CONTRACTORS' PROBLEMS IN WARTIME

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CAPTAIN WORTHINGTON:

Gentlemen, we are fortunate in having as your speaker this afternoon Mr. Courtney Johnson.

Mr. Johnson is a graduate of Princeton University, where he obtained his degree in engineering. He has spent virtually his entire life in the automobile industry, entering that field as early as 1915.

He has at various times been purchasing agent for Dort Motor Corporation and later production manager of that company. Since then he has been active in the field of automobile sales. At various times he has been sales manager of the Hudson Motor Car Company and of Nash Motors, and for some time he held one of the top sales positions in the General Motors Empire.

During World War I he was a captain in the Field Artillery. During World War II he played an active part in the operations of the Automotive Council for War Production, and has acted as chairman of the Materials Control Committee of the Council. At the time the Controlled Materials Plan was under discussion he was detailed by Studebaker to duty within the War Production Board. He was also active in the Contract Termination Committee of the Automotive Council and was the principal termination executive for The Studebaker Corporation.

At the present time he is assistant to the Chairman of the Board of Directors of The Studebaker Corporation, and this morning will address us on the subject, "Contractors' Problems in Wartime."

MR. JOHNSON:

Captain Worthington and gentlemen: It is a great pleasure to have the opportunity again to enter slightly into the affairs of the Industrial College. I was pleased to have that opportunity somewhat over a year ago in connection with the courses on contract termination.

Captain Worthington has told you that I am going to talk today on contractors' problems in wartime. When General McKinley originally wrote me and asked if I would talk on that subject, I was somewhat flabbergasted, because I think you could probably talk about the problems of contractors in wartime for two or three weeks, if you have enough knowledge, and still not cover the subject. But in further correspondence and discussion they let me off the hook a little bit. What I am really going to talk to you about are some problems that we had in The Studebaker Corporation, because I think I can talk about those with some knowledge and a small amount of authority.

I would like to emphasize one problem which I think is the most important to the contractor and to the Armed Services working together for the protection of the country. That is the problem of the time element involved in the use of the industrial machine to assist in the arming of our Services.

In order to do that, I am going to give you in some detail the experiences of The Studebaker Corporation. I will have to ask your indulgence if I talk a great deal about my own company. It is the one about which I know most. In order to do that, I would like to give you a little background of what the Studebaker company was before the war, so that you may see the basis from which we started.

Studebaker, in the three years before the war, was manufacturing automobiles and trucks. On the average it manufactured during those three years about 120,000 units a year. Of those units about 10,000 were trucks and about 110,000 of them were passenger cars. The dollar value of the business during that period was about 115 million dollars a year. We were employing in the neighborhood of 8,000 men and women, but mostly men. We had about 5 million square feet of floor space, of which about 4 million of it, you might say, was usable manufacturing space.

We had a foundry, a large one, and made all our own gray iron castings. We had machine shops for general machining and for building engines. We built all our own engines. We built our bodies. We bought some of the large stampings on the outside, the panels and roofs. In general, we assembled the rest of the car.

That is the kind of company that we were. We had, at that time, about 15 million dollars worth of working capital.

As we got into war manufacturing, we undertook the manufacture of three main units. First, we manufactured about 198,000 6x6 and 6x4 2½-ton trucks. They cost about $3,000 apiece, including the parts that went with them. We also manufactured the Wright 1820 airplane engine. We manufactured about 64,000 of those, enough to equip about 15,000 B-17 Bombers. Finally, as a third product, we manufactured the M-29 Cargo Carrier, which is more commonly known as the Weasel.

In addition, in our engineering departmnet, we undertook a number of experimental projects, making pilot units for both the Army and Navy. I don't know whether or not these units were actually manufactured later. They were not manufactured by us. We did the experimental work on them. We also operated our own proving grounds and tested some 710 vehicles over about a million miles of test. Those vehciles were of all kinds and makes. We did that for the Ordnance Department.

That, in general, is the picutre of The Studebaker Corporation. I would like to take each one of these major products, namely, trucks, aircraft engines, the Weasel, and describe to you, particularly from the time element angle, what it meant to get into production on these items. I will first take the military trucks.

As far back as 1939, when defense manufacturing was just starting, we felt that we wanted to be part of it. So we set out to see whether we could satisfy the Army in building a truck. We built a pilot model or sample model of a 1½-ton four by four truck. We sent it down to Camp Holabird, which was under the supervision of the Quartermaster Corps. Later, trucks came under the Ordnance Department.

It was tested and we failed to get the business. They didn't give us any business on the 1½-ton trucks, for a very good reason. They gave it to the three largest producers of 1½-ton trucks, which were, of course, Chevrolet, Ford, and Dodge. It was thought at the time that the 1½-ton truck would be the vehicle that would be most used by the Armed Services, the Army particularly, to solve their transport problems.

Having failed to get that business in 1939, we were still looking around. Finally, they suggested that we see whether we could build a 2½-ton truck. We think we can build anything; so we started to see if we could build that.

They already had one source on the 2½-ton truck. The General Motors Truck Company, one of the divisions of General Motors, was building a 2½-ton truck, which is the one that you have seen wherever our Army went. That vehicle was in existence. They knew exactly what they wanted. Parts to make the vehicle were available. You had here a case where a company like ourselves, trying to get into production, could go to sources of supply, as we actually did, and buy an engine, because our engine plant couldn't make that particular size of engine without a great time lapse. We could buy an engine from Hercules, and did. We could buy a transmission from Warner Gear, and we could buy axles from Timken, which we did. They were all available. We used the same axles as General Motors. They bought them from Timken also. So we produced a pilot model of this truck, and finally got an educational order for five hundred trucks.

We finally built, as I told you, 198,000 of those units. Almost all of them went to Russia. Those trucks, they tell us, were the trucks on which they mounted their offensive operations. They were their main transportation.

I would like to give you a picture of the time element involved in building that truck. We started to do some estimating on that truck in the fall of 1940, about October. We got the contract for the first educational order on February 6, 1941. We produced and shipped the first truck on June 19, 1941.

Now, here we have a product where the design was known and sources of supply were available. There was no particular shortage of material. Manpower was available. We had the buildings. There wasn't any major tooling problem. It took from the time we first got the contract, when we got the "go ahead" signal, four and a half months to produce the first truck.

I might say that we were working just as fast as we could. We were putting all the pressure on it that we had. But we had to find 585 subcontractors and suppliers. They had to have their blueprints. They had to get their material sources. They had to have a bill of materials; in other words, a guide to buying materials. We had to get the parts flowing in to us. In spite of the best conditions that you can imagine, it took four and a half months.

Now, I might also say that to get into the production of ten a day took six months. It was a month and a half after the first truck was produced before we were up to ten a day. To get into a production that really meant anything, it took that much longer. Subsequently, through succeeding orders over a period of the next three years, we got to a production of six thousand of these trucks a month. To do that, we had to lengthen our lines and to some extent increase our facilities.

But the point here is that with everything in our favor, including an urge to get business, because we weren't the only ones that were trying to be the second source of this truck--and the record we made in getting into production would make some difference--in spite of all that, it still took four and a half months to get started.

That is the first product. On the second product, the Wright aviation engine, we had a different situation, because there we had an engine that was completely designed, tested, all the engineering done, and all the blueprints available. To get into high production in a complicated mechanical item like that requires very expensive tooling. We did not have the buildings. The floor space that we had available was not suitable for aircraft engine manufacture. The buildings had to be built. Machine tools had to be purchased and installed, and the tooling had to take place.

We had to assemble and train the force to build these engines. Eventually we built up a force of 18,000 men and women at the peak, not one of which, as far as we know, had ever been in an aviation engine plant before. They were all kinds of people. I mean, there were preachers, lawyers, doctors, domestic servants, bootblacks, a whole cross-section of our population, in that aviation plant. But they were trained and they produced the goods.

We first discussed aviation engine production with the Army Air Forces at Wright Field in the fall of 1939. At that time Wright was building an engine. As I remember, it was an engine of about 2,000 horsepower, maybe a little more than that, which was for fighter planes. It was thought that they would need a greater production than they were then able to obtain. They suggested to us that we should make parts for Wright, and we agreed that we would.

Almost immediately, though, they changed their plans. They wanted another autonomous source of these engines. So in December 1940, we made our first contract to build engines. That was this engine for fighter planes.

In January we broke ground for the buildings and were proceeding to build the buildings, buy the machine tools, get the lay-out, and go through all the operations necessary. Then about March of 1940 the plans were changed and it was decided that they would concentrate on engine production for bombers. That meant a different engine. So in the middle of the stream we had to change from one engine to the other.

Now, I think that change may have delayed us a little, maybe a month or two months, but not very much, because we had not proceeded far enough so that it made a whole lot of difference. Many of the machine tools we had ordered were still applicable to the new engine. The tooling had not progressed so far. Of course, it didn't make any difference with the buildings.

However, not having the tooling and not having the machine tools, it was March 10, 1942, before we produced the first engine. In other words, we got the contract, the "go ahead" signal, in December of 1940, and we produced the first engine in March of 1942. That is a fourteen months' period from the "go" to the production of the first engine. It was July of 1942 before that production was up to ten a day, or a period of eighteen months from the "go ahead" signal. Even that, gentlemen, was four months sooner than the Army Air Forces had expected us to produce the engine. We beat the schedule.

Now, I want you to get a clear picture of the difference in these two problems that we had. The main difference is that in one case the major tooling was available, not at our plant, but at other plants. That didn't have to be done. We were able to get some kind of production in four and a half months and fairly good-sized production in about six months.

With the engine, the tooling was not available. We had to buy five thousand machine tools. We had to set up jigs, dies, and fixtures to go with them. That delay, so to speak, meant that we didn't get into production for fourteen months and into sizable production for eighteen months.

Some of those machine tools were very complicated. I think some of you are familiar with them. One of the problems in the manufacture of those engines in large volume was the machining of the cylinder head. That was one of the most difficult things to do. On one of these engines, it required about fifty different operations. We designed a cylinder head machine that was manufactured by the Greenlee Comapny. It was 175 feet long. It had five miles of electric wiring in it for automatic operation. It had fifty stations where the cylinder head stopped and had some work done on it. It used 162 tools, such as reamers, drills, taps, mills, and some special tools. The machine was working on 130 cylinder heads all at the same time; so they were coming off the end of the machine constantly. It is almost impossible to tell how much time that saved and how much money was saved.

I used that simply as an example of the problems involved in getting your machine tools and setting up production on a complicated mechanical item in large volume. That is what we are up against if we are trying to get into high production. There were many other similar problems, but not quite as complicated as that one. In spite of the fact that all those problems were solved, and, I think, solved with speed, at least with more speed than the Army thought we could solve them, it still took fourteen months to get into production.

Now, the third product we manufactured comes under still another category. On the first one, we had the design and the tooling. We had the buildings and, in effect, we had the men, and so forth. On the second one, we had the design, but we didn't have the men, but manpower was not a problem. We had analyzed the area before we went into this engine production. We found--and it proved later to be true--that we could get, within a radius of thirty-five miles from South Bend, about sixteen or seventeen thousand men and women workers. We knew we would need seventy-five hundred or eight thousand for the automotive plant, which would leave seven or eight thousand or eighty-five hundred for the aviation engine plant.

We also knew that it was going to take somewhere around seventeen thousand men to build that engine. Consequently, we couldn't put all the plants in South Bend. We put the main plant--about a million and a half square feet--in South Bend. Then we put about a million, two hundred thousand square feet partly in Chicago and partly in Fort Wayne. Those were feeder plants, one for machined parts and the other for gears.

Now we come to another situation, which is the Weasel or M-29 Cargo Carrier, or, as it was first called in these experiments, the T-15. When we first were approached on the subject of building what eventually was called the Weasel--by the way, that name came about because that was the code name of the product when it was a secret product--that idea was no more than a dream in somebody's mind. Nobody knew what the vehicle was going to look like, how it was going to run, how it was going to be powered, how big it would be, or any of those things that you have to know to manufacture a product. All we knew was this: They wanted a vehicle which would travel over deep snow, which would climb a forty-degree grade, carry a thousand pounds of cargo and three people, which could be dropped out of an airplane, go over any kind of terrain, and run thirty-five to forty miles an hour on the flat. That was the original idea on that. That is what we had when this thing started.

The purpose of this vehicle, as many of you have read in the public press, was to make commando raids in Norway and destroy the electric power stations, where electric power was being generated to make heavy water. As far back as that, they were worried about atomic bombs, and the production of heavy water might have contributed to the atomic experiments.

We first started experimental work on that Weasel on January 26, 1942. I might say, gentlemen, that we were told that we had to start shipping these vehicles, of which nobody even had an idea yet except such ideas as I have given you, in October of 1942. That meant that the vehicle had to be conceived, designed, the experimental work done, the testing done, all the subcontractors secured--eventually there were 306 of them--the manufacturing accomplished, the line set up, the workers trained, between January 26 and October of that same year--a nine-months' period.

It was quite an operation. It is the only one of which I have ever heard where the design, engineering, experimental work, testing, purchasing, manufacturing, and training of personnel were all going on at the same time. As soon as anybody got an idea, we started building it that way. If that idea proved to be wrong, we threw out that idea and started building it according to the next idea.

That was a necessity. I want to impress that on you, because here was a project undertaken under the most terrific pressure. It had the highest priority of any project in industry at that time ... I know. I was in Washington at the time. In order to get this done, we had to get some triple A priorities. I went over the General Staff, who were supervising this project. It was extremely secret. I said, "What am I going to tell these people? I have got to tell them something to get these priorities. I have got to go to the Army and Navy Munitions Board and get some triple A's. I can't tell them what this is. What will I tell them?"

Well, finally we came out with something like this: They said, "You can tell them that this is a project authorized by the President, the Commander in Chief of the Army and Navy, under the supervision of the General Staff, and that it has the highest priority of anything in the coutnry." So I had pretty good authority to go on.

Then I went over to Mr. Eberstadt, who was the head of the Army and Navy Munitions Board at that time, and told him I wanted a triple A priority on the whole project. I didn't get that, because he very logically said, "We will give you a triple priority on any item that you need it on, but there is no use giving you a triple priority on everything, because you won't need it on everything." And that was true. We eventually got about fifty triple A priorities.

Well, the upshot of this effort was that we did start shipping this vehicle in October. We met the date. The fact that the invasion never took place is something else. They decided by that time to do it in a different way. They did it by some underground people in Norway. They did destroy the power stations and accomplished the purpose. But these vehicles were manufactured, and eventually some went to Italy and were used at Angio. Some went to the Aleutions and some were used in training in this country.

Having reached the first objective in nine months under the most serious pressure, they then decided that the vehicle as built for that purpose could be transformed into something else, in other words, an amphibious vehicle. That meant some more design, some more experimental work. Eventually the M-29 was evolved. That was an amphibious vehicle which could go through water, go through mud, climb grades, go fast on the flat, and do all kinds of things. We built about fifteen thousand of them. They were used in the mud of Holland when we had to put supplies up there. They were used in the Pacific for various purposes.

In building that second model we finally got into production on May 28, 1943. Again I bring up that time element. Under the most terrific pressure it took nine months. To really get into production on the final article, it took fifteen months.

So we now have these three cases. I have given you an item on which we had the tooling, the design, and everything favorable--four and a half to six months; an item on which we had the design and everything approved but no tooling--twelve to sixteen months--and I say twelve, becuase I am subtracting the possible delay of two months on account of the engine change; and an article on which we didn't have anything, design or tooling, and it took, in this case, fifteen months. You can extend the latter time just as far as you want because it depended upon how quickly ideas jelled. In this case they jelled pretty fast, but it took fifteen months.

I think we can, from the standpoint of the Armed Services and industry working together, draw some conclusions from this cross-section of Studebaker's experience.

First, I think it has been evident in this last war that industry can solve the problems that have to be solved. They certainly can solve the problem of buildings and the arrangement of buildings; of machine tools; of jigs, dies, tools, and fixtures; of manpower, the assembling and teaching of manpower; and money. As to money, we always have that if we need it for those purposes. For our Aviation Division, Defense Plant Corporation put up about 75 million dollars finally. That is where the money came from. Obviously, we couldn't operate over those five years, producing a total volume of a billion, three hundred million dollars, starting with a working capital of fifteen million dollars. We got advances. The money is always available.

All those things are solvable. I think inventions are available or will be available in this country, and the engineering skill to take those inventions and make them into usable products, into materiel.

The one thing we cannot change, gentlemen, is time. That is the thing that you can't change as far as industry is concerned. I think that the time element that I have given you here will pretty well hold true throughout all that part of industry that manufactures complicated mechanical, metal products that move. Those are the things that take the time, because it means tooling.

What does that mean? Well, to me it means this: That if we have an emergency, it will probably be a sudden attack. I am just guessing about that. If it takes four and a half to six months for industry to start volume production on any one of these necessary items, then obviously your Armed Services must be equipped at the start so they can keep going for four and a half to six months without getting anything from industry, practically speaking. You have got to have that basic equipment.

In 1941 there was an engineer over here from Great Britain whose name was Alex Taub. He had done the conversion of the automobile industry in Great Britain. At that time I didn't know much about what it would mean to convert--at that time in 1941. So one day I asked him how long it takes to convert an automobile plant into an armament plant. He said, "It seems to me that all depends on how close Hitler's bayonets are to your rear end." I think he is probably right. Metaphorically speaking, I think somebody's bayonets are going to be awfully close to our rear end the next time.

So on equipment you have got to look at it from the point of view of industry. On equipment you have got to have the Armed Services equipped with whatever it will take to stand that first shock and carry the load for perhaps six months.

Now, to expand at the end of that period, as far as industry is concerned, the tooling must be in existence in order to get into volume production. If you want to really start getting stuff in volume within six months, this tooling must have been in existence at the beginning of the six months. If you don't have the tooling, you are not going to get the production for at least twelve months from the starting time. It seems to me that that is the lesson in this whole time element.

I think it would be wrong if I told you the problems and didn't at least make some kind of suggestions in regard to them. I certainly am not an expert, but I was mixed up in this for quite a long time; four years; and I think I have a suggestion.

If we must have the tooling available in order to protect the necessary industrial production within a period of four to six months after hostilities start, then let us get the tooling made whenever we get a new product. Let us tool up for volume production. By that I mean the jigs, dies, and special machine tools that you have to have. Having done that and used them sufficiently to know that they will work, then let us put those tools in the grease and keep them in grease until we get a better product worked out experimentally. As soon as we get that better product worked out experimentally, let us tool up for that one and throw the other tools away. True, that is expensive, but it is not half as expensive as not having any tools at all if an emergency arises.

I believe, gentlemen, that officers such as you, going through this course, will probably be the future generals and admirals, the heads of departments and bureaus, and members of the Staff, that will have to meet this problem of the induction of industry into the Armed Services in case

of an emergency. I hope that the little discussion that I have had today with you will impress on your minds this question of the time element. If I have been able only to say one word that will stay with you as you progress from this course into the future, that work is: Think about the time element all the time. Then I won't feel that I have wasted your time today. Thank you.

CAPTAIN WORTHINGTON:

We are open for questions.

MR. JOHNSON:

I am not a machine tool expert, so I can't answer detailed questions on that subject. Any questions otherwise I will try to answer.

A STUDENT:

In your discussion of tools, you used the expression "having the plant tooled up." By that I gather you mean machine tools, gages, and dies.

MR. JOHNSON:

Yes.

A STUDENT:

Would you recommend keeping all those items in addition to the machine tools?

MR. JOHNSON:

Very much so. Yes, sir. Not necessarily all the machine tools. Your machine tool problem at first is the special machines. The standard machine tools are pretty much available in the plants all the time. We use them all the time. There are certain special machine tools for high production jobs on these items that may take a year to get if you haven't kept them. Knowing that ahead of time, my suggestion simply is this: Let us spend the money to keep them in the grease so that we can use them if we need to.

I went so far on this thing one time as to figure out what it would cost. I was told by some officers in the Ordnance Department that it cost about three billion dollars to tool up for this war. I said, "Well, all right. Suppose you had to do this replacement job every three years, which you probably would not, because I don't think we can invent things that fast, or that everything would have to be thrown away; but suppose you did have to tool up for everything, your average expenditure would be a billion dollars a year." That would be the maximum--somewhere around a billion and one or two or three hundred million. This tooling job could be done to a point where those things that are absolutely necessary to have developed would become much more quickly available when needed and in large quantities.

I realize, as you all do, that when you get to talking about spending even one hundred million a year for something like this, you have a lot of arguments on your hands with Congress, the watch dog of the purse strings. But I hope enough people will remember that it will take, without these tools, possibly twelve months before we can do anything. That was the case this last time as you well remember. We didn't amount to anything on the offensive, if I remember correctly, after Pearl Harbor, for about twelve months. It was that long before we could really get going.

A STUDENT:

Mr. Johnson, what was Studebaker's experience in the particular problem of supervisory personnel when you had to go through your expansion, and what would be the solution to that same problem if we had another emergency?

MR. JOHNSON:

I might say that we didn't have any problem, because we were able to take out of our supervisory personnel in the automotive factory enough people to start with, and then through them to train others. We were able to do that more rapidly than we could get the tooling done. We had a very good force of supervisory personnel. Any large manufacturing company would have under those conditions.

I again want to impress on you the fact that when we went into the manufacture of such a particular item as the aviation engine, it didn't make any difference. These people are metal-working people. You can put them on any kind of complicated mechanical job and they will do it. It is not a case of knowing how to make an aviation engine. They just know how to do things. They know how to run machine tools. They know how to handle tooling. You can give them anything to make that you want to.

The thing that astounded us was the fact that you can do the same thing with workmen and workwomen who don't know anything. It became quite evident, practically speaking, that you can teach anybody how to make an aviation engine if you lay it out right and tell them right. It is just anybody, because that is what we got. We got anybody. We had just an average of men and women from all walks of life. We had college girls. We had waitresses out of the restaurants. As far as I could see, one did just as good a job as the other when it came to making engines.

A STUDENT:

Would you relate your experience in getting into truck production as between solving red tape in the Government and actually producing the materials to erect your plants? Was there a lack of balance there so that the red tape delayed you?

MR. JOHNSON:

No. I don't think, from the start of our truck program, we were at any time handicapped by the government formalities that were necessary. Don't misunderstand me on this four and a half months period that it took us to get into production. It takes us just as long as that now, if not longer, to get into production on an automobile, because we are not under pressure.

You have got to go and find sources of supply. For instance, suppose it is just steel. You have to go to the steel mill and give them the specifications of the kind of sheet steel or strip or bar that you want, and the analysis and the size and the gauge and everything else. Then they have actually got to roll that steel. Then the steel has to be shipped. You have got to process it. The chances are that it may go through another step. The steel may not come right to you.

For instance, take the frames that go into one of these vehicles. The frame manufacturer would have the blueprints. It requires a certain width of sheet to stamp out that frame, a certain gauge, a certain analysis. He has to have all those things before he can make the side rail of the frame. So he has to go to the mill and place his order. They have actually got to roll the steel. This is not all done overnight.

This is what is generally called lead-time. Under the best conditions you couldn't get that steel from the steel mill for a month. That is during normal times. In wartime it will take longer, about a month and a half to two months. Then it goes to the frame manufacturer. He has to put it through his process, which may take a week. Then it has got to be shipped to you. You have to get it drilled. Then you have to assemble it on the vehicle as it comes through. By the time you have done all that you have a four months' period in there.

Now, it is not right to call that a delay. It is not a delay period. That is my point. It is a period that is there no matter what happens. If everything is perfect, it will take four months, practically speaking, to make anything that is a complicated mechanical item, a piece of materiel that moves, that has bearings in it, and that has to be machined very exactly according to specifications. It is going to take that long. That is better than we do in the automobile business.

If we said right now we wanted to produce a new model automobile, here we are in January of this year. Say we hadn't done anything. We hadn't drawn a picture yet. We couldn't possibly produce that automobile under eighteen months right now. You have to figure roughly about six months of that for designing. It would take nine to twelve months to get all these different parts. We used to figure six. Now we have to figure nine to twelve. So you are eighteen months away from the new automobile right now. That is probably one reason why you won't see many new designs in automobiles next fall. As far as I can tell, nobody has those in process now. Does that answer your question?

A STUDENT:

You didn't correctly grasp my question. A speaker from one industry here said that if the Government would get out of the way, they would get a lot more done, particularly in expansion of facilities.

MR. JOHNSON:

I have heard that plenty of times. I am not entirely sympathetic with that attitude. Those people completely overlook the fact that we have got to take materials away from one company and give them to another. If you don't all these companies rush out for materials and get in each other's way. You would be much worse off than with the Government taking a hand. Somebody has to decide that this company will get one thing and another company will not get it. Somebody has got to keep this thing in balance.

I am not at all sympathetic with a planned economy or Government control. Quite the reverse. But I think those things are necessary in wartime, when your whole economy has to be aimed at one purpose and one purpose only, that is, to win the war. Your war economy has got to be run by a dictatorship. That is what it has got to be. It has got to be an absolute dictatorship, which tells everybody exactly what they are going to do. Otherwise you may lose the war. That is a good enough reason in my opinion. Just to say that if the Government would get out of the way, we could do things much quicker, I don't believe is true.

Naturally, it is annoying for men in industry who are accustomed to use only their own judgment, to have superimposed over it the judgment of somebody else. Yet it is essential. It is essential because, if we get out sixty million product tons of steel and we have an eighty million ton demand, someone has got to work out where that steel goes. You can't just let everybody scramble for it in wartime. In peacetime that is all right. That is part of the game. But not in wartime. That is what all this so-called red tape is. It is to keep those things in line.

A STUDENT:

Will you tell us how you would phase your production of passenger automobiles? Also I would like to have your opinion as to whether or not in a future emergency you could maintain 25 or 50 per cent of passenger car production as well as expand to take on ammunition production.

MR. JOHNSON:

I will try to answer the last part of your question first. My opinion is that you could not maintain any passenger car production in future war, for two reasons: The availability of materials and the availability of manpower.

In this last war I think, generally speaking, we used our manpower very badly. In fact, we were looking at it from the prewar viewpoint. We used more than there was, because we used people that we could not conceive of having used until the necessity came.

Likewise on the materials. For instance, take steel. We have a dozen limitations on the capacity of steel, which at the moment is about 60 million product tons a year. That is about between 90 and 100 million ingot tons. In wartime we need all of that for the war except a small part that is essential to keep certain things in civilian life going. Now, building automobiles is not one of those things. You don't have to build automobiles. You can live on your fat, as we just proved, for four or five years if you have to. They are not necessary.

So in phasing this, you might say there are two steps that have to be taken.

A STUDENT:

You would go out of that business?

MR. JOHNSON:

I think the first step is to go out of the passenger car business and have the Government tell you what you have to go into. Otherwise you would never get anywhere, because no company is going to get out unless they are all made to get out. Of course, that was done this time. It was done in January of 1942.

The War Production Board said, "Gentlemen, you will stop production." I think it was February 7th or something like that. Maybe it was January 27. In other words, that meant "you will stop" and everybody stopped right where they were. Regardless of what happened, they stopped. That is the best way to get out of the passenger car business in wartime. That really worked. Nothing else did work.

A STUDENT:

Would you tell us a little about how production scheduling is practiced in your particular plant, on components, assemblies, and the time of getting them out?

MR. JOHNSON:

That is a very difficult question to answer. On the surface it appears as if that is an exact time. It isn't. In almost all of these companies a great deal of that has been by the fact that there are a lot of men there who just have the know-how in their heads.

For instance, we had a great deal of discussion during the war of this material control problem that had to be solved on the lead-time. Most of the men in the plant had never used the words "lead-time". You could ask them how long it would take to get out a set of body dies, and they will say "nine or ten months." In arriving at that conclusion they think to themselves that it will take three months to get one thing done and three months for the next and three for something else. Some things they won't buy until the first of August. Others they will order on the first of March for the delivery to come out in September. They don't lay down the schedule on all those things. They just know from experience that it takes six months to get one thing and eight months to get another and only one month to get another. They do that all the time automatically.

Now, if you were to put those all down on paper, they would add up to something like twice as long as it actually takes, because a lot of these things telescope together.

I realize that I am giving you a very unscientific answer, but I think I am giving you a true one the way these things are done.

A STUDENT:

This is a little beside the subject, but I am wondering what is the present status of this administrating agency, The War Production Board.

MR. JOHNSON:

That is out of business.

A STUDENT:

Is there any exectuive agency in the industry that has any ideas such as that?

MR. JOHNSON:

There is not at the present time. The only move that has been made by the Automobile Manufacturers Association is that one of the staff members has been instructed by the Association to keep in very close touch with military developments and is working to that extent with the Army.

I think the way the companies want to handle it is that as different things come up which the Army or Navy would like to have investigated, or applied experimentally, or developed for the future or planned for the future--maybe tooled up for the future if this idea I have expressed should come off--they will take each one of those as they come along and find the company that will deal with it.

My own opinion is that we should, as an industry, have a small body or committee working with the Armed Services. I can tell you that we haven't one now. I hope that eventually we will have. I think the individual companies are worried and eager to do something.

There is one handicap in effect that you will run into. Apparently the Armed Services have run into it. Under their general instructions they must place these experimental contracts on a fixed-price basis. Well, that doesn't work. It doesn't work as far as we are concerned, because once you start on an experimental contract, you don't know where you are going.

For instance, take the Weasel. We thought we would have to make one trip, possibly up in the snow somewhere. We went down in the Andes and tried to find snow fields down there. We couldn't find any satisfactory ones. Finally, we found a snow field up in the Canadian Rockies. Instead of making one trip up there, we made two or three. That meant that a lot of men and materials and products had to go up there, all of which cost money. We couldn't foresee that it would be necessary to do that.

We have been approached to do this work, and we will be glad to do it. But we can't make any fixed price or estimated price. All we can tell is that it will probably cost an awful lot. They want us to tell how much it is going to cost. We don't know. Nobody else knows either.

I think the only way this experimental work can be done is on a cost-plus-a-fixed-fee basis or a cost basis without any fixed fee, without any profit at all if you want to look at it that way. What I want to be assured of is that we won't spend a million dollars that we can't get back.

A STUDENT:

You said you turned out 120,000 units in 1939 with 8,000 employees. I am wondering how many employees it would take now to turn out that same number of units.

MR. JOHNSON:

I would like to distinguish in that question a little bit as between how many units we can turn out and how many we must turn out. I don't think the two are the same. I think that if we get a few breaks on materials and so forth, we can probably turn out 160 or 170 thousand units this year. We now have 13,000 employees. Now, that wouldn't be so bad if we actually could do it. Last year was the worst, because we still had 13,000 and we didn't turn out 170,000 units.

I know what you are driving at--the present-day efficiency. It is very hard to measure that. But I think it is safe to say that the present labor's efficiency is about 75 or 80 per cent of what it was. That is as near as I can guess it. I hope it will get a little higher than that. I don't think it will get back to 100 per cent. Maybe it will only go to 90 per cent.

A STUDENT:

Would you compare the labor policy of your company with those of its competitors generally?

MR. JOHNSON:

We have a CIO union. It is Local No. 5. They never called a strike. We have gotten along with the union as well as or better than the other companies. I think probably the reason we do is because we have a very good labor relations department, and the important negotiations are carried on by the Chairman of the Board and the President of the company. In other words, the labor relations are at the top, where I think they ought to be.

Don't get the idea from that that conditions are perfect. We have the usual number of daily arguments about some very small things and some larger things. The general attitude of working men at the present, I think, is unreasonable. That is putting it rather mildly. I think that attitude over a period of time will change.

We are the only company that operates on an incentive plan, which may have something to do with our labor relations. We operate on a piece-work basis. In other words, they are guaranteed a base rate of pay for an eight-hour day, and that produces their hourly rate. As their production goes up above that, they can earn more than that pay. They generally earn somewhere between 15 and 20 per cent over the daily rate by increased productive effort.

Now, that is a beautiful theory. It doesn't always work just that way. We have an incentive plan, which probably has something to do with labor relations. The national union doesn't like it, but our men won't have anything else. So we let them fight that out between themselves.

A STUDENT:

Would you say, from your experience, whether you know of any great engineering improvement we could expect as a result of the war?

MR. JOHNSON:

I don't know whether you would call this a result of the war. I think the answer to your question is that we can expect some great engineering improvements. But at the present time, if you are talking about a different kind of engine or a different kind of any mechanical part of the car, that means a complete new tool-up for the company involved. That is just the subject I have been talking about.

In the first place, to tool up for a new engine means a minimum of five million dollars. That is for machine tools, jigs, dies, tools, and fixtures. That is the first thing you have. Then I would say it is a minimum of eighteen months from the time you start until the actual production will be in process. You have the design, and the testing to be sure that it will run all right.

So I don't think that you are going to see what you call radical improvements in the mechanical operation of automobiles perhaps for another two years. During the war, obviously, it was not possible to do the experimental work, particularly the testing, actually build the samples and test them, which it is possible to do in peacetime. So all the work that is being done started after V-J Day, with the possible exception of drawing some lines on paper. I think you are still a year and a half or two years from any of that work reaching fruition in the form of the product being made better.

The only change you probably will see during these two years is going to be a change in appearance. That means a new body, new fenders, and things like that. But I don't think you will see any new engines, transmissions, axles, or front-wheel drive, or any of those things that take all of that experimental work and engineering and testing, for a year and a half or two years.

A STUDENT:

Do you arrive at your price of a car a long time in advance by gauging the market on the materials?

MR. JOHNSON:

No, sir. We do not. In fact, quite the contrary. Everybody buys his materials--I think everybody does--we do--as late as possible and still get them. We ascertain as accurately as possible what particular costs are going up.

Now, when a new car is coming out, you can estimate what the price of the car is going to be. But the actual price is set on the car at the very latest possible minute. I mean that even to the extent that many companies many times will ship cars all over the country to dealers and put no price on them at all until they have sent them out in the field, because they want to wait for two, three or four weeks before they set that price. The price is generally set at the last minute. Estimating goes on all the time.

As far as gambling on materials, I don't think anybody does that. It is too risky. In our business we can't build up stocks of materials. We don't have enough room for a great amount of them. Our turnover--and this is true for all large companies when you get into normal operations--on the whole inventory of materials is about once every seventeen days. It is going on all the time. Otherwise, you couldn't operate, because there isn't room for a lot of materials.

A STUDENT:

I wasn't thinking of commercial stock.

MR. JOHNSON:

There is another thing. This is a very interesting thing in the automobile industry. When we say "materials" we mean materials as we buy them. For instance, in our case we happen to buy our transmissions. To us a transmission is a material. In another case they may buy sheet steel. That is a material. In another case they may buy carburetors, and that would be a material. So when we say we are buying materials, that means materials the way we buy them, What we actually place purchase orders for.

The very high percentage of those materials in any automobile company are materials on which work has been done by some processors down the line. It is customary in the business not to make contracts any farther ahead than you have to make them to get the stuff. The market will change or labor rates will go up and basic material prices will go up or down, or freight rates change. So that by the time you start getting the materials one of two things may have happened. Either your supplier is going to lose his shirt at the price he has quoted you or you are going to pay too much at the price he has quoted, due to changes in the market occurring in the two, three, four, five, or six months since the contract was made or the purchase order issued.

I think it is safe to say that pretty well through the industry, on one side or the other, those adjustments were made in spite of contracts or purchase orders. I will tell you why. This relationship between the supplier and the automobile company is very apt to be one that is going to continue for many years. The company will lose its source of supply if the supplier of transmissions or carburetors goes out of business. So if conditions arise where the contract you made with him proves to be too low, you raise the price for him. On the other hand, if conditions arise where the contract will cause him to make too much money out of it, he will lower the price for you. I don't mean to say that those things are entirely automatic. But that is what finally happens.

If we didn't do that, business would be impossible. We all depend on subcontractors. I would like to give you some figures. We had altogether, for the three products that I mentioned, about 1150 subcontractors and suppliers. Those people all over the United States shipped us stuff. The other fellow has got to make a little money, but not too much, if this is going to be a continuous process for our automobile production. We have to have three or four hundred subcontractors and suppliers to build automobiles. So does everybody else in the industry. This relationship must be kept sound. That is why you make these apparently altruistic changes in prices that have already been set.

A STUDENT:

Can you tell us something about the quality of the materials which you are able to get today as compared to what we had before the war?

MR. JOHNSON:

I think, generally speaking, they are good. You get some scrap in your steel, particularly your cold rolled sheets. That is probably due to two things. One is that the quality of the scrap is not as good as it was prewar. I think that will probably work itself out, because scrap which is the result of war has alloys in it and a lot of things that are pretty hard to tell. Of course, it has been very short. I think the mills, and the foundries too, for that matter, have been using some scrap that they ordinarily would not use if they could get better scrap.

The other thing, to be perfectly fair, is that there is more carelessness on the part of the men doing the work in the factories or the mills than there was prewar. So to that extent you get somewhat poorer or a larger percentage of poor material than you got prewar.

That doesn't mean you get poorer materials in your automobiles, because those things are worked out before they get into the automobile. If you get sheets that are not right, you don't use them. If your supplier under pressure does give you poor material, it never reaches the automobile. But the material itself is to a percentage somewhat less usable than it was prewar.

Any idea that the current automobile is not as good an automobile as it was prewar--and I don't care which one you are talking about--is not true. These present automobiles are just as good automobiles. In some instances you may get an automobile where, due to some carelessness in the factory, some nut has not been screwed down tight or a bolt doesn't have the quality of thread, or something else like that happened and the inspectors didn't catch it. You get a somewhat higher degree of those things now. You always get a little of that. But otherwise I would say that they are just as good automobiles as they ever were.

CAPTAIN WORTHINGTON:

Thank you very much. We are very much indebted to you for a very fine speech.

(1 April 1947--350)E