

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

Interview with
James Magruder

November 22, 2004
Las Vegas, Nevada

Interview Conducted By
Joan Leavitt

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

Joan Leavitt: *We could start with some of your career that leads up to your experience and participation in the Joint Verification [Experiment] [JVE].*

James Magruder: All right. Where I really started being involved was in 1987. Tom Clark, then the manager for the Nevada Operations Office [NVOO], had asked me to participate in the nuclear testing talks going on in Geneva.

So this was before Nick [Aquilina] came aboard.

Before Nick, yes. And as such, I was asked to give a presentation on the [Nevada] test site and the testing operations.

At Geneva?

At Geneva. So I went over for about a two-week period to the nuclear testing talks going on, and the U.S. [United States] head of the overall delegation there was Bob Barker.

Now this was sometime in '87? Was this around June?

You know, I don't remember. It may have been. It was probably May or June time frame of 1987. What they typically did was have two or three weeks of discussions there in Geneva, they'd break for a few weeks, and then come back. I came back in about November of '87 with the delegation. At that time the task was to sit down between the U.S. side and the Soviet [Union of Soviet Socialist Republics, USSR] side and develop a protocol for exchange visits to each other's test sites.

Was that also what you were aware you were going to be doing in June?

No. If you recall, President [Ronald] Reagan had the concept, "Trust, but verify." And so these talks were initiated to see how the actual protocols for the PNE, Peaceful Nuclear Explosive, test and the Threshold Test Ban Treaty could be implemented. So at that time, they were just informal discussions to kind of feel both sides out and see how they would progress. Now in November of 1987, the task for the group in Geneva, both the U.S. and Soviet side, was to determine how visits to each other's test sites could be accomplished; what details should be presented by each side, both the equipment displays as well as actual briefings, the time period, and all the details to house that. Now I had been given by Bob Barker a little heads-up on that and had put together a straw man paper as to kind of all the operations that *we* considered critical for testing, the things that we'd certainly like to see how the Soviets did, as well as equipment.

Were you thinking in terms of a joint experiment at this time?

I wasn't, and I'm not sure—

Or was it just visiting the other person's and verifying?

First off, it was just the visit of the test sites to become more familiar with how each side did their business; and from there it would allow people to develop the sites, to go on and develop how they would implement the protocols for those treaties. And it was in that discussion and really under Paul Robinson that they decided the best way was to have these joint verification experiments. But in '87 it was just strictly looking at how we could structure visits to each other's test sites. In Geneva, I was appointed as the U.S. lead for the working group, working with a Soviet counterpart and their groups to facilitate these visits. And the visits did occur in January of 1988. Now as the assistant manager for operations here in Nevada, it was my responsibility, of course, to set up the test site for the Soviets' visits and actually do the hosting

when they arrived. We were kind of helped a little bit by the first visit being to the Soviet test site, and overall I thought they did quite a great job, and we had a—

Can you describe what your visit was like with them? You were the first Americans to go to Semipalatinsk.

To Semipalatinsk, yes. Probably the highlight was really Moscow, though. It was the St. Basil's Cathedral there in Red Square. You've seen pictures of it for years, or all of your life, and I [00:05:00] thought it was really just a great opportunity to see it and the way it's lit up at night. But what we did was fly in, of course, to Moscow. We stayed at the hotel just off of the Red Square there. They had stores for foreigners only, foreign exchange stores where the Soviets citizens could not buy things, but we could go in—

Oh, but foreigners could.

Hard currencies, right, only hard currencies. There are a lot of things that I thought were of interest there. They just had quite a variety of pretty nice things that foreigners could buy, a lot of furs and quite a variety of things.

The Soviets then took us on a chartered aircraft, very similar to a 727 U.S. aircraft, and flew us from Moscow into—and I can't remember the name of the town, but it's near the Semipalatinsk test site. And then from there, it was another aircraft flying us right into the test site proper.

I was surprised how far away Semipalatinsk was from that test site area. I think they said 150 miles.

I suspect at least that. They flew us in on a smaller turboprop, into an airstrip right there at the test site. And then stayed at a hotel that they'd set up for the U.S. delegation there. And of course it was pretty cold at the time.

Well, this was January.

It was January. We were allowed to free roam, of course, in the hotel and the immediate area right outside of it, but no further. They did have armed guards around. There was—[it was] pretty cold there. One night they did take us to a movie at a theater.

They had movies.

Yes, but it was one that had a fair amount of propaganda, how great the Soviet Union is, but they had a lot of pride.

But getting back to the visits, a lot of the briefings were given right there in our dorm area, the second story of it. And then they did take us out to see a drill rig, their setup for a device canister, and their control and command area. Overall, I think the Soviets did a real nice job.

At that time did you realize the drilling was going to be a problem?

Well, they had always indicated drilling was a little bit of a difficulty.

Even at the very beginning, then.

Well, I don't know exactly where it came up. But during the discussions of the CORRTEX system, that is, being able to put a cable in a hole parallel to the emplacement hole, the Soviets didn't think it could be done. And it turns out, indeed, that drilling over on their test site is much more difficult than drilling here.

Because of the higher water table?

Higher water table, but drilling through granite. It's a hard drilling. As you probably know, we sent our own drill rig over there to drill for the JVE there. We went through a variety of bits before determining just how to do the drilling. But in the discussions, the U.S. was pretty insistent that we needed something like a CORRTEX system which would be emplaced in a hole

about ten meters away from the emplacement hole; it had to run very parallel to the emplacement hole around where the device is, and the distance being such that the cable wouldn't be picking up nuclear weapons data, which they were very paranoid about from day one.

No intrusion.

No intrusion. But you had to have it straight; you had to have it the proper depth and all. And they did not feel that could be done. And during the actual negotiations under Paul Robinson for the actual JVE, they finally came to the point that [they] said that if we needed it and felt we could do it, then we could bring our own drill rig and we had the responsibility to drill the hole ourself over there.

That was somewhere around April. That took a couple of months to—

Right. That was after the familiarization visit.

Yes, even after some of the drillers were already over there, wasn't it?

Not the drill rig.

[00:10:00] *No, this was Larry Neese and Guy Allen and some of those who were there to log the hole that the Soviets had built.*

The emplacement hole?

Yes.

I don't remember exactly when we sent the drill rig. It was considered from day one, that is, after the familiarization visits, both sides went home and then there were negotiations. And that's when Paul Robinson took over as the head of it, with the title of ambassador. It was during those discussions and the details being worked out that a complete schedule was put together. Now at that time, I headed up the—I think there was five working groups total at that time, and I headed up the one on operations.

And what does operations consist of?

I had the responsibility for all the people that went over to participate in that—were under my area of responsibility. They either worked for me, if they were DOE [Department of Energy] people, or they were contractors and supported the operations under me at the test site on the contractor side.

Did Chuck McWilliam, was he kind of a part of some kind of a chain of command, too?

Chuck McWilliam was working for me under the NTSO, the Nevada Test Site Office division out there. He was one of the branch chiefs. Chuck came into it after we got the Soviets here on the test site. We'd set up to have a daily meeting where if we had some concerns with them or what was going on, we could tell them; if they had concerns—to work out the next day's schedule and all the issues to assure that they could do their verification activity. And initially I had appointed Rick Hague [sp] who was on my direct staff, to do that. Now Rick was a very thoughtful man, very much of a scientist, very much of a gentleman, and did know the test site pretty well but wasn't out there on a daily basis. It just turned out that Rick, a great man and all just didn't kind of fit the niche very well. You needed somebody that was very intimate with all [of] the test site, which Chuck was. You needed somebody that was really kind of a strong individual, because the Soviets, they respect knowledge and they respected somebody that could tell them no if they had to and stick to it. So we put Chuck into that role and he did superb, absolutely superb.

He was a young man, too, wasn't he?

Yes. And still is.

Yes, and that was quite a remarkable responsibility because he was negotiating with Viktor [Mikhailov], who was the head of their lab.

Yes, right. But Chuck did a great job, and he and Viktor developed a very good rapport. In fact, regarding Chuck, he was over here for the JVE. After we finished up over in the Soviet Union, he wanted an opportunity to go over there, and we sent him there to help kind of close down the operations and escort the equipment back, so he had an opportunity to see both the U.S. and the Soviet operation.

He did a lot of implementation, too, didn't he?

In what way?

Oh, implementation of the JVE protocols.

Yes, indeed he did. Now at that time, there was the DoD [Department of Defense] organization, the Onsite Inspection [Agency] group [OSIA], too. I say at that time. I think they were. It's long enough ago, my memory's a little hazy. But there are just so many people involved in one way or the other that—

Well, I think, as controller you had eighteen agencies that reported to you?

Well, on any test you have something like that, yes. There are various DOE laboratories, Department of Defense people, a couple of other federal agencies, the Weather Service, an element of NOAA [National Oceanographic and Atmospheric Administration], as well as the Environmental Protection Agency [EPA] representative. But, you know, all of them working as a team to get the test off.

Can you describe how a test controller is different from a test director?

Yes, I guess. The lab may want to disagree. I would say the test controller is totally [00:15:00] in charge. The test director is the laboratory individual and has the responsibility to oversee the laboratory efforts from the time that the test is starting to be fielded. So anybody from that laboratory that's out at the test site, or anybody working on that test to develop it, would

essentially be under the auspices of the laboratory test director. The test controller is the senior DOE official that has the overall responsibility for the safe execution of that test. The test controller doesn't have the responsibility to acquire data or anything else. That's the test director. The test controller is responsible for assuring that if that test is set off, given the authority to set it off, that it's set off within guidelines that have been established by the Department of Energy. Some of those guidelines were firm that "thou shalt do," or "you do not shoot if," whatever. For example, there is an area that was deemed to be a controllable area. The EPA had gone out and canvassed the area, and that they either had enough monitors and the population is sparse enough or that the people would respond to their suggestions about evacuation; or taking areas, but within that area, that they had the resources to make sure that there was no harm to the public if you had a problem with the test of radiological venting. And so that boundary was marked out and we called that the controllable area. And at that point, any venting—

Is that where "test controller" comes from? Controllable area?

I don't know exactly where it comes. It predates me. But anyway, if you had a release, the exposure limit beyond the controllable area couldn't be beyond 170 mR [milliroentgen]. Now that was just an absolute threshold. If your best models would indicate that the exposure to the offsite public would be above that, we delayed the test until conditions were more favorable. But then there were other conditions that you could look at and—they were good practices—if you'd look at the environment you had and determine whether they would preclude conducting the test or not.

Now are a lot of these estimates, were they the ones that would be given to the Containment Evaluation Panel [CEP]?

No. The Containment Evaluation Panel would look early on at a design for containment, the containment scheme that was designed by the sponsoring laboratory. The Containment Evaluation Panel then would pass judgment as to whether they felt that all the radioactive debris would be contained or not. If they had issues or questions of it, then the sponsoring laboratory was sent back to redesign their containment scheme. But that was done before the device was put in the field or anything.

So who did the estimates on what the different radiation sometimes would be?

The Weather Service. What you had was that containment design that the laboratory had developed that had been reviewed by the Containment Panel; that came out, and that was then something that you physically had to—it was a design concept. You had to put it physically in the ground. So on the day before you conducted the test, there was a final review of the CEP to assure that the as-built, that the construction people were able to build it as it was designed or close enough that it wouldn't cause a problem. So on D-minus-one, the day before the test, you reviewed that. The next thing you also reviewed was the weather. The Weather Service also took the source information from the laboratory; and the venting, from a model that was developed years ago, that if you had a venting, how much radioactive debris could be expected to come out. Then with the weather conditions, particularly the winds the way they are, what your ground deposition would look like, and the exposure levels at different points. So for every test, that was done. You did it on D-minus-one. The Environmental Protection Agency, their monitors would have been out in the area a few days before the test, canvassing the people out there in the public to see how many people were there at the various locations. You counted them by number. You knew exactly how many people, and they also would know [00:20:00] what they'd be doing at

the time of the test, so that if there was a problem, they could take action. But they would review that again on D-minus-one as part of the test controller's panel.

And you were part of that briefing, then?

Well, as the test controller, you're the head of it. I might mention, for a test controller's panel, you had the test controller. The test controller is supported by a scientific advisor from the laboratory that is sponsoring the test; a representative from NOAA, the Weather Service; a representative from the Environmental Protection Agency; and a medical doctor; and in the later years, we had one of the DOE health physicists as part of the panel. Then you have a whole—literally like a hundred people supporting you in different areas: construction, security, the health physics monitors, whatever. But the panel itself would convene at the control point, D-minus-one, and go through these various briefings; looking at, first off, that the containment had been put in as planned. Then what the weather conditions looked like for the time of the test, what the trajectory of any debris that would come out would look like. The Environmental Protection Agency people, where their monitors would be, whether they had the adequate resources to handle any evacuation if there was a problem. Looking at the crafts and the operations at the test site, what operations were going on, any special setup that we might need to take, or any modifications. And then an operations briefing as to virtually where everybody, by number, and you had another list that showed by name, where everybody on that test site would be at the time of the test. So that you knew that, first off, that the conditions looked like they were favorable that you could proceed with the test. If there was any problem—which you didn't expect because of the containment design, the containment implementation, and the review of that containment—that if you did have a problem, you're ready to go out there. Now if everything looked good, the test controller would schedule another briefing the morning of the test, and

usually it'd be somewhere four or five or six in the morning, depending on what the test was and some of the conditions. But you ran through essentially the same thing again to see—

Make sure nothing had changed?

Right, and if they changed, it only changed with the better. After that, the group would convene back upstairs to the test operations center where you have displays of all this. You have the live video coming from the forward areas and you have video from closed-circuit TV in the helicopter. And sit there and monitor those. As time got closer to the planned shot time, give authorization to unlock the device. Now the device that's down hole has cables that come up to a facility called a Red Shack. The cables are locked out there so that you can absolutely make sure that no energy gets down to that device. The test controller gives the approval for the laboratory representative, the test director, and his people to actually physically unlock those cables and make connections up to the equipment that would be sending the arming and firing signals later.

There's supposed to be some code that only a couple of them know. Like Joe Behne said something about that.

Right. Both laboratories have a lockout system. They are implemented a little bit differently, but what they do is make it where you scramble the codes coming out there, any signals coming out there. Therefore it's something like one out of ten billion possibilities of any proper number being set by chance. So at the Red Shack, then, out near the device, Joe Behne or the test director and some of his people would actually set in a code there, so that they were sure that nothing could come from the control point on out, and then would go back. Then when the test controller gives authority to unscramble the system, in the control point, then, they set the proper code at that point. So at that time, you have a connection for all the way [00:25:00] from the control point to the Red Shack. No signal's going through right then, but you have a connection such

that you're ready to send signals. Then the test controller gives authority to go ahead and enter the countdown and fire the device. The laboratory, through one of their control rooms, the one that actually goes through the countdown, sends all the various signals to the various users out there to acquire the data that they're going to acquire, as well as those device-related signals that do the arming and firing of the device, and then the data acquisition. The test controller and his panel, then, is watching the detonation, assuring that there is no debris coming out, and after an appropriate time, gives authority to reenter. Now if there is a problem, or should be a problem, then the test controller is responsible for directing emergency response actions to mitigate any problem that way.

So would you also be responsible for notifying the community in case of evacuations and stuff like that?

We didn't really have the authority to order evacuations. What we could do through the EPA is to recommend evacuation or whatever. If you go throughout the history of testing, there have been at times—the state was very comfortable with the DOE or its predecessor agencies and the EPA to actually recommend evacuations, or essentially recommend them. In later years, it got to where they really wanted DOE and EPA to go through state representatives to do that. And so it depends on where in testing, but the bottom line was that the test controller and the EPA would assure that the public got the information if there was any time lag or whatever. Our first responsibility was to the health and safety of the general public out there. The tolerance of the testing program relied very heavily on the good will of those people out there. There were periodically briefings that the EPA and DOE would go around and give to the people, a very close working relationship with the people, like at Rachel which had the largest population area out there. But most of them, you know, they're ranches where there are two, three, four people or

so. But it was very important to make sure they understood what we were doing. We gave them tours of the test site, too. And absolutely make sure that they were confident that we were worried about or concerned about their wellbeing and would take the steps needed to assure it.

Did you feel like you had a pretty good relationship with those smaller communities, then?

Absolutely. And a lot of that is really the credit of the EPA monitors, just being out in the field and working and getting to know the people. But yes, a very good relationship with them.

You had another title that I noticed. You were project manager? Was that different from controller or—?

Well, at DOE I've had various titles, but project manager, I've gone to project management training, but I don't recall ever having a title as project manager.

OK, because that was in something I found that said that you were—

It may very well be, but it's not something we'd typically—I was the assistant manager for operations. As that, I was the senior test controller of the other test controllers, and I would establish the schedule of the test controllers. The other test controllers would be working for me. They'd be usually one of my division directors.

Do you have any experiences working with the Soviets when they came here that maybe you would like to share? How did you feel about their coming in the first place?

You know, I thought it was an opportunity. Now when you work in a program like the U.S. nuclear weapons test program, you're always curious. What does the *other* side do? How do *they* implement things? So I thought it was a great opportunity to be able to go to Geneva, because I have always been curious about the negotiations and how it goes on. About like watching grass [00:30:00] grow. It's slow but very methodical. I was always curious about the Soviet testing practices, so being able to go over there and see that was a great opportunity. Having them over

here was really, I think, a great opportunity. I think it helped better understanding between the two sides. I didn't have great heartburn with them coming over, and I think by and large most of the testing community pretty well welcomed it. We wanted to make sure we had things in place and that they did not have access to information they shouldn't have, and I think we did a superb job at that. But them coming over, I think everybody welcomed it. It was just a good opportunity to see how they did things and to with them and hopefully foster a little better understanding and relationship between the countries.

Were you able to compare their system with our nuclear program at all?

Oh, yes. Even starting with the familiarization visits. They have a high water table. You mentioned that earlier. About fifteen meters underground, you start getting a brackish water. Their device canister was essentially like a submarine. Now most of the testing we did out at the test site was above the water table. Not all of it. But when you go below the water table, and particularly at very high depths, you have other problems, trying to keep water out from where it shouldn't be. But their device canister was just beautifully designed. And obviously their diagnostic was a lot more limited than ours, and their canister, therefore, was smaller. But there's a lot of areas that we were able to see and get the feeling of how they did things and how different from ours. But the thing at that familiarization visit from the hotel to their test site that struck me was when the Soviets set their mind to something, they did a superb job. But if it wasn't a thing of real importance, it may be pretty trashy. Like their hotel, the Rossiya, was really considered—it was just for foreigners and considered one of the best hotels. But when you look at the finished detail around in the rooms and things like this, it left something to be desired.

Is this the same hotel that the drillers got to stay in and some of the other people?

You know. When we sent people over and they went through Moscow, they stayed at several different places, so some of them, I'm sure, stayed at the Rossiya, but I don't know if all of them did.

Because there were some pictures of the hotel that Larry Neese stayed at, and I was just curious—

I don't know where he would have stayed.

I'll have to ask him. Because you've given the name of the hotel. You're the first person to have mentioned a name. How do you think that's spelled?

R-O-S-S-I-something-or-other. Well, I had the opportunity of staying in it three times, maybe four times, I guess.

Was that the first familiarization—?

In and out of Moscow for the familiarization, and for the JVE, in and out of Moscow. And then I went to Moscow in '91,'92 and I stayed at a different hotel, much more modern.

Now is this in Moscow? The Rossiya?

Yes. Now what you probably saw pictures of is where they stayed out in the forward area.

It was.

Yeah. That was even a little bit more rustic. The hotel, the Rossiya, was a nice hotel. It's just that when you look at some of the finish work, it wouldn't meet the standards that you would consider appropriate. The television, you're supposed to unplug it when you're not watching it because they had concerns about the power supply shorting out and fires. There are just several things that you'd think, well, they may not perform as well as you'd expect or whatever, but in areas where they placed their emphasis, like in their weapons test program, they just did first-grade work.

But getting back to your question about kind of the experience when they came. One area that I had responsibility for was getting their equipment from meeting it in Washington and [00:35:00] getting it sent on to the test site here. We had a variety of people back here, but we had worked with the Dulles Airport. The Soviets were bringing their equipment in on an AN-124, one of the big, big transports, and we were going to, of course, offload it there; go through a process of them sealing it, and then loading it on a C-5A to transship on out to Indian Springs there, and then truck it from Indian Springs to the test site. The airport was very concerned. We were going to do this operation on one of their taxiways—the only place that was available—but they were concerned about having two of those large transports on the ground at one time. We assured them that wouldn't happen. We had the Soviet plane scheduled in at one time and the Air Force C-5 at a different time. But the Russian plane ran a little late and the C-5 ran a little early, so we did have—

And you did have two of them—

Nose to nose, right there on the—

And they're gigantic.

They are big. They are big. Overall, the operation went well there, and of course the airport people were just super. I think one other thought: the Soviets' testing practice. Their diagnostic trailers and their control point was one or two clicks [kilometers] from the ground zero. Now our operation's a lot different. We have the trailer park very close to the emplacement hole, where you put the nuclear device down, and the trailer park is just outside the exclusion area where you're going to get cratering. So it's very close and it's subject to a great deal of shock. Now our control point where we have most of the people would be many miles from the testing area. They, on the other hand, had their diagnostic trailers and their control point at one point, about

one or two clicks away. So their diagnostic trailers were quite a bit further from the test and the shot, the emplacement hole, than ours would be, but their personnel would be much closer to it.

Did that make you nervous?

No, no. But you get, when they detonate over there, there's kind of a prairie grass on the test site and you can see kind of the rippling and you get a very sharp shock wave when it comes by. But the Soviets, they're used to that and not their trailer up close. They had a great deal of concern that their trailer would not survive the shock wave because it was so close. It was not right in the U.S. trailer park but it was right adjacent to it and kind of separate. But they had a great deal of concern that it wouldn't survive. They had a great deal of concern that we were setting them up.

To fail?

To fail. But they were just sure that that wouldn't survive. I kept assuring them that it'd come through just fine. When we conducted the test, Mikhailov and several of his other people—Mikhailov was right behind me and the others around there, and they were very anxious, and the first thing out of his mouth is something to the effect that their trailer was still there. I told them of course it was. We provided all the shock mitigation for it, so we *knew* and had had a lot of experience that the trailer would survive.

But he had had his doubts.

They had a lot of concern, and of course I'm sure they were under a lot of pressure.

I think Chuck McWilliam said that the anxiety that Viktor had, there was some real concern whether or not that his health would handle the stress.

He's a very intense man. He was under a great deal of pressure. And the Soviets, they were a little concerned as to whether they might be snookered, whether you might be setting them up or, that they didn't know how well they could trust you. Now as an American, you think everybody

should trust us because we're not going to go out there and we're not going to dink with their equipment, we're not going to set them up for failure, and we're going to help them where we can. But at the same time, even though they acknowledge that, I think they always have it in the back of their mind, Well, maybe [00:40:00] that's not true, and maybe you're trying to set them up for a little bit of propaganda or whatever. And he *was* under a lot of pressure that everything went well, and of course we wanted it to go well for them, too. And it did.

That really was an experiment in trust, wasn't it?

Yes, probably much more so for the Soviets than the U.S. I think just the difference in culture is such that Americans are more trusting, and the way that Americans are raised and all, that you're just much more trusting. And their society is much more, or was at least at that time – this of course was before the fall of the Soviet Union – was a little bit more suspicious. Some of their people, that was the first time they'd been out of the Soviet Union, the first time being directly involved with Americans, and I'm sure they've had a lot of stories how bad Americans were.

Well, did you get maybe observe their cultural tendency to seek opportunities to embarrass or to pass the blame?

No. No.

You didn't see that.

You know, all the time I dealt with them in Geneva, the dealings I had here or over at their test site, they were always very courteous, very honorable. I never had a bad experience or ever saw anything that would make me think they were trying to do something dishonest or anything to us. I just never saw that. Now I think they fully recognized that there are things that we wouldn't authorize them to do or see or whatever, and to my knowledge they always honored that. But we had things in place so that if they didn't honor it, they couldn't have done anything.

“Trust, but verify.”

Absolutely. You protect your secrets or the information that you do not want to pass on. You protect it very well. But a lot of that is completely transparent. That is, nobody ever sees any of that.

The Americans have a rather interesting way of focusing on a problem, you know, problem-solving.

Right. No problem. They would pick up the word “no problem.” Yeah, very much so. Americans are very optimistic, and I don’t think always the Soviets were quite optimistic. But there are areas where it was outside their experience that in areas they just had doubts. But I think things worked out very well.

The far-reaching consequences of that success went beyond the fall of the Soviet Union.

Well, they of course had a few opportunities to come back and do verification after the JVE, after the protocols were actually signed.

Did they ever come back?

Yes, they did. I say yes, they did. There was one or two tests that they’d come on. There were others that they had the right to come on but they declined the opportunity to come over.

Did the Americans go over for a couple of their tests, then?

No. No, they never—there were thresholds. The yield of the test had to be like above thirty-five kilotons before there were onsite verifications. You could do teleseismic verification but not onsite. During the time of the rest of the test program, they never had a test above the threshold that would allow the U.S. to come back on their test site.

So that was the way they controlled that, then.

That’s the way they controlled it.

It seems like they were pretty anxious to stop testing after that. Viktor Mikhailov seemed to be quite impressed that Americans had more financing for their program.

Well, I know they felt that we had a great deal more resources out here. Even our vehicle fleet, it just amazed them. From sedans, pickups, big trucks, tractors, whatever you needed. So obviously [00:45:00] they were more limited, perhaps, that way. But their concept of money or budgeting or what things cost was completely different. They couldn't tell you what something cost, even though they did come with dollar figures that we owed them for various things.

They know how much when someone owes them something.

Well, but they would come up with a number but when you sat down with them, they would explain that they just don't operate that way. So being able to separate costs or determine what costs were was—

So budgets were not really part of their system, then?

Not the way that we do it, anyway. Obviously, somehow, they're going to have to have some budgets in some way, but I don't know. I don't understand it. There's a lot of times you could talk with some of their interpreters, over in Geneva in particular. They had really superb interpreters and would help us. The U.S. had some that were *real* great and the U.S. had some that were really not so good.

I heard that elsewhere, that that had been a problem, getting interpreters.

Oh, yeah. And a lot of times, their interpreters would help ours some. There were occasions that I saw their interpreters [in]downtown Geneva and talked a little bit with them. But the one that was really *super* good, his father had been assigned to the UN [United Nations] when he was a child and so he picked up English. Just spoke flawless English and just really great. But

sometimes they would kind of tell you that there are areas that the Soviet society is such that, like the budgeting or costing, it's just not quite the concept there.

Oh, it's from the interpreters that you would get some of this information?

Some of it. You'd get it right there in the meetings and all, too. But when you started trying to put costs down and all, they just didn't know.

I know that hole was expensive.

This one over here, or there?

The one over there.

Yeah, indeed it was.

Now you weren't involved in the shipping of any of the drillers and the—?

Oh, yes, it was under my responsibility. We identified a drill rig and I loaded it on a C-5 out at Indian Springs to send over there. Vern Witherill, which was one of the division directors under me, Chuck McWilliam's boss, was over there for the start of the drilling, for that operation, and Joe [Joseph] Fiore, which was division director at that time under me. I don't remember at that time whether he was in engineering or the environmental restoration division, but he was over there. But yeah, any of the U.S. operations over there was under my responsibility, to put it together, to staff it, the people, equipment, and get it over there, support the operation while it's there in country, and get everything back, as well as all the operation out here.

Now was the experience over there more, in your opinion, a blue collar experience, with drillers working more with one another, with other what you might call blue collar nuclear weapons people?

I'd prefer to call them the trades as opposed to "blue collar," but I would think that by and large our trades people would work with theirs, yes. But we always had like a Vern Witherill, a Joe

Fiore, Guy Allen,. They were all division directors, that had the overall onsite responsibility there and would deal with the appropriate people. Usually I think they dealt with the general that headed up—I know they had a lot of dealings with the general that headed up—

[Arkadii] Il'enko?

Il'enko. Headed up the test site over there. And then I'd get a call daily from them, giving me kind of a status report on how things were going.

The other thing that seemed to be interesting about the experience over at Semipalatinsk was that the drilling didn't fall under the highly classified area. It was something that they could [00:50:00] share more, work side by side with one another, and so it was a shoulder-to-shoulder experience, in many ways more so than the one over at the test site.

Physically where the equipment is. That may be true. The Soviets would be very concerned about the Americans gaining any access to their weapons information, and rightly so, as we didn't want them to gain any weapons information from us. So there would be a separation of your scientific people. Now indeed there was a lot of scientific discussions at Geneva, the test site here, the Soviet test site. But a lot of times it's not that you'd go in and work with the equipment or side-by-side. But obviously they needed to know what we were doing over there, to satisfy themselves that there wasn't a problem, even though there was the inspection of the equipment going in and where you had two sets and they chose one set for us to use there, as we chose one set for them to use here. But always there was still the concern that unwarranted information or unauthorized information might be gained. And that was one of the kind of stumbling blocks for a long time there in Geneva. You know, putting a cable down by the device. If it's close enough, you get device information on it, and they were concerned about that, and there were a lot of briefings, discussions, the various technical people, as to whether that would

be the case or not. I'm not sure whether somebody's talked to you about what CORRTEX does or how it operates.

I have read about it. I have seen that it's cables. Joe Behne explained a little bit. You want to go ahead and explain yourself?

Well, just very briefly. The cable is in the crush area of the nuclear explosion, and that explosion as it propagates out from the device when it's detonated starts electrically shorting that cable out. You're sending pulses down and you're measuring how long it takes that pulse to go down and get reflected back. By doing that, you can measure the length of that cable. So the explosion is starting to crush that cable, make it shorter, and it's the timed rate of change of that cable that scientists can determine what the yield, fairly precisely, of that device is. So you're wanting to be out there in the high shock area where that cable crushes, but not close enough where you get the device information when the device goes off, the information that talks about—gives you information on staging or anything else on that device.

So there was a lot of concern by the Soviets that what we were proposing early on, we the U.S., with the CORRTEX system was going to give us device information on their devices. And another problem, as I mentioned early on, is that they didn't feel that you could drill that hole ten meters away, thirty feet from the emplacement hole, not ruin their emplacement hole, and that's one other thing that they were very concerned about is if we're going to be drilling that close—they felt they couldn't do it, they didn't think we could, and they thought that the net result would be that it would destroy their emplacement hole. They could drill into it.

That was one of their concerns, then?

So there were just an awful lot of back-and-forth discussion between the scientists on the concept and what you would or would not see and whether you could or could not drill and all of those issues.

You said it was like watching grass grow. It was very slow at times?

Sometimes it was kind of tedious. For one thing, anytime that you're having a speech or a talk given and are going through an interpreter, it takes time, and is subject to some errors. But there are a lot of times that you kind of come back to the same issue multiple times. And it's not something that you can get down with a few people and come to a fast agreement on. So the discussions or negotiations just went on for a long time, and it's not fast-paced and not real [00:55:00] exciting. I'm sure that some of the discussions could be very exciting or very interesting, but some of it's not. A lot of it has to be rather mundane stuff, too, but it gets resolved.

Are compromises given slowly?

I don't know if they're compromises as much as working out the details and agreeing upon—two people can look at one issue and see it from different aspects, and it's not that it's one item, but you really come away with kind of two different perceptions of it.

I was surprised that the Joint Verification Agreement was over a hundred pages long. That was a lengthy—those were a lot of negotiations, then?

Oh, yes. But on things like that, you go through and have a paper and go through it word by word and go back and change—this is where I said it's just about like grass growing, because you change one word and it's back and forth and it's really—.

Is this like Congress trying to make a law?

I guess. I don't know. Before our visit, maybe it was a working group for the JVE, but on the JVE, the Soviets, they obviously had had some direction from home. I could tell that the Soviet counterpart, my counterpart, the head of that working group, was kind of embarrassed to say it, but they had a whole list on what we had to do because they had fears of AIDS [Acquired Immune Deficiency Syndrome]. At that time, they didn't have an AIDS problem and they thought the U.S. had a big one, but there were certain inspections we'd have to go through and something about the food we could bring in and this and that.

Didn't they know how AIDS was transmitted?

I don't know. I could tell that my Soviet counterpart was clearly embarrassed to bring that up but felt that he had to. And I knew that it was being directed on him, it wasn't his, so I turned around and I told him, Fine. I assumed that the Soviets had no problem with us doing— and I just clicked off everything that he told me. And he kind of shook his head yes, and of course went back to his people. Then the next meeting he came back and said that that had all been resolved. There was no issue anymore. But like I say, it clearly wasn't an issue *he* had and wanted to address, but one that had been thrust upon him. And so I felt I needed to give him a little ammunition to kind of go back and rebuff it a little bit.

No problem.

Yes, no problem.

No problem. Well, let me go ahead and switch this.

[00:58:07] End Track 2, Disc 1.

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

Now is there anything else you would like to add about your Geneva experience or Semipalatinsk or their coming to Las Vegas?

Can't think of it. Yes, I guess one other thing. When the Soviets came to the familiarization visit, we of course took them out shopping some, and as I mentioned, in the Soviet Union at that time they had these hard currency stores where the local Soviets couldn't go in and buy things, only foreigners. But they kind of thought that we'd set the supermarkets up just for *their* benefit.

Frances Guinn had told them to just kind of open a phone book and pick out one and we'd take them to it, to show them that indeed there wasn't anything special set up. The supermarkets, they existed around for everybody, not just for—

You have just really shed some light on that if there were foreign stores, then all of a sudden that answers the question of why they thought these were special.

Set up, yeah. Well, you know, they had talked about, or I'd heard anyway, that the Soviets at some time had kind of did things like that. That is, set up special things, making the visitors feel that well, all the populace could participate in it when they couldn't. But it was just mind-boggling to so many of them. They had not ever been to the West, and to be able to see all these shops, stores, supermarkets and all is just an eye-opener for them.

Well, there's a beautiful picture of them at Siegfried and Roy. Did you get to attend that with them?

Yeah, right. They got to go up on stage afterwards with Siegfried and Roy and the little tiger cubs.

Do you remember how they responded to that show and the animals?

I don't remember offhand. I don't think they were quite as impressed as perhaps we were—I don't know. I don't remember.

It's a beautiful picture.

Yeah, I think I have one. There were several of them taken, but I think I have one of them. But Siegfried and Roy were very gracious at the end, to be able to come out and meet the whole group and take photos with them.

When we were over in Moscow, they *did* take us to one of their circuses. They had a lot of trained animals and all. Like I have mentioned, I thought that they were just very gracious with us in the visits. They also took us to the ballet there one time.

In Moscow?

In Moscow. The Bolshoi. Roger Ide who is now deceased but is from Livermore laboratory—he was really a connoisseur of the ballet and he had asked them if they could arrange it, and they did.

You haven't met Fred Huckabee yet?

Not yet. Well, I haven't gone to interview him yet. He's on my list.

Have you talked with him?

He's been hard to—he hasn't been feeling very well.

Is that right? Fred is really a great guy. I took him to Geneva with me on some of the negotiations where we really needed to concentrate on the drilling. And Fred is from Texas and has a very much of a Texas accent. And you know his accent always just fascinated the Soviets. And somebody asked him where he was from. He says, I'm from Maine. And with that accent, everybody was just shocked. The main part of Texas. [Laughing]

Oh, how cute.

Yeah. But with his accent and his personality and nature, they really liked him, really could associate with him. And of course he was an expert in drilling, too, and so did well.

Amazing, the people who got to go to Geneva.

Quite a few, yes.

Now what was your background?

Well, Bachelor of Science in Electrical Engineering, Master's in Business Administration. After [00:05:00] graduation I worked for Boeing a couple of years in the Minuteman program. When EG&G [Edgerton, Germeshausen, and Grier] was in Seattle recruiting, I went down and interviewed with them and they offered me a job, so my wife and I moved here in October 1966. My first job was out at the test site for EG&G. I worked in the timing control area, originally for Livermore and then over on the Los Alamos side, so I knew pretty well the signal generation, sending out there the signal set being sent down to the devices, which helped me tremendously throughout my career. While I was with EG&G, I also did several presentations to Nuclear Explosive Safety groups. Before a nuclear device is assembled at the test site, there's a special panel pulled together to review all the proposed operations and to assure that it can all be done safely. And so with EG&G, I made several of the presentations, particularly on the arming and firing, or the T&F system, the timing and firing.

Who are these presentations made to? Are they made to lab representatives?

No, they're made to the Nuclear Explosives Safety group, which would be chaired by a DOE person and then would have a representative from Sandia National Laboratory and Los Alamos National Laboratory and Lawrence Livermore. But that panel would kind of look at all facets, write a report to the manager of the DOE in Las Vegas—

Would that be like Nick [Aquilina]?

Like Nick, for his approval that we recommend that things as proposed should be fine, or that they would make some recommendations for changes. Now after I left EG&G and went to DOE, I chaired the safety studies for a while, and then I also worked in the NEST [Nuclear Emergency

Search Team] area. Worked in that area for, I guess, oh, eight or nine years, and then for a year was the director of the test operations division where we actually do the DOE support of the testing at the site.

So you got to come to Las Vegas pretty much and stay in this area, not get transported to other places like Idaho or—

Right. No, I stayed here. From '66 till the present, I've been here.

You've been a resident for a long time. Do your neighbors know who you are or what you do? I wondered about that as I drove up.

No, I suspect not. I can't believe they'd really care. There are times there's only—your past is only kind of important to you yourself, I think. But anyway.

That their neighbor participated in the Geneva testing talks.

Yeah. Well, it's not something you usually talk about.

They probably don't know, do they?

No, I'm sure they don't.

Well, I think there's a lot of children and grandchildren of test site workers that will be very interested to know some of these details.

You know, I'm sure that Troy [Wade] anyway made the point, maybe Nick, that virtually everybody that worked out at the test site, I think, had really a sense of accomplishment, a sense that they were contributing to world peace. And I know that there's a lot of the antinukes people feeling otherwise, but I think the people I knew, I always felt really felt that they were making a contribution. And I think that gives you a lot of satisfaction.

Well, you really got an inside view of the standards that they used for making things safe, too.

Well, absolutely. I was in at various levels throughout my career, like the presentations to the Nuclear Explosives Safety boards, and knowing that when you design a system that's going to be used out there, what you have to be looking at to assure that you have a [00:10:00] safe system that the board would concur with it. And then being able to chair the Nuclear Explosives Safety studies later. And then in the Test Operations Division, having oversight for the Containment Evaluation Panel. And then as the assistant manager for Operations, and even prior to that, being the test controller, but being the AMO, seeing all the radiation safeties put in around the test site. There's the Threshold Treaty Review Panel that the AMO chairs. Even before the treaty for the Threshold Test Ban was signed, which limited nuclear explosives to 150 kilotons, both the U.S. and the USSR at the time abided by it. And so on the U.S. side, for any device that had the design yield of 125 kilotons or better, there was a committee pulled together to review and to assure that indeed you wouldn't exceed that 150 kilotons. But there are just an awful lot of safety features put together to do things safely and also if there *is* an accident—and no matter how safe you are, you know, you're just sure there's not going to be an incident, but there's always some chance—making sure that you have all of the resources and capabilities to respond to it. It was just ingrained in you from day one that you'd be thinking safe, and you looked out for the public health and safety.

Then how do you feel about some of the accusations that you've heard? I mean when they say testing wasn't safe for this reason or testing wasn't safe for that reason. Are there things you would like to respond to?

Not necessarily. I think a lot of the people that make those statements absolutely don't know what they're talking about. Congress, several years ago, probably four or five years before I retired, put together a group, a Defense Nuclear [Facilities] Safety Board. And they went around

to all the DOE organizations looking at anything that dealt with special nuclear material. And so our operations were looked at extensively by that board and we did fine. Congress had put together under their—it kind of escapes me, but their—like a GAO [Government Accounting Office]. Anyway, a technological review group that Congress had empanelled, and they came out looking at the testing practices and containment. Containment was their big issue, and whether indeed what kind of leaks we'd had and how we responded to them, our monitoring capability, and on and on. And of course part of those hearings or reviews that they had, we gave a lot of presentations as to how we did things and why we did things the way we did. But there were some of the various antinuclear groups that gave presentations that they thought that we were not safe. There was one guy that I remember explicitly from West Germany that felt that we could have a massive leak at the test site and would never detect it. And he just went on and on, on that. But the bottom line, when they did their analysis, they came back to the conclusion that no, the DOE had the bases covered. Just the extensive monitoring capability we had out [there]. So I think that a lot of the people that make the arguments really don't know what they're talking about. And a lot of them have their own private agenda. We all have our own opinions on things, and a lot of them, I think, are absolutely wrong. But bottom line, I just think that a lot of them don't know what they're talking about, or do they care to know, really.

Have you ever been able to sit across the table with anybody like that to answer those kinds of things, or is that just not something you have been able to do?

Oh, I've participated in many conferences, meetings, usually at DOE headquarters or organized [00:15:00] by them where indeed there were discussions back and forth.

Do you think it was mostly closed and already—?

By and large, I think a lot of it is. Now there are some people that indeed would kind of change their opinion. This individual that headed up this GAO-sponsored group, when he came out he acknowledged that he was not in favor of testing, but he assured us that he would be open-minded. And right then, you kind of think, ah, he's already against us. But I have to say that indeed he stuck to his word. He was, I thought, very fair and open and certainly came to the conclusion that, by and large, the containment for the tests were sufficient and that the setup that DOE had was good. So indeed there *are* times that you can see some people *do* change their opinion.

Do you think that the Soviet threat is sometimes minimized as far as the necessity for nuclear testing?

I don't know exactly how to answer that. The threat that the Soviet Union—when the Soviet Union was falling in Russia, the transition between the two, I had some concerns about the safety and security of their nuclear devices. I think a lot of that, and the U.S., you probably know, helped a great deal to try to fund and help assure the safety and security of those nuclear devices. I think most of those issues are behind us, although you always still have some concern that you don't have some material being sold on the black market or something of that nature. Whether you say that the threat is such that the U.S. needs to return to testing or not, I would have to leave it to people that are much closer to it than what I am now. My *belief* is, and I know Troy Wade doesn't agree with me, but it would be awfully, awfully hard for a president to ever reactivate the testing program. That's not to say that if there isn't a major problem, that there wouldn't be one or two tests conducted. But even then it would be a major issue, I think, to do that. But I wouldn't believe it would reconstitute the test program, and certainly not the way it was.

Aren't we also starting to lose some of that expertise and knowledge?

Oh, absolutely. When you go through a program like the testing program, and as I mentioned, there always was so much stress on doing things safe, as you go along, you learn. If you go back in history, obviously the first tests were atmospheric, so that there was a lot of debris that was released. Then you went to various types of containment and underground, but any release from the underground was certainly a lot less than the atmospheric. What I'm getting to is as you go through time, you're learning better and better containment techniques. There are things that you have tried that you see have failed. The risk is that when you try to start back and you don't have some of the people that have some of that history or whatever, that you have to relearn those mistakes. There's, I think, times that you look at a problem and you say, Ah, this is the obvious solution. When the old head that might be looking at it says, Well, you know, that direct path isn't the best one. You go a little different way, because that individual has some experience that you don't have and experience that if you tried to go out, you're going to learn.

I was surprised how many test site workers came for a couple of months and end up staying for twenty or thirty years.

Well, it was, I think, overall a great program. The test site is a fascinating place. But I also get back to the point that I think most of the people that worked out there felt that they were making a contribution to world peace. You know, you just have the [00:20:00] satisfaction of feeling that yes, you helped.

Now would you agree with Troy Wade that the test site helped to win the Cold War?

Oh, absolutely. That's what I'm saying, yes.

Would that be an articulation of what you just said?

Absolutely. That's what I'm—yes—you're keeping world peace, whatever, in the Cold War.

Yes, I would agree with that. I really think people that have worked out there can take a lot of pride in their work and their accomplishments.

Was it hard on your family, your work there?

I don't think so. Theresa is a pretty capable individual. When I first came here, I was working at the test site, so I took the bus out to and from, usually, and I was going to school nights at UNLV [University of Nevada, Las Vegas] getting my MBA. Since I had a technical degree as opposed to a business degree as an undergraduate, you have to take double the classes. That is, you take all the solid undergraduates at a graduate level and then what you need for the MBA. So I was gone quite a bit that way, and throughout my career I've traveled quite a bit. But I think they were able to adapt quite well.

So you didn't have a problem of not being able to tell her what you did, then?

I just didn't talk about work, period. Never did. And she always accepted that quite nicely. It didn't bother her and it certainly doesn't bother me not to talk about it.

When you come home, you can leave it at the office, I guess.

Well, you don't always leave it at the office, but you don't always verbalize it, either. With any job there are things that you bring home and you mull over and maybe losing sleep at night or whatever, but it's not something we have to discuss or whatever. So I don't think that it ever bothered the family at all.

How many kids do you have?

Two. My son is here and left just before you came.

I saw somebody walk out the door. That must've been him.

That's my son, yeah. He works up there in the Howard Hughes Center.

The financial district?

Yes. So he came home on his lunch hour, wanted to chat for a few minutes. Then the daughter, she lives in Carlsbad, New Mexico. She has three children, a boy that just turned seven and then twins that are about a year-and-a-half now. So I don't have a real large family.

Were you able to do things within the community apart from the test site, or was it mostly work for you?

Well, mostly work, I would say. I haven't tried to run for office, if that's what you're saying, or worked for charities or something.

Oh, no. No, I'm talking about Little League, Boy Scouts, church, that kind of thing.

Yes. The son participated some in Little League and soccer, but not a lot, and I was never a coach. For one thing, I don't think I have quite the disposition. Now my older brother is just great, and he's been a coach and he just has that knack for—kind of like Nick, you know, just—

The personal touch?

Yeah, real good. But I don't think I would be quite that—the best coach or anything, for a couple of reasons. One, of course, I'm not a real sports enthusiast, and therefore I don't know a lot of the ins and outs of sports. So I wouldn't be very good at teaching them and just wouldn't be the best dealing with them, I don't think.

Well, sometimes we take what we are and—

Well, you have to. You bet. Absolutely.

Now where were you from?

Born in Wichita, Kansas, and then moved to the Seattle area just before I turned fifteen. And then about six months after Theresa and I got married, we moved to Las Vegas.

What college did you go to, then?

In Seattle? Seattle, Washington.

Oh, Seattle, Washington. Well—

I'm sorry, the University of Washington there in Seattle.

So then you pretty much had college and then came to begin an electrical engineering career, EG&G, is that right?

[00:25:00] Well, I worked two years at Boeing after graduation.

Boeing. OK. You didn't have a military background.

No. I had ROTC [Reserve Officer Training Corps] in college and that's it. When I graduated, it was the height of Vietnam, and so I went down, just before I graduated, to join the [U.S.] Air Force. They had this six months' active duty and six months' reserve. But I didn't pass their physical. Then when I went to work for Boeing, they automatically put in for a defense deferment. When we came here, when leaving Boeing, they notify the draft board that you're no longer with them, so I was sent over to L.A. [Los Angeles] for a physical and didn't pass it.

What was the problem?

I had some stomach problems. But anyway, I've never been on active duty.

I was curious about that. Would you mind talking about your mother or father's background and kind of what they were from and like?

My father came from Missouri to Wichita. Worked at Boeing most of the time in their Quality Assurance Program, and in fact that's how we went up to Seattle. He was transferred from Boeing Wichita to Boeing Seattle.

And how your first job was with Boeing.

Yes, more or less. I actually had three jobs with Boeing. While I was going to school, I worked—they had a little off-campus engineering group. I worked there for a while. And also for

one year, I worked downtown Seattle at a night shift. I'd go to school during the day and then work second shift at Boeing in their wire assembly shops. It kind of wore me down, so I had to quit it. And then when I graduated, I went to work as an engineer there.

And what about your mom?

My mother came from Oklahoma. She did hold down several jobs, did a little real estate work at times but primarily bookkeeping work. But it was kind of off and on. And then my father passed away in '87, my mother in '98.

Do you have any siblings?

Oh, yes. There are five of us total. I have the older brother I mentioned a moment ago, and then two younger brothers and a younger sister.

Oh, four boys and one girl.

Yeah. Wasn't she lucky?

And what are your brothers doing?

Well, my older brother's retired. My brother just younger than I works for the Burlington Northern Railroad. My sister sells real estate. And my youngest brother works at Boeing in Quality Assurance.

What parts of the country are they in? Are they scattered out?

They're all within about five miles of each other.

Really? Except for you?

Yeah, except for me. They live kind of in the Bothell [Washington] area. My one brother lives in Everett, but he lives about five miles away. They see each other frequently.

That's nice. Well, I'd like to ask you just some philosophical questions here. What do you consider to be the most difficult time of your life?

Probably about the time I left DOE was the most difficult. Terry Vaeth was the acting manager and [I] didn't quite agree with how he was posturing the test site there. And you know you kind of come down to a choice of either banging your head and accepting it, or leaving.

Now what year was that?

Ninety-six. Ninety-six is when I left.

So that was pretty much when things were starting to stop, then.

No, actually it stopped in about '92, so the testing itself had stopped. There was a time that we went through a lot of studies, thinking that it was going to be starting up, and never quite got the approval to start up. Went through a big effort to get these subcritical experiments approved, where you set off some HE [high explosive] that had nuclear material but it was in such a configuration that you wouldn't get a nuclear contribution. But did briefings up to the Secretary [00:30:00] of Energy for there and finally got them approved just shortly before I—a few months before I left. But in my view, something like that—and the labs certainly pressed for them—if we didn't get a program like that going, there just wasn't something for the test site to continue to do.

Could you feel an end of an era, then?

Yes, you do, somewhat. You kind of recognize that certain things have changed drastically and will never be as they were before. And obviously you can't hold on to the past. You need to accept it and you need to try to tailor things to meet the needs of the future the best you can.

Did you go into full retirement then, or did you do some contracting-type things?

I did a little consulting, but Theresa and I for years have had rental property. Right now we have twelve rental houses and most days we're out there working on them. In the last about three years, we've had quite a turnover. A lot of the tenants we have had have been in them for many

years. So going in, you want to bring them back up to an excellent condition, so there's a lot of rehab. So the last three years, we've been running pretty fast to keep up with it.

If you had to do it over again, would you make any changes in your life?

Obviously all of us have made some changes, but I think the question is more, Would you make significant changes, major changes? I don't think so. I think I'm pretty happy, satisfied in my personal life, and by and large, in my career I've been pretty happy. I didn't particularly like working for Boeing. You may never have been inside one of the Boeing facilities but engineers are considered pretty high up there. You walk in and you walk into this big building and as far as you can see is row after row after row of desks, and each desk is butted up against the other, and you have a little chunk of work that you do, and it really wasn't quite what I liked. When I came out to EG&G and then also to DOE and worked for them, just the freedom you had, the breadth of work. In engineering, there are just circuits, design circuits or help implement or integrate different concepts, like when I came out to the test site, prior to that, all the timing signals were sent over hard wire. It's 19-gauge telephone wire from the control point wherever you're going. And I got there just at the time they were starting to change over to pulse code modulation, where you send multiple signals over one line. And also the microwave systems for telemetry and all. So you know, there were just an awful lot of projects that you had an opportunity to participate in. And then with DOE, just a great opportunity on a variety of things. The NEST program, the Nuclear Emergency Response program, and helping in the very early phases of it, to be able to work that.

Can you talk about the NEST program?

I think most of it's able to talk about it. But also things you may have been told about, the operation warning, like going up to Canada to help retrieve the Russian satellite. And then things

like going to Geneva, and I've gone for DOE to the UK [United Kingdom] several times, and France, and Germany. It's just that there was such a opportunity to do a variety of things.

Once you got out of Boeing, the world just opened up for you, didn't it?

Yeah. Boeing was a good company, or is a good company, but still, you didn't have the freedom and the breadth of experience that someplace like EG&G or the Department of Energy allowed. I've been very pleased with it. As I mentioned earlier, I've been fortunate [00:35:00] through my career of having some excellent bosses, and just things went well.

What was your best time of your life? It sounds like you're describing that right there.

Yes, pretty much. I would think maybe around the JVE time. The '87 to '90 time period was probably the best. Of course, you always think the best is coming yet.

Didn't that make your work at the test site extremely meaningful, though, to have this closure of the Cold War?

Yeah, but you always feel that you have the closure of the Cold War, but as I mentioned, you have the concern about are all the Russian or the Soviet Union nuclear weapons safe? Or all the nuclear material over there, is it controlled in such a way that it's not going to get out of hand? So there's some parts that you think are super good. I was glad to see the Cold War over, the Soviet Union fall. At the same time, I think it presented other challenges to the U.S. and to the world.

These renegade nations that might get access to that material.

Right. And at the time of the breakup, not all the weapons were in Russia proper, although they took efforts to pull them back.

It's a little easier when your enemy is all in one piece rather than scattered everywhere. That probably raises a lot of concerns for the future, doesn't it, for you?

Well, you know, I have absolute confidence in the ability of the U.S. to handle things. Indeed, I think that there's a lot of areas where the threat's different than what it used to be, and certainly if the threat's different, the response has to be different. But in my view, the U.S. is up to the challenge.

Well, you have seen some pretty loyal, confident, patriotic people.

Well, you know, you had mentioned early on that there's something like eighteen agencies involved in conducting a test. The atmosphere out there was just different than you'd see in most places, and where you had so many different organizations working shoulder-to-shoulder and all, and when you come down to firing the test, there's that one individual that's in charge, the test controller. And you got good support, just absolutely good support. And people like Nick helped that a lot, and Troy before that. But obviously the culture like that was developed years ago within the Department of Energy, the Nevada operations area, and you just worked well.

Nick called it a single-minded mission.

To get everybody to get the job done, that particular job, you bet.

Quite a remarkable sense of teamwork. Well, I was astonished to find out how many agencies had to come together in order to do a single shot.

Very early on, the old AEC [Atomic Energy Commission] felt that to have credibility with the public out there, there had to be more than just the Atomic Energy Commission personnel.

People like Dowdy [sp], EPA, but before—whatever they were called—Public Health Service.

And NOAA. You had to have people that were experts in their various areas and that would have the credibility with the public. So whoever started tailoring things the way they went, I think had a lot of foresight, and certainly the people coming along and helping develop it continued on.

Things worked well.

I've been so impressed by this concept of committees and examining and questioning and really scrutinizing plans as they go forward.

Oh, yes, several times. And if there is a problem, that you call it up short and you solve that problem before you proceed. It was just an ingrained culture, that you did things [00:40:00] safe. When you're setting off a nuclear device, there's a lot of power there, and if you mishandle it, you can have bad consequences. Everybody involved recognized you had to do things right. You had one chance. If you did them wrong, you felt that the program was shut down on you, and perhaps rightly so. You had a responsibility to the public. The people offsite had no control over what you were doing, but their wellbeing depended upon what you did, what decisions you made, what actions you took, and you had a responsibility to them. So I think it's something you don't take lightly.

Yes. Well, even the fact that nuclear testing went underground for the sole purpose of public safety.

Right. Of containment. Right.

Yes, and that's a lot of extra money, extra drilling, extra manpower to contain it.

Sure. Yeah.

Well, if there's anything else you would like to say to protesters or anybody else, feel free.

No, I never liked talking to the protesters. We dealt with a lot of them out at the test site. And obviously they have absolutely their right to express their opinion. They of course didn't have the right to come on the test site and try to disrupt things. But at the same time, I always felt that we had to act prudently. We had to be able to show that we tried to protect their safety. And nobody got hurt. When we started having people really coming on the test site to disrupt tests, [we] implemented several things. One would be a siren that started several minutes before we

conducted the test, where we had the area under video surveillance. We did that so that if anybody happened to be there that we had passed over, they could make their presence known and we could go in and help them. We also set up perimeters such that we took great care to make sure that people *were* excluded. But trying to make sure that they *were* safe. At the same time, they weren't welcome, either. But I think the protesters, certainly their mindset is not one that I would concur with or agree with.

Well, I have really enjoyed this. I think I'll go ahead and turn that off.

[00:42:53] End Track 2, Disc 2.

[End of interview]