RESTRICTED

CURRENT MOBILIZATION PLANNING FOR SHIPBUILDING

27 April 1950

CONTENTS

Publication No. L50-134

INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D. C.

Rear Admiral Frederick E. Haeberle was born in Missouri in 1893. He graduated from the U. S. Naval Academy in 1917. He served in World War I as a junior officer aboard the USS WYOMING with the 6th Battle Squadron, British Grand Fleet. He is a graduate of the Naval Academy and received his Master's degree at the Massachusetts Institute of Technology in 1921. He became a Rear Admiral in November 1945. From 1942 to 1945 he was Head of the Design and Construction Branches of the Bureau of Ships, Navy Department, responsible for the design and construction of all naval vessels. From 1945 to 1949 he was Commander of the New York Naval Shipyard. He holds the World War I and II Victory Medals, the Legion of Merit, Gold Star in lieu of second Legion of Merit and various theater decorations. Admiral Haeberle is at present on duty in the Navy Department, serving as Assistant Chief of the Bureau of Ships for Ships.

CURRENT MOBILIZATION PLANNING FOR SHIPBUILDING

27 April 1950

GENERAL HOLMAN: Gentlemen, during the production phase of the Industrial College course, lectures have been scheduled to cover mobilization planning for three major industries, namely, shipbuilding, aircraft, and ordnance. Today we will hear about "Current Mobilization Planning for Shipbuilding."

Our speaker is Rear Admiral Frederick E. Haeberle, USN. Admiral Haeberle has behind him many years of experience in this highly specialized and important field. During the war period (1942-1945) he was head of the Design and Construction Branches of the Bureau of Ships. After that duty he commanded the New York Naval Shipyard until 1949. He is at present the Assistant Chief of the Bureau of Ships for Ships. In this capacity he is responsible for the design and development of all naval vessels.

Admiral Haeberle, it is a great pleasure, indeed, to welcome you to the Industrial College and to the National War College for this joint lecture.

ADMIRAL HAEBERLE: General Holman, members of the staff, and student officers of the National War College and the Industrial College of the Armed Forces: It is indeed a pleasure to have the opportunity of discussing with you today a subject that has been very close to my heart, and one which covers a major portion at least of my experience during World War II.

Shipbuilding production covers a pretty wide territory--too wide, I assure you, to really do it justice in the short period allotted to me this morning. But I shall try to cast out the nuts and bolts of detail and focus your attention, if I may, on the high lights. I will take a tip from the old-fashioned experts in the stripping business by eliminating enough of the things to command your attention and keeping enough to cover the substance.

The Bureau of Ships of the Navy Department is responsible for the design, construction, conversion, and maintenance of all combatant ships, and of all naval auxiliaries not under the Military Sea Transportation Service. The Bureaus of Ordnance, Aeronautics, Supplies and Accounts, and Medicine and Surgery contribute ship components and equipment as their names imply, but the over-all responsibility for a balanced design and for the materiel condition of our naval vessels is vested in the Bureau of Ships.

Shipbuilding production, the subject of my talk today, is the responsibility of the Chief of the Bureau of Ships, who has additional duty as Coordinator of Naval Shipbuilding.

Shipbuilding production will be treated in a broad sense to include three primary sources of producing naval ships--see Chart 1, page 21, "Sources of Shipbuilding Production": (1) activation of Reserve Fleet ships, (2) conversion of merchant vessels, and (3) new construction.

Before analyzing the nature of these sources and their potentialities, it might be well to look at the probable demand for shipbuilding production in another world emergency. Our national mobilization planning contemplates combatant and auxiliary naval vessels in World War III slightly less than the peak number actually afloat in World War II. Taking the World War II peak number as 100 percent, the probable demand and sources may be something like given on Chart 2, page 22, "Demand for Shipbuilding Production." Now, this prospective demand seems to me like a reasonable one; that is, if we expect the Army to do appreciable fighting on other than our home soil.

At first glance, it would seem that a requirement for 84 percent of the ships actually produced in World War II is feasible and attainable. But there are important differences to consider. World War III ships will be larger, more complex, and considerably more costly to build. The trend to increased size and cost in ships and planes is dictated by the complex interplay of offense and defense, of measure and countermeasure.

Another difference is the timing in shipbuilding production. In World War II shipbuilding was off to a running start. Nuclei of skilled builders were formed, developed, and enlarged well before German submarines opened fire on American vessels. Today the shipbuilding industry may not be sick but it is certainly undernourished. Let us take the patient's pulse--see Chart 3, page 23, "Ship Productivity--Then and Now." Since 1945, the shipbuilding industry has been slowed to the tempo of the early 1930's when the imminence of war seemed considerably less than it does today. If an enemy should strike tomorrow, this country would have one-fifth of the ships building that we did when Germany went into Poland, one-fiftieth of the ships building when Japan struck at Pearl Harbor.

Although the United States may need fewer ships than in World War II, do not expect them as soon as you got them in the last war. Overseas shipment of fuel, men, and materials in quantity to follow up the atomic bombing of strategic targets will have to await shipbuilding production, itself hampered by strategic bombing from the enemy.

From this general picture of the probable demand and the present supply, I shall turn to a more detailed examination of the three sources of shipbuilding production; namely, activation of Reserve Fleet ships, conversion of merchant ships, and new construction.

The Reserve Fleet

While World War II was still under way, and, in fact, before the course of events assured us that victory was in sight, the Navy Department undertook a technical study of the proper steps which should be taken to preserve the country's investment in naval vessels when demobilization became in order and common-sense budget consideration required that the operating Active Fleet be reduced to a fraction of the active wartime fleet. It was recognized that the billions of dollars which had been spent for naval vessels represented a true taxpayer's investment, and, more important from the technical military viewpoint, these ships represented thousands of tons of material and millions of man-hours of labor which had been expended and could never be replaced.

Briefly, the original plan went something like this:

1. Military consideration would be given to the various types of ships. Any type which seemed not to warrant retention would be eliminated right at the beginning and sold for scrap or other purpose.

2. Of the remaining types, each ship would be considered by itself. Any ship whose age, deterioration, or damaged condition indicated undesirability for retention would be eliminated.

3. The remaining ships would be considered on both economic and technical grounds to determine the numbers in each type whose retention offered optimum return. Then selection would be made from that type of the individual ships to be retained.

4. All the ships selected to be retained would be divided into two groups: (a) those to be kept in commission in the Active Fleet or for training or test purposes, and (b) those to be kept in the Reserve Fleet in a high state of preservation.

5. The Reserve Fleet ships were then supposed to be overhauled by a naval shipyard as necessary to make them fully operative, to be inventoried for deficiencies in on-board spare parts, and to be preserved and dehumidified in accordance with detailed procedures developed by the Bureau of Ships.

6. Each Reserve Fleet ship was to be tied up in a berthing area with a roving naval crew assigned to a group of ships. This crew would make periodic inspections, check dehumidification machinery, maintain preservation, and train for activation of the ships in an emergency.

7. Finally, every effort would be made to keep the active Fleet fully modernized and always ready for instant combat service.

The ideal plan that I have described would have provided that every ship in the Reserve Fleet could put to sea in less than 30 days, ready to operate in combat with the equipment which the ship had installed on its last active day of service. The actual ready-for-sea date would depend upon the time a trained crew reported on board. In every case the vessel would be almost immediately ready for use to train her crew when assigned.

It was recognized under this plan that each year a ship remained in reserve would see her approaching obsolescence as a naval vessel. This obsolescence pertains less to the hull and propelling machinery than it does to such fighting equipment as search radars, armament, and fire control. Had the plan been carried out as originally intended, the shipbuilding production problem connected with Reserve Fleet ships would have been limited almost entirely to the question of correcting obsolescence.

The material bureaus of the Navy Department are continually looking for better things to make better ships. Considerable effort is being expended for research and development to find improved equipment to perform better some function already incorporated in ships, or to deliver or counter some new weapon. These developments are incorporated into ships which are under construction, so that any new ship, like a new automobile, is a current model. Many of the new developments are not worked into existing ships to increase their effectiveness. The improvement is sometimes of such a nature that its cost would be prohibitive in the older ships. On the other hand, it would be folly not to install the newly developed equipment in new ships.

There are some developments, however, that must be made to the older ships to make them usable for their original and intended purpose. Such developments include the employment of heavier and faster aircraft, augmented fleet requirements for radio communication and countermeasures, increased range of detection required to combat faster enemy aircraft, and countermeasures to new types of enemy mines. The installation of new weapons in an older ship may make it possible to improve her effectiveness a great deal. An important example of this kind is the possible extension of attack range by the substitution of rockets or guided missiles for projectiles fired from guns. The field of research and development reaches into every feature of our ships. It is difficult to generalize, but it is safe to say that certain material improvements will have to be made in Reserve Fleet ships before they can be used in combat. A great many more improvements could be made to increase the effectiveness of the older vessels and thereby reduce the total number of ships required in the Navy.

I have just discussed what was intended and planned to happen in the creation of the Reserve Fleet. Now I will tell you what actually did happen.

When the end of World War II came, everything went according to plan until the returning ships began entering port for overhaul,, inactivation, and preservation. At that point the discharge of both officer and enlisted personnel became so rapid that it was impossible to accomplish the planned preservation work with the military personnel on most of the ships. Preservation had to be done by civilians in naval shipyards. Initially, those ships which needed overhaul were made available for shipyard repairs so that they would attain the full operability planned. As money tightened up, these overhauls were progressively reduced in scope until a great many ships were actually placed in the Reserve Fleet without any overhaul. They were not restored to a reliable operating condition.

The preservation work which had to be turned over to civilian labor in shipyards diverted money from repair work to preservation. In addition to the financial effect, there was a limitation on the total civilian labor force available. However, the job of preservation was effectively done. It is reasonably safe to say that our ships in the Reserve Fleet have been preserved so that serious deterioration will not be experienced.

Because repairs on many ships were not made prior to inactivation, a new plan was drawn up to fit the economic situation. Under this plan, every ship in the Reserve Fleet was scheduled for an overhaul once every five years. This schedule would have permitted accomplishing any repairs which had been deferred at the time of inactivation. This plan went along on schedule for about two years. In the fall of 1949 money limitation forced the abandonment of this five-year overhaul plan. At the present time, any repairs which have to be done to make the ships operable have been deferred until mobilization of the Reserve Fleet. The primary effort is now to preserve the integrity of the watertight envelope of each ship so that dehumidification of the interior will prevent further deteriorations.

Another effect of the rapid discharge of military personnel was the difficulty in getting an accurate inventory of on-board spare parts and the preparation of requisitions to fill deficiencies. At the same time, the far-flung supply system which had been necessary to support the Navy was demobilized so rapidly that much of the material could not immediately be handled by the peacetime supply system. Even today some of this material is still being identified and taken up in current Bureau of Ships records. The supply system was reduced to a peacetime operational level before it could process the thousands of requisitions and furnish material required to fully outfit the Reserve Fleet. At this time, however, requisitions are mostly prepared. They are ready to release, to start the flow of material to the Reserve Fleet when mobilization comes.

Had demobilization gone as originally planned, who knows whether the optimum condition of the Reserve Fleet would have been adequate compensation for the delay in getting manpower back into peacetime pursuits or whether the drain on the Treasury which a slower demobilization would have caused would have been justified? It is a good bet that, when political and economic factors are considered, the proper action was taken. The present status of the Reserve Fleet comes under the head of a calculated risk we must take.

It may be good "flag waving" to talk about getting the Reserve Fleet into action overnight. It is better for you and me to remember the practical aspects I have described. With this understanding of the present and prospective condition of ships in the Reserve Fleet, there are three things which must be keyed together to produce active ships ready to fight: (1) design, (2) material condition, and (3) manning.

By "design" I mean full consideration and decision by both technical and military minds to determine what changes--principally what additional installations and replacements of equipment--have to be made in each ship before it will be usable by a tactical commander for a wartime military function. As an example, if an LST is required to transport a Marine Corps tank battalion, and if the tanks now used by the battalion are of a new design which cannot be accommodated in the LST until certain changes have been made, I would consider that the ship is obsolete and not deployable until the alterations have been made.

By "material condition" I mean the state of maintenance and repair of the ship's hull and of installed machinery and equipment which is necessary for her to operate. This material condition is quite apart from the question of obsolescence. As examples, a ship whose shaft clearances have reached a point where only a few days of reliable operation can be expected, or a ship which has two out of four main feed pumps inoperable, cannot be considered as ready for use in combat.

By "manning" I mean that officers and enlisted men in sufficient numbers and of proper qualifications are on board to operate the ship in shakedown operations. This means the training of the entire crew, including raw recruits, with the ship at sea.

The planning and scheduling of the three elements--design, material condition, and manning--must consider different factors, but all these factors can be summarily designated as lead time. In this case, lead time can be considered as the interval of time between the moment of decision and the accomplishment of a purpose. If the moment of decision is M-day, and it certainly is so far as the country as a whole is concerned, then all lead times are variables depending on many things but all collectible under the general term "planning." If intelligent planning

in the area under consideration has been completed and is being kept up to date, any lead time from M-day is a minimum. If all planning must start on M-day, the lead time is naturally a maximum. The variation here can be very wide, possibly as much as two years. As it happens, what I have designated as design will doubtless be the controlling element in the timing for getting reserve ships ready for full active service. Design is also the area in which most effective planning can be accomplished. It is possible to theorize that good planning accomplished in design matters will shift the control from design to material condition and probably in many cases to manning.

To replace the vessels of the Reserve Fleet today would cost about 18 billion dollars. The cost to inactivate, preserve, and dehumidify these ships was less than 1 percent of the cost to build them. The cost to activate, repair, and modernize these ships will be considerably less than the cost to build, and to do so will be considerably quicker. With the funds now being made available, about all we can do is keep our powder, and our ships, dry.

Conversion of Merchant Vessels

The second primary source of naval shipbuilding production is the conversion of existing merchant ships to naval use. Under current mobilization planning, every merchant ship afloat, both active and reserve, is being examined and earmarked for specific service in event of war.

For those merchant ships designated for conversion to naval vessels, existing naval ships are being selected as prototypes to represent the best practices based on World War II and current developments. So far as funds permit, drawings will be made and bills of material prepared to have immediately available contractual and technical information for release to the shipbuilding industry at the same time that the ships are sent to the yards for conversion.

In new designs of merchant ships prepared under the United States Maritime Commission, basic national defense features are incorporated by the expenditure of national defense subsidy allowances. Such features are acceptable only if they do not make the design unattractive to the ship operator or penalize him unduly in competition. For example, the machinery plant may be designed for operation with a fast amphibious task force, whereas a lower speed would be more economical over the particular trade route in which an operator is interested. Close liaison is maintained with the Maritime Commission to foresee and plan for conversions from merchant to naval use.

Current construction of merchant ships is far short of the minimum requirements for an orderly peacetime replacement and for conversion to naval use in an emergency. Even with the conversion of all existing passenger and passenger-cargo ships, and with the utilization of some 50 transports under the Military Sea Transportation Service, the combined troop-lifting capacity would fall short of the World War II level of requirements by approximately one-half. Of the 100 or so ships potentially available for use as troop transports, 21 are over 25 years old and only 52 are in active operation. A shortage in troop-lift capacity can be partially met by the conversion of cargo ships as was done out of necessity in World War II. Such conversions are time consuming and costly, and they are made at a sacrifice of the cargo ships themselves, for which the need would probably be only slightly less urgent than the demand for troop ships.

An exception to the present lull in shipbuilding is the private construction of tankers. Recently 32 new tankers have been completed and 23 others are still under construction. These replacements are sorely needed, as most of our tanker fleet is the T-2 type built during the war years.

The position of our country in regard to dry-cargo vessels is becoming increasingly critical. By far the greatest part of our dry-cargo fleet is composed of slow Liberty ships. The higher-quality cargo vessels of the C-2 and C-3 types were nearly all built between 1939 and 1946. Two types of modern cargo vessels are being designed. Unless the current shipbuilding program is supplemented by dry-cargo vessels to replace war-built tonnage, this country will not have the balanced merchant fleet which national security demands.

We do not yet know of any satisfactory substitute for surface ships for lifting the great quantities of things any war will require to be moved between the land masses of the earth. The ocean, like the air, is a self-lubricated, cost-free highway. The ocean has the advantage over the air of supporting loads by displacement. The ratio of useful lift to drag is one measure of efficacy of transport. This ratio is a hundred times greater in a ship than in an airplane, which does not make use of the cleavage surface between fluids of different densities for support.

Every indication is that the replacement and augmentation of the merchant fleet will form a major portion of the shipbuilding production requirements in an emergency.

New Construction of Warships

To perform the functions allocated to the Navy by the Joint Chiefs of Staff, new construction of warships starts with the development of

characteristics by the Chief of Naval Operations. Working with the Bureau of Ships in successively more detailed feasibility tests, the Chief of Naval Operations develops the characteristics, which specify the principal military features, such as sustained speed, cruising radius, armament, enemy detection, mobility, ammunition, and communications.

The Bureau of Ships is responsible that ships float stably, move at specified speeds for planned distances, respond to the will of its commanding officer, carry and service assigned weapons, survive damage to keep these weapons in action as long as practicable, function internally and with other units, and provide conditions of habitability which permit every man on board to remain physically and psychologically fit to perform his duties.

In peacetime principal design effort is directed toward the development of prototype ships in which new weapons and defenses can be evaluated under service conditions. This design and evaluation cycle is applied also in the alteration of existing naval vessels to improve their performance. It is applied also in the conversion of existing naval vessels to a different type with a different function. Conversion work may not only establish the suitability of the design for mass conversion if need be but may also serve to develop and test new weapons and equipment in service before designing and building a completely new ship around them. An example of this procedure is the test of antiaircraft guided missiles from the seaplane tender Norton Sound. Exhaustive service tests will be conducted before a guided-missile ship to carry a main battery of these missiles is built for the purpose.

As it is impracticable to build samples of all new and converted types for which a need is anticipated, the Bureau of Ships is developing a scheme for planning conversion and construction in a realistic manner, a scheme that will reduce productive lead time when mobilization begins. This process follows a normal step-by-step procedure in about the following way:

1. The Ship Characteristics Board in the Office of the Chief of Naval Operations furnishes basic requirements.

2. The Bureau of Ships design force develops contract plans and specifications. If assistance is necessary, a contract is made with a shipbuilding design agent to prepare plans for consideration and approval by the Bureau of Ships before proceeding with the next step.

3. The contract plans and specifications are furnished to a design agent. He proceeds with the detailed design to whatever extent is necessary to permit developing an erection schedule for the ship and specifying the principal components.

4. The Bureau of Ships selects prospective shipbuilders to undertake the construction of the ships which are in the mobilization program. The Bureau works with each of them, determines all steps which must be taken to improve or modify their facilities, and gives them data on which they can estimate their manpower requirements and plan their production.

5. The design agent and the Bureau of Ships together line up prospective manufacturers for the components the contractor will have to furnish.

6. Based on the required military characteristics, and on the current status of research and development, the Bureau of Ships prepares specifications for government-furnished equipment for the new ships.

7. The Bureau combines the requirements for new ships with like requirements for converting existing ships and then proceeds to phantom procurement for the total requirements.

The procedure I have outlined is complicated in two ways. First, there is a tremendous amount of it. The procurement incident to mobilizing an expanded fleet reaches into every industry and every channel of trade. It involves hundreds of thousands of items, and millions of procurement papers. Naturally, the bulk of these papers cannot be handled in advance because of personnel ceilings. It would be necessary to employ thousands of people, virtually the same number that would be needed if procurement were actually under way.

What we can do and are doing is to develop our specific material requirements on the assumption that M-day will be tomorrow morning. The requirements for each type of equipment are listed for each three-month period after M-day. These estimates are farmed out to industry. The estimates give each manufacturer enough detail so that he can plan on what he will need in machine tools, floor space, personnel, raw material, and so forth. As time passes and new developments make earlier equipment and earlier ships obsolete for planning purposes, our estimates to industry are revised. When M-day comes, many of our material estimates can be immediately translated into contracts. On other estimates, we will have a lag due to recent developments, but the manufacturer will know the approximate type and quantity of equipment we will need. Much of his planning can go into the execution stage while we are getting out detailed drawings and specifications for him.

Because of current personnel ceilings and the tremendous amount of detail involved in planning material requirements, it has been mandatory to develop a system which uses machine tabulating card methods. Changes in the number and type of ships in the proposed fleet, as well as changes in the time when new ships are to be ready for sea, can now be handled

by machine tabulation. The machine will turn out the quantity of each size and type of material by specific stock number. It will show when the material is needed. This mechanical method permits rapid recalculation of any change in basic plans.

The second real difficulty, which is probably the harder, is the reluctance to make technological decisions in advance. It is not easy to make a decision today which is, in effect, "If we mobilize tomorrow, this is specifically what we will buy." Decisions must be made before sweeping orders for manufacture can be placed. The Joint Chiefs, the Chief of Naval Operations, and the Chief of the Bureau of Ships must make binding decisions. They know that such decisions will start a chain of operations leading to ultimate manufacture which might, under certain circumstances, interfere with the procurement of a better item if it is developed later. They realize that, when M-day actually arrives, it will bring with it the final moment of decision.

In this regard, you might visualize two extreme conditions, and I assure you that both are very extreme.

In the one case, no decisions have been reached. M-day labor is standing by to be employed on war production. Industry is standing by to receive orders for war production. Procurement personnel are standing by awaiting to be told what to buy. Design people are standing by awaiting to be told what to design. Bureau chiefs are standing by, probably on the Chief of Naval Operations' doorstep, to find out what plans will go into effect. The Chief of Naval Operations is sitting with the Joint Chiefs waiting for word from the Secretary of Defense. The Secretary is at a Cabinet meeting on Pennsylvania Avenue trying to find out what the President will authorize.

That extreme may appear to you to be far-fetched, but to those of us who were in the Bureau of Ships in 1940 and 1941 it is a very real possibility.

The other extreme is admittedly ideal. The enemy is known. His equipment and plan of attack are known. Decisions have been made as to mobilization requirements. They have been translated into logistic requirements in necessary detail. Authorizations have been issued so that the Chief of the Bureau of Ships is free to act on initiating procurement. Designs and specifications have been prepared and made known to prime contractors. The prime contractors have agreed to definite production schedules. The Munitions Board has confirmed the agreements. Information is in the hands of prime contractors in such a form that simple telegraphic letters of intent can start the wheels of the shipbuilding industry turning.

In the first instance, where no advance decisions have been made, any procurement would represent the latest technological development as of that date. There are certainly some types of items where this is the only possible procedure. However, if the application was universal, the delay in getting things started by this approach would be months, and the actual launching of the first post-M-day ships might be delayed as much as two years.

The second picture, where all decisions have been made ahead of time, presents the optimum for getting equipment flowing from factories to ships. Against it is the accepted fact that the equipment produced would be at least as far behind technological advances as the calendar period gained in production. If that is the only disadvantage, the choice resolves itself into a case like the following: If a destroyer delivered 24 months after M-day embodies the latest possible technological developments, will it be of more value in an antisubmarine campaign than a destroyer delivered 12 months after M-day and deficient in some of the latest developments? I recognize that no general answer is possible. The master planners must make decisions on matters of this kind. These decisions will be just as final as similar decisions made in wartime.

Mobilization planning calls for far greater effort to assure alertness to developments than is necessary in wartime. In wartime we have an enemy and contacts with him to keep us alert. In peacetime we have only our knowledge of technological developments and our imagination as to what they can mean in war. It is a real problem.

You may be interested in some of the current trends in ship design which will affect mobilization requirements.

During World War II Diesel-driven generator sets for shipboard uses were required in large quantities. A program to develop a standardized line of the electric ends of these sets has resulted in standard ratings. The generators are interchangeable. They are suitable for coupling to Diesel engines of types already in service. The program includes sets from 30 kw to 1,000 kw and has resulted in increased industry preparedness in the form of approved designs ready for production.

Shipboard electric motors were one of the very critical items in World War II. An important factor was the lack of standardization and the many variations inherent in motor design. Industry produced the motors on a job-shop basis because of the large number of designs needed by the driven machinery. In a single horsepower rating of an AC induction motor, we now have 192 different designs in the fleet. A standardized line of motors is being developed which will drastically reduce this number and at the same time will increase the interchangeability of repair parts.

Design developments require flexibility in mobilization planning. An example is the increasing use of more highly alloyed steels with higher strength-to-weight ratios. The trend in this direction is dictated by the need for saving weight and space in the equipment and machinery so that increased armament and new weapons can be carried without increasing the displacement of a ship.

The latest prototype ship designs will use higher steam temperatures and higher pressures than those of the World War II ships. This trend requires the use of more highly alloyed steam piping.

Gas turbines are being developed and improved for use in the propulsion of ships and as prime movers for emergency generators. This will result in increased Navy demands for techniques and materials peculiar to gas turbine production.

To avoid detection and tracking by enemy craft, it is vitally important to reduce the noise in our ships. The quieting of gears is therefore a major objective. Precision manufacturing methods not only produce quieter reduction gears but also permit higher tooth loadings. Developments in this field may eventually require all suppliers of naval gears to have precision manufacturing equipment and precision measuring instruments.

In our effort to reduce the weight of ships so that more military equipment can be added, the Bureau of Ships is building an experimental destroyer to test new components. For example, it will have a very high electrical current frequency for the ship's electrical plant. If this pilot installation proves satisfactory, important changes will be required in electrical manufacturing plants supplying the Navy.

The increasing size and weight of radar antenna to detect and track modern aircraft requires topside weight savings in our combatant ships to preserve their stability and keep them upright in a heavy sea or when they are damaged. One step to meet this need is a design trend to lighter structural materials for masts and deckhouses to compensate for the larger antenna.

The continued development of magnetic mines, introduced first by Germany early in World War II, is demanding the use of increasing amounts of nonmagnetic material in minesweepers. Unfortunately, the constituents in nonmagnetic structural materials suitable for ship construction are strategically critical in quantity.

Every effort is being made to utilize the experience of World War II in the standardization of highly repetitive equipment and machinery to facilitate and expedite production and at the same time to retain flexibility whereby design improvements can be readily absorbed in the mobilization plans.

In closing this talk, I shall endeavor to summarize the over-all problem of shipbuilding production.

Chart 4, page 24, "Actual National Effort--World War II."--From 1941 to 1945 our total national effort, expressed in billions of dollars, doubled to provide the ships and arms needed to fight World War II. You will note that the effort on civilian goods and services remained substantially level on a dollar scale. At the same time military expenditures were climbing rapidly. The productive ceiling of the United States was not reached, but we approached it much more closely than in World War I.

Chart 5, page 25, "Required National Effort--World War III."--If World War III comes and lasts long enough, the annual productive output may reach a physical ceiling, by whatever dollar value it may be represented. Military expenditures must go from the present level of about 13 billion dollars annually to a mobilized level of almost 200 billion annually.

Chart 6, page 26, "Required Shipbuilding Effort--World War III."--On M-day, or soon after, the Bureau of Ships should be in a position to place orders on industry for delivery within 36 months of material aggregating a total cost of 60 billion dollars. Of this total cost, about 25 billion dollars will go into the shipbuilding industry proper and about 35 billion dollars into general industry for material and equipment. These dollar figures are intended only to indicate the order of magnitude and the probable relation between the shipbuilding effort and the over-all national effort.

Chart 7, page 27, "Shipyards Building--Then and Now."--Contrasted to our position on D-day in December 1941, less than one-tenth of the shipyards are building naval vessels now than there were then. Of those shipyards still building, the average tonnage in each is considerably lower than the average tonnage per shipyard in 1941.

Chart 8, page 28, "Required Shipbuilding Facilities--World War III."--However, the shipbuilding industry, including the Government, today owns physical plant facilities which are capable of accomplishing a little over 50 percent of the mobilization tasks. Of the increased facilities that will be required, about 25 percent will be provided by the expansion of existing plants and 25 percent by the construction of completely new shipyards. These new yards will probably be for "multiple building." They will mass-produce a specific type or class of ship. They will be unsuitable for flexibility in the construction of varied types. When building sites are selected and funds are available, it will be possible to erect shipbuilding facilities almost as rapidly as ship design information and material can be assembled. A survey of appropriate sites is being conducted at the present time.

Chart 9, page 29, "Shipyard Labor--World War II."--Our real task in shipbuilding production is going to be the recruitment and training of shipyard labor. For two years before the Pearl Harbor attack, the shipbuilding industry had been augmenting its labor force at a net-increase rate of about 20,000 men per month. By December 1941 employment in the industry had reached close to 600,000 men. After Pearl Harbor the rate of recruitment was stepped up to an average of 48,000 net gain per month. This proved to be somewhat too rapid for proper assimilation and training. However, it was done and the shipbuilding industry reached its peak of 1.75 million men in July 1943, 19 months after Pearl Harbor.

Chart 10, page 30,"Required Shipyard Labor--World War III."--The apparent mobilization task in the recruitment of labor, starting from the present level, will require a net increase of employment at an average rate of over 80,000 men per month for naval shipbuilding alone. The finding, employing, and training of that many men to accomplish productive work in an industry like naval shipbuilding and repair is a problem to cause us all to ponder. In the United States, where industrial miracles are the order of business, we may be able to accomplish this result in concert with the requirements of the Air Force and Army, but believe me, it will be a real job.

While shipyard manpower is climbing up to about 1.5 million men in World War III, general industry must divert 2.5 million men in support of the program. We see the task in the industries behind the shipyards as one of using presently employed labor in approximately the location it is now employed to turn out, in general, the same thing it is doing now but to Navy designs and specifications. Thus we visualize the shipbuilding industry's task as one of great expansion and general industry's task as one of fairly violent conversion.

Chart 11, page 31, "Naval Prototypes Under Construction or Conversion."--In conclusion, I would like to nail to the masthead the importance of design and specification in planning shipbuilding production and in mobilizing rapidly to the required output. Ship prototypes such as a task-force command ship, hunter-killer ship, fleet-type destroyer, destroyer-escort conversion, fleet aircraft-carrier conversion, escort-carrier conversion, fleet submarine, and general-purpose minesweeper are under construction or conversion to develop and prove in service new designs and their components. Few of the studies are as glamorous as the guided-missile ship and the nuclear-powered submarine, but each contains thousands of design decisions which are profoundly important in the production of those ships in an emergency. The problem is to design the minimum amount of men, material, and facilities into the maximum amount of fighting power.

Chart 12, page 32, "From Ship Characteristics to Ship Design to Production."--If military armaments are considered to flow outward from

the Joint Chiefs of Staff at the center to the battle fronts at the periphery, the progressively greater importance of each decision is visualized. Ship characteristics are shaped by a board under the Chief of Naval Operations, ship designs are delineated by a few hundred in the material bureaus of the Navy Department, and ships are built by thousands of men in general industry and shipyards. An ounce of design thought may save a ton of fabricated material on the shipbuilding ways.

My suggestion to the graduates of the fine course at this college is to look to the roots of industrial mobilization as well as to the branches.

Thank you very much.

CAPTAIN LOOMIS: Gentlemen, Admiral Haberle is ready for your questions.

QUESTION: Admiral, is the Navy taking steps to utilize so far as possible the standard products of industry, particularly in the matter of equipping its vessels?

ADMIRAL HAEBERLE: In so far as it is practicable to do so, yes. The difficulty in many cases is that the standard products of industry are not designed for the conditions they meet at sea, so that frequently we have to place restrictive specifications on articles in order to have them stand up. I remember particularly the walkie-talkie, for instance, designed for various people walking around on shore, where it worked very well. It did not work at sea for more than a week because of salt-water and salt-air corrosion. There are various other things.

I would say, in general, in answer to your question, that we attempt to do that wherever the article will meet our needs.

QUESTION: Is the percentage of 84 that you mentioned applied right down the line? For example, would you need only 84 percent of the carriers that you had in World War II?

ADMIRAL HAEBERLE: That is not a percentage down the line.

QUESTIONER: My other question is: Why do you need only 84 percent?

ADMIRAL HAEBERLE: I would much prefer to have the Joint Chiefs of Staff answer that question, because it is simply our evaluation of their plans. Naturally, our experience is based on World War II. There may be some overemphasis of certain types because the operation may be entirely different. But I believe that there certainly will be an overseas operation, if we can make it that way, and anything that goes overseas must have seapower to protect it and get it there.

QUESTION: Admiral, would you comment on the current costs of shipbuilding? As I understand it, in aircraft, a 1950 fighter costs something like 8 or 10 times what it cost to build a fighter in 1940.

ADMIRAL HAEBERLE: We have to define what we mean when we compare costs. For example, speaking of destroyers, when we compare the present-day thinking of what a destroyer should be with the World War II thinking, we have two entirely different ideas.

Let me put it this way: The cost of building a World War II destroyer averaged around 7 or 8 million dollars. That same destroyer built today would cost in excess of 20 million dollars. The new type of destroyer, including the cost of ordnance and ammunition, costs around 48 million dollars.

I usually use a thumb rule of three-to-one so far as our ships are concerned.

QUESTION: Admiral, are there any radical changes being made in the designs of conventional cargo-carrying ships which will facilitate the unloading of those ships in areas where there are no port facilities, or conventional port facilities?

ADMIRAL HAEBERLE: There are studies going on. There is no actual ship built as yet, or converted as yet, for that purpose. But there are in the 1952 shipbuilding and conversion program ships of just that type, for which we have not received the characteristics as yet, other than preliminary ones. It is going to amount to about a 3 million dollar conversion. I think you can get the extent of the operation from that figure.

QUESTION: Admiral, one of the means of diminishing the effectiveness of submarines is to increase the speed of our convoys. Would you comment on what you consider to be the maximum speed of our convoys in the next war, and whether it is feasible to get our convoys up to as high as 17 knots?

ADMIRAL HAEBERLE: Taking the latter part of your question first, I would say it is feasible to get it up over 17 knots, but we would have to pay a terrific price for it.

I might say that the thinking of a year or two ago was to get the convoy speed up to 20 knots. But I believe that most of the people who make out the characteristics are beginning to realize that they pay a terrific price in the size of ship, in the horsepower of the machinery, and in the ability to produce the machinery.

I think it was our World War II experience that the time factor in producing a new ship is dependent upon the time we can get the machinery and equipment for that ship rather than on the hull. We can wrap a hull around the machinery, if we have the machinery, in very quick order. Many times hulls were floating in the water ready for the machinery and had been launched without the machinery. So, naturally, the more you increase the speed of convoys, the more difficult that problem becomes.

I would hesitate to answer your question directly as to 17 knots because that takes quite a bit of study as to just what that would do. But you all know that for the normal cargo ship, for instance, 12 knots is a pretty good speed. To boost it to 17, you must build an entirely different ship in its hull form, its length and size, and its machinery characteristics, and you end up with something that will be a greater drain on the national economy and industrial effort.

It is a matter that needs careful study and decision. I know it is being considered in the Office of the Chief of Naval Operations at the present moment.

CAPTAIN LOGAN: Admiral, would you care to carry that on a bit and comment on the relative composition of these convoys in the early stages of a war, especially as to the number of Liberty ships?

ADMIRAL HAEBERLE: Just before coming to the lecture, I was discussing what the situation of our merchant fleet might be on some M-day which is not too distant. I had a feeling that, because of the lack of interest in building new ships and the lack of monies for building new ships, unless M-day is considerably postponed, we are going to enter World War III with what we have today in both the active and reserve merchant fleet. I have forgotten the exact figure, but I think about 85 percent of the ships in the reserve merchant fleet are Liberty ships, and, to me, it seems almost inevitable that, if M-day comes within the next five years, we will have to place great reliance on the Liberty ships, in the initial phases at least.

Undoubtedly, there will be large shipbuilding programs, as there were during the last war, and eventually new types will come out. Presumably they would follow the new Maritime Commission designs, which are higher-speed ships and better ships than the C-2 and C-3 classes.

QUESTION: Sir, I seek clarification of some of your statistics. You showed a bar chart which indicated 1,107 ships under construction in December 1941 versus 20 at the present time. You mentioned the factor of 50 involved in those figures and then stated that we would have to wait in World War III for our ships. I inferred that, perhaps, you meant we would have to wait longer in World War III than we did in World War II. But I recognize a non sequitur in that particular argument. That compares new construction, which is only 38 percent of the 84 percent on your chart.

Now, how do we compare today with 1941 in terms of the Reserve Fleet, availability of merchantmen, and the fleet in being? In other words, how does the aggregate of 84 percent today compare with such an aggregate in 1941?

ADMIRAL HAEBERLE: Of course, in 1941 there was no merchant reserve fleet, so we are just as far ahead at the moment as that indicates, except that we must remember practically all of them are Liberty ships. The condition of those Liberty ships is very questionable. I say that advisedly because the Maritime Commission has been trying to get money to repair them. The two Houses of Congress passed such a bill for 25 million dollars last year, but it was thrown out in conference.

There is a great need to find out, by overhauling at least a portion of those ships, what condition they are in. I predict, knowing how little was done to preserve them, in accordance with the Navy standards at least, that a great deal more than most people realize has to be done to those ships to get them to sea reliably.

The number of operating ships in the merchant fleet today is approximately the same as it was in 1941. I would say the average age is perhaps five or six years less than it was in 1941. So in that respect we are a little better off.

Our tanker fleet is considerably better off than it was in 1941.

Ships in the active fleet have been taken into account in the conversion jobs because, as I visualize it, practically all ships would be converted and made suitable for naval use.

Does that answer your question?

QUESTION: Sir, the aggregate of 84 percent--how does that compare with the aggregate in 1941?

ADMIRAL HAEBERLE: It is a little difficult to answer your question directly. It is all averaged in there. I would say that so far as new shipbuilding is concerned, the 84 percent would be about right. So far as the Reserve Fleet is concerned, that is all on the plus side of the ledger. So far as the active fleet is concerned, that probably would be about the same.

QUESTION: Could you produce figures on man-hours required to build and convert the naval and maritime merchant ships that you envision for a third war, with some of the figures for the total production of ships in the Second World War?

ADMIRAL HAEBERLE: I cannot produce them offhand, sir. I am sorry; I don't have those figures totaled in that fashion.

QUESTION: Admiral, could you give us any idea as to whether, in this information you have given us and in your planning for construction of merchant ships (troop and cargo), the JCS took into account the availability of such shipping from the NATO organization?

ADMIRAL HAEBERLE: I cannot answer your question directly. I don't know. I think they have taken a percentage of that availability, not all. I think it would be unwise to count on all of it, because many of those vessels will not be made available to us.

CAPTAIN LOONIS: Admiral, in behalf of both the National War College and the Industrial College, I thank you for a very fine presentation.

ADMIRAL HAEBERLE: Thank You.

(31 May 1950--650)S

Chart 1

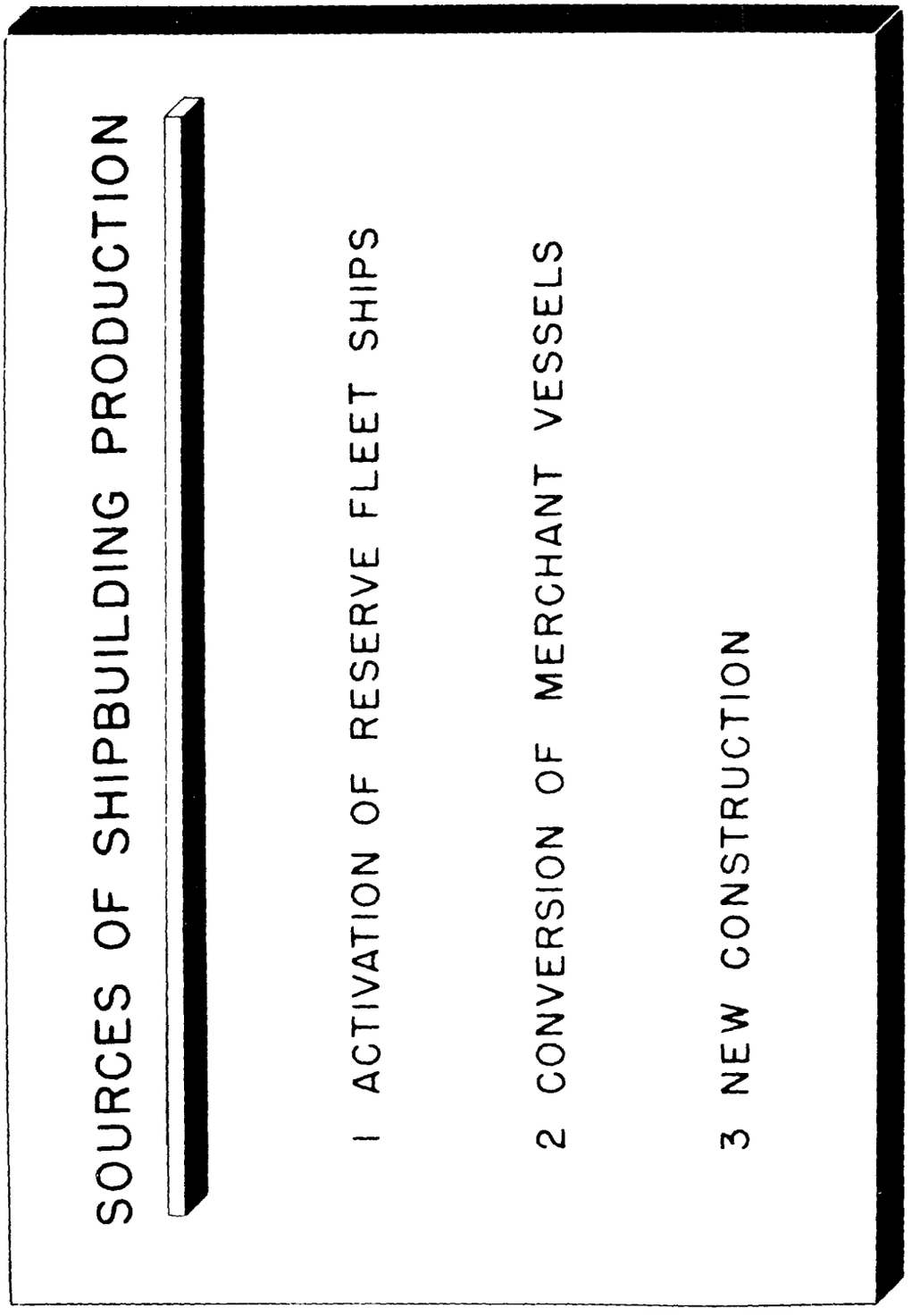

SOURCES OF SHIPBUILDING PRODUCTION
1 ACTIVATION OF RESERVE FLEET SHIPS
2 CONVERSION OF MERCHANT VESSELS
3 NEW CONSTRUCTION

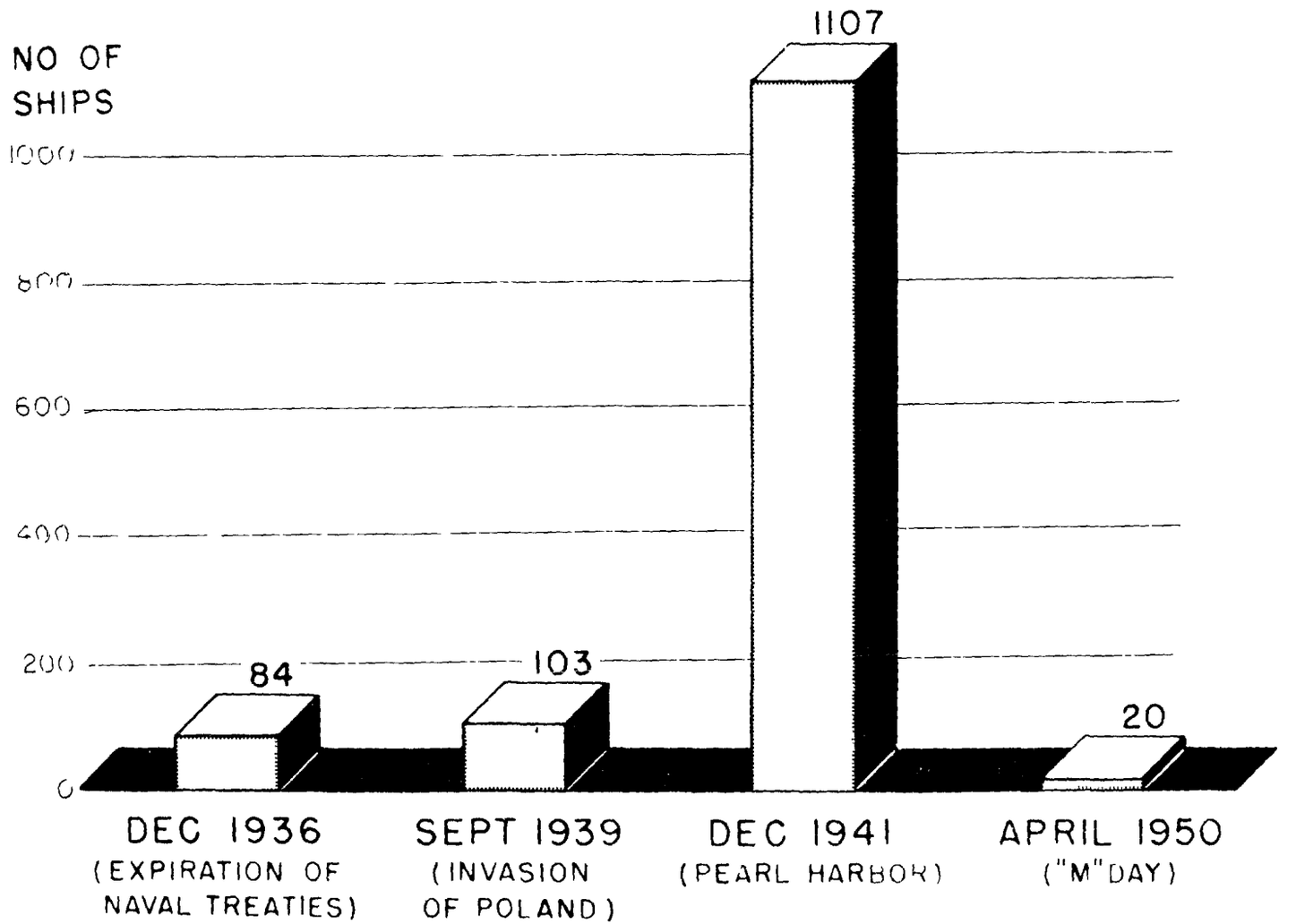
Chart _

DEMAND FOR SHIPBUILDING PRODUCTION

WORLD WAR II	100%
WORLD WAR III	84%
OBTAINED FROM	
ACTIVATION OF RESERVE FLEET SHIPS	26%
CONVERSION OF MERCHANT VESSELS	12%
NEW CONSTRUCTION	38%
PRESENT ACTIVE FLEET	8%
TOTAL	84%

Chart 3

SHIP PRODUCTIVITY—THEN AND NOW



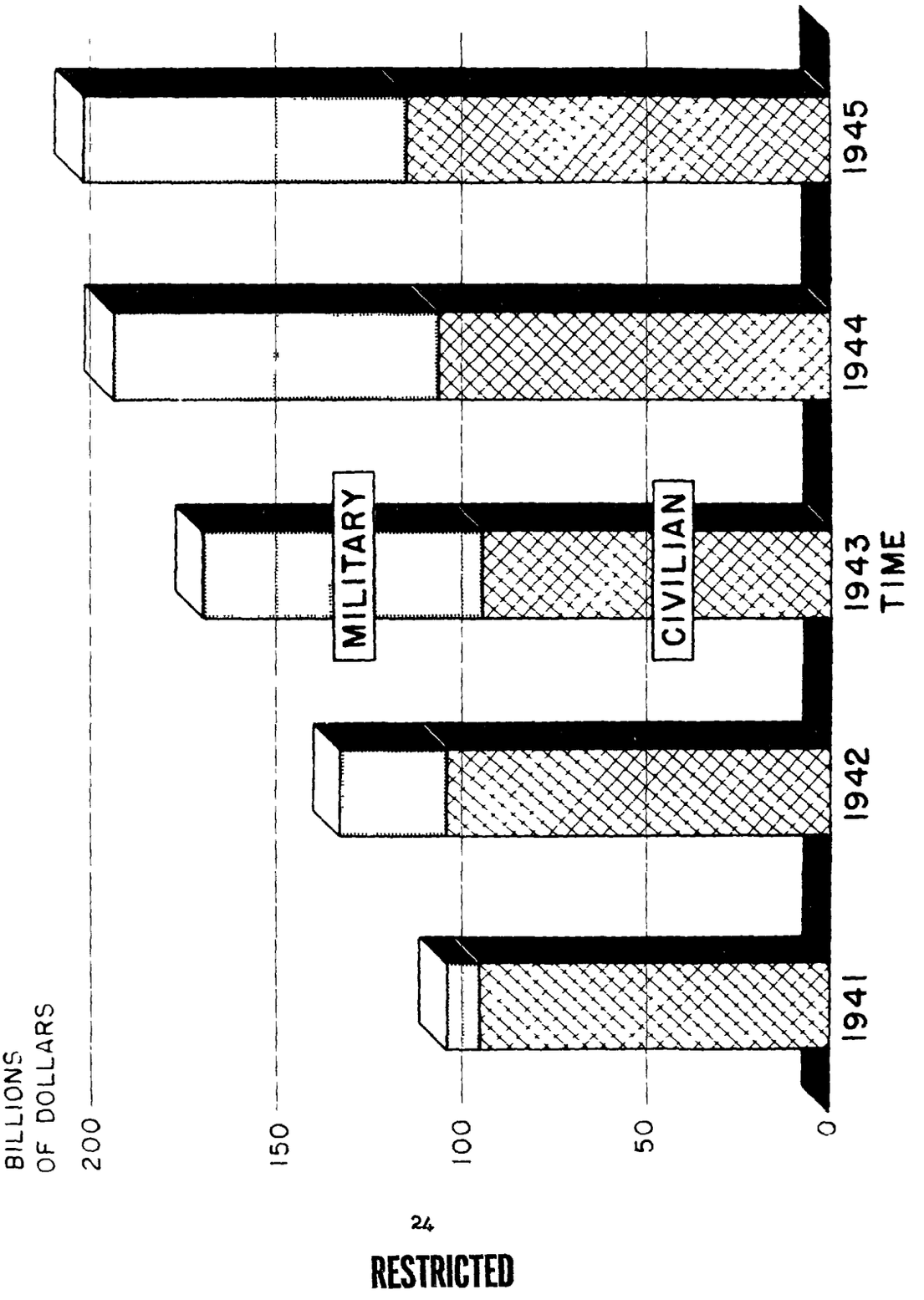
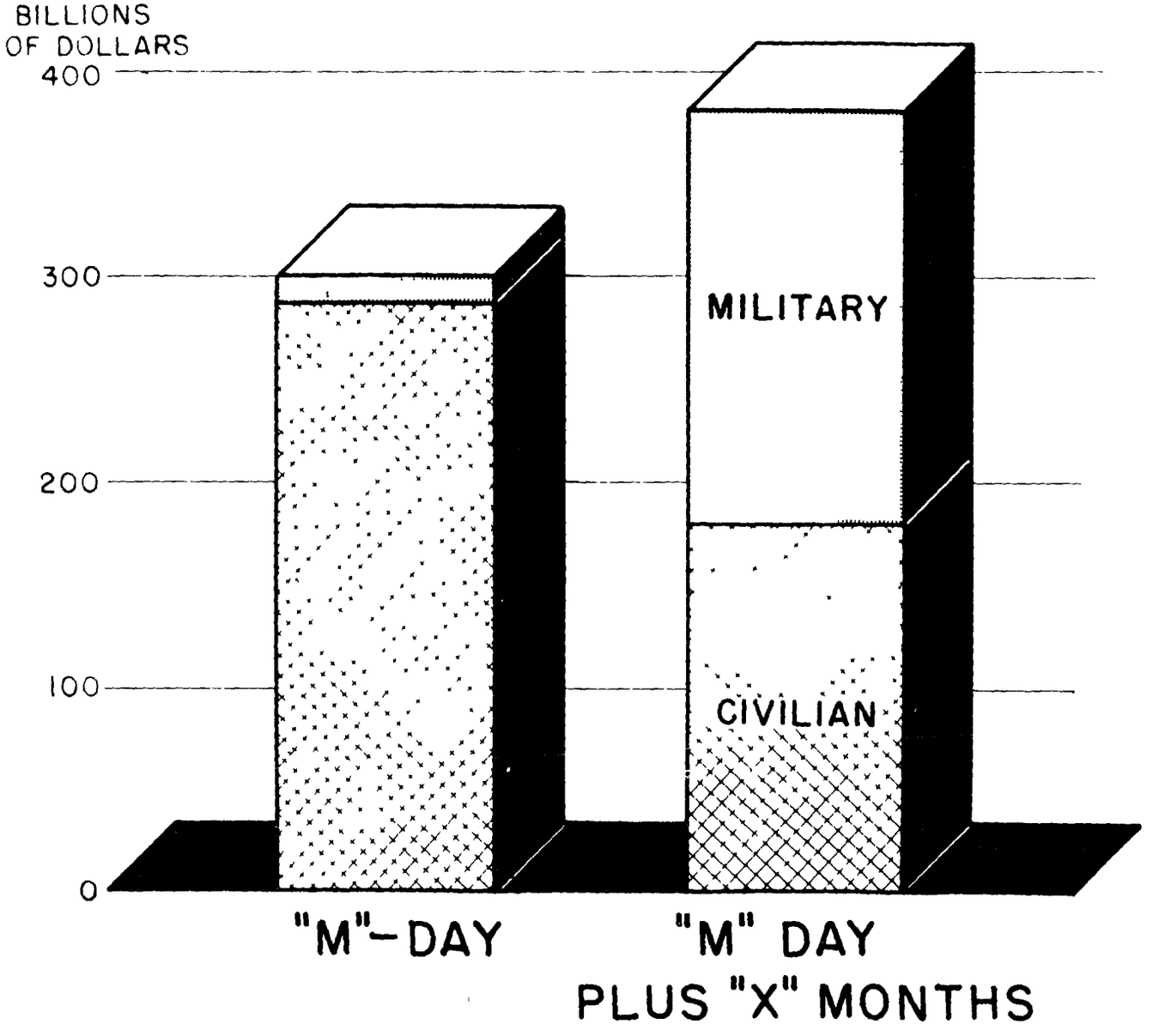

ACTUAL NATIONAL EFFORT-WORLD WAR II
BILLIONS OF DOLLARS
200
150
100
50
0
MILITARY
CIVILIAN
1941
1942
1943
1944
1945
TIME

Chart 5

REQUIRED NATIONAL EFFORT-WORLD WAR III



RESTRICTED

Chart 6

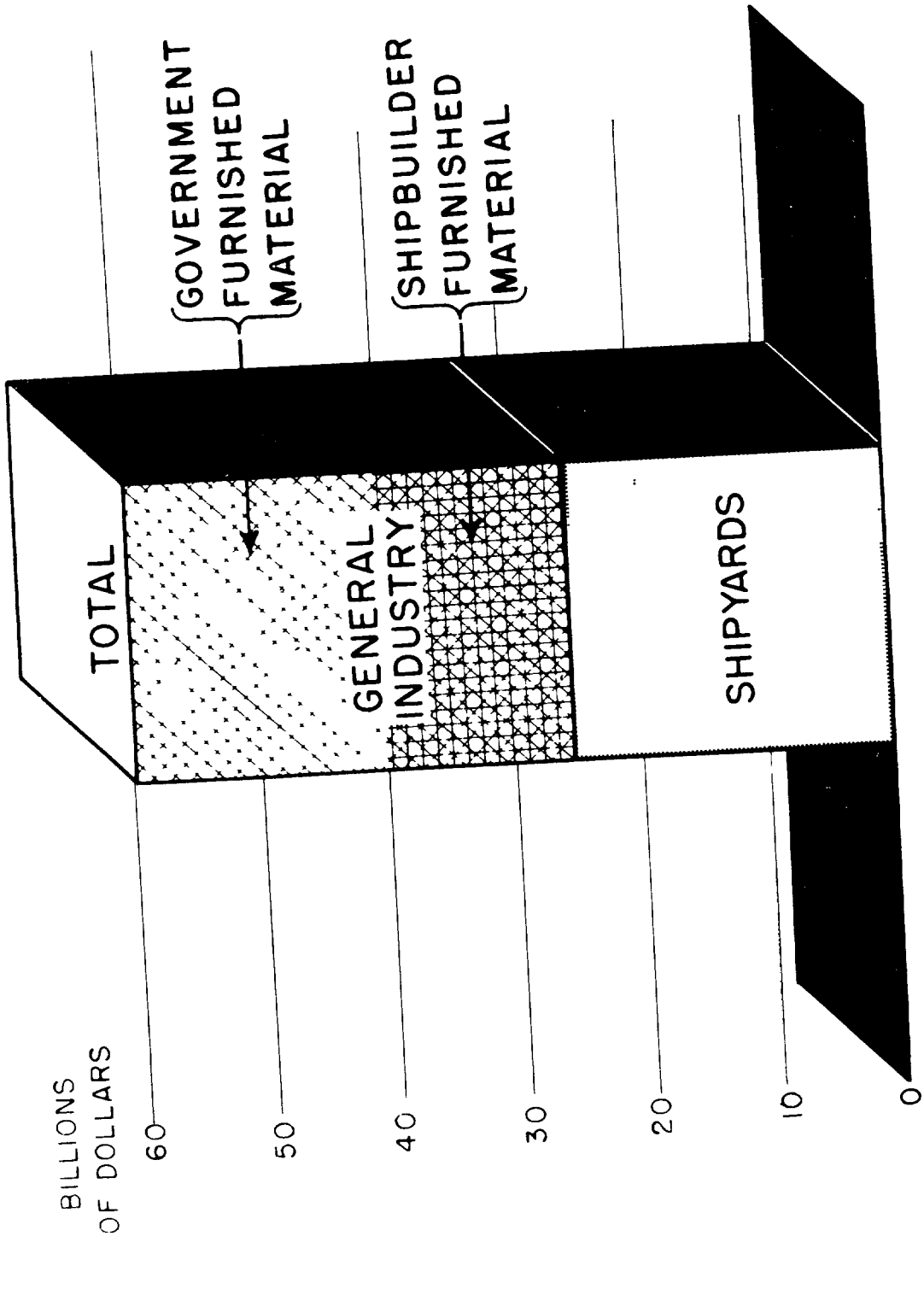

REQUIRED SHIPBUILDING EFFORT - WORLD WAR III
BILLIONS OF DOLLARS
60
50
40
30
20
10
0
TOTAL
GENERAL INDUSTRY
SHIPYARDS
GOVERNMENT FURNISHED MATERIAL
SHIPBUILDER FURNISHED MATERIAL

Chart 7

SHIPYARDS BUILDING - THEN AND NOW

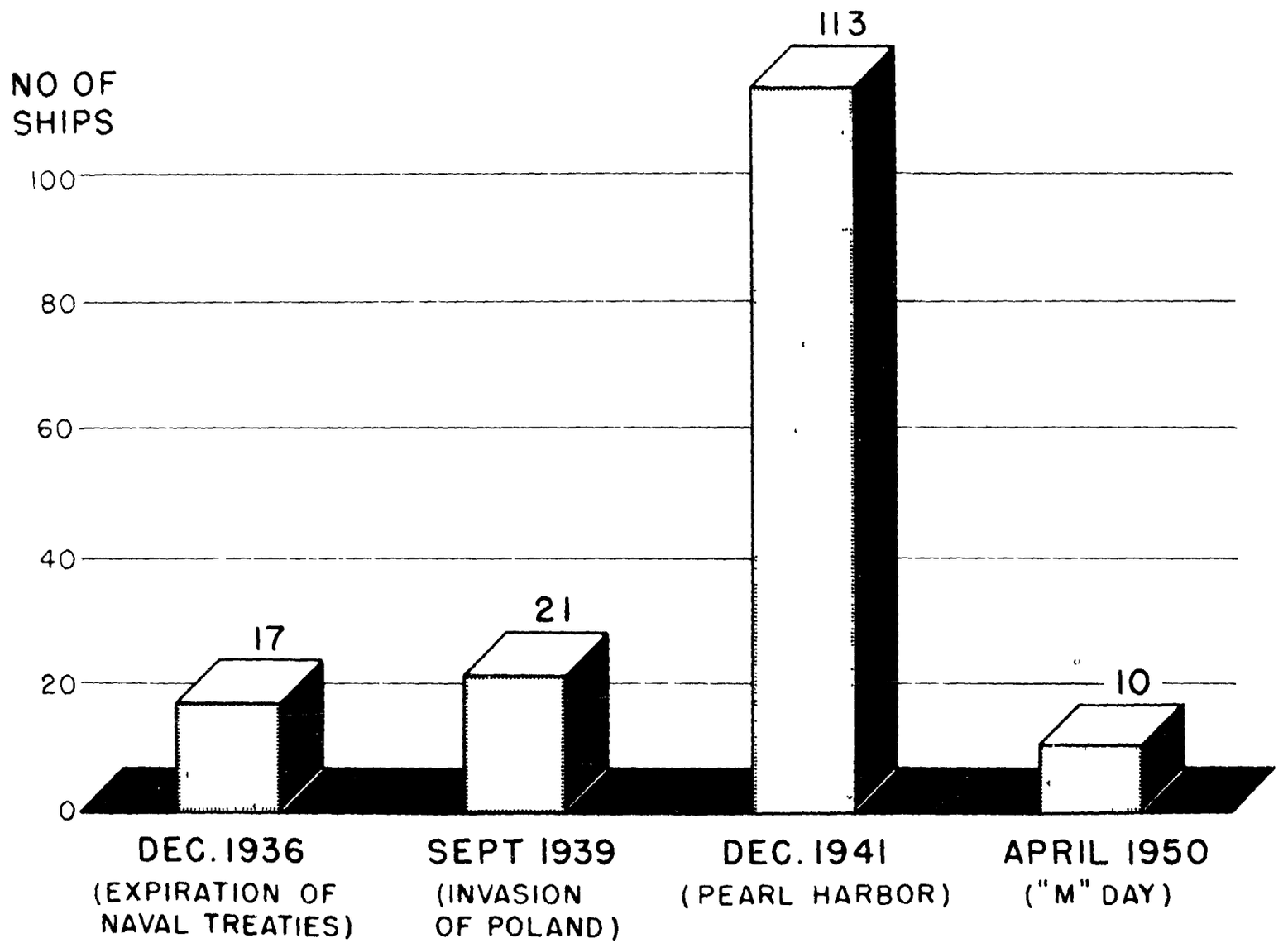


Chart 8

REQUIRED SHIPBUILDING FACILITIES
WORLD WAR III

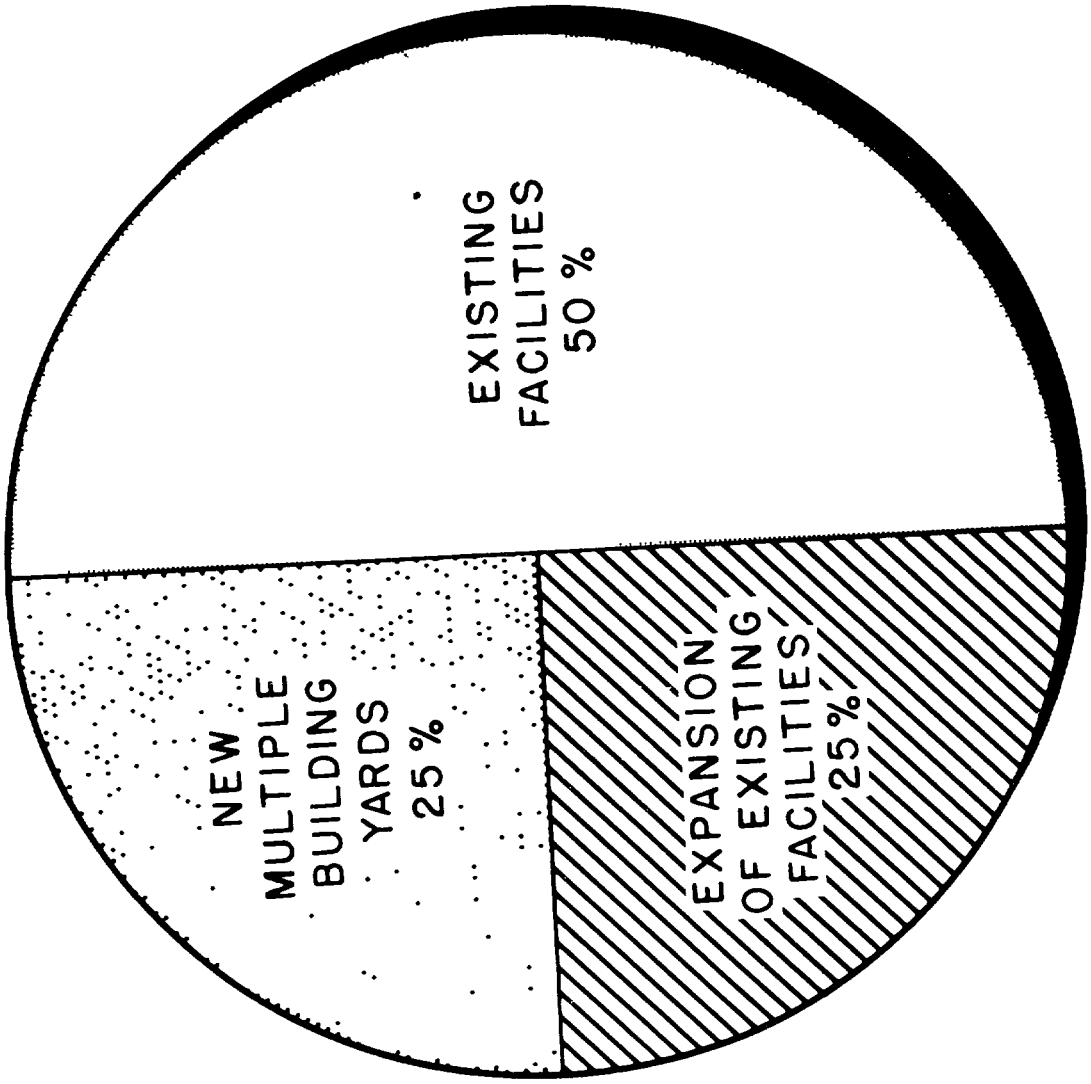
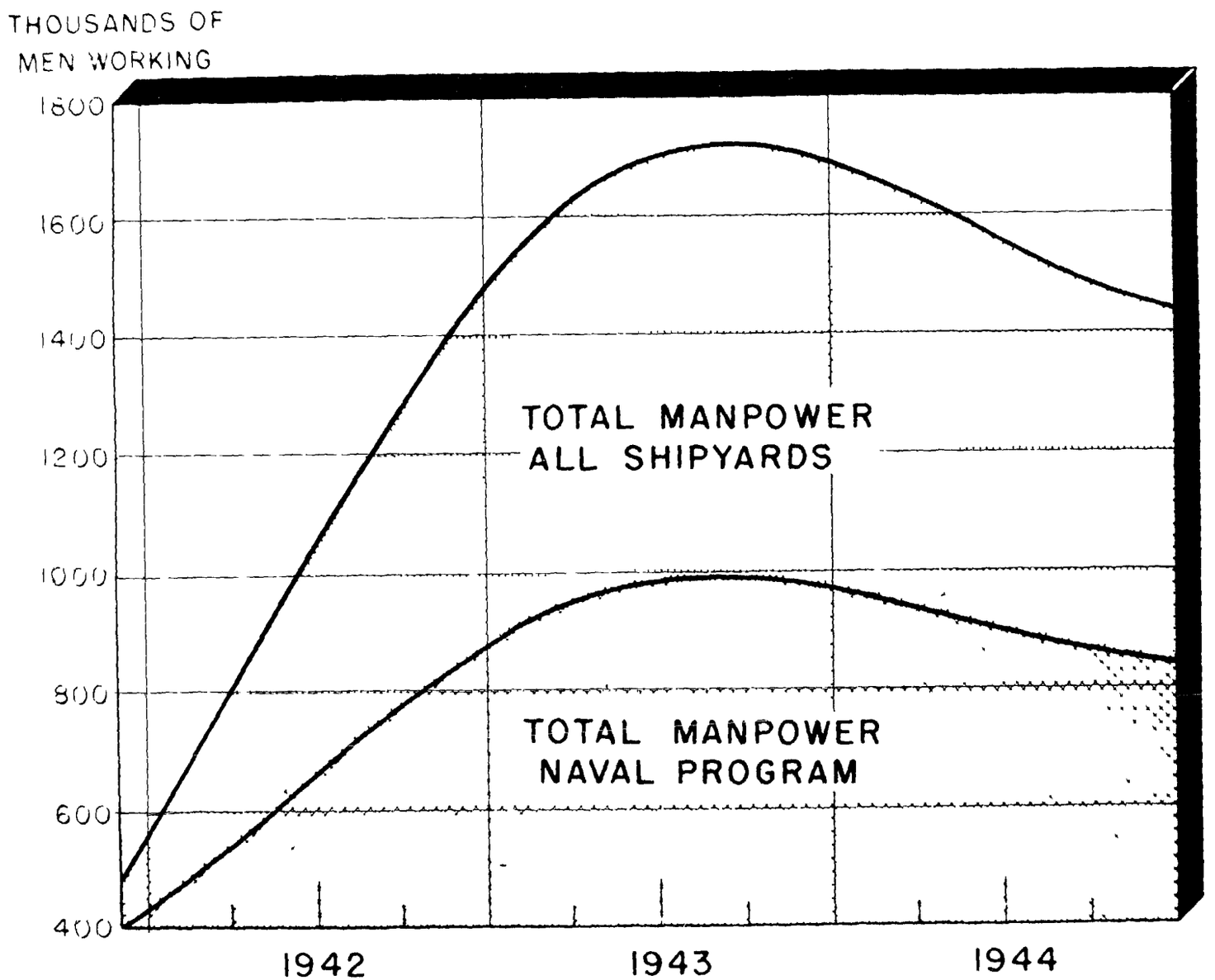


Chart 9

SHIPYARD LABOR - WORLD WAR II



RESTRICTED

Chart 10

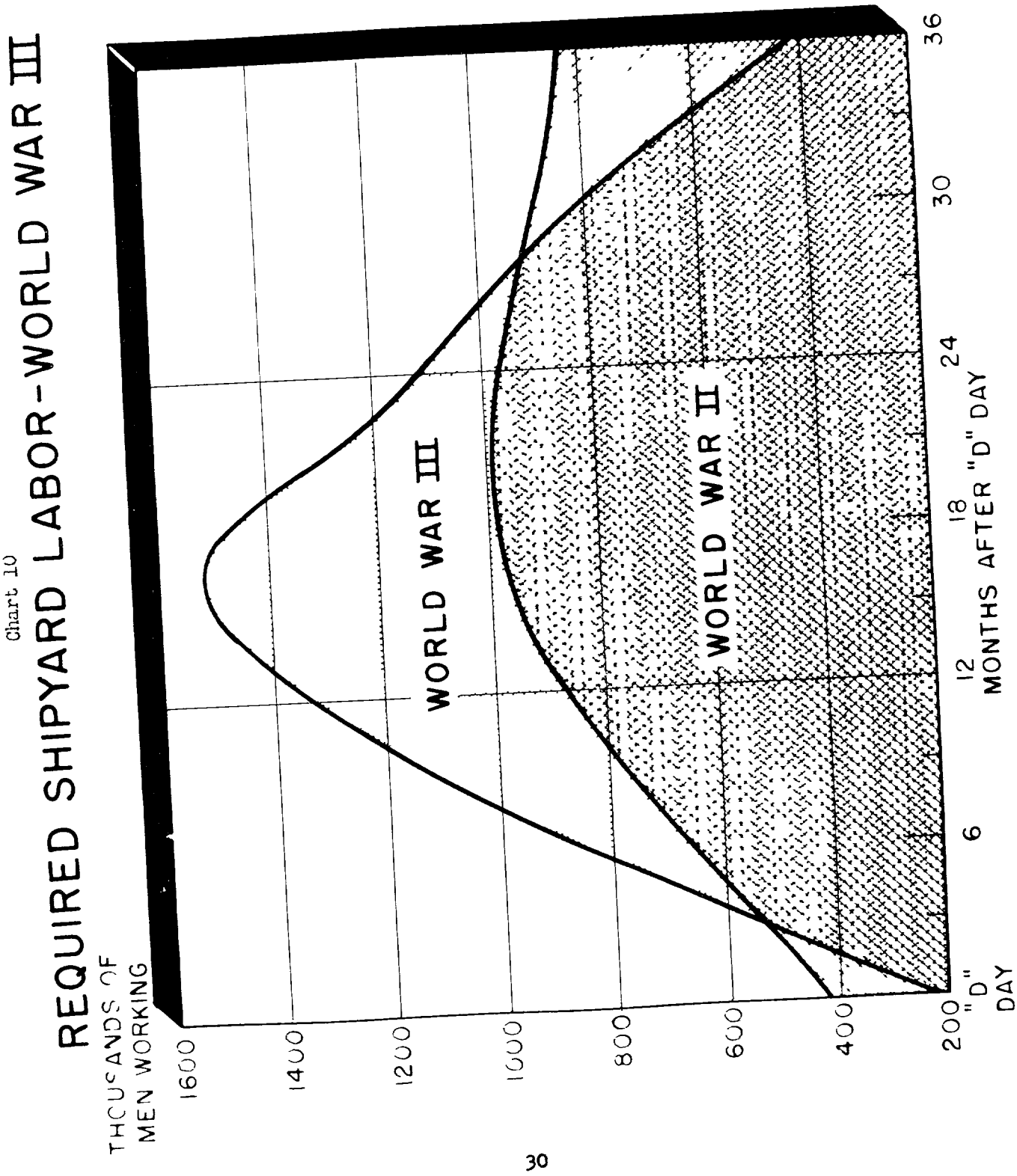

REQUIRED SHIPYARD LABOR-WORLD WAR III
THOUSANDS OF MEN WORKING
1600
1400
1200
1000
800
600
400
200
"D" DAY
6
12
18
24
30
36
MONTHS AFTER "D" DAY
WORLD WAR III
WORLD WAR II

Chart 11

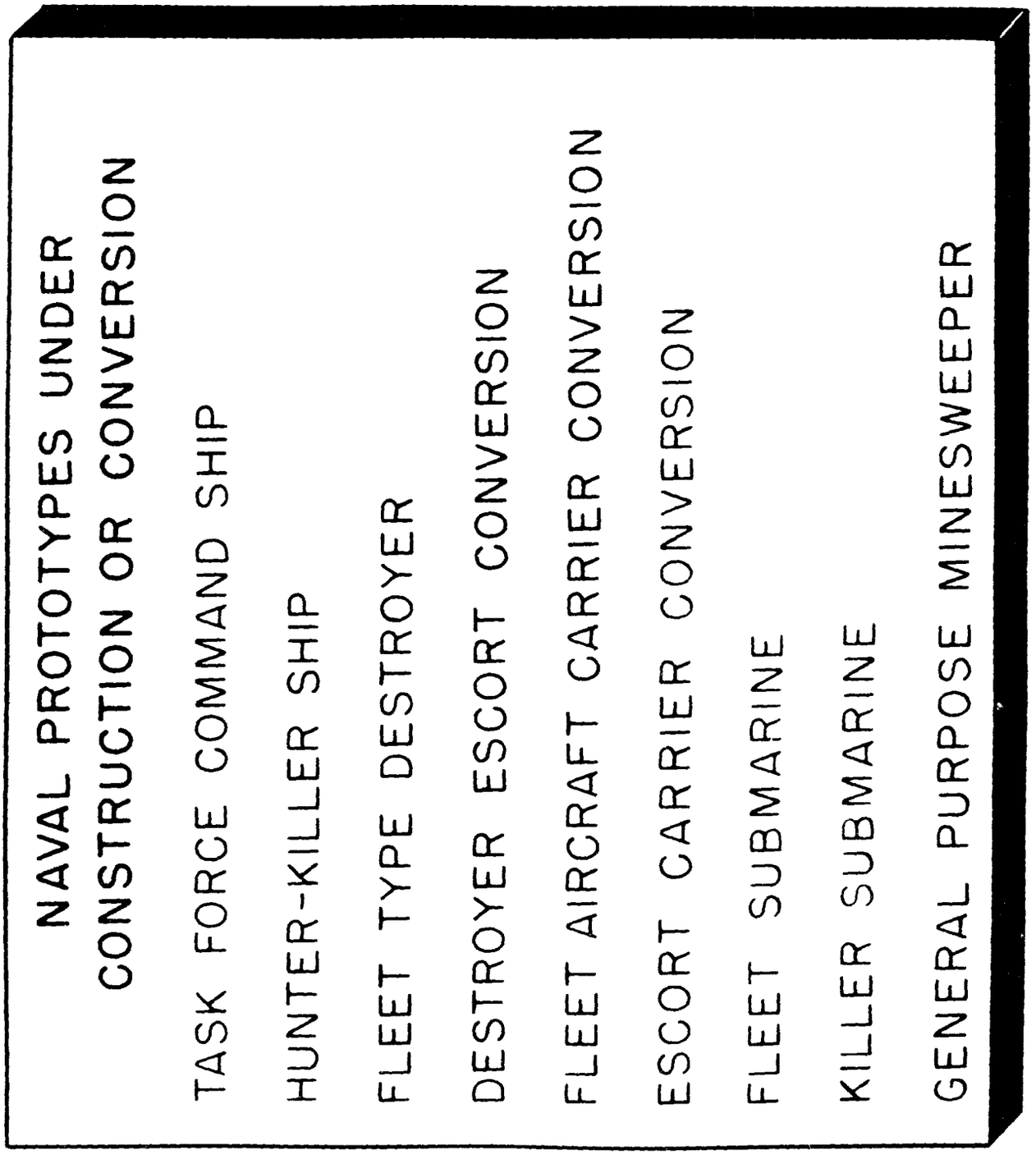

NAVAL PROTOTYPES UNDER
CONSTRUCTION OR CONVERSION
TASK FORCE COMMAND SHIP
HUNTER-KILLER SHIP
FLEET TYPE DESTROYER
DESTROYER ESCORT CONVERSION
FLEET AIRCRAFT CARRIER CONVERSION
ESCORT CARRIER CONVERSION
FLEET SUBMARINE
KILLER SUBMARINE
GENERAL PURPOSE MINESWEEPER

Chart 12

FROM SHIP CHARACTERISTICS TO SHIP DESIGN TO PRODUCTION