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PROBLEMS OF TANK PRODUCTION

17 March 1948.

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PROBLEMS OF TANK PRODUCTION

17 March 1948

GENERAL MCKINLEY: Gentlemen, when the subject of tank production is mentioned, one invariably thinks of the Chrysler Tank Arsenal, which pioneered in the mass production of tanks and was the country's largest producer. And when the name of Chrysler Corporation is mentioned, one naturally thinks of its dynamic president, Mr. K. T. Keller. During the past war he not only directed the vast and diverse war production of that corporation, which was one of the master strokes that he directed, but also served as personal adviser to the Army's Chief of Ordnance. His outstanding capabilities and extreme versatility are further evidenced by his appointment last March as Chairman of the President's Advisory Committee on the Merchant Marine.

This afternoon Mr. Keller will talk to you on "Problems of Tank Production." I take great pleasure indeed in welcoming back to this platform Mr. Keller.

MR. KELLER: General McKinley and friends: It was particularly pleasing, on being invited to speak once again here at the Industrial College of the Armed Forces, that the subject given me should be discussion of the problems which we at Chrysler Corporation met in tank production during the late war. Making tanks was our first World War II job. It was the one in which, when all was done, we had taken the greatest satisfaction.

Other production assignments involved extremely challenging problems. Several were at least on a par with tanks in importance. One involved far more plant space, more machines, and more people. But we had taken on tank manufacture in 1940 when the country's coming part in the war still was undefined. We had developed the proposition of providing the United States Army with an arsenal laid out for line production of tanks. We had put into the shaping of the contract and beginning the actual work all of our enthusiasm for executing a task of true importance to the security of the Nation.

We were determined to get our part done in a manner that would reflect credit on those in Government responsible for tank supply, and who had chosen us for the task.

As the first of the great Ordnance projects, this undertaking had a major part in developing the pattern of relationships that guided the Industry-Ordnance team. It set the groundwork for the lasting partnership we must maintain between the Nation's defense forces and her producing industries.

When we have said these things, and they could be expanded at great length, we must go on to face the facts that confront us today. One of the first is that our responsibility in this mutual relationship is to prevent our ever having to go through the same pioneering stages that we did then, in a time of national danger.

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It is very encouraging to see what the services are doing, and industries are doing too, to enlarge our joint education in our mutual problems. The course of study you are going through here is a case in point. So is the program under which officers are stationed in industry to study companies' methods and principles. So is the increasing civilian participation in evaluating and guiding research programs of the services. So is the great effort of the American Ordnance Association, which has recognized the equal interest of all the services in industrial preparedness. This has done much to keep the civilian cooperation from being too narrowly put into compartments.

These activities are good in themselves, but we must never lose sight of the cardinal principle that activity is only as good as the intelligence brought to it, both by those who present the facts and those who absorb them for purposes of action.

It often seems to me that the greatest problem in all affairs these days, is to avoid being taken in by the surface appearance of things. Increasingly, I believe, acceptance of the obvious is dangerous, and one of the essentials for success is hard-headed questioning of what superficially seems to be the facts. In all kinds of relationships things assume certain shapes, and when certain results follow, the first temptation is to say here is cause, and there is effect. It is very easy, for instance, to credit the results to the way a job was organized. Someone makes a chart and says: "This worked the last time. Follow it and you will get a good result."

Yet, if time is taken for a deeper look, we usually find that the result did not really owe its being to the pattern described by the chart. It was due to the assembly of certain personalities and certain human qualities, which as likely as not broke through inherent limitations of the prescribed course to obtain their results. At times too, circumstances quite outside the control of the plan dictated the outcome. Here again it was the extent and type of human intelligence which shaped these forces for good or bad.

If the experience of the late war has left us with a national fixation on a superficial idea, I think it may be the concept of ascribing the successful outcome to sheer mass of power mobilized by this country: That massed research made the atom bomb; that massed airplanes and tanks, with their bombs and guns, flattened the resistance of the enemy; that massed industrial machinery made these possible.

Here is a plausible idea, but I wonder how far it stands up.

I wonder if General Groves would not tell you that application of certain individual intellects and ideas, at key places and times, controlled the success of the atomic exploration. I wonder if your tacticians and strategists will not tell you that the mass firepower was the back-stop, important for its availability to retrieve any reverses, but it

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calls for increased production alternated with drastic cutbacks. Disappearance of critical materials held it up. Sudden changes in design upset ability to deliver, and broke the planned flow of operations. We never once had all of the machine tools and equipment that our schedules called for.

Spare parts requirements, ignored in the first rounds, became threatening rivals of complete tanks.

The ultimate war requirements, of course, broke up the original plan of self-containment of the tank in an arsenal, and converted this into an assembly plant fed by eleven Chrysler plants, as well as by a multitude of subcontractors. We kept there the heavy machining which automobile plants could not handle, but we farmed out all but 22 percent of the value of the arsenal's product. Where at the peak the arsenal had hardly more than 6,000 workers, the tank job in our company as a whole required nearly 25,000 men and women.

When we turned the plant back to the Ordnance Department with the job completed, it had delivered 23,745 tanks of twelve different models and very nearly a quarter of a billion dollars worth of spare parts, plus nearly fifty million dollars of parts furnished to other tank builders.

It never could have been done except for the trust and cooperation which the top men in Ordnance gave us all the way through, and the way they went to bat for essential needs when the chips were down. I believe the record shows that we earned their support by making our promises realistic ones and by keeping them without fail. But one does not earn another's intelligence and courage. We were dealing with truly great men.

What can we distill out of this experience that will help in the future?

If we start with first things, we begin of course with continuing research. This should be conducted in partnership between the military and those in industry who have the capacity to give effective aid and advice. It should be done with those who, when need occurs, can be depended upon to take hold and mobilize not only their own, but a host of associated resources.

We should, I think, be very hard-boiled about the extent and scope of this study and development work. The less there is of the lavish or extravagant about the programs carried on, the more public support we can count on. This will reduce the risk of having the work stopped by misdirected hopes for lasting peace, or by drives for economy in Government which, if properly channeled, still are essential to the country. Those who have this work in hand must confirm and keep the trust of Congress and the public.

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But if, as we know, the time factor is critical, and the availability of every essential to production is limited, then we have to weigh these costs quite carefully, because we probably have a smaller margin for waste than we think.

There are two ways to meet the problem. The most constructive is to see essential changes coming and so provide for their eventual incorporation well ahead. That sounds easier to say than to do. Yet, if that attitude is firmly planted, it will be surprising how much can be accomplished in an orderly way despite the sudden twists that campaigns take. The second is to question vigorously, and always, the supposed necessity for a change. If it is real, it will stand up under honest examination. If it is a whim, lives will be saved and campaigns advanced by laying it aside and keeping the product coming through. Much of this is a problem between procurement agencies and using services, but there is nothing in it that combat officers will not grasp and appreciate once they realize the effects involved.

Fifth, I would list a very closely related point. We cannot too often stress that volume and efficiency are produced by a steady rate of output, not a jitterbug pace. Twenty-four hours a day inefficiently used is quite as likely to yield loss than eight hours properly paced and sustained. An undue rush also dissipates the never too abundant resources of leadership, manpower, and equipment.

To turn our requirements on and off with every change in the weather, to heed every smile and every frown of fortune in the field, costs much more in the long run, physically as well as financially, than to adopt a sound schedule and hold to it.

There should unquestionably be a medal for bravery for the military procurement officer who sets a proper schedule and then has the courage to stay with it against the clamor and frantic cries that are sure to surround him. We should never have to sprint production to build political morale through statistics of volume. Possible consequences to individual careers should never dictate overcautious and unwarranted cut-backs. These are stern tests of character which face you men who some day may play critical roles in industrial procurement.

Sixth, we have entered so deeply into the era of mechanized military action that no emphasis can be too great on the problem of mechanical maintenance and service. The functioning and requirements of the horse and mule were well understood and masterfully cared for in the mounted forces. There was tradition of centuries back of it, and there evolved doctrine and science, and infinite care of an Army's animals. This enlisted not only the thorough attention of the individuals using the animals, but also that of a corps of professional specialists.

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So if we are to make progress, the job has to be broken down into definite pieces, each of which can be accomplished. Pieces which, one by one, will make a definite contribution to shortening the final make-ready periods, and to getting more end product for the effort mobilized.

Let us summarize the several items I have covered from just this standpoint of quick mobilization and early return:

First: Maintain effective partnership in research. This should be between the Services and those sectors of industry that have shown they can contribute effective work. Here you build industry's familiarity with the product, far in advance.

Second: Keep development and design of new items close to the realities of production methods and productive resources. Infinite amounts of tooling and manufacturing time can be saved this way.

Third: Define and fix now the ground rules of contract relationships between the Armed Services and industry. There is no conflict between the true public interest and the true best interests of private companies. It makes no sense to have to divert time and energy to these things when it is time for action.

Fourth: Recognize as a basic principle that making changes suddenly, after once you start organizing production, wastes enormous amounts of time, material, and manpower. This postpones the day when our forces have effective striking power.

Fifth: Economize on the industrial resources of the country by thinking at all times in terms of production rates first. Plan for sustained output rather than round totals.

Sixth: Limit the drain on production of complete items, which is caused by excessive demand for replacement parts. Recognize what the specialist can accomplish by thorough coordination of all the steps that underlie maintenance and repair of mechanical equipment in the field.

All these add to saving time, and getting the most for the effort. Some of the objectives are easier to attain than others, but I am confident that all are within the very great abilities which exist in the country's military services. These abilities are fully equal in their sphere to the best that industry can marshal.

On the industry's side you can count on a very great degree of practical cooperation as you move towards specific objectives. We, as well as you, know the interests of the Nation, and of us all, require close acquaintance with one another's problems and ways of thinking. We must keep this an everyday affair, not a once-a-year get together.

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it. If you have sixty teeth to cut in a gear, you know exactly how long it will take you to do it. If you put eighty teeth in it, you are going to get that much less off the machine. So it is very simple if you know those things.

But we were conscious of one thing, and that is that the system of distribution was not too good. I may be getting far afield and you might not like what I am going to say; but, nevertheless, I think the sooner you get these things out of your system the better you feel. We were always conscious of the fact that there was a great delay between the creation of spare parts and getting them to the place where they could be used. I think a lot of that was due to the conception that they should be stored in close proximity to the place they were going to be used, which resulted in six or eight or ten or a dozen stockpiles. Then you worked out a very elaborate system so that sixty days after any given date you could tell about how much was in any of those stockpiles sixty days before.

Now, one of the first things we recommended was that there be a parts warehouse placed alongside of the tank arsenal, and that the entire surplus stock of parts to repair that tank be carried in that warehouse. We could ship to seaboard on the Atlantic in five days and to seaboard on the Pacific in eleven days. In that way you would have in concentration all of the repair parts except those which had begun to flow to the point of use. Then you would save a lot of time and a lot of parts. I am quite sure that there were quite a number of parts that lay for a great many months in a great many depots that had never been touched when the war was over. If you had had your parts concentrated in one place, that would not have happened.

We worked that out on the Dodge truck eventually. It worked fine. Nobody thought it really could be done. It cut down a good deal on the number of parts that had to be made and it gave you service with a great deal more dispatch than if they had been stored all around the country.

One of the things we ran into was this: I visited all these tank arsenal stocks around the United States at one time or another during the war. You never had a commander in charge of any of them long enough to get acquainted with the operation. Before he could get acquainted, he was moved somewhere else. Each new man that came in had a different way of solving the same problem, which he had considered was a problem before he came to the arsenal. So the procedures were always taking on a new complexion.

I had that experience once. I had a manager at a tank arsenal who was beefing about all the changes. So I said, "Well, Ed, come on. We will go out on the desert and see what they do with these tanks." So we

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GENERAL MCKINLEY: Did you find any pressure to wipe out your program of spare parts and put end-items on priority?

MR. KELLER: It depended on which category the officer was in where the question came up. That is no different from what happens at your home or anywhere else. They think that a person is expected to look after, he is going to look after. That is the most important thing to him.

QUESTION: You said that it would be a questionable enterprise to plan on where and how things would be made in another mobilization. That seems to be a logical approach.

MR. KELLER: Yes. I will give you an illustration. You began to warm things up about 1938 or 1939. At that time you said, "We want to have a quotation from you to make some 3-inch shell forgings and do some machining, including putting on the band, closing etc." I said, "Yes, but how about some antiaircraft guns?" You said, "No. In the survey you are down for 3-inch shells. Your machinery will fit them" and so on and so forth. So we took a contract for 3-inch shells.

We set up a plant to forge them and to make them. After a while I went back and said, "How about antiaircraft guns? Let us get a look at those." So I finally got a set of drawings. I think it was the 37-millimeter.

I came back and we made one out of wood. Then I went back and said, "Would you give me an order to set up a production line for antiaircraft guns?" They said, "No, we can't do that. We are only getting two made." That was the 37-millimeter.

We made 65,000 40-millimeter guns before we got through. We never made any shells other than that first order.

That is what I am referring to. You look the place over and say that that is a good place to do this, a good place to do that. We would have fought the war, so far as Chrysler was concerned, making 3-inch shells, according to the plan. Isn't that right?

COLONEL CRANE: Yes.

MR. KELLER: We never made any of those things. We made a lot of other things. That is what I am referring to. You can't set down and plot out the country and say "This is it" because I think the thing you found in this late war is that as your development goes along, you are going to have to fit your job into the places where they have the human resources to cope with the engineering and technical problems that are involved in them. These technical people are hard people to transfer and very hard to get coordinated and working together. I think some of the

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machinery is available then, it has to be located. What I attempted to show here is that if all that work is done and the machinery is located and it is earmarked for the job, yes, you will cut six months off the time of setting the job up.

The thing that made the preparation time so long before was the fact that machinery had to be made, that in many instances the castings had to be made for the machinery, patterns had to be made for the pieces, and tools had to be made to make the engines. Those preparatory things are very hard to do and take a long time. Then, when you get into priorities, it takes you twice as long as it would in a free market, sometimes three times as long.

It would be nice to have an all-inclusive, simple answer to a complex problem like this, but I don't know where to get it. You have to break it down. It is like a problem in arithmetic. You have to go through all the stages and finally get the total down at the bottom. I don't think you can pick it out of the air very easily. But you are going in the right direction.

QUESTION: I have a question on the designing of new factories for war production and the effect on the design of unknown changes that you are sure are going to happen. Based upon your hindsight in the tank arsenal would you have changed the design if you were doing it over again?

MR. KELLER: I am glad you asked that question, because I recall very distinctly that when I came down to Washington, I looked at the model tank and the drawing of the tank and said, "How much armor do you have on there?" They said, "We have an inch of armor." I said, "Why don't you make it three inches?" They said, "Oh, no. We can't do that now. We might put it up to two inches later." I said, "What does the tank weigh, anyway?" They said, "Eighteen tons."

I went back and I told the boys, "You lay out a plan that will make a thirty-ton tank and get the machines big enough to swing pieces twice as big as these, because that is what it is coming to."

We did that. We went all through that tank production and didn't have any trouble until we finally hit this turret with the big counter-balance in the rear. Then our boring mills wouldn't swing it. We had to get new columns made with a gap in them. We were able finally to swing that turret. But the rest of the machinery went through pretty well. I think it went through because, having gone through World War I, I had had a little experience on the way these things build up and I told the boys to get their tank twice as big as what we were figuring on. And I think that helped.

COLONEL GODARD: You remember early in 1941 we broke the B-26 into an awful lot of major assemblies--one at Chrysler, at Warren Avenue; one

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GENERAL McKINLEY: You have been very generous. We have had you answering questions for quite a time. I want to tell you how much we appreciate it. Thank you very much.

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