

Nevada Test Site Oral History Project
University of Nevada, Las Vegas

Interview with
Edward B. Giller, Jr.

April 19, 2006
Albuquerque, New Mexico

Interview Conducted By
Mary Palevsky

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Table of Contents

Introduction: joins Army Air Corps as pilot trainee (September 1941) and thoughts on Pearl Harbor and advent of World War II in general	1
Stationed in occupied Germany at end of World War II (1945), thoughts on atomic bomb and Japan	2
Impressions of post-war Germany	3
Thoughts on atomic bomb, how it would affect policy and change war, and how it affected weapons effects testing by AFSWP	4
AFSWP interaction with national laboratory scientists on weapons effects tests, custody of weapons, creation of DoD, relation of effects tests to war planning, etc.	8
Transfers to AEC as flag officer (1967) and description of tasks at DMA	11
Role of laboratories in “selling” weapons to DoD, encouragement of competition between labs in weapons development, and development phases	14
Discusses various directors of LANL	17
Talks about policy decisions made concerning weapons use	18
Cannikin (1971) and its relation to Safeguard, creation of Polaris, and reliability testing of weapons	21
Military view on necessity of “scenario planning”	23
Baneberry (1970) and learning containment	25
Comparison of LANL and LLNL re: ideas for and production of weapons, weapons still in the stockpile, weapons that have “faded off into history,” and the current technical challenge of stockpile safety and reliability	27
Future of nuclear weapons in the U.S. armed forces	31
Conclusion: retires from USAF (1972), becomes Assistant General Manager for National Security (AEC), and later arms control negotiator for the JCS	32

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[00:00:00] Begin Track 2, Disc 1.

Mary Palevsky: *Thank you so much for meeting with me again, and as I said, I just wanted to pick up a couple of threads to fill out the story from last time, a year ago, which was where you were when Pearl Harbor happened and what you thought, and then what you had to do.*

Edward Giller: Well, I had joined the Army Air Corps as a pilot trainee in September of '41, end of September. I was sent to Stamford, a cow town in Texas, which is not too far east of where we are here, where there was a training field for primary, that is, the first stage of flight training, flying Stearmans. I had eighty hours previous to this, so I had no trouble flying the airplane.

I remember Sunday morning, laying in my bunk, which was a day off, when the radio came on about Pearl Harbor. We hadn't been particularly following the Japanese aspect. For the year or two previous, one had seen a lot of RKO Pathé News images of England and all of the background that went with that; most of us accepted that there'd be a war, in a general sense, probably with the Germans. Although there was some talk of the Japanese, it was still primarily a European-type war we thought would come to pass. When Pearl Harbor was bombed, the Japanese, mainly what it did was point out there was another front, the South Pacific front, that would have to be fought. But speaking frankly, we were twenty, twenty-two-year-olds, and our basic direction is toward learning to fly this airplane, and the structure of exercises, line up, do this, go fly, take your courses; doesn't leave a lot of time for introspection. At that age, most of us weren't doing introspection anyway. So in a sense, it just made concrete the fact we were

going to war and as a pilot we expected to go somewhere. So it's a short story but that's sort of how it was at that time.

That's exactly what I wanted to know. Now fast-forward, because you talked to me a lot about your combat. You said last time that you had thought maybe you would be sent to Japan but you weren't.

Well, when the war ended in Germany, there was uncertainty what anybody would do; the war in Japan was going on, so everybody said, maybe we'll go. Somebody's going to go. But since there were so many groups in the Eighth Air Force, bombers and fighter groups, it was unknown and just speculation, so we were waiting after the war ended to see what was going to happen; by the throw of the dice, cards, our group ended up in the occupation of Germany. Other groups who went back to the States to get ready to go to the Pacific didn't make it because the war ended over there. So there was a whole series of movements among the individual groups toward the South Pacific, which I don't know if any of the groups that left England ever made it to the Pacific in time before the war ended.

So where did you hear about the atomic bombs and then finally the—

In the news in England. Even though I was an engineer, not a physicist, I really didn't have a very good idea except it was big. The only thing we knew is what we heard on the news. There was just no other intelligence, even classified intelligence coming into the remnants of the World War II bunch in England.

So it was a big bomb, basically.

That's right, just a hell of a big bomb is about all we could say; we weren't in the bombing business, we were in the fighter business, so that made it even a little more remote from our main interest. But the war was over. We were having fun. We survived. We were goofing off.

And so you were in England at the time, you say?

[00:05:00] Oh, yes. See, the war ended, we were in England, and in July we moved the group—I'm sorry, you're right—we moved the group to Kaufbeuren, Germany, so it was in Germany. My time frame was wrong. It was in Germany that we heard about it. So we were even further away from any news sources. Commercial shortwave [radio] wasn't in place in those days like it is now. We got the *Stars and Stripes* and that's about it. (It was a newspaper.)

Yes, I know. So one other question about that that I don't think we talked about, just because I'm curious about it, what were your impressions of Germany? I see pictures, newsreels of utter destruction of the landscape and the cities. Is that pretty much how it was?

Yeah. Before we moved to Germany, two or three of us said let's go see what's over there. Well, we fly to Munich and land at an airfield right outside of Munich. The GIs come out to greet us. The sergeant comes out in a Jeep. It has a platform on the back. Throws back the blanket and says, Would you like some of these guns? You want to buy these cameras? Here's the prices. It's a traveling PX [post exchange], you might call it. So I bought a camera there and one gun, a handgun. And then we found a Canadian that had a big car, so we all went driving around Munich, which I have 16-millimeter movies of. I was taking movies then. And you'd drive through the streets of Munich one car wide. You'd drive by the opera in Munich and it's sort of in pretty sad shape, and you went by the BMW factory and everything's all fallen in. So it was, the part of Munich that we went through, you had to be able to drive through it, was pretty just blown up, you know, fallen down. And that was true of the other cities we could see when we flew over them at lower altitudes. But that's the only city I actually toured, you might say, at that time. We were going down to an *autobahn* where we had

strafed a lot of airplanes, and so I have pictures of us standing in front of these airplanes we strafed, and this is where I got my hit in the shoulder with a bullet, when I was doing that.

But after we moved to Kaufbeuren, we traveled southern Germany. We were in Bavaria, so we traveled there and we went down into Switzerland to see the countryside, not to see blown-up cities. But Bavaria did not have the destruction that the big industrial cities—Munich had some, but I mean the countryside in Bavaria was fairly untouched. That's why the airfield where we were had never been bombed. It was a little primary field and just grass, no runways.

But I drove my antique car to Antwerp and I had to go up through Germany to get there, so I saw a lot of it then. The Americans bombed the bridges. Now the *autobahns* are as good as our interstates. And you come to a bridge across a little river or ravine, they blew the bridge, so you'd drive along and all of a sudden you had to pull off to the right, go down the hill, across a little makeshift bridge, back up the hill, get back on the *autobahn* again. And you'd fly along and you'd see bridge after bridge blown.

Well, those were the little two pieces that I wanted to get of that war narrative. So let me go back over here. You said in the interview from last year something about [Henry Harley] Hap Arnold and your phrase was something like the impact of science and engineering on equipment tactics, et cetera, and before we turned on, you were talking about the way this mysterious new powerful weapon was unknown and to what degree was it going to change the way people did war, so I wonder if you could talk a little bit about that and then maybe we can—

I don't know. Well, when the news of the defeat of Japan due to the bombings came to us through the *Stars and Stripes* and the Armed Forces Radio, we had only a small picture [00:10:00] of what was being said about it. Most of it was just factual. Therefore, we were not really exposed to, what does this mean? I mean we were still fighter pilots, you know, we're

imbedded in an organization doing something and had not been worrying about policy. We read all about policy ten years later. So there really wasn't much, I don't remember, very much discussion about, what does this mean to the military, to world politics, to military—? That came a lot later, even after I got out of graduate school almost.

And when it did come, what were the kinds of things that—you obviously—not obviously, but this—because of the work that you've done, this new reality comes into your consciousness in phases, I guess, when you begin to understand the weapon better and then you begin to understand what people are thinking about in terms of the weapon.

Well, until I actually ended up with the Armed Forces Special Weapons Project [AFSWP] which was the nuclear business, I was really enmeshed in graduate school. Anybody that's ever worked on a doctorate knows what that means. You are focused. So I do not recall in any way very much thought process or discussions about the bigger picture of realizing they're nuclear weapons. We just knew it existed. And I came into AFSWP with a degree in chem[ical] engineering which meant technical, an engineering degree, and engineers are problem solvers. I viewed my job, or at least it turned out as the way I did it, mostly inclined to solve problems that I got when I inherited this job in AFSWP, which was to find out what the bomb effects would be on military equipment and people, et cetera. So I approached it as a technical project, not particularly as a sociological or a broader picture. And you would read and hear more about that side, but that still was peripheral to the main thrust of my daily life in the Pentagon.

That's so interesting because I guess part of my bias, if you want to say, is when I read a lot of the stuff that came out of the Manhattan Project guys, not military people but people like [J. Robert] Oppenheimer, you know, this weapon changes the very nature of war. We are not going to be able to be warriors in the same way that we were before. [This] was some people's

philosophy. And yet it seems that what the Cold War history tells us in certain sense is no, that's not really true. The military systems as they existed absorbed these problems and figured out things that they've always figured out, which is what are these effects of these weapons and all those kinds of things.

Even though the senior people, I presume in the Air Force, planners would have thought a little bit more about the bigger picture. I'm still in the trenches, as far as I'm concerned, at AFSWP, solving technical operational engineering problems to carry out these effects tests; so most of my debates had to do with how to do it, what to do, almost independent of whether it's ever going to be used, in a sense. We had to assume it was going to be, but we had to find out as much as we could for the military in order to write a handbook, the *Handbook of the Effects of Atomic Weapons*, which was one of them. Then there's the military version of that. And so our job was to put information in front of the services to use as they saw fit. [Note: *Super Effects Handbook*, 1953 and *Capabilities of Atomic Weapons*, 1955 were classified documents for the military] Now we sometimes had individual thoughts about whether that made sense or didn't make sense, when we found out there was an awful lot of ignorance, or not ignorance but just—well, I suppose it's ignorance, about what this thing would do technically, which is natural. I mean it's a whole new subject. And so part of our job was to help the services find tests that would provide information. We didn't have much to do with—it's just here's how you use it or you shouldn't use it or should use it, things like that.

So that's what's behind all these kinds of weapons effects tests that then develop over time to become more and more sophisticated.

Well, it's on-the-job learning. AFSWP had its own tests we thought should be done, mostly measuring, being sure that measurements were made of what came out of the bomb when it went

[00:15:00] off. That's what's going to hit somebody or a tank or something. The services would propose: we want to learn about this and this. And this and we'll do it by putting a tank, a Jeep, or a person—not put people but dummies and things like that, at different distances, that meaning different levels of damage flux. And so we started out, all of us, with some odd ideas of what would happen. Then after the first test, oh, that's, you know. And so the tests became a little more useful, and if I use the word “sophisticated” I'm going to hear from all my friends at Los Alamos [National Laboratory, LANL] that nothing was sophisticated. But be that as it may, there's a bunch of soldiers in the trenches and airborne in the air that really are pragmatic, you know, I want to see it—a few times there were some surprises. So the idea was to—never think of it this way, but it was to get ourselves educated on what we'd inherited, whether we wanted it or not, the military systems. That's different than the development of one set of weapons after another as they grew in yield and shrunk in size. That's another story. In AFSWP we were not concerned with that so much, but it was getting the understanding so we could write down the effects of atomic energy on all aspects of the military, not the policy levels but the technical levels.

So on the battlefield, if these weapons are used, this is the kind of thing that will happen.

Yes.

Now before I turned on the machine, you said something about these four phases, one, two three—is this related to this or is this—?

No, this is not related to this. I learned more about that when I ended up in AEC [U.S. Atomic Energy Commission] headquarters sometime later. In fact, that system had not been generated in the fifties, even in the sixties. You want to talk about this?

Yes. I just want to make sure that if there's anything else, because now I have a better understanding of the effects tests. But at this point, I guess one other follow-up on that is, and you touched on it, I think, before, but to what extent now are you interacting with the lab scientists on these things?

Not so much in this technical sense. We interacted with the labs on what were they going to test; next, and we wanted to have a test that we could have a pretty good idea it's going to work, it's going to be about this size, because if it doesn't work or we have big surprises in output, then all our experiments are no good. And so we were interested in a series, within a series, which one would most suit our needs, not just one, maybe a couple of them. And that was so we could design our instrumentation and lay out our test program and what have you.

Another part of AFSWP dealt with, what were the developments going on in the labs? What were they up to next in terms of the next weapon, regardless of what the effects were? And you may have come across it, but in that particular time frame, AFSWP had custody of the weapons. The services did not. By law. They're in the law. So if you wanted to use one, it had to come through Headquarters AFSWP in order to get it to the service. We had to release the bombs from Manzano Mountain up here [AFSW Command Manzano Base, New Mexico] or wherever they were at that time. There weren't very many anywhere. And that was pretty clumsy, obviously. But we had to have a senior officer, not necessarily a general, on duty twenty-four hours a day in the Pentagon. And I used to sleep in the general's office about every two months when my turn came, waiting for the telephone to ring to call up another telephone. Well, Congress changed that, I forget when exactly, and just got AFSWP out of the chain of command that way. So we had custody of the weapon. That was the idea. And it's got to be in the history some—

[00:20:00] *It does. But that's really interesting because it speaks to my question, and this is where I don't know the history, this kind of detail of the history well enough, because you have the Atomic Energy Act which says the Atomic Energy Commission is civilian, and so my understanding was—so where does AFSWP sit? It sits in between—?*

No, that Act created the Division of Military Application [DMA] for the purpose of military applications, obviously. As a consequence of that, the Department of Defense [DoD] created the Armed Forces Special Weapons Center [Program] to be the interface between the two; we represented the three services, but limited primarily—well, not limited, but whatever there was between the three services as a group, the Department of Defense, I should say. And I'm trying to remember who the commanding general of AFSWP reported to. The Secretary of Defense. Did we have a Secretary of Defense then? That's a piece of timing I can't remember.

I don't know either. Right away, we didn't have the Secretary of Defense, but when the Defense Department is created, I'm not sure.

There was a time in which there was a SECDEF before there was a Department of Defense. We went from two services, the Army and Navy, to then a—Congress created a kind of Department of Defense. It was called the [National] Military Establishment. I remember that part. [N]ME—three letters. And then it went on to become the Department of Defense the next time the Congress got in the act.

[Original AFSWP charter, January 1947; revised charter July 1947; first SECDEF James Forrestal 9/17/1947; National Military Establishment created 9/18/1947; NME renamed Department of Defense 8/10/1949]

So there's a transition which came about—that transition came about more with the fact that everybody was trying to get the Air Force as a stand-alone service. Now we have three of them. And people were always used to this Army and Navy, now you got a third, and whoever the president was, I think, decided that was enough. He wanted to have one guy running all of them. That's the simple version of it. But that history is well written up somewhere.

Right. But that's interesting because I didn't know that AFSWP actually had custody and then would have to—

For a while, we went through a strange, as far as I was concerned, very clumsy means to get a weapon released to the Air Force to take and fly and use it.

And then that changed. I think in the history that Byron [Ristvet] wrote, I think he says it's five years out. I'll have to look [See Defense Special Weapons Agency, 1947-1997, www.dtra.mil.]

It's someplace in there.

That's interesting.

We had a Development Division in AFSWP which interacted with the laboratories with the idea, what are you guys thinking about next, technically? What do you have planned for the future from a technical standpoint? What are you going to test? What's the purpose of that bomb? And things like that. So an interface having to do with what they think they can do and what the services thought might be a good idea, whether they could do it or not, would be handled by another division of AFSWP which I was not in, therefore I didn't follow it personally very closely.

Now in the history of the military, and again forgive me if I'm being too vague but it's because I have little understanding of these things that I ask these questions, this sounds like a new kind of

relationship with a fairly big civilian establishment as far as weapons development. I mean before this kind of bomb, obviously other places are developing bombs and civilian—

Well, the services did their own. The Army and the Navy, all their bomb developments were done by their own laboratories and/or civilian contractors. And they still do it today.

But I'm saying, because it was nuclear science and that these guys had the expertise, I guess, you had to look to them to really develop these weapons at first, I would imagine.

The military didn't put any weapon expertise into the system. What the military at that time put into it was an interface that could be—the language could be understood between the people talking, between the scientists on the Hill [Los Alamos] and the uniformed folks in the Pentagon. It really was a communication channel, I'll look at it that way, where there's a common language, but insofar as the services giving much technical input, really technical input to the labs, other than [00:25:00] critique, you know, occasionally individuals might have their own personal views, but not as a group.

You have something from the other interview that I like where you said, the question was, is it going to change the fundamental kind of war we're going to do, and wise old owls popping off about different things, but no one really knowing exactly how this whole thing was going to play out. I guess, in the early days, and that's what you're trying to figure out with these effects tests, at least, is what's it going to be on the battlefield?

Well, I think the services wanted to know what this thing could do for them and against them in a kind of a remote—not remote but an isolated technical sense. And then they had to decide, what does this mean to our formations, to our operational tactics, to the whole war planning world?

And I personally didn't get into much of that, and AFSWP didn't either. We were a provider of

information but not have any major impact, contribution to I'll call it operational planning on how to use it.

Yes. So let's hop forward, then, because that was the other area I wanted to ask you about, was when you went later, right, late sixties or earlier seventies as the flag officer at the AEC?

I went in '67. In '67 to '72.

So that's five years.

Yeah. Well, then I got kicked upstairs for another five, so I was in a sense sitting on the same job except I had other things, like all of AEC security, arms control, technology transfer [laughing].

OK. So just to get a better sense of, to start with, what that function of that officer within the AEC was at that historical period in time, what was the definition of what your tasks were there?

Well, of course it started with the Atomic Energy Act with the Division of Military Application which was to watch out for the military application of the atomic energy as opposed to civilian power reactors. And so they created the Division of Military Application, and then they said it has to have a flag officer to run it. That was to give it some form of structure and a little bit of flag rank at the top to presume they'd be heard. They created this, I think, in the same Act, or later, the Military Liaison Commission, which was another interface between the AEC and the military. I can't remember whether it's in the Act or not. Anyway, the job of the DMA, the director of DMA, was to oversee all the things with the nuclear weapons, whether it was research, development, test, manufacturing, and destruction, and what have you; whereas other AEC divisions had physics and they had research reactors and material production, so there were several divisions in the AEC. And we had a commission, but we all we reported to a general manager, and then he reported to the Commission.

Now when I arrived, it had been in existence since '47 or so and I arrived quite a bit later.

Twenty years.

There had been several flag officers ahead of me, so there was a structure I walked into already running. It wasn't as if I created it. And we had a division which followed the science, one which followed the manufacture, one which followed testing. Now what this meant mostly was that we tried to keep up on one hand what the labs were doing and planning to do, and the other side would be in contact with the Department of Defense to see what these individual activities might have an impact on anything or what would be required actually to have such an activity. So it [00:30:00] was in a sense a big liaison group between the laboratory production, the military use, the civilian world of control, which was the Commission. We were just pure managers. We didn't contribute anything scientifically. If it was, it was just individual.

One of the biggest things we did is to arrange all the budgets, get the budgets, organize them, debate them with, why do you want this, and tell me more about that, because we had to take the budgets and go to the Commission. Well, first we had to go to the damn comptroller, and I say "damn" because we had to fight with him a lot. The comptroller kept trying to keep the cost down, and so then we end up in front of the Commission, and then they saw in front of them what it is Los Alamos wanted, or Livermore. And so our job as staff was try to defend why we supported that, or why we didn't support one part of it, if we wanted to do that, which we did a few times. Then the comptroller would weigh in. Then the Commission would decide. They would send their budget to OMB [Office of Management and Budget], I guess, and then it went to Congress. Then the Joint Committee on Atomic Energy would have hearings, not only on all parts of the AEC budget, but on the weapons budget. I had to appear before them and answer any questions they had about what, why, where, and when, and what have you. So a good portion of

our time was trying to know what's going on in the labs for the budget purposes, and whether it made sense or not, at least to us.

The other activity was the interface with Defense, partly through the Military Liaison Commission [MLC] and partly directly on: what's a new weapon, should we have a new weapon, should it look like this, what's it for? And that meant interacting with the services as to why this was a good idea or a bad idea, what were the problems with it.

At that time, there are two labs, competition, and they didn't bother a lot to go through AFSWP to talk to the Department of Defense or to DMA, individuals, I mean; they were constantly inventing something they were sure the services wanted, and they would go in and try to sell it over there.

To a particular service.

To a service, yes, or to the—not the Secretary of Defense but in case there was a senior individual in DoD who happened be an ex-laboratory guy like there were. So they had their own sales pitch, not only in the Pentagon but in the Joint Committee. So Harold Agnew was one of the better salesmen, but they were all pretty good. And in some cases DMA found itself in between, a tug-of-war on things, because all of these ideas had budget implications as well as anything else.

Well, when I arrived there, they had this phase structure. Phase 1, we just encouraged the labs—we didn't have to encourage them, but they were encouraged to—new ideas. “Maybe this'll do something.” Because the labs had a fair understanding of the military side of the use of these things by '67, we said OK, if you want to work on something, write it up and we'll call it a Phase 1 and both labs can do Phase 1 on the same idea. Like when the 280-millimeter cannon was developed, there were two competitions for the shell. We encouraged competition between

the labs deliberately on each and every application, because we said, either lab can build either one of these things. And so we encouraged competition, so that was the reason Livermore was born. And there was a check-and-balance. When somebody got too carried away with his ideas, the other lab would say, now wait a minute, you guys are too far out [00:35:00] on the science pole. And so we encouraged critiques. What we found was, one lab would hold the test data and wouldn't give it to the other ones; so they'd get a strong lecture, now wait a minute, that's Uncle Sam's data, you give it to the other lab because it's technical data. So we continually had to kind of say, fellows, share your understanding because you're not going to get to use it till the development of the next weapon.

There was competition to really be given Stage 3, which was the actual development. Stage 1 is just an idea, and they can do all they want and they can throw the papers away. Stage 2, it's come to the point where it's definitive enough to try it out on the military through the MLC maybe or maybe direct, to see if we could get an official reaction out of them. And if we did, then we would have a Phase 2 development, which would probably, not always, sometimes would be given to two labs, these are the criteria you want to meet, so come up with your two plans. Now from those, we in the Department of Defense, we being the AEC, DMA, would pick a single one. Now we've pushed the competition as far as we can, and we tried to be sure the labs were balanced, big weapons, little weapons, airborne weapons, bombs. So we would give— DMA or AEC actually said, Livermore, you're given the development part for this particular weapon warhead for safeguards. One of the reasons we had to go to Amchitka [Alaska]. That was Livermore.

But anyway, if the test for a specific design worked out, they were given the next phase, which was—well, that's the development; that's to prove it actually did work. The next one would be manufacture.

OK, so that's [Phase] 4.

That would be 4, and so then that was they decided to make—and then you have to know how many and what year, how the budget structure—all these have budget structures with them. So that's how we sort of got from an idea to stuff in the stockpile. That's all written up in DMA's history someplace, I'm sure of that.

How interesting. It raises a couple of interesting questions. When you're at the AEC in '67, Livermore's been around for a while, but there's a lot of debate and discussion about whether Livermore should've been formed, whether, you know, Edward Teller, how much he did or did not have to do with that, and I'm sure you must have spoken to Sybil Francis. Did you talk to her? She did a dissertation on the competition between the two labs.

I may have. I mean it's not in my memory bank.

Maybe you didn't. It's an interesting work. She had a lot of access to classified material at Livermore, and she had a theory about what the competition was. So the military, at least when you get there, sees this competition as a good thing. Because there's a lot of controversy— Well, it had already happened by the time I got to DMA. It long had been settled. And there's books written on that gestation period, going way back before the war [World War II] with [Ernest O.] Lawrence, and eventually getting Livermore into existence. Part of it had to do with the Air Force pushing Livermore to go into existence, but that didn't happen when I was involved.

Right. But I guess the general question is, if the function of the flag officer is to be this liaison, from what I'm reading, as you already said, there's also these direct lab-to-service contact.

Oh, yes. We didn't discourage them. We said, you guys can run around and sell all you want.

However, we don't have to agree with you when the time comes to propose something or to approve something. So we just gave them free reign, but I felt we had to know enough when we say, you've gone too far, and were willing to stand up publicly and do it. Because each lab [00:40:00] director was expected and encouraged by everybody to testify directly to the Joint Committee on Atomic Energy. And I would tell each one, you can tell them what you believe, but that doesn't prevent me from coming right behind and saying, that's wrong. I'm not talking about things science; I'm talking about, you know, the nonscientific aspects of it. And that was pretty rare.

What was rare? That you would do that—?

That it would be a true basic disagreement between myself, my office, and one of the lab directors' testimony.

So when you come in '67, it's still [Norris] Bradbury [directing Los Alamos lab], I guess, and then it becomes Agnew in '70.

Yeah.

And I don't know who the Livermore director was in those days, in your day.

It was Johnny Foster or Harold Brown. One of the two [Brown directed Livermore 1960-1961; Foster, 1961-1965]. Then Mike May came a little later [1965-1971]. I interfaced with Mike a lot, and then Norris, and then Harold [Agnew].

You said that Harold Agnew was a good salesman. What did you mean by that?

Well, he was articulate, he knew how to put things together, had a good personality, and he had a personality to schmooze the Commission and the Joint Committee and most anybody, and he still does. He's on all sorts of committees still. And Mike was a little more academic, probably a little more technical, and very careful, and very smart. But I discovered that he was a tough cookie when it came to my trying to get him to reduce his budget, compared to Bradbury who wasn't quite as strong in holding on to his position. These are budget questions, not technical questions.

I understand. I've also read that—I'm wondering what your view on this is as a military man—is that Agnew—I don't want to say this wrong, but he, you know, was willing in a sense to work more directly with the military, where Bradbury may have been more—

That's probably true. Bradbury was the last of the Hill [Los Alamos] people who remembered the Manhattan District, et cetera, and the fact that they thought they were just in the nuclear technology world and that bunch over in the Pentagon didn't quite understand all this. Some of his people did, but personally he just didn't want to get into that, where Agnew was the opposite. He probably was the reverse. He probably knew less technically, but he sure knew how to use the knowledge he had to integrate it with the user, the military world.

So from a military arsenal standpoint, there are particular kinds of weapons that are going to be used for a particular kind of delivery that the science and the engineering has to be developed on, and there's this dialogue basically about what's the best? You've already said that you're not in that larger geopolitical world, but I guess someone's making decisions about the arms race and what we need against possible scenarios of what a nuclear war might look like or what we need for deterrence. Something's driving these decisions from a policy point of view as well, right? But that's not you.

Not particularly. We were a peripheral player in it. We didn't have a policy division at DMA for that. Individuals had a lot of individual knowledge about things and may have been consulting with various other groups in the Pentagon that were working on this bomb or that. But the Chairman of the Military Liaison Committee, who is an Assistant Secretary of Defense, had to testify to the Joint Committee at the same time we did, that this weapon is wanted by the service, and so he had to face, if they wanted to ask him that, why. What are you going to do with it? Why do you need so many? How's it going to work? Whatever the Joint Committee had on their mind. [00:45:00] So we didn't want to be in the position in DMA of saying, the Army had to have an eight-inch shell, or we needed the safeguard, which was the antimissiles. The missile system didn't go anywhere. Or that we need this kind of warhead for Poseidon if Poseidon is going to work. That was representing the user, Defense. And so they had to convince the Joint Committee that this should be built, and this would be the general use of it. But in those days, early on, going back before I got there, there were so many ideas flying around. The Army wanted to have a battlefield weapon or two, their own missile system right on the battlefield. Then the Navy wanted them on ships, and the Air Force wanted them on airplanes, they wanted them on rockets. So there was no dearth of ideas of where to put these things. And they were born mostly in the military world, although egged on by lab directors or lab individuals, not just the directors, from these private conversations that they would have all the time there. Their marketing activity is what we called it. And so there was no dearth of new systems. When I got there in '67, it settled down a bit, pretty much. But for a while there, I was off doing something else for a while. There was a lot of things born.

And things that went all the way into the stockpile?

For a while, yes. You can find them by name, like Honest John, an eight-inch cannon, and I don't know what else. A couple of Air Force missiles, ground-launched missiles, I think. Airborne-launched missiles. It's amazing how many delivery systems the services thought up, I guess they still do, but they thought up in those days that maybe you ought to have a nuclear weapon on it. And the AEC side of the house was not inclined to take a fundamental critical evaluation. That would mean going into a world we weren't trained in or even equipped for. We sometimes questioned. The only time I really questioned one was, in the development of Safeguards [Safeguard Ballistic Missile Defense Program], which was the anti-satellite system—*That's called Safeguards?*

Well, the warhead had another name. Now what is it? There was another name. [Spartan/W71] Anyway, it was to be a very big bomb to go up to high altitudes and explode and it would take on satellites and things of that nature. But it was proposed that they have a small version inside the same damn weapon. By turning off everything that was big, they would have a little antiaircraft device in there, another little bomb. But that required a whole chunk of plutonium, which we didn't have. I don't know if I convinced him, but I went over and argued with Johnny Foster about this. Come on, Johnny, you're really going to put too much in it and it's going to cost us all this plutonium and everything. Johnny was actually a weapons designer at Livermore. So they cancelled that optional yield that they had. Because we were building weapons that had dial-a-yields, it was called. A dial inside. You want 10 kilotons, you want 100 kilotons, you want 1,000. And see, now that's another technology capability, the labs came up with how to do that. I don't know, I mean that was just our acronym for it, you know, just the local term for it, dial-a-yield. And it was, technically speaking, sort of clever. But then people dreamed up—I shouldn't say that—found target systems where the smaller one might be better, and the big one's not

[00:50:00] necessary, in other words. So some of them have adjustable yields. You have to adjust them on the ground.

So there's scenarios of possible nuclear war where you're saying this would be a useful thing to have, for example, Foster's idea that you could take out something big in space but inside it you'd have this capability—

Well, if you wanted to get some airplanes, you didn't want to have several megatons going off.

This gives you an idea of how people tried to combine, maybe, two uses in one weapon.

Right. So Safeguard means an antimissile system.

It [Spartan] was going to have a multi-megaton warhead. Livermore was the developer of it.

That's why we went to Amchitka.

Yeah, that's what I was going to say. Was that what Cannikin was about?

Well, Cannikin was a test.

A test of that weapon.

Of the weapon for that system. It was cancelled, of course.

Yes. We talked a little bit about Cannikin before, but what year was that? I have that somewhere.

That was when you were with the AEC?

I went up there. It was like '70, '71. [11/06/1971]

And what was your opinion of the test? I mean you had thought it was a good idea to do the test, obviously.

Well, Defense said we wanted it. Livermore was selected. It was very complicated weapon, a complicated design technically. Nobody in my unit could say it would or wouldn't work, technically. It just wasn't our cup of tea. It was clear we couldn't test it in the United States. It was too big. Where are we going? And so that's why we ended up going to Amchitka. And it

took a couple of years to drill the hole and to pull the test off. And it was a test of the weapon for the Safeguard system. The decision of whether to test or not was not something that AEC headquarters could comment on. The lab said, we have to have this kind of a test, and we have to have a room at the bottom of the hole to make these measurements. And we said, well, yes. We had to rely on the lab directors, the labs to, in good faith, put together a test program that they felt they had to have. There was no benefit. There was no commission for more tests.

I understand what you're saying. Once the decision is made that this weapon will be useful, we think, you give the assignment to the labs [and] they have to test it.

Yeah, and it goes from there unless it turns out something pops up. Poseidon [Polaris], I think it was, was the first of the submarine ones. And the submarine system was the third leg of the triad, where you can't find it; it'll just stay underwater for thirty days and you can't find them. So it became an extraordinarily important new addition to the armory, after the airplane, and along with the missile. But the missile for the submarine was kind of small in diameter compared to big missiles or airplane bombs, and so the labs had a real challenge to get the kind of yields they wanted in a small package. And then the thing goes roaring up through the atmosphere and comes down and it gets hot and everything, you want to be sure it goes off. So there were a great number of tests, more to guarantee the thing would work under extreme circumstances. A lot of tests had to do more with reliability under certain extreme conditions. We knew it would work in normal conditions, but now we're going to put it in an extreme atmosphere, environment. Is it going to work there? And so a number of tests were really done to prove that it would work as advertised [00:55:00] after it had gone through this extreme environment, which rocket warhead reentry vehicles are pretty extreme. And that was just the beginning of the technology of reentry vehicles.

Yes. Now what was the missile system that was being tested at Cannikin? Was that—?

Well, just the warhead for Safeguard.

But that was cancelled, right?

Well, the whole system was cancelled later.

Later. How much later was that?

I don't know that they ever manufactured—I don't know how it dribbled off and stopped, but it actually just ran down. I mean somebody said, that doesn't make any sense—ten years had gone by and it just didn't look like it would be a prudent investment. That was before [Ronald] Reagan and Star Wars and the new antimissile system they have now, which is a hit of point and hit in space, it runs into it. This was just to fill a big chunk of space full of radiation and disable incoming warheads from the Soviets. Completely different approach.

Right. So you're hoping that the radiation messes up their—

Well, they did tests. Some of the tests that went on in those tunnels [at the Nevada Test Site] had to do with that subject. How do you keep your own from being ruined, and what can you do to ruin theirs? And so some of those tunnel tests were pretty elaborate, because you had to get a vacuum in space, so they put a big tunnel to pull the vacuum down. Those are pretty expensive and pretty complicated tests, I must say.

Byron talked about that and I've talked to different people about that, but that's what's so interesting because a couple of days ago, that's what he was explaining to me, about how you're looking at the effect on your satellites, on your stuff, what the radiation does to your instrumentation, to mirrors or whatever, at different levels, and you need to test that, and then you need to think about it offensively also, what it's going to do to theirs. And I think for a layperson to stand back, I guess why I keep harping on that question which you can't answer,

which is, someone's imagining the real possibility of a war that these things are involved in, I guess to a certain degree, or just, are people thinking, what's the worst-case scenario we have to be able to—?

Well, this is a long-running debate we have today right now. If you're planning for a war, does that mean you really want a war? The answer, of course, is no. The military's view is, we have to plan for everything. The relationship between that and the probability of ever using it is very low. On the other hand, if something shows up and we didn't plan, you know what happens then. Everybody descends on us and complains, you didn't plan. So a lot of people are willing to defend the necessity of scenario planning, and if you need technical information on that subject, to go get it, that it must be done. It had nothing to do particularly with your plan to use it. It had nothing to do with whether you were planning to use it. All it has is, if it's ever decided to use one of these things, you got something to draw on. But that goes on right now today. This new development of the all-purpose warhead, with our penetrating warhead that's going on now, it has to do with—I think that's an old, at least in my modern times, argument about the military's planning for something. That means if you think about it, really it makes it more liable, more liable to use. I don't believe that at all. One of the reasons that we have never used atomic weapons, in my view, mainly is the horror of Hiroshima and Nagasaki was laid out for everybody to see. It's not hypothetical. It's not what might happen. That's a little thing and look what happened. And as far as I'm concerned, that probably [01:00:00] has deterred more people from ever pulling the trigger on any nuclear device, weapon.

Hiroshima and Nagasaki themselves.

Those two. Yeah. That saved more Japanese and American lives that would have been lost in an invasion. I think it saved a hell of a lot of lives, because that damn bomb would've been tried

when they might have had hundreds years later in some scenario. That's why Harold [Agnew] and I want to have a big offshore test once every five years and make all the heads of state come and look at it.

Really. An atmospheric test.

Oh, yes. Hell, yes. We both claim it'll do more to cool off the hotheads. Most of them are reasonable. The new dimension now is terrorism, with no concern about any of that, and that's so irrational that there's no way you can affect that business by what Harold and I were talking about.

Right. Well, I have thought about that lately because talking so much about what you just expressed, and that really helped me understand some of those scenarios because, again for a layperson, the notion is, well, you must be planning for this kind of war. But what you've said is actually the opposite of that. But it's interesting, isn't it, that now I think the nuclear worry is much less technical than war in space.

Oh, now it's moved into a new realm which there is no background, there's no logic, and it's a very difficult situation in which to decide what to do, other than try to prevent somebody else doing it. Not Russia. It's not the old powers anymore.

Right. Let me stop this for a second.

[01:02:21] End Track 2, Disc 1.

[00:00:00] Begin Track 2, Disc 2.

Maybe you could talk to me a little bit, just because I'm trying to get different aspects of the Baneberry story as one of the events. You were in your position at the AEC at that time. And just so I have that story, what was that like when you said before we started recording that you got the news on it? It was around Christmastime?

Well, Baneberry was one of the earlier underground tests, and you've probably had people tell you about the containment panel in Nevada that examined every test as to whether it'd be contained. A little bit of leakage is not what they were worried about.

So Baneberry took place, it must've been in December because DMA was having its annual Christmas party down the road. And somebody came in and said, Baneberry blew. I knew it was supposed to shoot. The Commission wants to see you. And so, oh boy. So I go back and get on the telephone first, trying to find out what happened. Yes, it really sprung a leak and they just described on the telephone what it was. And all I can tell the Commission is yes, it blew out, it's being tracked, the cloud. All we can do now is to have a deep review of what went wrong, so they don't have it again. So in a sense, it was just keeping them informed so they don't get a telephone call from the president's office or something and the staff out there, what's all this rumpus out in Nevada about? Although I don't recall that there was very much. Now my memory is not too good on all these things.

But then we did have the review by an independent group from their containment panel, and I think they came to the conclusion that there was a geologic fault they somehow or another had missed. They hadn't really buried it deep enough, and in the future we'd just go deeper, the bottom line, so the next underground shots were buried deeper, with an extra sense of precaution. But the movie of it is really dramatic, I think. It looks like the genie coming out of the bottle if it ever did. It just happened to be the sun, the clouds, and the airplane were located just—I don't know if you've ever seen it.

I've seen the still photographs, but now I have to find the movie.

Anyway, that's sort of what it was. We were just beginning to learn containment. On our first tunnel containment, it didn't work. I don't think that was the first—Baneberry was not the first

shaft shot, it wasn't shot in the hole. I don't think so. Somehow or another, they drilled into where there was a fault.

When I talked to Wendell Weart about it yesterday, he gave me a lot of detail, and he seemed to indicate that there were three factors. It would've been deep enough if it hadn't been clay, but it was clay, so the water and the clay coupled the force of the explosion, one. Two, the steam was then formed, which they didn't expect, because the water vaporized. And then it did find that fault. But he was saying that they hadn't really been looking that carefully at faults until Baneberry made them—

That's probably true. I mean what he tells you is a lot more detailed and probably more accurate than—I do not remember—

No, I'm just in conversation about it because we just talked about it yesterday. But I was just curious from your point of view how much flak was there in Washington—

I don't remember very much.

I'm going to have to look at the history and see.

I'm sure there was some low-level squawking going on between the Commission, myself, our people, and the labs, and what the hell did you do, or the Nevada Test Site, I guess, more than anybody.

Yes. And then the treaty, I guess, was involved because we weren't supposed to have anything cross, as you were saying, no fallout crossing borders. So what did you say, the fallout stopped at the—?

Well, the tracking airplane didn't go into Canada, so therefore we had no measurements in Canada. It sort of went up to the northern border and turned and went east. Nobody seemed to

worry. I don't remember anybody commenting on that one particularly, other than the plot looked a little curious.

[00:05:00] *That's given me a good understanding, what we talked about a little while ago, about that position and those relationships between—that's what I didn't really understand clearly, the relationship with the services, the relationship with the labs. At your point in time, the competition between the labs looks useful as far as planning is concerned.*

Oh, it had settled down before I got there, and my predecessors, like myself, had competed the labs for ideas openly, feeling that was the way to get advancements, and I think we did. It's sort of interesting, though, that some of us—well, myself, I suppose, more than anybody—we viewed Los Alamos as not quite so imaginative as Livermore, but they always produced something that worked. Livermore had more, looked like really good ideas a little further out. Some of them didn't work. And my understanding is, most of the stockpile today is Los Alamos-designed.

What that tells you, I don't know, but part of it is not because the Livermore devices failed. The carriers that they were on have been taken off; they've been removed. See, a lot of the deliver systems, we're down to a couple of submarine—maybe just one submarine missile (maybe there are two) and one or two Minuteman-type missiles and one or two—three bombs, I guess. I really don't know what's in the—I've forgotten what's in the stockpile.

Yeah. But generally, it's the delivery systems have become much more—

A lot of the delivery systems that were hot ideas twenty, thirty years ago have faded off into history, like the battlefield weapons, the land-launched atomic bombs, I think even some of the airplane-launched atomic bombs, I mean the rocket bombs, you know. I think submarines, I don't know whether they're still carrying Cruise missiles or not. In other words, over the years these systems grew up and faded into history. I'm sure someplace somebody's written the history

of all of the systems that were generated and what happened to them, where they went, and a lot of that data is probably open, that is, not necessarily the fine details. I've never seen one.

Right. Well, that is an interesting point, and I wonder, based on what you just said before, if that's a function of this notion that we have to think about what all the possibilities are, and as the major threat of the Soviet Union fades, then maybe some of these possibilities don't seem so possible anymore, and then you don't need these kinds of things? I'm guessing.

Well, I think the utility of some of them in the current political world and physical world are not obvious anymore. A lot of them were born when—we did try all kinds of things with this new, new weapon that's quite different, and so people in different groups within the services come up with an idea and they get the labs to say, sure, we'll build you one for that, and so the momentum would start. Some of them would die, but some of them would go all the way through to production. Then they died because after they actually had the things, it wasn't clear that you could use them very well. I mean there wasn't really that much use for them. The battlefield weapon would be a hazard to yourself as much as the rest of the people, and on and on and that sort of thing. But early on, people had no understanding of what it was, what you'd be faced with after they went off. It's just the evolution. I mean it was pushed on us so fast, and by a set of organizations that knew little about this thing, and the laboratories, who liked to build all kinds [00:10:00] of them. I mean almost as if they got paid by the number they could build. So there was a momentum to use atomic energy, bombs, anywhere you could for, I don't know, the first ten years. Then it finally slowed down and now we're taking most of them out. And then came, the thrust a few years later, we need stockpile safety and reliability without testing, and so now we've created a new challenge to the technical field more than anybody else. How do you certify these things that have been sitting around for twenty years, you know? Will they really work if

you want them to? And are they safe? Safe in the sense of people handling them. See, people got worried about command and control, and that's because you don't want unauthorized anybody, including Americans, doing something with them deliberately. And you don't want any of them doing it inadvertently, so your safety systems, which Sandia [National Laboratories] does most of them, is a whole world in itself. And then if one's in a fire, you don't want it to go off, and so what can you do to—? That's a kind of safety problem. If you drop one from an airplane, which we have done a few times, you don't want it to go off. So we actually had a test in Nevada where we simulated what would happen if you put a dirty bomb, a high explosive on plutonium. We fired high explosives around plutonium and went out and measured everything and the stuff's still out there. It's called [Operation] Roller Coaster [1963]. So it was an understanding of dispersal. And as far as I know, at one time there was a proposal to clean it up. You going to clean up four square miles of dirt that's three feet deep? Put a fence around it and let it wait. You'd stir up more damn plutonium in the air than you ever—just leave it where it is.

So the purpose of that, because I was curious about that, was to see what would happen if a weapon had dropped?

Well, I cannot remember precisely what was written into why we should do it, but it was presumably to find out what the dispersion would be and what the character would be, what would be the particle size, and we did it out in the test site.

Right, right, because I've heard about that area that's fenced off.

That's one of these endless other things to test that go along with, is it going to go bang and how big? Also, one thing that I ping on Sandia a little bit about is, remember, you're the interface with the military for hands-on using them, picking them up, carrying them around, training, testing, real ones. And the services have lost their enthusiasm for nuclear weapons, the

individuals in the service, as a career path, especially in the Air Force. "See, they have these things they figure nobody's ever going to use and it's tough on my career." And the Army, I think they're out of it entirely, essentially. The Navy has the submarine folks. The Air Force has some missile people, which is a little different. But still, a nuclear career in the services is sure not what it was when it was the thing. It's been replaced next by space, then next by intelligence. Now it's IT [information technology]. So if you want to get promoted, get into IT. And so you've got military people handling nuclear weapons, you sure don't want them being [00:15:00] casual about it or sloppy or disinterested or whatever. But Sandia is the designer of the knobs and nuts and electrical wires and everything that go inside this thing, and which the GIs have to practice on dummies, but still have to handle real ones eventually. So I keep telling Sandia, you have to keep an eye on the services as to whether they're meeting the requirements, in your view, of the personnel's part of the system for safety and security. Safety mostly. Now I'm not saying they're not doing it. I'm just saying that, you know, you're faced with the other side of the fence from you, it's not the first thing, it's not a high priority subject they want to be in. But you know I'm not saying they aren't doing it. It's just that I keep reminding them that you, Sandia, have the responsibility to look over the fence and see how is this going, and if you see something wrong, they certainly can bring it up.

Now given that and the fact that it's no longer of interest and maybe what you also have just said about fewer delivery systems and what really is practical and usable, what do you see as the future of nuclear weapons in the armed forces? I'm asking also because of this whole controversy about this bunker buster and whether there should be an earth-penetrating nuke and all this thing. But nuclear weapons obviously are playing a different kind of role, post-Cold War. Do you see them becoming obsolete at some point?

Not unless the world changes a lot, and it's up to Congress anyway. Fundamentally, it's up to Congress. It's not up to the military or the technical people about whether we'll have them and why we have them. Sandia just produced a 4-DVD set—they sent me a copy of it—which tracks the development and the flow—ebb and flow is a better word—of nuclear policy starting in 1940, and it brings it up to, I don't know, a few years ago. And they sent me a copy and it was really good. It's all policy, and they interviewed all the old folks, and I knew a lot of them. And so I loaned it to a friend of mine and I got it back, and then I mailed it off to another guy who got involved with it up in Santa Fe [New Mexico]. And if you can get your hands on one—it's a 4-disc job.

Yes, Byron told me about it, so I'll ask and—

It's pretty good. They did a first-rate job with that.

That's what he said.

But it has all to do with ebb and flow of policy.

That would be interesting to see.

Yeah, from that standpoint.

Well, this is great because I understand better that role of the AEC, and then just to close, then you said you were kicked upstairs and that was even a—

Well, I retired in '72. The Air Force retired me. I didn't have any choice in the matter. But I was in the AEC at that time, and so Jim Schlesinger was the head of it, and he said OK, I'm creating a unit above DMA and I'll put [Hyman] Rickover in the reactors, which was paper more than anything else; and DMA, arms control, AEC security, and export control—they called it National Security, you know, just as a title, so I became the Assistant General Manager for National Security.

OK, now you're a civilian now, though.

I'm a civilian now, and an Army guy came in, general, Camm, Frank Camm, took my job.

Your successor.

His first worry is that I would keep the car that I had that came with the job, and I said no, you can have your car. And a driver.

OK, so it was a car with a driver.

Oh, yeah, because we're at Germantown and a lot of the action takes place downtown where the Commission meets a lot, and the Pentagon, so you really did a lot of back-and-forth, back-and-forth.

So when you retired, what was your rank then?

Major General.

Major General. But you said, I think, last time that this new position had also under it—oh, yeah,

I think you just said arms control, so you did things in that area too? The civilian position?

[00:20:00] The AEC had a small group on arms control, mostly doing the test ban, things like that, that kind of arms control. Arms control in a State Department concept.

Did you like that job?

Well, it was broader. I mean I had other things. Yes, I enjoyed it. But I finally got tired of Washington and left. Actually I ended up in ERDA [U.S. Energy Research and Development Administration] for two years. But when it was going to be DOE [U.S. Department of Energy], I left.

You'd had it?

Essentially, yeah. Well then, JCS [Joint Chiefs of Staff] had offered me a job to go to Geneva [Switzerland] to be an arms control negotiator, and since we'd never been stationed overseas, that was a kind of a specialty, I mean something I wanted to do for a couple of years.

Oh, so that was with the Joint Chiefs?

I worked for the Joint Chiefs as a civilian, representing their interests. I think we went over how a delegation is put together. This was during the Carter years.

Right, right, because you mentioned that last time, and the completely different world that that kind of diplomacy is.

That's another world. The State Department world is another one.

What an interesting career, though.

It's a career, yes. Sometimes sarcastically I'll say, their biggest challenge is to keep it going forever and living in Geneva on per diem. Not just the U.S. but a lot of these countries. The world's biggest collection of lunch-and-dinner outfits. Well, Geneva's the home of the International Red Cross, all things international, control of the radio spectrum. Well, not just radio spectrum but the whole electromagnetic spectrum and that is how is it divided up. There's all kinds of outfits like that.

Yes. And CERN, the big European laboratory, is there, because my dad worked at CERN one year, so when I was in college I went there. Beautiful city, but a really international city in a world of its own, I think.

Oh, yeah, it's French primarily. Money. We had a young man from Basel that spent several months with us in Washington and his father was a lawyer. And we used to go up to Basel long after the war. But anyway, during the time we were in Geneva, I asked him if he wanted to come down to stay with us for the Geneva auto show, which is a pretty big thing. [And he said], 1 '11

come down but I'm going back. I'm not going to stay in that decadent city.

He's a German. He thought that was a terrible place down there.

Interesting. Well, great. You told me a lot again. Is there anything else that you want to add, or I've made you talk enough.

Well, that's all that occurs to me at the moment.

OK. Great. That's good. Perfect. Quarter of eleven.

Is your chauffeur coming?

[00:23:34] End Track 2, Disc 2.

[End of interview]