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ARMY ORDNANCE WARTIME PRODUCTION PROBLEMS  
12 February 1948

148-65

CONTENTS

	<u>Page</u>
SPEAKER--Major General E. S. Hughes, Chief of Ordnance, Department of the Army.....	1
GENERAL DISCUSSION.....	9

Publication No. L48-65

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

WASHINGTON, D. C.

RESTRICTED

# RESTRICTED

CAPTAIN WORTHINGTON: None of us in the military service has to be told of the importance of ordnance materiel to fight a war. We are highly honored today to have the Chief of Ordnance in the Army tell us of the problems of getting ordnance materiel. General Hughes has had experience in two world wars, both in the Ordnance Department of the Army on the General Staff. I am happy to introduce him to this group. General Hughes.

GENERAL HUGHES: We are all fellow students here today, thinking of the major problems of industrial mobilization, but you people have the advantage of us because all you have to do is concentrate on industrial mobilization; we have to take it in between times. It is a problem about which we can start discussion from almost any point of view. We don't have to ponder on where to start.

So I would like to start today from the basic assumption that the next war is always different from the last war. I think that can almost be accepted as a maxim. So I want to start, then, with my conception of what the next war is going to be in comparison with the last war, to see what common problems there are, and what changes we have to make in our program.

My conception of the next war--and I think I am in agreement with the great majority of people about it--is that it is going to be fought in the United States to a large extent, especially the air war. There is going to be, as I see it, a great deal of sabotage, a large number of aerial attacks, a great deal of demolition. We will not have any allies holding off possible enemy while we place orders and get large quantities of machine tools and do a great deal of constructing while we are getting ready.

The next war, I think is going to be different from the last war in that we are not going to have the same rich supply of raw materials. I know we were short of rubber and of some of the products of the Far East, but as a matter of fact, we did have in the United States in the last war large quantities of steel, copper, and other necessary materials.

Now, there comes to mind the idea that the most important difference between the next war and the last war is the time element. We just aren't going to have the time to do many things which we took time to do for World War II. So, if we examine the late war for the most important time-consuming elements, we come to a long list of things that we had better examine very carefully for the purpose of seeing what we can do about them. I haven't attempted to list these time-consuming elements in any order of priority.

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# RESTRICTED

# RESTRICTED

I start off with the question of drawings which have to be examined from the standpoint of mass production, and you can also go into the questions of availability of materials, tolerance, and machinery requirements.

The next item is description of manufacture. All of you know, I think, what description of manufacture is. It is the attempt on the part of some oracle--speaking from the Ordnance Department's point of view--to say how a fuze or how a round of ammunition or how a tank is put together, what machines are used, and what processes are adapted to the manufacture of that particular item.

The next one is the question of specifications. All the Services use specifications; and a great many of them--in fact, too many--are different in verbiage and in accomplishment.

Fourth, comes the question of machine tools. The acquisition of machine tools prior to any war is a difficult problem, time consuming. Coupled with this is the matter of construction of plants, also time consuming. We have here the question as to where the plant is going to be built; the question of acquisition of property; and then the job of erecting the buildings, and installation of equipment for the particular production job which lies ahead of that plant.

Calculation of requirements is another time-consuming detail. We must know what we are going to need, and we must know early enough to get those requirements into the hands of the people who are going to fill those requirements.

Then there is the question of competition for allocations--who is to get this plant and who is going to get that plant. Many allocations are coming right now from the Munitions Board. But these allocations to date have covered only very minor plants. There has been no allocation of the larger corporations such as General Electric, General Motors, or the automotive industry as a whole; and it is going to be difficult for somebody to decide what facilities will be made available to the Air Force for the manufacture of engines, to the Ordnance Department for the manufacture of engines, and to the Navy for the manufacture of engines. Somebody has to exercise a good deal of ingenuity and do some good guessing.

The question of competition for skills: All through World War II we heard complaints, and we are still hearing complaints, about the manner in which the Selective Service people took good mechanics and good tool makers out of our shops, put them in uniform, and sent them out to handle a rifle.

Another time-consuming factor was the job of getting acquainted with industry. Through the days prior to World War II, we made an attempt to

RESTRICTED

know industry. We in the Ordnance Department had our districts. We were very poorly manned, usually by an officer and a secretary, and the officer got to the point where he didn't know anybody because he was never admitted anywhere. He knocked at the door, but was turned away because everybody was so busy doing something else they didn't have time to talk to him.

The question of having too many manufacturing agents was an ever-present problem, with the Navy buying the same things the Army was buying. I don't sympathize too much with the complaints which have been made by industrialists that they dealt with more than one man. In peacetime, every firm likes to talk about all the customers it has, but in time of war, it wants just one customer. I don't sympathize with that entirely, although I do believe that there was too much time lost in trying to adjust the conflicting requirements of these various purchasing agents.

Time was lost in the education of officers, from the standpoint of industrial mobilization and from the standpoint of production. There was too much time lost in the education of civilians. I am sure there were people who came in as directors and deputy directors of some of the governmental agencies who had not spent enough time prior to the war in similar jobs to know just how the Armed Services functioned and what their requirements were, and how to go about it.

Now, that is just a rough list of some of the time-consuming factors of World War II. It is a list which, in my opinion, we should examine to see whether or not something can be done to get every one of those items, and others, worked out to the point where they can be taken care of faster and more efficiently than the last time.

Under our visualization of the next war, there are certain new factors that have to be given consideration; for example, the dispersion of plants. As you go around the country or as you look at an industrial map of the United States, you will find very heavy concentration of industry in such places as Chicago, Pittsburgh, New York, and Houston. I was down in Houston the other day and traveled for about 15 miles along the ship channel where there is a long line of production plants. Any bomber coming over there, whether he is using an A-bomb or just old type TNT bombs, could certainly do a lot to devastate that particular industrial area.

Regarding underground installations, our World War II experience gave us the idea that underground installations were advisable and necessary. Whether they are not, I do not know. First of all, they are expensive. I will not go into that now, but that is a factor for the next war.

Better intelligence is going to be a great factor in the next war. The organization of industry must be such that it can operate more or less from a self-contained point of view without asking so many questions about things that the Army, Navy, and Air Force cannot answer.

RESTRICTED

# RESTRICTED

We will have the complication the next time of our association with other nations. We have standardization with some countries of South America and we are opening up a wide field of mutual interests. All this is going to require a great deal of planning and work in order that we may cooperate on a working basis with other nations.

Another factor, which is important and which has not been solved as yet, is the matter of decentralization. We have, in the Pentagon Building, one of the finest aerial targets I have ever seen. Within its walls are important data and a lot of trained personnel which are going to have to be dispersed. Assuming that a lot of sabotage has been going on in the United States, how are we going to solve the problem of getting a tremendous production program started and continued in spite of constant destruction here, there, everywhere? I frankly do not know, but it is a problem that we are working on, and I think it is a problem we can solve. We have solved almost everything else that we have tackled.

Now comes the question of what to do. We have gone back--at least I have gone back--to World War II to try to figure out the time-consuming factors so that we can do something now to reduce the amount of time required to solve those problems. We have looked at the picture of World War III to see what new factors will enter into that war according to our conception as of today, and we find certain things that we are tackling and that I think should be tackled by everybody interested in industrial mobilization, to see what can be done to shorten the time.

First of all, from the Ordnance point of view I think it is essential, and I think there is general agreement throughout the Department of the Army, that our district offices must be continued. It is a form of decentralization which has worked now for two world wars and I think will have to work and work better during the next war than ever before.

If our conception is correct that the production capacity of the United States is not going to be the equivalent of what it was during World War II, that we are not going to get started fast enough, and that there may be a reduction in production, it would appear to me that we must do a lot more than we have been doing recently to build up our war reserves, to have on hand the ammunition, the guns, and all the other manufactured items that we are going to have so much difficulty making the next time. We must have them on hand and ready to go.

We will have to retain stand-by plants--we in the Ordnance Department are arguing strongly for it--in order to cut down the need for new plants. We have retained a number of establishments typified by the Dickson Gun Plant down in Houston, a tremendous plant constructed during the war at great cost for making medium caliber cannon for the United States Army, and I think some for the Navy. We have a large number of loading plants throughout the country which we are maintaining or trying to maintain in

# RESTRICTED

RESTRICTED

703

stand-by condition.

We are doing something about machine tools. It takes months to make some of the special machines which are required for the production of heavy ordnance. Through the months we, working with the Navy and the Air Force, have tried to build up, within the fiscal limitations imposed upon us, as large a reserve of machine tools as possible. Those machine tools are still being selected and are still being stored. We hope that, by having a large reserve of machine tools, we can get started faster again. Rather than to wait for machine tools to be designed and made, we will have them in stock.

Within manpower and fiscal limitations, we are attempting to bring our drawings up-to-date, and we have an arrangement with the Commodity Committees of the American Ordnance Association which will work about like this:

Mr. Knowles, a vice president of Procter and Gamble Company, which did a lot of ammunition loading for us during the war, is the chairman of the Ammunition Committee of the American Ordnance Association. We have agreed with him that, if we design a new round of ammunition or a new fuze, we will make the ordnance drawings, manufacture the round or the fuze in accordance with those drawings, send the item to Aberdeen Proving Ground for a test, and if it works, we will send the drawings and the specifications to the Commodity Committee. That Committee will guarantee that the drawings and specifications are submitted to a firm either allocated to the Ordnance Department for the manufacture of ammunition or a firm which made ammunition for us during the war. The firm will examine the drawings and specifications from an industrial point of view, from a mass production point of view.

This procedure is necessary because there are many ways of manufacturing an item which will require a large number of special tools; and there are ways of manufacturing the same item which won't require so many special tools.

Mr. Knowles has told us that if we will let him have those drawings, he will examine them and come back to us with a proposal for the substitution of materials or the substitution of a design from a mass production point of view. We have promised, in turn, that, when those drawings come back, we will make some of those items according to the mass-production drawings, and if they still operate and function properly, we will put the mass-production drawings in the safe and have them available for use by a manufacturer when and if the time comes. Everybody, then, involved in research and development, design, small production and mass production, will have had something to do with the item, and it won't be a complete surprise when the requirements are made known to some manufacturer.

RESTRICTED

# RESTRICTED

We are trying to use World War II experience to determine what was made during the war that need not have been made. Operating on the principal that the production capacity of the United States is not going to grow more but is going to grow less, we are already trying to reduce the requirements down to the point where it would be possible for us to meet them from the production end. Colonel Olmsted, in my office, is working on the question of requirements on the basis that, from the experience of a four-year World War, we can get a fairly good idea as to what we made that we didn't need to make, and, from that, determine a better method of indicating what we want. In these studies, we started with ammunition, and we have covered a series of calibers to date. I brought down here today the letter which we sent forward yesterday, which reads, in part, approximately as follows: "The 240 millimeter howitzer ammunition is particularly susceptible to study under the concept established in the above references."

By that concept, I mean this: That during world war II we worked on the basis of a day's supply or a day's fire, or some other method adopted by the Army Ground Forces for shortening cablegrams. Or they would say they wanted so many tons of ammunition, which is even worse. It was too much for them to say, "We want seven million rounds of so and so."

We have figured that the Army Ground Forces can get what they want under any terminology they want to use, but we do not see any necessity for manufacturing that ammunition according to that same terminology, because we have proved to our own satisfaction that during our biggest war we used a method which has resulted in a large amount of ammunition being left over. The second sentence of this letter is: that "of the 408,000 rounds"--remember we are talking about 240 millimeter ammunition, which is a big projectile--"produced in World War II, only 119,000 were officially reported as expended in combat and 227,000 were left over."

Now, it is my conviction that it is not necessary to make 227,000 rounds which are going to be left over when you consider that this production requires men, it requires buildings, it requires machine tools, and, above all, it requires raw materials. So we are examining the requirements based upon a long war, a big war, where there were distribution lines covering the whole world. We say we cannot disregard that experience if it shows to us that requirements are larger than necessary.

Something has to be done about the question of warmongering. Industry cannot put its heart into the present task if it is under constant threat of being called warmongers. That problem has to be solved one way or another.

If the people who are going to make the equipment required not only by the Ordnance Department but by other segments of the Armed Forces, cannot be told what the problem is, then we might just as well go back

# RESTRICTED

RESTRICTED

706

to the days prior to World War II and simply say we cannot make any change. Something has to be done about solving the problem of secrecy. You cannot have men in uniform discussing these problems with men in civilian clothes and constantly guarding their tongues and giving only half the picture. During the war, top secret documents caused more trouble than anything I know of, when 300 men ought to have known about a problem and three men got hold of it and kept it to themselves. Things just went awry.

So far as underground plants are concerned, the Engineer Corps is charged with the study--I think it is doing an excellent job--and we in the Ordnance are trying to get some money for the establishment of one plant to see how it works. We are not attempting to put loading plants or arsenals underground, but in every industry there is a choke point, usually a small one. That is the reason that the U. S., Air Force and the RAF picked on ballbearing plants all over Europe, because that was the choke point of German war industry. It was a small plant, but if they did not get ball bearings, they could not get major mechanisms that require ball bearings.

So far as acquaintanceship with industry is concerned, present world conditions have forced great changes. We do not have to spend so much time pleading with industry as we did years ago. There is a definite industrial interest in what we are doing and a very definite awareness of the necessity for industry to do something about it. Our speakers are getting around, and we have direct connections with scientific societies and with the Commodity Committee of the American Ordnance Association. The Navy has its Navy Industrial Association and the Air Force has its Air Force Association.

More and more we see a closer tie-in between industry and the Armed Forces from an organizational point of view than the United States has ever seen before. It is a tremendous job. When you people sometimes feel that it is not going fast enough, just realize we are now trying to organize a nation in which industries continue to be competitive with one another but are noncompetitive so far as we are concerned. This arrangement poses quite a problem. To treat Uncle Sam one way and the man across the street another way requires quite a bit of adaptability which has not become effective as yet.

Complaint was made after World War II that too many people were buying identical items. To correct this, a very laudable attempt has been made, which is growing more successful each day to cross-procure. The latest example I know of is the assignment to the Navy of the procurement of hand tools. That is what is back of the assignment of some item or some group of items to some one man and letting him buy for all the Armed Forces.

RESTRICTED

# RESTRICTED

The allocation of plants is coming along slowly, but there is going to be a lot of working at cross purposes in that program because of the competition for these particular facilities. After we get a good strategic plan, with an idea as to what the next war is going to be, how it is going to be fought, what equipment is going to be required, and approximately what quantities, I think allocation of plants can be made much more quickly than in the past.

I have covered the matter of requirements, but I want to cover that again because to me it is the most important part of the whole Industrial Mobilization Plan. During World War II, the requirement was anything that overseas personnel put on a requisition. When that requisition got to the lieutenant colonel, it doubled. When it got to the brigadier general, it doubled again. Before it left the theater, it had probably doubled again; and by the time it got to the United States the requirement was tremendous.

For the most part, quantities of items were set up in what we call SNL's or in all kinds of manuals. No commander dared go ashore on any beach unless he had everything that was called for as an essential item by some manual prepared by some CAF-5 during the prewar years. I remember in the North African and Sicilian landings we issued orders that if anyone had anything he didn't want, he could turn it in. The beaches were filled with stuff that they wanted to get rid of that the manuals and SNL's had called for. They were tickled to death to get rid of a lot of stuff they had been carting around and had never used.

Now, the question of civilian organization is also a very important problem. It is necessary that some of these chairmen of special boards and agencies who come to Washington guard their jobs. I think they do guard them, but they are in difficult positions because they are trying to handle their own businesses in civil life and also work for Uncle Sam. But, sooner or later, there must come a realization of the fact that these jobs they have are full-time jobs, and some of our ablest civilians must come in and accept them as full-time jobs.

Another thing that I can think of to do is to get some of you people, after you have had a year at the Industrial College, on the staff as G-3--not make you G-4--so we will have some combat commanders who realize that the ravens don't do all these things, that there is a lot of hard work involved.

If the combat commander thinks too much of supply and maintenance he never moves, but if he doesn't think about them at all, he moves too far or too fast. So a compromise has to be made. The only thing I can suggest is that, after you people are thoroughly indoctrinated in everything to be known about supply and industrial mobilization, you get some of these combat jobs.

# RESTRICTED

RESTRICTED

707

If there are any questions, I would be glad to answer them.

QUESTION: That 240 ammunition, General, how much of that which was left over when the war ended was in pipe lines?

GENERAL HUGHES: All I know is that we made 408,000 rounds. After the war ended there were 227,000 rounds left over. We had the longest pipe lines the United States has ever had. They extended from the United States in every direction. I simply say we made that much and there was that much left over, including everything that was in the pipe lines, including everything that was fired, everything that went up when a dump exploded, or whenever a ship went down, and including all losses for the three or four-year period. That gives us a very good experience as to what actually happened.

These requirements during the war were built up by somebody who started from the gun and assumed that, during each active day of firing, each gun would fire so many rounds. In World War II, when we had thousands of guns, all of which were not firing all the time and many were not fired for long periods of time, it was nonsense to say we had to manufacture the maximum number of rounds required for an active gun on an active day. Those things just cancel each other out.

QUESTION: You speak of stockpiling machine tools. Will they be the difficult-to-get machine tools or ordinary lathes and types generally used?

GENERAL HUGHES: We are stockpiling both. We are stockpiling big presses that take 12 or 18 months to two years to manufacture. We are also stockpiling a large quantity of general purpose machinery. We do not know what we are going to have to make next time so we have more or less abandoned stockpiling special tools.

QUESTION: General, it appears that the Ordnance Department seems to be one of the agencies of the Armed Services that deal in manufacturing items such as tanks which require tremendously long period to get tooled up for production. You mentioned presses; I am wondering what the Armed Forces in general, the Ordnance Department in particular, have done or are doing from the viewpoint of basic or pure research of means and methods of the reduction of inexcusably long periods required to get drill presses and other items necessary to start production.

GENERAL HUGHES: I don't regard that as our business. I perhaps failed to tell you that everywhere I go I emphasize the responsibility of industry. It is my conception that industry is responsible for everything connected with mass production. That means examining the drawings that we in the Armed Services turn out, to see whether or not the drawings fit some small pilot lot or whether they are adapted to mass production.

RESTRICTED

# RESTRICTED

If the industry feels that a certain machine tool is required, is essential or desirable from the standpoint of mass production, it is up to them to do something about the design of that machine tool.

The industrialists of the United States are beginning to accept that responsibility. In addition, the Ordnance production people that are dealing with us have accepted another responsibility, which is what we might call the production engineering aspect of it. The two tie in together. We do not go into the machine tool aspect of production except from a very limited point of view at our arsenals. At Picatinny, for example, or any other arsenal where we are manufacturing an item, it is our ambition to have at that arsenal a pilot line which is manufacturing that particular item, using the best machine tools that we can buy or that we can have designed.

There is a great deal of difference between manufacturing 100,000 of something and setting up a pilot line for that production, and manufacturing a hundred million where another kind of tool might come into being that would expedite the production of the one hundred million. We are doing the best we can to have good pilot lines with the latest type of machine available even if we have to design it, but we cannot design it from a mass production point of view. We can make only a guess at that.

**QUESTION:** The question I am going to ask may be controversial. It may be that the military has no direct say-so in this matter. On the other hand, I think it is something in which we all have an interest. Specifically it is a matter of the maintenance of industry in the very best state of preparedness, with new equipment, faster equipment, and equipment that will do more things. We were told from the platform yesterday that the bill for replacement of American industrial capacity in the various states, to bring the total to where the engineers feel it should be, might be between the order of 50 and 75 billion dollars.

We recognize, of course, that an industrialist getting ready to replace machines now finds the reserve he is allowed to accumulate by the Treasury Department under depreciation on the old cost of his machine does not permit him to go out and buy one at present-day prices. My question is: Is there anything that the military can do or should do, or is the military asked an opinion by anybody in Congress when they are discussing matters of taxes, or is it something that we have to depend on industry itself to carry the burden and hope that it does a good job of it?

**GENERAL HUGHES:** Well, I would say that the only thing the Armed Forces can do is to make known to the manufacturers the requirements, what it is they are going to have to make. Then from there on, industry or that particular manufacturing establishment has to give consideration to how far it can go in installing new machine tools for the purpose of

RESTRICTED

208

making the civilian end product or making a wartime end product, and the two do not always fit together. That is one of the final aspects of industrial mobilization after the requirements have been made known, after secrecy has been covered, after we get to the point where we can actually go to the plant that has been allocated to the responsible department, take them into our confidence, and say, "This is a list of what we want you to do."

CAPTAIN WORTHINGTON: General Hughes, on behalf of the College, I want to thank you for a most forward-looking and instructive talk.

(23 March 1948--450)S/mmg.

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