

RESTRICTED

SOME ASPECTS OF THE CONVERSION OF THE TEXTILE INDUSTRIES FOR NATIONAL DEFENSE

5 March 1948

248-105

CONTENTS

	<u>Page</u>
SPEAKER--Dr. Stephen J. Kennedy, Research Director for Textiles Clothing and Footwear, Office of the Quartermaster General.....	1
GENERAL DISCUSSION.....	18

Publication Number L48-105
THE INDUSTRIAL COLLEGE OF THE ARMED FORCES
WASHINGTON, D. C.

RESTRICTED

RESTRICTED

SOME ASPECTS OF THE CONVERSION OF THE
TEXTILE INDUSTRIES FOR NATIONAL DEFENSE

5 March 1948

COLONEL HOFFER: I believe we can all agree that the production of textiles is the industrial art longest known to man. At least we can read in Genesis that Adam and Eve made aprons out of fig leaves. And ever since, man has been using vegetable fibers or animal fibers or synthetic fibers to produce textiles.

Today we have as speaker a man who knows all about the production of textiles from the various fibers. In addition, he knows the tremendous demands for textiles for all climates and all altitudes and the wide variety required by the Armed Forces during World War II. He has written extensively on textiles and prior to the war had much experience in the textiles field. In addition, during the war he was responsible for textiles research and for the scheduling of all textiles production for the Quartermaster General, who probably was the biggest purchaser of textiles in history.

I take great pleasure in introducing Dr. Stephen J. Kennedy to the class. Dr. Kennedy.

DR. KENNEDY: Before starting on the paper which I have here, I should like to make one observation, based upon a comment made to me by someone who read it, that I should point out at the start that I am not trying to outline for you detailed plans for the conversion of the textile industry. What I am, accordingly, going to talk about is simply "Some Aspects of the Conversion of the Textile Industries for National Defense."

Introduction and Point of View

A study of German economic thought during the past hundred years will reveal that their analytical method has been characterized by a broad realization of the importance of the process of development; that is, the way in which the concept or situation has developed historically. Recognition of the importance of history as a dynamic force in the present is fundamental as well, to the Marxists. In fact, one of the cornerstones of Marxist ideology is what is referred to as the "economic interpretation of history", an inversion of the analytical method by which, according to their dialectic, the historical process becomes a dynamic force directing mankind toward certain unalterable goals.

RESTRICTED

RESTRICTED

The expenditure of a relatively small sum of money upon a critical analysis of War Production Board records, correspondence, and files, showing how conversion actually took place during the war, might throw far more light upon the technique of conversion of the textile industry in some future emergency than any amount of collection of industry capacity data.

On the Nature of Military Requirements for Textiles

It would be well perhaps to start this discussion of industry conversion by developing a general picture as to what the textile industries would have to be converted to producing, both quantitatively and by types of materials. Here are four important elements which, among many others, need to be kept in mind, because of their influence upon the significance of whatever figures are used for planning purposes.

First of all, there is the indeterminateness of actual quantitative requirements because of the impossibility of foreseeing the strategic situation at the outbreak of war, since this can be considered as coming about only by the action of some aggressor nation attacking us. Under such a situation, an opponent would choose the time and place of attack, the scale of attack, etc., and could plan effectively his own initial quantitative requirements, whereas we, not knowing such factors, could not plan with any significant degree of accuracy just what we would need at the outbreak of such a situation. Without expanding discussion on this point, it is worth noting that the problem of conversion is like a coiled spring. Initial conversion is no conversion at all. In fact, in the early days of war, the War Production Board textile officials declined to use the term "conversion" because of the ease with which the initial shifts of production capacity could be effected. However, as conversion began to go deeper, and conversion had to be made of mills of which production could be had at only a great loss of efficiency or capacity, it began to be realized that conversion here was as real as in such industries as the automobile industry.

The amount of this quantitative requirement is exceedingly important to this problem. In fact, it actually defines the problem. By the same token, no set of requirements can be ultimately valid in any quantitative sense of the word. Hence the importance of adequate general plans, which would be flexible enough to permit varying the details substantially to meet whatever particular situation develops.

A second element which we would do well to consider is the basic fact that the military requirement for textiles, unlike that for subsistence, ordnance, or most other items, is quantitatively a function of the climatic area in which operations are projected.

RESTRICTED

RESTRICTED

in supply of textiles, which under other conditions could have confronted the Army early in the war. In place of twelve to twenty-four months to build up an adequate supply of cloth and clothing, the Quartermaster Corps was confronted with a large force in being, already trained, and which had to be supplied on very short notice with a complete Combat Uniform, different from what they had previously been issued. Accordingly, very great requirements for the combed cotton, wind resistant, water repellent fabric for the Field Jacket and trousers were created. It placed a very great burden upon the textile industry in the Fall and winter of 1944-45. This crisis in textile supply and the need for forced conversion of marginal mills was deepened by extraordinarily large demands from the European Theatre for tentage.

The other example to cite on this point is the change in the sleeping equipment for troops in the field from blankets to a wool sleeping bag. It was found that a wool sleeping bag with a water repellent cotton case was more efficient than blankets. A decision was accordingly made to provide this wool sleeping bag to the Army as a whole, since there was not a sufficient supply of waterfowl down and feathers to provide down bags. This decision, made in 1944, which called for production of five and a half million sets of bags, created an enormous demand for the water repellent poplin cotton fabric for the case, amounting to some thirty million yards, where no such requirement had previously existed. The need for better sleeping gear, of course, arose from the fact that we were planning to operate in a temperate climate under winter conditions which would require ample protection at night.

This influence of the climatic factor upon requirements may be further illustrated by the fact that in the Table of Allowances 21, the standard allowance of clothing for the tropics uses 29.5 yards of cloth and 35.5 yards for the semitropics, as compared with 64 for winter in temperate areas. (The figures for the Arctic at present would be meaningless in view of the fact that this whole assembly is being redeveloped along non-comparable lines.)

The determination of climatic requirements of clothing for different areas in the world it may be said, constitutes a considerable part of the program of the Quartermaster General in environmental research. It certainly may be expected, however, that a more thorough study of efficient protection in different climatic areas of the world will hardly decrease the significance of this factor upon the determination of quantitative requirements for mobilization.

Another element affecting military requirements for textiles is the fact that, regardless of climatic areas, military textiles are significantly heavier in the aggregate than textiles used in the civilian economy. This heavier weight constitutes a controlling factor

RESTRICTED

RESTRICTED

9.3

carding capacity, and then also they tended, by and large, to run their carding departments a full three shifts. A study of the available data from the war of the way in which this need for additional carding capacity was met by individual mills in relationship to the switch in their yarn sizes to produce different weights of fabrics, would probably be one of the most rewarding surveys as a basis for planning future conversion in this industry.

A fourth point which will affect very substantially the military requirements for textiles is the fact that the tempo of textile and clothing research and development, both in Army and in the industries themselves, is accelerating at present. The impact of this is going to result in significant changes in the functional requirements for textiles, and probably changes in quantitative requirements as well as weights of fabrics. Similarly, improved textiles will come to be developed as new clothing needs become known. Whether there will be a total increase in the yardage of textiles required or a decrease, simply cannot be foreseen at this time, but it is probable that actual increase in yardage will come from such development.

One or two examples will illustrate the point. Here is the case of the light-weight pyramidal tent. Heretofore, the tents furnished to the Army have not been noted for comfort, either in the summer or winter. There has been a great deal of criticism of them in the past and as a result of various directives, our office has developed a light-weight four to six man tent for cold climate operations. This tent is the first satisfactory tent produced in this country for Arctic operations, at least so we are told. Our ability to make it comfortable when the ambient temperature is well below zero arises from the use of a liner. This liner, which is made of a light-weight, fire-proof fabric, creates an air space between the liner and the tent roof, which helps greatly in insulating the inner well in which the occupants live. Its use practically doubles the yardage of textiles required, even though it has been possible to keep the weight of the tent down by using very light-weight fabrics.

Similarly, in our Arctic clothing developments we are, at the present time, working on various types of combinations of insulating materials which will probably result in a greatly increased yardage of fabric, while at the same time reducing the over-all weight and greatly increasing the efficiency of the assembly.

RESTRICTED

907

planning of conversion of these industries, during the years prior to the late war, did not take sufficiently into account. Also, it should be noted that there is a large number of indirect military requirements which simply cannot be known in detail to any planners. Just let me ask you how you go about planning the requirements for fabrics for buffing uses and for abrasives. These are both purchased by plants in many industries as minor supply items in the finishing of various types of equipment. In case you are inclined to underestimate the importance of such indirect military uses, it might be noted that this one requirement amounted to several million yards per month during most of the war.

These requirements, not immediately apparent to people who are concerned primarily with direct procurements by the Government, actually overshadow direct military requirements. In the first quarter of 1945, for example, when industry was straining every effort to meet the greatest military textile requirements of the war, what was the pattern of military and other uses? On cotton goods, the War Production Board Report No. 658 showed the following, for carded fabrics, combed fabrics, and cotton duck combined:

<u>Shipments 1st Quarter 1945</u> (000omitted)					
<u>Total Carded, Combed & Duck</u>	<u>Military</u>	<u>Rated AA-2X & Higher Non-Military</u>	<u>All Other Rated</u>	<u>Expert</u>	<u>All Non- Rated</u>
2,377,715	594,526	611,571	397,721	179,433	594,465
100%	25%	26%	17%	7%	25%

I believe these figures, showing that the military was only taking 25 percent of the total production, with other rated AA-2X and higher amounting to 26 percent, should indicate rather conclusively the fact that keeping the administration of textile industry conversion in civilian hands has a great deal to be said for it. Regardless of any question as to how well the job was done, and by and large it was done extraordinarily well, the fact is clear that there were national interests of very great importance which at least equaled direct military requirements. For these same reasons, it is quite improbable that the actual administration of textile industry conversion in any future emergency will wholly be in the hands of the military, or that civilian and other essential requirements can be waived aside in an all-out attempt to get the military requirements out of industry production.

It should be noted of course that, while it is true that in the early part of the war, conversion of the textile industries took place very largely on a voluntary basis, later, as military requirements increased

RESTRICTED

In this case, our overseas route to India was effectively cut. That such would be the case in some future war may be a matter of conjecture. The fact is that the entire world is dependent upon its supply of cheap, coarse bagging materials from the production of jute in the area around Calcutta, India. If the strategic developments attendant upon the outbreak of a war cut us off from this supply again, this requirement for bagging would again have to be met out of our own industry's production.

In contrast to the situation on jute and burlap, our supply of wool from the Southern Hemisphere countries, while threatened in the early part of the war, actually never was cut. Had the Japanese pressed farther south and cut us off from communication with Australia and New Zealand, we should have had a critical supply situation with respect to wool. It may be regarded as a matter of chance that such a situation did not develop. Certainly, in some future emergency, that supply line could be disrupted, with very important consequences to the military services. Since at the present time the sheep population in this country is diminishing, we would not be able to produce enough raw wool to meet military needs. In wartime, this would present a serious problem. Of course, it is possible that development of synthetics may progress to a point which will make us no longer dependent upon natural wool, whether domestic or imported. It is not believed that we have reached such a point today, however, from the standpoint of the functional efficiency of such products, although it is quite possible that within the next few years, very substantial progress in this direction may be made.

I have mentioned only two specific cases where strategic aspects of supply may affect the conversion of the textile industries. There are a good many others that could be mentioned and which are also of great importance to certain segments of military requirements and the economy as a whole. One certainly is that of cordage fibers, where again we are wholly dependent upon imports. Some progress has been made in starting production of abaca in Central America, and, of course, as you know, we did produce a considerable amount of hemp in this country for use in the production of rope.

A detailed study of the various imported textile materials which were in short supply during the war and which imposed special burdens upon industry from the standpoint of conversion, would certainly need to be undertaken in any broad planning for industry conversion. With it, of course, one should go not only to primary materials, but should include such secondary supplies as chemicals used in processing.

RESTRICTED

RESTRICTED

9, 6

followed other policies during the war. That policy undoubtedly was well advised, but its impact upon the supply of certain types of textiles proved to be critical. This applied to military textiles as well as certain other types which were needed for civilians. Along with this were other aspects of the recapture of profits of industry which had a great deal to do with the attitude of industry toward conversion.

Another subject which ought to be carefully studied by a critical historical analysis was the relative advantage of selling to the Army, as compared with selling to the Navy or any other rated orders. It might be assumed that it made no difference to whom you sold, whether the Army, Navy, or Marine Corps, or to some other rated purchaser. Was this actually the case on all items?

I should like now to mention three types of studies which should be particularly fruitful for the determination of possible future policy of conversion of these industries. The first of these is the study of certain key products of the textile industries that were in a critical supply situation during most of the war. Among the items which come under these headings are the following:

- | | |
|----------------|-----------------------------------|
| Carded yarn | Merino yarn (a wool-cotton blend) |
| Combed yarn | Heavy combed fabric |
| Cotton duck | Wool tops |
| Cotton webbing | Tire cord |

That is a fairly small list, but I believe it holds the key to well over half of the total shortage situations which were encountered in the cotton and wool branches of the textile industries during the war. When we say simply that there was a shortage of carded yarn, for example, we have not added anything to our knowledge. What we need to know is wherein that shortage lay, for what products the shortage was critical, how the normal flow of yarn was disturbed, what increases there were in the allocation of purchased yarn to specific products or markets, and finally, how the channeling of yarn to deal with this situation was accomplished. The same may be said in general for the other products down the list.

The second type of study referred to above is the study of specific machinery shortages. Here reference is made to standard equipment, rather than specialized equipment, where an actual shortage of equipment existed against the wartime demand. The two principal instances are cotton carding equipment and wool combing machinery. To appraise

RESTRICTED

707

yards per month from the available installed capacity for making these yarns. While the poundage could probably have been increased by forcing mills to convert to this fabric, the uneconomic situation would certainly have had undesirable aspects over-all.

Accordingly, the question may be raised, and it was raised repeatedly during the war, whether it would not be desirable to build an industry able to produce the Army's requirements of a wind resistant fabric like Byrd cloth. The policy of our office was instead to direct our interest toward the development of other fabrics of approximately comparable weight which could be made on existing equipment. One fabric developed was the wind resistant poplin which ran actually around six to seven ounces in weight. Beyond that, we undertook extensive research into the development of the principles of how to construct tightly woven fabrics which would be satisfactorily water resistant. This work is still in progress. We have made fabrics which, from a water resistant standpoint, are many times more resistant than Byrd cloth. They present other problems, however, which are still in the process of being worked out. Accordingly, in some cases of this sort, it may be that the real solution of obtaining a satisfactory product from the standpoint of functional performance is less one of rebuilding an industry than it is to redevelop the product.

The second illustration I should like to give is that of nylon. This fiber, despite certain limitations on its utility, has a great many applications in military clothing and equipment. Its high strength-weight ratio presents one of the most effective means for reducing weight of the soldier's textile items. The importance of this is constantly stressed to us by the using Arms and Services. The present capacity of the DuPont Company for producing nylon amounts to only about thirty million pounds per year, which would certainly be vastly less than would be needed by the military services in the event of another war, because the margin resulting from the greater efficiency of a man freed from the encumbrance of heavy equipment may be sufficient to enable him to win over an opponent less efficiently clad or equipped.

The pressure to use a light-weight, strong fiber like nylon or fiber A, which is currently approaching pilot production, may result in a demand from the using services for these fibers which will make it imperative that productive capacity be enormously expanded.

I can speak very feelingly on this subject because all during the war we were conscious of the value of nylon in improving the efficiency of Quartermaster items. Only after the Air Corps had built up a big reserve of parachutes, in 1944, could we get any appreciable quantity of this fiber for Quartermaster priorities. Even then, the allocations were on an off-again-on-again basis--one month we had an allocation, the next month we didn't. However, even on this basis we found a great many places where it helped reduce weight and improve efficiency importantly.

RESTRICTED

RESTRICTED

508

The hosiery industry also provides another illustration of this same problem in the matter of the attachments for making the cushion sole socks. During the war, the Army adopted a cushion sole sock as our standard item. There has been wide approval of this item and it is very doubtful if the Army will ever want to go back to the short-lived, light-weight wool socks which were the standard item before the war. However, the special attachments required to make the cushion sole sock are not needed in peacetime in anywhere near the quantity required by the Army in wartime, and the result is that mills which equipped themselves to make this sock during the war are currently disposing of or already have disposed of their attachments. The result is going to be that if we suddenly had to have a production of ten million pairs of socks a month for mobilization, the industry could not possibly produce them. It might take a year again to get new attachments built and get the industry able to produce. The sad part about it is that according to any normal concept of charging off costs, the Government had already paid for those attachments in the contract price of the socks that were purchased, but instead of owning them outright, the mills held the title to them and were free to dispose of them. What should have been done and what should still be done is to hold an adequate reserve of such attachments to enable the Army to meet its requirements in case of emergency.

Summary

In this discussion, I have attempted to outline for you some aspects of the problem of conversion of the textile industries for national defense which ought to have very thorough study. The discussion has been limited largely to cotton textiles, with some incidental reference to wool and synthetics. There are a large number of small industries in this group which present special problems of their own which require far more detailed study than has been generally realized, as was found by the War Production Board in their attempt to administer this whole group of industries. Their experience with these small groups was probably one of the most revealing aspects of over-all industry administration and is deserving of a great deal of careful study.

The point which I have tried most to stress and illustrate is the importance of a thorough critical historical analysis of the operation of the administration of the conversion of the textile industries during the war by the War Production Board. I do not know the status of their records or correspondence files. Possibly a considerable part of these

RESTRICTED

RESTRICTED

707

next winter, uses very little in the way of natural fibers. It is all synthetic except for the outer layer, which is still cotton. If we could develop a satisfactory nylon water-resistant fabric, that layer would also be nylon, because we would be able then to cut the weight of that fabric about in half.

COLONEL HOEFFER: Dr. Kennedy, on behalf of the College, I thank you very much.

(30 March 1948--450)S.

RESTRICTED