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UTILIZATION OF SMALLER PLANTS FOR WAR PRODUCTION

13 April 1950

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Mr. Robert C. Enos was born in Ashtabula, Ohio, in 1888. His earlier business activities, from 1912 to 1936, were principally with leading companies supplying the automotive industry. During this period he was successively president, American Distributing Company; sales manager and later vice-president and general manager, Torbensen Axle Company; vice-president, Charge of Sales, Eaton Manufacturing Company; and associated with the Curtis Publishing Company and the General Tire and Rubber Company. Since 1936 he has been president and director of the Standard Steel Spring Company, Coraopolis, Pennsylvania, and is director and chairman of the Board of the E. W. Bliss Company, Detroit, Michigan. During World War II, through his efforts the Standard Steel Spring Company converted to the successful manufacture of war products. Mr. Enos is recognized for his outstanding contribution to the Tank Armor Plate Program in the Detroit District, the General Purpose Bomb Program in the Pittsburgh District, and the Truck Axle Program in the St. Louis District. He is a member of the American Ordnance Association and chairman of the Bomb Committee of the Rocket, Bomb, and Artillery Ammunition Division of the association. His present position is president and director, Standard Steel Spring Company.

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MR. BAUM: A difficult problem of war production is the effective utilization of industrial resources, particularly those of smaller manufacturing companies whose peacetime product has no military counterpart. This morning we have as our speaker an old friend of the college, an industrialist, who in World War II successfully organized and directed a group of these smaller plants for war production, and in so doing contributed greatly to the success of three major ordnance programs. His subject is, "The Utilization of Smaller Plants for War Production." It is a pleasure to present Mr. Robert C. Enos, President of Standard Steel Spring Company and Chairman of the E. W. Bliss Company.

MR. ENOS: Gentlemen, I appreciate your asking me to come back down here.

Maybe we at Standard are a little prejudiced in favor of small business. I think there may be a number of reasons for that. Maybe part of it is jealousy. But also we believe that small business can turn to war production more quickly; that the management is, let us say, more resourceful. They don't have to go through a lot of committees and pay a lot of attention to charts and that sort of thing. I think if I tell you the steps that we went through in the job that we at Standard took over on armor plate, it will illustrate our ideas.

Our business is manufacturing springs and bumpers. We are what is called a relatively small company. Prior to the war we explored things that we might make for the Government in the event of war, and we decided that tank armor plate and aircraft armor plate would lend itself to our manufacturing facilities, and, most important, to our know-how. After we had qualified so far as your ballistics are concerned as an armor plate manufacturer, then after Pearl Harbor our first job in getting started was to get a customer. We naturally went to the people with whom we had been doing business, because we knew them. We went to Cadillac and that company gave us the job of manufacturing armor plate for the M-5 tank, knowing full well that we had never made any armor plate before.

I might add that armor plate to a layman is an ominous-sounding thing. It sounds very technical. The big steel companies put a great air of mystery around armor plate. It is not that kind of product. It is a very simple thing to make if you have good, clean steel.

We got this Cadillac contract. We were going to make the armor plate in our own plant at Coraopolis. But this thing just snowballed.

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We had held that order only three days when we received a call from International Harvester Company, who had been a customer of ours for a great many years. Its representatives said, "You are going to make our armor plate. We are going to make tanks." We told them we didn't have any capacity. They said, "We are not interested in that. Ordnance says you are going to make our armor plate and that is that." Then Colonel Crawford called up and he was even more positive.

We wanted to build a plant, because all the capacity we had in our own plant was taken up by this Cadillac job. We worked like the devil for thirty-six hours laying out a plant, with new equipment and everything. We came down here to see Crawford. General Christmas was in on it too. We laid our beautiful prints on the table; but this fellow Crawford, who is a tough "cookie," just swept them over on the floor and never looked at them. He said, "What we want you to do is to take your competitors, line them up, and work with them and help them convert their plants, because we can't wait to build plants and equip them. We must have armor plate now."

While we fight with our competitors and don't like them in peacetime, we all worked together on this war project. They were all very helpful. If I recall, before we had the first meeting with our competitors, which was two days after the meeting down here in Washington, we had another tank contract. They just threw them in there fast, because they were hopeful of getting armor plate and getting it quickly.

This will give you a little picture of the procedure. We contacted our competitors. We had the prints of the armor plate required for the M-5 Cadillac tank. We had a meeting in Toledo, laid these prints on the table, and said to these fellows, "What pieces will fit your furnaces? What pieces can you make?"

Now, those fellows were patriotic, but they were also dollar minded. We were talking about armor plate at 75 cents a pound. So they all wanted the big pieces, but we finally worked that out. Some pieces of armor plate, as you gentlemen may know, run down to less than a pound in weight. But we allotted to them the pieces they were best equipped to make, according to the facilities they had.

This is another illustration of what I say about the utilization of small plants. I think small companies are a little bit more resourceful in utilizing the equipment that they have instead of having to have brand new equipment. For instance, in beveling the edges of the armor plate, instead of using milling machines, we flame-cut the edges or we ground them ourselves. We did that right away, and our subcontractors did it. If we had waited for a lot of new equipment, it would have taken months and months.

So we lined up our competitors. They are all good manufacturers. But then the orders came in so fast that we had to get more subcontractors.

We took in a number of companies who were manufacturing stoves. We took them because they had furnaces and they had some presses. We took in some people who had never heat-treated anything before in their lives. But they were good manufacturers. Some of them we had to supply with furnaces.

To show you what can be done, let me tell you about one of the times when we were awfully hard up for heat-treating facilities. One of our people came up with a brick manufacturer in Streetor, Illinois. Strange as it may seem, with those long ovens, where you get a slow soaking, we got some of the finest armor plate that we got from any of our subcontractors. That company didn't require any conversion at all. It turned those brick kilns into armor-plate heat-treating plants.

One of our problems was to assure ourselves of a supply of steel, because at one time, if I recall, we had a schedule from Ordnance--and I might say, those schedules went up and down with some frequency--for 38,000 tons of armor a month. They never actually required that much, and we never got up to that; but we had to plan to produce that much.

There were only two companies manufacturing steel for tank armor when we went into the manufacture of armor plate--Carnegie-Illinois and Republic Steel Corporation. The question of getting steel for this tremendous amount of armor plate that the Government wanted was in itself a problem. We had to develop new sources of steel. So we went to National Steel, Great Lakes Division; Jones and Laughlin; and Youngstown Sheet and Tube and asked if they could make steel for us. They decided they would, and they did. We got the majority of our armor plate steel from National Steel, Great Lakes Division.

Strange to say, not one ton of armor plate steel that we used had any nickel in it. For one thing, we couldn't buy any nickel-bearing steel from Carnegie and Republic. For another thing, nickel was very short and we thought we would have a better chance of getting a continuous supply from the steel companies if we developed a steel that did not have any of the scarce nickel in it.

We learned a number of things. One was that armor plate was simple to make--and I mean it is simple--if you have clean steel to start with. Because our people hadn't had any experience with it and didn't have any past history of it, they experimented. They did things that maybe with more experience they might never have done.

Standard Steel Spring developed a method of testing armor, which was afterward adopted by all the arsenals and is now standard. We tested the steel before we heat-treated it. It saves a tremendous amount of money and a tremendous amount of time. We found out that if you have clean steel, free from inclusions and dirt, then you need only to go according to the figures in your heat-treating specifications and you just can't help getting good armor plate.

There were numerous problems in lining up these subcontractors, but not too many. The Government gave us as much money as we needed to supply these manufacturers with the necessary equipment in order to do the job. Some plants might not have furnaces. None of them had flame-cutting equipment. Some might not have grinders. We supplemented their equipment with government equipment which we bought. We in turn asked the subcontractors to make the same kind of facilities contract with us as that which we had with the Government, and we had the same accountability.

We soon realized that everybody was anxious to do something. There was a lot of fear, not alone among our subcontractors but in our minds also, not that we couldn't make the plate, but as to how, after we once got into making it, we were going to get out without losing our shirts. We had a tremendous amount of money involved in government equipment which we had to account for. We were worried about the termination of those contracts and what would happen then, how long the Government would take to wind up war contracts and free us to take peacetime contracts. They all were a source of wonder and worry. But that was secondary. The first job we had--and we did it--was to get out the armor plate.

We turned out our first armor plate about six or seven weeks after we received that contract from Cadillac. We received that contract, I think, in January. Then, when we were working with this group of subcontractors, which had grown by then up to thirty-three, we had our largest month in September, in which we reached a schedule of 16,000 tons of finished armor plate. That was the peak. From then on, due to a reshuffling of schedules, we went down.

As the volume required went down, we eliminated the people who were the highest priced. Naturally, they were the ones who were the least productive. I believe we ended up with only twelve subcontractors.

We made armor for all the tanks and armored vehicles except for the tanks by Chrysler, which was supplied by Carnegie, the Pullman, the Pressed Steel, and the M-3's by Ford.

There has been a history of this armor plate job written up. It is a matter of record. If it wasn't, I would hesitate to tell you that we made more armor plate than all the big steel companies and all the rest of them put together. We made, I would say, twenty times as many pieces as they did. When I say "we," I am including the brickyard, the fellow who made door handles, the fellow who made kitchen sinks--all of those and others.

We not only did it in a hurry, but we did it cheaper than the big steel companies. I believe it can be done time and time again. I think that is the thing that amazed many people. It was the subject

of much dispute. There were several meetings with the renegotiation officials about the manufacture of armor plate. But that again is a matter of record.

I am quite sure that at the end of the war we were supplying armor plate through this conglomeration of subcontractors and paying the steel companies a profit on the steel that we bought from them, shipping it, and all of that, and still were saving the Government a lot of money. On the T-26, which was the big tank, we saved the Government 18 percent over U. S. Steel on identically the same armor plate. We made it not only economically, but we made mighty good armor plate. That is also a matter of record.

The inspection problem was one of the many things we worried about. It turned out to be not too tough a problem. We had, you might say, three inspections; probably many more. First, we inspected the steel at the mill. Then we inspected the product that our subcontractors made. Their own inspectors inspected it. Then we had government inspectors. Our prime contractors had their inspectors. I think at one time we had six different sets of inspectors.

That gradually worked down until at the end, outside of a few roving inspectors and the government inspectors, there was only one group of inspectors and that was the subcontractor's own organization. I think that is the way it should be. We didn't have too much trouble on the inspection angle.

In fact, this job sounds a lot bigger and a lot tougher than it actually was when once we started on it. But we never could have done it without the hundred percent cooperation and help of representatives from Ordnance. They gave us everything we wanted and did it gladly; they cooperated. I don't mean that we didn't have some arguments with them from time to time. We did, but as a whole things worked out all right.

You might be interested in this: I spoke about worrying about getting through. We had our first cancellation in November 1942. I think that was the Yellow Truck and Coach job. We set up a procedure to handle that cancellation. We told the termination team to take its time, because we realized that what we set up and what was adopted as a procedure in the first cancellation might very well be taken as a yardstick on what might happen when we finally rang the bell. It took us, I think, five or six months to get the first termination and cancellation completed. It was well worth-while taking that extra time.

To show you how it worked, the proof was that at the end of 1945 we had every one of our subcontractors completely cleaned up and out of the war business and completely relieved of responsibility for equipment of the Government and with all their bills paid. They were

free and clear, and so was the Standard Steel Spring Company. I don't think we would have been able to do that if we hadn't started to do it in the early part of the war.

In 1943, after we had the production of armor plate going well, some of the government-created armor plate plants became available. We had some arguments with Ordnance then as to whether--now that we had been good boys and done such a good job--we should have to pass out and let the 75-million-dollar government plants take over the armor plate business. We objected rather strenuously. We managed to keep the business.

We thought in 1943 that things were easing up, but then General Campbell came to us with the proposal that we adopt this same planning and go into the manufacture of 4 x 4 and 6 x 6 heavy duty truck axles. We didn't want to do it, but we eventually did. That was a much tougher job than armor plate. We had the blueprints. We knew a lot about axles, but it was a question of finding subcontractors.

It was just about that time that the machine tool business in this country, as you may remember, began to taper off. In fact, the machine tool business in September and October was very slack. Those people knew how to manufacture parts to close tolerances. They had the plants, they had trained personnel, and they were looking for something to do. We loaded up a couple of army trucks with a display of the parts that we would require for these axles. We took them to places like Providence, Bridgeport, Cincinnati, Cleveland, and Chicago; and at those places we invited those machine tool manufacturers to come in and look at them. Someone would say, "I can make this" and someone else would say, "I can make that."

That worked out all right. We had to agree to make a certain proportion of those axles complete in our own plant. They gave us a surplus cast-armor plate plant down in East Saint Louis. We ended up making 30 percent of the actual complete axles down there. The rest of them were subcontracted. We had people making differential carriers and transfer cases. For instance, we had Bullard and Cincinnati Milling Company. They were all good people.

The Government gave us and our subcontractors 28 million dollars in machine tools on this axle program. We were successful in terminating the contracts of every one of those subcontractors by the end of 1945.

If we have another war, greater emphasis than was given in the last war should be placed upon prompt termination settlements. The main purpose, if we have another war, of course, will be, as it was in the last war, to get the job done.

I think the small companies can convert more quickly than the large ones. I think they are far more resourceful. I have no disrespect for big companies. I wouldn't like to work for one of them, because I wouldn't like that regimentation that you must have in a big company. Small companies, just due to the fact that they are small companies, are more resourceful. They make their decisions more quickly. They get to doing things more quickly. We proved in this armor plate business that by utilizing these small plants you can get things done not only more quickly, but you can get them done very economically.

QUESTION: Where do you draw the line between small business and large business?

MR. ENOS: I don't know. I would say that somewhere around four or five hundred employees is about as far as you can go in a small business.

QUESTION: Would you discuss the scheduling and transportation problems that were created due to dividing your business up among ten or fifteen or even more companies scattered all over the country?

MR. ENOS: Yes. On the M-5 tank there were sixty pieces of armor plate. What we tried to do in this subcontractor setup was to have two or three sources for each piece and to locate those fellows geographically, spread them around. That required some extra hauling and so forth, but we thought it was justified early in the war. Later in the war we eliminated some of that.

We would give, let us say, the W. B. Jarvis Company, of Grand Rapids, Michigan, an order for so many pieces. After we had made the ballistic samples and the steel had been approved, we bought the steel and shipped it to Jarvis. That company knew that it had so many pieces that were supposed to be shipped every day to Cadillac. McInerney Spring and Wire, of Grand Rapids, was another source. It had so many pieces to ship every day to Cadillac, or maybe it was the Kalamazoo Company at Kalamazoo or the Standard Steel Spring Company at Coraopolis that did the shipping. We scheduled production just the way the automobile people do in their regular business, so they would have a constant flow of materials coming in every day.

At one time I think we had fifteen people making those Cadillac parts. We got the schedules from the prime contractor, and then Standard scheduled it out to its subcontractors. We in turn supplied them with the steel. We kept that steel in our name. We never invoiced the subcontractors for that steel. They in turn, when they invoiced us for the work they had done, treated it as ours. Their work was purely the machining and the finishing of the armor plate.

At the start of the war we had a great deal of duplicate and inefficient handling. It was bound to happen. For instance, we had people who had furnaces and who could heat-treat armor plate, but they had no machining facilities. So we would heat-treat it and maybe ship it several hundred miles to be machined. From there it would go to Cadillac, Fisher, Pressed Steel, Buick, or whoever was making the tank.

As time passed and we were able to get the equipment in the heat-treaters' plants, we eliminated a large part of the duplicated handling. But I think you will always have to expect some waste in handling and some extra freight cost at the beginning in order to utilize existing facilities and get quick production.

QUESTION: Would you comment on the problems, if any, of converting labor to wartime production and to new types of production?

MR. ENOS: The problems didn't happen to us until after the war. We had CIO U. S. Steel workers in our plant. We had no trouble at all with labor. We don't have much now.

We learned some things from this experience. One was that the next time we should go ahead and get the job done, even if there is lack of time to make time studies, lack of experience with some particular part, or if wage rates are too high, and so forth. Maybe wages were too high. I am not so sure. They were high enough to get the production--we know that--and that was the most important thing.

In peacetime these men on making bumpers and springs had been earning around $1.35 an hour. During the war they made $1.75, $1.80, or $2 an hour. After the war was over, the natural assumption on the part of the men in the plant was that they would get $1.85, $1.90, or $2 an hour when they went back to peacetime work. I am not so sure that they weren't right on that, because of the increased cost of living.

I don't think that the labor end of it was a particular problem.

QUESTION: Did you have any problems in training men to change from your previous business to the new business?

MR. ENOS: No, because our peacetime business was not too far removed from the new business. In heat-treating springs you heat-treat steel. That is all there is to it, except that you are doing it in bigger pieces in the armor plate. You eliminate welding. That is what we had been doing in forming bumpers. I don't think any of our subcontractors had too much trouble at any time. They wanted some help from some people up there. But this armor plate was not nearly so complicated a job as it might sound.

COLONEL BARNES: If I understand you correctly, I think you said your average costs were 18 percent under what Republic and Carnegie

charged or what it cost them to make armor plate. That is a surprise to me. They are in the business of making steel and probably wouldn't have the conversion problem that you or your subcontractors had. Would you explain a little why that came about? Was it that you were willing to make it 18 percent cheaper than the steel companies or that you could actually produce it for less?

MR. ENOS: I can't explain Carnegie's reasoning or philosophy in establishing prices. I can tell you what ours was. We wanted to do it as economically as we could. These renegotiation boys, even if you had the idea that you wanted to make a lot of money, soon dispelled such idea. On the armor plate, the bombs, and the axles we were 100 percent on war work and we all were under renegotiation. I suppose that Carnegie was too. So far as Republic is concerned, I am not sure.

I don't think Republic made much on its plate in the last two years of the war. But I am positive that the only armor plate that we could compare, or that Ordnance could compare, was for the T-26 tank, Chrysler bought 100 percent of its steel from Carnegie; and we supplied 100 percent for Fisher Body. It was identically the same armor plate. We sold it to Fisher for 18 percent less than Carnegie sold it to Chrysler.

Now, why there was that difference I don't know. We had a duplication of profits, because our subcontractors made profits, the Standard Steel Spring made a profit, and the people that sold the steel made a profit. So according to all principles of business that I ever heard, Carnegie's price should have been a lot under our price. But I am sure that the figures available to you people would substantiate this statement that I just made.

QUESTION: To what extent is mobilization planning being conducted by small business today?

MR. ENOS: I don't know. I haven't heard.

MR. BAUM: May I make a remark here? How about this project that you had at Newcastle on the bombs?

MR. ENOS: That was initiated by our people. Up at Newcastle we made 1,014,000 500-pound, general-purpose bombs.

A couple of years ago we thought it might be a good idea if we could get a spinner and a wabbler out of government suplus and set them up in that plant in which we are now making truck axles. We talked to Ordnance about it. We know where the wabbler and spinner are. We hope they are still up in Minneapolis, but we don't have them down at Newcastle as yet.

QUESTION: I would like to pursue this 18-percent-less price that you produced this armor plate for. During the war they had a Small Business Act which allowed increased payments to small businesses because they couldn't produce as cheaply. Do you think we need such an act in the event of another emergency?

MR. ENOS: I don't know. But I would like to correct an impression that possibly you may have. We did not come under that act. Our price was 18 percent under Carnegie in the same armor plate with no subsidy. I don't believe the small manufacturer needs any subsidy.

MR. MUNCY: Would you comment a bit more--you have alluded to it already--about your experience during the war with renegotiation, bringing us up to date on the peacetime renegotiation which now affects government contractors? Would you tell us your experience and maybe crystal ball a little bit with us on that?

MR. ENOS: We haven't had any experience with your present peacetime renegotiation. Strange as it may seem, we didn't have too much argument with the renegotiation people. Of course, the tears rolled down our face.

I think there is one thing that might be cleared up in a new renegotiation act. I think most of the people who hollered about renegotiation as it affected their own company did so because they had heard of some competitor who was allowed a higher margin of profit than they were, somebody who was maybe selling the same products at a higher price or who was allowed a higher margin of profit.

I certainly wouldn't like one of those jobs on that Renegotiation Board. I think that all in all they did a fine job. They did a good job with our subcontractors. We have no record or knowledge of any of those sixty or seventy subcontractors of Standard Steel Spring ever appealing any decision of the Renegotiation Board.

QUESTION: Because of the renegotiation clauses in your contract and other features of government contracts during the war, did you have to make any particular increase in your cost-keeping procedures and things of that kind in order to have the data necessary to comply with the provisions of these contracts and be able to have these data for renegotiation purposes?

MR. ENOS: No, we didn't. Not for the renegotiation. But in view of the accountability and the tremendous amount of plant facilities, it cost us more for the bookkeeping and accounting on government work than it would cost us today on our present business. But for renegotiation alone, no.

QUESTION: I have heard the statement that there is no such thing as a good small business, because, if it was good, it would soon grow into a large business. I don't believe that, but what is it that keeps a good small business from growing into a large business?

MR. ENOS: That is rather a broad question. I am not competent to answer it. I know why some companies don't sell out to big business. I think it is a purely human thing. You would rather be a big frog in a little puddle than to be part of a big show. You have more freedom of action.

QUESTION: It appears to me that you would soon be able to drive many large companies out of business and capture the market.

MR. ENOS: The softest picking I ever have is Carnegie-Illinois as a competitor.

As long as we are on that, I might as well brag a little bit. We are in a very competitive business. We not only have competitors making the same thing we do, but we are always confronted with the threat that if we are not efficient, there is nothing in God's green world to keep these automobile, tractor, and truck companies from making their own springs and bumpers. So we have a double-barreled competition. But even at that, the Standard Steel Spring Company, of which I am the president, doesn't do so badly.

QUESTION: It is interesting to know that there are good, bad, and indifferent smaller war plants. How do you separate the sheep from the goats?

MR. ENOS: They automatically separate themselves as you go along. We made some bad guesses on some of our subcontractors at the start. I didn't take long for their lack of performance to eliminate them. We had only one on armor plate and I think we had two on axles. Whether or not that is the normal percentage that you might expect I don't know, because we haven't any measuring stick for past performance. But I wouldn't think that would be too much, to have one bad one or one that you would have to eliminate or who would eliminate himself, which is the same thing.

DR. REICHLEY: I would like to go back to that mobilization planning. As I understand your Newcastle story, about two years ago you offered to set up a pilot line for the production of general-purpose bombs in your own plant with the Government furnishing the necessary machinery and the necessary tools with which to do it. To date the Government has not responded to that offer. Is that right?

MR. ENOS: Let me be sure now that we understand each other. We offered to set up a wabbler and a spinner in our Newcastle plant. That wouldn't be a complete line. But those are two special machines

that it would take a long time to make if they disappeared or somebody couldn't find them in the event we had to get them. You can get drill presses, you can get presses, and you can get furnaces; but those two particular pieces of equipment would be mighty tough to get. For that reason we offered to provide the facilities and the space as an experiment and set them up in what would be a bomb line when, as, and if they rang the bell. But they bogged down somewhere with some red tape.

GENERAL HOLMAN: Would you give us a brief description of your relationships with the Ordnance district that you operated under, and which one was it?

MR. ENOS: We operated under the Detroit District.

GENERAL HOLMAN: And with the Cadillac Company, who had the major contract for the tank assembly job. I think those two relationships would be interesting for the student body to hear.

MR. ENOS: When we got started on the manufacture of armor plate, the question came up as to whether we would operate under the Pittsburgh Ordnance District or the Detroit Ordnance District. Most of our customers, the larger number of our subcontractors, and our main source of steel were in the Detroit Ordnance District. We asked General Campbell to have us assigned to Detroit. Colonel Crane was there at the start and after that General Quinton. Then they in turn fanned it out to the other districts where we had subcontractors.

They checked on the scheduling, of course. They checked on the inspection. We always had the benefit of their help. They helped a great deal on the expediting of the necessary equipment that we had to get. But that seemed to function fine. If we had a problem, we took it up with General Quinton, who assigned men to our particular project.

QUESTION: This may be repetition, but I would like to be sure that you haven't been approached by the Munitions Board or the NSRB with regard to some war assignment in the case of another emergency like steel plate?

MR. ENOS: We have not. But I might answer your question, if I may, in another way. We are not waiting to be assigned anything. We are out soliciting some armor plate business right this week up in Detroit.

MR. BAUM: Mr. Enos, on behalf of the College I thank you for a very fine lecture and a most informative discussion period.

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