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

Interview with Patrick Rowe

November 5, 2004
Las Vegas, Nevada

Interview Conducted By
Joan Leavitt

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Joan Leavitt: *OK. I'm sitting here with Pat Rowe, and will you just go on ahead and talk about your life leading up to working at the test site.*

Patrick Rowe: I was born in Denver, Colorado. Shortly after Denver, we moved to Southern California, Southern California to Dallas-Fort Worth area, and eventually we ended up about 1965 in Santa Fe, New Mexico. Pretty well raised in Santa Fe. As a result of that, we used to take annual school trips, field trips, up to Los Alamos and visit their museum. So I was quite knowledgeable, even at the age of five or six, about Los Alamos, what they did and what their involvement was in the Manhattan Project.

Now that was in 1965, '66, so you were knowledgeable about it because you lived in that area?

That's correct, just because of growing up there. Eventually, just before I graduated from high school, we moved to Albuquerque. When we moved to Albuquerque, we started finding a little bit more about Sandia's involvement in the weapons environment and their conditions.

Was New Mexico quite proud of Los Alamos?

Oh, very much so. They are quite proud of both Sandia and Los Alamos, and they used to be considered almost one laboratory. It was almost Los Alamos South and Los Alamos North. Over time, Sandia branched out into some other areas and they became their own separate laboratories. They have some close ties even today.

Are they still very proud of that history?

Very much so.

So they haven't experienced this metamorphosis that Las Vegas has towards the [Nevada] test site?

I think the metamorphosis that you've seen here in Las Vegas that's occurred over the years is relatively recent, and I think it has been because of the large influx of the folks that have come from other places into Las Vegas who were unaware of the fact, even if they had been here on vacation before, that the test site even was in operations and that we were conducting weapons tests out there, even though some of the casinos would announce that there would be a test and people would walk outside and watch the northern light kind of light up, and then they would go back to gambling. But I think for the most part there was not a lot of general knowledge that it was here. I do know that having been *the last* REECo [Reynolds Electrical and Engineering Company] employee after forty-four years and over 160,000 employees, when I first got here it was not unusual when people would ask you, `Where do you work?` That we weren't allowed to talk that much about what we did. When they would ask, `Where do you work?`, we could turn and say, `We work at the Nevada Test Site.` It was not uncommon—in fact, I would say that probably nine contacts out of ten – they had someone that they knew, whether their fathers or brothers, aunts, uncles, whatever, had worked or *did* work at the test site. And so it was like, `Oh yeah, yeah, we know about the test site.`

OK, we were talking about Las Vegas attitude towards the test site, comparing that to New Mexico.

In several instances, it wasn't uncommon to have—for instance, at that time Las Vegas was a town of two hundred thousand people, of which approximately between ten and twelve thousand people crossed the gate each day. So it was not uncommon to have folks that had worked at the test site previously with the laboratories. So it was much more accepted. It wasn't the same

attitude that just recently we experienced related to the license plate [mushroom cloud design proposed for Nevada license plates] that we were trying to get across, and we actually had state representatives that made comments about, `There's some things that are better forgotten`, et cetera, which upsets me quite a bit. I think that's more of an attitude of other folks that have moved into Nevada versus the people that were here at that time and have grown up with the site.

Well, I'm curious. In New Mexico, was it a large part of the economy, the workers who worked there?

It is, just because of the fact that Los Alamos itself is almost like a company town. There's not a lot of land up there, and so most of the people that are up there work for the laboratories, or their spouse or siblings work for the national laboratory there.

So they can see thatt as an important part of their industry and livelihood.

In fact, the city itself, when it was originally developed, was a closed town, and so people would go into Espanola or they would go into one of the other surrounding areas for dinner, and their license plate didn't say Los Alamos. It was a town that essentially didn't exist. Even today, you can look at Santa Fe which has grown significantly since that time, as well. A large number of the folks who are on the managers' aspects of the city and that provide counsel to the city, et cetera, are folks that live in Santa Fe but work at Los Alamos. When you *have* a group or you have a huge number of very strong scientists, doctorates in almost anything, it's a *tremendous* scientific basis, and as a result, Santa Fe and Los Alamos both have very, very strong science programs within their public schools. In fact, out at Los Alamos it's typically a Los Alamos child who wins the mathematics award for the United States because there's a good chance that their mother *or* father or *both* have their doctorates, and there's a *tremendous* emphasis on education,

and that's kind of gone in—and they are well-paying jobs, generally, but they're the same thing here. If you look at the difference in unions, we have a large number of unions. It's a union house up there at the test site; it's a union house pretty much here in the city of Las Vegas. The prevailing wages are essentially the same. One of the *big* differences is if you look at, for example, a casino that hires ten, fifteen thousand people. That's a lot of people, but the average pay for those folks would be lower on than average than for those folks that would work at the test site because of the technical basis, the scientific, the engineering, the construction work. So when you have a town of two hundred thousand people, their contribution back into the city *was* fairly significant. It's not *near* as significant today as what it was then. Now we have a valley of 1.6 million people. We have a casino that [employs] fifteen thousand people. The test site, we may have, between both Yucca Mountain and the weapons site, close to—it varies, but somewhere around fifteen hundred to two thousand people up there. And you—

So it's a much smaller part of the overall—

It's a *much* smaller part, and it's kind of a shame because some of the secrecy issues of what we did at the test site, I would've hoped that there was much more of an impact into *our* local education processes and elements, as well, and I don't think it has been *near* as significant as it is within—

The interest in science hasn't been there kind of like it was in New Mexico, has it?

That's correct. Well, even in Albuquerque, with Sandia National Laboratory, it still—and at that time, Santa Fe being smaller than Albuquerque, but Albuquerque was about the same size as Las Vegas here, and even *with* that, the scientific community of Los Alamos and Sandia had a much larger impact on the community there. And I know that for a fact of having gone to high school

there that they would take kids and they would put them in the science program at the national laboratories there at Sandia.

So are you saying there was more interaction into the community?

[00:05:00] *Much*, much more. Much, much more.

And that's lacking here at the test site.

And I think a lot of it has to do with because of the distance. *If* the test site was right up next to the city, well then I think it would be much easier for folks to go over or to involve their kids and go. But since the fact that it's sixty miles to the border, it's *another* thirty-five to forty miles to the edge of where we did the testing—

Well, isn't the problem, though, with the labs you're not having the sense of the danger of the radiation. The lab isn't as dangerous a place, perhaps, as the test site?

I don't think that's the case because I think the test site as a whole is a very safe place. I think it has more to do with the fact that you have a larger concentration of scientific people in a small area, and not every one of those people in the national laboratories work on classified programs. There is obviously a substantial number that do, but there's also folks that work within the environmental fields. There's other folks that work in—I mean you name it, such a myriad across the board, and as a result of that—

Do we have so many scientists, I mean in our community, as Sandia would?

That come and go.

But are not residents.

That is correct.

OK, so that would be one difference, is that they would be residents *in New Mexico, whereas they would not be long-term residents here.*

That is correct. And then if you take a look at it, for example, but we had engineers out there, we had scientists that *are* in residence, that live here. The other issue, though, is these folks were more available because they were right there being able to interact within the community. With the test site, just to come in—if you were to come in for a meeting, it's several hours, and then to turn around and head back out. It just makes—I think it's more convenient to have a national laboratory right next door, and it's more convenient for those scientists and the engineers and the other folks that are highly educated to interact with the community in a very positive manner. And it's a little more difficult because of the fact of the test site and the distance that we have in the test site, and the fact that these folks were working *long*, long hours. We would catch a bus at between four and five o'clock in the morning. We would not get home until seven, 7:30 at night. And a lot of that was seven days a week. Just *long*, long hours put in. It just makes it a bit difficult to communicate and to contribute to the public like they did in the national laboratories.

So it sounds like Las Vegas, then, perhaps didn't get the involvement or maybe even the participation. I mean I'm not saying it was a bad thing because they were focused on doing the testing and they were trying to get a job done within time limits and they were trying not to spend more money than they needed to. I mean there were a lot of reasons, but it seemed like the public relations end of things maybe was not what it could have been.

Well, I think part of it, and let's go back to you made a statement about the monetary aspects of it. The vast majority of those folks that went into the test site each day, between eight and ten thousand, the vast majority of those people live here in the city of Las Vegas. The budget was over a billion dollars per year. The vast majority of that budget came back into this community of Las Vegas and helped *build* Las Vegas to what it is today. So from an economic perspective—*Las Vegas benefited.*

Most definitely. Very, very significant.

Yes. But it's just too bad that it didn't benefit from a public relations point of view.

That's very true. It did not. It did not. But in my mind, it doesn't deter or take away from the contributions that they *did* make, both nationally and even in the community. I would have *loved* to have seen a little bit more effort or ties into like UNLV [University of Nevada, Las Vegas] to strengthen the engineering school here at the school, do some other activities, and I think there *could* have been that relationship, but I think that the cloak of secrecy kind of helped keep some of that from happening. In fact, again I was not at liberty to talk about what I did at the time. It wasn't till Secretary [Hazel] O'Leary came into office that it became a lot more open in being able to discuss. It made for some very interesting relationships because you would go to a dinner party or other get-togethers and almost the first thing everyone asked you is, `What do you do?` And of course you weren't going to lie to them, but on the other hand you really couldn't tell them that much of what you did. And most of the people here understood it. The minute you said you worked at the test site, then all questions kind of stopped, and they knew that you weren't at liberty to discuss what you did.

Well, I grew up in the shadow of the test site. I knew that something went on out there but, you know, it didn't really—and it was before the sixties where it was a big party-type acceptance of **[00:10:00]** *it. But I didn't ask questions either. The test site, you just kind of said, `OK, that's not an area where we get to inquire.`*

That's correct. And it allowed us to continue to do our job, and I think we did some pretty remarkable things.

Now the underground testing—oh, you know, we didn't really finish—I got distracted—I distracted you from Albuquerque, and maybe we could—because we're still trying to get you to the test site.

Sure. When I graduated from school there in Albuquerque, from high school, at the time I was thinking about going into engineering. In fact, I've known since I was about nine or ten that I was going to be in the engineering field. It was just a matter of which one. I was thinking about either chemical *or* petroleum engineering, were the two interests.

Well, was your father or mother engineers?

No, my father was a geologist. My mother was a nurse. My father, though, hadn't worked in any kind of programs or anything like this. It was just I've always had a very strong background in physics, calculus. Those are the fields I loved. Didn't really care for English, really didn't care for some of the other programs. I loved history. But it was really along the scientific and mathematical boundaries that I really found and really excelled. And so about that time I was thinking about going to school there in New Mexico, but as I called some of the major oil companies, because that's who I thought I would be working for, and asked them where they recruited from, they didn't recruit from any of the New Mexico state schools. There's a little school just outside, just south of Albuquerque, and it's a technology center, and even that, which had a program in mining and petroleum engineering, they didn't recruit there. The big companies also did *not* recruit for chemical engineers from New Mexico State, which I felt at that time had a pretty strong engineering school. And in doing so, when I asked them, I said, `Where *do* you recruit from?` It came back that they recruited from Texas, Texas A&M [Agricultural and Mechanical], and the University of Oklahoma. And so I decided to apply and was accepted to the University of Oklahoma, which as it turns out, that's where my father got his geology degree from. And so I went back there. I put myself through school—I worked in the oil fields of Texas and Louisiana, Oklahoma—and graduated, and about the time just before I graduated—I was going to graduate in December, and the summer prior to, REECo, Reynolds Electric and

Engineering Company, were recruiting for interns, for engineering interns, in the drilling department and other areas. And this is about the time the oil field had taken a major nose dive, so this is early eighties, and the oil field, everything's drying up, the jobs that I actually had preliminary contracts with, everything died, and I could see the writing on the wall. And so I went to an interview with Bill Flangas, and Bill showed this movie about big hole drilling and asked if I wanted to come out and drill big holes, and applied, and was accepted, so I came out as a summer intern for REECo, and absolutely loved it. The test site was fantastic. We were doing things on an everyday basis that the rest of the world was trying to do for the first time. It was exciting. It was *fast*. I was using engineering aspects that you weren't—you couldn't—you essentially were writing the book on engineering limits.

Now was it mining engineer? Oil engineering? What was it that you started out with?

In drilling engineering, in petroleum.

Drilling engineering. And you were going to use that in oil.

That's correct.

And then they transferred…. Now there seemed to be a lot of mining and drilling specialties that came together to solve the various problems of nuclear drilling, is that right?

In both of them, and really it's how to build test beds. We signed the Limited Test Ban Treaty [LTBT]. In the Limited Test Ban Treaty, it said that you could no longer—and by the way, there's a background on—we were actually showing that across the world, the strontium level—strontium and calcium are absorbed into your body, and your body has a greater affinity for strontium than it has for calcium. And so we were showing slightly elevated levels of strontium worldwide in the bones of the folks. And so it was decided that we could no longer release—and this was, by the way, Great Britain, Soviet Union [Union of Soviet Socialist Republics, USSR],

and ourself decided that we had to ban and we could no longer test in the atmosphere, deep outer **[00:15:00]** space, under water. So they signed a treaty that made it in 1963 after that there could be no testing. So now we had to look underground. Actually the first underground test at the Nevada Test Site was done in 1957.

Early on.

Very young. And it was done using—drilling was a vertical shaft a little over five hundred feet in depth, and Pascal-A was its name, and this test, it was done using standard oil field practices to drill the hole. Thirty-six inches in diameter was still pretty much the maximum for the oil field and what they would typically drill. Conducted the test. There was no stemming material in the hole. They put it down at the bottom and they *significantly* reduced the amount of radiation that escaped, even with no stemming material on top.

So they knew that holes was a wave of the future, then?

That's correct. And then we did a tunnel test a month or so later, Saturn B. And so that whole series. And then we entered into a test moratorium in 1958. So when we came out of the testing moratorium in 1961, we were pretty much aware that there were some significant benefits. But it was a whole new culture and a whole new paradigm for the testers because you're going from measuring primary blast phenomena, pressure, radiation, neutron flux, you're measuring all these things directly on the blast, to now you're looking at particle emissions from the device, from very nearby to the device. And so your *timing* on your diagnostics now all of a sudden changes. Before you had milliseconds and in some cases seconds and others. *Now* you're talking about in a couple of milliseconds, everything's gone.

They had to learn a lot very fast, didn't they?

Absolutely. Absolutely. And *that's* what kind of caught the scientists by surprise as we started to resume testing, is it *was* a completely changed paradigm. The interesting part is during the moratorium, though, there were *tremendous* advancements in the diagnostics. And these diagnostics were actually set up to where they were *more* conducive with *underground* tests than they were in atmospheric tests.

Well, wasn't it because they were able to go back and really analyze it and spend more time? Was that the Rainier, is that what you're talking about?

The Rainier test was one of the tests that we did shortly after we came back, but it's really the diagnostics of understanding what the device is doing, and *that's* where the advancements were done, is we were coming up with some very, very fast diagnostics, and so being very fast, they could be very *close* to the device and still be able to get the data that they had in time. And in times before—

But they're disintegrating even as the data is being relayed.

That's OK. That's correct. So it gets the information, it relays it, and as it shoots it down a cable, your instrumentation is destroyed. And so as we got better and better at the diagnostics, they realized that actually underground testing—because not putting anything into the atmosphere, we had the diagnostics to work it with. Well then also underground testing started to be—and there were some reluctancies within the national laboratories of shifting those paradigms.

So when the Soviets exited the testing moratorium, and actually over about a four-month period of time conducted fifty-nine nuclear weapons tests, we were very much caught off guard. And being caught off guard, it forced the guys—by the way, during the moratorium, we also had some safety issues to devices that we had actually put into inventory, into our nuclear weapons inventory.

So as we exited the moratorium, a lot of the scientists were not interested in developing *new* bombs. They were interested in answering the *safety* problems related to the devices they already had in the inventory. That was a higher priority. They wanted to do safety tests. That only made the Kennedy administration even madder because we wanted to do these little tests, we wanted to do them, and he wanted to—

[John F.]Kennedy didn't want to concentrate on the safe tests, is that—?

He did, but what he wanted to do is, understand that one of the tests that they conducted off of Novaya Zemlya, their northern test site, is they dropped the SAR bomb. And the SAR bomb was originally designed as a *hundred megatons*. They *modified* it just before they dropped it and made it *fifty* megatons. So they have a nuclear weapon that's a hundred megatons—understand, that's *five* times larger than anything *we* have ever tested, at a hundred megatons, and *now* all of a sudden they *airdrop* this bomb off of their northern test site. *What* a message to the world: `We have a hundred-megaton bomb. In the United States, you don't have anything near this.`

So that was an incentive for the nuclear competition to start back up again.

Correct.

Well, along with the Cuban missile crisis.

Correct. That's the response. Absolutely right. Did we have the capabilities? Were we smart? **[00:20:00]** Could we make the devices? Absolutely. And the other part is, but the safety portion is a very important question because *all* the administrations, whether they focused on that, if you look at it from a worldwide response and say, you know, if you're doing a small test, is that a message to the Soviet Union that you're building back up, you're doing this stuff? The answer is no. Didn't change the fact that the scientists and the administration were very important. In fact, safety was so important that if you look over time, over 50 percent of our budget went to

designing devices that were safer. In other words, they related in safety—for example, we used insensitive high explosives. You could shoot it with a gun. You could burn it in a fire. In other words, they had to be able to survive. These things are on aircrafts. Aircrafts go down. You got fire. You got shock waves. Don't want the devices going down because these aircrafts not only go down over enemy territory, they go down over friendly air space as well. So you want to make sure that the devices *cannot* go off until you really want them to go off. So we went through *extreme,* extreme efforts to make them safe. As we got into later years, we also realized that from a safeguards perspective—in other words, let's say if you had some in a battlefield and your area was overrun, what was the enemy going to do with your now-captured devices? You didn't want them to turn around and be able to use them. And so now you put anti-intrusion systems on your devices. *Then* but the anti-intrusion systems and the insensitive high explosives and everything else we did *affects* how the weapon goes off, because if you make it to where it doesn't want to really go off, then how do you get it to go off when you really want it? Because we had to certify the devices. So you got into some very involved changes.

Kind of like the twist caps on the prescription labels that, you know, it gets so hard to get it—

That's correct. It's to protect what's inside, but in doing so, it protects what's inside. And that's exactly what we got into, was that whole evolution aspect on being able to do what we needed to do but also have the devices—as our systems and our rockets and other systems got more and more accurate, we realized that we really didn't *need* the megaton bombs, and so we were going into more and more strategic-type devices, et cetera, and then looking at the appropriate systems and how to work with it.

And in fact, one thing that's kind of interesting is the whole philosophy, the differences between the United States and the Soviet Union on developing, let's say, an ICBM

[intercontinental ballistic missile] system. What *we* would do is because the nuclear devices we had, we had gone from something that when you look at just the special nuclear materials, the high explosives, we went from a system in Fat Man that was over *eight thousand* pounds and sixty inches in diameter down to something that was quite small. In doing and making it quite small, we got to the point to where we would develop—they would—the Air Force, it was a longer practice to develop the rocket than it was to develop the nuclear munitions that went with it. So they would say, OK, we need generally this shape, this size, this area, in order for this—for our nuclear warheads, and so they would spend all this time building rockets. And then they would come back to the laboratory and say, OK, I need now a nuclear weapon that goes with this that has this characteristics, this yield, has to be able to withstand this. Here's the environment, etc., etc. And the laboratories would then go and develop that. The *Soviets* would develop the bomb and then they would design the rocket around the bomb.

So it was a completely different concept on how and what—how our interface—the Department of Energy [DOE] interface with the military and being able to bring these systems together. And there you get into a lot of the differences between the national laboratories. Los Alamos and Lawrence Livermore did a lot of the same general-type activities; that is, developed the devices themselves. Sandia didn't develop nuclear weapons. *They* specialized in all the systems to make them go off or not make them go off, and all the systems that were associated, anti-intrusion systems and everything else.

So are they more concerned with the safety issues, then? Is that what I'm hearing?

They're both concerned with the safety issues, the laboratories more from using insensitive high explosives, doing safety tests that were related to that, and then Sandia is more interested in how you weaponize this—you'll hear me use the term "device." I don't use the word "weapon" very

[00:25:00] often, and the reason is we didn't test very many weapons. *We* tested a scientific experiment at the Nevada Test Site. It wasn't weaponized. There were a few that we did stockpile stewardship tests that really we tested a weapon. Very few of them, you could do that. And the reason is, is because Sandia designed some of those systems to where, for example, if it had to go up, if it was a missile, you have the initial acceleration as it launches, you've got the rotation of the missile so you get some acceleration related to that, you get it as it arcs back over, and then you usually get a deacceleration, then you get a reacceleration and it comes back into the atmosphere. The weapon is designed to sense all those, and it has to go through all those steps before the device will arm itself to go down. So the laboratories, that is, Los Alamos and Lawrence Livermore, were more worried about, OK, here's the device. Once it gets all the signals, is it going to go off, and what's the yield is it going to go off, and what's the characteristics? How much neutrons? What's the neutron flux? What's the X-ray flux? What's all these other terms? How is this device going to work? Sandia was, what's the environment it has to go through, and how do we make it to where it doesn't go off until we really want it? For example, we'd seen missiles where you launch them and all of a sudden they go out of control and they blow them up. We wanted to make sure that if they blow up that rocket, that that nuclear device is not going to go nuclear, as well.

OK. Now you've been giving various examples of what the test site and the labs perhaps defined as being safe. And I think this kind of a really, you know, I appreciate your explanations. In fact, I'd like further explanations about this. Because one of the criticisms of the test site is that the public might have one definition of safe, or a spokesman for radiation and other things might have one definition of safe, and yet inside the test site they continually asserted that things were

safe. And I think it's really a matter of defining the kinds of standards that were being used to make that definition. Would you like to add anything to that?

Actually it's a wonderful question because that's one of the things that I have been *most* impressed with in understanding *my* actual experiences at the test site, as well as understanding the experiences and the people that were—I'm standing on the shoulders of a lot of wonderful people. Those people that were before me, their emphasis on safety was absolutely phenomenal. And understand that you're in an environment—for example, I'm going to go back to one of *my* personal heroes, Al Graves. Al Graves and some of his early testing parts, and understanding that nobody had ever worked with this amount of energy in this small an area, and he *constantly* asked and he *constantly* challenged his people to ask the question, What if? For example, in the South Pacific they looked at what happens if the device when it goes off shifts a large block of coral, could it be large enough to start a tsunami, and what would be the impact of that tsunami in Hawaii? When they started going through it, they said, yeah, there's an issue here. Maybe we need to put it out deeper in the lagoon so that the impacts on the coral is less. That has *always* been—and the *challenging* attitude of being able to—*anybody* could challenge the safety of anything that was happening. I have never been in any—and understand, I worked in the oil fields, I've worked in the construction business, I've worked in all these different areas. I have never been anywhere where people challenged safety *more* than what they did at the test site.

Have you been able to see the comparison between the Soviets' focus on safety versus the U.S. [United States]?

They have different parameters that they have to kind of deal with. And the answer is yes. There is very much a difference in how the Soviets worked, and some of it actually had to do with the treaties. And what's interesting is that in the treaty, the Limited Test Ban Treaty that we were

talking about a little bit earlier, if you look at the way the treaty is written, they weren't identical in the language between the Russian version and the English version. You'd think that they would be. They weren't.

What was the difference?

The *Russian* version said, `No bad atom out of the test.` So what's a bad atom? *Ours* **[00:30:00]** said, *`No` `atoms.`* So it came down to a question of, again, what's good and bad, for example. So how that changed us was this. The *Soviets* in some of the tests that they conducted is they actually brought the radiation beam out of the tunnel and actually exposed military hardware that was sitting outside of the portal area. We would've *never* even considered that. And the way our treaty was written, the way we interpreted it, we would not be allowed to do that, and probably wouldn't have wanted to do it anyway.

Now that treaty was what, the containment, the tunnels, the underground big hole drilling, is that when all of that began, then?

Absolutely. That's when the underground test beds, whether they're tunnels for weapons effects tests or vertical shafts for weapons development tests, such as building the new devices, that's when that *really* got a push to move forward. And for example, when that was signed in 1965, in between 1961 and about 1965, as we were starting to look more and more, we brought in a couple of rigs. We were still doing atmospheric testing, so we were starting to do some of the vertical holes. We were doing some tunnel tests. Now we're starting to wrap up. Shortly after the signing of that treaty, the, what we call the flats area, the Yucca Flats area—it's on the eastern side of the Nevada Test Site—just *bristled* with rigs. The mesa *bristled* with rigs. We brought in multiple contractors. There was in some cases close to a hundred drill rigs that were operating at any given time for all kinds of different purposes, to look at where's the water, what the geology

to drill the shafts, *all* the stuff to characterize the test site and try to make it safe. We have a very unique area here in southern Nevada which is we picked this area because it is—when we looked at multiple sites around the United States, we looked at Alamogordo, New Mexico, for example, where they did the first shot, where Trinity was done. We looked at Camp Lejeune, the Marine base there in North Carolina. We looked at Dugway Proving Ground [Utah]. We looked at multiple sites when we were trying to choose. One of the reasons why we were looking at even a continental test site had to do with the fact that our South Pacific site where we were doing the tests, there were some issues because the Korean War had started up and there were some real issues about being able to protect that site and *secure* the site out in the South Pacific. Then you had the blockade of Berlin. You had the Soviets conducted their first nuclear weapons test. To take ten thousand people out ten thousand miles in the South Pacific, and along with *all* their—

Expensive.

Expensive.

Not safe.

And a logistics nightmare.

Needed to be mainland.

Need to be—and that's where they started saying, OK, we really want a mainland—and that's at the same time as—when the Soviets conducted their first test we announced, that is, President [Harry S.] Truman announced that we were going to start the development of the hydrogen bomb. So the idea was we needed a continental test site to develop the *low*-yield, what we called the fission portion, of the device, and then we would do the *high*-yield fusion part out in the South Pacific. So we needed a place where we could proof-test a portion of this device, and then we would do the big tests out there. And so in 1951 is where they decided we would use *both* the

South Pacific *and* the Nevada Test Site. So the test site boundaries were established and President Truman signed the order that withdrew 680 square miles out of southern Nevada on December 18, 1950. The first test was conducted on January 27, 1951. And we conducted five tests. They were all air drops, and they were air drops essentially of a device—they were almost like calibrating the test site, and so we were using a device that was very, very similar to Fat Man in its configuration. But understand that even prior to that, we did some tests in the South Pacific, but there wasn't really a push. There wasn't really a real *drive*. We had some weapons in the arsenal, but now that the Soviets had conducted their first test, *now* indeed there was a real emphasis to try and get better devices, cleaner devices, safer devices, than what we currently had. And so that's where we *really* started accelerating our programs. And then in the late 1950s or early 1960s is where we went to underground testing, and then since that time—and then our last test was conducted in September of 1992.

Now the underground testing, the test site ended up being surprisingly perfect, and that came **[00:35:00]** *almost as a surprise because it wasn't originally planned to do underground.*

It was picked for atmospheric testing, and it was picked because it was remote, yet you could fly people in from Las Vegas, you could do the different things you needed, it was dry. Serendipitously, as you said, we probably chose the best area in the United States and possibly in the world for even conducting underground nuclear tests.

Well, it also had a very, very deep water table.

That's part of it. It's an isolated hydrologic basin, and that is that the water that's there on the test site stays within that area. It does not communicate with the Las Vegas aquifer system. So even with all those underground tests, the water's not going to come in and people here in Las Vegas are not going to be consuming water, even water from underground sources, that have

radionuclides in it. It's a deep water table, as you mentioned, which to us that was very important because having a very deep water table means that we could test in a dry environment, which means that our diagnostics could be right there by the devices and we could have it. In relations to that, the French and the Soviets, when they do a vertical test, the French, they're basically in the ocean, so their water table is at line zero, but the Russians, their water table is fairly shallow. It's in the neighborhood of twenty to forty feet below the surface. They have to build and put their device in a submarine-type thing. And the same thing the French do. And so you build this stuff. So how much diagnostics—because it's very expensive to put these things very deep under water and conduct it. So the larger you get, it proportionally goes up in cost and expense. And so the Soviets in their testing, they have conducted in the neighborhood of about 250 shaft tests and about 250 tunnel tests, because their vertical shaft tests, they're very simple diagnostics, they're in the water, their stemming is different than we use. We developed a very unique stemming program in order to keep all the radiation contained underground over time, multi-different materials in different configurations. The Soviets used principally just rock because they have to drop it through water. They can't use talcum powder, sand, like we use, in alternating layers because you drop that stuff through water, it just clogs up and forms a mess, so—

Are you saying, then, that the conditions of the test site made it possible, ultimately, to do more tests there than the Soviets were able to do?

We could do much more complicated tests in a vertical mode—

Because of the geology and the conditions that were there.

Because of the waters that we had there. Exactly. But it also changed how we built our test beds, because we developed a big hole drilling system to where I don't have to have a hole full of fluid in order to drill it. So our systems were designed specifically *around* those conditions, and in

doing so we have drilled over 1,050,000 feet of shaft over thirty-six inches in diameter. And we have done over *seven hundred* shaft tests. The Russians have done about 250 shaft tests. They spent more time in the *tunnels* because in the *tunnels* it's more expensive, but in the tunnel tests is where they could get more diagnostics, they could try and understand a lot more how their devices performed, where they *couldn't* do that under water as easily.

It *also* changed, as I mentioned earlier, our *containment* program. Our containment program, even for our tunnels, was very, very sophisticated over time. In fact, we *shared* that containment program with the Russians in the 1988 Joint Verification Experiment [JVE]. The Russians looked at it and they said, oh, this is wonderful, but their next question is, but we can't use this. They can use it for the *tunnel* part, but because their vertical conditions are so *different*, having water so high up, makes all the difference in the world in how they conduct a test.

Now can you address this issue of this hole? The Soviet hole. Because it seems like this is where U.S. technology had passed Soviet, was in the drilling. Scientifically and even diagnostically, they seemed to be like they were on a par with one another, but the real problem seemed to be that the United States required a very straight, plumb hole, and for some reason when the Soviets were charged with that task, that it did not meet the criteria.

That is correct, and there's two parts to your question. I would tend to refute your earlier statement about saying that they were kind of on par. The Russians technically are *very*, very sound, but they don't spend a nickel more than they have to on equipment. For example, their **[00:40:00]** oscilloscope, very, very fast and *very*, very sophisticated oscilloscope. Their *cabling* was not very sophisticated. And a lot of their support systems were not very [sophisticated]. So where they *had* to spend the money, they *did* spend the money.

But getting to your next part. So I would tend to agree that if you look at the device itself, and I definitely can't go into the classified aspects of it, do they tend to be probably very, very similar? I would say in general cases yes, absolutely. Diagnostically and how they did their tests—in fact, let me just kind of go through very quickly of how that's set up and I'll go into big hole drilling at the same time. Our drilling program, starting again using oil field techniques, we went from that technique very quickly to what we called a dual drilling string and flat-bottom drill bit. But we also went very, very far away from a thirty-six-inch-diameter hole and—

Now do you have pictures of any of this in your presentation?

I do. The Russians are still, for their test program, are still at about a one-meter-diameter hole, and that matches their submarine size. Their submarine is about two feet in diameter and not very long, but they don't do very complicated diagnostics in them. They just basically lower this in, drop rock on top of it, about three-quarter-inch crushed granite, and a little bit of cement in various places, and they detonate these things. They do get leaks out of their system. *Our* holes, though, we use this flat-bottom drill bit and our typical holes were anywhere from eight to twelve *feet* in diameter. We could drill them down and we had capabilities to depths of over five thousand feet.

So you are talking a huge, huge hole the Soviets had never before drilled.

Not like this, and not economical. They use what they call a reaction turbo motor. We refer to it here as a mud motor. You circulate mud through it, it turns a stator which turns a drill bit. Well, you're talking about something that's maybe six to eight inches in diameter. To remove a cutting from the hole, it's to the square of the velocity of the fluid you have circulating. Now that may sound a little sophisticated, but what it essentially means is if you have a hole, particularly a big hole, how do you take a big hole, particularly one that's ten, twelve feet in diameter, and put any

kind of circulation rate through that to get even a small cutting out of the hole? Because all of a sudden your volumes, in order to get your velocities, also your *volumes* go up through the roof.

What *we* did, what we did at the Nevada Test Site, is hydraulically take a ten-foot hole and we make it look like a seven-inch-diameter hole, and we do that by circulating fluid, air and water, in between two sets of pipe. It goes down through the drill bit, picks up the cutting, and comes up through a seven-inch inner string. All the circulation takes place within those confines within two sets of pipe that are integral set together. That system allowed us to keep our circulation system going. I don't have to keep a hole full of fluid now. I can circulate water starting out somewhere about five hundred to seven hundred gallons per minute. Once I get down to about five hundred feet, I'm circulating at about 350 gallons per minute, and I can remove all my cuttings and a cutting up to the size of about an inch out of the hole.

The *Russian* system, since you got these multiple motors, and you think about an oil field dripping on the bottom, and these mud motors are turning these individual drill bits, and then this rig is turning this entire thing around, well think about it. They have a whole lot of open room. And a mud motor means that you circulate down through the pipe, through the motor, and then it comes up the angular area in the pipe. So you got a hole that's three feet in diameter. What's your circulation rate that you have to put through that hole to remove even a small cutting at the top?

Was it quite a bit?

It's significant. Where we pump about three hundred gallons per minute of fluid, they pump between seven and eight *thousand* gallons per minute of fluid in order to get the cutting out. And in fact, when I was over there on the Joint Verification Experiment, I did a hydraulic analysis of their drilling assembly and I talked to their head driller.

Now when was it that you went there?

I went there on May 1, 1988 and I left July 4 to fly into Moscow and left there just a few days after that. So first of May to middle of July is when I was there in 1988.

And it goes back to your second part on this hole straight and plumb. Well, because of the fact that we're testing in a dry environment and we have these things, you think about it. An eight-to-ten-foot hole is a pretty small laboratory to be able to diagnose what a nuclear device does and do it in anywhere from a couple of picoseconds, 10^{-12} of a second, to a few milliseconds, and then it's all gone, but we have to give the scientists as much area as we **[00:45:00]** possibly can in order to do those diagnostics. So that was the emphasis to get to larger to larger, is to do better and better diagnostics. So the drilling program developed the tools and systems to very economically—and by the way, to give you kind of a reference point, where we drilled on our flats, which is relatively soft material, we drilled at an average of eight feet per hour with a ten-foot-diameter drill bit. In *hard* rock the equivalent of granite, we drilled at three feet per hour. The outside world, and that is even the free world besides behind the Iron Curtain portion, drilled at about one-tenth of those rates. So we developed technology that was absolutely phenomenal. We actually went from drill crews of having forty, fifty drill rigs operating at any given time to where we had two rigs operating, one for Los Alamos, one for Lawrence Livermore. We eventually got down to the point toward the end of the test program, because our number of tests had also fallen out, but our excavation rates had gone up so high, I had one drill crew, they spent six months working for Los Alamos, six months working for Lawrence Livermore, because they got so efficient on their drilling programs, et cetera, and it has to do so much with their difference in technologies.

When I've talked with Marat [sp] who is the head of their drilling program and I told him, I said, For your first two hundred feet or so, that's a little over a hundred meters, I said, you're cutting about the size of pea.

And he looked at me and he said, Ja.

And I said, When you get below that, I said, you get down to where your cutting is less than a millimeter.

And he stopped and looked at me very close in the eye and got closer and he says, How do you know that?

And I said, Because your hydraulic system, your circulating system, can't circulate out anything more than that.

And Marat wasn't one of the folks who got to come over and see *our* drilling program *here*, and so he asked me, he says, Well, how do *you* guys do it?

And when I told him that we drilled three-to-four-meter-diameter holes, and I told him the rates that we drill it, he was absolutely flabbergasted.

To get to the straight and plumb requirements, our diagnostic rack that the scientists would design, typically they're somewhere about eighty-five to ninety feet, but they *have* been over three hundred feet in length. And each one of those diagnostic racks has a series of line-of-sight pipes that are lined within six-thousandths of an inch of looking at a very particular part on that device.

Now did you get to see the Soviet-drilled hole?

Yes.

And who actually is the one that made the determination that it would not be workable?

We did. We used our logging crews and we logged it. They logged it before and they came in—

The Soviets did?

They did, before we went over, because we saw them drill the bigger hole, and the hole that we were talking about—there's two holes that are of concern to us in that test. There's the emplacement hole, which is about one meter in diameter, and then there's *another* hole which we call it here the CORRTEX hole, but it's a satellite hole. It's a smaller-diameter hole, about twelve inches in diameter, and it goes down and it parallels at what we call eleven meters plus or minus three, so about thirty feet away or so, and goes down right beside the main hole, and particularly the last bottom three hundred feet or so are the most critical portions because that's where we take all of our measurements from, or our principal measurements. In doing so, that portion has to be *very*, very accurate to the Soviet hole. The Soviets drilled a fairly straight emplacement hole. It went down, then it curved over—it did a little dogleg and cut over off in one direction. Their smaller hole, their satellite hole, went down and it actually was pretty good until it got near the bottom, and it went off the opposite direction. So it diverted. It went beyond this eleven meters plus or minus three.

Because I was reading a telemessage from Guy [Gylan] Allen, and he had been talking with General [Arkadii] Il'enko, and they were trying to figure out a way that the hole could still be made to work with a little bit of U.S. direction and technology, but then all of a sudden it seemed like Geneva had already decided that the better solution was that the United States simply just drill their own hole. And it caught Guy off guard.

That's correct. It did. Again, their hole wasn't too—if you could've come up in the hole—the issue was is we wanted something as close to a hundred kilotons as you could get it, somewhere within a hundred to a hundred and twenty-five kilotons, right there close, because that's what we wanted to verify from the treaty perspectives. And so when it went off that direction, they said,

[00:50:00] Well, can we come back in and maybe bring some of our drillers over,

and could we whipstock it and bring it in a little bit straighter? The answer is we may have been able to do something but the problem is, we might've bound something up in the hole, and if we had bound it up in a hole, well then we would've been in a lot of trouble. And so—

Well, I mean the question that still came back to me was that, whatever, ten million dollars or whatever for flying everything over, was that necessary?

Absolutely. If we were going to do the diagnostics that we really needed to do and keep—because see, what happened—what they were trying to measure is a blast wave when it comes off of a detonation, I don't care if it's a firecracker *or* a nuclear device, for a small distance that wave will move out proportional to the third of the yield of that detonation. So that shock wave velocity becomes almost independent of the media that it goes through. Doesn't matter if it's going through air, rock, mud, water, it's proportional to that yield. So we had to have it close enough to where that effect—because once it gets out a certain distance, *then* it's *directly* related to the media it goes through. And so you got to catch it when it's still within that—when it's independent of the media, which means you have to be very close. Obviously a little farther away from a nuclear device than what you have from a firecracker, but the principle's the same. So that eleven meters plus or minus three meters and that bottom portion was absolutely critical of having that. So the answer is yes, it became very important. We sent a logging crew over. They logged the holes. They logged both holes. They sent it back to Geneva: Is this going to work? Is this going to work? And the answer was no. That's what Troy Wade—

Now by logging you're not talking about wood, are you?

No. What I mean by logging is we'll put a tool in the hole, it may have a gyro on it, and it very accurately tells us what direction that hole goes in and how far it deviates off. And we did it with both holes. We did it with the larger holes and we did it with the smaller ones.

Now that was Larry and that was—that were over there and did that. How did they find that to be?

No, actually Larry Ruud and Fred Huckabee was in the first group that went over to do part of that logging.

OK. That was their purpose, then, was to do—because he talks about spending twelve hours at the site.

That is correct. *Then* the next aircraft that went over, once it was decided, OK, we can't use the hole, so what do we do? And so then it was decided, OK, we'll drill the hole, and that's when Troy Wade in Geneva said, `Hey, then we'll bring our other crew,` and they said, `OK. Bring them.`

He said that surprised him that they said yes.

Yes, it did. Yes, absolutely. To have an American *crew* over there doing construction, particularly after they had tried to drill the hole already. And so the next aircraft that went off had—I was on that very next aircraft. And there was actually a series of aircraft that took [the equipment] because it was the drill rig, it was the drill pipe, our mud motors, all the things that we would need in order to be pretty much self-sufficient to be able to drill this hole. And so we landed there at Semipalatinsk and they came in and they actually brought—our rig was road-mobile, so we had to move—some of our other equipment, like moving drill pipe, they brought in some carriers that would normally move tanks, and we loaded the pipe on these carriers and we took them out to the test site and we started drilling the holes.

And on the average management, even at *that* time, was typically out at the site. We ran two crews, so they were both working close to twelve hours a day, and we drilled the hole. And then at the same time, we very carefully monitored and logged and understood exactly where we were at, at all times. So our hole not only went down straight, but in the bottom section where the dogleg was, we paralleled their hole. So it *was* right in line with what they were doing. We were done, oh, about the middle of June, thereabouts, and so we started sending the crews home, et cetera.

And then they asked me to stay over and help a little bit because we were using some very, very heavy concrete down near the bottom, heavy cement, and the Soviets weren't sure that they could mix it up to what our specifications were, so they asked me to stay and help design the equipment, and so I did. I worked with them and we designed the equipment to mix it up. And it wasn't so much the equipment because they had some good equipment. It was the practices of what ingredients you add when in order to keep the sand from basically falling out of your mix.

Now it sounds like you were very focused on the problem, focused on solving the problem, and what might have been a little bit of a bruised ego, you were able to work past that.

Oh, absolutely.

Now were you there when the bruised ego was, you know, or heard word about that General Il'enko was—?

[00:55:00] Oh, absolutely. To have an American rig on their soil. And we sought input from their crews. But the guys actually, it almost instantly went away because the Soviets, the Russian drillers, helped *our* guys rig up, so they worked hand-in-hand, and so when you're talking blue collar to blue collar and you don't—once the guys—you know, when you rig up a rig, even

though there's some differences between the rig, basically the guys know what to do, and so one guy would start to pick up a hose and two more guys—next thing, you'd look back and there's two Russians helping them drag the hose over to put it in place. Broke out their equipment. And *that* helped change a lot of things. Then it became, well, man, this is a neat rig. This rig that we had was a very, very nice rig and they didn't have anything—their rig tended to be much older designs, and so it was like man, this is really neat. And *then* they got into difference in operational practices. For example, we used a spinning chain. It's standard oil field practices of how you do your initial tightening or loosening. In other words, you throw a chain around it, you pull the chain, and it spins the pipe up quickly. The Russians would not use a spinning chain, they hadn't seen one used, and they were just *stunned* that we used spinning chains. And so when we would be making a connection, and we'd had a horn, because we'd have to do the circulation system along with it, so they would blow this horn, and the Russians would *race* up on top of the rig. Now understand, they're standing there in, for all practical purposes, shower slippers, they have a hard hat on, no safety glasses, and they're complaining about unsafe *we* are by using a spinning chain, and our guys are there with hard hat, safety glasses, steel-toed shoes, gloves, and everything on, and they're standing there on the rig complaining to us about that aspect of it. And I will tell you that it wasn't very long that these guys are drawing pictures in the sand, telling jokes. I don't think it took long to get past the bruised aspects of it. We ended up getting a logging tool stuck against a shelf in the satellite hole, and so Fred Huckabee and I designed a tool to go down. The Russians were the ones who lowered it, and they used *their* crews. In fact, it was amazing because—

I think I almost have to—yeah, I think I have to turn this, so let me do—

[00:57:33] End Track 3, Disc 1.

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

So Fred Huckabee and I designed this tool to go down, and one of the interesting differences in the operations, for example, they were going down on small tubing, and they were going down with a system that would push this tool down, and then we could realign it with the hole and bring it back up. *We* would've use tubing tongs, which is just hydraulic spinners that would spin up the pipe, and that would be great. Well, the Russians didn't have any tubing tongs available because again they don't spend any more than they had to, and after all it was just simple tubing. So they basically put a big pipe wrench on it and they had a whole *line* of Russian drillers standing there, and they would come up and they would put the wrench on it. One would grab it and he would run as fast and as long as he could, and then when he petered out he'd fall out and the next guy in line would grab the pipe. So we went down over a thousand feet with pipe, with the Russians standing in line using a pipe wrench to make this pipe up. So we went down and we got it on the tool, we pushed the tool down a little bit, and we brought it right back out of the hole. And so it was *very* interesting, and I think the blue collar folks—and let me take just a second to talk because I think you'll *really* find this part *very*, very interesting, and it's the fact that blue collar people we found across the world are blue collar folks. They think alike, they operate alike, and they get along *absolutely* famously when you put them together.

Well, the telexes over and over again would talk about the extent of cooperation that they were receiving.

It was absolutely fantastic. Now the other part is, for example, when we did get the opportunities, when the Soviets would conduct a test, they would basically ask us to leave. And so they would bring up some vans and we would head into town and they would take us to libraries and different places like that. Well, with the drillers and stuff, what we would do is I had a couple

cases of Bazooka bubble gum flown in from Germany, and so our guys would stuff their pockets with Bazooka bubble gum, and when we'd go into town and we'd go to a restaurant, when we'd come back out they would try to usher us on the vans and we would just sit down on the porch. And then as kids come by, we'd offer them bubble gum. And they would see our badges and realize that we were Americans and they would come up and say, Do you mind if I practice my English on you? And we said, No, we'd love to do it. And we got some of the most incredible questions, and we were asked, Why do you want to kill us? Why do you want to bomb us? Why do you want to—?

How do you answer that?

I told them, I said, We don't, and I said, That's one reason why we're here, is to get a better understanding between the two countries, to try to give us an opportunity so that we *don't* do that. And I think that's kind of been the whole legacy, in my perspective, on the test site as a whole. I feel that we have, and I think history supports my opinion on it, that we have prevented World War III, so far. Do we have a chance to politically mature enough and socially mature enough to prevent it in the future? I certainly hope so. But the *kids* had been told that. They had been told that you're making sacrifices for Mother Russia because the Americans want to kill you. They want to do this stuff. And so the kids, they were unabashed enough to *ask* us those questions. And it was *marvelous*. And then it was like once we told them that, it was like, oh, OK. And then they would turn, How is it really in America? We hear different things but how is it? How's this? And then they would run and get their parents, and pretty soon we would have, you know, everybody starting—and then they would invite us down—there was a town fountain and the kids would cool off there in the middle of the summer and they would dance, they would play in the water in the fountain. And they would ask us, while they would play in the water, Do you mind if we came down

and just sat down, and then they could play in the water and they could talk to us? And their parents would talk to us. I understand the area had been closed for over three hundred years to foreigners.

That long!

That long. Semipalatinsk actually meant "ten tents." It means that that was a *military* camp. That's where Genghis Khan used to ride up from the steppes of Mongolia into Russia, there in Kazakhstan, and ride up through this area.

They hadn't seen foreigners for three hundred years?

It's been closed. And a lot of their major military—not too far from us was Dolon base, which was a base where they actually had nuclear missiles. This whole area was just, from a strategic military perspective, very, very important to their overall military security. And so it *had* been closed to folks for so long, and now all of a sudden much less to have foreigners, much less *Americans* in this area was absolutely—and it was absolutely wonderful. And I will tell you that Nick Aquilina, when I got back, Nick asked me to—when he went back for the actual test itself and I was here for our test, and I didn't have the opportunity to go back for the actual **[00:05:00]** detonation, but Nick called me and he asked me to come down and talk to him about some stuff and as we were talking he basically said, he said, Patrick, he says, I don't know what you guys did but, he says, everywhere we went kids came up and wanted to know if we had bubble gum and we had oranges, and they wanted to *talk* to us. They wanted to know— And *then* he says, Well, you know, because as a scientist and manager, he says, white collar, they weren't quite at liberty to sit down on the steps and sit and talk with them as much. And so it became a very short period of time to where even the *children* wanted to know when the *fun* Americans were coming back. And Nick identified it that we were—it was incredible ambassadors, and he wanted to

know a little bit more about what did we do, because he says, I went to places that I knew no American had ever been, because they took us to these places, and I'd walk around a corner and on a garbage can somewhere is an NTS Big Hole Driller sticker. And he says, And the people, everywhere we went, wanted to know when the fun folks were coming back. And it was *because* of the fact that it was blue collar to principally blue collar. And they're the same worldwide. Now if you think about it from a scientist's perspective, they're really, because of the way the protocols were set up, they weren't really at liberty to do the same things that we basically took the liberties of doing *because* of the interface between the people and the people, and it made it for an *absolutely phenomenal* event, and *I* think led very, very much to a *much* better understanding between, at least within that small area that we had to influence, you know, a *much*, much better understanding, and realized that we weren't the devils with the tails. We were there just like they were. We got our hand dirty just like they did. In many cases, our roughnecks lost fingers just like their roughnecks had. The risks were the same. And the way we lived was the same. And therefore it's easy to justify that we *weren't* there to do them harm. We *were* there to have a better understanding.

Did you find that they had heard about Las Vegas?

For the most part, no, and what I did find out, because I asked—I observed something. When I was sitting up in our—for the most part, we had an American lounge upstairs. We were in a two-story building right next to an artillery base there on their test site. And I was sitting there one time by myself, and understand we had a whole bunch of couches and some chairs. So I was sitting there by myself on one of the couches and I had like fifteen inches between me and the armrest. And a Soviet came in and he sat in that spot, that fifteen inches. Now if you think about

an American, because of our space that we use, to have someone sit that close to you, particularly someone of the same sex, you would start to—

Be a little uncomfortable.

Uncomfortable. That's a good way to put it. And so I didn't take offense to it but I noticed—I sat on the steps that went down one time and I just observed the Russian lounge, and the first Russian that would come in would sit in a chair. The next one would come in and sit on the armrest of that chair. The next one would come in and sit on the other armrest of that chair.

They liked proximity, then.

They have much closer—but this is what I found out, *why* in those aspects, and it kind of goes back to your question of how they *view* Americans and how they view our society.

As a result of what I observed, I sat down with one of the Russian interpreters and I said, I'm not trying to embarrass you, but I noticed this. And I said, I was just kind of trying to understand why.

And he said, Patrick, remember when we were coming in and I was with you in the Jeep and we went by and you asked me, you pointed toward a small cottage in the country and you asked me how many *families* were in that cottage, and I didn't answer you, and you said, Two. And he says, How in the world did you know that that was two? He says, You were right. He says, How did you know?

And I said, Because there were two TV antennas on that. And I said, And it wouldn't have been—

He says, Now let me tell you my experience in growing up. He says, First of all, you need to understand that in Russia, in this Communist country, a right to free speech is not a civil right. Right to commune and be as a group is not a civil right. He says, What *we* consider to be a civil right is to have

a roof over your head and to have a job. You consider a job to be not a civil right but to be a benefit. We don't see it that way. So he says, You're right. There were two families in that cottage, and he says, and there was probably one bed. One chair, maybe two chairs. So he says, To have that many folks in **[00:10:00]** there, you end up with a very low space around you. He says, And we've noticed that. You guys like your space. And he says, When we want to talk and we get [closer], he says, you guys are stepping back. He says, So it's been an adjustment on our part as well and, he says, it has to do with the fact of how we don't *have* a lot of space, so for someone to say–

You get the roof. You just don't get the space.

That's correct. And so to sit in a couch by yourself – that's what one of them would've done if they had walked in there – would be taking up his *unfair share* of space, and therefore he is actually being, for all practical [purposes], he's being greedy, *and* in some ways insulting, because he's taking all this by himself. And so in their culture, it's very much so, is that that's why they come and sit, because that's where they're coming—that they're not taking up their undue space. He also said, Watch the news. Come down to the Russian lounge and watch the news tonight. And he says, They *always* have a story about America. *Always* have a story about America. He said, We're very interested in what happens there. But he says, Regardless of what they're talking about and who they're talking to, they're going to show the homeless in Chicago or New York. Why? Because it's a violation of our civil rights. So even if it's a story about your president, they're going to show the homeless. They won't say that it's, you know, this, and look, here's the homeless. But the image sits in their eyes very, very much so.

So to get back to your question of how they look at Las Vegas, in our interfaces with the people they finally, over time, when they got to know us—in fact, I had one interpreter who he had been told some misinformation about how they built their atomic lake. And I listened to him very carefully about what *he* had been told, and *then* I told him that what he basically said, that's a lie, and I have the videotapes that your country sent to ours of how this was made. And it kind of stunned him, and he kind of sat back, and at first I felt like, Oh, man, I really shouldn't have said anything. *But* the outcome of that was he finally came to me and he says, Patrick, I'm very concerned. He says, I'm supposed to be one of the trusted. He told me, I'm a member of the Communist Party. I have this. They told me this and they sent you the videotape? I said yeah. I said, Bob, that's exactly right. That was the first time he turned to me and said, What's it really like in America? So instead of taking a canned answer, he now asked me in sincerity, How is it really like?

And before I went over there, I was one of the security escorts here for the Russians that were here. I was also one of the only people in REECo that was authorized to brief the original—when Viktor Mikhailov and everybody came over originally, I was one of the only people in my company that was authorized to brief them on how we do big hole construction and stuff like this.

And when they came over and they had a permanent presence, then I worked with Chuck [Charles] McWilliam and some of the other folks, and I was one of the folks that would bring them into town. And on one of the trips into town, we heard one of their people that we assumed was an intelligence officer tell the other folks, Don't believe anything you see because they have *budyoskos[sp]* like we have, and a *budyosko* is a foreign market, so they only

take foreign currency over there but they have things that the common Russian citizen cannot get.

Like a black market, then.

Well, not black markets, because it's state sponsored, but it's way in which to bring in foreign currency and *control* that foreign currency and keep it *off* of the black market, is kind of the principle behind it, but it's also where their elite shop. And so he said, They have *budyoskos* just like [we do]. So I went to Chuck and asked him, I said, Chuck, can we and would you allow me to let them pick where wherever they want to go? Before we took them where—you know, we had it all arranged, you're going to be here, here, here. And he says, If you're willing to do that, Patrick, I'm willing to let you do it. And so I said absolutely. So we were actually going to get their May Day celebration. So I'm one of the other escorts. We told them that. I said, Here's a newspaper. Look through the paper. If there's someplace you want to go, or if we're driving and you want to stop someplace, we'll stop. So we were driving down the expressway and they pointed to a Smith's store and they said, We want to go into that supermarket. [Claps hands sharply] Pulled off the expressway, walked into it. And actually that just happened to be only a couple of blocks from my house, and they actually had remodeled it and it was *absolutely* gorgeous. And again, I didn't pick it. They did.

Is that the one on Rainbow?

[00:15:00] Actually it's the one that's on Jones and the expressway, that's just off of that, and at that time they had just, again, completely remodeled. And anyway, when we walked in there—because they were going to shop for their own—they were going to cook their own May Day celebration. And so they went off. I said, Go get what you need, bring it back, and I'll pay for it. And so one guy comes running back and he's holding some Jimmy Dean

sausage, one of the big rolls, and he says, How much? He obviously didn't want to know the price. He wanted to know what he was *limited to* on amount. And I said, If you're talking about amount, I said, there is no limit. Get whatever you need. It's always here. And his eyes lit up and *boom!* [claps hands together] off he went. He went back to get some stuff.

I walked behind one of the head of the delegation down the cookie and cereal aisle, and I could see the look on his face – again, I was a little bit behind him – and I said, This must look like a big waste to you.

And he stopped and he looked around and he says, You were reading my mind.

And I said, No. I said, I'm actually headed for your country tomorrow but, I said, the way I understand the way your system works, and tell me if I'm wrong, but, I said, essentially the government tells you *how* much you're going to produce, where it goes to, and how much it sells for.

And he goes, Yeah, that's essentially right.

I said, It doesn't work that way here. I said, Americans love choice. And I imagine to look at this almost full aisle of cookies on one side and full thing of cereals on the other is like, *My God, too many choices.* I said, This is the way it works here, and I picked up two things of cookies and I said, Americans love choices, so they have to stockpile. *But* because they *buy* it from the manufacturer—the government just doesn't tell them what to do. They buy it from the manufacturers, then if they put it on the shelf—they have to have it there—but this one sells more than this one, and if they keep it on the shelf too long and it goes bad, *these* are the folks that lose money. So therefore, they watch their inventory very carefully *and* they know how much they sell

and they *balance* those to where it's not on the shelf too long to where it goes bad.

And he looked at me and he said, You really live this every day, don't you?

And I said, Yes, and I said, and I only live a couple of blocks from here. This *is* the store I shop at.

And he looked at me and he says, Damn good system.

And he started to cry and he looked and he took a picture from his chest level and he said, My wife will cry, too, when she sees this. He says, I now understand, regardless of who said what, he says, you really do live like this every day.

And I said, Honest to God. This is the way we live every day.

And we went into stores that had plumbing goods, because it turns out that that a lot of their plumbing supplies are not real hot. They bought lots and lots of plumbing supplies. The U.S. military clothes, they bought lots of. U.S. electronics. For example, when we—also when I left there, we made arrangements to fly in—all the folks that were left kicked in twenty dollars, which bought a Walkman and two tapes, cassette tapes, to go with it, and we got some batteries. We presented those as presents to folks, you know, different portions of it. I gave mine to a driver that I had befriended—

Larry Neese said he gave one of his to—

Yes, to one of them. And basically he came back and he told me, he said, Patrick, he says, if I was to buy this, he says, you know how long I would have to save? And what it came down to, equivalent, is everything that didn't go to food, he'd have to save for almost a year. And to us it cost twenty dollars.

So they loved electronics. Our electronics are much cheaper than theirs. It's a lot easier to get a hold of than theirs. So they bought lots of electronic goods. And so those were kind of some of the differences.

The way they lived, their equipment in general that I saw, their drill rigs, their cranes, all the associated equipment, it's like their time stopped in 1945, after the war. They're using the same design and the same equipment. There's not been an incentive. There's no competition to develop a crane that's a lot more advanced, a drill rig that's a lot more advanced. So—

That's somebody else's job. The government's job.

That's correct. And the government tells them what drill bits to use. They have a certain priority listing. In fact, they have top priority. But for example, they'll contact a bit company like Reed, which is a company that makes those here, and they'll buy twenty thousand drill bits from them. Then it comes in and then they distribute them to wherever they go: test site, their drilling **[00:20:00]** programs, oil field, natural gas, et cetera. And so they don't have a lot of opportunities to go through and talk with the manufacturers and talk and stuff and say based off of this geology and based off of this condition, what's the best one to use? They basically use what they have. And they have done a fantastic job of doing that. They do incredible things with almost nothing. But there is no incentive to do better. The equipment that I saw that was a little bit better came from Bulgaria. You know, different things like that. So whatever you say about our system and the other aspects, competition is *absolutely* the mother of advancement.

And if government owns everything, it's very inefficient and it reduces many of our choices, then.

Significantly, both in the way you live your life—obviously the propaganda was, you know, we saw it and stuff. We saw it in their news, we saw it in everything, what the kids asked us. You know, when you control the stuff, you end up with basically the people just kind of continue on,

and those people—we even got told—one of their stories, one of their jokes that they told us is they have a saying there that says, The tallest sunflower plant is the first one to get its head cut off. And what they meant by that is if you work hard at your job, your boss thinks that you're trying to get *his* job, which means that when you come to work the next day, you got bathroom detail.

So there's no motivation for trying to be creative or incentive or—

In fact, there's things *against* that. There's actually aspects—because a job is a civil right, and then you get someone who's willing to work hard, that's threatening, and so there's actually incentives *against* those type of things.

We even went to one of their churches, and I was talking with one of the older ladies there that could speak English and I was asking her, I said, You have some beautiful icons here. You have some stuff. And I asked her, I said, I have heard, and it sounds like I was misinformed, that basically the government does not, you know, basically is officially atheist and does not encourage people to go to church. And I said, And in fact, we even heard that there were potential persecutions.

She says, No, no, no, not directly. She says, Look around. She says, What do you see in here?

I said, I see a lot of older women.

And she says, You see any men?

And I said, No.

She says, This is how it works here. She says, They don't discourage us *but* you come to church, you're a young person, you go to work the next day and you're on bathroom detail.

They always brought it back to bathroom detail, and I will tell you that there's some *real* reason why it is. Some of the toilet paper, it's just, I mean that's a whole other story and subject.

Larry had showed us the toilet paper, how rough it was.

I mean it looks like our crepe paper.

Oh, it looks like something recycled.

That's correct, and that's if it's even available.

It's not always available.

It's very *seldom ever* available.

Oh, no wonder that's one of the first things Nick was presented when he arrived in Semipalatinsk was toilet paper.

Yes. Absolutely. And it's also—not that we knew that at the time, but we actually—we took over within the drilling program, we had like six or nine *cases*, only because I put in, as the logistics officer, four cases and one of the other guys, anticipating that we may have some toilet paper problems, he threw in another five or six cases, and so we ended up with—I mean but then the Russians were taking them home with them because of the fact that it was so much different.

But everything came back to you end up on bathroom detail, which obviously is *not* a very good position to be in. And she says, `So basically you don't go to church on the aspects.` But those people who have retired, who have put in twenty years of service—and that's the one thing that's kind of interesting. You put in your time—let's say you start work, let's say, at twenty, because you have to do a couple of years of military service. It's required for men and women. So somewhere between twenty and twenty-two, you start your professional career. You're eligible to retire after twenty, twenty-five years. So at somewhere between about fifty years of age, you're eligible now for retirement. A lot of people will continue, but they will

pay you your retirement fee to go and do that. So it's an earlier retirement than what we really kind of have here. But *those* are the folks that you can't threaten with bathroom detail. Those are the folks that you can't really do a whole lot with, and so those are the people that at that time were going to church. And now that's changed fairly significantly, talking with some of the **[00:25:00]** folks, that there *is* actually encouragements now for the younger folks to go to church and different things, but at that time it was the older ladies. I never got a real good answer why there weren't any older men, except that I think it was just that it was just not something that—whatever. I'm sure there were quite a few. I didn't get any reason why there weren't any men in that group in the church that we were at. But a beautiful church.

And again, kind of the common thing is the people that we met were very kind. They gave us the very best they had to offer.

Yes, I read that they gave you china and silverware.

OK, we didn't get that, as the drill folks. We did get some caviar. We got salmon caviar; we got beluga caviar. One of the things is you can't take paper money, or at that time couldn't take it out country, but you could take out some of the coins. So they have beautiful commemorative coins for almost everything, their *rubles*.

And so when we finally got the opportunity toward the end there, through Joe Fiore we approached General Il'enko and said, `General Il'enko, you know that your people got to pick where they wanted to go. I know because one, I was the security officer. Two, I saw the reports that they submitted to you.` And I said, `We would like the same reciprocity.`

He says, `How many are there?`

And I said, `There's only about a half-a-dozen of us left.`

He says, `OK,` and he says, `You guys get to pick where you guys want to go.`

So where'd you go?

So we went in, and the first stop was we stopped at essentially a dime store. *Beside* it, though, was a supermarket. And so we had been getting—the bread that we were getting at the test site, I'd heard about this *wonderful*, wonderful Russian bread and that was *not* what we were getting at the test site. Not that it was—it was, you know, nutritious and everything else. It just wasn't this—and I couldn't imagine anybody considering this to be wonderful Russian bread.

Was it rye bread?

No. It was more like flour with water. I mean it was still kind of shiny on the inside. The inside of the bubbles were shiny. So it was, you know, it was a staple but it would not entice anybody's taste buds.

So I went into the supermarket store, and the driver went in with me, and I picked some bread out. And first of all, I had walked around the supermarket to see what they had, and kind of confirmed, when I was a security escort, what I had learned from there. Cookies: they had one cracker and one cookie. Quite a few different types of candy. The cuts of meat: there was no hamburger. There was no steak. You got two kilograms of beef, some cut with the grain, some cut without the grain, maybe it's good, maybe it's—you know, I mean there was no discernible pieces. It was just two kilograms of beef. Lamb, pork was the same way. The only thing that had discernible pieces was the chicken. And I looked at the fish and they had quite a bit of fish, a lot of it frozen fish, canned fish, lots and lots of canned fish. Think about a supermarket that has row upon row, you know, where you get your orange juice, in those kind of open freezer things? Think about those full of canned fish, one after another. Lots and lots and lots of canned fish. You can get almost any kind—

Eat a lot of fish. My goodness.

A lot of fish. And almost any kind of canned fish you can imagine. Now the *frozen* fish was in one *small* freezer, almost like the freezer you'd have at home, maybe four feet by four feet. That was the frozen. The pork and beef and stuff was also in a small area. And then all the canned vegetables and the canned fish and all the other stuff took up lots and lots and lots of room. They had lots of that stuff.

Well, I grabbed some bread, and the bread was fifteen *kopecks*, fifteen cents a loaf. And so I grabbed like three or four of the kind of the wheels, a couple of long ones, and I went up to pay for them.

And the driver came up and he took them from me and he says, I cannot let you pay for these. He says, You're a guest in my country. He says, *I* will pay for them.

And I told him, I said, But you won't get reimbursed for this.

And he says, I will do it because, he says, you are my friend.

And when they opened up the cash register, I asked him, I said, Oh, can you exchange a couple of these dollar *rubles* for your coin ones?

And they looked at me, and I explained to the driver, he could speak some English, and then he understood what I was trying to do, that I wanted something I could take back as a souvenir, and he explained it to her and she looked in, she thumbed through, she went through a couple—they didn't have hardly any of the *rubles* there.

So I said, That's OK.

And he reaches in his pocket and he pulls out—he's got like three or four different ones, and then he takes one off his keychain and he says, This has been my lucky charm. I want you to have it.

[00:30:00] And I said, I can't take it.

And he says, Absolutely.

And I said, `Well, let me at least reimburse you.`

And he said, `Absolutely not.`

So that was kind of the—their hearts were very big. Very, very gracious people. For example, we had a lot of tongue when we got there at first. Tongue is considered absolutely the best part, a delicacy. Not necessarily here. So the guys would come off the rig, what's for lunch? A big tongue hanging out of the bag. [And they'd say], `Oh, I think we'll wait until dinner.` But it didn't change the fact that they truly gave us the very best that they had. The best cuts of meat, the best cuts of stuff. Everything they provided to us was absolutely the best. There's a difference in culture. For example, they gave us sausage. The sausage was, you know, you'd look at it and it was like it was very fatty to the point to where I mean *very*, very fatty. To them, the fat is considered to be a delicacy because of the cold climate and all the environment and the energy it gives you and everything else. So I mean we were getting absolutely the best sausage and we were looking at it as uh-oh, arteries clogging, and that type of stuff. So it was kind of a difference in culture and it did take some *reminding* of the guys because some of the guys would, you know, they kind of, well, you know, this just not— And it's like, guys, it's not America. Understand, they are truly giving you absolutely the very best.

Now I understand when some of the fruits and vegetables were shipped over, that there was some concern that the Russians might perceive this as a reflection that their food wasn't enough or good enough.

Actually I don't think that was the perception at all. For example, we had some lettuce came because they didn't have—in fact, to tell you of the lettuce, our interpreter, she went in and she presented the cook with a couple of head of lettuce and was very proud of that. And the cook thanked her very much and then promptly tried to fry it. And from her perspective, it was the

lousiest cabbage she'd ever seen in her life. And yeah, looking from that perspective, she was absolutely [right]. So then the interpreter had to go back and explain how to make a salad using that, and then it was like, oh, OK.

Their oranges – and again, we had oranges and other fruits flown in – but their oranges came principally from Cuba and they were *lousy*. You know how you get that orange that's been sitting up there too long and it's *hard* and you get a little soft on one side but, you know, half of that and it's—*that's* the way their oranges were. They were terrible oranges. That's OK, you know, if you really want an orange, then the oranges were available. They just weren't that great of oranges compared to what we would have normally, considered our standard. So when we flew some oranges in and we stuffed them, you know, some in our pockets and we ate them and we took them to town and gave them to the kids and different things.

So they would get strawberries and they would get different things like that. We didn't have strawberries flown in, and their strawberries were just wonderful. Plums, different things, were just, you know, as they came. But the problem that they have is it's hard for them to quickly get it to market before it rots. In some ways it's actually—I mean their strawberries were *absolutely* marvelous because they were vine-ripened. They weren't like ours here which, you know, they pull them when they're just a hint of—

Hint of green, yeah.

Yes, you know, that have kind of little bit of a bitter taste to it. It's not like when you pulled it out of the garden as a kid. Theirs were. And so from the perspective of what we had, the problem is you're not going to get that ripe strawberry very far anywhere before it's going to rot. That's the problem. It does. It rots on the dock. And so they don't ship them very far. So we ate local strawberries. But they actually bought them on the markets, the markets where people would sell

their stuff, and they actually used to sell the strawberries by glassful. They'd fill up a glass and they'd pour it in. OK, that's, you know, whatever stuff. And so those things were *absolutely* marvelous.

Their milk, because it's not homogenized – it's pasteurized but it's not homogenized – had the cream on top. And it was absolutely—it was like drinking it as a kid. It was like, oh, this is so good. I'll go for another one of these.

And so those type of things. Again, think about where we were earlier in our portion, in our life, because again we had trouble—you know, we weren't bringing in fruits and vegetables from all over the world like we do now. You got a lot more about what was in season, what was kind of in—a little bit more kind of regionally grown. Same thing there. You get what's in season, unless you want to buy it frozen. And the vegetables, you get corn and peas, most of that **[00:35:00]** corn is canned rather that just frozen. And you do. So it's not that much different than where we were before, but I'll tell you what. It was awesome, though, in the stuff, the strawberries, the milk, the plums, and the stuff that we had because again it was vine-ripened, and they bought it. And I will tell you that the cook took great pride—and our roughnecks were very good at, you know, I mean they weren't particularly picky, and the food was very good. And they served you a lot. You didn't ask very often for seconds. I asked one time for seconds when they had their stuffed cabbage. Their stuffed cabbage, their national dish, was absolutely fantastic. I haven't had anything like that anywhere close to here, so I asked for seconds and she looked at me, you want seconds? And she was very thrilled about going back and getting me seconds and stuff and, you know, different things. And so—

So by the time you were there, they were no longer using the china, then? What were they using?

We were using just kind of almost standard dishes and different things. It wasn't the real, real fine china or anything like that they were giving us.

But it wasn't paper.

It was not paper. No. It was definitely [everyday] ware. I'll tell you what. One of the other stories that they did for us is in talking with—there was a little gal who kind of ran the little store. You could get perfume, you could get stamps, you could get different things like that. But she would also take orders. So you could say—for example, the first U.S. American flag that was flown over there was mine. I brought it over. And it flew over the majority of the mission. Well, all of a sudden people started, I want—

That's another story I want to get to.

`I'd like to have a flag.` But then it was like, `You know what? I'd like to have a Russian flag that flew over it.` So we told her, we said, `Can you get us a Russian flag?` [And she said] yeah. And they got us a Kazakhstani flag and we flew the Kazakhstani flag underneath the Russian national flag. And different things like that. It was an indoor flag, so we didn't fly it for very long. And she would do her darndest, because again there's not just a single store. They don't have a Wal-Mart that they can go through and get almost anything you'd want. They have to go from store to store to store to store. So it was really quite an effort for them to get these, quote, special orders for us, and they did it and they did it with few—you know, very, very delightful.

And so yeah, it was—in talking with their scientists—again, I worked with their scientists on this side, worked with their scientists when I was over there—their scientists were—they're like our scientists. They were a little stuffier than the roughnecks and the miners, and that kind of comes from, there again, you can call it concentrating what their doing, whatever, but that's kind

of the realm, you know, there's a certain aristocracy that goes along with that and they were expected to hold up to that because that's what they would normally see. There, their engineers and scientists are in a little upper class as a whole, and our scientists were expected to be the same way. And so that's one reason why we were able to do things that Nick could not do, and different folks, but it also gave us opportunities that they did not have, and on the other hand, they had technical opportunities that we did not have. But I did—again, talking with their scientists, and we looked at their cables and we talked with them and looked at their oscilloscopes and looked at the details on the different things.

And in fact we went to a hydroelectric dam and I asked them if it would be OK if I climbed into the turbine. And he looked at me and he says, `You an engineer?` And I says yes. And he says, `Please, help yourself.`

And so they had a ladder there and I climbed up the ladder and I climbed in the turbine. Very nicely done. The turbine was an excellent turbine. It was manufactured in Czechoslovakia or something. In other words, they would—this is kind of the neat part. They told us, they says, for example, they said, things are manufactured kind of regionally and what they kind of have a historical—they said instruments are made in—and I forgot, I don't remember, it was like Bulgaria. Czechoslovakia makes kind of the heavy equipment. This country makes this. This makes this. This makes this. And then it's distributed from those places throughout the entire Soviet Union, those places, so chances are if you're playing a guitar in Russia, it's going to be exactly the same guitar that they're playing in Kazakhstan. Because of where it's made. So that's how they deal with kind of their more durable goods and how it's manufactured, it's done more regionally and then it's shipped out to the various places.

Yes. Well, I have two stories I've heard about, and you know I'm hoping that you have more **[00:40:00]** *details on this one, too. One of them is the U.S. flag getting flown over in Semipalatinsk. This seems to be kind of significant because I heard that the Russians over here insisted that their flag get flown, that there was kind of a ruckus in Washington over that flag. Tell me about this.*

Well, I designed a flagpole that went on and what it—

And there's even pictures. I found pictures of this flag-raising.

Sure. Yes. And it was actually quite an event. We actually stopped operations to have it. And I know that there were some people, because I've talked to some folks here, who had some pretty hard feelings about seeing a Russian flag here over the test site. I will tell you that from our perspective, it was sure awesome to see our flag. So if it did the same thing for them that it did for us, then it was well worth it.

Now did you have permission?

Yes, we did. In fact, we asked them up front. We talked to General Il'enko about that and he was like, Ummmm, OK. And then when we talked to him I said, What we'd like to do is, I said, I'll design the flagpoles and our mechanic will go ahead and put them up. And then I said, What we'd like to do is kind of have a little ceremony to where one of our roughnecks will take our flag up and unfurl it, and then one of *your* folks, up on *our* rig, will also climb *our* mast—

Oh, that's what that story's about.

—and will unfurl *your* flag. The interesting part about it is when I asked him, because I needed to be able to design the flagpoles to withstand—so I needed to know the size of their flag, and not making the assumption that it was exactly the same size as ours, they basically said, It's close. It's pretty close.

And so I designed the flagpoles. And it turns out their flag is larger than ours, their standard flag, and it's done that way on purpose, because if they're flown side-by-side, they wanted their flag to be slightly larger than ours, to be slightly more predominant. Great national idea. But that's what they did. So that's what we did. I designed the flagpoles, we got the poles made to it, we got it mounted on the top of the rig, and we stopped the operations, and the Russians all came out. Everybody came out for it. Our roughneck, the guy who was on the day crew who was our derrick hand—that was his job, was to climb the derrick—he climbed to the top and he mounted our flag and he unfurled it.

Now was Vern Witherill there?

I don't think so. I don't think he was there. I'm almost positive that it was Joe Fiore. Guy Allen may have been the lead at that time. But I don't think Vern was there yet.

OK. Because I was under the impression that Vern was the one with the story, and so—

It could be from—well, I understand—well, let me kind of finish that story. Well, after their roughneck climbed up and they unfurled—well, of course, we all clapped when ours unfurled. They all clapped when theirs unfurled. And then as we got toward the end and it was like you know what? I'd kind of like to have a flag, you know, different folks said, `I'd kind of like to have a flag`, and then it was decided that maybe we would exchange flags, and so at that time Joe Fiore was the lead that was there and Joe Fiore called back and he had some other U.S. flags flown in. And so toward the very end, before we took our rig down, in the morning when the sun was up to make sure that the light was out, because we put spotlights on them and everything else—and by the way, it was the only flag that was flown over Communist airspace that could be seen from any distance. There was only like two other flags there in the Soviet

Union. That's at our embassy and our mission. Both of those are in interior corridors. You cannot see from outside the building.

Do you still have that flag?

I do have it. In fact, it's hanging up in my office.

I hope someday you donate that to the [Atomic Testing] museum.

I'd be glad to donate it to them.

That's such a marvelous story.

And then what happens to it is we have the flag, so I took my flag down so other people could fly theirs, and I did fly a Kazakhstan flag that I brought back, as well, and then the last U.S. flag to be flown up actually was Joe Fiore's flag, the one that he wanted, and then *that's* the one that got exchanged for the *Russian* flag that actually flew over—so the Russian flag never really changed that much. We'd fly other regional flags underneath it as appropriate, but that pretty much flew the entire—very durable flag. And so that was officially exchanged for the U.S. flag that flew over. So I actually have the flag that spent almost two months in the air, and then they exchanged it.

And then over here, of course you're right, they heard about it and I know that our **[00:45:00]** guys—but I will tell you again, I was a little saddened when I heard that our guys had a little bit of a fit over it because I *know* what it did for us over there, and it was like you can imagine being in a foreign country and then seeing your flag go up.

Now was it the Soviets over here who said, `If that's happening over there, we want our flag raised, too.`

I think that's probably the case, that they would like to fly the flag here as well.

Then it was more the Soviets over here saying, `Wait a second, we're being left out here.`

I think it may have been. I don't know for sure because like I said, that happened almost the same time that ours did over there, but I think that that was probably the case, because I know that again a couple of the folks that I know here, when they were telling me the story, *man*, they were angry as bees, and then I told them my story. I said, `Yes, let me tell you what it did for us.` I mean it was a *real* lifter in morale.

And the Soviets, that you *experienced, did not feel that same anger and resentment.*

No, not at all. Not at all.

Isn't that interesting!

In fact, they're very prideful of their country and there's no reason not to be, but to think that they have any less pride than us, to me, is a sad, sad statement. And I will tell you another part that kind of reconfirmed that. Toward the end there, I mean when there was just a handful of us, we were outside talking one day. Of course, we had already seen all the videotapes that we had and we were tired of watching them. And so we were outside and we had our one-per-week Czechoslovakian beer and we were just out talking and we were drinking it out there, and one of the folks that was in the military base beside us was playing—it was an English band, I couldn't even tell you the name, I didn't even really recognize the song, but just to hear *English* in a song, and I mean it was a really lousy band to boot, but just to be able to hear English, and hearing the aspect just takes you, even if it was British, it takes you right back home. And I raced in and got everybody else that wasn't out there and we all sat out there and listened to that lousy music, but all of our morales were just lifted for it.

And so, yeah, it was, you know, after two months over there and doing stuff. I did tell you that when I got back, I told my father that—because, again, the people, they don't live off of much, they really don't. They do extremely well with very little. They're real survivors. Told my

father that I was very concerned because of the fact of what I'd heard about the sunflower plant getting its head cut off, that it would take multiple generations to turn that country around. I was wrong, and I'm glad that I am wrong.

I also told my father I really wasn't interested in going back anytime soon. I *would* like to go back. I'd like to go back and see how it's changed. I've talked to some of the folks. They said, `You wouldn't recognize it.` They said, `Those people who *were* willing to change are doing very, very well. Those people who are *not* are sunk way down into it. You have two classes: the very poor and the very, very rich.` But I always try to take rumors with kind of a little bit of a grain of salt, understand that there's probably a little bit of truth in all of it and not a whole lot of truth in all of it. But I would like to see it because what [Mikhail] Gorbachev did—unless you had seen it and understand how it was ingrained, have kids asking you, `Why do you want to kill us?` To go from that to say, `Take down the wall.` Absolutely incredible. Incredible. Gorbachev did, when he said, `The buck stops here, and our system has failed,` it was absolutely phenomenal.

Yes, it was incredible that that kind of a man came to power.

And it's hard to understand how difficult that decision was unless you saw it, and when you saw it and realized that their entire culture—he destroyed their entire culture in one night, and he did it because the only way that they were going to get out of 1945 was to make that decision. And no one before him was willing to do that.

Yes. Well, he certainly got maligned for it, too, didn't he?

Absolutely right. So in the end, all the stuff that we did on the Joint Verification Experiment, I think has come—understand that their last test that they did was on October 24, 1990, so two **[00:50:00]** years before ours, almost exactly two years, a little less than two years. I think it was very significant, and the communications that we've done over there was very significant to

allow the Comprehensive Test Ban Treaty [CTBT] to be put in place. And I think that was the starting point of being able to develop that understanding, because before that, to be able to sit down with the Russian scientists and talk about nuclear weapons testing and how it's affected their economy and their people and their culture, as well as like we started earlier today, how has the test site—has it affected the culture here? I think it has. I think it's been very beneficial. Not quite as beneficial, because of the size and the distance, of maybe what the other national laboratories are, but it has significantly shaped the world. So toiling in the desert for twenty years, fighting the heat in the summertime and the cold in the wintertime and working my butt off and running around with my hair on fire all the time, a lot of times seven days a week, twelve hours a day—worth it? Absolutely. Do it again.

There's such a sense of pride, I guess, I've talked with people, in being a part of something bigger than themselves.

Absolutely. Absolutely. And I will tell you that I feel the same way about Yucca Mountain. I've never worked on a project that probably wasn't somewhat controversial, but I see it as even Yucca Mountain, I don't think there's another project going on anywhere in the world that has the opportunity to *protect* so many people. Again, it's not well-liked locally, for the most part. I know that even in the organization you work with that there's aspects on how [U.S. Senator] Harry Reid feels about it, et cetera, et cetera. But if we don't do something in a long-term, and if this stuff does get out, *or* World War III *does* happen and these sites do be targeted, there will be very few Americans that will not be impacted. It will affect *every* seacoast: Pacific, the Gulf Coast, the Atlantic.

You're talking about World War III or—?

No, the waste itself. It'll end up in every major waterway in the United States. And even right now there's over thirty-five million Americans that have their municipal intake systems along the waterways that would be impacted. What's our population that live on our Gulf Coast? On our coasts?

And you're saying that's why it has to be gathered up and put into one place.

That's why, yeah. And it *has* to be done in a *safe* and secure manner. And just like the test site, and I think your observation was very, very good, people don't get a choice, don't get an opportunity to go up on the test site and *see* what we did, and as a result to *see* whether what we were doing was safe or not. I will tell you that having been there, the folks got a heck of a bang for the buck. They were *visionaries* on trying to make things safe. Does that mean that there weren't problems? Of course we know there was. Downwinders. We know about a lot of the issues on there. Doesn't change the fact that they made tremendous efforts to do that, to try to make it as safe as possible. And that style and that culture carries over even into Yucca Mountain. People there see it as a project bigger than—

That sense of dedication.

And I will tell you, it's not in everybody, because I think that comes from if you worked there at the test site and you understood that and you understand those aspects versus coming in—I know a lot of people tell me, `But I won't tell my neighbor what I do.` And they say, `Well, what about you?` I said, `Every one of *my* neighbors know what *I* do.` Because I'm *proud* of what I do, and I'm proud of what we did at the test site.

Well, it seems to me that no one took more risks than the miners and the drillers.

I heard it said by one of the managers that the real people that earned their pay were the miners and the drillers. You're absolutely right. The highest hazard operations on the test site,

everything from handling a *huge* amount of equipment, rotating equipment, working on the stuff, and the people that were in there—in fact I was even asked today, they said, `Do you miss the test site?` I said, `It's not the site. It's the people.` It's the people that make up **[00:55:00]** the site that I miss. Do I miss, again, how fast we were moving? I mean when you're doing twenty tests a year, you're doing one every two weeks, and you're running, oh, it's absolutely fantastic. You're writing your own books on engineering. You're writing your own books on everything you do.

And some of this is getting lost, isn't it?

Oh, it's all getting lost.

All this technology that was built up over that fifty years.

But it's the *people*. The technology itself is nothing without the people. And that attitude, that can-do attitude—in fact I think there's a tape out that's a fifty-year anniversary and Chuck McWilliam says, `Used to be a sign out there that says, *The difficult we do immediately and the impossible just takes us a little bit longer.*` We *did* that *every day*! *Every single day* of our life that we were up there, that's exactly what we did. I can't tell you how many, you know, that even—engineers and scientists that were at the national laboratories that were—when they went to *their* engineering groups said, `Can't help you. Have no idea of how I can design something that's going to do what you just want it to do.` Know where they came to get those things designed? They came to the test site, because we never turned anybody away.

Where do you think that can-do attitude came from?

Just because of the fact that the people—because we were, I mean, they would just—no one ever said, you can't. It was go back and figure out and come back and tell me how you can. And *management* did that.

Well, there seems to be a lot of people who came for ninety days and then stayed for thirty years.

Oh, Larry Neese and all the other folks that we—yes, that's correct. Absolutely.

A lot of them, you know.

Well, it's just like me. I came for a summer. At the end of that summer, I went to Bill Flangas and said, `Bill, if you would like to have an engineer that's willing to come back and work hard for you, I would like to be considered.`

Yes. There was not a real high turnover either, was there?

In fact very, very low. *Significantly* lower than what you'd see even here. *But* the difference is, here in town you're going from one project to the next. You may be a couple of weeks between them, depending on how you're called out in the hall. That was pretty much 365 days a year, but I think there was so much pride because I think most people—in fact they've done these studies and analyses of what really provides an incentive for people to go on, and the monetary aspects, particularly with technical people, is relatively low. It's like seventh or so on the list. Pride in your work, all these other things, come first, and I think that's what you had. In fact I can tell you a personality—if the person's worked on the test site and they tell me how long they were there, I can cue you their personality and what they're willing to do because, again, the hardships and the long travels, let's face it, your family life sucks. It *suffers* greatly because you leave before the kids get up—

And you can't share your work with your wife.

You can't share your work with your wife. You're there. You get home just before the kids go to bed. You get to see them on the weekends, and you get to do those type of things. Tremendous sacrifices, personal sacrifices. *Everybody* that was up there paid *huge* personal sacrifices. So what compensated them? What caused them to go back day after day after day after day? And that's because the project that they were doing was bigger than themselves. *That* was the key.

Well, there is no personal gain because your name basically remains anonymous.

Absolutely.

And so it's not for popularity.

That's correct.

You're not doing it for popularity. But you were doing it, why? The passion.

The passion. And that's what you can pick up on. So if they've been up at the test site for more than a couple of years, their passion is going to be incredible. And I think you've seen it in the other folks that you've interviewed, et cetera. That passion is absolutely—in fact we've had people come from other projects that go on tours of the test site or go to these different classes, and that's the one thing they say: `We can't believe the passion you guys have for it.`

Yes. Absolutely. Absolutely. The reason.

Yes. Well, when I interviewed Larry Neese, you know, the extreme dedication to his craft. I mean he had catalogs and catalogs, and he studied that equipment, and the long hours he was willing to work. And he didn't necessarily even think the Soviets were dangerous, wasn't really interested in that. But he had one eye. And he had people who had been loyal to him and had given him support and encouragement. Wasn't trying to blame him. Wasn't trying to get rid of him. There was not this quick turnover, firing a quick thing, it was always OK, how can we do the job better?

And that challenging is a very important part. Being able to challenge it and say, how do we **[01:00:00]** make it better? And nobody took it—I have never met a manager up there that ever had any problem with having people that were smarter than him around him and underneath him. I will tell you that I've seen other jobs where the managers are *very* uncomfortable and see it as a

potential challenge to their leadership or other parts to do this. Not up there. You challenged everything. But that's what worked.

Well, it seemed like for a lot of years they had a very close hands-on type of management, too.

That's correct.

I mean Nick Aquilina knew what was being served at the steakhouses out there.

Absolutely.

And you think, well, that's really—I mean he even knew what you guys were eating over in Semipalatinsk.

Oh, absolutely. He read the reports. He was there. Well, the fact that here I was, at the time I wasn't even a department manager, Nick Aquilina knew my name, he knows my background, he knows all the elements of that, and so you've got the manager of the Nevada Operations knows essentially every engineer that's out there, knows every department manager, he certainly knows the division managers, and then he can also point out that he probably knows half or more of the crafts that are out there.

Well, I think he had a lot of respect for miners since his father was a miner.

Well, and then he started out in the drilling department up there.

Yes, I think Larry said something about that, that Nick had—

He did. He did. He started out—that's correct. Fred Huckabee was a driller, and then went over to DOE in management. Vern Witherill, again a tremendous background in engineering and everything else. Yes, it's a very tight knit group. You needed something done, you knew who to call, you called, nobody ever complained, nobody ever worried about it, we got it done, and you moved forward because there was always something the next day and it was not going to be what

you worked on today. And it was a kick in the pants, is the best way I can describe it. It was an e-ticket ride in a work environment—

It was really fun, wasn't it?

Absolutely.

It was really, wasn't it? It was quite a high.

Absolutely. And the other part is we did it. And Larry was right. He didn't care about the Russians, but what he did care about, like you said, was himself and his family, and so that's what people, you know, when they ask me again, `Why did you do it?` I said, `Well, because not only did it do a lot more for the nation, but basically did it for you, did it for the other people of Las Vegas, the other people in the United States, the other people in the world.` And that's why. And the Russians were the same thing. Tremendous pride in what they did. They did it for the same thing. They may have been told different things, you know, and let's face it, we went through our civil defense aspects in that they wanted to bomb us as well. And so how we ended up in the end, is it that much different than the Soviets? They had a little less money to spend; equipment was a little bit older, a little more antiquated on the designs. Was the overall end result pretty much the same?

Yes. It was the pride, both sides. Both sides.

We only have time for one more little story. I've got ten minutes here. This has really been enjoyable. It's another one of these stories I've heard. When Nick got word that the Soviets were coming to the test site, I understand that the drillers painted their drill rig red, white, and blue. Do you know any details about that?

Yes.

I was hoping you would.

It wasn't the drill rig, and I'm the one who got in trouble for that.

You are the right person, aren't you?

Yes. What it was, we were out in the drill yard and we knew that they were coming, and since I was the one that was going to be briefing them there, the guys came to me and they said, We would like to paint the equipment so it looks nice. They said, What colors would you like it painted?

And I said, There's only three colors I can think of.

And they said, We understand. You just have to leave it up to us.

And then just before the Russians were supposed to show up, Nick called—now was it Nick? I believe it was Nick called me and he said, I heard that you guys are about to antagonize the Russians, that you've painted everything red, white, and blue, stars and stripes everywhere.

And I said, No, Nick, I said, that is untrue. That is just a rumor. I said, My 108-inch drill bits are blue. I said, All my drill bits really are blue. I said, That drilling assembly that's sitting out in front of it?

And he says, Yeah.

I said, The drill bit is blue, the mandrill is white, the donut weights are red.

And he says, So you didn't go through and everything stars and stripes?

I said, No. Drill bits are blue. Every drill bit is blue. All mandrills are white. Drilling weights, and the only ones I've painted are the sixty-inch that are mounted on that, and they are red to differentiate them from the drilling weights.

And he goes, OK. He says, I can buy that. He says, Not a big deal.

[01:05:00] *So the drill rig itself was not painted.*

The drill rig itself was not red, white, and blue. No, from the colors it was naturally, the crown is almost always yellow, and then you have white, and so it wasn't the drill rig itself; it was the equipment that was in our yard. And I will tell you that when the Russians showed up, Viktor Mikhailov walked up and he looks around and he says, `I like your colors.`

That's their colors, too, isn't it?

Well, pretty close. And I said, `How to show`, I said after he—actually it was quite appropriate. But as I said, they were close to detouring them and forcing me to get out there with my paintbrush and change all the colors of the stuff in the yard.

Does this mean that when you found out they were coming, that you weren't too happy about it at first?

I was absolutely thrilled about it.

You were.

Absolutely. Absolutely. I didn't have any problems with it at all.

Some of the miners were not.

Well, they didn't get the chance to go to the mines, into our mining operations. And so I just looked at it as an opportunity of, why not? Where it was a whole new world for all practical purposes at that time was starting to change. We were starting public open house tours. People were starting to get to see it. So it was like, why not?

Yes. Yes, because the press hadn't been out for a number of years.

That's correct. That's correct. And they have done different stories and I'd help the different press folks with different stories and different activities and the different stuff.

No, I was absolutely thrilled. Now did I ever think it would happen? The answer is no. I never would've dreamed that we would've had Russians on our soil, particularly at the test site. I

would *not* have believed that. If you'd have told me when I got started, it would've been you're crazy. Head downtown. We got special places for you.

Yes, Troy Wade said it hit him. Here he had been defending the test site against the Soviets all of these years and now who is he about to show the test site to? And it was quite a shock to him.

That's right. And then on the other hand, though, we had just opened up our skies for the Open Skies discussions and territories and different things like that, so they were going to be able to overfly our stuff with aircraft that had *what* on them? All kinds of different things on them. So I could see it coming but, yeah, we never would have believed it. But yeah, that's the story related to the—it was actually the drilling equipment, it wasn't the drill rig, and I'm the one who got the call—

Oh, I'm glad I got your story!

Because I was the one that was to be out there to brief them, and I will tell you that I took great pride in representing REECo and the drilling department, because I not only briefed them at the equipment site, but I also went with them up and I briefed them at the rig site when they were actually drilling the hole at 19-AX, and briefed them on that and we talked about the different elements, and so I very much enjoyed representing REECo as a whole and talking about some of these different activities. It was great.

And you are also right. The DOE folks, there were very strong working relationships. It wasn't just managers. It wasn't DOE to contractor, You have a contract. Go do what it said in your contract. That's not what we had. After forty-four years up there, that wasn't at all what we had. And in some ways I think it kind of hurt REECo in the end. When we decided not to re-bid the test site and stuff, when they decided to go ahead and put it on the contract, I think that there was kind of a—they thought—because everything went so smooth,

you basically—you didn't—you took care of problems before they got elevated up, or if you had a problem, they would just turn to you and say how long is it going to take you to take care of it? Well, there wasn't a whole lot written up about it. You just went and you did it, and that's the thing. So *I* think that as a *new* generation was coming into DOE, I think that they felt that running the test site was not a problem at all. Because—

They had good people. They had real live confidence in their people.

And the relationships were people-to-people. You know, to have Nick Aquilina call me directly on the aspect, and as well as other folks—it wasn't just me—on the aspects of it, that's absolutely phenomenal. And then also to realize that—

You were just a young guy, too, weren't you?

Absolutely. And then to think about it that, No I'm not in trouble. Yes, Nick, what can I do for you? How can I help Nick Aquilina out today? It wasn't go see my contracting officer if you're going to direct us in this stuff. Because there was direction given and you could just be out there: Hey, I need this taken care of. [Claps hands together] I mean it happened. In fact the director of Los Alamos National Laboratory asked me to tour with all his associate directors and the question was, again, why me? Why would you have—? And the answer came back was I was a representative of saying, and this is *his* words, I can get more done with a single phone call to Patrick than I can making phone calls or **[01:10:00]** passing paperwork to you guys for six months. And he says, It's not only Patrick. It's the whole test site. And then he said, And you can't tell anybody this because they'll get involved and they'll mess up the system we have here. He says, What I'm telling you guys, there's a different way of doing business. And he says, The reason why the test site has always had this operating environment is people are afraid outside of the area of getting

into the authorization process because if something goes wrong, it can be a *big*-time wrong, and they don't want to be associated with it. As a result, we became an island within ourselves, but it became an island to where everybody knew the other folks, and the working relationship was absolutely fantastic.

Really a sense of trust, that was.

That's right. Then when they changed contracts, that history didn't come with it. So now all of a sudden it was like put it down in the contract. And so we went from a situation that we created that made it look like the test site—

A closer community, a closer family. They used family, right?

That's correct. Correct. That's a wonderful word. I had never—hadn't thought about it in that term, but that would be the exact word I think I would use. And so you could get things done, to where now you couldn't, and in doing so we made it look like it was *easy* to manage the contract, but in reality *everybody* was managing the contract. *Everybody* was doing what they were supposed to do.

It was a single purpose.

That's correct. And now all of a sudden it wasn't DOE was oversighting us and beating us upside the head and shoulders, because you didn't have to. DOE told us what they needed. DTRA [Defense Threat Reduction Agency], Defense Nuclear Agency [DNA], told us what they needed and we got it done. There was no, well, it's not in my contract, or, throw money in this direction. We had the pot of money. I will tell you that our budget on how we worked out the budget every year was we just got a handful of people together and said we got this many tests. Therefore, Holmes and Narver, based off of this number of tests, you normally get about this much. Here you go. REECo, you get this much. Laboratory, you get [this much]. And it was done. It would

take—I've never been in any, you know, now having worked with other DOE agencies, oh man, fight and bicker and, oh, it's *terrible*! The test site was a joy to work at.

And you got to work under which managers?

Frank Solaegui is who I started with. Then Larry Neese took over after that. And then I took over Larry's position after that, and so I was actually co-department manager. Pete Sandoval [sp] was my other co-department manager for drilling. Then I became co-department manager with Waid Tadlock for Area 12 for the mining operations, as well. Prior to that, in fact there was a couple of different managers, again, that they had.

But Frank Solaegui was the one who had—Frank Solaegui was my mentor from a management perspective. I have never met a more incredible natural engineer, not degreed, natural engineer than he is. I've never met an individual like him. *And* his people skills are absolutely phenomenal. I mean what he's done, even at young ages, in managing mines and managing crews, and then what he did up there, absolutely just—Frank was the one that I *learned* the tactics of *how* to get things done with a single phone call that you couldn't get done any other way. I not only learned it from him but I *used* him on a number of occasions: `Frank, I really need this to happen, but if *I* call them, then it's not going to happen.`

He had the knack for it.

And he'd say, `Give me five seconds,` and he'd dial, and he said, `Just stick around.` Done. And it would happen. Absolutely fantastic.

[01:13:48] End Track 2, Disc 2.

[End of interview]