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Interview with William J. Perry, Under Secretary of Defense for Research and Engineering

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Interviewers:
Alfred Goldberg
Roger R. Trask
Stuart I. Rochester

Goldberg: This is an oral history interview with the Under Secretary of Defense for Research and Engineering, William J. Perry, on December 17, 1980, at 2:15 P.M. in Room 3E1006, the Pentagon. Mr. Perry has had an opportunity to look at a list of questions submitted by the OSD Historical Office and has agreed to speak to some of them. Mr. Perry --

Perry: The first question asked had to do with the tools which I found to be most useful in exercising effective controls. In the acquisition process, it is important to observe that while the Under Secretary, Research and Engineering supervises all of the research and all of the acquisition in the Defense Department, the actual execution of acquisition programs is done in the Services, and therefore it is most important to realize that this function is not one of conducting acquisition programs but of overseeing programs which are being conducted in the Services. The ways of effecting the supervision have to do first of all with understanding what the Service programs are; secondly, having some broad acquisition philosophy as well as specific regulations that you're trying to enforce; and third, having some specific mechanism for conveying these ideas, conveying specific guidance to the Services. Formally, this is done through a mechanism which is called DSARC, Defense System Acquisition Review Council, of which I am the chairman. Each acquisition program has three milestones -- one which formally starts the program, a

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second which starts full scale development, and a third which starts production. At each of those milestones there is a DSARC review, and the outcome of that review is either the approval or disapproval for the Service to continue. So that is obviously one of the most effective formal methods of control of acquisition programs. I stress the word "formal" because in fact most of the debate and discussion and persuasion that take place in an acquisition program take place prior to one of those reviews. So the Council meeting itself is not that important a control mechanism. But the fact that there is to be a meeting and the fact that approval or disapproval stems from that meeting then gives the acquisition executive tremendous authority in negotiating changes that he wants negotiated. And that's done instead of a unilateral direction to the Service--that's done in a dialogue that takes place typically in the several weeks or few months prior to the DSARC II or DSARC III. The great benefit then of the DSARC is that it concentrates everybody's attention wonderfully on the problem, and both sides are motivated to try to work out an accommodation of the disagreements.

Goldberg: And it puts the decisions on the record.

Perry: Yes. From my point of view, the great benefit is that the Services realize they have to get the approval before they can go on to the next major stage of the program. Therefore, they're willing to debate and negotiate how the program should be modified in order to get that approval. From the Service point of view, obtaining that

approval removes whatever ambiguity there might have been about whether the program itself is an approved program with the full support of the Secretary of Defense. So, on both sides of this debate there is a great benefit to the DSARC meeting and the result that comes from it. Even if the result is negative, it is a benefit to everybody to have that doubt about the program finally formalized in a clear crisp decision that the program will not proceed. The point, then, I would stress is that the DSARC is an extremely important process, the most important management tool that we have for affecting and influencing, even controlling the Services as they implement the acquisition programs. But the importance of the DSARC meetings as such have been greatly overemphasized; most of the really significant management dynamics takes place prior to the meetings, not at the meetings.

Goldberg: It's the process rather than the meetings.

Perry: Yes - It's the process, and it is the recognition that approval is required before entering each of those three major stages. I would make one further comment about the DSARC process. One of the reasons the meeting is less important than one would imagine is that the entry into full scale development or the entry into production is not a discrete process. In fact, in nearly all of our major systems, the entry into production is a process which takes place over several years. The date at which you announce the DSARC authorization of production is a somewhat arbitrary date selected somewhere in that period. If we were not to begin any part of the production process until we get the

DSARC approval, we would be faced with a very unattractive set of alternatives, one being that we do not authorize production until all the development and testing has been done, which would add about 2 or 3 years to our acquisition cycle over what it presently is. That's the nonconcurrent approach to acquisition--no concurrency in the programs. The other alternative would be that we authorize production well before we have enough information to make the final production decision because, in fact, our programs are concurrent. The point I'm making is that the production process starts about 3 years before the development and testing is completed. That's because of the long lead time that's required to start building the facility to do the production and start buying the long lead components and the tooling. So we are spending production money in the program perhaps 3 years before full scale production starts.

Goldberg: Is what you said about DSARC III also true of DSARC II?

Perry: Not to nearly as great an extent. It is true that the so-called advanced development phase and full scale development phase has a certain amount of overlap in it. One can regard that as more of a discrete process, but the entry into production is something that takes place over about a 2 or 3 year period. Therefore, we can choose whenever we want in that 2 or 3 year period to make the DSARC III decision. If we make it too soon, at the beginning of the process, we have to make the decision in the absence of important information about testing and development. If we wait until the end of the process, we are so far committed to the program that it is

an academic question. So ordinarily we have that DSARC III meeting somewhere in the middle of the process, while we are still conducting development and testing but well along in them, and after we are about a year or two into the early stages of production but before serial production has begun.

Goldberg: How does the scorecard read on DSARC III? That is, have you guessed wrong at times and had to cancel a program, defer it, or whatever?

Perry: You mean after DSARC II or before?

Goldberg: Well, at DSARC III.

Perry: We rarely cancel a program at the DSARC III meeting for the reason that I mentioned before, that the important management decision dynamics take place before the meeting, and if we are convinced that the program should be cancelled, we've usually persuaded the Service of that before we ever get into the meeting. It's either because the requirement for the program has gone away, or because there has been some sort of a major technical fallshort on the program relative to expectations--it was approved presuming a technical breakthrough that did not occur--or because there has been a major cost overrun. Now the first two examples that I gave you are usually obvious to both the Service and OSD, and there would be a mutual agreement to give up on the program. It does not require a meeting. The third one, though, the high cost, is one where there can be a major difference of opinion. Because when you say that a program is facing a major cost overrun, that's a prediction of the future. At the DSARC III point you're just beginning production, so the major

costs have not been incurred yet. You probably have faced by then a development overrun; you have the first set of predictions in on production costs--which may be twice as high as you thought they were going to be. All those things create an environment where the program protagonists take the position that the cost figures are exaggerated, and the program antagonists say not only has it escalated in the last few years but that's just an indication that it's going to escalate even more. So you can very well enter a DSARC III meeting with a wide variance of views as to what the cost of the program is going to be.

Goldberg: Where you have relatively small production runs for new weapons or systems may not the development cost actually be the greater part of the total?

Perry: That can happen, and I'm hard pressed to think of examples except in the field of nuclear weapons. ICBMS are perhaps the primary example, where it only takes 200 MX missiles for the entire force, and in that case the cost of development of the missile is about equal to the cost of procuring 200 missiles. So the development costs are a very significant percentage of the total there. For most of our tactical weapons, where we are building thousands or tens of thousands of weapons, the developmental cost is a small percentage of the total, 10 or 20 percent of the total cost. In both of those cases, we often focus our attention on development costs and procurement costs, tending to overlook what usually is the dominant cost in the system, which is the life cycle operating

cost. In most of our systems, the operating costs over a 20-year cycle or 25-year cycle are larger than the development and procurement costs combined.

Now to get back to this procurement issue, or the DSARC III decision. We try to schedule the DSARC III meeting at the point at which the system enters low rate initial production. So there has been perhaps a year or two of expenses for facilities and for buying long lead items. There has been some significant production expense in the program already. We have a DSARC III meeting to decide to begin low rate initial production, but we will defer the decision as to when to enter serial production. That is, the DSARC III approval is not an approval for serial production. And we either have a DSARC IIIA meeting perhaps a year and a half later, or at least have the Service come back and have the program reviewed at my office before that stage is reached. What we are doing then in that DSARC IIIA or that second level decision--if you imagine the production rate is proceeding at some very low rate--is deciding when to ramp it up to full scale production. I have become convinced, after 4 years at supervising this process, that in most cases, the real issue at DSARC III, is not whether we're going to produce a system but when we will begin the full scale production of it. We have to determine what set of criteria to use for determining when we can pull out the throttle and go into full scale production.

Goldberg: Well there's never any question really of discontinuing that production but when you're going to take off on it.

Perry: The classic case was the XMI tank. There was not any serious consideration in this building of terminating the XMI tank program. Had there been some complete technical disaster on it, which indeed some people alleged had occurred, we might have considered it, but our technical assessment is that we have a sound design. So all of the debate at the DSARC hinged on whether the system had proceeded far enough in its tests to demonstrate desired performance and reliability, or whether we should keep it in test another year or two before entering production. The decision we made was that we would enter low rate initial production, but we would establish a set of criteria of durability for the engine which would have to be demonstrated in continued testing before we would allow it to ramp up to full scale production. That has the advantage of keeping pressure on the program office to make those durability or reliability improvements which might make a 50 percent improvement in the ease with which that equipment could be operated or in the economy with which it could be maintained.

Goldberg: Do you have stretchouts on some of these programs for budget reasons?

Perry: Yes. There's hardly a weapon in our Army modernization program that is being produced today at its most efficient rate, or the rate at which we intended to produce it when we structured the program, or the rate at which we facilitized the program. When you build facilities envisioning a production rate of 100 a month, then only produce 30 a month, it's clear that you're going to end up with an uneconomical rate for producing the system. That's true for nearly every army

weapon we're building today, and it's true of our tactical air forces as well. Only in our strategic forces are we authorized production at the most efficient rates--the cruise missile program, for example. In fact, from the time that program was authorized in '77, it took only 4 years to run it through its competitive development cycle, enter production, and bring it up to serial production. We started production expenditures on that program in '77. That was an example of where we applied all the funding that the program needed. There was no holding back of funds; there was no trimming during budget cycles. When we do it that way, we not only can keep good schedules but we can achieve the lowest unit cost possible on the system.

Goldberg: Do you think the stretchouts are getting more common and will probably get more so in the future?

Perry: That of course depends on what the Defense budget will be in the future. The conditions which are causing the stretchout are twofold. Even though our defense budget has been increasing in the last 4 years, we're still faced with a stretchout problem, for two reasons: First is that the Army in particular has a procurement modernization bulge which is hard to deal with. They had more than a 10-year pause in equipment modernization during the Viet Nam war--from the mid '60s to the mid '70s. As a result, Army equipment in the field now dates back to designs of the '50s and production in the '60s mostly. So they're desperately in need of modernization, but they're in need of modernization in all categories of equipment. All

of these developments took place during the '70s, and they are now simultaneously all coming into production.

Rochester: This is the bow wave problem?

Perry: Yes. It exists to a certain extent in all three of the Services, but it is particularly acute in the Army. It includes, for example, the new utility helicopter, new attack helicopter, new air defense system (Patriot), new mobile air defense missile, the division air defense gun, and a new rocket system (the multiple launch rocket system). You could go down every major category of army equipment, and we not only see a new system to replace one that dates back 20 or 25 years, but we see them all coming into procurement over about a 3 year period. So it's an enormous problem, and as we look to the problem of how to phase them in, we are confronted with agonizing decisions. They're all needed, and one is needed about as bad as another, and they're all ready to produce about now. Having carried a major program through development, having started a production run, to just put it on hold for 2 or 3 years would cause major inefficiencies. So, we have not really been able to make a decision to do these five and not those five. We really wanted to do all of them at once.

The second problem, which has really caused acute difficulties in the modernization program, has been not only inflation as you experience it when you go to the supermarket but the particular inflation in the aerospace industry. The inflation in the industry from which we purchase our equipment has been even greater than the

average and has not been planned or accounted for in the budgets sufficiently.

Goldberg: Military inflation has been greater right along now for 30 years.

Perry: Not military inflation, per se.

Goldberg: I meant the industrial/technical inflation.

Perry: Yes.

Goldberg: It was true during the Korean war and after, during the Viet Nam war, and is still true today.

Perry: It tends to be true during periods when the demand is greater than the supply. And that happened during the Korean war and the Viet Nam war. It is happening now, but for a different reason. In those two cases it happened because of the excess demand being created by the Defense Department. Now, we're not buying any more tanks or guns or airplanes than we were 5 years ago, but the commercial airplane industry is buying the second generation of jet transports, and that not only affects the airplane companies, it has passed down to the second and third tier subcontractors, making all of them busier than they could accommodate. That excess demand could be accommodated either by the industry responding with increased capacity or by the industry simply stretching out the input and raising the prices. It's the latter which has happened. The reason the former hasn't happened (the increase in capacity) is that most companies have made the judgment that this is a short term excess demand--that it will go away in a year or two, and therefore if they build up increased capacity, they're going to be stuck in

a year or two with excess capacity. So most of them are trying to finesse the problem, to wait it out. And as a consequence, we've had superheated inflation in that industry. In the aerospace industry in the last year, 1980, it's been somewhere between 15 and 20 percent, which is even higher than the consumer price index has been during the same period. Whereas the budgeting for the year assumed inflation levels of around 9 or 10 percent. So when we talk about a 5 percent real growth we're talking about 5 percent on top of 9 and 10 percent. And that doesn't quite get us up to what the inflation really was in the equipment-purchasing account.

As a consequence of these two problems, and in spite of our planning and budgeting, there has not really been money to allow for increased procurement of tanks and airplanes. We're trying to deal with this bulge without stopping programs which seem urgent to us. As a consequence many programs are getting stretched, and of course that's a circular problem because as you stretch them you take what already was not optimum procurement rates and cut them in half, say, and that tends to increase unit costs even more. I suspect those two underlying problems are going to be with us for a while. The bow wave is not going to go away for at least a few years. My judgment is that we've got at least another year or two of excess inflation in the aerospace industry to contend with. So it will take very large increases in the procurement budget account to deal with those problems. The budget which the President will submit in January will have major increases in the

procurement account. The '81 budget approved by the Congress similarly had major increases, but neither may be enough to offset the problems I have described. There is talk by the new administration of having an '81 supplemental, but whether that will happen or not is something that remains to be seen.

We have already merged into several other questions. Your question concerning organization and responsibilities of my office. The simplest way of stating it is that we are responsible for overseeing the technology and acquisition programs of the Defense Department. I've already explained that overseeing does not mean executing those programs but rather overseeing the Services' execution of the programs and I've explained how the DSARC is involved in doing that. I should mention that the other method of control is through the budget process. By and large, the OSD management team that comprises the DSARC is the same team that comprises the Defense Review Board (DRB), which makes budget recommendations to the Secretary. So there should be some degree of congruity between the decisions. You would think that when the DSARC recommended that a program should go into procurement, that when the same people met 3 months later with a different hat on to look at the budget they would also recommend to find the funds to procure it. That does not always happen though. And the reason it doesn't is because the two processes are different in nature. In the DSARC, we are putting our blinders on in effect, and looking only at this one program; we're not looking to the left and the right, at how

it compares with other programs in terms of priority, except to one extent. We have added to the DSARC process the requirement, at both DSARC II and DSARC III, that the program be included in the Service 5-year defense program. So at least the Services, in their priority determination and in their estimate of what the funds will be, have projected funding for that program on into procurement. Nevertheless the 5-year defense program is changed from year to year. As it gets changed, some programs which have been approved to the DSARC II or DSARC III levels may fall out after the budget level has been set. And we see that happening. We see the same group which sat down at DSARC and recommended that a system enter full scale development or full scale production, a few months later sitting down in the resource meeting and determining that there are not enough funds to proceed on the program. One of the classic examples of this is the AV-8B program. The AV8B program has passed every DSARC milestone with which it's been confronted. The DSARC has always determined that the program had a valid requirement and that the technical and programatic aspects were being adequately met. But 3 years in a row it flunked the budget test. Interestingly enough, it always just barely flunked. That is, it was always one of the programs in the budget, but when the line was finally drawn as to where the budget would be for that year, it always happened to fall one or two programs below the line. And so it ended up not getting funded. I believe that it will however

be in the 1982 budget.

Goldberg: It'll make the Marines happy.

Perry: Yes.

Goldberg: What are your thoughts on the organization of your province here in research and engineering? Are you satisfied it has been adequate and effective? Do you think it can be made more effective than it is? And would you recommend any changes in R&E?

Perry: When I first came into this job we made almost immediately a major reorganization, in fact the most major one that's ever been made in the office, in that the Secretary determined that we should add responsibilities to this office that had never been here before. The most important of these was adding responsibility for production of weapon systems as well as R&D, although he did not change the title. It was still R&E. He also added supervisory responsibilities for several agencies that previously had not been under us--DARPA, DCA, DNA, DMA, the Assistant to the Secretary for Atomic Energy, and Dr. Gerry Dinneen, the Assistant Secretary of Defense for C3I. Dr. Dinneen and his staff were brought in and he was made principal deputy. So those were profoundly sweeping changes that vastly increased the responsibilities of the office. And it made us responsible in this year's dollar terms for about $60 billion worth of programs instead of about $15 billion. That was a very major change in organization. Now to accommodate that at the time there were added the staffs that had been with the C^3I office and that had been with the Assistant for Atomic Energy.

And about half of the staff that had been with the Assistant Secretary for I & L. Then when all of those were nominally added, there were subtracted some several dozen billets on the theory that it would be more efficient to bring all of these together, and therefore we wouldn't need as many people to do the same work. As a consequence of that subtraction we eliminated some of the offices and some of the functions that existed before. We made a fairly fundamental change in organizational approach. Before, there had been offices that supervised the R&D of programs, and a different office supervised production programs. We took the offices that had the R&D responsibility and simply expanded them to include R&D and production. So instead of having two different offices that were responsible for the Patriot missile, one for R&D and one for production, we had one office responsible for the Patriot R&D and production and a very small office which is responsible for production techniques across the board. And that was the way we accommodated the removal of several dozen billets in the organization.

Goldberg: How did it work?

Perry: The combining of the R&D and production was a great improvement. What was happening before was that there were two different offices which spent half of the time writing memos to each other. All of that busy work was immediately eliminated.

Goldberg: They could still write memos inside.

Perry: No, because it was not just a single office doing that job; it ended up being in most cases a single person. Had we simply brought all

of those people together into one office it could have had that effect, but we lost the people by the time we got the responsibility. So we simply had to expand the responsibility. That worked generally pretty well. Where it did not work well, and where I would do it differently if I were doing it over again, is that we carved too many people out of the organization, with the consequence that there were too few people left to follow up on production techniques. And we have had an inadequate emphasis in the last 4 years, in my judgment, on the productivity of our industrial base and the productivity of the few arsenals we have left. There has been no strong advocate, no strong voice in the building for insuring the appropriate buildup of our productive base. And that I think has not been a result of the organizational change; it simply was a lost opportunity. There never was a very strong voice for it because the I & L office was never that strong. But having brought this in under an undersecretary's office, there now was an opportunity because the undersecretary's voice could be a very strong voice in that field. But not having a strong staff for this function, it tended not to get the emphasis that it should. So as I look back to the last 4 years, one of the major things I would have done differently would be to put a much stronger emphasis, more people, stronger staff in that area so that we would have a strong advocacy within the department for maintaining and building our production base.

Goldberg: And what about the role of the Services in this connection?

Perry: Well again, the Services collectively manage the production base. But since this office oversees that function, we can either be a strong voice for assisting the Services in their desire for increasing production or we can sit back and say "well of course they want more money to do that but that has to compete with other requirements and we judge the other requirements to be more important." So there was not a strong enough support for maintaining and increasing the industrial base within the Office of the Secretary of Defense to amplify the interest and demands that the Services had or even to prod them in that direction. There was a mixed view, there was a mixed activity in the Services relative to the production base. Some of the Services some of the time pushed it strongly, others did not. Whereas there should have been a uniform push by them and strong support from us.

Goldberg: Well, there's also the matter of the quality of the base as well as the size of it, and here the Services would surely have some concern.

Perry: I'm speaking primarily of the quality of the base, not the size. The principal deficiency of our industrial base today is its quality as measured by productivity. The principal reason this productivity is sagging is because we have not modernized the equipment, the facilities in our plants, to the extent that we should.

Goldberg: So when you speak of expansion, you're really speaking of improvement?

Perry: Productivity improvements, which both relate to reducing unit cost

of equipment and to reducing schedules. To put it another way, if you don't make those improvements, as time goes on you're going to see costs increasing higher than they should and schedules dragging out. There have been very major improvements in the technology, in the process manufacturing technology, that allow for significant improvements in productivity, but those simply have not been incorporated in our plants to the extent that they should be. There are two reasons for this I think: In general our industry has not increased its productivity or modernized its facilities to the extent that Western European and Japanese industries have. We see ourselves falling behind in commercial competitiveness because of that. And since our industry builds most of our defense equipment, one of the victims of this lack of productivity increase has been the defense programs done in industry. But another reason, that is more unique to defense, is that our procurement contracts have not provided the proper incentive for modernizing equipment.

Goldberg: You seem to be pleased with the change that's been made. What do you think of the two undersecretary system as distinguished from what preceded it? Do you find that there is any closer relationship between the policy side and the R&E side than existed before?

Perry: Yes. I think part of the reason for that has to do with the personalities involved, so you cannot guarantee continuation of it; and another part of the reason has to do with the fact that the lines of communication are simpler. You don't have so many assistant secretaries dealing with so many other assistant secretaries. I

think that's been a major improvement. They should have gone all the way though and gone to three undersecretaries. We still have two undersecretaries and a batch of assistant secretaries. The original plan was to have three undersecretaries, and the benefits we got by going to two would have been even greater had we gone to three. The Secretary and Deputy could have had much more effective lines of command and the undersecretaries themselves would have had much more effective lines of communication.

Goldberg: You'd have had fewer people to deal with.

Perry: Fewer people to deal with, and the people you dealt with would have had the authority to solve the problems. When I deal with Bob Komer on policy matters, when he and I reach an agreement, I can count on him carrying out his end of it, and he can count on me carrying out my end of it because we have enough authority to do that. So you don't waste so much time coming to agreements with people and then finding out that even though you agree, nothing happens.

Rochester: Has your job been made easier or more difficult by having a Secretary of Defense who is also a scientist like yourself? Does that facilitate your job or does it in some ways diminish your authority in the R&E area.

Perry: I have to say I was very apprehensive about that when I came into this job. It is not just that, he's a scientist, it's that he previously held this very job. And so I imagined that he would

believe that he knew how the job should be done and would be second-guessing every action that I took. In fact, that has not been a problem. I think that has more to do with the personality of the man and the fact that he is so enormously busy with all the demands on him, that if he is satisfied with the way a job is being done, he lets it be done. He's been for me a very effective supervisor, a very effective person to work with in that we discuss issues enough that I know what his policy is and what he is trying to accomplish but not so much that he tries to give me day-to-day direction on how to accomplish it. By and large he has supported me in what I've done. And I felt very good about that. It was not predictable; the problem you raised was potentially serious.

Rochester: How important do you feel it is for the Secretary to have technical or scientific expertise?

Perry: I don't think it's necessary for the Secretary of Defense to be a scientist. I do think when you consider the importance of the technical decisions that we make on our weapons systems, it's important that he have good perception on technical issues. He has to be able to communicate with technical people so he's not snowed by them. Now I've known many people in the Defense Department who without the technical training had that property. Robert MacNamara, for example, or Jim Schlesinger. None of the technical people in this building ever snowed either of them. So it's not required for the Secretary to have technical training, but it is, I think,

absolutely required that he be able to conduct an effective, intelligent, coherent conversation with technical people so that he can grasp the real issues involved.

Goldberg: One of the big problems over the years has been the relationship between policy, between strategic planning and policy, and the technical side, development, production etc. Does this new organization--the two undersecretaries--help in that regard? Do you feel that there is a closer relationship? Do the policy people pay more attention to what you are doing here? Do you inform them so that they can be informed in relation to the policy decisions?

Perry: We have had a very close relation between R&E and policy in the last 4 years. Probably an unprecedented close working relationship between the offices. Part of this no doubt is attributable to the change in organization. But I think a good part of it simply reflects the interest and the personalities of the people involved. I have a profound interest in policy and how our technology can be used to support policy. Bob Komer and Dave McGiffert, Walt Slocombe, the people we work with in that office, and Dan Murphy, are all quite at home and conversant with technical issues, can discuss them freely, and are quite sensitive to the role that modern weapon systems and technology play. In some of our programs we find technology leads policy; in many programs it happens more as you think it should be, that policy leads technology. For years, I would say, in the nuclear weapons field technology led policy; we built the nuclear weapons

that technology allowed us to build and then we tried to work the policy around the weapons that we had. And that was, I think, a fair description of how policy, nuclear policy, evolved out of our technology and our weapons.

Rochester: Do you think that's been the case with PD59? Going to counter-force when you have the capability of a more accurate missile?

Perry: No, I don't think that was an example of technology leading policy. I think that was truly a case where over the first year or two with this administration, the policy people, led by the Secretary, evolved what they thought was an appropriate policy to deal with the strategic problems in the world today. They were aware of the fact that our technology would allow systems that could attack silos, but I don't they were driven by that in any sense. You get different views on that, but my view of how PD59 arose was a policy-driven consideration with an awareness of what technology could do rather than being technology or weapon-driven.

Goldberg: On this same question of the relationship between policy and technology, what about the Services? Do you feel that they have done something I know some of them have been striving to do for years--achieve a closer relationship between their planners and their R&D people? I've heard many military people discuss this subject in the past; many of them bewail the state of that relationship.

Perry: If that has happened in the Services than I have not observed it.

Goldberg: So you have done much better in that regard here you think than the Services have been able to do?

Perry: I think so. In that regard, They have a different problem of course, It's hard to draw an analogy between the two organizations.

Goldberg: There are big differences. No question about that.

Perry: Well they have a uniformed Service and then they have a secretariat, and when we talk about the Service we have to stop to reflect which of those two we're talking about.

Goldberg: Well I'm talking about the uniformed Service primarily.

Perry: Well I haven't seen that congruence between either the uniformed Services or the secretariat to any great extent.

Goldberg: Within the uniformed Services?

Perry: Within the uniformed Services, I have not seen it nearly to the degree which I would like or that they would like. You would look for example in the Army to seeing a closer degree of planning between TRADOC and DARCOM. And I don't see that happening to the degree that I think it should, and I believe that if you'd ask General Guthrie and General Starry that question, you'd get a similar answer. They might say what progress has been made and what the good things are, but I believe the bottom line would be that they think there's a long way to go in that respect.

Goldberg: Does the Navy do better do you think?

Perry: No, I don't believe so.

Goldberg: Then the Air Force doesn't either? The Navy was generally considered the best in the past in that regard in achieving a closer working relationship.

Perry: It's hard for me to comment on the Navy. The reason I hesitate is because in the last 4 years the significant design, technology, and weapons issues have not been brought to a head in the Navy as they have been in the Army and the Air Force. In the Air Force, we've come to grips with the strategic nuclear modernization program. In the Army, we've come to grips with modernization of the ground forces. In the Navy, it does not seem to me that we have come to grips with what the next generation Navy would look like. We have continued to build ships which had already been designed. We've continued to build airplanes which were designed at an earlier stage. But the gut issues in the Navy have to do with where is the surface Navy going and what kind of ships are most appropriate to it; what is the future of the carrier and what size should it be; what is the role of vertical take-off and landing aircraft; should we be going for few large submarines or many smaller ones? Those are the kinds of questions that have been asked in the last 4 years, and I don't see that any of them have been brought to a reasonable resolution. Not for want of trying and not for want of interest in getting the answers to those questions. So until we start to get some of those questions resolved, I'm hard pressed to really assess the effectiveness of the interface between policy and materiel in the Navy, because the acid test of effectiveness is the resolution of issues of that degree of importance. These are issues that do involve the bringing together of requirements and materiel, of policy and technology. I believe you cannot make any decisions of the

kind I've described, that I've listed here, by looking at only one or the other. An intelligent judgment on any of these questions involves a marriage of those two points of view.

Goldberg: My observation is that it's always been difficult to find out what's going on inside the Navy.

Perry: It may be that the issues aren't raised; they're just new enough, have been addressed recently enough, and are difficult enough that they just haven't reached the state of maturity yet. In the next year or two you may start to see the answers come out, but I would be surprised.

Goldberg: Well, they're percolating inside.

Perry: They're percolating, and I not only have not seen the answers, I haven't even gotten much of a measure of progress towards resolutions.

Goldberg: Could we speak to the third question, on priorities, and your thoughts on those?

Perry: The question about hard choices between weapons and technology on the one hand and manpower, training, and operational readiness on the other hand. How do you choose between those when you're forced to choose?

Goldberg: Where do you put your money?

Perry: Yes. That is truly an agonizing choice.

Goldberg: I'm really thinking of the present situation and the immediate future, and this coming administration is going to have to make some of these choices. You've made some of them. They're going

to have to make some more. What are your views relative to your experience at this point?

Perry: I'll tell you what I see happening first of all, and then I'll give you my view on it. What I see happening I think is a mistake. There has been a major pivot happening in the Defense establishment now, which I think will continue through the next administration, away from technology and modernization and towards what is called readiness, which involves manpower, training, and operational factors. I think that is a serious mistake that's based on a false premise, and the false premise is that these two are in conflict with each other. They are indeed in conflict with each other when it comes to getting funds. But I think the beginning of wisdom in this problem is understanding that the modernization program that's under way today is critical for improving the problems we're facing in manpower, training, and operational readiness. Each of those three, independently and collectively. There is a widely held belief, which is a complete distortion of what the facts are, that the technology that's going into our weapons today makes the equipment more expensive, harder to operate and harder to maintain. That's just incorrect. Our equipment today is hard to operate and hard to maintain. The operational readiness is sagging not because of the technology that's in it, but because of the absence of modern technology. That is because most of the equipment that's out in the field today embodies designs 20 to 25 years old. The major technological revolution that's happened in the last few decades, which allows me to state that

technology improves reliability, operability, and maintainability, is the semiconductor in general, and large scale integrated (LSI) circuits in particular. The introduction of that technology, the development of weapon systems that make major uses of LSI technology, will have a profound positive impact on manpower, training, and operational readiness. The equipment just entering production today, the equipment which is just completing development today, which embodies the modern electronics, will be far easier to operate than the equipment in the field today. It will be far easier to maintain and it will have an inherently high reliability, so that the operational readiness rate will be higher. And the longer we delay getting that equipment in the field the more we're going to aggravate this other set of problems we have. We cannot solve those problems simply by putting more manpower on them or by buying more and more spare parts for these obsolete equipments that we have. We have to take this step in modernization to solve the problem.

Let me give you an example. I just came from visiting the XMI factory and driving a tank around. That tank has performance improvements over its predecessor, and when we brag about the XMI tank compared with the M60 or the M48 we're usually talking about its performance advantages. But it's also true that it is far easier to operate than any tank we've ever built. If you were to go to the proving grounds and sit down in the driver's seat, they could teach you in 5 minutes how to drive that tank. And if

you ever drove a World War II tank, you will appreciate the comparison. It is no more difficult to drive than driving a modern automobile with an automatic transmission. But literally, in 5 minutes you can learn how to drive it if you've ever driven an automobile, which most American young people have. Now secondly, you go to the fire control system and in 5 minutes you can be checked out on how to operate the gun. Maybe 10 minutes to really get a good understanding of it. When I was checked out in that 10 minutes and taken out for a test drive, out of the five shots that I made at a tank, I made four of them as direct hits. And this was firing from a moving tank moving over rough bouncy desert terrain. That's not because I'm a good shot, it's because it's easy to learn how to fire it. Any kid who has played a video game is sort of automatically checked out on one of these systems because the controls, the sighting, the things you do are like the things you do on a video game. Really all you're doing is looking at a screen and keeping a bull's-eye on the target, and when you decide you're ready to fire, you have two triggers to press. One is the laser trigger which measures the range accurate to a fraction of a foot, and second is the firing trigger. In the fraction of a second between the time you press that first button and the second button, a computer does all the things that a gunner used to do, which is figure out how to correct for windage, how to correct for the motion of the tank, and how to correct for the bouncing of the tank. It makes all of these computations, points the gun in the right direction and fires it.

The gunner never points the gun. The gunner simply keeps the bull's-eye aimed at the target and pulls the trigger. And the computer does all of the pointing.

Goldberg: How reliable is the computer?

Perry: It's a very reliable system. It's much more reliable than the mechanical parts of that tank, probably by a factor of a hundred. If you've ever used one of these little hand held calculators - that's the kind of technology that's in it. It's composed of micro-electronic chips which have a very high lifetime. We had a problem to get it designed and checked out, but once you have a system like that through its infant mortality, once you have it adequately designed and incorporated into the tank, they just go on forever, with minimum maintenance required. It's not like trying to repair a radar during the Korean or Viet Nam wars where you had to have people going in and looking at individual circuits. That took real training--to train a person to repair an electronic circuit. We don't let a person anywhere near the circuits on this system. He wouldn't know how to repair one of these little chips if he had it. So instead, the whole maintenance philosophy is a subsystem replacement, where if it goes wrong, you've got built-in test equipment which tells you which card is wrong, which chip is wrong, and you have to take it out and replace it with another one. So it eases altogether the problem of maintaining the equipment. It greatly simplifies the operation of the equipment, and it has a much higher reliability, a much higher operational readiness. But until we get

that equipment out in the field, what we're going to be living with is equipment that has vacuum tubes in it, or discrete circuits, equipment that has electromechanical equipment in it which is highly susceptible to breaking down and very difficult to learn to operate and very difficult to repair.

Goldberg: Then you are maintaining that future weapons with very high electronic component elements are going to be much more reliable.

Perry: Yes, far more reliable. If you ever used an electromechanical desk calculator, which I have used off and on all through my life, and compare that with a little hand held semiconductor calculator in terms of the ease of operation, in terms of reliability, in terms of maintainability,and in terms of cost - in all of these there is a factor of 10 or a factor of 100 improvement simply because the electromechanical equipment is fundamentally unreliable, fundamentally difficult to keep operating, particularly in rugged military environments. So as we go from a M48 tank with an electromechanical fire control system on it to the M60. which has electronic circuits, discrete circuits and analog circuits, there's an improvement but not a revolutionary improvement. As we go from that to the XMI which has integrated circuits, digital circuits on it, we finally reach the stage where we're realizing the real benefits of the semiconductor revolution in military equipment. But we're faced with a dichotomy. When a congressman is looking at the programs he's approving he's seeing all of this modern technology in the XMI tank, the Patriot missile system, and the cruise missiles. But while

he is approving funds for that high technology equipment, he's also getting reports which say that our troops can't operate or maintain our equipment and the operational readiness is down; and he tends to equate those two. But the reports he's getting on the operational and maintainability problems are dealing with equipment which was designed 25 years ago and built 10 to 20 years ago.

Goldberg: He's also looking at the Washington Metro system, the fare card system, which may not use the technology that you're talking about, but presumably used some related technology that may be more simple perhaps --

Perry: That's a clear example. That is a modern technology where you'd have to say the systems engineering was not done adequately. It's certainly true that we have some defense systems in which the system technology wasn't adequately applied either. The technology is not a panacea, it has to be applied properly, the system engineering has to be done properly. The Metro system does not have the benefit of this agonizing development and test processing that we go through. For all of the gripes about our acquisition cycle, how long it takes, those 2 or 3 years that we spend in operational testing before we go into serial production, pays for itself over and over again. And I will go so far and have gone so far as to argue for concurrency of programs, to have the operational testing overlap our development cycle, our production cycle. But I have always supported and will continue to support the importance of a vigorous operational test

program to catch the bugs that are in the system. Metro never had the benefit of anything like that. This Metro system operates well compared with the system where I came from -- the BART system in San Francisco, which was the first such system that was built. It had enormous systems problems that persist to this day.

Rochester: How seriously does the shortage of strategic minerals affect our R&D or our planning?

Perry: The problem that it poses at the present is that it is part of the aggravating factor in this inflation that I was talking about in the aerospace industry. One of the reasons for that extraordinarily high inflation is that we have a very high use of strategic metals. As a consequence, if there's a shortage we see price increases that are comparable to or in some cases greater than the price increases in oil, fuel. Cobalt for example -- the last time I looked at the figures -- had increased by a factor of 7 in the last 4 or 5 years, not 30% or 40% but 600%. So that's the kind of a problem that we see every day. Our jet engine prices for example have increased far more than other things we are buying because they have a high percentage of scarce materials in them. And because they're scarce, and because the demand may be higher than the supply, and because a few countries control the supply and therefore can in effect "pull an OPEC" on us, we are finding ourselves highly susceptible to great price increases. Now there's also a potential problem in the future of not being able to get them at all. So people tend to worry even more about that problem than about

the price problem. And for both of those reasons, I think it's important that we take some pretty significant actions on that. One of them is taking actions to develop domestic supplies. If you think of fuel as an analogy, that's like going after the synfuel program. There are things we can do to accomplish that. In fact, our Defense Production Act already gives us the authority we need to develop domestic supply. Basically, what needs to be done is to provide a price guarantee and a price floor over some period of time, and that's the incentive that US industry needs to go in and develop their own supplies. The second thing that we are doing, perhaps not vigoriously enough, is developing synthetics, alternate sources, substitute sources I should say. As part of our R&D program we're developing super alloys which using common metals, making alloys of steel or aluminum will be able to perform the function that cobalt, vanadium, and so on perform in systems today. So those are the two approaches to it. Alternate sources by stimulating domestic suppliers and substitute sources through R&D. Neither of these efforts has been pursued vigorously enough in my judgment they must be pursued much more effectively over the next 5 years. Even if we do pursue them effectively, the real benefit is probably off in the late '80s sometime. It takes a long time to get these kinds of programs.

Rochester: This a problem that seems to have crept up on us. There seem to be so many imponderables right now. How is it possible to have a 5-year defense program that is anything more than a wish list, that is not very tentative and problematic?

Perry: I find the 5-year defense program a very useful planning guide, and I consider it certainly much more than a wish list. I think the history of it has been that, to the extent our budget predictions were reasonably accurate, the kinds of programs that we executed within those budgets have been fairly consistent. I say that because basically I'm challenging the premise that these problems have crept up on us. The public awareness of them has come recently, but the knowledge by defense planners of the problems with scarce metals and minerals has been with us for a good many years. What has been lacking is the vigorous management prosecution of solutions to the problems. And to a certain extent, you require public awareness and congressional awareness before you can muster enough support to do things like invoke the Defense Production Act and stimulate domestic suppliers.