EFFECTIVE MANPOWER UTILIZATION IN INDUSTRY

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Mr. Don G. Mitchell, Chairman of the Board, Sylvania Electric Products, Inc., was born in Bayonne, New Jersey, 26 April 1905. He attended the University of Cincinnati and the University of Florida, specializing in mathematics and mechanical engineering. Mr. Mitchell has been awarded honorary degrees from Parsons College, Iowa; Rensselaer Polytechnic Institute; Northeastern University; and Stevens Institute of Technology. After a short period as an instructor of mathematics at Montclair High School, Montclair, New Jersey, he joined the McGraw-Hill Publishing Company and later became manager of the company's industrial site service bureau. He was appointed director of Industrial Development of the Niagara Hudson Power Company and was active in development work in enterprises dealing in rayon, hosiery, bakelite, and paper milk containers. In 1933 he became manager of the Marketing Division of the American Can Company. It was through his efforts that the paper milk container and the metal beer can was placed on the market. In 1937 he became general sales manager of the Manufacturing Division, Marshall Field and Company, and in 1939 he was appointed vice president in charge of sales of the Pepsi-Cola Company. In 1942 he joined Sylvania Electric Products, Inc., as vice president in charge of sales and became a director in 1943. In 1946 he was elected president of the company and served in this capacity until April 1953, when he was elected Chairman of the Board. Mr. Mitchell has long been a leader of industry association work and has served on many industrial and civic organizations. He has served as a member of the Advisory Council to the Senate Committee on Trade Policies; National Distribution Council, which is advisory to the Secretary of Commerce; adviser to the Under Secretary of the Air Force on electronics matters. In December 1953 he was named a member of the Hoover Commission task force.

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COLONEL NORMAN: Admiral Hague, General Niblo, members of the class and faculty: If we reduced to a simple statement a definition of management, I think it might well be "the organization, control, and direction of both material and human resources toward the attainment of an objective or mission." Simple though this statement may sound, I think we are all well aware that the successful application of the art and science, if it is a science, of management is fraught with many difficulties and situations which call for our every ounce of judgment and the pragmatic application of every guiding principle that we have acquired. And then I am sure there are times when we are not quite pleased with the results attained.

Since we can't reduce this problem of how best to utilize and manage human resources to a formula, I think we can profit, however, by taking a look at principles and concepts and add to this, practical experience that has been successful. This morning we are adding in just this mix. We have asked our speaker, Mr. Don G. Mitchell, Chairman of the Board of Sylvania Electric Products, to discuss with us his ideas and philosophy of the "Effective Manpower Utilization in Industry," a philosophy which he has gained during an enviably successful career.

You have seen his biographical sketch, so I am not going to read it; but there are a couple of items I want to mention. One is that in recognition of his outstanding abilities and accomplishments in the field not only of education in the service, but in the whole field of management and human relations, he has recently participated in a survey or study of the Army War College curriculum at Carlisle. Also, recently he participated in the global strategic meeting at the Navy War College.

I am very happy to welcome you back to the college, Mr. Mitchell, and to present you to this audience.

MR. MITCHELL: Admiral Hague, gentlemen, and ladies: Industry is commonly thought of as that part of the national economy that manufactures goods and equipment. In order to distinguish it from

agriculture, banking, or other economic pursuits, that definition of industry is adequate. However, it is only when one is asked to define industry in its broadest sense that one is confronted with a concept much more complex than just production of materials.

While industry is basically physical or mechanical, it has come to realize that it constitutes a far-reaching social force. Production is the output of people, and the machines they operate are but the tools that the people work with. Whatever their product, it is the product of men's minds. That product has no substance beyond the substance of the individuals and their minds.

Now, industry is also many other things. It is research and engineering--the development and application of new knowledge. It is legal, in the sense that it operates within the framework of a number of laws regulating the conduct of business. In fact, in one sense or another, industry really represents every aspect of modern society.

When that is understood, it is not surprising that industry should employ so many professional people of almost every kind that you can think of. There are a great many physicians in industry, for instance. There are so many that they have formed a professional association of their own--the Industrial Hygiene Foundation of America, Inc. Teachers are being employed more and more for training work. In fact one company, I understand, employs a minister full time and with very interesting results.

Rapid technological progress, competition, regulation, and unionization have complicated the course of industrial management and have made it necessary that the best in professional skills be available to solve the wide range of special problems. There is a science to industry today that did not exist 30 or 40 years ago, and its performance depends very largely upon the wise use of professional skills and advice. I suppose the comparison with business of 25 or 30 years ago is just as startling as to compare the U. S. S. "Langley" with the "Forrestal," or the Curtiss Hawk of the twenties and the supersonic jet of today, or the 3-inch antiaircraft gun of 30 years ago with the Nike battalions.

The largest number of professional people employed in industry are, by all odds, the engineers; and the number is steadily increasing. At the turn of the century, industry employed one graduate engineer

for every 250 workmen. Today it employs one engineer for every 50 workmen and would employ more engineers if it could get them. This indicates how extensively engineers are being used.

In other professions, men with formal education are mainly self-employed or are employed in organizations largely manned by members of that profession. Think of law, medicine, education, or religion.

Just the opposite is the case with engineers. A very few are self-employed, and there are a few that work in consulting engineering offices; but by far the large majority, as far as civilian engineers are concerned, are employees of organizations engaged in general fields, such as manufacturing, construction, transportation, communication, and utilities.

It is estimated that the number of engineers at the present time is upwards of 500,000, and that the manufacturing industries employ about 40 percent of them.

Looking at that area of industry engaged in manufacturing, about 160,000 engineers are engaged in a wide range of activities. And that number is not enough. We roughly estimate that 20 percent more engineers are badly needed today for the civilian work alone. Of course, this has not been helped any by the fact that the graduating classes of the engineering schools steadily decreased from a record high of 48,000 in 1950 to a record low of 19,000 this year. The curve begins to turn up again next year. We will have 30,000 by 1956 and 34,000 by 1957. But the net number of available engineers is likely to go down every year, because a large number of those youngsters have to do their hitch in the service, either because of Selective Service or ROTC.

You are well aware that the reverse situation exists in Russia, where engineers are being turned out at the rate of 50,000 a year. I say "turned out" advisedly. Engineers are being turned out at the rate of 50,000 a year, because their concept of engineering education is mass production. Their quality is low by American standards. But 50,000 is still two and a half times the number which will graduate in America during the entire current school year.

Furthermore, let's don't sell ourselves down the river too far on how bad those engineers are. I myself saw some of the materiel they

built and used against us in the Korean unpleasantness, and it wasn't as bad as I expected Russian-built equipment to be.

All of you recall how hard pressed we were for engineers during World War II. The number of engineers was some 25 percent less than the number today, and many of them were in uniform. Still we got by--I often wonder how we did--and we furnished our Armed Forces with munitions of new design and in such quantity as to confound our enemies and amaze our allies.

Without taking away one iota from the brilliant and gallant achievements of our Armed Forces, let me say that victory would not have been possible without the engineer. It was the engineer who found ways to do the impossible and to raise our productivity, not only to meet, but even to surpass, the enormous quotas demanded of industry. It was the engineer who teamed with the fighting man and assured victory.

If we could do such a whale of a job then with fewer engineers, what has happeded to cause a shortage now, when the total industrial production is only slightly more than it was at the peak of the war? The answer is simple, of course. Then we had only one job to do, and that was to win the war. We could concentrate our energies. Today we have a combined civilian and defense production job of unprecedented proportions.

It is immensely more complicated now than ever before, because of the advances throughout every technical field. Perhaps industry has enough engineers to take care of civilian production needs, but it has not nearly enough to satisfy the national defense needs as well.

A further complication is the technical manpower needs of the armed services themselves. Sylvania has about 2,000 degree-holding engineers out of its 25,000 total employees. Now, I would guess offhand that 500 of those work full time on military projects.

In addition, some of our engineers are engaged in nonmilitary projects developing processes and techniques, of a type which usually prove to be valuable to military projects. The developments of new assembly machines is a case in point. This presents a problem--the problem of striking the proper compromise between getting the job done for the Government and taking care of our civilian needs so that we can remain a strong industrial competitor.

And I might say here, in case any of you don't know it, that there is no profit in doing the job of the development of machines for the Government. Perhaps you think there should be, but there just isn't. Our contracts are all either cost-plus-a-fixed-fee or contracts similar to that kind, and you can't make any money selling engineering man-hours to the Government. It is not humanly possible to do it, even if you don't take into consideration the loss of such engineering man-hours as are not going into our civilian work.

The utilization of engineering manpower this year has made any engineering manpower utilization that we had before look silly. On just one project alone, we got past the study phase two months ago. Now we enter into phase two, and where there were 30 engineers used on the study phase, we have to find, and put on that job, 560 engineers more by 1 January 1955. This is only one project.

Now, believe me, we are one company and this is one project. You multiply that by the number of defense projects that are being placed by the Armed Forces today. And, though some of the contractors may grouse a little about the low total number of dollars they are allowed in the contracts they already have, their real concern is how to divide up their engineering man-hours so as to fulfill the requirements of the contracts that are being let.

Obviously, under those circumstances, the challenge to industry is to assure proper utilization of the scientists and engineers that we do have. In those words "proper utilization" lies the solution to the problem.

Let me describe to you some of the ways we and industry as a whole seek to discharge this responsibility. Our technical personnel are employed to find ways and means of increasing industrial productivity, in order to keep costs down as low as possible to meet competition and to, in turn, meet public needs. That after all, is the essence of a free economy. We have to do that to live in industry. We have also to do that same thing so we can live in case of another mobilization. It is obviously just as important to keep these costs down to the military on its materiel as it is on commercial production. It is this competitive and economic stimulus to constant improvement in productivity that keeps the United States industry in the lead as the arsenal of the free world.

Looking at it more broadly, scientists and engineers are charged with the responsibility for improving our standard of living. Productivity is part of it, by bringing a steadily increasing flow of goods

and services at lower and lower cost. Increased productivity brings new and improved ways of living--housing construction, household appliances, amusements, transportation, and utilities.

One of the marvels of the postwar years has been the rapid expansion of the television industry--an engineering achievement which in many ways is less than a decade old but which demonstrates what industry can do. That, of course, is true only in this country--that TV is less than a decade old. But it does point up the job we do when we take hold of something in this country.

I saw perfectly satisfactory television being broadcast in 1939 in England. There wasn't any television, as far as America is concerned, commercially in 1939. It really didn't emerge until after the war. But when the American electronics industry began to go, it really went! But to make it go, all of us had to concentrate our engineering manpower on the job in hand. That is the only reason we were able to do it so fast.

Sometimes we move too fast, needless to say. An example of that is color television. The true facts of life are that color television is still very much in the developmental stage. Let us say that a woman would walk into a store and say, "I would like to see a demonstration. I would like to see a color television set operate," the dealer would say, "Yes, ma'am. Assuming that there is a color signal on the air, I will demonstrate it to you if you come back in 30 minutes, because it takes that long to warm it up." That may seem to be a little thing, but the American public is not going to buy a color television set that has to be warmed up for a half hour before it goes on, I will tell you that.

But in addition to that the dealer would say, "Madam, if you buy this set, I would also like to sell you a full-time live engineer. If you will wait a minute, you can take your choice. We have 15 or 20 of them here. You will need one to keep the set working for the duration of a television broadcast."

We don't have a truly commercial set today; but it is coming. My point is that by the middle of next year you will be able to buy a good big-picture, color television set for somewhere in the $600 to $700 range. And that isn't enough. They won't really go over until they are $495 or in that range. In other words, the secret of industrial success is to create not only a useful product but to bring it into a reasonable price range.

These achievements came not only from applied science--in other words, engineering--but from science as well--the unearthing of new, fundamental information upon which our entire technology rests. From this new information on the behavior of matter come new devices to extend the boundaries of human happiness, human endeavor, and human well-being.

This little thing which I have in my pocket is an example. This actually is a radio tube although it doesn't look like one. The thing that is new about this is that it is put together in an entirely new fashion, so that you can't stop it from working by subjecting it to intense heat, vibration or shock. Incidentally, I'll bet Curt LeMay would like to have this in his B-36's. This is called the "stacked tube." The second development by Sylvania was this stacked tube. The first one was the subminiature, premium performance tube which many of you have seen in various devices and which was used so extensively during the war in proximity fuses.

Now, looking at this subject from another standpoint, the engineer is entrusted with the efficient utilization of our raw materials. It's a tremendously important task. Again, he did a swell job during this last unpleasantness, because we all know there is a limit to the earth's bounty in the way of raw materials.

It's completely amazing what these fellows can do when they have to find substitutes. It hasn't been very many years ago when you just simply had to use pure nickel in a radio tube, and a lot of other things. I remember sitting in an electronics production board meeting when the facts of life were that if you wanted a certain number of radio tubes, you had to have a certain amount of nickel. There wasn't that much nickel to be had. So the question was, What do we do now? The answer was that we found we didn't have to have pure nickel, that a lot of other things would work that way. That was a job for the engineers and they found new materials.

The fields of communications, transportation, and utilities are dependent upon the engineer not only for their existence but, even more importantly, their future progress. The electric utilities are a striking example perhaps of what I mean. Electric generating capacity has doubled every decade for the past five decades; remember that. It may well reach a trillion kilowatt-hours in 15 years. The electrical manufacturing industry has also doubled in the last decade and is growing steadily now. And it may double again in the next decade.

In addition to these broad categories of engineering responsibility, industry has found certain advantages in using men of technical training wherever technical matters might be involved, such as in sales, in purchasing, and in industrial relations. Our own company has developed this phase very highly. This may seem to be an example of the waste of industrial manpower but it wasn't. Our last two industrial relations directors have been trained as electronic engineering specialists. They were excellent industrial relations directors. One of them has been retired and is now the head of a research institute's technical program. They were good industrial relations directors but they were still good electronic engineers.

The field of plant supervision is another extremely fruitful one. In our business we use many trained technical men as foremen and superintendents.

Altogether, engineering is a pretty broad area of responsibility for such a small segment of our population. Nevertheless, each year the demands upon it grow greater because technological progress is really a chain reaction that cannot, and shouldn't be slowed.

Actually, the problem is more deep seated than simple the quantity of engineers. Some of them are good; some are not so good. But proper utilization of them is the overriding challenge.

Probably the shortage of equipment has had something to do with my next point, but there is an amazing difference between the engineer of today and the engineer of several years ago, in that he is reasonably well paid now. I gave the commencement address at Stevens Institute a couple of years ago. I devoted much effort in my talk to trying in a friendly way to explain to the young engineers graduating that day that they should not get a false impression of how much they were worth by the salaries they were being offered by industry. I pointed out that competition had made it necessary to offer those young fellows $400, $450, $500 a month, freshly out of school. I said: "You are going into an industrial organization where there are plenty of engineers who have been there 10 years, and they are only getting $550, $600 or a little more. And don't think that they don't know that you brandnew fellows are getting almost that amount of money. Somewhere that thing has to level off and your gravy train may not go on forever. I wouldn't say that this is the most inspiring commencement address ever made, but if the advice that I am giving you is taken to heart, it will probably do you an awful lot of good in the next few years."

I am not sure, however, that even in the old days, when we paid engineers poorly, we weren't in many instances paying them too much for the jobs they were doing. That wasn't their fault. That was our fault; we weren't utilizing them properly. We used them for everything from draftsmen to messenger boys, it seems. We soon learned to stop doing that and to use them as engineers.

Industry has had to answer this question before in other fields, so engineering is nothing new except that it involves a more highly educated personnel.

Do you remember once when industry had to get journeymen machinists? Nobody was any good unless he was a journeyman machinist in your production shop. That required seven years of apprenticeship. You couldn't get enough apprentices and the unions weren't too anxious then to start any more. So what did industry do? Industry started up these training within industry programs. It had to have fast-training programs in the shop. We were making better machinists by far in six months of intensive training than these fellows had been doing in their seven years of apprenticeship.

We can do the same thing with engineers. I am not saying that they will end up as full-fledged engineers, but we can relieve the engineer shortage by training technicians quickly to relieve the engineers of those activities not requiring a full engineering education.

We can do that through the greater use of assistants. There is a good deal of paperwork that the average engineer in industry has to do. Much of the paperwork itself doesn't require engineering knowledge. There are a good many routine jobs in the laboratory that can be done by technicians, especially if you train them a little bit.

You have the same thing in the Armed Forces. You can use engineers' assistants in the military laboratories. You do use noncommissioned technicians and they are the backbone of the technical combat units.

The training of these men ought to get an extremely high priority. But there is just one thing I would like to say to you about it. We have to train a good many of them for you. I don't know that there is a thing in the world that you can do about it in the armed services. But it is a little discouraging when you fellows send us 100 men to be

trained as technicians in the radar field, in a one-year course, and at the end of four months 25 to 30 percent of them have been transferred; by the end of the course, many of them have completed their hitch and they are completely out.

It does seem to me that it would be possible to figure out before you send a man there when his hitch will be up, so that, when we finish training him for work in the armed services, he will have a few months of service left after getting trained so he can do something for you. He is no good to you if he just goes home.

I have been doing a lot of work on this subject of trying to make the incentives for reenlistment a little bit greater than they are. It seems to me that it isn't very good reasoning, if you want a man to reenlist rather than leave the service, to offer him very much more if he quits than if he reenlists. I would myself do it the other way. I would offer him more if he reenlists than if he quits.

Now, returning again to the subject of upgrading engineers, there are some things that can be done now that will be effective, but just as the situation was a long time building up, it will take some time to make the necessary adjustments. In the first place not all engineers can be upgraded. This is a problem we have had for years. Some of these boys on the drafting board are there because that is just as far as they will ever go in their engineering knowledge. We must let them stay on the drafting board.

Another problem we have is that of trying to make a manager out of a specialist, a generalist out of a specialist. When you have a highly trained technical man who is also a good manager, you have a pearl of great price, believe me. But you don't find that combination too often. Yet these fellows are human beings; and when one of these fellows is a good technical man in the laboratory, and the job of manager of that laboratory becomes available, the great morale question is, What do you do? If you put that fellow, who obviously wants the job, who thinks he is entitled to the job and can't see why he doesn't get the job, into the job of manager of that laboratory, you may lose yourself a grand technical guy and get yourself a punk manager. And it frequently happens. On the other hand if you go outside and get a good manager, who may not be nearly so good technically as this other fellow, but who can manage people, and put him in over the head of this guy who thinks he deserves the job, you may then gain yourself a good manager and

still lose yourself a good technical man. If he doesn't quit, he may get grumpy on the job and lose incentive and so forth. This is a very great problem in industry.

The only suggestion I have to make is one that I have tried out in many places. I wouldn't want to say that you could always do it. But, who says that the manger of the laboratory necessarily has to be paid more than the expert technicians that work under him? Habit, surely; and you generally do. But really, who says so? You may have a whale of a good technical man who is not a good manager, and you may have trouble with him if he can't go in the next box higher up on the organization chart. But what is to stop him from getting more pay anyhow? Who says that he doesn't deserve more money in that technical job than a manager does?

I will give you a specific example. We have a machinist in one of our development shops who is the most fantastic guy at designing machines that I ever saw in my life. And he would probably be the worst manager of a production shop that you ever met. He doesn't want to manage that production shop. He wants to make machines talk. That is his business.

Well, it bothered us for years, until we finally thought up a grand title. Titles are wonderful things. We thought up the title of "engineering specialist," for the man who deserves high recognition but is not a managerial type. The man I have in mind has a sort of roving commission as a machinist to develop that machine in the shop. He actually makes considerably more money than the fellow who manages the shop and he is very happy.

The fellow who manages the shop understands this. The organization chart doesn't show the specialist reporting to him. So he doesn't care that this fellow makes more money. But if that lad reported to the manager, you could not pay him more money.

This reminds me of the time I was working as a civilian without compensation (WOC) with the Air Force, and, because I was WOC, I had access to the Secretary's office and the Under Secretary's office quite freely. I had no authority, no responsibility, no rank. But the Under Secretary decided that he was going to bring a fellow down for a job in the office alongside me who had been an Air Force officer. He was going to come down and wear the uniform. It wasn't necessary for him to wear the uniform, but he did.

He was also going to have a roving commission. He was going to wear his uniform and he had two stars on it. He was going to do a job that by all rights should have had a civilian in it. And I said to the Under Secretary: "I want to stay here just long enough to be present at the first meeting in your office when this two-star general tells a four-star general what he is supposed to do. After that I will go home." The answer was that the man left after 60 days and he went home.

I am often asked for my opinion on the pros and cons of drafting or deferring young engineers from military service. The Selective Service requirements cut down on the number of graduates available for industry and made the shortage just that much greater. However, the time these men are lost to industry is short; and the draft of two years will be made up pretty soon by the releases of those previously drafted. So that isn't really a very serious thing.

The serious thing is what you do with them when you draft them. I know that in times of emergency, when a directive comes--"I must have 1,000 men for 1,000 slots"--you haven't the time to wonder whether these men are electronic engineers or anything else. All you know is that they are 1,000 men. But why wouldn't it be possible, in times like these at least--when there is such a terrific shortage of engineers, and an even greater shortage in the armed services--to use these engineers during those two years in engineering slots? I realize your engineering slots are not infinite, but the problem deserves top consideration.

If you don't, then after two years we have a two-year vacuum. They have just about forgotten the engineering they did have and we have to train them all over again to get them back on the job. This training is a difficult and time-consuming thing. If you would use them in engineering slots for those two years, they would be worth more to us when we get them back.

I'll tell you an amusing thing about training young engineers. At a meeting of the American Society of Engineering Education I got into an argument as to whether they could do a better job teaching engineers. My plea was: "Look, couldn't you teach them a little bit about how to read and write, just to make it interesting?"

One reason that an engineer often doesn't get ahead faster in industry is because he cannot write a recommendation for his department in anything but language that sounds like a long-haired engineering professor. I am sorry, but too many of the fellows up above just cannot evaluate

the recommendation. Well, it is perfectly easy for an engineer, if he is trained rightly, to write that thing so it is fascinating and so that, without changing a word, the president can read it to the board of directors and get their approval of it far more readily.

The other thing they don't teach them is to get on their feet and talk. One of these professors told me at this meeting: "Don, we can't do that. We only get this man for 147 hours. In that time we can't teach him the things we have to teach in engineering, let alone something else."

"Well," I said, "that is a good argument. I am going to turn it around on you. What does this young lad know when he comes to you as a freshman?" One hundred percent of these professors said to me, "He knows nothing, absolutely nothing." So I said, "By the time you have had him for 147 hours, you have taught him an inadequate amount of engineering?" "Yes." I said, "When he leaves you, he knows nothing plus an inadequate amount of engineering. A fine way to send a man out in the world.

And now perhaps you have some questions.

QUESTION: If my memory serves me right, sometime ago the statement was made from this platform that the military, with its projects, and industry, with its constant desire for better tools for better living, are using up our basic research at an alarming rate. My question is, Does your company have any of these high-powered research scientists on your payroll doing some of this pure, basic research?

MR. MITCHELL: Yes. We still do. And I don't believe we are using up our basic research at an alarming rate.

These ivory-tower boys--and we have a certain number of them--in my opinion will never be anything but, and they don't want to be anything but, ivory-tower boys.

If you want to test that out, try sometime to get one of these lads, who has come up with a brilliant idea, to tell you what that idea will look like when it is made into a commercial product. There have been times when we have had one of them come up with an idea and have said to this fellow: "O.K. That is your idea. You ought to be more interested in it than anybody else. We are going to make you the project

engineer on that thing. You stay with the problem. You live with it. You carry it on through from its point of conception until it is a commercial product on the market." Do you know what happens? It will never become a commercial product on the market.

And it can't be, because when this lad gets to work on it, he can't leave it alone. He wakes up early one morning at home and decides that this thing isn't really good enough. This must be changed and that must be changed. And the more he thinks about it, the more he convinces himself that it really isn't worth anything without that change. So he comes back to the manager and he says, "Look. I was wrong. This thing really isn't ready for commercial development yet. It will be a much better commercial product if we change it this way." So he changes it.

Then he wakes up early one morning at home and he decides that this is all very well, but that another change should be made. Well, you can carry that on to infinity. But the point I am trying to make is, he will never let go of it. He will never come in and say, "All right--let us take it out of the laboratory and put it into production." Oh, you might find one in a million who would. But that is what I mean by saying that many of these ivory-tower boys want to stay in their ivory tower.

QUESTION: Mr. Mitchell, you made a statement that was very interesting to me when you said you have tried to convince some of these boys who come to you from the Air Force or some other service that they ought to reenlist. That is a very big problem with us.

MR. MITCHELL: It certainly is.

QUESTION: I was at one of the technical installations not long ago. Some of these boys were about at the end of their enlistment. They had had this training with industry and seemed to be very much interested in their work. I asked them, "Do you intend to reenlist and stay with us?" They all said, "No." They already had opportunities offered them by industry. Are you aware that there is a great deal of competition with the Air Force from industry?

MR. MITCHELL: Yes, sir. I am promoting some of that competition. I think that the Air Force could cut that down by making it more attractive to reenlist than to quit. And I am talking as a result of my service on the Strauss Commission when it was investigating

Haverford University on behalf of the armed services about two years or a year and a half ago. It was definitely obvious then to us that, if you add up all the things that you received when you quit the Armed Forces--the G. I. Bill, the separation pay--and then add up what you received if you reenlisted, all the balance was to talk a man out of the service and not talk him into staying in.

One of the basic things that has to be faced--and I don't know how successfully it can be faced--is to offer more incentive besides dollars to a man to come back in than to quit.

Now let us say you have had a fellow in there for six years. If you are able to get him to stay for six or eight years, it does seem that you have some chance to hold him as a career man because of the incentives he has in the form of early retirement and the perquisites he gets on the job.

I think your worst trouble is going to be in this period of four to eight years. You are going to have trouble getting that man to stay that long. I don't know how you are going to do it unless you can offer him some extra pay for certain specialties that you want badly. Then, if you do that, you know what the men that don't get specialty pay are going to say. They have a name for it. The Greeks had a name for it.

It really is a terrific problem. If you had a small regular corps, it wouldn't amount to so many dollars. But, if you had 3.5 million under arms and you paid these specialists anything comparable to what they get in industry, you would have something else again.

QUESTION: My question deals with the ivory-tower boys. You gave an example of television and the way it has affected your industry. We have had other examples, such as radar, the V-2, jet propulsion, and many other things. Is there no single American ivory-tower product, say, since the 1940 vacuum tube, which we can hang an American hat on, which did develop out of an American ivory tower?

MR. MITCHELL: I guess I am not technical enough to be able to answer that question "Yes." My impression is "No." This is a hard thing to say, but--

QUESTION: How about the atomic bomb?

MR. MITCHELL: Let us go into that, if you want. My impression is that, shall we say, the mathematics which generally starts the

generation of these things, the blue light that suddenly comes in this mathematician's mind when he sees the formula that wasn't there before, that he needs to solve this problem, doesn't seem to start in this last couple of decades in American ivory towers. If you go back far enough, the first part of this idea is in many instances, picked up somewhere else.

But the minute that idea gets into American development industry, watch it go. Certainly, a great deal of truly scientific research is done in the United States, but we have far from a premium on it. Our greatest strength is in engineering--the application of scientific information.

Another thing, let us take our friends across the water in Britain. A professor tells me that in England, if you want to have stature in the scientific field, you can't be an engineer. You have to be a scientist. Oxford doesn't turn out any engineers. Oxford turns out scientists. Cambridge turns out mainly scientists. If you want to be an engineer, you have to go to a London trade school.

QUESTION: I think I am quoting you correctly, "It is impossible to make money selling engineering man-hours to the Government." What would you suggest as to the nature of the incentive for outfits not so patriotic as Sylvania?

MR. MITCHELL: They are all just as patriotic as Sylvania. But there isn't any way of doing it except this: If an industrialist tells you that really to come out even and show any return at all, "I have got to be allowed 10 percent on that CPFF instead of 6," then don't fight that so hard and say, "We can't let you make 10," because you have all kinds of protection to get it back if he really makes too much. You have renegotiation. If the work goes to production, you have redetermination. There is plenty of protection for the Government.

QUESTION: You stated that the services should use engineers in the proper slots. I think that is more easily said than done. We don't exactly control a good many of these slots that you speak of. They have to be civil service. For design engineers you don't use the operating forces. There is nowhere near the number that we need of these people with an engineering education. How else would you recommend using engineers in the United States Navy, for instance?

MR. MITCHELL: I realize your problem. You have those machines which sort out cards by military occupation specialty and

civilian training. When you have that information and the slots are there, try to put engineers in them. But we still have plenty of indications where, figuratively speaking, a Ph.D. in physics dug ditches as a private in Korea. Let me say again that I recognize the problem, and it isn't easily solved by any means, but let's keep after it. I also know your civil-service problem. But perhaps you could fix that too. In fact, there is some leeway in some of those technical slots under civil service, where you have a little leeway other than straight competitive examination.

QUESTION: It seems to me that everyone picks on the isolated bad-utilization instances in the services. An yet the services do have a relatively small percentage of overall engineering and technical talent. What is industry doing to improve the utilization in the proper slots of the technical personnel that you have?

MR. MITCHELL: We are doing what we are forced to do. We are forced to turn out engineering products with less engineers. The way we are doing it is by using nontechnical men in every slot in the engineering department that we possibly can. We have very few instances where a good engineer, who could do a better job of engineering, is being used in a sales job. There are a few, but not too many, and we are studying the situation, to do whatever can reasonably be done.

QUESTION: If you checked into the situation in the services where an individual comes to you and says "I am a graduate engineer, but I am not being utilized properly," don't you think you would find that he is one of the drafting board engineers that you spoke about?

MR. MITCHELL: Yes. I presume so.

QUESTION: In research and development it seems that there are some advantages in getting things done on the one hand through Government laboratories, and on the other hand through industrial laboratories. Would you care to express your view on the subject of the optimum way of getting the job done.

MR. MITCHELL: Yes. I have some ideas all right. Some of them are firsthand and some are secondhand ideas. Let me blue-sky on this thing for just a second and see if I ring a bell that you recognize here.

A field request comes to research and development telling of the need for a gadget. Never mind what the gadget is. R&D takes that

gadget and gives it to its industrial engineers. They try to make a gadget that will do everytning that that field request says they wanted this gadget to do. Given time, they come up with it. Its cost will be excessive, and it will be most complicated.

At some point that gadget is taken to industry. Industry, however, at that point is told to build a prototype, let us say.

Now, industry takes a look at this gadget and says, "Yes. We can build a prototype, but it will take a long time, and it will be very expensive. But it is an interesting proposition."

So the engineering department in industry takes this thing; and, although the engineers will generally tell you that it can't be made the way your fellows designed it--part of that is pride of authorship and part of it is true--when it comes out of industry's laboratory as a bread board model, a prototype, believe me, it will do everything that your gadget would do. They haven't simplified it any. It probably has 18 more tubes in it and 14 more other things as well. Then this goes back and at some point the procurement people say to industry, "Go make that." And industry tries to make it.

In this process it is almost impossible, short of a national emergency, to get any one man to give the cutoff date either from your R&D to industry's prototype building, or from industry's prototype shop to production. There is always some improvement, always things you can do to make it better. "Give me another two weeks and I will make it really work."

Wouldn't it be possible--I never saw this done, although I won't say that it hasn't been done--at the time this field request comes to your boys in R&D, for them to take a little while to get together with maybe two or three companies who may be able to eventually make the thing and approach it from this standpoint: "Now, what is the simplest way that you can get 80 percent of that done? Couldn't we make a $10,000 unit cheaper, with 50 less receiving tubes in it, so that our maintenance could be done more easily?" Isn't that the place to think about original simplification, when the interpretation of what the field wants is put on to a possible gadget? I am told that we could save a tremendous amount of money in producing the eventual hardware if we approached it from that standpoint.

Now, the field won't get 100 percent of what it requested, but it will get 90 percent and it will probably get it a lot sooner. It may

even get to the point where the pilot himself and the navigator may get it to work, which would be a novel thing too.

COLONEL NORMAN: Again, Mr. Mitchell, you have given us a very outstanding lecture and discussion, for which we are very appreciative, and even more so because of the very pressing demands on your time.

(27 Dec 1954--750)S/ibc