the War Industrial Facilities Program

The construction work involved in the 1943 war facilities program is undoubtedly well within the range of feasibility. Such

work progressed at the rate of about $340 million a month during 1942, and at $450 million during the most active months, while present schedules indicate a monthly average for 1943 of just over $150 million, tapering off from $220 million in the first quarter to about $100 million in the last quarter of the year (Table 59).

There is, on the other hand, some question whether all the equipment required for the 1943 program -- over $3 billion worth -- can be supplied unless changes are made in methods of operation in the machinery industry. In the absence of reasonably detailed and accurate information on supply and requirements for most types of equipment it is, however, impossible to arrive at a definite conclusion, and any judgment must rely largely on indirect evidence.

Judging by the backlog of orders, total requirements for machine tools at the end of 1942 are below $1 billion (Table 62 and Chart XXXVIII). As the present rate of machine tool production for domestic use, about $1-1/4 billion per year, there would seem to be no doubt, on an overall basis, that the machine tool requirements of the war facilities program can be met by the end of the year. However, most of the orders are for machine tools needed in the first half of the year, while the supply of machine tools during that period is not expected to exceed $700 million. Therefore, it would appear that completion of numerous war industrial facilities will be delayed because of difficulty in obtaining machine tools when they are needed although delays generally should be limited to a few months.

The situation is less favorable for a number of critical tools. Compared with an average firm order backlog of about seven months at the end of 1942, orders for fourteen types of tools, accounting for about one-eighth of the total backlog, represented (at the production rates of November and December 1942) more than nine, and in three cases, more than twelve months' output. Such a comparison, however, may well present a too unfavorable picture, since production is likely to be stepped up for these critical tools. But even if the calculation is based on expected delivery dates, it appears that among twenty critical tools deliveries of fifteen types will extend into the fourth quarter of 1943 and three types into 1944. Moreover, there will probably be a significant number of tools required in 1943 that had not been ordered by the end of 1942.

Shortages are also known to exist in certain types of equipment other than machine tools. But since requirements originating from new war industrial facilities for all equipment other than machine tools are probably not in excess of $2 billion, or about $1 billion below actual installations in 1942, this overall category should not constitute a hindrance to keeping the 1943 war industrial facilities program on schedule. There are, however, a few critical equipment items (including heat exchangers, valves, vacuum pumps, compressors, boilers and extrusion presses)

for which requirements in the near future exceed supply, e.g. for steel valves by about 25 percent, for heat exchangers and for boilers by about 15 percent. Unless the production of these tight items is stepped up, by improved scheduling or other methods, considerable delays may be expected in the completion of some facilities projects, particularly in the chemical field.

Possibilities of Reducing the Program

The possibilities of cutting the 1943 war industrial facilities program are of two types. First, it might be possible to reduce the need for new facilities all along the line by certain measures of general applicability such as an increase in utilization of existing plants, improvements in production technique, and extension of the process of conversion of civilian industries. Secondly, expansion projects may be dispensed with because the munitions which they are scheduled to produce either are no longer required or can be obtained from other facilities in operation or under construction.

1. Increasing the Utilization of Existing Plants. There is undoubtedly some room for an increase in men employed on the first shift, although a quantitative measure of the increase thus possible is lacking. The opportunities for enlarging the number of workers on second, third, and Sunday shifts seem to be greater, since the average utilization of metalworking plants is only in the neighborhood of 90 hours a week against the theoretical maximum of 168 hours or of a more practical maximum of about 140 hours. Overall figures, however, are not conclusive in a problem of this type. A wider use of second and third shifts is mainly dependent upon the local labor situation and upon the balance of the plant's machine complement, although the energy with which management strives for full utilization is an important factor. It is doubtful whether a further general and significant rise in the rate of utilization of munitions plants can be expected to materialize during 1943. Considerable increases are, however, possible and will be required in a limited number of tight fields. Some of these increases may take the form of commandeering tools now idle or little used and transferring them to plants where they can be utilized for long hours on essential war work.

The scope for increasing utilization is statistically larger in small plants than in the large ones. For example, among machine tool plants, the average machine operation in December 1942 was 115 hours per week for the large plants, 95 hours for the medium sized ones, and only 73 hours for the small plants. But the difficulties faced by these smaller units in an increase in utilization are also great, particularly in the matter of finding the supervisory personnel required by second or third shift operations. On balance these small plants may, therefore, not be in a much better position to increase their rate of utilization than the large ones.

2. Increasing Hours of Work. Utilization of facilities can be increased by a lengthening of weekly working hours, particularly in plants where only one or two shifts are being worked. However, working hours are probably already near the optimum in a number of bottleneck industries such as machine tools and machinery, and are only rarely under 48 hours in any of the munitions industries. For practical purposes, therefore, the increase in production that could be achieved by lengthening the work week in the munitions industries, with the concomitant possibility of dispensing with new facilities, must be regarded as rather limited.

3. Increasing the Efficiency of Production. The possibility of increasing the output of armaments through stepping up output per man-hour above the 1942 level and also beyond the level anticipated in laying out the new facilities is undoubtedly still great. If carried out, this increase would permit cancellation of part of the planned new facilities, at least in certain sections of war production. However, quantitative and comprehensive information on the trend of productivity is as yet lacking and a judgment covering the entire field of war production is impossible.

While potential savings of labor and new facilities through an increase in productivity are probably large, no practicable method exists for making these savings actual, especially within a short period of time. Therefore, the principle that seems to have been followed of not taking such increases into account in laying out the facilities program, while perhaps over-cautious, appears defensible. At any rate, the possible gains in productivity do not seem to be definite enough, either in size or in their incidence, to warrant a general reduction in the facilities program for 1943.

4. Increasing Conversion from Civilian Production. The scope for further conversion from civilian to military production is limited for large and medium-sized plants in the metalworking industries. Among these, production for the direct or indirect use of the Armed Forces appears to have accounted for about 80 percent of the total output by the end of 1942. It is, therefore, unlikely that conversion could proceed much farther. Much of whatever additional margin exists for conversion is already preempted by supply contracts that were let in 1942.

Some idea of the further progress of conversion that may be expected in the first half of 1943 can be obtained from the situation in 35 metalworking industries (Table 65). In almost every one of these industries between October 1942 and June 1943, shipments of combat materiel, as now anticipated or scheduled, will increase more than other shipments or will increase in the face of a decline in other shipments. The increase in the share of combat materiel is particularly pronounced in the agricultural and special industrial machinery, office machinery and locomotive industries.

Slightly greater scope for conversion of civilian plants, some of which are now under-employed or idle, probably exists among smaller firms. The amount of facilities that could be brought into the war production effort from this source, however, is relatively small compared with total requirements, even though it may be significant for some items. In 1939, plants with less than 50 employees accounted for only about 10 percent of the total value of production in the metals industries. A considerable proportion of the small facilities is already engaged in war production, and part of the remainder is not fit for conversion. Both factors further reduce the extent to which additional conversion of small firms can be substituted for the construction or enlargement of specialized facilities.

5. Elimination of Individual Projects. The elimination of individual construction projects has been going on more or less constantly since the beginning of 1942, but particularly since the creation of the Facilities Review Committee in October, 1942. The results to date, however, have been quantitatively small in the field of war industrial facilities. Up to the end of 1942, less than $400 million worth of facilities projects had been cancelled and less than another $500 million had been deferred. The total of cancelled and deferred projects, therefore, amounts to not much more than 5 percent of the facilities projects still included in the program. This process of pruning will likely be continued throughout 1943.

Among projects cancelled in 1942, those for explosives, gun tubes, small arms and ammunition, and cargo and escort vessels bulk largest. It is quite possible that some of the cancelled projects in the last two instances will have to be reinstated in 1943. Plants for iron and steel products, several of them for tank armor, constitute over one-half of the deferred projects. Most of the remainder comprises new plants for chemicals and synthetic rubber. In many cases, particularly the facilities that were intended to increase the output of basic materials, deferment may be only temporary and work may be started or resumed before 1943 is over.

Why the value of deferred and cancelled war industrial facility projects has been relatively small is not entirely clear. The great difficulty of being positive about the need for specific plant expansions, so long as the entire munitions program is in flux, must have been an important factor preventing stricter screening. Also, it may well be that no large-scale reduction in projected facilities is possible until our standards regarding the degree of utilization of facilities are drastically changed.

Possibilities of Speeding up the Program

Present prospects point to an average delay of possibly as much as three months in the scheduled completion dates of war industrial facilities now under construction. As a result many projects

will not be completed before late 1943 and some will be carried over into 1944. This delay could be avoided and in some cases actual completion could even precede schedules if the output of critical machine tools and other types of equipment were speeded up sufficiently. In the absence of detailed engineering studies, it is difficult to evaluate the possibilities that exist in this direction. A number of obvious steps to speed up the production of critical items of equipment, however, may be mentioned.

First, there is obviously room for a more intensive utilization in many branches of the machine tool and machine industries. Machine utilization in the machine tool industry as a whole now averages about 105 hours and is as low as 73 hours for the smaller firms. It seems to be around 80 hours in the rest of the machinery industry. Secondly, the existing facilities for the production of machinery could be concentrated to a larger degree than at present on the production of critical types of machines. Undoubtedly, there are considerable difficulties in the way of such concentration in a highly specialized industry, but it is hard to believe that more could not be done in this direction. This concentration would have to be accompanied, in the third place, by reduction below present schedules of the output of less critical tools, and fourth, the substitution of old tools, now idle or under-utilized, for new critical machines.

Conversion of the Machinery and Machine Tool Industries

Up to the end of 1942 the machinery and machine tool industries had not been affected, to a significant degree, by the conversion to production of munitions that has played such an important role in most metalworking industries. This was due, of course, to the urgent demand of other war plants for their usual products -- machine tools and equipment needed directly or indirectly in the production of armaments. Sometime during 1943, however, the problem of converting the facilities of the machinery industries will arise.

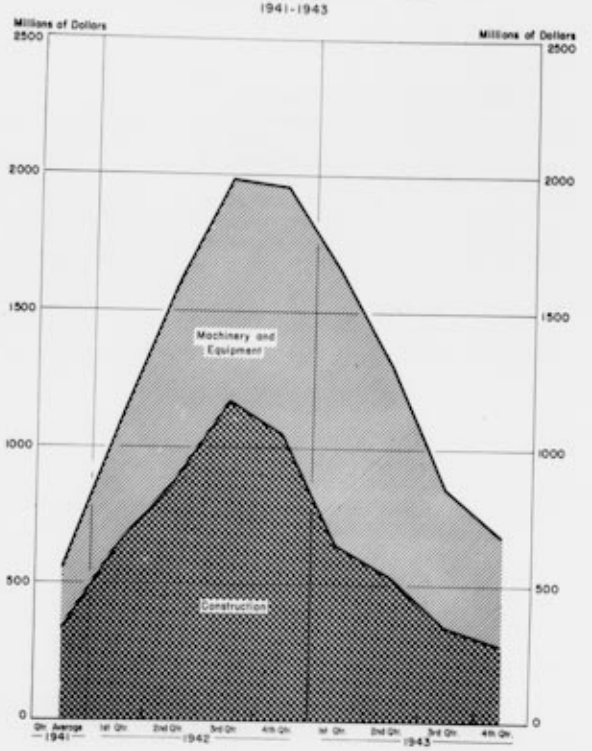
At the beginning of 1943 the machine tool industry was producing for domestic use at a rate of about $1.3 billion a year. Its capacity, under assumption of fullest utilization, concentration and standardization, probably was not below $1.5 billion. Output of other types of machinery used in industrial plants was around $3 billion; capacity was considerably higher, as evidenced by the relatively low rate of utilization of plants in the machinery industries. War industrial facilities, on the other hand, will absorb in 1943 not more than $3 billion of equipment of all types, including $1 billion for machine tools. At least in the second half of 1943, the present facilities of the machine tool and factory machinery industries, therefore, will not be fully utilized unless the war industrial facilities program is greatly enlarged, machinery exports increase sharply, requirements for civilian industries rise, or parts of the industry are converted to the production of munitions.

Machinery exports are expected to grow, but the absolute amount of the increase is small compared with the total output of this type of equipment. Civilian industries are unlikely to be permitted any substantial purchases of equipment. How large the war facilities program for 1944 and later years will be is beyond accurate determination at this moment. There is, however, every reason to assume that war industrial facilities expansions after the end of 1943 will be at a rate considerably below the peak reached in late 1942 and early 1943. Some of the facilities of the machinery industries, and a large part of those of the construction industry, should thus be available for conversion to other war production beginning with the second half of 1943. It does not appear, however, that this conversion, which has already taken place on a small scale, will affect the majority of plants in the machine tool and machinery industries. Both the British and the German examples indicate that demands for industrial equipment continue high even after the initial facilities for all-out war production are created. It is, therefore, not advisable to figure on the machine tool and factory machine industries as potential large-scale additions to the facilities available for munitions production. But even a partial conversion of these industries will be important because the nature of their equipment and labor force will enable them to take over production of difficult items and to break important bottlenecks among finished munitions or critical components.

CHART XXXII

ESTIMATED VALUE PUT IN PLACE IN GOVERNMENT FINANCED INDUSTRIAL FACILITIES

1941-1943



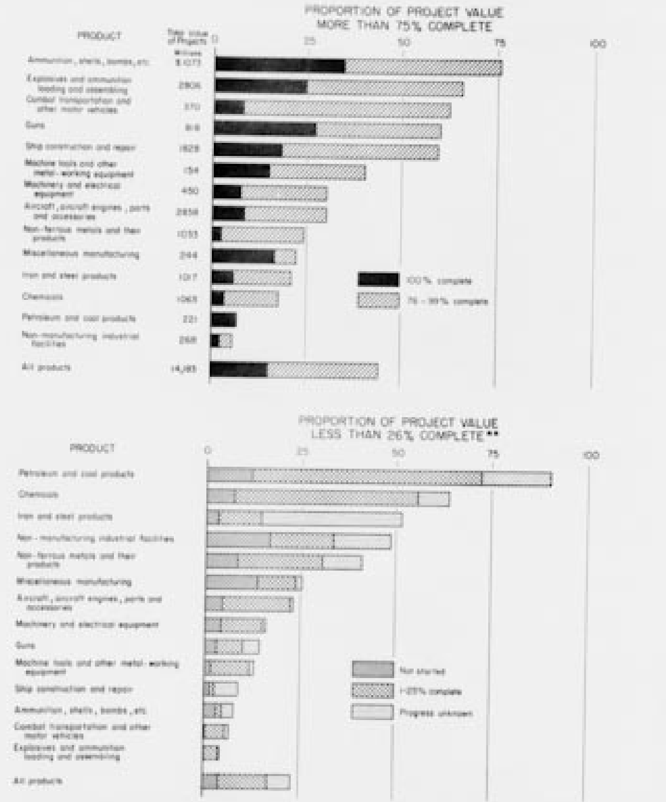
WAR PRODUCTION BOARD
Statistics Division

CHART XXXIV

WAR INDUSTRIAL FACILITIES FINANCED WITH PUBLIC FUNDS*

STATE OF COMPLETION AS OF NOVEMBER 30, 1942

BY TYPE OF PRODUCT



* Does not include $453 millions of deferred projects
** Projects for which progress is unknown are assumed to be less than 26% complete

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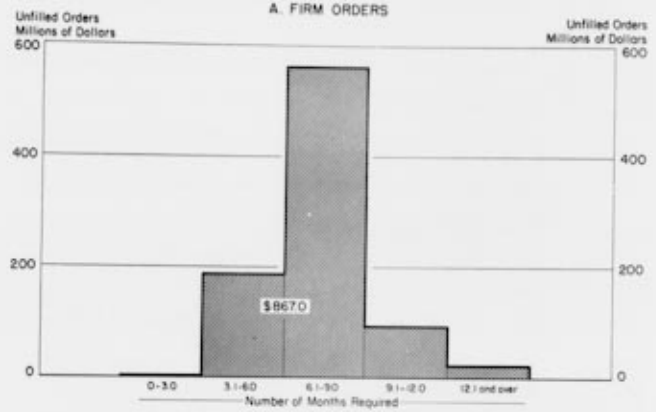
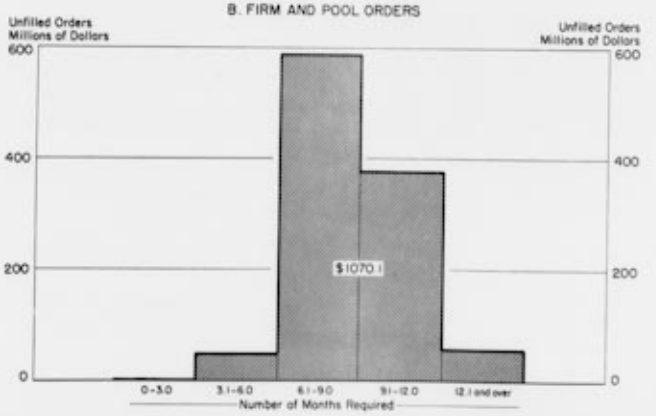
CHART [illegible]

NUMBER OF MONTHS REQUIRED TO COMPLETE UNFILLED ORDERS ON HAND FOR MACHINE TOOLS AS OF DECEMBER 31, 1942*

A. FIRM ORDERS



B. FIRM AND POOL ORDERS



*Calculated on basis of average value of shipments in November and December 1942.

WAR PRODUCTION BOARD
Statistics Division

SECRET

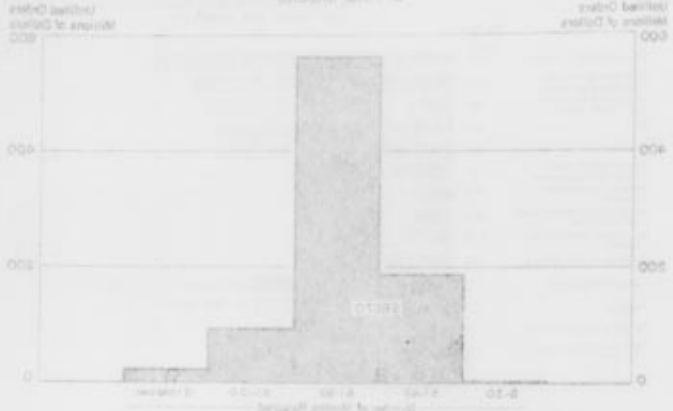


TABLE 59

Estimated Value of Construction Put in Place, 1941 - 1943
(Subject to Revision)

(In Millions of Dollars)

	Total 1941 a/	Total 1942 a/	Total 1943 b/	1943 Quarters 1st	2nd	3rd	4th
I. Industrial Facilities (Government Financed)	2,200	6,608	4,500	1,662	1,305	850	683
Construction	1,350	3,715	1,800	642	525	350	283
Machinery and Equipment	850	2,893	2,700	1,020	780	500	400
Aircraft	459	1,210	1,001	370	290	189	152
Construction	208	546	308	110	90	60	48
Machinery and Equipment	251	664	693	260	200	129	104
Ordnance	1,081	2,409	1,242	460	360	234	188
Construction	744	1,498	646	231	189	125	101
Machinery and Equipment	337	911	596	229	171	109	87
Shipyards	350	981	561	207	163	106	85
Construction	273	731	425	150	125	83	67
Machinery and Equipment	77	250	136	57	38	23	18
Steel, Synthetic Rubber, Chemicals and Other Raw Materials	167	1,368	1,374	505	400	260	209
Construction	81	714	340	121	99	66	54
Machinery and Equipment	86	654	1,034	384	301	194	155
Machinery and Machine Tools	66	446	228	84	66	43	35
Construction	20	127	47	17	13	9	8
Machinery and Equipment	46	319	181	67	53	34	27
Other Facilities	77	194	94	36	26	18	14
Construction	24	99	34	13	9	7	5
Machinery and Equipment	53	95	60	23	17	11	9
II. Industrial Facilities c/ (Privately Financed)							
Construction	678	195	75	25	20	15	15
III. Utilities (Privately and Publicly Financed)							
Construction	950	725	275	70	80	60	45

a/ Preliminary.
b/ Estimated.
c/ Includes privately financed plant constructions not under certificates of necessity.

TABLE 60

War Industrial Facilities Financed with Public Funds: a/
Number of Projects, and Estimated Cost,
By Type of Product and Percent Complete

As of November 30, 1942

Type of Product	Total Number	Percentage of Completion: Not Started	1-25%	26-50%	51-75%	76-99%	100%	Deferred Project	Progress Unknown
		A. Number of Projects							
Total	3,190	365	303	315	444	611	836	44	272
Aircraft, aircraft engines, parts and accessories	455	55	44	64	88	95	79	-	30
Ship construction and repair	299	23	14	21	43	91	90	-	17
Combat transportation and other motor vehicles	83	1	5	8	10	21	26	1	11
Guns	295	25	15	23	34	71	108	-	20
Ammunition, shells, bombs, etc.	447	34	8	20	27	44	280	-	34
Explosives and ammunition loading and assembling	91	6	1	3	16	26	35	-	4
Iron and steel products	293	36	42	31	29	50	52	23	30
Non-ferrous metals and their products	131	25	23	19	19	18	12	2	13
Machine tools and metal working equipment	213	6	10	21	62	65	39	-	10
Machinery and electric equipment	375	47	36	54	72	79	62	1	24
Chemicals	191	47	51	18	16	17	12	12	18
Petroleum and coal products	45	10	24	1	1	-	2	2	5
Miscellaneous manufacturing	193	29	19	25	22	26	32	1	39
Non-manufacturing (power lines, railroads, etc.)	78	21	11	7	5	8	7	2	17

a/ Includes projects estimated to cost $25,000 or more which have been approved by the War Department, Navy Department, Maritime Commission, Defense Plant Corporation, Reconstruction Finance Corporation and British Ministry of Supply Mission. Excluded are projects for pilot training, RFC loans for working capital, and commitments for machine tool purchases by the War Department, Navy Department, and Defense Plant Corporation.

TABLE 60
(Concluded)

Type of Product	Total Number	Percentage of Completion: Not Started	1-25%	26-50%	51-75%	76-99%	100%	Deferred Project	Progress Unknown
	B. Estimated Cost in Millions of Dollars								
Total	14,636	521	1,858	1,797	2,872	4,133	2,189	453	873
Aircraft, aircraft engines, parts and accessories	2,838	116	513	465	868	617	237	-	22
Ship construction and repair	1,828	27	20	111	461	761	332	-	116
Combat transportation and other motor vehicles	408	1	19	81	34	202	29	38	4
Guns	818	25	56	84	124	270	222	-	37
Ammunition, shells, bombs, etc.	1,073	34	17	21	157	440	373	-	31
Explosives and ammunition loading and assembling	2,806	1	100	269	587	1,148	697	-	4
Iron and steel products	1,288	32	113	162	118	155	59	271	378
Non-ferrous metals and their products	1,048	85	235	170	187	224	28	15	104
Machine tools and other metal working equipment	154	3	15	39	33	39	23	-	2
Machinery and electrical equipment	450	17	51	125	118	103	33	b/	3
Chemicals	1,177	76	515	99	99	151	35	114	88
Petroleum and coal products	230	26	134	5	1	-	15	9	40
Miscellaneous manufacturing	245	33	25	52	76	14	40	1	4
Non-manufacturing (power lines, railroads, etc.)	273	45	45	114	9	9	6	5	40

b/ Less than $500,000

TABLE 61

War Industrial Facilities Financed with Public Funds: a/
Estimated Cost of Total Project and of Equipment by Type of Product
and by Period of Scheduled Completion
As of November 30, 1942

Type of Product	Total	SCHEDULED COMPLETION PERIOD							
		Completed prior to November 30, 1942	Scheduled for Completion in						Deferred Projects
			December 1942	1st Quarter 1943	2nd Quarter 1943	3rd Quarter 1943	4th Quarter 1943	1944	
A. Estimated Cost of Total Project, in Millions of Dollars.									
TOTAL	14,636	2,129	1,656	4,049	3,608	1,789	757	265	453
Aircraft, aircraft engines, parts and accessories	2,838	237	147	763	950	317	226	198	-
Ship construction and repair	1,828	332	372	416	456	83	169	-	-
Combat transportation and other motor vehicles	408	29	61	168	34	78	-	-	38
Guns	818	222	150	252	152	33	-	9	-
Ammunition, shells, bombs, etc.	1,073	372	173	388	107	33	-	-	-
Explosives, and ammunition loading and assembling	2,806	697	348	993	337	431	-	-	-
Iron and steel products	1,288	59	61	189	399	304	5	-	271
Non-ferrous metals and their products	1,048	28	113	305	359	147	81	-	15
Machine tools and other metalworking equipment	154	24	26	82	11	1	10	-	-
Machinery and electrical equipment	450	33	41	197	97	40	42	-	b/
Chemicals	1,177	35	92	154	409	203	170	-	114
Petroleum and coal products	230	15	b/	29	95	31	11	40	9
Miscellaneous manufacturing	245	40	63	69	44	16	12	-	1
Non-manufacturing (railroads, power lines, etc.)	273	6	9	44	158	12	31	8	5

TABLE 61
(Concluded)

Type of Product	Total	SCHEDULED COMPLETION PERIOD							
		Completed prior to November 30, 1942	Scheduled for Completion in						Deferred Projects
			December 1942	1st Quarter 1943	2nd Quarter 1943	3rd Quarter 1943	4th Quarter 1943	1944	
B. Estimated Cost of Equipment, in Millions of Dollars.									
TOTAL	8,028	955	817	2,404	1,988	913	453	178	320
Aircraft, aircraft engines, parts and accessories	1,976	133	77	648	591	215	170	142	-
Ship construction and repair	624	90	130	188	136	19	61	-	-
Combat transportation and other motor vehicles	339	25	52	139	31	59	-	-	33
Guns	657	182	115	207	124	22	-	7	-
Ammunition, shells, bombs, etc.	684	240	102	234	81	27	-	-	-
Explosives, and ammunition loading and assembling	791	120	129	290	113	139	-	-	-
Iron and steel products	796	45	41	134	207	173	4	-	192
Non-ferrous metals and their products	582	18	33	174	227	75	44	-	11
Machine tools and other metalworking equipment	126	20	21	69	7	1	8	-	-
Machinery and electrical equipment	338	30	31	135	73	28	41	-	-
Chemicals	704	25	46	94	265	112	89	-	73
Petroleum and coal products	167	8	b/	20	71	26	10	24	8
Miscellaneous manufacturing	170	17	38	51	37	16	10	-	1
Non-manufacturing (railroads, power lines, etc.)	74	2	2	21	25	1	16	5	2

a/ Includes projects estimated to cost $25,000 or more which have been approved by the War Department, Navy Department, Maritime Commission, Defense Plant Corporation, Reconstruction Finance Corporation and British Ministry of Supply Mission. Excluded are projects for pilot training, RFC loans for working capital, and commitments for machine tool purchases by the War Department, Navy Department, and Defense Plant Corporation.

b/ Less than $500,000.

TABLE 62

Unfilled Orders for Machine Tools as of December 31, 1942
Classified by Number of Months to Complete
on Basis of Average Value of Shipments
in November and December, 1942.

Number of Months to Complete	Types of tools		Value of tools	
	Number	Percent of total	Million $	Percent of total
I. Firm Orders:				
Totals	65	100.0	867.0	100.0
0 - 3.0	4	6.2	3.3	0.4
3.1 - 6.0	21	32.3	189.4	21.8
6.1 - 9.0	26	40.0	561.2	64.8
9.1 - 12.0	11	16.9	93.0	10.7
12.1 and over	3 a/	4.6	20.1	2.3
II. Firm and Pool Orders:				
Totals	65	100.0	1,070.1	100.0
0 - 3.0	2	3.1	0.9	0.1
3.1 - 6.0	8	12.3	46.6	4.4
6.1 - 9.0	31	47.6	588.5	54.9
9.1 - 12.0	17	26.2	377.8	35.3
12.1 and over	7 b/	10.8	56.2	5.3

a/ Duplicators, various gear cutting machines, and external cylindrical universal grinders.

b/ Surface broaching machines; die sinkers, plain and universal; duplicators; various gear cutting machines; gear grinding machines; external cylindrical universal grinders; and automatic chucking single spindle lathes.

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TABLE 61

October 1942 Shipments and Estimated a/ June 1943 Shipments in 35 Metal-Products Industries
(Dollar Figures in Thousands)

Industry	Number of reporting plants	Total Shipments			Combat Material Shipments			Other Shipments		
		October 1942	June 1943	Percent increase	October 1942	June 1943	Percent increase	October 1942	June 1943	Percent increase
Cutlery and edge tools	95	8,556	11,431	33.6	753	2,440	224.1	7,803	8,991	15.2
Power boilers	162	42,847	57,415	34.0	7,113	11,374	59.9	35,734	46,041	28.8
Electric generating and distributing apparatus	216	174,908	196,946	12.6	57,895	74,511	28.7	117,013	122,435	4.6
Electrical appliances	92	17,838	28,487	59.7	9,133	17,572	92.4	8,705	10,915	25.4
Automotive electrical equipment	51	36,731	65,785	79.1	23,030	47,442	106.0	13,701	18,343	33.9
Communication equipment	111	94,271	135,090	43.3	65,330	100,881	53.5	28,941	34,209	20.3
Steam engines, turbines, and water wheels	13	12,857	16,586	29.0	4,847	5,453	12.5	8,010	11,133	39.0
Internal combustion engines	63	109,193	151,307	40.4	59,183	80,371	35.8	50,010	72,936	45.8
Tractors	25	51,906	76,406	47.2	10,225	21,053	105.9	41,681	55,353	32.8
Agricultural machinery (except tractors)	116	20,187	37,952	88.0	6,520	20,368	212.4	13,667	17,584	28.7
Construction and similar machinery	133	50,213	68,098	35.6	9,291	16,180	76.1	40,929	51,718	26.4
Oilfield machinery and tools	82	14,507	29,467	76.1	7,703	15,589	102.9	6,804	9,918	45.8
Mining machinery	35	7,090	11,316	59.6	1,196	4,396	280.3	5,914	6,920	16.6
Metalworking machinery	109	52,616	84,521	60.5	4,664	9,396	15.7	27,952	39,125	40.0
Food products machinery	116	14,222	22,613	59.0	6,115	12,707	107.8	8,107	9,906	22.2
Textile machinery	96	15,376	21,573	40.3	5,418	10,900	101.4	9,964	10,673	7.1
Woodworking machinery	52	4,086	5,361	31.2	1,630	2,817	56.0	2,456	3,144	28.0
Paper products machinery	46	5,501	7,679	37.1	1,865	2,669	43.1	3,736	5,010	34.1
Printing trades machinery	55	16,021	19,773	20.3	11,103	13,146	18.4	4,918	6,127	24.6
Special industrial machinery, n.e.c.	76	11,[illegible]8	19,881	67.7	4,482	10,963	144.6	7,376	8,918	20.9
Pumping equipment and air compressors	129	44,154	55,722	26.2	10,553	16,811	59.3	33,601	38,911	15.8
Elevators, escalators, and conveyors	62	15,419	23,377	55.5	4,919	8,697	76.8	10,500	15,280	45.5
Industrial cars and trucks	25	5,323	6,739	26.6	16	23	43.8	5,307	6,716	26.5
Blowers: Exhaust and ventilating fans	29	7,247	10,139	39.9	297	418	40.9	6,950	9,721	39.9
Mechanical measuring instruments	39	6,641	9,975	50.2	2,052	4,736	130.8	4,589	5,239	14.2
Mechanical power transmission equipment	112	52,997	66,377	26.2	13,149	19,303	46.8	39,448	47,074	19.3
Mechanical stokers	26	5,585	7,300	30.7	1,365	2,432	78.4	4,222	4,868	15.3
Machine shop products, n.e.c.	433	112,555	182,789	62.4	49,862	104,311	109.2	62,693	78,478	25.2
General industrial machinery, n.e.c.	187	45,402	60,385	33.0	15,800	22,215	40.6	29,602	38,170	28.9
Office and store machines, n.e.c.	60	25,971	57,898	120.6	8,986	34,938	288.8	16,985	22,954	31.6
Domestic laundry equipment	23	8,194	11,673	43.2	4,768	10,287	52.0	1,386	1,386	0.0
Commercial laundry equipment	24	4,828	5,808	20.3	632	663	4.9	4,196	5,145	22.6
Refrigerators and air conditioning units	88	35,370	67,415	90.6	18,392	46,955	155.1	16,978	20,460	20.5
Locomotives	12	51,191	128,951	139.4	32,404	102,008	214.8	18,787	26,943	9.1
Railroad cars and street cars	72	63,521	163,185	156.9	48,276	128,999	166.3	15,245	34,186	127.1

a/ Based on peak rates reported by plants.

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II-4. Labor Requirements and Supply

The 1942 manpower requirements of war industries and the Armed Forces were met without serious difficulty. While shortages of skilled workers of many crafts developed early in the year, these were, in general, successfully met by training, upgrading, and job simplification. General shortages arose in many local areas, but with a few exceptions these had not become so acute by the end of the year as to seriously impede war production.

In early 1943 the manpower situation appears to be entering a much more critical phase. The increase in manpower requirements for war production and the armed services will be only slightly smaller than last year, while some of the sources from which last year's requirements were met are rapidly approaching exhaustion. Substantial curtailment of employment in many of the less essential consumer goods and service industries will be necessary this year to permit the withdrawal of manpower for war industries and the armed services. To an increasing extent, the success of our war production program will depend upon our skill in allocating and transferring labor to the activities where it will contribute most effectively to the war effort, and in maintaining the productive efficiency of the workers so employed.

Labor Requirements for War and Essential Civilian Industries

War Industries. There is no completely satisfactory method available for estimating the additional manpower required to enable munitions industries to meet present production schedules. The problem is not a simple one, since production schedules run in terms of finished products, and do not correspond to production in any single group of plants or industries for which employment data can be assembled. Increases in production may be accomplished by further conversion of plants from the production of civilian goods as well as by increases in their total output, while only in the latter case are labor requirements affected.

Estimates of "requirements", therefore, are usually based upon employers' own forecasts of their labor requirements as reported to local employment offices. On the basis of these employers' reports for November, 1942, the increase in employment during 1943 in what we may call munitions industries may be estimated at 1.85 million, or 26 percent.

This group of "munitions industries" includes plants making ammunition and explosives, government manufacturing arsenals and navy yards, the rubber industries, and almost all of the metal fabricating industries, excluding only those which do not appear to have converted to war production in any significant degree. It does not include the basic metal and chemical industries--steel, smelting and refining of nonferrous metals, and basic industrial chemicals. For these industries the employers' reports for November indicated a required increase of employment of 110,000. Thus for the two groups of industries combined we have total additional labor requirements for 1943 of 1.96 million. (Table 64).

Any estimate based largely upon unreviewed employers' forecasts must be regarded with a certain amount of skepticism. Employers' knowledge of the prospective production schedules is imperfect, especially in the case of subcontractors or parts suppliers several stages removed from direct war contracts. This factor probably tends to render such forecasts low, since they are likely to take into account firm commitments only. Yet this tendency may be outweighed by the tendency to overstate labor requirements in the hope that this will help in obtaining labor. The fact that the labor requirements report goes in the first instance to the local office of the U. S. Employment Service, upon which employers will have to depend increasingly for recruitment, makes this possibility a serious one.

Labor Requirements and Production Schedules. As a test of the reasonableness of the labor requirements estimates, we may compare them with the increase in munitions output.

The value of munitions output in January, 1943 was about $4.27 billion. The reported figure will be a little less than this, since a good deal of output which would normally have fallen in January was cleaned up before the end of the year and included in the December total.

If we exclude from this total such items as clothing and miscellaneous supplies, and add the value of machinery and equipment for installation in war plants, the January figure is reduced to $4.03 billion. By January of next year our production schedules will call for an output of $6.45 billion--an increase of 60 percent over the year 1/. This figure may be compared with the required increase in employment from December 1942 to December 1943, since at least a month elapses on the average before work done at various stages of munitions production reaches the stage of actual output of finished goods. The estimated increase of 60 percent in munitions output may be compared with an estimated increase of 26 percent in labor requirements in munitions industries. The difference between these two figures must be accounted for by further conversion, fuller utilization of labor, increased productivity, and longer hours.

Conversion. If the residue of nonmunitions production in the "munitions" industries is further reduced, munitions output may expand without a corresponding increase in employment. Data from the WPB Plant Operations Survey suggest that nonmunitions products probably did not account for more than about 15 percent of total output of industries in this "munitions" group in December. It seems probable that munitions output in these industries can be increased by an additional 5 per cent through further reduction in nonmunitions output.

1/ January 1944 is assumed to be at same rate as the end of 1943.

Labor Utilization. Increases in the effectiveness with which labor is utilized are of much greater potential importance. Overstaffing is reported to be prevalent in many war industries, as a result of several factors. Faulty scheduling of the flow of component parts, plus pressure for speed in getting out production, frequently necessitate the employment of more labor than can be continuously used. In some cases, employers have hired workers in excess of their requirements to protect themselves against anticipated losses of workers to the Armed Services or to other industries. It is to be expected that a very considerable improvement in labor utilization will take place as scheduling of components is improved and the War Manpower Commission undertakes to control labor hoarding. It is the general impression of persons familiar with conditions in munitions plants that better labor utilization could yield an increase in output of as much as 10 percent.

Productivity. If it were not for offsetting factors, we might anticipate a considerable increase in productivity in munitions industries in addition to the increase resulting from fuller utilization of labor. As manufacturers become more used to making new types of products and work out improved production techniques, we would normally expect production per man-hour to increase substantially. Yet the problem of training large numbers of additional workers and replacements for men lost to the Services, the generally lower quality of the new workers who will be hired this year, and the other problems involved in a further rapid expansion of production and employment will all tend to limit the increase in productivity which might otherwise be expected. On the whole it is perhaps better not to count on any substantial increase in over-all productivity this year, beyond that resulting from fuller utilization of labor.

Hours. Some increased production from the present labor force in munitions industries can probably be obtained by increases in hours. But actual average hours per week in the munitions industries were nearly 48 in December, indicating an average work schedule of well over 50 hours. Further increases in schedules above this level would probably yield considerably less than proportionate increases in output per man.

In some plants, equipment rather than manpower will be the factor limiting production. In cases where equipment is now utilized on a round-the-clock basis, increases in hours would not be helpful, since any increase in hours always results in some decline in output per man-hour and consequently in output per machine-hour. In other cases, where equipment is not a limiting factor, and especially where three-shift operation is the rule, an increase in the work week would involve rather difficult problems of shift rearrangement.

In industries where these factors are not involved, we must be careful not to permit hours to rise so much that in the long run production suffers, as appears to have happened in Britain after Dunkirk. For the bulk of the munitions industries where scheduled hours are now below 54, however, there probably can be some further increase. For the group as a whole this might yield an increase of as much as 5 per cent in output per worker.

The combined effect of a 26 per cent increase in employment, with increases in munitions production per worker employed of 5 per cent from further conversion, 5 per cent from increases in hours, and 10 per cent from fuller utilization of labor, would be to increase munitions output 53 per cent. On the basis of these assumptions, the estimates of labor requirements based on employers' forecasts do not appear to be unreasonable, though we would seem to be justified in regarding them as minimum estimates.

Federal War Agencies. In addition to munitions and basic metals and chemicals industries, we must take account of probable requirements of Federal war agencies for additional personnel. Unfortunately no satisfactory estimate is available for this area. But in 1942, these agencies added over 1 million workers, and some further increase in 1943 is certainly to be expected. We may tentatively allow an increase of 500,000 in this field.

Transportation, Public Utilities and Fuel Industries. Among the nonagricultural nonwar industries there are several in which we cannot permit output to suffer by reason of labor shortages. Although these have not been classified as war industries, they are no less essential to the successful prosecution of the war, for a breakdown of these industries would cripple war production as effectively as a shortage of labor or materials for munitions industries themselves.

The principal group of such essential industries consists of those supplying transportation, communication, power, and fuel. We may estimate the increase in labor requirements for these groups at 220,000. This estimate is based in part upon employers' reports, and in part upon estimates of requirements prepared by the Bureau of Labor Statistics and by the Office of Defense Transportation.

Summary of Requirements. Additional labor requirements for war and essential industries may thus be estimated in the aggregate at 2.68 million, including 1.85 million for munitions fabricating industries, 0.11 million for basic metal and chemicals, 0.50 for Federal war agencies, and 0.22 for transportation, public utilities, and fuel industries (Table 64).

Manpower Requirements of the Armed Forces

Net Increase in Strength. Present plans for the expansion of the Armed Forces call for an increase in net strength from 7 million on December 31, 1942 to over 11 million at the end of 1943, including the women's reserves. Of this increase, the Navy, Marines, and Coast Guard account for 1 million, and the Army 3.1 million (Table 65, Part A).

Gross and Net Manpower Requirements. The net increase in strength of the Armed Forces does not measure the full extent of the drain that will be placed on the civilian labor supply. In order to attain the planned net strength, additional men will have to be taken to replace those who are discharged or lost in action. It is understood that during 1943 the Services plan to induct about 900,000 additional men in order to replace 300,000 who will be killed, lost, or disabled, and an additional 600,000 who will be discharged by reason of age, minor injuries, and similar reasons. The gross drain on civilian manpower will thus be 5.0 million; but since the 600,000 who are discharged will presumably be available for industrial employment, the net loss to the civilian labor force will be only 4.4 million (Table 65, Part B).

During 1942, the net increase in the strength of the Armed Forces was 4.9 million. During this period, discharges and losses were negligible, so that this may be taken to represent both the gross and net loss of manpower to the services from the civilian population. Thus the net drain of 4.4 million on civilian manpower during 1943 will be almost as large as last year's, while the gross drain of 5.0 million will actually be larger.

Before incorporating the manpower requirements for the Armed Forces into our general labor requirements and supply analysis, it is necessary to adjust the figures to represent a date slightly in advance of the middle of December, rather than December 31, in order to make them consistent with other data used in the analysis. On this basis, the gross requirements amount to 5.19 million, and the net requirements, 4.59 million.

Relative Magnitude of Military and Civilian Manpower Requirements. It is important to recognize that the Armed Forces account for the major part of the total increase in labor requirements. In the war and essential civilian industries as a whole, the increase in employment in 1942 was 3.47 million, as compared with an increase of 4.53 million for the Armed Forces. In 1943, however, these industries will require only 2.68 million as against 4.59 million net for the Services.

This comparison serves to emphasize the importance of avoiding the induction into the Services of more men than can effectively be utilized. We do not intend to undertake here any appraisal of military manpower objectives in terms of considerations of strategy or logistics. But if, as has been contended, the present manpower objectives will result in the accumulation of some 2 million more trained men than can be sent to theatres of operation or used to advantage in the United States, the critical importance of this margin to the 1943 manpower problem should be made clear.

Impact of the Draft on Munitions Industries. The withdrawal of men from the civilian population for service with the Armed Forces may affect war production in two ways. First, it draws the most productive workers from the labor force, intensifying labor shortages and making it more difficult for all industries to secure and hold labor. Second, if substantial numbers of workers are taken directly from war industries to serve in the Armed Forces, this may considerably aggravate the problems of recruitment and training which these industries already face as a result of their rapid expansion. During 1942, while munitions and basic metal and chemical industries were increasing their total employment by 2.42 million, they also replaced an estimated 1.03 million of their employees who entered the Armed Forces. Thus they had to hire a total of 3.45 million workers, in addition to normal turnover replacements. In 1943, it is estimated that these industries will lose about 1.3 million men to the Services. In order to replace these losses and at the same time to increase their employment by 1.96 million, these industries must hire a total of nearly 3.3 million, again exclusive of normal turnover. This is only slightly less than last year's requirements, and in view of the increased stringency of the labor market, it will present a problem of much greater difficulty (Table 66).

This estimate assumes that these industries will not benefit as a result of deferment to any greater extent than was true last year. A change in deferment policy might, of course, modify the situation. The present trend, however, appears to be to place increasing emphasis on the deferment of agricultural workers rather than workers in munitions industries. Any tendency in this direction will, of course, increase rather than reduce the impact of the draft on the working forces of these industries and upon munitions production.

Increases in the Available Labor Supply

Increasing labor requirements of war industries and the Armed Forces in 1942 were met largely by reductions in the number of unemployed and by increases in the total labor force.1/ Together, these two sources provided 5.8 million of the 8 million who went into war industries and the Armed Forces. To what extent can these sources be counted on in 1943?

Unemployment. The number of unemployed was reduced during 1942 by 2.3 million, and at the end of the year numbered only 1.5 million. This probably represents something near the minimum necessary to allow for workers between jobs and for workers disemployed because of curtailment of nonessential activities who cannot be immediately absorbed in expanding war industries. It has been assumed in most recent forecasts that unemployment could be reduced to 1.0 million by the end of 1943. We may tentatively accept this figure, though it appears rather optimistic. On this basis, we can obtain 0.5 million workers during 1943 by reducing the number of unemployed.

Increase in total labor force. The total labor force normally increases by about 0.7 million per year as a result of population growth and long-term trends. During 1942, the actual increase was 3.5 million, or 2.8 million more than normal. The increase which will take place in 1943 will depend on a number of factors whose effect is difficult to evaluate. Some indication of the reserve which is available is given by the results of a special inquiry made in connection with the November 1942 sample enumeration of the Census Monthly Report on the Labor Force.2/ All persons 14 years of age and over in the sample households who were not working or seeking work were asked whether they could take a full-time job for wages if one were available in their community within the next 30 days. On the basis of the responses to this question, the Census Bureau estimated the "available labor reserve" at 5 million, of whom 4.5 million were women (Table 67).

There are a number of reasons for believing that this apparent reserve cannot be fully utilized. The reliability of the responses given to an enumerator's query as an indication of actual willingness to work may be questioned; and some of those who were "available" would probably turn out to be unable to hold down a job.

1/ The term "total labor force", as used in this discussion, includes members of the Armed Forces as well as the civilian labor force.

2/ "The Nation's Available Labor Reserve", Bureau of the Census release, MRLF No. 7.

But the chief difficulty lies in the geographic immobility of this group. In response to a supplementary question, only 24 per cent of the total "labor reserve" indicated that they would be willing to move to another community. This mobile portion of the reserve, which may be estimated at 1.2 million, probably included virtually all of the 0.7 million students and "other nonworkers" under 65 years of age, and only about 0.5 million of the home houseworkers. The low degree of mobility of this latter group is not surprising, but it will make the utilization of the reserve very difficult, for the demand for labor is highly concentrated in centers of war production, while most of the remaining labor reserve is to be found outside these centers.

We may attempt to adjust these figures to obtain an estimate of the number who might actually be drawn into the labor force in 1943. For this purpose, we must take some account of the difficulties which will be encountered in using even the mobile group because of the congestion in the areas to which they must be moved. If we assume that two-thirds of the mobile group and one-third of the immobile group could be used, our estimate of the usable portion of the reserve is reduced to 2.1 million. Some allowance must be made for the increase in the total labor force (including military) which will result from drafting 18 and 19 year old students for service in the Armed Forces, as well as for the effect of normal growth. There are about 0.4 million male nonworkers in the 18 and 19 year age groups. Allowing for some delay in induction and for physical rejections, we may estimate that this will be reduced to 0.1 million by next December. But not all of these 0.3 million can be added to our estimate, since some will have already been included in our estimate of the usable labor reserve. Allowing 0.1 million for this duplication, we have the following estimate of the probable increase in the labor force in 1943:

	Total	Male	Female
Usable labor reserve	2.1	.3	1.8
Effect of 18-19 year draft	.2	.2	-
Normal increase	.7	.4	.3
	3.0	.9	2.1

The reasonableness of this estimate may be checked by a comparison with British experience during the first three years of the war, which may be regarded as representing a period roughly comparable, so far as manpower mobilization is concerned, with the three years from December 1940 to December 1943 in the United States (Table 68). During the first three years of the war, the percentage of the male population 14 to 64 in the labor force in Britain rose by 4.0 points, whereas on the basis of our forecast the corresponding rise is 4.2 points. The U. S. percentage, however, refers to labor force and population 14 and over, and thus reflects the substantial increase which has taken place, and the further increase expected, in the number of workers 65 and over. The U. S. increase for ages 14 to 64 only, on a basis comparable to the British figure, would be about 3.4 points. This difference is not unreasonable in view of the more highly developed machinery for manpower mobilization in Britain.

The U. S. rise in the percentage of the adult female population in the labor force is 9.0 points. Before comparing this with the British figure, two adjustments are necessary, since the British figure excludes domestic servants as well as persons over 64. We may estimate roughly that we will have a decline of 0.3 million in the domestic service category in 1943. If we excluded this decline in domestic service, as well as the numerically insignificant change in the age groups over 64, the U. S. percentage would rise roughly 9.5 points. This may now be compared with the British rise of 11.1 points. But in interpreting this comparison it is important to remember that the British increase was not accomplished without the use of compulsory measures, including the drafting of certain classes of women for both military and industrial service. Similar measures are not likely to be fully applied in the United States during 1943, or, at any rate, not early enough to affect materially the situation at the year-end. Thus our estimate seems fairly reasonable. Yet it should be remembered that the proportion of the female population in the labor force is considerably lower here than in Britain, and that this may make possible a somewhat more rapid increase.

In making these comparisons, British experience has been used as a guide to the increase in the proportion of the population in the labor force which may be expected, rather than as a guide to the actual proportions. If we were to apply the British percentages directly to the United States population, a substantially larger estimate of the potential labor force would result. Yet there are a number of reasons for not adopting this procedure. The first is purely technical: the precise definition of the labor force underlying the British data is not known, and differences between British and American practice in this respect may be very considerable. The second relates to the differing composition of the British and American population: a much larger proportion of the United States population is agricultural, and in the agricultural population the number of women who are in the labor force is very much lower than in the population as a whole. The third is related to the administrative problems involved in mobilizing women for industrial work; the principal factor limiting the mobilization of women is more likely to be the rate at which they can be induced to accept employment, relocated, trained, and placed in essential work, than the total number potentially available.

A further increase of 3.0 million in the labor force during 1943 thus appears to be a reasonable expectation. But in accepting this figure, we should not overlook the fact that any estimate of this sort must be based explicitly or implicitly on certain assumptions with regard to manpower policy and the effectiveness with which it is administered. A skillfully administered national service act, if it were generally accepted by the public, could increase this figure

materially. An effective policy of concentration of civilian production in slack labor market areas would likewise help in utilizing more fully the potential labor reserve, and thus accomplish a larger increase in the labor force. So would more adequate provision for the housing and local transportation of war workers, and for the care of children of working mothers. On the other hand, the increase might be much smaller than 3 million if the anticipated degree of success along these lines is not achieved, or if, as a result of a partial breakdown of local distribution and service industries, housewives find it necessary to spend a larger share of their time in maintaining their households and are therefore less willing to undertake additional responsibilities.

The Impact of Labor Shortage

Of the 7.87 million required by war industries and the Armed Forces, the sources thus far examined yield a total of only 4.1 million--0.6 million discharged from the services, 0.5 million by reduction of unemployment, and 3.0 million by increase in the total labor force. The remaining 3.77 million must be drawn from other industries.

Not all of the "non-war" industries, however, can be permitted to suffer reductions in employment. Some, like agriculture or transportation, are no less important to the war effort than the war industries themselves. But in others, like construction, curtailment already planned for other reasons will release substantial numbers of workers.

Agriculture. It appears that agricultural employment must be maintained at roughly the same levels as in 1942 if 1943 production goals are to be met. This overall conclusion conceals important factors in the agricultural labor situation. In the major commercial crop areas, it seems fairly certain that the usual supplies of seasonal labor will not be available this year, and that the mobilization of high school children and volunteer workers on a fairly large scale may be necessary to meet seasonal labor requirements in many areas. The month of December, which has been selected for the general framework of this analysis, is particularly inappropriate for agriculture, since farm employment in this month is near the seasonal low point.

In spite of the prospect of fairly acute agricultural labor shortages, there probably remains a substantial reserve of workers on substandard farms which make a negligible contribution to agricultural production. The difficulty in utilizing these reserves lies in their geographic concentration in the rural areas of the Southeast, in their geographic immobility, and in their generally low level of employability for either agricultural or nonagricultural work. In general, the difficulties attendant upon the utilization of this reserve of workers are probably too great to warrant any reliance upon this group to furnish substantial numbers of workers in 1943 except for those who may be mobilized to meet agricultural labor shortages in other areas.

It is unfortunate that more strenuous efforts can not be made to utilize this group more fully, both by facilitating their transfer to other agricultural areas or to nonagricultural employment and by taking measures to increase the productivity of those who remain. At the same time, it should be noted that of all the essential industries, agriculture has been given the greatest degree of protection against loss of manpower either to the Armed Services or to war industries. As a result of the agricultural deferment provisions of recent legislation, the impact of military manpower requirements will be much more heavily concentrated on nonagricultural industries, including war industries, than would otherwise have been necessary.

Construction and Construction Materials. One of the most striking developments of 1943 will be the sharp curtailment of construction activity. WPB estimates show a decline in the total value of construction from $3.2 billion in the fourth quarter of 1942 to the $1.2 billion in the fourth quarter of 1943. This is a decline of a little over 60 percent. The Bureau of Labor Statistics estimates the decline for the same period at nearly 70 percent, and on this basis forecasts a decline in construction employment from 1.70 million in December 1942 to 0.52 million in December 1943. This decline may be slightly excessive, but it would seem that we would be justified in assuming a decline in employment to at least 0.60 million.

This decline in construction will undoubtedly be reflected in the construction materials industries. But in some of these industries, like lumber, alternative uses for their products in war production will tend to maintain activity. A consideration of these possibilities suggests that the decline in employment in 1943 will probably not amount to more than 25 percent, or from 1.16 million in December 1942 to about 0.87 million in December 1943. Thus the total decline in the construction and construction materials category may be set at 1.39 million.

The transfer of this number of construction workers to war industries is a task of no small magnitude. Yet it will probably prove to be one of the easier transfer problems of 1943. Many of these workers, now engaged in building war plants, will be on the spot when the new plants seek to recruit their working forces. Moreover, construction workers are traditionally a mobile group, and possess a good deal of general mechanical skill which should be fairly readily transferable to factory work in war industries.

Other Manufacturing Industries. After allowing for anticipated decline in construction and the construction materials industries, we have a deficit of 2.38 million workers. We have no basis for estimating the distribution of this deficit among the remaining categories of nonagricultural employment, though we can make rough assumptions as to the probably declines in domestic service and self-employed. The decline for the group as a whole amounts to about 10 percent, though the limited possibilities of curtailment in some groups of industries and in some geographic areas will necessitate much sharper reductions in others (Table 69).

The food industries might well have been put in the "essential" class, though there are probably some industries in this group in which reductions in employment are possible. Direct military and foreign food requirements will take a considerable part of the output of manufactured foods, and any sharp curtailment of output for domestic consumption would, of course, be disastrous.

The textile, clothing, and leather industries can probably stand a cut of up to 10 percent. This would imply a considerably sharper decline in employment on civilian goods, since direct military requirements for textile products are substantial. The remaining group of manufacturing industries includes paper, printing, furniture, and a large number of smaller industries. In many of these industries very substantial reductions are possible, ranging up to 50 percent or even more.

It is in these two groups of industries that selective curtailment in areas of labor shortage and the concentration of production in areas where labor is relatively plentiful can make an important contribution to the problem of geographic redistribution of labor. There would seem to be little excuse for permitting any plant in these industries to operate in a labor shortage area unless other plants are unable to take care of minimum required production.

The decrease in employment in these industries does not necessarily imply a proportionate decline in output. Working hours in these industries, though they have been rising during the past year, have not yet reached maximum levels, and could be increased substantially without serious loss of man-hour productivity.

Trade, Service, and Miscellaneous. Substantial curtailment of employment in the trade and service industries will be much more difficult. In many war production centers increase in population, resulting from continuing influx of workers, will make curtailment in these fields impossible and may even necessitate substantial increases. Excessive curtailment in such areas may defeat its own purpose by imposing such burdens upon working women as to force their withdrawal from the labor force, or by making living conditions so difficult that incoming war workers will return to their home communities. And curtailment in other areas will merely release labor where it is not needed.

Government, Exclusive of Federal War Agencies. This category includes about 450,000 Federal employees in the nonwar agencies, and over 3 million in State and local government, of whom over 1 million are school employees. It seems proper to regard this as a group not subject to curtailment.

Self-employed and Domestic Service. A decline in employment in domestic service seems inevitable as the labor shortage develops and domestic servants have an opportunity to find more attractive employment. It is perhaps not unreasonable to assume a decline of 15 percent, or 300,000.

The number of self-employed persons declined during 1942 by nearly 1 million, or about 20 percent. This decline doubtless reflects the adverse effect of war conditions on small establishments in varing lines of business, including building, auto repair shops and filling stations, and other lines of retail trade and service. It seems improbable that so sharp a decline will take place next year, but some continuation of this trend is certainly to be expected. We can probably anticipate a further decline of about 400,000 in 1943.

Effects of Dilution of the Labor Force. Our analysis thus far has run solely in terms of numbers of workers. Yet it is clear that when we withdraw several million male workers in the most productive age group and replace them with old men, middle-aged women, and girls, the average productivity of the labor force will drop appreciably. In December 1941, men aged 20 to 44 accounted for over 42 percent of the civilian labor force; by December 1942, the figure had dropped to 36.3 percent, while in 1943 there will be a further substantial decline. This means that labor requirements may well prove to be higher than we have calculated, and the curtailment of output in civilian industries correspondingly greater.

Increases in Hours. To some extent the inferior quality of the new labor supply may be offset by increases in hours of work in the civilian industries. Increases in hours in munitions industries to a 54-hour level wherever possible have already been accounted for in the estimate of requirements. Among the essential industries some reduction in labor requirements should be possible with a general increase to a minimum 48-hour week. In the civilian industries such an increase, while it would not effect the required curtailment, might reduce substantially the effect of this curtailment upon the output of goods and services.

Geographic Factors. These over-all estimates fail to bring out some of the most important aspects of the problem. Our labor supply is not a single national pool which can be drawn upon to meet labor needs whenever they arise. Munitions industries are not evenly spread over the country, but are necessarily concentrated very largely in the areas which before the war were centers of heavy industry. Expanding labor requirements in these areas have been met during 1942 very largely by migration from other areas. And the possibilities of further migration are limited by the availability of housing accommodations and by the capacity of local transportation services and other community facilities, as well as by the unwillingness of potential workers to move to new communities. In many of these areas the possibility of drawing more workers from the resident population has likewise been virtually exhausted.

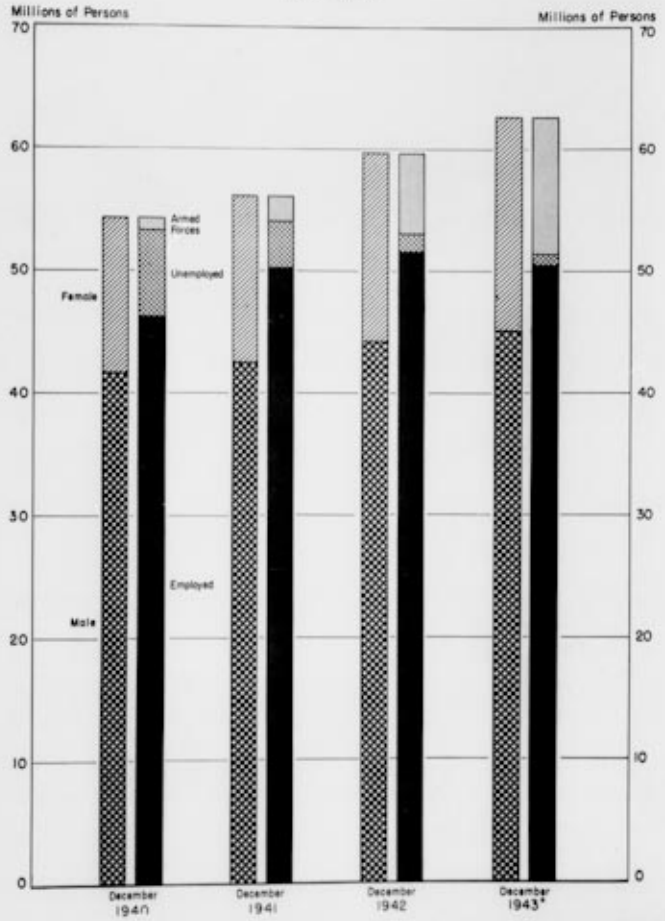
The Impact on War Production

It seems inevitable that labor shortages will impede the fulfillment of the war production program to an increasing degree in 1943. We cannot hope to allocate and transfer labor with sufficient skill to make full use of our labor resources. And the mistakes we make will not always be reflected in the inability of a war plant to hire the workers it needs; they may be reflected in ways which are less obvious but are no less serious for war production. The withdrawal of men for the Armed Services will increase labor turnover, which may restrict production even though adequate numbers of replacements are available. Excessive curtailment of local distribution and service industries may lead incoming war workers to quit and return to their home communities, to move to other war production centers in search of better living conditions, or, in the case of women, to give up employment altogether or to be frequently absent from work. Shortages of manpower in local transportation services, leading to undue congestion and delay, also may be reflected in excessive absenteeism and tardiness. In general, war production is more likely to be impeded indirectly by labor shortages in essential civilian industries, resulting in high turnover, absenteeism, and lowered efficiency of war workers, than by an outright numerical deficiency in the supply of workers for war industries themselves.

CHART XXXX

TOTAL LABOR FORCE OF THE UNITED STATES

1940 - 1943



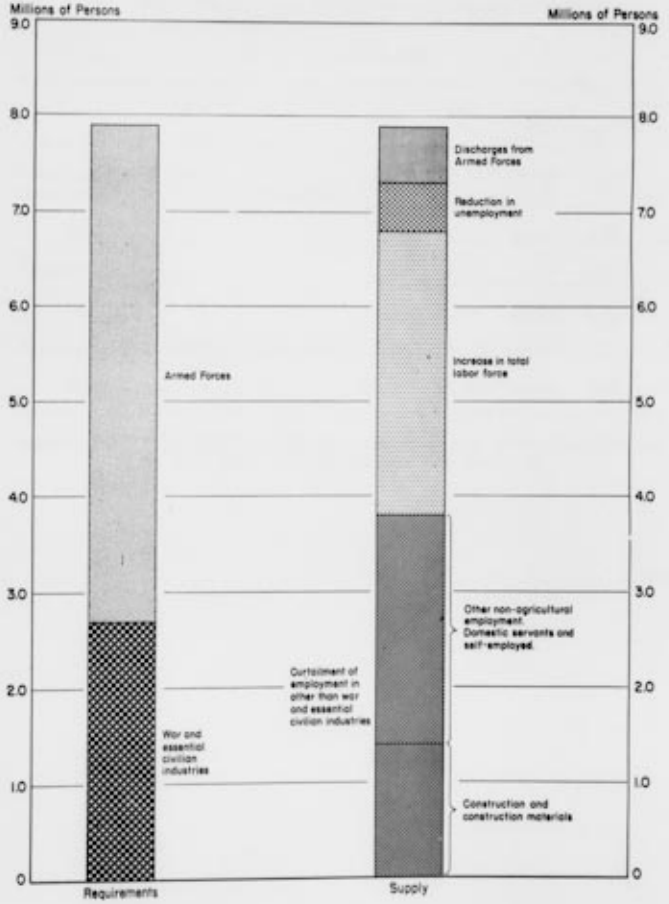
*Estimate

WAR PRODUCTION BOARD
Statistics Division

CHART XL

LABOR REQUIREMENTS AND SUPPLY

1943



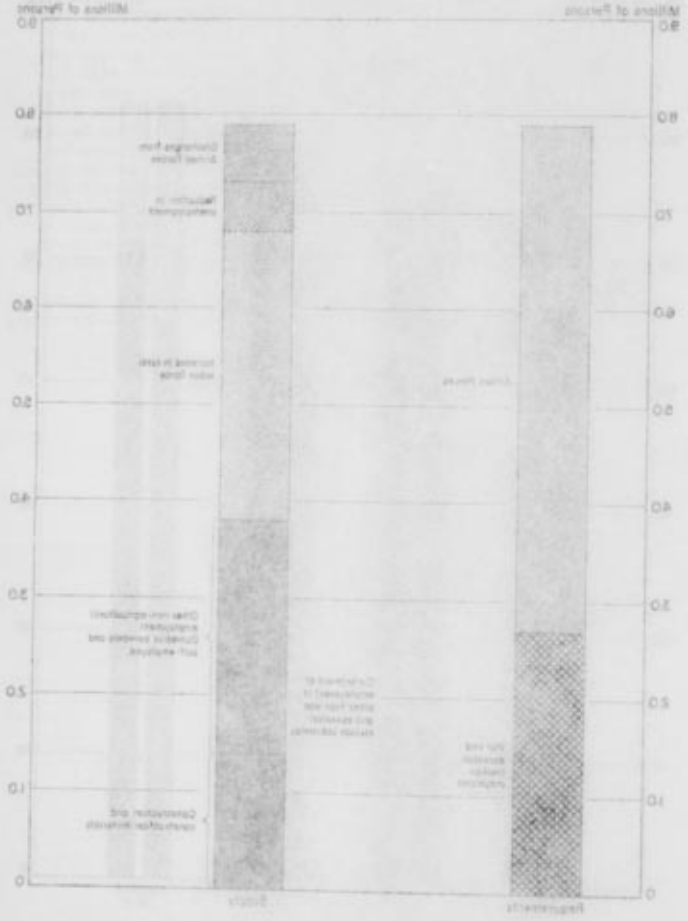


TABLE 64

Estimated Manpower Requirements Of War And Essential Civilian Industries, 1941 - 1943

(In Millions)

	Dec. 1941	Dec. 1942	Dec. 1943	Increase during 1942	Increase during 1943
Munitions industries	4.75	7.14	8.99	2.39	1.85
Basic metal and chemical industries	1.15	1.18	1.29	.03	.11
Subtotal	5.90	8.32	10.28	2.42	1.96
Federal war agencies	.46	1.47	1.97	1.01	.50
Subtotal	6.36	9.79	12.25	3.43	2.46
Transportation, utilities and fuel	4.59	4.63	4.85	.04	.22
Total	10.95	14.42	17.10	3.47	2.68

General Note: For definition of the categories and sources of 1941 and 1942 data, see General Notes to Table 38.

TABLE 65

Military Manpower Requirements for 1943

(In Millions)

A. Net Increase in Strength as of Dec. 31:	1942	1943	Increase
Total, Including Nurses and Women's Reserves	7.00	11.11	4.11
Total, Excluding Nurses and Women's Reserves	6.96	10.78	3.82
Army	5.37	8.25	2.88
Navy	1.59	2.53	.94
Navy	1.21	2.00	.79
Marine Corps	.24	.36	.12
Coast Guard	.14	.17	.03
Nurses and Women's Reserves	.04	.33	.29
Army	.03	.29	.26
Navy	.01	.04	.03

B. Manpower Requirements, 1943 Calendar Year Basis:	Total	Men	Women
Gross Manpower Requirements	5.00	4.70	.30
Discharges (except Disabled)	.60	.59	.01
Net Manpower Requirements	4.40	4.11	.29
Other Losses	.29	.29	-
Net Increase in Strength	4.11	3.82	.29

C. Net Increase in Strength, as of Dec. 8:	1942	1943	Increase
Total	6.58	10.88	4.30

D. Manpower Requirements, Dec. 8, Basis:	Total	Men	Women
Gross Manpower Requirements	5.19	4.91	.29
Discharges (except Disabled)	.60	.60	.01
Net Manpower Requirements	4.59	4.31	.28
Other Losses	.29	.29	-
Net Increase in Strength	4.30	4.02	.28

TABLE 66

Military Separations in Munitions and Basic Metal and Chemicals Industries

(In Millions)

		Total Employment	Male Employment	Military Separations	Per Cent of Male Employment
1942	Jan.	5.99	5.48	.05	0.8
	Feb.	6.16	5.62	.04	0.7
	Mar.	6.34	5.77	.04	0.7
	Apr.	6.54	5.94	.05	0.8
	May	6.73	6.06	.05	0.9
	June	6.96	6.22	.06	0.9
	July	7.24	6.41	.08	1.2
	Aug.	7.48	6.55	.10	1.5
	Sept.	7.66	6.64	.13	2.0
	Oct.	7.89	6.74	.16	2.3
	Nov.	8.10	6.79	.14	2.1
	Dec.	8.36	6.89	.13	1.9
	Total	--	--	1.03	16.5
Monthly Average		7.12	6.26	--	1.4
1943	Total	--	--	1.30	18.0
Monthly Average		9.40	7.23	--	1.5

General Notes: 1942: Military separation rates for all employees obtained from special tabulations of data from Bureau of Labor Statistics labor turnover reports for the industries included in these categories. For definition of categories, and sources of total employment data, see notes to Table 38. Male employment estimated from data from B.L.S. for April and October; rough interpolations for other months prior to October; November and December estimated from data from WPB Plant Operations Survey.

1943: Total employment estimated on the basis of requirements, given elsewhere in this section. Male employment estimated by assuming substantial increase in the proportion of women in these industries. Male military separation rate estimated on the basis of relationship to gross increase in the Armed Forces during the last half of 1943.

TABLE 67

Summary of Results of Census Survey of the Labor Reserve in November, 1942

(In Millions)

Total available labor reserve		**5.0**
Men, Total		**.5**
Students:	Ages 14-19	.2
Others:	Ages 45-64	.1
	Ages 65 and over	.2
Women, Total		**4.5**
Students:	Ages 14-19	.2
	Ages 20-24	.1
Others:	Ages 25-44	.1
Home houseworkers, Total		**4.1**
	Ages 14-19	.3
	Ages 20-24	.4
	Ages 25-44	2.0
	Ages 45-64	1.3
	Ages 65 and over	.1

Source: Adapted from "The Nation's Available Labor Reserve", Census release, MRLF No. 7.

TABLE 68

Changes In The Total Labor Force Of The United States, During 1941 And 1942

	Number in Millions			Per Cent of Population 14 Years of Age and Over	
	Total	Male	Female	Male	Female
December 1940	54.2	41.7	12.5	83.2	24.7
December 1941	56.1	42.3	13.8	83.6	27.0
December 1942	59.6	44.1	15.5	86.3	30.0
December 1943 (estimated)	62.6	45.0	17.6	87.4	33.7
Increase to December 1942					
From December 1940	5.4	2.4	3.0	3.1(2.5)	5.3(5.2)
From December 1941	3.5	1.8	1.7	2.7(2.1)	3.0(3.0)
Increase to December 1943					
From December 1940	8.4	3.3	5.1	4.2(3.4)	9.0(9.5)
From December 1942	3.0	0.9	2.1	1.1(0.9)	3.7(4.3)

General Notes: "Labor force" as given here includes Armed Forces. Data are from Census Monthly Report on the Labor Force, plus Armed Forces. Increases shown above are smaller for Males and for Total than those given in section I-6 of this report because in these figures adjustment has been made for errors made by the Census Bureau as a result of their inability to obtain correct figures on the strength of the Armed Forces.

For derivation of December 1943 estimate, see text.

Figures in parentheses are estimates adjusted approximately for comparability with British data given in text, excluding persons 65 years of age and over and domestic servants.

TABLE 69

Required Changes in Employment in Nonagricultural "Nonwar" Industries in 1943, by Economic Categories

	Dec. 1941	Dec. 1942	Dec. 1943	Changes During 1942	Changes During 1943
Construction and construction materials	3.13	2.86	1.47	-.27	-1.39
Other manufacturing	6.77	6.58	*	-.19	
Food	1.38	1.40	1.40	+.02	-.00
Textiles and clothing	2.80	2.69	*	-.11	
Other	2.59	2.49	*	-.10	
					-1.68
Trade	7.51	7.10	*	-.41	
Service and miscellaneous	4.23	4.29	*	+.06	
Government, other than war agencies	3.50	3.57	3.57	+.07	.00
Total "nonwar" industries	25.14	24.40	21.33	-.74	-3.07

* No basis for estimate.

General Note: For description of categories and sources of 1941 and 1942 data, see General Notes to Table 38.

TABLE 70

Balance Sheet of Labor Requirements and Supply in 1943

(millions)

Requirements		
Armed Forces		5.19
War and essential civilian industries		2.68
		7.87
Supply		
Discharges from Armed Forces		0.60
Reduction in unemployment		0.50
Increase in the labor force		3.00
Subtotal		4.10
Reduction in employment, total		3.77
Construction and construction materials	1.39	
Other nonagricultural industries	1.68	
Other manufacturing		
Trade		
Service and miscellaneous		
Domestic service	.30	
Self-employed	.40	
Total Supply		7.87

SECRET

II-5. The Impact on Civilian Consumption in 1943

In 1942, the economy barely maintained the level of civilian consumption while absorbing a great increase in war production and a great drain of manpower to the armed forces. The present indication is that it cannot repeat its performance in 1943. The expansion of output to be absorbed is greater and the unused resources of the economy are now far smaller than they were at the beginning of 1942.

The Difficulties to be Met

The output of munitions and military construction in 1942 was $33 billion greater than in 1941. To achieve the 1943 munitions and construction program, we shall have to produce $37 billion more goods than in 1942. The expansion of output to be achieved between 1942 and 1943 is even greater than that achieved between 1941 and 1942. Even the increases to be achieved between one year end and the next are impressive by 1942 standards. In the fourth quarter of 1942, munitions and military construction were $11 billion greater than in the same quarter of the previous year. By the end of 1943, we must produce at a rate of $7 billion greater than at the end of 1942.

In addition, the present plans of the Army and Navy call for a great expansion of personnel. Between December, 1941 and December, 1942, the Armed Forces took 4.9 million men. During the current year they plan to take nearly as many more - 4.4 million men (net).

These great drains, finally, must be met by an economy that is already working at close to capacity levels. It is true that the new supply of many critical materials will be greater in 1943 than in 1942, but these increases in most cases will not be wholly adequate to meet the increase of military demands. Further pressure upon the civilian use of raw materials is in prospect.

In 1943, moreover, we face shortages of labor as well as of materials. The additional men required to fill the ranks of the Armed Forces and war industries must be secured from labor reserves that are already somewhat depleted. In 1942 as many as 2.3 million unemployed persons were drawn into employment. By the end of the year, however, the pool of unemployed had been reduced to 1.5 million. This was less than 3 percent of the total labor force. It will be difficult to reduce this number further, not only because many of the remaining unemployed are physically handicapped and otherwise difficult to employ, but also because a certain percentage of workers must always be unemployed in the course of shifting from one job to another. Indeed, unless action is taken to reduce the rate of labor turnover such transfers may be especially numerous in 1943. For in the past year a very large number of people found war jobs by reason of the conversion of their old plants and industries to munitions production. Such conversions are now virtually completed.

In 1943, the men who turn from civilian to war work must in larger measure actually move from one industry to another.

The declines in output for civilians to which these conditions point are already under way. We saw in Part I that, even in 1942, the output of consumers' durable goods and of clothing was falling. Only the output of foods and services was being maintained. Labor shortages in 1943 will cut into the volume of services that consumers can secure, and though the total output of food will probably be larger in 1943 than in 1942, the quantity available for civilians will have to be cut if military and export requirements are to be met.

These declines in output can be offset in part by liquidation of inventories. Indeed it is certain that the decline in consumption in 1943 need not be quite as great as the decline in output. Although inventories were falling rapidly at the end of 1942, there was no dissipation of inventories over the year as a whole. In 1943, on the other hand, liquidation of stocks is expected to add between 1 and 3 billion dollars to goods available for civilian purchases. By comparison with the latter part of 1942, on the other hand, very little if any relief from this source can be expected. For the rate of dissipation of stocks was extremely rapid in the last quarter of 1942 and this rate will hardly be exceeded in 1943.

The estimates now available of the impact of the 1943 program upon the civilian economy run in terms of the flow of goods to consumers. Explicit estimates of consumers' takings measured in dollar values have been made by a number of investigators.1/ No great accuracy can be claimed for these forecasts. Nor can the extent of agreement among them lend great support to them for they were not prepared wholly independently. They do represent, however, orderly compilations of the information now available about the prospects for 1943. A consideration of the material will help to clarify the situation that faces us in the coming year.

Estimates of Total Consumption

These estimates are derived in two ways. One set, which we may call direct estimates, is secured by the summation of forecasts of the individual components of consumers' expenditures -- food, clothing, house rent, and so forth. A second set, which may be called

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1/ Forecasts made by the following agencies were used as a basis for the discussion of this section: Division of Research and Statistics, Treasury Department; Office of Civilian Supply, WPB; Office of Progress Reports, WPB; Trends and Stabilization Section, National Resources Planning Board; Planning Committee, WPB; Division of Research, OPA; and Munitions Branch, Statistics Division, WPB.

residual estimates, is secured by forecasting the total economic output of the nation during 1943 and subtracting output for war, for government non-war purposes and for capital investment by private business. The remainder is available for consumption. The estimates yielded by the two methods are considered in turn.

Direct estimates. Investigators in five different agencies have made direct estimates of prospective total consumption in 1943. Their forecasts indicate that the supply of goods and services available to civilians in 1943 is likely to be between 10 and 15 percent lower than in 1942. Moreover, their calculations suggest that in the second half of 1943 civilian supply, restricted by mounting military demands, may be as much as 20 percent below the level of the second half of 1942.

Estimates by the direct method are built up from calculations, made in greater or less detail, in a number of separate areas which together comprise the whole of consumers' goods and services. The first step in each case is to estimate total output. These figures are then adjusted for military requirements, exports and inventory changes. The resulting figures are the quantities which represent the goods and services going to consumers.

Each step in the process is, unfortunately, subject to great uncertainty. The estimate of total output in each commodity group depends largely upon information about the available supplies of raw materials and facilities. Some effort was made to take account of labor supply, but this was naturally far more difficult. For while it is probable that consumers' goods industries as a whole will suffer from some labor shortage, it is not possible to say with any assurance to what degree each will be affected. Moreover, the available information about military and export requirements for civilian type goods is not very accurate. By comparison with munitions, military and export requirements, demands in the non-munitions area are less completely formulated and scheduled. One cannot, therefore, emphasize too much the provisional character of these forecasts.

Civilian supply as a residual. The quantity of goods and services available to civilians may also be forecast indirectly. By this procedure, a forecast is first made of the total output of the economy including the output of war goods and of other finished goods and services for uses other than civilian consumption. From this estimate of the value of the total economic output of the nation -- or gross national product -- the subtraction of Federal expenditures for war purposes, of other governmental expenditures and of the value of finished goods and services bought by business on capital account, leaves the supply of goods and services for consumers as a remainder.

Three investigations[1] yield such forecasts, each secured by basically different techniques -- a fact that adds interest and security to the results obtained. Each forecaster, however, made different assumptions about both the size of gross national product that might be achieved in 1943 and the magnitude of the war program capable of accomplishment.

Upon the assumption that the full war program now projected is achieved, the forecasts suggest that the supply of goods and services available to civilians in 1943 will be between 8 and 14 percent smaller than in 1942. These results correspond well with the forecasts yielded by the direct estimates discussed earlier. Alternatively, it was assumed that the war program would fail of achievement by as much as $7.5 billion. This assumption naturally produces a more favorable forecast of civilian supply. On this hypothesis, it appears that the civilian supply in 1943 will be between 3.5 and 10 percent lower than in 1942. But even on the most optimistic estimates of gross national product and the least optimistic estimate of war production, a comparison of the second halves of 1942 and 1943 indicates a curtailment of about 8 percent.

These figures, however, cannot by themselves indicate the full impact of the increase in war production upon many important areas of the civilian economy. For the forecasts as shown above are combinations of supply in areas like housing accommodation and tobacco, which will decrease little or not at all, with supply in areas like durable goods and clothing in which the cuts are likely to be more severe than the average for all areas. For a more adequate impression of our problems in 1943, more detailed forecasts are required.

Estimates of Civilian Supply in Major Areas

Forecasts in detail are subject to even wider margins of error than affect the estimates of total supply. There is less occasion for errors in particular segments to offset each other, and there is no way to check the direct estimates by indirect means. Still the data set out below probably furnish a fairly good impression of the different degrees to which the expansion of war production in 1943 will be felt in the major areas of civilian expenditures.

Table 71 presents estimates for 11 groups of commodities and 7 groups of services from 1939 through 1943. These estimates represent the actual physical volume of consumption through 1942 as calculated by the Department of Commerce and forecasts for 1943 made by the Treasury Department. The overall decline from 1942 to 1943

1/ National Resources Planning Board, Fourth Quarter Report, and unpublished memoranda prepared in the Munitions Branch of the Statistics Division, WPB, and the Planning Committee, WPB.

indicated by these figures, 12 percent, brings consumption to the 1939 level.

This degree of curtailment lies in the middle of the range suggested by the various estimates discussed above, and we may therefore take these forecasts to be fairly representative of the outlook as it now appears to a number of different investigators.

As might be expected the forecast decline in consumption is greater for commodities as a whole than for services. The expected curtailment between 1942 and the second half of 1943 is 20 percent for commodities, only 8 percent for services. At these levels, consumers' purchases of commodities would be 10.5 percent below the 1939 level. Services on the contrary would stand about 7.5 percent above 1939. And commodities and services taken together would stand some 5 percent below 1939.

The greatest curtailments from 1942 are in durable goods. Purchases of furniture and household appliances, for example, are expected to decline over 40 percent from the levels of 1942 to the second half of 1943. Between the same two periods, the forecast decline of jewelry, clocks and watches is over 60 percent. Another striking decline is that in consumption of motor fuel, tires and parts. Present rations of gas and a small decline of tires and parts from current levels will cause a reduction in this group of 35 percent compared with 1942.

Possibly more important than these curtailments, however, are those forecast for clothing and textile products. By the second half of 1943, clothing purchases are expected to stand at but 75 percent of 1942 and at less than 90 percent of 1939. These reductions, though less steep than the apparent curtailment of durable goods consumption probably affect the ordinary consumer more severely. The high rate of consumer purchases of durables during 1940, 1941 and part of 1942 brought consumers' stocks of these goods to high levels, and they will continue to furnish adequate service for some years to come. Clothing wears out more rapidly, however, and with replacement curtailed, our apparel standards must soon begin to drop.

Supply of food to consumers is also expected to fall seriously in 1943. By the second half of the year a 13 percent drop from 1942 levels is expected. In spite of this decline, however, food consumption will still be slightly above prewar levels.

The chief reason for the relative maintenance of total services in 1943 is the fact that we are, on the whole, amply provided with shelter. Our figures, based on overall provision of dwelling units indicate a slight rise in the standard of shelter in 1943

compared with 1942. On this basis, the rise since 1939 would approach 10 percent. Unfortunately there is no way to take adequate account of the deterioration in the quality of shelter that has accompanied the great shift of population from their prewar homes to overcrowded centers of war industry. This must be considered an important offset to the increase in housing indicated on the face of the data.

Other services will decline from 1942 to 1943. The most important change is undoubtedly that in medical care. So extensive are present plans for the induction of physicians and nurses into the Armed Forces that medical care, together with funeral services, is expected to decline 10 percent from 1942 to the second half of 1943. At this level, however, the standard of medical service will still be some 10 percent higher than in 1939. It is clear that while most people will be unable to secure the care provided in 1942, the provision of medical services will still be better than in the days immediately preceding the outbreak of war.

Another large, but far less important, area of service expected to drop considerably in 1943 is domestic help. The transfer of domestic servants to industry is reflected in the forecasts for home maintenance. In the second part of 1942 such services are expected to stand 17 percent below 1942 and over 20 percent below 1939. Recreation, too, will be hard hit, partly by labor difficulties and partly by transportation shortages. By the second half of 1943, the drop from 1942 is expected to be 25 percent. This would bring such services back to 1939 levels.

Other service areas, too, are expected to decline from 1942 levels. The curtailment of transportation will be especially notable. But judging by the forecasts for the broad areas surveyed, none of the services except home maintenance will be provided in smaller volume than in 1939. Transportation furnished will still exceed prewar levels by some 20 percent, household utilities will be 5 percent higher than 1939, and personal services, such as beauty parlors and laundries, will stand nearly 6 percent higher than 1939.

Consumption per Capita

The forecasts of consumers' purchases discussed above naturally do not include consumption by members of the Armed Forces. Hence to the extent that the civilian population declines because of the expansion of our military personnel, the prospective curtailments of total consumption discussed above exaggerate the cut in consumption per capita. As it happens, no great adjustments are required on this account. Indexes of the physical volume of consumption adjusted for changes in total population and for the

growth of the Armed Forces are presented in Table 72 and Chart XLI.

The civilian population is expected to decline about 2.5 percent between 1942 and 1943. The 12 percent drop in total civilian consumption between the two years will, therefore, mean a drop of only 10 percent per capita. By comparison with 1939, per capita civilian consumption in 1943 will be negligibly higher - instead of negligibly lower.

The forecasts of total consumption in the second half of 1943 indicated a drop of some 16 percent from average 1942 levels, and of 5 percent from 1939 levels. Per capita, however, the drop in consumption will be only 14 percent from 1942 to the second part of 1943. The drop from 1939 to the same period will be just short of 2 percent - a decline that can hardly be considered significant in view of the crudity of the estimates.

Consumption and Minimum Requirements

The discussion above has attempted to indicate the severity of the expected curtailment of consumption by comparisons with the levels prevailing in the prewar year, 1939. Another way of judging the adequacy of the quantity of goods consumers are likely to secure in 1943 is to contrast it with the minimum quantity required. Such comparisons are presented in Table 73 and Chart XLII.

The estimates of minimum essential civilian requirements there shown are those prepared by the Office of Civilian Supply. Minor adjustments and the consolidation of several groups served to make these estimates comparable with the forecasts of consumption presented above. The estimates of minimum or "bedrock" requirements attempt to set the quantities of goods and services in broad functional groups at such levels that, "in a long war, it is believed curtailment below these levels would detract more from the prosecution of the ...war...than it would help by releasing materials, labor or other resources." For short periods of time, consumption might be still further contracted, but, in the opinion of the Office of Civilian Supply, such further curtailment, if long maintained, would result in a net reduction of our fighting efficiency. On the other hand, the levels set are so low that they can only be justified on the assumption that the goods supplied are perfectly distributed. Thus this definition of bedrock requirements implies a much wider extension and far more efficient administration of rationing than is now in prospect. Given the present scope and efficiency of rationing procedures, it would be necessary to supply more than the stated requirements in order to ensure that each individual's minimum needs are provided for.

The consumption forecasts for 1943 exceed minimum requirements in the aggregate by some 31 percent. The apparent excess in the first half year is 37 percent; in the second half of 1943, 26 percent. Thus it appears that curtailments far greater than those in prospect in 1943 might be made with advantage to the war effort. It is well to point out, however, that the extent by which such curtailment might immediately add resources to war production is less than the difference between 1943 consumption and the level of minimum requirements. This is due, in part, to the fact that a portion of 1943 consumption will be secured from dissipation of inventories, and, in part, to the time required to transfer workers from their present employments to war work. Thus if consumption were suddenly cut to minimum levels, the chief result for a time might be an increase of unemployment. And finally, the curtailment of consumption is not a costless procedure from the point of view of war production. Some losses in efficiency (presumably less than the value of the resources released) are to be anticipated, and it would be necessary to add considerably to the force of officials devoted to controlling the production and distribution of consumers' goods.

By comparison with minimum requirements, the prospective surplus of services supplied is far smaller than that of commodities. For the year 1943 as a whole, consumption of services appears to exceed requirements by only 9 percent. This is partly due to the special treatment used in the case of the most important of the services, namely housing. Since the stock of houses is given and cannot be reduced except by ordinary wear, minimum requirements were not set below the level that this existing stock can furnish. More important, however, is the fact that in almost all cases, services are highly perishable. Thus, by contrast with durable commodities, it is rarely possible in the case of services to set requirements low because consumers' stocks are very large.

In two service areas, our forecasts indicate that consumption will, in fact, not exceed requirements. In the second half of 1943, home maintenance (largely, domestic service) is expected barely to equal bedrock needs. On the one hand this reflects a large continued drain of domestic servants to industry, and on the other, a rather large need for domestic servants to make possible the release of housewives to industry.

Transportation supplied to consumers will fall somewhat below minimum needs if the forecasts here presented are accurate. A drop of only 11 percent below 1942 levels is forecast, but minimum requirements are set only about 5 percent below 1942. Requirements for local transport by common carrier are held at 1942 levels because of the small portion of such travel that serves social or recreational purposes. No useful purpose would be served by curtailing it since equipment and manpower requirements are determined by rush

hour travel to and from work. Requirements for inter-city travel, far less important than local transportation, are also held close to recent levels because only a small part of such travel is recreational. Thus the only available area of curtailment was in services to consumer-operated vehicles. Such services are heavily slashed. These considerations make it clear that there is danger of a decline in the provision of civilian transportation services that may be dangerous to the war effort.

Another service area being contracted to a level close to the danger point is medical care. On these estimates, supply will exceed requirements by less than 5 percent in the second half of this year. In view of the fact that the estimate of requirements assumes perfect distribution of the available supply, the apparent surplus is probably more seeming than real.

Commodities as a whole are now expected to be supplied in quantities greatly in excess of minimum needs. The apparent surplus for the first half of 1943 is 54 percent, for the second half, 39 percent. In spite of the severe prospective cuts in food and clothing consumption by the second half of the year, the supply of each will exceed requirements by close to 30 percent. Prospective surpluses are even greater in other important areas--195 percent in furniture and household appliances, 56 percent in drugs and toilet and cleaning preparations, 52 percent in tobacco.

Only two broad commodity groups appear to be close to the danger point. These are household fuels and motor fuels, tires and parts. The forecasts suggest a surplus of 9 percent for the first group and of 4 percent for the second in the latter part of 1943. Since major elements of both groups are already being rationed it appears that great care in the administration of the rationing schemes is indicated if the short supplies are to be rendered adequate.

Consumption in Foreign Countries

The serious curtailments of civilian consumption that are in prospect in 1943 invite comparison with developments in foreign countries. Data that are fairly comparable with United States figures can be compiled for the United Kingdom and Canada (Table 74). A serious difficulty in the way of interpreting the figures is, of course, the different times at which the war effort started in each country and the different pace at which these efforts developed. To overcome this difficulty in part we also present estimates of the proportion of the gross national product, that is of the total economic output, of each country devoted to war purposes.

The war effort in the United Kingdom started earlier than in the other two countries. Even in 1938 it absorbed 6 percent of the

country's gross national product and by 1941 had risen to 47 percent. In the ordinary course the ratio would have been still higher in 1942. That it did not rise is due to the fact that imports from Canada are now received as a gift and thus not charged to war expenditures. Lend-Lease receipts from the U. S. are similarly treated.1/

This great increase in the proportion of total output devoted to war has been accompanied by a substantial decline of consumption. By 1941, three years after the beginning of the war effort, total consumption stood 10 percent below 1938 and in 1942, the fourth year of war effort, there was a further curtailment to 16 percent below 1938.

The year 1939 is often taken as the last year before the beginning of the war effort in the United States. If we use this year as a comparison base, American experience appears to stand in sharp contrast to that of Great Britain. In 1942, the third year of the war effort, consumption was 13 percent higher than in 1939. Even in 1943, present expectations are that consumption will not be reduced significantly by comparison with 1939.

This strikingly different experience may be traced to two facts. One is that the war effort in the United States did not attain any considerable size until some time in 1941. For better comparison with British experience, we might take the fiscal year ending June 1941 as a base period comparable with 1938 in the U. K. On this basis, present forecasts for 1943 suggest a drop in consumption of about 10 percent in two and one-half years as against a U. K. decline of 10 percent after 3 years.

A second factor accounting for the variant developments in the two countries is their different experience in increasing total physical output. Rough calculations suggest an increase of only 13 percent for the U. K. between 1938 and 1942. The United States, on the other hand, increased real gross national product over 35 percent between 1939 and 1942. To secure their increase in war expenditures, therefore, the U. K. had to rely heavily on curtailment of consumption and upon the dissipation of capital. In the United States in the same period, we were able both to add to capital and increase consumption. Only in 1943 will it be necessary for us to curtail consumption in order to find additional resources for war.

Canadian experience presents still another problem of interpretation. In 1939, when the U. K. was devoting 15 percent of its total output to war the Canadian ratio was still only 4 percent. If

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1/ The Canadian contribution and U. S. Lend-Lease shipments are treated as part of the war expenditures of those countries.

exports to U. K. were counted, this ratio would no doubt be somewhat greater. By 1942, the Canadian ratio had risen to 41 against the British 46, a somewhat sharper increase. Unlike Britain, however, Canadian consumption rose some 15 percent between 1939 and 1942. This favorable experience reflects a great increase in Canadian output and some disinvestment of capital. Forecasts for 1943 for Canada are not available.

These comparisons are suggestive indications of the burden imposed by war in each of the three countries. They indicate that United Kingdom standards of living have already been pushed far below prewar levels. In the U. S. and Canada we have thus far enjoyed higher standards than before the war, and in the U. S. at least, we shall only reach prewar levels in 1943.

Summary

The great expansion of output for war purposes in 1943 will be achieved only at the expense of a serious curtailment of civilian consumption. Present indications are that consumers will not be able to purchase more than 85 or 90 percent as much in 1943 as in 1942. In the fourth quarter of 1943, indeed, the flow of goods and services to civilians may be 20 percent below the same quarter of 1942. Curtailments of this magnitude would reduce consumption to 1939 levels for the full year 1943 and bring it about 5 percent below 1939 in the fourth quarter of the year.

The severity of these declines for ordinary civilians will be somewhat mitigated by the departure of men to join the Armed Forces. Civilian population is expected to be about 2.5 percent smaller in 1942 than in 1943. But even after allowances have been made for changes in the total population and in the Armed Forces, per capita consumption by civilians must fall sharply in many areas. Between 1942 and the second half of 1943, present indications are that Food consumption per capita will fall 10 percent; clothing and textile products, 23 percent; household fuels, 20 percent; furniture, 40 percent; transportation, 12 percent; and medical care, 7 percent.

Serious as are these declines, however, per capita consumption will in most areas remain at a level higher than obtained in 1939. Durable consumers' goods and clothing consumption are the most significant exceptions. But even in the second half of 1943, it is not expected that the supply of clothing per person will fall as much as 10 percent below 1939 levels.

Consumption in 1943 will also stand higher than minimum requirements in almost every important area. For consumption as a whole, the excess even in the second half of the year will be in the neighborhood of 25 percent. For foods the excess over minimum requirements will be 30 percent; for clothing 27 percent. There

are a few areas, however, that will be scarce even by comparison with minimum requirements. One such area is household fuels; another is transportation both by private automobile and by common carrier. A third shortage area, of high importance, is medical care.

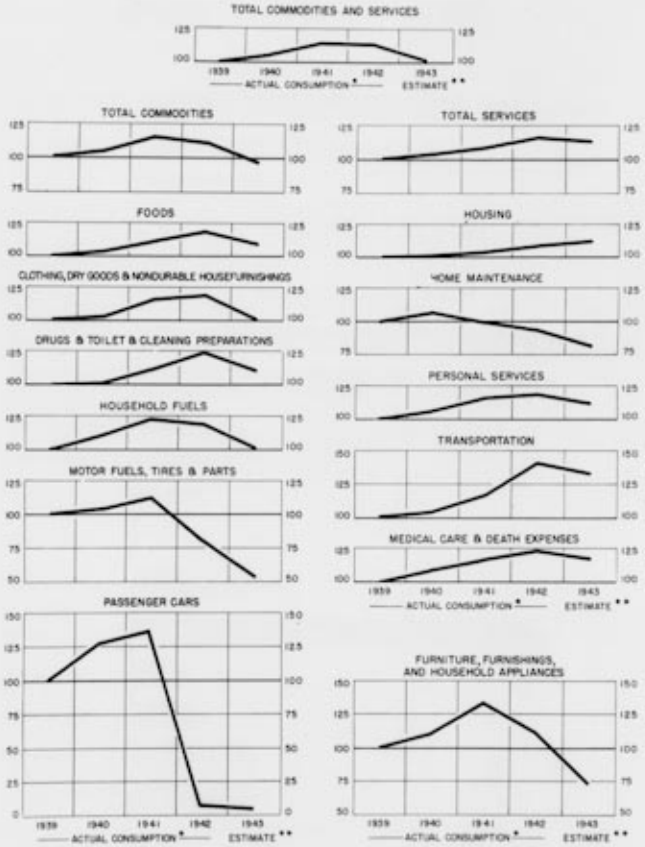
While these over-all figures suggest a picture for 1943 not unfavorable as compared with 1939, the large magnitude of the reduction expected during this year as compared with 1942 will raise problems of organization and planning that must not be minimized. The differences in the impact of this reduction among various categories of commodities and services and among various population groups and areas in the country must also be kept in mind as possibly aggravating its burden upon the consuming population.

CHART XLI

PHYSICAL VOLUME OF CONSUMERS PURCHASES PER CAPITA FOR SELECTED COMMODITIES AND SERVICES

1939 – 1943

INDEX: 1939 = 100



* Department of Commerce
** Treasury Department

WAR PRODUCTION BOARD
Statistics Division

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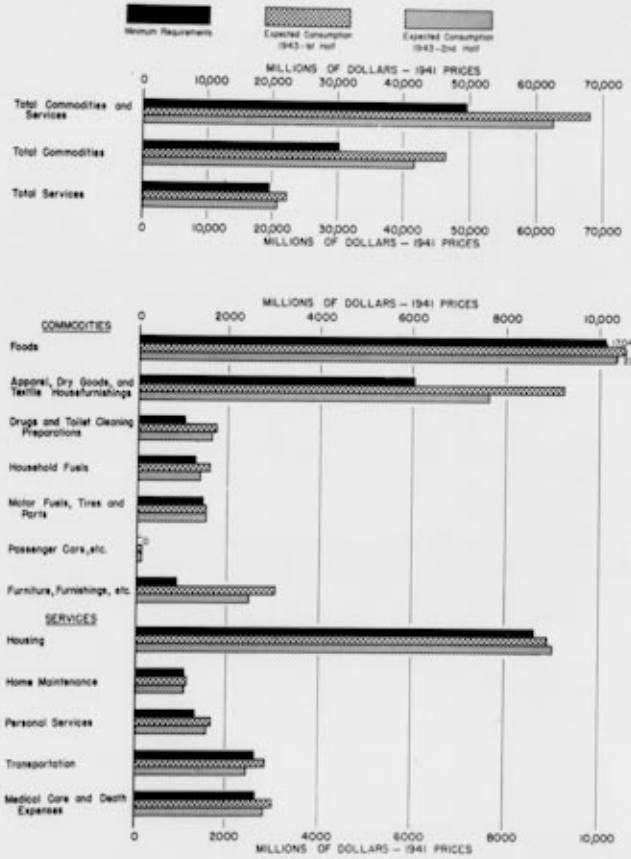
CHART XLII

COMPARISON OF EXPECTED CONSUMPTION IN 1943* WITH MINIMUM ESSENTIAL REQUIREMENTS**

Annual Rates



*Estimates of Treasury Department
**Estimates of Office of Civilian Supply, WPB

WAR PRODUCTION BOARD
Statistics Division

TABLE 71

Indexes of Physical Volume of Consumers' Purchases, 1939 - 1943

(1939 = 100)

	1939 a/	1940 a/	1941 a/	1942 a/	1943 b/	Annual Rates Seasonally Adjusted 1943 b/ 1st Half	Annual Rates Seasonally Adjusted 1943 b/ 2nd Half	1943 As Percent Of 1942 1st Half	1943 As Percent Of 1942 2nd Half
Commodities: Total	100.0	104.0	116.4	111.8	94.7	99.7	89.5	89	80
Foods	100.0	104.6	111.6	115.2	106.6	110.0	103.1	93	87
Tobacco	100.0	102.0	113.5	128.8	129.5	129.5	129.5	104	104
Clothing, dry goods and non-durable housefurnishings	100.0	103.2	116.4	116.3	97.8	107.2	88.5	91	75
Drugs and toilet and cleaning preparations	100.0	101.9	112.7	124.6	107.3	112.7	101.9	90	82
Paper products and recreational supplies	100.0	104.5	115.3	124.3	102.2	112.6	91.9	91	74
Household fuels	100.0	111.3	125.3	119.7	99.4	106.0	92.7	89	77
Motor fuels, tires and parts	100.0	104.9	113.6	80.2	52.5 c/	52.5 c/	52.5 c/	65 c/	65 c/
Passenger cars	100.0	126.7	137.2	7.7	4.3	4.3	4.3	56	56
Jewelry and clocks and watches	100.0	104.9	111.5	114.8	99.0	73.8	44.3	64	39
Furniture, furnishings, and household appliances	100.0	111.8	134.8	111.5	71.4	78.5	64.2	70	58
Durable commodities, n.e.c.	100.0	105.4	124.7	130.1	110.2	122.6	97.8	94	75
Services d/: Total	100.0	105.5	110.5	116.9	110.3	113.2	107.4	97	92
Housing	100.0	102.3	105.0	106.2	109.8	109.2	110.5	101	102
Home maintenance	100.0	106.0	100.4	93.4	79.9	82.5	77.3	88	83
Personal services	100.0	104.2	117.4	116.1	106.8	111.8	105.9	95	90
Transportation	100.0	104.8	116.8	140.2	129.8	139.7	119.8	100	85
Household utilities and communications	100.0	107.1	113.2	119.7	107.5	109.7	105.3	92	88
Medical care and death expenses	100.0	108.9	117.8	125.6	114.5	118.3	110.7	96	90
Recreation	100.0	112.5	117.5	130.1	113.0	125.8	100.2	91	75
Total Commodities and Services d/	100.0	105.9	114.7	113.3	99.5	103.7	94.9	92	84

a/ Actual consumption as estimated by the Department of Commerce.
b/ Forecasts based upon Treasury Department estimates.
c/ Estimate based on number of vehicle-miles allowed under present rationing system and on small decline in present rate of purchase of repair parts and tires.
d/ The following groups of services are omitted from these comparisons: Gifts to organizations, employment expense and family business, and educational fees (privately paid).

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TABLE 72

Indexes of Physical Volume of Consumers' Purchases Per Capita a/ - 1939 - 1943

(1939 = 100)

	1939	1940	1941	1942	1943	Annual Rates Seasonally Adjusted 1943		1943 as percent of 1942 1943	
						1st Half	2nd Half	1st Half	2nd Half
Commodities: Total	100.0	105.3	115.6	111.8	97.3	101.8	92.7	91	83
Foods	100.0	103.9	110.8	118.2	109.6	112.5	106.5	95	90
Tobacco	100.0	101.3	112.7	124.8	133.1	132.4	133.8	106	107
Clothing, dry goods and non-durable housefurnishings	100.0	102.5	115.6	118.3	100.5	109.6	91.4	93	77
Drugs and toilet and cleaning preparations	100.0	101.2	111.9	124.6	110.3	115.2	105.3	92	85
Paper products, recreational supplies	100.0	103.8	114.5	124.3	105.0	115.1	94.9	93	76
Household fuels	100.0	110.5	122.4	119.7	102.2	108.4	95.8	91	80
Motor fuels, tires and parts	100.0	104.2	112.8	80.2	54.0	53.7	54.2	67	68
Passenger cars	100.0	127.8	136.2	7.7	4.4	4.4	4.4	57	57
Jewelry and clocks and watches	100.0	104.2	110.7	114.8	60.6	75.5	45.8	66	40
Furniture, furnishings and household appliances	100.0	111.0	133.9	111.5	73.4	80.3	66.3	72	59
Durable commodities, n.e.c.	100.0	104.7	123.8	130.1	113.3	125.4	101.0	96	78
Services: Total	100.0	104.8	109.7	116.9	113.4	115.7	111.0	99	95
Housing	100.0	101.6	104.3	108.2	112.8	111.7	114.2	103	106
Home maintenance	100.0	107.2	99.7	93.4	82.1	84.4	79.9	90	86
Personal services	100.0	105.5	116.6	118.1	111.8	114.3	109.4	97	93
Transportation	100.0	104.1	116.0	140.2	133.4	142.8	123.8	102	88
Household utilities and communications	100.0	106.4	112.4	119.7	110.5	112.2	108.8	94	91
Medical care and death expenses	100.0	108.1	117.0	125.6	117.7	121.0	114.4	98	93
Recreation	100.0	111.7	116.7	136.1	116.1	126.6	105.6	93	78
Total Commodities and Services	100.0	105.2	113.9	113.3	102.3	106.0	98.0	94	86

a/ Consumers' purchases per capita were computed by dividing total purchases by population outside the Armed Forces. Sources of basic data are the same as in Table 71.

TABLE 73

Comparison of Expected Consumption in 1943
with Minimum Essential Requirements

	Annual Rates (Millions of dollars - 1941 prices)			Expected Consumption as Percent of Requirements 1943	
	Minimum a/ Requirements	Expected Consumption b/ 1943 1st Half	Expected Consumption b/ 1943 2nd Half	1st Half	2nd Half
Commodities: Total	30,106	46,403	41,740	154	139
Foods	17,043	23,703	22,222	139	130
Tobacco	1,707	2,590	2,590	152	152
Apparel, dry goods and textile housefurnishings	6,021	9,241	7,630	153	127
Drugs and toilet cleaning preparations	1,033	1,781	1,611	172	156
Paper products and recreational supplies	353	1,251	1,017	354	288
Household fuels	1,271	1,593	1,394	125	110
Motor fuels, tires and parts	1,440	1,500	1,500	104	104
Passenger cars, etc.	0	80	80	-	-
Jewelry, clocks and watches	2	451	271	-	-
Furniture, furnishings, etc.	851	3,070	2,511	360	295
Durable commodities, n.e.c.	384	1,143	914	298	238
Services: Total	19,726	22,068	20,951	112	106
Housing	8,615	8,926	9,025	104	105
Home maintenance	1,085	1,158	1,085	107	100
Personal services	1,344	1,688	1,598	126	119
Transportation	2,644	2,849	2,443	108	92
Household utilities and communication	2,174	2,369	2,272	109	105
Medical care and death expenses	2,688	3,026	2,833	113	105
Recreation	1,175	2,052	1,695	175	144
Total Commodities and Services	49,882	68,471	62,691	137	126

a/ Estimates of the Office of Civilian Supply, W.P.B. The following groups were adjusted to secure comparability with 1943 forecasts:
1 Furniture, furnishings, etc. - Requirements of 50.1 million dollars added to allow for replacement of heating and cooking appliances in owner-occupied homes.
2 Housing - Imputed rent of owner-occupied homes eliminated. - Requirements for replacement of heating and cooking appliances transferred to Furniture.
3 Medical care and death expenses and Recreation - Requirements for services rendered without direct charge to consumers were eliminated.

b/ Based on estimates of the Treasury Department.

TABLE 74

War Expenditures and Civilian Consumption, United Kingdom, Canada and United States, 1938 - 43

Year	Percent of Gross National Product Devoted to War a/			Indexes of Physical Volume of Consumption		
	U. K.	Canada	U. S.	U. K.	Canada	U. S.
	(1)	(2)	(3)	(4)	(5)	(6)
1938	6	1	-	100.0	95.0	-
1939	15	3	2	-	100.0	100.0
1940	38	12	3	94.5	107.0	105.9
1941	47	28	9	90.0	113.0	114.7
1942	46	41	31	84.0	115.0	113.3
1943	-	-	51	-	-	99.5

a/ Based on dollar values not corrected for price changes.

Sources: Column (1) OPA estimates based on data in British White Paper (Cmd. 6347, April 1942); 1942 estimate is based on data for year ending March 1943. Interest on government debt is added to gross national product.
Column (2) OPA estimates based on confidential sources.
Column (3) 1939 - 1942 from Department of Commerce; 1943 from Treasury Department.
Column (4) Geoffrey Crowther, "National Incomes, U. S. and U. K.", unpublished memorandum dated December, 1942 - Includes imputed rent of owner-occupied homes. Estimate for 1942 based on data for year ending March 1943.
Column (5) OPA estimates based on confidential sources. Omits imputed rent of owner-occupied homes.
Column (6) 1939 - 1942 from Department of Commerce; 1943 from Treasury Department. Omits imputed rent on owner-occupied homes, privately paid education, employment, expense and services connected with family affairs and gifts to organizations.

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PART THREE

BASIC POLICY PROBLEMS FOR 1947

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TABLE OF CONTENTS, PART III

III-1 Introduction

History may well write the 1942 war production performance of the United States as a miraculous achievement. After a year and a half of slow-starting and gradual mobilization for purposes of defense and aid to anti-Axis belligerents, the entrance of the United States into the war in December 1941 initiated a tremendous upsurge in the output of fighting equipment. In June 1940, the first full month of defense activity in the United States, total military expenditures were less than $300 million; and this outlay comprised primarily deliveries under orders placed here by foreign governments and expenditures for peacetime military activities of the United States. Under the stimulus of the growing defense program and increased foreign procurement, total expenditures for military purposes rose to over $800 million in December of 1940. During 1941, the increased need for larger defense preparation and for construction and facility expansions incidental thereto, adoption of the Arsenal-of-Democracy program, and finally, entrance into the war, spurred mobilization in the United States and brought total war expenditures to over $2 billion in December of 1941.

Throughout 1942, war production increased month after month with the net result that the rate of expenditures at the end of the year was almost three times that at the end of 1941. Although absolute gains and the rate of increase were slowed up in some months, the year was characterized by a phenomenal rise throughout the first half and again in the final two months. The gains during 1942 were particularly marked in the output of munitions. The "seed corn" planted in earlier years was beginning to yield results. Though military construction and productive facilities continued to account for a large proportion of total expenditures, munitions output climbed even more sharply. It rose from $1 billion at the end of 1941 to $2 billion in June of 1942 and to $4.4 billion by the end of 1942. Nearly as large a quantity of weapons of warfare was produced in the final six months of 1942 as in the entire preceding twenty-four months. Because of demands for training purposes here in the United States, widespread distribution of exported armament throughout the world, and the lag between production of weapons and their actual use at the fighting front, the impact of America's war effort was not of real consequence until late in 1942. Thus, while 1940 and 1941 brought enlargement of basic resources and initiation of large-scale fabricating facilities, and 1942 saw the first mass output of fighting equipment, the big impact upon the enemy of the product of America's mines and factories will be felt in 1943.

The bare figures cited above convey a striking impression of the phenomenal gains attained in war production during 1942. An even clearer realization of what these gains imply is secured as one traces the successive phases in the complex business of turning out war materiel on a large scale. Production objectives had to be determined with sufficient comprehensiveness to take account of all the contingencies of the armed conflict; with adequate detail to

provide the basis for specific arrangements for production; and with a clear indication of importance and urgency to permit intelligent decisions as to priority and timing. Sanctions in the form of appropriations had to be secured from Congress, with the attendant need of translating the objectives into the monetary common denominator; contracts had to be placed, with the proper choice of the plants and firms that could assume production and delivery responsibilities; production schedules had to be elaborated, spelling out the objectives over time and providing the basis for planning for the immediate future. Scarce materials had to be mobilized--the total supply augmented and considerable diversion from less to more essential uses secured. New facilities had to be built to produce such military end products as could not be manufactured by peacetime tools, or to expand the supply of materials and components critically needed in volumes much larger than in peacetime. Old facilities had to be converted to new uses, or the rate of utilization raised to take care of expanded needs. Huge additions had to be made to the active labor supply; and large flows secured to the rapidly expanding war plants. The impact on the civilian economy--both by transfer of resources into military production because of its superior monetary incentives and by restrictions upon civilian uses of certain critical resources--had to be planned and regulated to avoid undue hardships. A brief review of these sequential aspects of the organization of the war production effort in 1942 was provided in Part I of this report.

The ability of the United States to attain such a high level of war production so rapidly may be accounted for by the tremendous reservoir of existing and potential resources at hand when the defense program was first initiated. The size of this reservoir was the subject of many studies and much discussion in the period before Pearl Harbor, but few people believed that within the short space of from two to three years the total output of the nation could be increased so substantially. The results attained should serve to make us appreciate the tremendous losses and waste of available resources permitted in peacetime; and they should serve as an indication of what can be accomplished when peace has once again been won.

Shortcomings of 1942

Although war production accomplishments to date justify great pride and increased confidence, there is no place in war time for complacency or smug contentment. War demands are insatiable and war casualties cannot be compensated for. An appraisal of 1942 is necessary, not so much to criticize past performance, in the light of hindsight wisdom, as to provide guidance in 1943.

A carping critic might easily find fault at every level of organization of our war production effort in 1942. He could stress the fact that a comprehensive set of production objectives was not at hand until some time after the war began, and that it has taken over a year of programming to take proper account of feasibility

considerations and to evolve a set of objectives in satisfactory consonance with needs of the conflict. He might contend that the translation of objectives into appropriations and contracts was done with too lavish and too careless a hand. He might claim that the generosity in appropriations led to an unreasonably large flow of purchasing power to the procurement agencies and resulted in considerable waste. He could charge that the torrential rate at which contracts were placed led to an unwarranted concentration of war work in the bigger firms and left too niggardly a share for the smaller and medium sized firms. He might point out that the production schedules of 1942 were unnecessarily optimistic and misleading; and that, accordingly, there was more lack of balance in output than would otherwise have been the case. He might claim that the mobilization of productive resources--materials, facilities, labor, management, and technical knowledge--was too timid to secure rapid conversion from peacetime uses, and too haphazard to ensure that the employment of resources in war production was thriftily directed to yield the maximum amount of fighting equipment.

In any rapid economic shift, some waste and misdirection are inevitable; and one may question only whether their extent is unduly large, never simply whether they are present. The major respects in which our experience during 1942 reveals errors, are closely interrelated and stem back too far to be of immediate relevance. The existence of production objectives that were too large can be traced back to insufficient preparedness and foresight, and to the consequent pressure by the several procurement agencies to raise their sights rapidly as insurance against contingencies; and this in turn explains in large part the unreliable character of the production schedules and the delay in working out a coordinated and tight system of controls that would minimize wasteful flow of scarce resources. Yet the lack of preparedness stems back to the general position of democratic societies in the prewar decade and leads to far-reaching considerations of little direct relevance to the problems of 1943.

The major inadequacies of 1942, which still remain with us--the slowness with which a set of feasible military production objectives was developed; the somewhat chaotic and prodigal way by which the programs were translated into specific assignments to the industrial system; the failure to develop promptly tight and well coordinated controls over the resources--do reveal most emphatically the vital importance of looking ahead and planning the use of resources. Only such planning will minimize costs, in terms of strain and dislocation produced in the economy, and maximize the returns, in terms of effective fighting equipment for the purpose of a rapid termination of the war.

The Task for 1943

This lesson is all the more important because the program for 1943 discussed in Part II of this report, is most ambitious. The latest set of requirements, as submitted by the Armed Services and

including the agreed-upon needs of the Allied Nations, calls for total expenditures in 1943 for war purposes of $106 billion. Of this total, $83 billion is the value of munitions, war construction, and war industrial facilities; the balance represents nonmunitions.

If these objectives are to be attained, monthly expenditures during 1943 must average close to $9 billion as compared with the 1942 monthly average of less than $5 billion and a monthly outlay of $7.1 billion in December 1942. Most significant is the fact that war expenditures must total well over $10 billion a month at the end of 1943. The percentage increase of the 1943 schedule over 1942 production is considerably less than the percentage increase of 1942 over 1941. However, the important fact is that the absolute increase scheduled for 1943 over 1942 is greater than the absolute gain in 1942 over 1941--$47 billion as compared with $42 billion. Yet this large gain will have to be attained under conditions that are in several respects less favorable than those in early 1942.

As already noted, the sharp rise in military output accomplished during the last year was made possible in large part through expansion of the total supply of materials, facilities, and labor resources. To a lesser degree the 1942 achievement can be accounted for by diversion of resources from normal peacetime activity to war purposes and by more effective utilization of the resources that were made available for war production. Although precise measurement is not possible, it would hardly be correct to characterize 1942 as a year of great efficiency and intensity of resource-use.

As we face 1943, there is little slack in the economic system. The relatively painless methods of mobilizing resources by bringing them out of idleness or out of clearly non-essential uses have been pretty much exhausted. The way towards increased output is now much more difficult since it will call for a more intensive utilization of resources already employed and since it will involve choices not between essential and non-essential uses but among uses all of which are essential.

1942 and 1943 - Major Differences

Two consequences flow from this difference in the situation at the beginning of 1943 as compared with early 1942. First, the choices that must be made during this year will be much more difficult than those required last year. New demands can be met only by greater disturbances elsewhere. This is true as between military and civilian needs. Careful evaluation of the competition between direct and indirect military demands will be necessary if we are to avoid serious dislocation by excessive diversion to military use of goods and services required for maintenance and repair of industry and support of the morale and efficiency of the civilian economy. It will be true also within the military sector. As the combat pattern of the war emerges and the demands for various kinds of materiel manifest themselves, the flow of resources must be flexible enough to meet these demands and to implement reductions required in

the production of other items. The needs for different types of materiel--for bombers as compared with fighters, for escort vessels as compared with combat vessels, for merchant vessels as compared with materiel to be shipped, for training equipment as compared with combat equipment, for newer weapons as compared with older weapons--are at any time difficult to assay; in 1943, as resources become more scarce, the selections must be more specific and in a sense more nearly correct. We shall more rarely have the choice of simply increasing total military output in order to make good our lack of foresight. Increasing the production of one weapon will generally mean reducing the output of another.

Second, it follows from the greater difficulty of these choices in 1943 and the underlying change in the task of mobilization from sheer extension in the volume of resources used to greater intensity and efficiency in their employment, that the production controls introduced in 1942 will have to be tightened and elaborated into a more closely coordinated framework. Looseness in controls, leakages of critical resources, reliance on voluntary participation, delays in introducing stringent conservation measures, and failure to pursue positively maximum material, labor, and plant efficiency must give way to increasingly stringent controls and regulations. Otherwise, it is well to recognize at once the impossibility of achieving the goals set for 1943. The appraisal of regulations and controls should be taken into consideration in the programming task. The increasing stringency of these controls is in itself an additional cost that must be paid for a larger military production program. The value of added munitions must be constantly assayed against their cost; and one of the costs is the degree of control of the economy necessary to yield the added armament.

This point is forcefully suggested by the review, in Part II of this report, of the supply and requirements situation in 1942 for the major productive resources--materials, facilities, and labor. The general analysis presented there is necessarily over-optimistic in that, using over-all supply and demand estimates, it cannot take into full account the difficulties in adjustment that may and do necessarily arise in the numerous specific channels of production. The adequacy of the total supply of materials in ingot form is no assurance that delays and difficulties will not be experienced because of bottlenecks in certain shapes and forms. The feasibility of producing the total volume of construction and industrial equipment programmed for 1943 does not mean that for certain critical tools and types of equipment there will be no delays that could make the scheduled output of munitions an impossibility. The nationwide statistical balance of labor supply and requirements necessarily overlooks the tremendous difficulties of adjusting supply and requirements in every locality and occupation. Yet even such general analysis suggests a tightness in the balance of supply and requirements of major productive resources which implies that the program for 1943 will be attained only if the drastic organizational problems of production programming and control are solved promptly.

These major problems that face us in 1943 are discussed below. No effort is made to spell out the detailed implications or to offer precise mechanisms for the solution of each problem. The purpose is essentially to state these problems with sufficient clarity and detail to reveal their magnitudes and to indicate alternative solutions that deserve study and definitive selection.

III-2. Programming and Scheduling

An effective production program is a set of production objectives related to as short term intervals as feasible for as long a period in the future as is practical, based upon full consideration of military and civilian needs and the available resources of the economy. Such a program is basic to production planning and military strategy, which requires the most effective total output from available resources.

Proper determination of objectives requires knowledge of the positive contribution that the various end-products are likely to make, as well as of their cost, that is, of the draft they make upon the common pool of scarce resources. The problem is that of making choices that will yield the greatest positive contribution at the least cost.

Such choices are neither difficult nor imperative when the resources available for war production are relatively plentiful. Under these circumstances every category of military end-product that seems desirable can be included in the objectives, regardless of cost and of differences with respect to value in final use.

It is only when military production goals exceed available resources, and demands for various end-product categories cannot be fully satisfied, that both the need for and the difficulties of careful determination of objectives become great. The slowness with which adequate mechanisms and procedures developed for programming war production is understandable; it was only recently that war production programs reached a level that made for relative scarcity of available resources and compelled careful weighing of returns from additional increments of military output against their cost. A more careful choice of goals in non-military production became necessary, since scarcity of resources for military production necessarily also meant scarcity of resources to meet non-military demands.

Obviously a task as comprehensive and as difficult as setting production objectives for the whole range of the economy's output cannot be approached in a single step, as a single operation. It can be properly dealt with only by simultaneous attack at various levels--ranging from the top level of comprehensive and broad policy decisions, involving choices among broad categories of end-products, down to the lowest levels where the policy decisions are spelled out in detailed schedules specifying a great variety of narrow groups of end-products or components and tracing them through the individual plants.

The determination of broad objectives at the top levels may for present purposes be termed programming. The more detailed spelling out of these decisions into narrower categories may be termed

scheduling. The relation between the two is not necessarily all in one direction, in the sense of decisions being made only in programming to provide the frame-work within which scheduling is done. Scheduling, in turn, may reveal that the program decisions have been inadequate for lack of consideration of detail; and lead to revisions of program, even in the broader categories. Ideally there should be a flow back and forth between programming and scheduling, in which the top levels make the broad decisions, to be validated and perhaps modified by scheduling at the lower and more detailed levels of planning.

Our interest here is in programming and scheduling from the point of view of the War Production Board, a central agency responsible for the mobilization of the economy for war production. We are, therefore, concerned with comprehensive nationwide programming in the widest sense of the word, comprising basic decisions as among military, indirect military, and civilian production; and within each of these areas among the major categories. Our concern with scheduling is not in a detailed and minute spelling out of every single end-product, component, or material by months-to-come by various plants. It is rather in the general criteria that are to be applied to scheduling, with reference to the choice of the critical or limiting factors that must be kept in mind; to the basic concepts and definitions to be applied; and to the ways in which such schedules of critical resources can be centrally reviewed so as to provide the implementation to programming and scheduling -- production control.

Programming

Even though programming involves decisions in terms of broad categories, comparisons of returns and costs, no matter how approximate, cannot be avoided. It may be difficult off-hand to see how one could weight aircraft as against naval ships, or ordnance against synthetic rubber facilities. The positive contribution that each of these broad categories, or items within them, is likely to make cannot be measured precisely. Their cost, in terms of draft upon resources, can again be gauged only in broad overall terms and with a considerable margin of error. Yet decisions have to be made. It is important to recognize that no decision is a decision by default; and that even crude balancing of costs and returns is bound to make for better choices than extemporaneous action precipitated without much forward planning whenever a critical situation develops in one area after another.

One important implication of programming at the top level must be kept in mind: because of the broad overall categories involved, the decisions to be made must be preceded by full consideration of a variety of factors--military, economic, technical, and broadly political or social. When decisions are in terms of allocation of resources between all military production, on the one hand, and all civilian production on the other; or between armies of alternate sizes with the necessary complements of equipment on the one hand and

differing amounts of aid to Allies on the other, it is naive to assume that the choices can be governed solely by purely technical considerations of military strategy, or of domestic civilian patterns of demand. Such decisions necessarily involve also broad considerations of the potentialities of a productive system of a given composition of facilities and skills; of the social and political patterns of the country's populations, and the extent to which it will be willing to modify them under pressure of war; and of international policy affecting the relative positions of this country and its allies in the conflict. It is natural that broad decisions of this character have been made by the President, who combines in his office the considerations of broad military strategy, of economic control, of social policy and of international affairs. As a matter of course, such decisions, in their bearing upon domestic and international policy, are subject to review and modification by Congress, which may also take the initiative in the development of policies.

While the locus of responsibility for these top programming choices is clearly at the highest levels of executive and legislative authority, there is no such clarity as to organization, procedures, and authority at somewhat lower levels. The determination of military production programs is in the hands of the military and strategic groups; but the programs have to be reviewed and validated by agencies, such as the War Production Board, who accept responsibility for coordinating and guiding the efforts of the country's industrial system. Yet the Board does not exercise full control over all the productive resources of the economy; is hampered in evaluating the feasibility of the programs by inability to gauge the political implications of regulations and controls necessary for diversion of resources from one set of end-products to another; and is handicapped by the difficulty of distinguishing areas of differing degrees of urgency and importance within the military production programs. In the continuous determination of production objectives during 1942, the absence of a ready method for assuring joint consideration of military strategical needs, economic and production feasibility, and broad domestic and international political factors, made for a slow and cumbersome procedure.

The need for integrated programming is even more acute in 1943 than it was in 1942 because the unfolding logic of a growing war effort is bringing to the fore an increasing number of important issues for solution. The change is manifest in two ways. First, the line of distinction between military and civilian is growing vague as less essential civilian production vanishes and as all civilian output gradually assumes the character of essential, indirect military production. The corresponding shift in the character of choices that have to be made in programming makes it more difficult to secure the proper authority for the decision, except by going to the very top, viz. the President. It is logical to put the responsibility for the choice between aircraft and ground ordnance, or between the latter

and combatant vessels, upon the Joint Chiefs of Staff. But in decisions involving choice between the size of the Army and the total size of essential output, or between size of the munitions programs and those for synthetic rubber, war housing, and farm equipment, the military groups should be joined by others with particular responsibility for production and over-all national policy. As choices of this character grow in number and frequency, their decision should increasingly be guided by full consideration of all factors - strategic, economic, technical, and social.

The second change that has become conspicuous recently is a decentralization of responsibility for requirements and production control under pressure of growing problems in several areas. As the difficulties in the supply of rubber, petroleum, food, housing, transportation, and manpower became more acute, the natural response was to set up an agency directly concerned with the given group of resources and charged with exclusive responsibility to solve the difficulties within its province. The resulting proliferation of "czars", while serving the useful purpose of intensifying efforts in areas where critical bottlenecks developed, makes the need for a continuous coordinated view of the objectives in the several areas and their reconciliation into a feasible and balanced set of production objectives all the more necessary. For naturally the increase in the number of agencies, each with supreme jurisdiction over a separate area, makes the authority of any one agency below the highest level of executive and legislative authority, all the narrower; and the possibility of securing an over-all effective view all the more difficult.

No specific suggestions as to how this integration of programming is to be achieved can be made here. But in the light of difficulties during 1942 and the prospects for 1943, it can be urged that the need for such integration is becoming more pressing; and that efforts should be devoted in the immediate future to thinking how to obtain continuous joint consideration of strategic, economic, and broadly social factors, as they bear on production programming.

The major task involved would be the determination of the relative importance of various objectives measured by the positive contribution that the products involved would make to the prosecution of the war and to our post-war future. But necessarily the costs of these various objectives would also have to be considered. Costs would be measured in terms of drafts upon scarce resources, that is, in terms of the alternative weapons and other products that would have to be sacrificed. Such information would have to be provided by the several agencies that among themselves take responsibility for the productive efforts of the country. The relevant data could be properly secured only through scheduling out of the various objectives by these agencies so that demands upon critical resources over time can be clearly seen.

Scheduling

A production schedule, in its most specific form, is an order given to a productive unit for delivery of a given amount of product, and accepted by it as attainable within the time stated. If such schedules are secured for each productive unit in a country, for each of the numerous channels of resource-utilization, the result is a complete statement of what the economic system is planning to turn out within specified periods of time. From such a statement, the agencies responsible for the use of end-products can secure information basic for their plans (military or civilian); and the agencies responsible for the control of production can gain a view of how the several productive resources are divided among various end-product channels. It provides, therefore, both a translation of broad policy decisions of the programming bodies into more specific object classes over time; and a picture of the necessary allocation of resources, both those that are critical and those in ample supply, among various end-products.

Realistic schedules can be secured only if: (a) the program that provides the guiding framework for the schedules is within the limits of the productive capacity of the economy: (b) critical resources are allocated firmly and expeditiously, so that the productive units have reliable information on the supply of such resources available to them; (c) schedules are explicitly formulated as statements of what can actually be produced, and are not used for other purposes (e.g. to provide unrealistically high goals to induce larger output; to support claims for scarce resources, hence subject to upward bias). But if these are among the basic prerequisites for realistic scheduling, a logical circle is immediately indicated. Feasibility of the program (under (a) above) cannot be tested except through scheduling that is fairly realistic; and allocation of critical resources (under (b) above) cannot be done firmly except on the basis of schedules that are realistic in respect of all resources except the one under allocation. As usual, this logical circle is broken in reality by successive approximations and the corollary process of trial and error. A set of objectives is roughly blocked out, tentative schedules are based upon it; and a rough allocation of resources takes place. Then the difficulties that result in specific areas are resolved by an adjustment of the program, revision of allocations and a new set of schedules. Thus, by a constant process of adjustment the objectives become more firmly tested and the schedules more realistic.

In viewing scheduling from the comprehensive view of an agency responsible for the productive efforts of the country at large, one can clearly see that a complete scheduling out of all objectives in terms of the thousands of components and materials that enter the numerous end-products is an impossible task, even for procurement bodies charged directly with the responsibility of placing contracts and expediting delivery. It is even less practicable for a central

agency to attempt a complete translation of all production objectives into detailed schedules for end-products, components and materials.

Yet, if production controls are to assure the output that is wanted, if they are to allocate resources to end-products in accordance with objectives, some central review of schedules is indispensable. The carrying through of such a review in effective fashion involves: (a) proper selection of both end-products and resources with reference to which scheduling should be carried on continuously by the procurement and production agencies; and (b) setting criteria to which schedules should conform, with respect to definitions used and detail distinguished (time unit, plant, measurement of the product, etc.)

The selection of products, components and materials for which schedules are to be centrally reviewed is naturally based on the importance of the end-products judged by their magnitude and urgency of need; and of the components or materials, judged by supply and the corresponding need of a tight allocation and control. This explains the early emphasis upon and development of schedules for important categories of munitions and military construction; and the failure to schedule civilian-type end-products to any considerable extent. For the same reason, the selection of those materials and components requiring scheduling was determined, in its historical development, by the increasing scarcity of these resources in relation to requirements. As scarcity increased, the looser methods of influence and control, such as voluntary inducements, priorities, and horizontal apportionment, had to yield to more rigidly controlled allocation related more closely to the end-products desired; and this meant that the resources involved had to be scheduled out to see that the expected supply over time was geared to the requirements embodied in the end-product schedules.

It is not surprising, therefore, that during 1942 there was a continuous extension of both end-products and underlying categories of resources under schedules; and that during 1943 we may confidently expect a further extension in the list of products, components, and materials that would be scheduled. But, clearly, such extension in the area covered creates a greater need for seeing to it that schedules prepared by the several procurement or production agencies conform to the same criteria; that they are, therefore, comparable and can be fitted into a coordinated picture, and that a central agency, such as the War Production Board, assemble and review these schedules as a basis for allocation of scarce resources. The realization of this need, which became manifest after total military production objectives were reduced in the latter part of 1942 to what appeared to be roughly feasible limits, explains the emphasis on the responsibility of the War Production Board for central review and validation of schedules prepared by the several procurement and production agencies for end-products, components, and materials.

The criteria to which scheduling by the separate agencies must conform can be easily formulated. Schedules must define planned production in accordance with explicit assumptions concerning supply of materials and components to the producer, and these assumptions should be based on reasonably firm commitments. They must spell out expected deliveries as far ahead as possible by as short time units as feasible. In case only product summaries are to be submitted to the central review agency, they must be based upon detailed, plant by plant, schedules. They must be revised periodically, to take account of the changing situation both with respect to orders and to expected supply of materials and components.

Such easy formulation does not mean that the actual task of improving schedules to a point of conformity with such criteria is easy; or that decisions on the part of a central agency, like WPB, as to how far to go in modifying these criteria for selected categories of products or resources are easily made. But the progress of the materials flow mechanism toward such closer gearing to end-products, as is represented in CMP, and the rapid development of scheduling review operations in the Office of the Production Vice Chairman offer good promise that the various difficulties in arriving at a more realistic set of schedules as the basis of production planning and control will be effectively overcome.

Scheduling is important only as a basis for more careful allocation of resources, i.e. for better production control in an attempt to reach an authoritatively programmed and accepted set of production objectives. There exists between scheduling and production control the same circular and reciprocal relation that was suggested above between programming and scheduling. It is not easy to secure realistic schedules unless there are efficient and adequate production control mechanisms that deal exactly with the scarce resources whose allocation is scheduled. Yet without realistic scheduling, such control mechanisms cannot really operate. Here again the circle is broken by initiating control on the basis of rough schedules; improving the schedules as the result of better controls; still further improving controls; and so on. Thus, by a process of continuous adjustment there result improvements both in the reliability of schedules and efficiency of production controls.

In this area of production control the major problem for 1943 is that of coordination of control mechanisms for the different productive resources. This problem implies also the problem of coordinating schedules for various resources on a comparable basis. The coordination of schedules for various resources and the controls over their flow are the problems to which we now turn.

III-J. Coordination of Production Controls

In a system of free enterprise in peacetime, the flow of scarce resources, is determined through the market mechanism. The modest degree of control normally exercised by government usually relates to specific social or economic conditions that must be given special consideration, largely where free market institutions do not serve to protect the individual from malpractices and inequitable consequences. In wartime, the market mechanism cannot redistribute resources sufficiently to ensure the attainment of feasible military objectives. The degree to which administered controls are necessary depends in large measure upon the vigor with which indirect fiscal controls are exercised, the magnitude of the war effort, its impact upon the entire economy, and the stage of mobilization.

In the early period of our war production program, in 1940 and 1941, when there existed a large reservoir of resources, the normal financial incentives sufficed to meet the situation. The tremendous reserve of idle materials, manpower, facilities, management resources, and technical knowledge permitted a considerable increase in output of both war and consumers' goods. There was no necessity of imposing a wide variety of controls that would direct the flow of resources toward war production in preference to less essential purposes.

That the inducements to expansion of military production are usually purely voluntary in the early stages of a war program does not mean that the governmental activities of financing and placing contracts do not exercise an important effect on the economy and in that sense control its direction. The very size of the government procurement task assures major changes in the economic scene. For instance, the geographic allocation of government contracts reveals an unequal distribution because of industrial specialization and the large concentration of procurement upon such objects as ships, airplanes, and mechanized vehicles. Further, the degree to which raw material expansion varies from one commodity to another greatly affects the impact of the program upon the normal processes of the industry. Thus, the expansion of aluminum and magnesium was so great relative to steel that much greater government influence was inevitable. Likewise, the distribution of contracts by size of firm had a marked influence on the economic pattern and structure of the nation. Inevitably, procurement had to be centrally controlled and regulated so that the separate procuring agencies would conform to criteria designed to assure both efficient expansion of war production and minimum disturbance to the structure of the economy.

The response to voluntary measures and financial incentives was most satisfactory. But as the size of the war effort grew and competition between war and peacetime pursuits began to emerge, it became obvious that compulsory controls were needed. In a free economy, one cannot expect voluntary diversion of talents and resources to war

purposes on a wide scale, with a consequent loss of competitive advantages by individuals and corporations. Human nature, especially in a free enterprise system, is such that patriotic appeals for major sacrifices and disruptions can be expected to have but limited effect. Although people may be patriotic, patriotism cannot easily and fully overcome deeply rooted conditions and patterns of work and living. An important example of the dilemma confronting patriotic citizens is the conflict of responsibilities facing the typical manager of an industrial concern. As the agent of the owners of the business, he has an established obligation to conduct the enterprise as profitably as possible; as a citizen and the custodian of important war resources, he has an obligation to dedicate those resources to the protection of the nation. The managers of the great industrial enterprises can be freed of this conflict of responsibilities, and so direct their talents fully to the one objective of war production, only as the result of governmental controls that prevent the giving of precedence to immediate profits over the national interest.

The first general type of control to supplement financial incentives was of a preferential character, namely, the granting of preferential treatment to more necessary ends as determined by the government. Priorities served well in the early days of the war effort to give assistance to producers when scarcities were neither widespread nor intensive. They aided in speeding up the movement of materials and fabricated goods to those engaged in war production.

Monetary incentives and a limited use of priorities were the two basic methods by which, prior to 1942, the government induced expansion of war production. The year 1942 saw an upsurge in the flow of money to finance a greatly increased military production program; and a rapid extension of the area covered by priorities. Concurrently there developed a considerable loss in effectiveness of voluntary or preferential controls as methods of properly directing the economy's efforts into the new demands; and a variety of compulsory measures became necessary.

Inadequacy of Voluntary and Preferential Controls

The tremendous increase in the objectives and the corresponding rise in the magnitude of the procurement task meant also that the job of making procurement conform closely to centrally determined criteria became much more difficult. The pressure to get the contracts among many agencies, sub-agencies, regional offices, etc., brought about a loosening of central control, and considerable sacrifice of principles of economical and circumspect procurement policy. It may be disputed whether such sacrifice did or did not transcend the bounds of the necessary. But the exact answer is not so important now. It is important to recognize that the situation has changed materially since 1942; and that a tightening of production controls means also a more intensive central review and control over procurement.

That priorities grew increasingly inadequate during 1942 as a method of war production control resulted from both the fundamental

shortcomings of this mechanism and the difficulties of administration and enforcement. Theoretically, the granting of preference to certain areas over others should ensure production in the former before production in the latter. However, this result is neither likely, nor fully desirable unless preference is related to definite quantities of definite objects for definite periods of time. To give aircraft the first and exclusive order of importance would undoubtedly serve to ensure the largest and fastest plane production of which the industrial economy is capable; but meanwhile aircraft producers and suppliers would procure far ahead of when materials were needed and thereby unnecessarily disorganize other armament production and even the production of certain types of aircraft. The priorities system, in its continuous extension, attempted to provide a series of gradations within which all production--military and otherwise--would fall. Had there been some programming in advance, whereby the quantities involved in each grade could have been determined even roughly, and the priorities for each claim limited to the programmed quantities, the priorities mechanism might have worked well. But such a program was slow in coming.

On the administrative side, no success was attained in an attempt to limit priorities to specified quantities within certain time periods. The demands of the military are practically as varied as the demands of the civilians; and it is largely impossible to establish a list of items in the order of their individual importance. Even more difficult is the establishment of quantities of items in order of importance. The first hundred fighter planes may be more important than the first hundred tanks, but certainly, the first hundred tanks will be more important than an additional hundred fighter planes after a substantial quantity of fighter planes have been made available. Likewise, the preference for one type of equipment over another may vary greatly from one period to the next, depending upon the immediate combat outlook and the supply situation. The fact that priorities were, for practical purposes, applied to broad categories and that they had an indefinite extension of time, led to inflation of preference claims. As each category found it increasingly difficult to satisfy its needs fully, there was widespread and successful pressure to obtain higher ratings. Priority orders were written by the procurement officers in the field; and because of their desire to make good records, they had no incentive to be very critical in the granting of higher ratings. In fact, there was no self-policing anywhere in the system, since only at Washington was there any real inducement to keep down the inflation of priority ratings, and the lack of a tight hand in central headquarters over the issuance of priorities precluded any effective central control. As resources became more scarce, priorities became more inflated.

The entire priorities system rapidly became so complicated and the race for higher ratings became so competitive that a new set of ratings was required. In the late spring of 1942 the Army and Navy Munitions Board issued a Directive under which new ratings were issued. For the first time an attempt was made to issue priorities for given quantities; but even here the quantities covered several months' production, and

before long the inflation process was on again.

Compulsory Controls in 1942

The compulsory controls introduced in 1942 to supplement monetary incentives and priorities included limitation and conservation orders for cutting down less essential civilian production; tightening up the mechanism for distributing raw materials through the introduction and administration of the Production Requirements Plan and subsequent adoption of the Controlled Materials Plan; and the slow and halting introduction of scheduling controls over some critical industrial components and facilities.

Throughout early 1942, industry after industry was subjected to review, both as to essentiality of its product and as to the value for war production of its resources. Following the closing down of the automobile industry for the purpose of releasing critical materials, machinery and skilled labor to war purposes, the War Production Board issued a substantial number of compulsory orders directing the complete or gradual cessation of production of consumers' durable goods. In industries producing such products as automobiles and refrigerators the curtailment was fairly rapid and total; whereas in other industries, such as construction and paper, it was gradual and partial. Clearly, without such curtailment orders, there could be no assurance that these less essential industries would not continue somehow to obtain materials and continue in production well through 1942 and perhaps even 1943 at the expense of critical war production.

As the priorities mechanism became less satisfactory for the mounting task of apportioning scarce materials, the Production Requirements Plan was developed and put into operation in the third quarter of 1942. The system was one of distributing materials to individual users in response to requests made to the War Production Board for authorization. Applicants submitted their demands quarterly in relation to the preference ratings of their orders and preference patterns of past shipments. This system helped bring demand somewhat in relation to supply but did not serve adequately to flow materials for specific purposes and specific objects. It was impossible to trace materials requests of each manufacturer in the various stages of production to the specific scheduled end-products for which the materials were presumably requested. The system might have worked well had (a) the total program been somewhat closely related to the total supply of materials, (b) priority ratings not been inflated in time and in quantity; and (c) adequate steps been taken to insure against excess inventory accumulation of materials, components, and end-products. As a matter of fact, any system for distributing materials that had as its background a program properly related to available resources, and that was able to prevent unnecessary accumulation of inventories, of raw materials, components, and finished products, would serve the purpose at hand. While the Production Requirements Plan did take into account raw material inventories, it did not have the benefit of a realistic program; nor was it able to take account of inventories of

components or finished products. Manufacturers could, therefore, place orders in relation to a program that was impossible of achievement and further, in relation to fabrication capacity that was perhaps not fully needed.

As the shortages of critical materials became increasingly severe and materials previously in adequate supply were found to be short, the adequacy of PRP was questioned more and more. Finally, just at the end of 1942, a new system, the Controlled Materials Plan, was announced, designed to distribute materials in relation to scheduled output of end-products. Authenticated claims over the critical materials were to be given to the end-product manufacturer, to be passed down by him or his supplier to the immediate producer of the critical material. This system should permit a much closer coordination between the flow of materials and a given set of scheduled end-product objectives. Even so, it will be necessary constantly to review objectives in relation to resources, so that the entire burden of programming is not placed upon the mechanism for distributing materials. The successful evolution and implementation of this plan is one of the most challenging tasks for 1943.

The second half of 1942 saw also tentative efforts at more direct control over critical items of industrial equipment (machine tools, compressors, heat exchangers, and the like). Placing of orders for these items began to be more closely supervised by the War Production Board, to guide them into the plants in such a way as to assure prompt delivery, the best distribution of load on the industry, and the most expeditious division of products among the several claimant agencies. However, a major effort in this direction remains a task for 1943.

Controls for 1943

Viewing the immediate future, one can discern several important problems of development and coordination of production controls. In the first place, the Controlled Materials Plan will not be in operation until the second quarter of 1943. Being a new and certainly not a simple nor easily administered system, its first application will be far from satisfactory. In fact, even a moderately successful application of the Controlled Materials Plan for the third quarter of 1943 can be regarded as a major achievement. Because of the lag between the flow of raw materials and the completion of end-products, the full benefits of CMP for the production of finished items will, therefore, not be felt until 1944. The flow of materials may be less tightly regulated in 1943 than if the Production Requirements Plan had continued in operation.

Hence throughout 1943 direct control over the flow of raw materials cannot be expected to attain the precision, detail and orderliness that should characterize a truly all-out mobilization effort. We must resign ourselves to something much less than complete mobilization, unless this defect can be compensated for by the use of every possible complementary and alternative measure to bring about the best distribution of

resources within the year. There are two important controls that must be employed in 1943 to supplement the system for the distribution of materials. One is aggressive, continuous, and unified programming and scheduling of the use of all resources. This must be accompanied by vigorous and strict adherence to inventory control measures (inventory most broadly understood). The second requirement is increasingly tight control over the production, distribution, and use of raw materials, components, labor, management talent, and technical knowledge within plants. This will involve implementation of top controls within individual productive units.

While overall war production will be limited in 1943 primarily by the supply of the basic raw materials, production in many areas over the next few months will be restricted also by the available supply of critical components and parts. For many of these items the requirements were never carefully scheduled out and compared with the capacity to produce them. While the Controlled Materials Plan can cover these tight components, as well as raw materials, the delay in making CMP effective calls for an immediate and concerted attack upon the most critical limiting components and parts. Their requirements must be determined and scheduled out month by month; and their supply must likewise be ascertained. This will be difficult because of the lack of adequate consideration given to this important area to date. Without a direct attack upon this problem, production in the early months of 1943 is certain to be less than what could otherwise be accomplished. The sooner the attempt is made, the sooner can the bottlenecks be broken or schedules of production adjusted so as to get the maximum total output.

Beyond the materials and component problem is the entire area of labor supply and demand. Here the challenge is perhaps most difficult of all, primarily because of lack of experience. Adequate techniques have not yet been developed determining total demand for labor and the relative importance of constituent demands. Likewise, the potential labor supply is somewhat conjectural. Above all, there must be a coordination of controls so that the distribution of labor is integrated with the distribution of materials and components. Up to now, with the exception of minor delays or moderately reduced efficiency in very special areas and occupations, it has been possible to satisfy labor demands in war industries. But the free pools of labor, easy of absorption, are now largely gone.

In 1943 the Armed Services will induct several additional millions of young men, who must be taken from war as well as non-war industries. Millions of workers must be secured from new supply or from less essential industries to fill the growing needs of war industries and to replace the military inductees taken from them. Finally, if the civilian economy is not to be substantially demoralized, it will be necessary for millions of persons normally not employed to be engaged in productive activities. This total increase in labor force and the substantial shifts among less essential war industries and the Armed

Services will be of such dimensions in 1943 as to require many new and untried controls. Because of the threat of inflation and the constant race of wage rates among industries in a short labor market, it will be impossible to rely on wage differentials as an adequate guide of labor flow. Compulsory employment assignments may not be necessary but much more severe controls of hiring, shifting employment, occupational upgrading, training, apprenticeship activities, and geographical migration of workers appear unavoidable. Through administrative mechanisms the government must increasingly take responsibility for directing labor resources into the most necessary channels, at the same time ensuring that this distribution of labor is effectively coordinated with the distribution of other resources. Present administrative machinery will have to be strengthened to accomplish this purpose.

Coordination of Controls

Materials, components, labor are the major limiting factors upon production in 1943. But each covers a multitude of categories, some of which have emerged to the status of threatening bottlenecks and thus become subject to separate overriding jurisdictions (e.g., rubber, fuel, food). In addition there are significant present and prospective difficulties in the fields of domestic railroad and other transportation and in the supply of electric power. Going beyond production within the country towards the task of transporting war materiel and troops across the oceans to the theaters of war, we find that the shipping bottleneck, which has been with us during 1942, constitutes a problem for 1943 that in many ways transcends the importance of the war production task proper. Indeed, one is strongly inclined to say that the major problem of 1943 is not that of war production, but that of carrying the accumulated and prospective yield of our war output and of the training and mobilization efforts within the country to the theaters of attack upon the enemy.

The controls over these limiting factors have been made the responsibility of a variety of agencies. So-called "czars" have been established for commodities, such as rubber, food, and petroleum, and others for functions cutting across all commodities, such as production, transportation, price regulation, rationing, and manpower. Commodity czardoms are intended to provide vertical integration of functions, and have the particular virtue of promising vigorous mobilization of all factors for the increased production of the particular commodity. Recent trends have been in the direction of multiplication of such czardoms, and conform to the thesis that the experience of World War I indicated the superiority of reliance upon relatively autonomous commodity divisions. Functional czardoms are intended to provide horizontal integration of all commodity programs relating to a particular resource or technique, and have the virtue of promising consistency and recognition of degrees of essentiality among various commodities and services.

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In practice czars cannot operate as rulers of autonomous realms without imperilling the balance and consistency of the whole war production program. Commodities are dependent one on another; such functions as production, transportation, price, and manpower are interdependent; and commodity and functional czars cannot operate in the same economy without a great amount of mutual adjustment. Absolutely complete coordination and integration of controls, while ideally desirable, is unattainable except by partial, successive approximation. The task is altogether too huge to be tackled directly by a single agency; some division of labor is indispensable, and some division of authority is inevitable. But the need for an ideal of coordination must be kept clearly in mind as a goal toward which activities, both within and among the separate agencies, should gradually converge. Within the War Production Board proper a more integrated system of control over both materials and industrial components should be promptly evolved, with the activities under CMP and the production scheduling operations promptly knit into a unified whole. As between the War Production Board and coordinate agencies in charge of other productive resources, active collaboration must be developed so that decisions on the several resources serve to further the war production program, without the loss of time and dissipation of energies that are inevitable in a pure trial-and-error procedure.

This attempt would naturally raise both organizational problems, questions as to how the jurisdictional isolation of the several agencies is to be overcome; and substantive problems, questions as to how the systems of control that relate to the different resources can be meshed in with each other to effectuate the coordination desired. The technical problems involved are neither simple, nor easy of solution. Materials, which are fairly mobile and can, therefore, be shifted easily (especially in their raw form) from one end-product category to another, can be most effectively guided by one system of controls. Highly specialized industrial components, which cannot be easily substituted for each other, require a different system of control. Labor, which cannot be moved easily and which is identified with a large part of our population, obviously cannot be controlled in the same way as raw materials. Facilities, which are relatively immobile, raise problems quite different from those that apply to mobile resources; and require, therefore, a different system of controls. Coordination of controls will raise a number of intricate, technical problems. But, recognizing the difficulties, one cannot also but recognize that muddling through is far inferior to the solution that could be attained were adequate attention devoted to these problems. A major effort must be made to progress toward the coordination of controls that is so obviously the indispensable prerequisite to an efficient guidance of the economy into channels most productive in terms of the production objectives agreed upon. This appears to be one of the most important tasks for 1943.

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Procurement and Management

In their implementation, the controls discussed above manifest themselves through (a) directives given to the procurement agencies with reference to their procurement action, and (b) instructions flowing down to individual enterprises and affecting work within the plants.

Although in terms of volume the big procurement task is behind us, a number of problems relating to procurement will require new attention. If there is to be any realignment of production geographically, or by size of firms, or for the purpose of more closely integrating the production of the United Nations, these adjustments must be made at the procurement level. Thus, if a given community is overloaded with war work necessitating new housing, new community facilities, continued immigration of workers and the like, this situation can be corrected through redistribution of contracts. Certainly throughout 1943 every effort should be made to transfer contracts from tight labor areas to other areas. Of course, this operation should be integrated with a program of concentrating reduced civilian production in those plants and communities where the supply of workers and other resources is most adequate. Yet a great deal can be accomplished through shifting war orders alone. Much military procurement is for items that have peacetime counterparts and that can be produced in a wide variety of communities.

In order to introduce flexibility in procurement, which will facilitate redistribution of contracts as necessary, it might be desirable hereafter to shorten the period of commitment of contracts. In the early days, in order to stimulate and provide the maximum incentive to manufacturers, it was perhaps necessary to make procurement commitments for a long as 18 to 24 months into the future. Now that peak rates have been or are rapidly being attained, it would appear unnecessary to make commitments for more than 6 to 12 months into the future. A shortening of the time period of commitments will provide much more flexibility within the procurement mechanism and will be a step in the right direction in preparation for immediate post-war problems of demobilization.

In the rush to get the large scale production of munitions started in 1941 and early 1942 and in the absence then of firm cost data for many new items of military equipment, it may have been justifiable to give contractors the benefit of the doubt and to provide in the contract price for a generous coverage of all prospective costs and contingencies. The only practicable way to handle the problem was to get production first, and to check on possible excessive profits afterwards. Considerable progress in that direction has already been made during 1942 by the contracting agencies in cooperation with the War Production Board. The basic principles of renegotiating contracts after the close of an accounting period, and of treating all war profits of a firm during this period as a unit rather than renegotiating individual contracts will have to be continued and cannot be

superseded by taxation of excess profits.

There is, however, considerable room for further advances in this field. First, the renegotiation procedures of the contracting agencies should be unified to a greater extent than they are now. This might be done either by extending the function of the present Procurement Policy Board of the War Production Board, or preferably, by the organization of a separate War Contracts Policy Board. Such a board, using the powers vested by Executive Order 9024 in the Chairman of the War Production Board, should determine the basic policies to guide all agencies in letting their contracts. Secondly, the standards applied to renegotiation and to permissible profits need to be made more precise in order to reduce the uncertainty to which many contractors now are subject. This, however, should not go so far as to impose a simple profit ceiling on contracts, expressed, for example, as a certain percentage of the contract value of contractor's capital. Thirdly, provision should be made in contracts and plans prepared for the cancellation or tapering off of war contracts as hostilities cease or major changes in the war production program are made.

In 1943 a new problem is bound to come to the fore, the reduction of the real costs in the production of armaments, chiefly the number of man-hours per unit of munitions production. Up to the present time, relatively little attention has been given to this problem, as labor was fairly plentiful and many contracts were in effect, though not in form, on a cost-plus basis. With an overall labor shortage as a decisive bottleneck in war production, reduction of real costs to the minimum observed by efficiently managed plants becomes essential. Procurement methods alone are not sufficient to achieve such a reduction, but they can make a substantial contribution. One step in this direction, initiated in 1942, is the adoption of target-price contracts, which give the contractor an increasing profit if he manages to reduce costs below a stipulated target. Such contracts, however, are applicable only to certain sectors of war production, chiefly items produced in considerable quantities and without major changes in design. Other measures of more general applicability will, therefore, have to be given serious consideration. Foremost among these is the development of cost control supplemented, where appropriate, by standardized cost accounting. Continuous scrutiny of real costs will permit the procurement agencies to spot inefficient firms, to improve their performance where possible, and to redistribute contracts where inefficiency cannot be remedied and no other specific reasons exist for continuing the participation of relatively inefficient firms. Since we probably will have, by the end of 1943, more fabricating facilities for munitions than can be manned or supplied with raw materials for continuous operation, it will obviously be necessary over large fields of industry to concentrate production in the most efficient plants if we want to obtain the maximum output from out limited resources.

All of our controls, whether they flow through directives to procurement agencies or directly to the plants, constitute restrictive and guiding conditions upon the productive units in the economy. By and large, controls that have been introduced so far influence the

work of management; but only in rare instances has there been evidence of a tendency to direct, regulate, or control the internal operation of business enterprises. Obviously, in a system of private enterprise, this is a rather delicate area for government to interfere with, and it is consistent with the private enterprise concept to have the very minimum of government participation or direction within each productive unit. On the other hand, in wartime, when resources are so scarce and so valuable and when time and quantity of output are so important to the well-being of the country, there must be some assurance that the management of industry is satisfactory. Certainly, if materials are wasted, labor is kept idle, and critical equipment is not utilized, there would be justification for the government somehow ensuring better management. On the other hand, for the government to concern itself with the management of every enterprise would lead to so much regulation and control as perhaps to reduce rather than increase efficiency. As resources become increasingly scarce, it will be necessary for some happy medium to be attained whereby non-cooperative or incompetent management is improved or replaced, while, at the same time, government continues to interfere to the minimum with the internal running of private enterprises.

Increasing tightness, coordination, and intensity of government controls over production (as well as other aspects of the economy) are unavoidable in 1943. There are many who feel that this trend, required to bring about the earliest possible termination of hostilities, represents a giving-up on the home front of that which is being fought for on the battlefront. Certainly, the decision to intensify government controls can be successful and compatible with our democratic system only if the controls are developed and frequently reappraised through a process of consultation with the people, and are administered in such a manner as to assure equality of sacrifice. An atmosphere of consent is a prerequisite to successful administration of severe governmental regulations. If the imposition of more severe controls earlier in the war will bring about a more immediate victory, it may be highly desirable to subject ourselves to greater group discipline in order that we may more promptly dispose of the entire war problem and return to peacetime pursuits. The year 1943 will be one in which there is certain to be much discussion of and conflict over the extent of government direction, regulation, and control of the economy. Whatever controls and regulations are considered should be carefully appraised in relation to their contribution toward both the earliest winning of the war and a desirable post-war economic structure.

III-4. Integration of Production Among the United Nations

The concept of a United Nations' pool of resources and needs is quite simple. The United Nations have a joint task of survival an of victory over a common enemy and possess productive resources that differ in degree of scarcity with reference to needs. It follows that by pooling resources and by viewing their needs jointly, they could raise the yield of their aggregate resources well above the level that could be attained by treating each nation and economy as an independent unit.

Yet military and economic integration among the United Nations runs into numerous practical obstacles. Each nation, by habit of thought And action, tends to foster its independence, design its own weapons, maintain its normal sources of supply and channels of distribution, and rely as fully as possible on its own assured productive capacity. Each nation has specialized designs of military equipment, emphasizes particular categories of weapons more than others, and organizes and trains its military forces according to its own distinctive preferences. There are marked differences in business and production practices, great variations in the patterns of civilian life and consumption, and marked disparities in the production possibilities of each country. The specialized location of resources as well as specialize areas of use of particular end-products, raise complicated questions concerning transportation and the time element in getting finished products into combat zones. There is the inherent administrative complexity of integrating economic activities beyond the area of an existing independent integrated system. But underlying all and fundamental in importance is the strong feeling of group-consciousness of each nation and the tendency to look upon others as "foreign", no matter how strong may be the ties of common purpose and fellow feeling. The overcoming of such obstacles is a matter of gradual and carefully planned efforts.

The community of purpose between this country and the United Nations was firmly established only with our entrance into the war. The gradually increased supply of munitions and materials which, prior to December 1941, had been extended to the anti-Axis countries, first on foreign orders, then on Lend-Lease arrangements, could, with our entrance into the war, be further extended and made part of a United Nations military and economic strategy. Through formal declarations, conferences, and visits of diplomatic, economic, and political figures, there began to crystallize a nucleus of combined strategic and economic objectives. There was growing recognition in this country that the Lend-Lease concept, which had served a tremendously useful purpose, was not so important any longer; and that the main task was one of assigning weapons to those nations and to those theaters of operation that could use them most effectively. Combined strategic planning emerged during 1942, but was slow in becoming sufficiently definite to enable production authorities to integrate output with combined strategy. A number of combined bodies have been set up, both at the military-strategy and production-

guidance levels (Combined Chiefs of Staff, Combined Munitions Assignment Board, Combined Raw Materials Board, Combined Production and Resources Board, Combined Shipping Adjustment Board). The common pattern was to include representation from this country, the United Kingdom, and sometimes Canada. Others of the United Nations were given but indirect representation.

Alongside this trend toward greater recognition of the need of military and economic integration among the United Nations, there was a somewhat contrasting multiplication of obstacles to large-scale flowing of this country's materials and products to them. With the tremendous increase in the military production needs of the United States itself and with the development of bottleneck conditions in materials and in shipping, we naturally tended to scrutinize more closely demands of our allies for resources. Even though our war production objectives have been revised to conform more closely to resources limitations, the supply of materials is not adequate to meet all domestic needs and stated foreign requirements. Further, fabricating facilities in the United States soon will be more than adequate to process all available raw materials into finished products. This excess of demand and excess of fabricating capacity, as well as shortage of shipping, will necessitate a careful review of foreign requirements to ensure that decisions on the flow of resources from the United States will be made with full appreciation of the consequences.

The Goals Ahead

It is very important that there be a clear and common understanding of united strategy in order that all of the United Nations can bend their efforts toward a common set of objectives. These objectives must be spelled out in some detail if production scheduling and programming on a combined basis are to be practicable. The combined strategy must not be confined to the probable areas of active combat and corresponding distribution of overall military strength, but should also take into account the particular types of manpower and armament that should be assigned to each theater of operation. The line between strategy and production can never be precise. It is impossible to make strategic determinations without either purposefully and intelligently, or else by implication, taking into account the economic factors. The strategists must have some idea as to what they can get and this requires production and economic understanding. Similarly, the production people must know what the strategists are planning and need, and this requires some understanding as to types of weapons and the alternatives among military instruments. Just as there is within the United States a need for closer coordination between those who make production decisions and those who make strategic decisions, so there is a similar need for close integration on the international level.

Integration of United Nations production requires a knowledge also of the basic demands of a sound civilian economy in wartime in each of

the various countries. Determination of such demands is especially difficult; and, like resources and military needs, will vary in time and place. Nearness to the front and threat of physical danger or of capture are important factors in the development of public acquiescence to, and even demand for, those adjustments in standards of living that are deemed essential for victory. Further, it is necessary to understand the character and pattern of the entire economy of each nation in order to weigh the disadvantages of further civilian curtailment against the advantages of releasing resources for war purposes by such curtailment. While the entire concept of a united effort suggests equality of contribution and equality of participation, the term "equality" is not easily construed. The United Nations entered the war with very different standards of living, but equality of contribution would hardly call for the poorest accepting as great a percentage cut as the richest. The stage and degree of active participation in combat activities affects the degree to which the civilian economy can be curtailed, without in turn injuring war mobilization. The provisions for maintenance and repair in one nation as compared with another must vary in accordance with the degree of industrialization, quality of equipment at the outbreak of mobilization, and degree of use of equipment for what might be called indirect war purposes.

Another most difficult factor to take into account is shipping. If there is one single limitation that is going to determine the timing and force of the striking power of the vast productive resources of the United States on the enemy, it is shipping space. The quantity of merchant ships being built in the United States is of unprecedented magnitude. Nevertheless, the alarming rate of sinkings and the tremendous demand for shipping capacity to transport the rapidly growing supply of manpower and materiel overseas, indicate that there is likely to develop a huge stockpile of armament within the United States over the next year. In view of this condition it is obvious that, all other factors being equal, the production of the United Nations should be so integrated as to require the least amount of shipping to get the greatest amount of armament to the zones of combat. If the transportation of raw materials to the United Kingdom would require less shipping than the transportation of finished products--assuming England were at or near the area of combat--it would appear preferable to ship raw materials rather than finished products. Similarly, decisions of the kinds and quantities of resources to be shipped to Russia should be based largely on a test of maximum value at the point of use with the least demand upon shipping space. Although the changing fortunes of war make it hazardous to specify with certainty the prospective theaters of combat and to direct the flow of resources and production accordingly, full consideration must be given to shipping limitations in all plans to integrate the production of the United Nations.

A number of other factors must also be taken into account. Labor supply, both quantitatively and with respect to the particular skills most needed, is an important consideration. The condition of facilities

as it bears on immediate demands for resources for maintenance, repair, replacement, and expansion, is an essential factor. Safety from attack of industrial facilities, stockpiles, shipping routes, and other resources is important. Large quantities of industrial equipment and critical materials should not be provided to areas where danger of attack is great when these same critical resources could be used equally effectively in more secure locations. A very important consideration is the efficiency of use--as to manpower, material wastage, and the production cycle. Manufacturing techniques vary considerably from country to country and these varied techniques require widely different numbers of man-hours and quantities of raw materials per unit of end-product. When labor and primary fabricating capacity may be limiting bottlenecks, any wastage of materials in the fabricating process is costly. Certainly, the manufacturing procedures and facilities that require the least wastage factor should be given preference, all other matters being equal. Similarly, the period of production from raw material to end-product varies greatly from one country to another and is an important element in determining what fabricating capacity is to be used. If ships require twice as long to be built in one country as in another, critical materials and components will be tied up for weeks and months longer in the former nation than in the latter.

The need for more explicit policies directed toward integrating the production of the United Nations will be greatly increased in 1943 as compared with 1941 and 1942. The difficulties of implementing such policies will also increase because, as all-out mobilization is approached in all the nations, there is less flexibility in the production structure and less prospect for making rapid adjustments in favor of combined efficiency. This is particularly true because of the marked expansion in facilities in the United States, which will render increasingly short the supply of critical materials relative to our capacity to fabricate such materials. If the United States should tend to hold back more and more on raw materials previously made available to our allies, the other nations would find it necessary to make rapid and major adjustments in their production patterns.

Level and Mechanism of Decisions

In viewing the problems that call for attention in 1943, three basic considerations must be kept firmly in mind. First, decisions relating to the allocation of resources and tasks among nations are always charged with important political implications. What we do about the use and control of the large volume of ships that the United States' yards will turn out during this year; the distribution among the United Nations of such critical materials as aluminum, rubber, or copper; the apportionment of critical components or equipment; the degree to which managerial and technical knowledge are effectively mobilized; and the extent with which international division of work is related to manpower resources--will each have political repercussions for the immediate

present and the more distant future, within each of the countries involved. This necessarily political character of decisions means that a purely economic calculation of costs and returns is not easily made, nor in itself valid. It follows that such basic decisions must be made at politically high levels, at levels that are informed of and in a position to weigh the political, as well as the strategic and economic aspects of the choices. Unless this is done, there is great danger of issues in this field being resolved at lower levels, inadequately informed and poorly integrated with regard to broad political considerations relevent to the most desirable allocation of resources.

Second, decisions made in allocation of different resources are obviously inter-related. Determinations with reference to how much raw materials are shipped to our allies or received from them are an important factor in determining how much finished equipment (into which these materials enter) will be sent to or received from our allies; and reciprocally, assignments of equipment should be considered in determining allocations of materials and components. There is a close inter-relation between decisions on materials, components, and equipment on the one hand, and decisions on shipping space on the other. It follows that, just as in the case of production controls in the domestic area, there is need of coordination of controls by the various agencies that deal with economic and strategic integration among the United Nations. The combined boards should, therefore, be knit together into a firmer network of agencies that would make consistent decisions with reference to the various resources involved.

The third difficulty is that of securing information needed to provide a rational basis for decision. It is difficult enough to secure reliable data on supply and requirements, programs and schedules, for the United States itself. It is even more difficult to secure such information on a comparable basis for the several countries whose resources and needs are to be taken into consideration. The important functions that the combined boards perform in accumulating such information should be encouraged and strengthened by attempts to exchange information freely and by provision of an administratively secure basis for the collection, analysis, and flow of data to the bodies charged with the responsibility for decisions.

III-5. Problems of the Civilian Economy

An adequate economic policy for the civilian sphere must consider numerous and diverse ends. Four objectives, however, claim the particular attention of the War Production Board. First and foremost, civilian policy in time of war should seek to free resources (including materials, manpower, management, technical knowledge, and facilities) needed for the production of munitions and secure their transfer to war industry. Whatever curtailments of civilian consumption are planned should be designed to serve this purpose as efficiently as possible in terms of resources released, and as economically as possible in terms of loss to civilian consumption. No consideration ought to limit the magnitude of curtailment except the bounds set by the needs of war industry, the possibilities of transfers, and the minimum essential requirements of civilians themselves.

Coordinate with the need to shift resources, however, is the necessity of protecting the basic minimum requirements of the civilians. Bedrock levels of consumption must be set so low that any further curtailment would reduce the production of war workers more than the resources released would increase it. These minimum levels, however, constitute a first call on our resources for they are the foundation of any war effort. Every measure to curtail civilian output and transfer resources must be planned with full awareness of the necessity to protect the bedrock needs of the civilian population. This does not mean that we can ever say, finally and with full assurance, exactly what these bedrock needs are. But we must recognize that beyond a certain point, further civilian curtailment means more loss than gain to war production. The costs and gains must be carefully weighed.

Whatever resources are left to civilian industry must be used so as to provide the maximum quantities of the goods we need to satisfy our primary requirements for shelter, warmth, clothing, sustenance, health and morale. This is the third objective of civilian policy. In a situation in which consumption is restricted at the same time that we desperately require the population's maximum productivity, workers cannot be scrimped for their basic needs while precious labor and materials are used to indulge a taste for variety, fashion, and display. Nor can costly business practices be tolerated when they serve the ends of commercial rivalry rather than hard utilitarian needs. Competition in advertising and display, in overstuffed service to leisured customers, are costs we can bear in peacetime in order to maintain the freedom of the consumer and the businessman; in time of war they are intolerable waste of potential productive power. As our needs increase, this peacetime prodigality must be eliminated.

Finally the goods that are made for civilians must be distributed in a fashion that insures the minimum needs of every family and that people generally recognize as equitable. This does not necessarily mean a universal supplanting of the ordinary market mechanism by administrative rationing. But when supply is extremely short, the

market will leave many individuals without bedrock requirements. And when demand, stimulated by the monetary prosperity of wartime, is extremely large, completely free marketing becomes a frantic scramble that satisfies only those with enough anti-social aggressiveness and enough leisure time to become successful hoarders.

Controls, Past and Prospective

These objectives are not novel; by now they have secured wide assent. In many areas they have been actively sought and given adequate implementation through administrative controls. But the development of the latter is necessarily a gradual process that follows the expansion of our needs. Controls affecting the civilian economy passed through the phases made already familiar by discussion above: from the stage in which the major effect was that of financial pressure on the part of war production through the preferential treatment of war against civilian needs to limitation of certain civilian uses by prohibition, and finally to direct allocation.

While all forms of control that have developed impinged upon the civilian economy, there has necessarily been a change in the relative importance of the areas to which the different controls applied. Of especial concern are the shifts that are occurring now and are likely to continue in the immediate future.

We now stand at the close of one phase in the application of controls to secure the purposes of civilian economic policy and at the beginning of a new one. In the first phase the problems stemmed largely from the necessity of transferring critical materials, particularly metals, and metal-working facilities to war industry. This phase is drawing to a close. Curtailment of civilian uses of metals and metal-working facilities has now been carried to extreme limits. Bedrock civilian requirements for materials and facilities are matters of constant study and are properly urged before competent bodies as claims competing with the highest military demands. Conservation orders have gone far to insure economies in the use of critical materials, and allocation schemes operate to distribute civilian as well as military allotments to the most urgent end-products. The shock of curtailed output of metal and other durable goods was cushioned by large stocks in the hands of consumers and dealers and, in a few cases, by rationing.

The shortage area, however, has now spread. From metals and manufacturing facilities, it has moved to labor and to materials and facilities outside the metals field. More distantly it threatens to encompass power and transportation. The shortage of labor raises novel and difficult problems in transferring workers from civilian to war industries. Combined with the spread of scarcities to non-metallic materials and with an expansion of military and foreign demands for civilian type goods, it threatens a serious reduction of civilian output. Present expectations are that consumption may have to fall by as much as 20% between the fourth quarter of 1942 and the fourth quarter of 1943 if the war program is to be achieved. We must strive to minimize both the magnitude of the reduction and its effects upon the civilian population.

The Problem of Labor Transfer

The assignment of additional quantities of civilian type goods to the Armed Forces and the allotment to the military of larger proportions of our raw-materials supply raise problems of a familiar sort. In most cases, the grant of preference ratings will be sufficient to do the job. In some cases, limitation orders or direct allotment will be required. The mechanisms involved are not novel: extension of devices now in use will be sufficient to do the job.

To secure the necessary workers for war industry is a problem of a different order. It is estimated that during 1943 the war industries will have to find close to 5 million persons, approximately 2 million to replace men to be lost by induction to the Armed Services and 2.7 million as a net addition to the employed force. The essential difficulty lies in the fact that the war industries are highly concentrated in what are already labor-tight areas. The potential sources of the 5 million persons needed by the war industries are scattered over the country. Some part of the new demand for war workers will, no doubt, arise outside the shortage localities; and some few of the people can be drawn into employment from outside the normal labor force or from the unemployed who may be found within these localities. Under present arrangements, however, it appears likely that a very large migration of workers and their families to labor shortage areas is required.

Such a movement, large as it must be, can no doubt be secured. But to achieve it would possibly require a degree of compulsion that had better be avoided. It would certainly require the provision of additional housing and community facilities and add to the strain upon retail trade and service industries in the over-crowded centers of war industry.

The moral to which this situation points is clear. To minimize the migration required, we ought to reduce non-war employment in labor-shortage areas so far as possible. To effect this reduction, two devices are available. The first and most important is the elimination of civilian manufacturing from war industry centers. There were 7.7 million persons in all engaged in such manufacturing in December, 1942. If even a minor fraction of these workers can be freed for war work in labor-shortage areas, the difficulty will be considerably eased.

Other civilian employment in critical labor areas is less susceptible to reduction. It consists largely of wholesale and retail trade and of the service industries. Some portion of wholesale trading may possibly lend itself to concentration in areas where labor is relatively plentiful. For the most part, however, the output of these industries cannot be reduced in boom localities. On the contrary, the quantity of essential services provided will have to be increased if, as seems likely, the population of munitions towns continues to grow. Much can be done, however, to increase the productivity of labor in retail trade and service industries. Curtailment of non-essential services, consolidation of delivery routes, concentration of retailing and servicing establishments to ensure that each works to capac-.ty are some of the many possibilities for reducing the labor demands

in trade and services. Such a program of rationalization would make an important contribution to the supply of labor in shortage areas.

Reducing the Impact of Consumer Curtailment

During 1943, the per capita flow of goods and services to consumers is expected to fall between 10 and 15 percent below 1942. In the second half of the year, the drop may be as great as 20 percent overall. In some important areas like clothing and furniture, the declines may be even greater. In a few cases -- household and motor fuels, transportation and domestic service -- supplies may well fall below minimum requirements, unless the distribution of the available supplies is managed with great efficiency.

These declines are expected to result from shortages of labor, expanded military use of materials, and increased purchases of civilian-type goods by the Armed Forces and Lend-Lease. The resources and end-products vitally needed for military and foreign consumption must, of course, be released and transferred. But much can be done to reduce the impact of these transfers upon domestic civilian consumers.

Concentration, Rationalization, and Simplification. Present expectations of the 1943 cut in consumption are based upon the assumptions that the resources available to the civilian economy will be used to make much the same sort of products that are made in peacetime and that their production and distribution will be carried on by ordinary methods. Neither of these assumptions is necessarily valid if we choose to attack the problem with energy. By concentrating our resources upon production of simple, standardized articles of high utility, we can save a measurable quantity of both materials and labor. And, as said above, if we eliminate the luxury services furnished by retail trade, reduce the number of shops to the point at which each is working to capacity, reduce and consolidate delivery services, and curtail the less essential personal and recreational services, then again substantial numbers of workers can be released to be used in more essential jobs. All of these make possible the production of a larger quantity of essential goods and services than we could otherwise secure.

Rationing. Coordinate with these attempts to keep the supply of goods and services as high as possible must go an intensified effort to provide for the more efficient distribution of the supply of the essential goods and services that are scarcest. The chief obstacles to the extension of rationing are the time and experience required to devise simple and effective procedures. The diversion of manpower to the administration of complicated and extensive rationing schemes may be more wasteful in some cases than authorization of production of certain civilian-type goods at a level that would obviate the need for rationing many commodities. Within these limits, the distribution of essential consumption goods must be brought under administrative control to ensure minimum supplies to every individual and to maintain the confidence of the country in the equity of our economic arrangements.

Protection of Minimum Requirements. For the most part, our problems center on the transfer of resources required by the military and on meeting the impact of the transfers. As consumption falls, however,

we shall need to exercise increasing vigilance to make sure that essential civilian supplies are maintained intact. At the point at which military demands impinge on minimum standards, these demands must be resisted in order to protect our ability to make a maximum military effort in a long war. Continued study of bedrock requirements in the light of experience and their classification by income groups and geographic areas will be a most important responsibility in 1943.

Along with better defined standards of minimum requirements we shall, of course, need better and more extensive information about current supplies. Data on the quantity of goods being produced for domestic consumption are far from adequate. They are vital to any efforts to protect bedrock requirements and to furnish a guide to the areas in which simplification, rationalization and rationing are required.

Public Education. The successful application of the controls discussed above depends in no small measure upon the country's understanding of our position. People should know the reasons for unusual and distasteful regulations which strike at their ordinary means of earning a living and deny them their accustomed products and conveniences. The impact of war production upon his life will be felt far more by the ordinary person in 1943 than in 1942. Yet in many ways it will be more difficult for him to see the necessity for the disturbance. The sense of impending national disaster is gone. The signs that we are defeating our enemies are now many and may multiply in the near future. But if the fight is to be carried forward to a speedy victorious conclusion, the people must be made to see clearly not merely that continued effort is necessary but also the connection between that effort and the difficulties to which they are subjected.

This vital job of public education in the field of civilian controls has so far been inadequate. This is due in large part to the fact that, aside from a few very special areas, controls have thus far been directed to business rather than to the mass of consumers and workers. This task cannot be neglected any longer. Everyone will suffer loss or, at best, discomfort in 1943; everyone must understand that controls are necessary. In accepting the responsibility for administering the civilian economy, we must also accept the responsibility of securing popular understanding of the job.

A Six-Point Program. The problems and policies discussed above may be summed up in a six-point program: (1) eliminate civilian manufacturing and as much of wholesaling as possible from labor shortage areas; (2) increase productivity of retail trades and service industries with emphasis upon localities where labor is short; (3) curtail less essential goods and services and simplify and standardize the more essential; (4) extend consumer rationing as far as staff and experience permit; (5) protect the consumer's minimum requirements in every important area; and (6) make the public understand the war production problem. This program is far-reaching, but it is not comprehensive. It does not touch many vital problems in the fields of taxation, price control, wage control and manpower. It does, however, set forth the main lines along which the production agencies will have to move in order to adjust the civilian economy to the necessities of the war program in

1943. The success of this adjustment is to be measured, it need hardly be added, by the effectiveness of our impact on the enemy. Of necessity, therefore, the sequence and extent of adjustments should be directly guided by the relative gains to be expected of each alternative area and degree of adjustment.

Administrative Requirements for an Adequate Civilian Economic Policy

The pressing problems of civilian economy raise questions not only of policy but also of administration. The nub of the difficulty is excessive decentralization. This decentralization has several aspects and exacts its price in many directions.

No one agency is responsible for every important area of civilian goods and services. While the Office of Civilian Supply has responsibility for a large portion of the field, food, housing, transportation, coal petroleum, rubber and power are each the responsibility of a separate agency. Nor is this partition offset by arrangements for adequate liaison and effective central control. One result is to encourage rivalry in the promotion of narrow interests. Another is to weaken the representation that the overall claims of the civilian area must secure in questions that involve broad decisions between military and civilian use of resources.

Control of the civilian economy is also split along functional lines. The Office of Civilian Supply and other civilian claimants may make decisions about the necessity for rationing. But the administration of rationing belongs to the Office of Price Administration. The War Production Board may desire to protect consumers' essential requirements for services in critical labor areas. The War Manpower Commission acting independently can force workers out of these occupations into manufacturing. The Office of Civilian Supply may desire to concentrate civilian manufacturing where labor is plentiful, to simplify civilian goods or rationalize the service trades. The execution of such policies is in the hands of the Office of Operations and its industry division. Again the provisions for liaison and unification of policy are lacking or inadequate. With policy and execution so effectively split, civilian controls are naturally confused and hesitant.

Splintered responsibility makes for confusion in policy and administration. It makes public leadership impossible. As much as anything else, we shall need in 1943 a clearly recognized center of responsibility for the civilian economy, capable of defining and explaining policy with authority and of securing public trust and consent to its administration. One prerequisite for adequate public understanding of governmental controls is a closer approach to consistency in aims and action. Another is a concentration of public responsibility and leadership. Neither can be attained so long as civilian control is so widely dispersed.

The solution of this difficulty is not necessarily the creation of a single civilian economic agency. But the problem of securing more effective central leadership and more adequate liaison among the agencies in the field calls for closest attention.

III-6. Impact on the Economy -- War and Post-War

In comparing early 1942 and early 1943 one is impressed by the striking change in the war outlook as reflected in public opinion. At this time last year, the nation was deeply aware of the unfavorable turn in the war with the Axis countries; and while not familiar with details, was sufficiently impressed by the loss of territory, bases, men and weapons to have a clear idea of the severity of the conflict and of the urgency of the military problem that confronted this country. Combined with an equally clear realization of the degree of our unpreparedness, this feeling served to provide a forceful impetus to our war mobilization effort; to forge a grim unity and determination in turning the full force of our productive system as rapidly as possible towards terminating this phase of military reverses.

The feeling now is quite different. The sense of urgency and of danger to our shores has pretty well dissipated. The Allied countries have assumed military initiative and the gradual increase of their fighting power has recently inflicted reverses upon the Axis that seem a reliable token of still further reverses to come. The remarkable achievement of this country in turning out the large volume of war production during 1942; in making rapid strides towards not only replacing our losses but increasing manifold the supply of war materiel; in building up promptly a large body of trained troops, and in transporting abroad substantial groups of our armed forces -- all reenforce the feeling that danger to this country is past and that all that remains to do is to finish the war whose successful outcome is a matter of course rather than subject to any reasonable doubt.

This may be a somewhat exaggerated description of the change in public attitude towards war prospects; but the change is unmistakable, and its consequences are too numerous and important to be dismissed or neglected. As the feeling grows that the war is won and its termination merely a matter of time, less attention and wholehearted effort is devoted to the problems of war production and war mobilization in general; a greater restiveness appears about costs of military conflict; there is more reluctance to accept the discomforts and privations which developing pressure of war needs imposes upon the civilian population; and greater emphasis is placed on the post-war future, with the discussion of plans for it giving rise to divisive symptoms in the national scene, contrasting with the ernest unity that existed during 1942 in the face of apparent danger to the nation.

That this attitude may be premature or that the consequences drawn from it may be illogically deduced, is not relevant. If this feeling and its consequences do exist, we must take them into consideration and try to guide them into channels that would be least disturbing to the progress of war production. For obviously, a widespread feeling of lack of urgency in war production and in economic mobilization may endanger materially the prospects of attaining the objectives which we set for 1943 or will set for 1944.

And the most effective way to deal with this danger is to scrutinize carefully the basis for the new attitude; and see whether the underlying factors cannot be dealt with in such a way as to give them full weight in making them contribute to rather than detract from the war effort.

Upon consideration of these underlying factors, it appears clear that, granted a victory to the Allies in the present conflict, there is ground for concern about and emphasis upon the post-war future. Within the domestic scene this concern is primarily with the impact of war production upon the economic structure of this country. Is this impact such that major problems will face us right after the war is over? And if so, should we not deal with this impact now so as to reduce the heritage of problems to be left for the post-war future to cope with? The answer to both questions is clearly in the affirmative.

The very magnitude of war production and of construction of plants related to it, and the large increase in the labor force under pressure of greater need for manpower, imply problems of utilizing the increased stock of our productive resources at a stasifactory rate after the war is over. In aircraft and shipbuilding industries new war industrial facilities built or to be built from 1940 to 1943 completely dwarf--in the ratio of something like 30 to 1 -- those in operation before the defense program started. Investments since 1940 will also be in excess of pre-war investment in the machine and non-ferrous metals industries, in the latter case chiefly as a result of a tremendous expansion in the facilities for the production and fabrication of light metals. Even in such basic and heavily capitalized industries as iron and steel, industrial chemicals, and electrical machinery, plant expansion made since mid-1940 will amount to more than 50 percent of total pre-war investment measured by the depreciated value of corporate net tangible assets. A striking increase will have taken place in the machine tool population of American factories. From roughly 950,000 machine tools in mid-1940, the number will have risen to about 1,300,000 by the end of 1942, and 1,600,000 at the end of 1943, after making allowance for a high rate of depreciation to reflect heavy utilization in war production. In the entire decade of the twenties, a period of rapid expansion in American industry, only about 750,000 new machine tools were installed; and these, on the average, were of considerably lower efficiency than those now put or to be put in place.

There has been and will be a large increase also in the country's labor force. From roughly 54 million at the end of 1940 it is expected to rise to 62.6 million by the end of 1943, and may increase still further before the end of the war. This rise in labor force by over 15 percent in about three years was accompanied by a rise in non-institutional population of 14 years of age and over of only 3 percent. We are thus bound to enter the post-war period with a much larger labor force than before the war, and one that constitutes an appreciably higher fraction of the total adult population of the country.

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Much of the new industrial capacity and large groups among the new entrants into the labor force may not be suitable or available for peacetime production. And as far as machinery and equipment is concerned, there will be for some industries, restricted during war-time, a lack rather than surplus of capacity to cope with the expected large demands in the years immediately following termination of hostilities. Yet there is little question that problems of sufficient utilization of the country's productive capacity, which were so acute in the years following 1929 and even after the substantial recovery made between 1933 and 1937, will be aggravated in the post-war years by the additions made to our stock of machinery and equipment and to our labor force during the war.

There is further ground for concern in the possibly uneven distribution of additional capacity among various regions in the country; among different industries; and among firms of various size. A great deal of discussion and dispute has developed recently as to the effect of war production upon the relative position of various areas within the country, with some suggestions that the result has been by and large to increase the industrial status of States already heavily industrialized and to leave other States, formerly industrially backward, still further behind in this respect as compared with the rest of the country. There have been even more emphatic contentions to the effect that concentration of war contracts in the hands of large firms has served to accelerate concentration of economic power in the hands of large units; and rob the smaller and medium sized firms of a substantial proportion of their former share in the country's business.

It is significant that there are no adequate data to test these contentions. In the pressure and rush to turn out war materiel, impacts upon the structure of the economy were secondary to the purpose of producting war goods soon and in large quantities. As a result, the information collected is not now adequate to shed a strong light upon these impacts; and we are not in a position to accept or reject the effects upon the structure of the economy that are imputed to the ways by which the war production task has been apportioned among regions, industries, or firms of different size. All one can say is that it is possible, indeed even probable, that the urgent production task thrust upon the economy had to be distributed in such a way as to place the lion's share upon those strong regions, industries or firms that could be expected to bear this share expeditiously; and that the natural result was to strengthen the inequalities that already existed in the economic system and which gave rise to public concern as disturbing trends in the economic development of the nation.

All this suggests that there is solid ground for concern, as one views the impacts of the war production development in terms of the problems that they raise for the post-war economic structure of this country. It also suggests the three lines of positive action that appear advisable as means to counteract any retarding effects upon the war effort that may be exercised by a widespread concern over our post-war economic future.

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The first and most obvious step is to secure adequate data on the impact of war production developments upon the structure of our economy. We need reliable information on the distribution of new capacity and resources among various industries, regions, and firms of different size; this information should serve to reveal the extent to which additions to our resources are of the type that constitute economic power in the immediate post-war future. So long as maximizing war production was our only overwhelming concern, we were naturally not greatly interested in costs in terms of effects upon the enduring structure of the economy. But if the situation changes so that more attention may be devoted to the post-war future, reliable information should be available to reduce any controversial issues to conformity with firm data rather than with guesses and conjectures that necessarily permit bias and prejudice.

Secondly, such information would be needed immediately if, as it seems reasonable to suggest, greater attention were to be paid henceforth in the procurement and other aspects of war production to the impact of war orders and war output upon the structure of the economy. The recent pressure for a larger share of war output to smaller firms is a clear indication of the greater attention that should be paid to what might be called the "structural" aspects of war production costs. While the military production task ahead is still huge, there seems nevertheless to be more room in the immediate future than there was during 1942, for a more careful weighing of alternatives in placing contracts; and in seeing to it that the distortion of the peacetime structure of the economy be as small as feasible.

Finally, it is time to lay plans for the post-war future, not so much in the sense of discussing in sweeping alternatives choices that may never confront us, but in the sense of specific planning as to how the transition from the war to the peacetime economy is to be made. Numerous questions arise when such specific planning is considered: how to proceed with the necessary reductions in the output of munitions; what disposition to make of the government inventories of peace-type products; what arrangements should be made for gradual cancellation of outstanding contracts; what policy is to be adopted for government owned industrial facilities erected during war time; and a host of similar important policy decisions. The price of unpreparedness of war has been rather high; the costs of unpreparedness for orderly transition from war to peace may not be so dramatic, but can be extremely high nevertheless.

It is recognized that diversion of attention and energy to problems that do not directly concern the immediate war effort may detract from it. But, on the other hand, the cost to this effort of mounting and widespread concern with regard to post-war implications of our war production achievements may also be large. It is, therefore, possible that devoting some energy and attention to the factors that underlie such concern may be of net benefit to the accomplishment of the war production task proper. At any rate, serious thought should be given during 1943 to the proper balance of war and post-war considerations, to achieve the greatest net yield to the present and prospective welfare of the country.