PROBLEMS IN WAR PRODUCTION
18 June 1946.

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GENERAL ARMSTRONG:

Ladies and gentlemen, I would like to say to Mr. Knudsen that we haven't had an audience as large as this during the entire six months course in the Industrial College of the Armed Forces. I will say to General Knudsen that this is distinctly a compliment to him and his part in the war -- to have so many visitors, in addition to the student body, who could not escape if they wanted to.

Gentlemen, the speaker who is here this morning is the last on our list of distinguished American citizens, who have contributed to the winning of the war and who have addressed us during the present course. I think he proves the Biblical point that the last shall be the first.

I know something about General Knudsen's contribution personally. General Knudsen came to Chicago when we were struggling with reconversion to a war basis on production; and what General Knudsen meant to management and labor both was amazingly exemplified by what I observed out there. Whenever General Knudsen visited and looked over a plant, he always ended up by suggesting to them ways and means of improving production, which resulted in better production. Therefore we were delighted to have him come.

The General said that he wanted to speak sitting down this morning because of the long walk that he took here in the Pentagon in getting to my office. That surprises me, because I recall extremely well when he first came to Chicago. One of my old friends, General Quinton, was tagging along behind him looking a little pale and bedraggled. I congratulated him on his job. "Well," he said, "it is a fine job; but I wish General Knudsen wouldn't walk twenty miles a day."

Gentlemen, General Knudsen's career is so well known to you that it is hardly necessary to me to repeat it, and I shall not. You know what he has done as a civilian. I think in all of military history he is the only example of a man who got to be a lieutenant general without at least being a corporal first.

General Knudsen, we welcome you here to the Industrial College of the Armed Forces to have you address an audience of cilivians and Army and Navy and Air Force officers, to hear from you anything that you want to contribute to our thinking and planning as to ways and means of doing a better job if we are ever required to mobilize again as we were at the end of 1941.

Ladies and gentlemen, I have the honor to present to you Lieutenant General Knudsen, who will speak on the problems of production in war. General Knudsen.

MR. KNUDSEN:

By way of introducing myself let me say that I spent five years in the service of the United States -- a year and a half as a civilian and the rest of the time as an army officer. I had never been in the Army before. The reason was that President Roosevelt, when he decided to send me around the world, said, "You had better get a uniform on, because, when you get out there, somebody is liable to pull rank on you." So I was made a Lieutenant General and didn't have any trouble.

I flew two hundred and fifty thousand miles in the five years and visited twelve hundred plants that were in war production, plants making everything from a primer cap to a B29 airplane.

Naturally, the first year and a half were spent in overcoming the definite aversion that manufacturers had to working for the Government. We were at peace and business was pretty good. The only reason that I fell into this big job was that I had been in Germany in 1938. As president of General Motors I had no vacation, but every other year I used to go over to see the London and Paris automobile shows.

While I was in Germany I was courted by some of the high muck-a-mucks in the military establishment. One of them was named Mr. Goering, who took me out to his country place 75 kilometers from Berlin. He displayed a lot of showmanship--how he was getting along there. According to the record he was getting twelve thousand a year. He had only been in the top service for four or five years, and he occupied a place that was worth seven hundred thousand dollars on the hoof. So there must have been a little commission in it.

He was very anxious that I should agree to make airplane motors for the Germans in this factory of ours, which was the Opal factory, which made motor cars. It had twenty-two thousand men.

Well, I didn't like it. In the first place, I was born in Denmark, right to the north of there. My father was wounded in the last war between Germany and Denmark and hated the Germans, and I presume that a little of that was planted in me. So I stalled off. I knew that over here we were making motors for the French and English and that if I came back and announced that we were going to work for the Germans, they wouldn't be very cooperative. So I managed to evade the issue, and we never made war materials for the Germans in the General Motors plant.

Hitler took the plant over and we moved out. The twenty-two thousand men became about four or five thousand men and women. What happened to the other eighteen thousand, God only knows. I don't. They were all living around Frankfurt.

A very amusing thing happened when I was over there in 1938. The men wanted to strike. The manager that they had from America talked to them first. Then they called in two arbiters from Berlin, one representing labor and the other the manufacturers. The two heard the case and gave a verdict in favor of the management.

We had in the plant a big assembly place out in the open air, with a speaker's stand and a Nazi flag and everything that went with it. When we announced the decision, there was a great deal of booing. The men didn't like it. So presently a train backed up on the side track right next to the plant and a gentleman from Berlin got up and announced that if anybody didn't like the verdict, there was a train right there and he could get on it and start to go.

After Hitler took the plant over, they didn't have any violence. They didn't have any trouble at all, because he wouldn't let them start anything.

Well, I came back and I was all full of this stuff -- how to get done in time. I knew we could lick the Germans if we got going right. But we didn't know what we were about. I had never known what the Army required until I came down to Washington in June, 1940, as a member of the Advisory Commission to the Council of National Defense. We were called that because there was a law that established the Council of National Defense. The President couldn't use any more law at that time. The Advisory Commission didn't mean anything.

We soon started out, and the first year and a half were used up in making tools. Their original idea was that we had to get a line to produce the stuff. We had to be producing in a line, so we would know how many we could count on every day.

We started with powder and TNT. We knew what the capacity of the United States had been at the end of the last war. But these factories had been torn down after the last war. We had one that we thought was pretty good. I came down and found nothing but a smoke stack. That was all that was left of the plant.

So I tried to take each item separately -- powder, TNT, small arms, and then light guns, heavy guns, tanks, and airplanes. It proved to be very interesting.

But before I go any further I would like to tell you that in September of last year I was commissioned by the corporation as well as by the Army to go to Europe and inspect the plants over there. We had plants in nearly every country. I flew over and landed in England, of course; and from there went to Paris. From Paris I went straight to Copenhagen. I started in the north and worked south.

We had a plant in Copenhagen. That wasn't damaged at all. We had a new building. It was filled with German refugees. Denmark had been occupied for four or five years. We had about three thousand of them. We put them in the new building, because we thought perhaps the Germans might force us to operate it for them. There were three thousand people, mostly old men, old women, and half-grown children.

It was a sorry lot. Their original homes were near the Polish border. They lived and slept on a straw floor. They had to maintain the place themselves -- keep it clean, do the cooking and the kitchen work. It was

a sorry lot. I had heard that Mr. Hitler had developed a race of supermen. We didn't have any of them up there. They had rickets, syphilis -- all kinds of diseases. The Danes, of course, did the best they could for them. The Danish government had to pay the expense connected with it. That is, the Germans paid it to the National Bank of Denmark and then they took the money to pay the expenses with.

I didn't see any damage to amount to anything in Copenhagen. I was born there and I speak the language. They made quite a fuss over me after a talk that I gave there. I was there nine days and made eighteen speeches, part in Danish and part in English. But the Danes felt very enthusiastic, of course, because they had gotten their freedom.

One of the things that tickled them most was that a fleet of Mosquitoes bombed an eight-story building right in the center of the town which was the headquarters of the Gestapo. That was a very popular move. The Mosquito bombers came over in broad daylight, picked out this building right in the center of the town, and hit it without hurting the buildings around it. It was the most excellent example of precision bombing that I had ever seen. The Germans retaliated by bombing two plants in the city itself. But that was all the damage. Most of the real damage was done up in the northern part of the Jutland peninsula. There they had some quite heavy damage, in the provincial cities. But that was all.

From there I went up to Stockholm. The premier of Stockholm, Mr. P. Hansson, invited me to the movies and lunch with the highest officials. But there was no damage there. They had no problem of reconstruction. They had dollars. They had pulp and paper to be exported to the United States on a cash basis. That was the only country that had any dollars.

I flew over to Oslo, where we didn't have any plants. There was no damage there to speak of. All the damage in Norway was done between Trondhjem and Narvik, on the northern coast.

In Stockholm I was pretty well satisfied with the conditions. There was plenty of food in Denmark. The Germans weren't spoiling the farms. They were just taking what they could use. But in those five years Denmark had no coffee, tea, sugar, chocolate and the tobacco that they had was something awful -- weeds.

Thank goodness, the American ambassador asked me up to a meal and said, "Now, you may take anything at all you see in the American embassy." I said, "Give me something to smoke." He had cigarettes. He told me to take anything I wanted. So I took some things to smoke.

After finishing in Stockholm I had to go to Germany. I had a passport from the Combined Chiefs of Staff which permitted me to any plant if I could get there. There was no civilian air transport between Sweden and Germany. So I went down to the air transport command and found the commanding officer. I said, "I would like to go to Germany." He said, "Have you got your uniform with you?" I said "Yes." He said, "Put it on. I will take you down."

So he telephoned to Paris and a plane came up and picked me up at Stockholm and flew me from Stockholm to Berlin and then down to Frankfurt and Brussels and into Paris. I was hitch-hiking with the Army. They were very nice to me. They put me up wherever I went. I had very nice food, with all the comforts of home. If you are a general, you live pretty well.

I got into Templehof, the Berlin airport. I had been in Berlin several times before. The Air Force bombers had worked on a 24-hour basis on Berlin -- the Americans in the daytime and the British at night. I can describe it in one very short sentence. We got our money's worth. No question about that. The look of Berlin was horrible. It would take fifty years to rebuild it, because the fleets of bombers kept up a steady traffic twenty-four hours a day, and the Russians came in from the northwest and used their 155-millimeter guns. If you want to know the result of a 155-millimeter gun, you only need to make one hit and the house is down.

I stayed with General Echols. I knew a family who lived in a recreation area right outside of Berlin and I thought I would go over and look up the lady of the house and her two children. I tried my darndest and I couldn't find the house. I had been there before. There was no trace of the people that I went to see; so I gave it up. It was just like looking for a needle in a haystack, looking for people in Berlin.

Our Berlin plant was in Brandenburg, about forty miles outside of Berlin. I asked General Clay if this was in the Russian zone and wanted to know if I could get a pass to go out there. "Sure. You wait a minute and I will go and telephone." So he telephoned, and the next morning at ten o'clock, a Sunday morning, there was a car with a Russian colonel to take me out and back. He was all dressed up to beat the band.

We started for Brandenburg. You know about Germany's so-called autobahns that we hear so much about. They go out from Berlin in all directions. Well, we started out in the direction of Brandenburg. I kept looking out and I thought it didn't look very familiar to me. We couldn't go across country because the Germans had blown all the bridges. So I said to the Colonel, "If you don't mind, if it is all right with you, I would like to go back to Berlin and start over again and this time start for Potsdam. When we get to Potsdam, Brandenburg is the next town on the same road. You can't miss it." So after negotiations, back again we went to Potsdam, and, sure enough, we got to Brandenburg.

Our plant was smashed up pretty well. We had a pass to get into the Russian zone, but the officer in charge couldn't read. So he said, "The pass is no good." You can imagine what a show there was then. This colonel was going to have all of them shot at sunrise. I said, "Don't do it. It won't do any good. Go down in the city and pick up the local commanding officer. He surely can read and will recognize this pass." He did, and we got in.

Of course, there wasn't much to do after we got in. The plant was all smashed up. The equipment had all been taken out and shipped to Russia.

They were very thorough. Even the wash bowls had been packed up and shipped out.

We went back to Berlin, where I saw General Clay, and set out for Frankfurt. Down in Frankfurt I met General Eisenhower and paid my respects to him. I said, "I am calling on the customers." I saw him the other day and he remembered that. He said he was pretty well satisfied.

I went up to Rüdesheim, about twenty miles from Frankfurt, where we had a very large plant which manufactured a hundred thousand cars a year. That plant was smashed up too.

I will tell you what presented the greatest problem. You remember in the last war we had these small incendiary bombs. When these small bombs hit a concrete building, they just knocked a few chips off of them. We couldn't set them on fire very well. So I came home and recommended that we building nothing but concrete buildings. Well, we did. Over in England and Germany everything we built was built of concrete.

But now we have something that is called a block buster. They went right through the roof. The reinforcing bars were twisted up so that they made an awful mess. You couldn't do anything unless you blasted the whole thing down.

There was an engineering mistake that I am going to take the responsibility for, because we made an awful job when we made them of concrete. These structural steel buildings were not hurt much. We just put a new roof on the buildings and the windows and doors. We could repair them. But on the concrete buildings you have to move them off the lot and start over again. We learned a good lesson. If anybody has to build a plant again, the next time it is going to be built of structural steel, including the roof.

So I reported on that damage. It would take at least a year to make the plant usable. I recommended that the plant be repaired.

I flew over to Antwerp from Frankfurt. In Antwerp we had an assembly plant, quite a large one, with about four hundred thousand square feet of floor space. That was bombed by the Americans. I would say it was a mistake, because the Ford plant is right next to it, and that wasn't hit. We had about a thousand feet of floor space usable. It was the same thing -- concrete.

Then I went down to Paris. In Brussels -- I have got to mention this -- I talked to the premier. He was a coal miner by trade and had become the premier. He had a finance minister that had a Cornell degree. He had worked for the Detroit Edison Company. I knew a little French that I learned in school. I am afraid it is the "cabaret" variety. We had a very nice talk and I found out for the first time that this fellow had the reconstruction problem sized up right.

All the stuff that they had formerly exported had been taken away and they had only coal and building material left. So he was taking

these two articles and putting all his attention on getting more production per man -- more coal per man, more steel per man. He had the right idea. That saved a lot of overhead. He was very sensible and hard headed. I could make a comparison between this coal miner and another coal miner that we have over here. He was very serious and very matter-of-fact. He was quite sure that Belgium was going to get over her reconversion troubles quickly. Since I have been back, I have read in the papers the unanimous opinion that Belgium will be all right.

I went down to Paris. The damage was not serious -- a few scattered factories, but not much damage. But dirty -- dirty and run down at the heel. In my younger days, when we went down there, we always were taught to respect the French cleanliness. Everything was spic and span. There isn't anything like that any more now.

Of course, the Americans were being frowned on and being cheated from morning till night, cheated not only by the business men, but also by the government in the prices they had to accept and in exchange they had to put up with. It was 50 francs for the dollar and they had a right to get 125. A short time ago they passed a law which gave American soldiers 18 dollars a month as sort of sop for that, but they took away from them. Eventually they made the francs 125. So the French were soured and envious, and the Americans were mad at them. I saw in the Readers Digest the other day that the Americans were less mad at the Germans than at the French, because they had been drubbed so hard. As for being grateful for saving their hide, that was all off. There is a lesson in that for the future world.

We say the Russians are realistic. In Berlin they occupied billets in a picture show studio containing many small buildings. This is hearsay from some American officers. When the Russians took that over, an elderly lady, or a middle-aged lady, of the old German cultured class, came up and started to berate the officers for taking over their homes. They shot the lady and dug a little grave right on the front lawn, laid her in it, and put the sod back, and everything was all set. That is called realism.

But they scared them. No question about that. If anybody should say that there is any tendency on the part of the Germans to claim, as in the last war, that they had an unbeaten army, that is out. They are beaten, good and plenty. I saw enough of them to find that out.

In Paris we had two or three plants overhauling motors for the army on contract with the French government. In one plant we had 1100 men. They didn't need more than 500, I am sure. But if we wanted to fire any of them, we couldn't do so without seeing the government officer. It was under state control and management.

I went over to England. There is this about the British: Of course, the war is over and they are expecting to get back into the swing of things. I doubt it, with the new government they have over there. The British are sort of easy going. It probably will be some time.

I left London at three o'clock in the afternoon on Thursday and was home in Detroit for dinner at a quarter after seven Friday night. I didn't get my dearest wish. I always wanted to see Iceland. We got there at two o'clock in the morning. It was raining and blowing. I went up to the pilot and said, "Do you think you can find your way out of here?" "Oh," he said, "that is simple." He was born and raised in Detroit.

He said, "You see that runway over there and that red lantern? We will run down that and the next thing we will be in Labrador. We won't hit anything. If we stay right side up, we will be all right."

We were only five minutes late on the whole trip. I want to pay tribute to them, particularly to General George. The day before yesterday I said to General George, "You certainly have officers that know their way around." I heard a few of them talking at the airport in Paris. One said to the other, "What are you going to do over the week end?" "Well," he said, "I don't know. I have been thinking that we ought to go to Rome." That was just a little week end trip from Paris. In Europe, as well as every place I went, we were never more than five minutes late. I think it is a great credit to the organization -- these pilots, co-pilots, and navigators.

I compare that with the first time I went to Honolulu. I had a trip there with Secretary Patterson. We got to Honolulu and the next stop was Canton Island, sort of a gas station, eight miles by four, I think it is. Eddie Rickenbacker is a good friend of mine. He was awfully prejudiced against this place. He missed Canton Island and stayed twenty-one days in a rubber boat and pretty nearly starved to death. He came up one afternoon and told me the sad story. I was going to Canton Island. I began to think a little bit.

I went up to one of the crew and said, "Have you ever been to Canton Island?" He said, "No, sir." I asked the pilot, "Have you ever been to Canton Island?" "No, sir." I asked the navigator, "Have you ever been to Canton Island?" The navigator was only twenty-one years old. "No, sir." I hadn't been there either, so we started from scratch.

I had the usual amount of nervousness at night. We got off at eleven o'clock. About six-thirty in the morning the navigator came and shook me. I had fallen asleep with my Mae West right next to me. He said, "We will be there in twenty minutes." There was Canton Island down below, the most beautiful island I ever saw in my life. I lost my nervousness after that, because I decided that if he could find that place, he could surely find Australia.

But it was a great credit to the Air Force pilots. We were seldom more than twenty-four or twenty-five minutes late. And the co-pilots -- rosy cheeks -- looked like twenty or twenty-one. They knew their job.

Well, I left there and got back home here with a record of the damage. I was retired. I was over age. I have had odd jobs. I had a job in Detroit. We had our Golden Jubilee 50th anniversary of the motor industry and had a high time in Detroit. Had to spend three hundred

thousand dollars in five days. Everybody had a good time because it was mostly free. It was nice, though; a new experience.

But to get back to the war time: When I first went out in the country talking to people, the manufacturers had so many misgivings that the Government would do this and that. If they made a profit, they would be put in jail. If they lost money, nobody would help them. There were all sorts of silly talk about profit limitation. If they did make an exorbitant amount of money, the taxes would take it anyway.

But we were asked to do a great deal of missionary work. They were afraid they wouldn't have anything left if the Army and Navy should decide to end all the contracts. Also they were afraid of the inspectors. I said, "What are you afraid of? Don't you know more than a fellow who is coming out here to inspect you? If you satisfy him as to your quality, if you do a good job, he will recognize it." But they were afraid. They hadn't got the feel right. It wasn't until after Pearl Harbor that we really got in the swing.

As far as advice is concerned, if you ever have another party like this one, be sure that the man you have in the plant doesn't know it all. Be sure he has had some little experience. And mainly be sure that he can read drawings. Be sure he can read drawings and know the limits he can go. That is number one.

Number two, be sure they know shop practice. Let them go around and learn something. Most of the people you had in charge of plants never had had any plant experience at all. Whenever you had a reserve officer who had had plant experience, he got along fine.

So these are the main things. And the third one is, Don't get a big output one day and no output the next three days. See that you get so much a day, something you can depend on.

As we went along, the first thing was, of course, to take over powder and TNT. We didn't have very much of a problem with TNT, because we had two or three more plants put up with manufacturers to manage them. The quantity required was enormous.

I had a fellow working with me who used to run the old plant down in Tennessee. He was a young man. He knew all the manufacturers. Aside from the first period when the plants were being erected and being tooled up, we didn't have any trouble to speak of. Raw materials were plentiful.

Of course it was all a continuous operation. You could pretty well depend on the output every day. It was splendid work; hardly any breakdowns. We had two explosions, one on the Burlington in Iowa in a loading plant and one in a TNT plant, during the night, that took everything along with it. We had three units there. We had a central unit and a south and north unit. Only the central unit blew up and killed twenty-five men.

But outside of the fear that was instilled in these people who had never worked in a powder plant before, it didn't take long before they got back into production of the scheduled output. I always kept my fingers crossed when I thought how many plants we had around the country. I am very much indebted to the fellow who ran the Savannah Ordnance Works. He came around. He was an old timer, practical, hardheaded. He looked over all these plants and made recommendations for the protection of the people in them. That had a great deal to do with the very few explosions we had.

We had no airplane tail turret in 1941. A gentleman from the civilian service was talking with us. He used the expression "status quo," a number of times. Finally this man turned to me and said, "What do you mean by 'status quo'?" I said, "That is Latin for 'the fix we are in.'" You had to keep your sense of balance, your sense of humor.

One man said to me, "You must lay down the law to them." I said, "Oh, pshaw. We don't do that. We talk to them and teach them to think our way. Do that and you will be all right." And it worked. You can't use that kind of stuff with an American. He will pitch you out if you do. But you can reason with him. He is very practical.

I will say this: I never saw the spirit that there was in everybody the day after Pearl Harbor. All the men were sore at the Japs and all the women. They all had brothers, sweethearts, husbands perhaps over there. Everything took a jump almost like that (snapping fingers). That was due to the fact that we had a number of tools. Everybody was sore at the enemy. That is very important, as Napoleon used to say about one hundred years ago.

So when it came to machine work we had a great advantage. The only trouble was that we didn't have machine tools enough. A number of Leon Hendersons suggested that we build a government machine tool factory. I opposed it. I said, "If you build a government machine tool factory, you have got to use the machine tools in this factory. You won't have any for the rest of them. Let us try to install subcontracting wherever it is possible and expand the present plants and do it quickly."

And we managed to do it. We had an output of two hundred million dollars worth in 1939. We got up to nine hundred million in 1943. That is testimony of what you can do. We got them all in there. We appointed a committee and we put our problems up to that committee. They passed the word around and we got the machines that we needed.

It was a matter of getting it in balance -- lathes, boring machines, and so forth. We all worked in accordance with the shortages that the Army gave us, and the Navy.

That was a very fine job. I wish to pay tribute to the men, because we had to break in a lot of people. We had to upgrade laborers into machinists' jobs. We didn't have very much trouble.

A very amusing thing was when tank output came along. There are a lot of big, heavy steel castings in them. Chrysler had the job of making

the motor on the job. He had a fellow by the name of Hunt. This fellow Hunt said, "When we get the bed, get the clamps, get the single tooling, just turn the thing around and we can get along with simple tools." And we did. It was a very, very clever idea. It saved many man hours.

Man hours and the plant and the material were all we could work with. We didn't care a rap about the dollars. It was the man hour. If we could improve that even a small per cent, it worked all through the picture.

In small arms we had no trouble. Most prominent was the Garand rifle. The government factory at Springfield was very well equipped. Old man Garand was working in there as a mechanic. So we expanded that plant. All we needed was one more plant in order to get the output of sufficient size to take care of the war.

We got a lot of telegrams from Africa saying that the Garand rifle was no good there. We couldn't understand it, because we had tested every rifle. So we sent a young man over there. He went over to Africa and reported back that in landing the rifles they had dropped some of them into the water and then dropped them on the sand on the shore. All that was needed was a good cleaning. But naturally we still got messages from there about the quality.

However we didn't have much trouble. Comparing the amount of trouble that we had sometimes with the quantity of material we turned out, it was very small.

When it came to airplanes, one thing about them is that everybody loves to talk about them and fly them. Of course, the first thing that confronted us, was President Roosevelt's appeal for fifty thousand airplanes a year. We had been making about fifteen thousand in ten years at that time.

We got all the airplane manufacturers together and talked with them. They were leery because there was a lot of money per unit in airplanes. They cost all kinds of money, around ten dollars a pound. I knew that, of course; but I didn't take much stock in it, because I knew if they ever got the quantity, the cost would come down. It so happened that we started with ten dollars a pound and ran it down to 3.6 dollars per pound simply by getting quantity manufacturing.

I had the dickens of a time getting them to understand that you could have certain units of the airplane made by other kinds of manufacturers. The first fellow who had a wing contract in Detroit lost seven hundred thousand dollars on the wings. He didn't know what he was about. I had to hold his hand for about twenty-four hours down here in Washington. As a matter of fact, he became an outstanding airplane manufacturer of parts, and not only got his seven hundred thousand back, but quite a considerable amount more. But he had to get over that.

There were no drawings. The drawings were very crude and rough. I am not giving away any secret when I tell you that the airplane manufacturers spent a lot of time telling me that nobody else could do what they did. All the first airplanes, of course, that we had were light

airplanes, around two thousand pounds. A lot of trainer planes were required. We got them on the way. Of course the Air Corps was always talking about fighters. They wanted to go out and shoot up the enemy. The fighters were not quite good enough until we got them redesigned, with strong motors in them.

There was the usual argument between straight line motors and rotary motors. We got the United motors and Pratt and Whitney. I went over there and tried to get them to build some more plants. They wouldn't do it. They said they had all the plants they wanted, all the plants they had the supply organization for. But they were very fair. They said, "If you can find anybody else to make those motors, we will give you the drawings." So we hopped out and got a pretty good automobile manufacturer. After they started, I began to get worried about whether they were good enough. But one time I took six of these Buick motors and six Pratt and Whitney motors and disassembled them -- I learned that with Cadillac -- and mixed the parts up and then made 12 motors. We all thought they were perfect. I had the pleasure of riding in Australia in a plane with four Buick motors in it. I was ready to jump on Curtis if there had been any trouble at all, but we didn't have any trouble.

Wright Aeronautical did fine service. Of course, both the Army and the Navy spurred them up all the time, making them stronger. Their #3300 B29 motor was the biggest job in the Army. They had two plants making them -- in Chicago and Patterson.

To come back to aircraft: You know, an automobile is a unit that combines sheet metal work, machine work and then wheels and rubber that are bought elsewhere and assembled. We thought we couldn't do that with airplanes. I made one ruling. I said, "The assembler will be a man who is in the airplane business. Nuts and bolts can be made anywhere, but the assembler has got to take the responsibility for the quality of it."

We lost some men; that is true. But we all worked on it. Of course, we learned the modus operandi of building airplanes. While a few of them came down and we did have to do a little milling on them sometimes, it was quite successful.

Another thing that came up was turrets. There was very little knowledge of turrets. The men would get into combat in Europe and get knocked out. We had some B17's that didn't have any tail turret on them. We got a hurry-up call to put a turret in the tail. I sat down for sixty days with Boeing and others working with the Army Air Forces on that. We got it done.

We sent the first plane over there and got a report back that it had been in combat with the Germans. They said, "Boy, it was just like shooting ducks." Things like that were happening all the time. The turrets and the speed were unique. You couldn't help but admire them.

Later on, when I got over in the jungle and took a look around, I had to admire the youngsters that we had. They had probably never been outside their family. We planted them in the jungle thousands of miles

away from home, where there were snakes and crocodiles. They took it smiling.

I was over in an air field in New Guinea near Port Moresby. I met the commanding officer and the cook. He told me that he had heard a noise in the mess tank at night, took a gun and a flashlight, and found a fifteen-foot boa constrictor in it. He immediately nailed it up on the wall of the mess tent and invited everybody to have chicken a la King the next day. You couldn't beat the spirit of them.

Another amusing thing. You know, you had to get some of these things to laugh at. If you hadn't, you would go crazy. On the east shore of New Guinea there was a fellow who had been shot through the chest. We lost quite a few men there. In the meantime we built a hospital over on the other side of the Coral Sea in Australia. We flew these people over there. There was no jungle there. It was a nice, clean hospital -- palm trees and coral sands. They brought this fellow in and put him in a room. He had been in a tent before. Here he was in a modern establishment. An Australian nurse came in. He got a little sentimental. He said, "Did you bring me here to die?" The Australian nurse, in her English dialect, said, "Oh, no. We didn't bring you here to-die. We brought you here yesterdie."

I must pay a compliment to General Wesson. Before the war he wanted to keep his experiments in the different arsenals, with a specific job for each. For instance, Frankford Arsenal made fuzes and small arms; Picatinny, mines; Rock Island, machine guns; Springfield, of course, Garand rifles; Watertown, big guns, and Watervliet, large guns also. He had conducted certain experiments with shop practice, invariably starting improving a little on the quantity. But there was something to begin with.

So my advice to you gentlemen is,-be sure in your study that you get the shop practice down on paper on the latest experience. You might have a problem about drawings to understand them.

Get your drawings in shape. I got an order to make some tanks. I got a little blueprint, quarter size, just an outline. There was no motor, transmission, or other things. You had to do that yourself. So I went to Keller of Chrysler and asked him to come down and look at it. All I had to show him was this. I said I wanted him to make tanks.

"Well," he said, "I don't mind." I said, "I will build the plant until you learn how to do it." He said, "I think I will go home and build one out of wood; so I can find out how big the thing is." And he did build one out of wood. Of course, it was quite successful after a while.

The transmission was built in their factory. The motor was an airplane motor, which I think was a mistake. But we didn't have anything else. A tank motor ought to be made for a tank.

The British tried to build a special motor for tanks. It never was much good. We managed to get along with the aircraft motor, made by Continental. Eventually we used some bigger ones. But, of course, we had no advance notice of what a tank was supposed to do.

The first tanks we sent out had rivets on them. The report came back that a bullet would hit the head of a rivet and knock it off and kill the fellow inside, knock him right out. So I had a friend in Milwaukee. He is dead now; God rest his soul. He was a good welder. I called him in. I took some armor plate and told him, "Bend it at different angles all the way through and send some samples over here."

I took those up to General Wesson and said, "You break these welds," with the result that all the rivets went out and we got a machine called the Uniweld. It worked all right. I will say this: that whatever difficulty the American workman or manufacturer gets into, he will wiggle his way out somehow.

But get them with you. It is no use to pull a gun on them, not on the fellows that know anything. If you get their good will, they will do more for you. Money doesn't mean anything to them. But you have got to get their good will. You have got to try to get them sore at the other fellow. That is it.

Now, as to hot competition in the low price automobile field, I said to some of the fellows: "Fight the competition. Fight for it. Don't fight among yourselves. You can't make any money fighting."

You know, the American is practical. He will listen to you if he likes you. If he doesn't like you, he will try to call you a lot of names.

I was over in Kansas City in August of one year in a war plant. It was pretty hot. I walked out to the side of the plant to get some air. The operator of the plant came up and said, "Will you shake hands with me?" I said, "Why not? Here you are." He said, "You are probably wondering why I wanted to shake hands with you. I am going into the Army tomorrow, and this is probably the last chance I will have to shake hands with a general."

On ships we had a problem. Admiral Land took charge of ships. We immediately got into an argument as to how many ships we could build and where we could build them. I have got to say that the Admiral is very energetic and sometimes a little blunt, but he never stops working on a thing when he gets started.

The question came up whether we could build ships on a line. I had some little experience with it in the last war, building torpedo boats on a line. Of course, these were bigger ships. These were ten thousand tons. We finally decided that we could build just one kind of ships and build it in as many places as possible that we could get the men for. They were all identical -- ten thousand tons, stock models, reciprocating engines.

I went out to the first yard that we put up. We wound up with fifty-four ways. Naturally the shortage of material was appalling, because all wanted to start. Everybody was short of the same thing. That is where welding came in very handy. I had done a little bit of welding in my young days. We had no trouble. We welded the ships.

We had a little trouble getting plates fitted. But finally we did some work with formed plates. Of course, they were all alike. If you had the right ones, they fitted all right. We got some engine builders to make reciprocating engines. We got down to a reasonable price -- around a dollar a pound.

After we got going, the end result was that we had ships enough. In fact, we have too many of them now. They are lying around without any loads. But that was a big job, to make them.

On big guns, the forgings of the gun barrels were made around Pittsburgh. Machining them was simple. There wasn't much of a trick to it. An enterprising manufacturer down in Pittsburgh named Iverson of Mesta Machine Company figured out a way of boring the gun and turning the outside at the same time. He even had women learning to handle 155-millimeter guns. It is a rather slow job after you get the tools set up. He used men to set them up, and women to operate them. He did all right.

Airplane instruments were a big problem. I had the questionable pleasure of being asked by the gentlemen over in the War Production Board to take these instruments apart and find out how much was required in each instrument. When you find that this day's production only required a hatful of materials, you could go to work and set up all these outfits. He didn't do it.

We also had a gentleman there who got the bright idea that we were short on aluminum forgings. He wanted to keep a record of all the dies of aluminum forgings and so forth by sub-numbers of dies, and keep a record of what they produced, everyday. There was a bookkeeping job that was all out of proportion to what we would get out of it. We canned that one.

The only thing that really mattered was how many finished units we got a day. How many finished pieces did we get a day? Do we get them every day? If we didn't, there was something wrong with either the men or the tools. That is what we thought about when we thought about my going around the shops.

A colonel has written a whole book about this. It is very good. But I couldn't make a speech about it.

The way we got airplanes on the line -- one manufacturer I knew pretty well, and I preached to him one day about building airplanes on the line. He said, "It couldn't be done." It was exactly the same thing that had happened some thirty-five years before when we started to build

automobiles on the line. We wanted to wall it off, have a great deal of secrecy about it, have it hidden from the outside.

So I went over to Vultee Aircraft who were building trainers. I got hold of a little fellow by the name of Perelly, a very bright man. I said to him, "Now, see here. Let us make a line for these trainers." He said, "Sure." I said, "Let us begin now." We made a line for trainers and saved 40 percent of the floor space and turned out quite a number of planes.

Then I went over to North American and said, "What is the matter with making your planes on the line?" He said, "My plane is much better than this trainer." I said, "Oh, hell." At the end of the war he had the most efficient production set up of any airplane builder. Even B29's were built on the line. There is nothing impossible to build that way if you get enough to make.

Like in the old days Mr. Ford said, "Don't put anything on the floor. You are only going to bend down and pick it up again." If you move the materials so that they pass the man instead of having him handle them himself, you are bound to create a set of specialists that will give you more output a day than you could otherwise get.

Lord Beaverbrook came over here. He would walk around with both arms swinging, but he didn't get anywhere. He said to me, "Mr. Knudsen, you ought to take these fellows and tell them 'I will tear your hide off.' That is what we do." I said, "That won't work over here." There is the score -- 227,735 planes. There is one who worried about 50,000 a year. Just to make sure, we made 100,000 in 1944.

You probably have got this on record yourself and there is no use my repeating it; but let me tell you this: There is nothing that the Americans can't do in a line of production for war or even for peace if they get their heads together. Always believe in that. Down at the bottom the American worker is patriotic. He might have a big argument with you around about quitting time, but down at the bottom he is patriotic. I have seen it among the lowest class of help -- patriotism that I didn't find sometimes in the upper classes. But when you get, as I say, all the noses pointed in one direction, you are going to be safe. There isn't anybody can beat us.

I have been here forty-six years, and I have been all through the production period, starting in a shipyard as a riveter. I went from there to a railroad shop as a repairman.

They talk about mass production. Even the Germans produced a lot of junk. I got some of it. I had to ship overseas and go around to see how darn efficient the Germans were. Now the reports I get are that Mr. Speer failed in handling the production in Germany. So there you are. But we do know that over here we made a good bomber and made some good engines. The Germans didn't make any four-motor bombers, because they were too expensive and they didn't have the motors for them.

But don't let anybody get too overbearing, too over-imperious. Your country can take anybody on in any kind of scrap and come out on top. Thank you.

GENERAL ARMSTRONG:

Thank you very much, General, for your contribution to our store of knowledge.

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(24 July 1946 -- 200)P.