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

Interview with Lawrence Krenzien

September 8, 2005
Las Vegas, Nevada

Interview Conducted By
Suzanne Becker

Oral history is a method of collecting historical information through recorded interviews conducted by an interviewer/researcher with an interviewee/narrator who possesses firsthand knowledge of historically significant events. The goal is to create an archive which adds relevant material to the existing historical record. Oral history recordings and transcripts are primary source material and do not represent the final, verified, or complete narrative of the events under discussion. Rather, oral history is a spoken remembrance or dialogue, reflecting the interviewee's memories, points of view and personal opinions about events in response to the interviewer's specific questions. Oral history interviews document each interviewee's personal engagement with the history in question. They are unique records, reflecting the particular meaning the interviewee draws from her/his individual life experience.

Produced by:

The Nevada Test Site Oral History Project
Departments of History and Sociology
University of Nevada, Las Vegas, 89154-5020

Director and Editor
Mary Palevsky

Principal Investigators
Robert Futrell, Dept. of Sociology
Andrew Kirk, Dept. of History

The material in the *Nevada Test Site Oral History Project* archive is based upon work supported by the U.S. Dept. of Energy under award number DEFG52-03NV99203 and the U.S. Dept. of Education under award number P116Z040093.

Interview with Lawrence Krenzien

September 8, 2005
Conducted by Suzanne Becker

Table of Contents

Interview with Lawrence Krenzien

September 8, 2005 in Las Vegas, NV
Conducted by Suzanne Becker

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

Lawrence Krenzien: Ready.

Suzanne Becker: *Go ahead.*

My name is Lawrence Krenzien, but better known as Larry under working conditions. I was born in Green Bay, Wisconsin in 1933. My father was [in] long lines for the telephone company, long-distance lines. Two sisters, both of which were older than I. Grew up in Green Bay; graduated from high school there and then went to the University of Wisconsin in Madison; I got a degree in physics. Both of my sisters had gone before me to the university and both of them had degrees already.

What were their degrees in?

One was psychiatry and the other one was a dietician.

When my senior year came up, I did not—to go back a minute, I did not intend to go on to graduate school. So when my senior year came up, early in October-November, the Los Alamos Scientific [now National] Laboratory showed up to interview people, and my thought was, gee, they're here so early but that's good because I can go and listen to them and know the answers so that when somebody comes that I really want to go to, I'll know what the questions are. So I got interviewed by Los Alamos.

I'm sorry, I just wanted to back up a minute. So what did you study in?

It was a bachelor's degree in physics.

In physics. And what year?

Nineteen fifty-five.

And so this is just revving up.

That's right. And then probably December or so I got a letter saying, We don't have anything for you at the present time, which I guess was expected because I thought Los Alamos tended to hire the higher-ups in the class and my grades were not in the higher-ups of the class.

Now you were familiar with Los Alamos and the work that they were doing at that time?

I would say no. I would say probably not. I knew that there was an outfit coming called the Institute of Paper Chemistry. They're in northern Wisconsin. But Green Bay was very much a paper town, most people work in the paper mills, and I think my mind was along that line. When the Institute of Paper Chemistry came, I would probably try to join that group. They did come and I never even interviewed. That was after the fact.

But anyway, probably about February, I received a letter from Los Alamos saying, Can you fly out for an interview here? which I did. First time I'd ever flown. From Madison to Chicago to Albuquerque, and then on a small plane up to Los Alamos. Getting there, I had interviews with three different groups. One was the Van de Graaff accelerator group; the University of Wisconsin was very deeply involved with Van de Graaffs. Another one was with the weapons group and I think there was a third, which I can't really remember. By the time I was ready to get home, the weapons group essentially said to me, We're going to hire you. We don't know what we can offer you but we definitely are interested. So I went back to Madison, finished school, got a letter saying, you're hired into this weapons group and come after you graduate as soon as you can. I think graduation was early in June [and] I think I showed up [the] fifteenth of June [or] thereabouts.

Actually, to go back to my interview, I interviewed up there and I said to myself, I wonder how much I'll have to pay to work up here. After coming from northern Wisconsin in

deep snow and going to New Mexico and even though Los Alamos is seven thousand feet, it still is not—it was not Green Bay.

Right. It's not northern Wisconsin.

So I started in a weapons group in Los Alamos, and that was in '55, my first job. And really the main job that I had while living in Los Alamos was [as] a mass spectroscopist, [a] mass spectrometer, what that is, is an instrument that separates the isotopes of any particular element, and the elements that [I] was mainly involved with were uranium and plutonium. So it **[00:05:00]** would separate and tell you how much is uranium 234, '35, '36, '37, '38 was in the sample. What we were analyzing is we had one machine that analyzed all the parts that went into a weapon. The other machine was set up to analyze what came out of the weapon at shot time. And those were achieved by the Air Force, [who] at the time would fly airplanes through the cloud and collect samples—they looked like gasoline tanks out on the ends of the wings, but had filter paper in these tanks. Then that would be done by the chemist and finally come down to you as a sample to analyze. And I was doing that and I think in 1958 my boss decided, `Well, you've been working so hard, we're going to give you a gift sort of thing. Why don't you go to Enewetak for a while?`

So I went to Enewetak on the first two events from [Operation] Hardtack I; the first two Los Alamos events from Hardtack I, one of which was Cactus and the other one I think was Butternut, but I could be wrong. Cactus, I don't know if you looked at the pictures that were in the rotating museum a couple weeks—the last one before this. There was one corner—

Before the EG&G [Edgerton, Germeshausen, and Grier exhibit at the museum]?

Yes, before the EG&G [exhibit].

I vaguely remember—

There was one picture in the corner of a great big concrete dome in which they had—

Oh, yeah.

That was Cactus. That was the Cactus event, the crater from it.

And it was domed.

Well, no. What they did is in trying to get the Enewetak people back to live on it, they scraped up all the dirt and et cetera and put it in there and then domed it over. Getting them back did not work, though, mainly because the cesium [Cs] goes down into the soil too far and the trees collected it and brought it back up to the coconuts and it was—

So, inhabitable?

It was not habitable.

And coming back from there was an experience that most people probably never will and hopefully never have to [experience]. I came back on one of the sample planes from one of the shots. And the sample planes at that time were Boeing Stratocruisers, which are, I'm sure, long before your time, but they had a glass dome in the front; the whole nose was a glass dome. Like [when] Pan Am [Pan American Airways] flew them, I think that was the primary seats where you could sit up and watch the world go by. But it was a horrible plane, really, because they always said that if it dropped into the ocean, they didn't know how long it would last because they never had a chance to time it, it was so fast.

That's not very comforting to hear, flying in—

But anyway, coming back on a Boeing Stratocruiser, the samples were so hot. There were about six of us passenger on board. We had to sit on the floor in the navigator's compartment because the samples in the back were so radioactive that we weren't allowed to sit back there. I'd have no idea what kind of dosage we got, though.

Now I actually have a couple of questions at this point. Well, two things. Obviously you've seen some atmospheric tests.

Only at Enewetak.

At Enewetak. And I guess first, I'm wondering, back in Los Alamos when they told you, we're going to send you out to Enewetak, if you knew more or less what was going on, or you knew what you were going to be doing out there?

I knew, yes, because the group that I was in, those mass spectrometers should not have been in there in the first place. They should've been in a chemistry group. And the group that I was in was purely part of a weapons group that had *a* particular function with both the detonation and what goes into the stockpile, et cetera. So they were purely weapons groups. And so as a result, yes, I knew.

And what—a couple of things. When you were out at Enewetak, you were still collecting and testing samples?

No, I was doing the work that that group did, and I'm not going to say what that exactly was.

That's all right.

[00:10:00] But their function—there was I think about six of us—had to deal with the weapon. Also seeing that I had worked mass spectrometers, which require a real good vacuum system—Cactus required a good vacuum system—so I got designated because of weather delays to sit up on the island and go over to the building that Cactus was in and pump it down about every six hours or something, pump down some of the experiment. So, I stayed on the island by myself for that with, oh, probably about thirty mostly military people who are still on the island prior to the event, and then got evacuated like the night before.

And so when you witnessed this atmospheric test—

Fantastic.

Yeah?

Enewetak is an atoll. Cactus was up at the very I'd say northern end, and the place where people lived was on the southern end, and so you could stand on the piers and watch it. I'm not sure distance-wise, my rough guess is twenty-some miles. But it was spectacular. Everybody wore glasses. Looking at the water in the bay inside of the atoll, you could see that wave coming at you that the shock wave had put into the water. A later-on statement, in here, in Las Vegas, if I knew when [Lawrence] Livermore [National Laboratory] was shooting, I could sit in my back yard and watch the water in the swimming pool, and I could see that shock wave come, even though, you know, it wasn't much, but you could see it if you knew the time and knew what was going to happen.

That was quite a distance.

That's right. But anyway, it was fantastic, and pretty-wise, et cetera. Other than that, those were the only two atmospheric events that I participated on directly. Now—you had some more?

Well, just curious talking about the traveling back with the samples that were so hot, I'm wondering if you ever thought much about exposure to any of this, or if they or you talked about it or they talked to—?

You always wore your film badge. They got developed every month. I never really ever had any gross radiation—oh, what's the proper word? Exposure. And so no, I did not worry too much about it, no.

So you didn't think about it too much.

No. The samples that I was using in that, they would come in vials about that big [indicating size] and they would be a little—

Just a couple inches tall?

Oh, not even that. Maybe about an inch tall; in some cases it was almost drops in the bottom rather than any—

OK, so barely—

Yes, it was very small amounts on the post-shot stuff. The pre-shot stuff was larger, but the post-shot, there was a special instrument that had been made for that, to be able to—because the sample size that we were running was 10^{-9} gram, something like that. Very small.

That's very small.

But anyway, to get back.

Thank you for filling in the details.

Came back to Los Alamos, again restarted doing what I'd always done on atmospheric testing. And then at times started to come out to the [Nevada] test site [NTS] to help with, again, mainly with vacuum systems. And there was one test in Area 5 called Small Boy. There was a pedestal in the center that a device would be put on to go off, and then it was a large circle all the way around. It was a Los Alamos device, but each group had sort of like a pie-shaped section, and Los Alamos was doing *a* particular experiment in the pie-shaped section, and again it involved vacuum systems so that was my main reason to be there. But the military would have a pie shape and I think Livermore and Sandia [National Laboratories], the Navy, everybody had a pie shape around this place. But I got my work done and then went back to Los Alamos. Did not actually see the event itself.

So you came out there to set up—?

[00:15:00] Correct, set up is probably right, and then fly back because I wasn't involved in the final arming anymore.

Then, oh, time-wise, I'm sorry, I can't tell the date, but during the early sixties, at the beginning of attempting to test underground, the first ones were really in a hole drilled. But the laboratories did not know how to—Los Alamos in particular, because Livermore insisted that they would fire in tunnels and Los Alamos would fire in vertical holes, and neither laboratory knew how to control the fallout. Livermore's would come out the front end of the tunnel, and ours would come right up the hole. And it took a number of years. Livermore indeed finally also changed to testing in vertical holes, and the only people that tested later on in tunnels was the military. But it took a while to know *how* to backfill that hole and with what to backfill that hole and also the depth and all the things considered. But those first ones, they didn't stay in very well. They didn't come out like Sedan; I think you've probably seen pictures of Sedan coming up, because that was meant to. But they didn't come out like that; there'd be a big puff of dirt and smoke and everything else and I'd be back and forth doing that work on some things, but still doing the mass spectroscopy.

In '63 I was having problems with the boss and he was having problems with me, so I decided I'd better leave and I went to North American Aviation in California, working on Apollo. Mainly it was called special instrumentation, and it was a gas chromatograph, but that was a modern replacement for a mass spectrometer *in* certain cases, and in particular for analyzing gases. And the gas chromatograph on Apollo was meant to measure the oxygen content of the capsule where the men were, as a warning that it was operating properly.

Worked at that for a year. I did not like working for North American Aviation. It was not like working for Los Alamos.

I bet. Whole different feel to it.

It was a room full of forty engineers that each had their little desk and most of them didn't talk to even the guy next to them.

What was it like working for Los Alamos?

It was great. It was great. I was single at the time, of course, and Los Alamos was a great place for single people because there was a lot of single fellows and they would have dances to try to get the girls [who] were coming in as schoolteachers and nurses and what have you. In fact, that's how I met my wife. It was a good place to work. The people that you worked with—I actually liked this boss that I had, at first. When I came into the group he said, `Now why don't you go around and see what everybody's doing and come back to me if you're interested in something so we can put you in there where your interest is.` And that's how I got into the mass spectrometer. I'd never done that before, not in university. Well, he left. I know he came to our wedding, which was 1959. He probably left in '61 or '62.

And what was his name?

W.W. Carter, William W. Carter. He became the scientific advisor to, what's the German rocket man? I'll remember it, I hope. But he was the one that had made the German rockets and then came to this country. Wernher Von Braun.

So he became advisor to him.

He became scientific advisor to Wernher Von Braun. He would come out to the site, too, and one of the last times that—probably within a month or two that I was going to retire—he was out there. We got to talking and he said, `You know, when I hired you, your grades were not good.`

And I said, `Boy, I knew that. I wasn't going to go to graduate school because of that.`

[00:20:00] And he said, `But looking at your resume, in college you were working three jobs at one time to get through college and as far as I'm concerned, that was the most important thing in the world.`

I actually took care of kids for room and board.

Did you really?

One year at least.

In Madison.

In Madison. With my two sisters and myself going to the university, my family did not have a lot of money to pay for all of us, and so I probably paid for 75, 80 percent of mine. In fact, when I came out to Los Alamos, I borrowed from the Snow Physics Fund for money to be able to fly out.

That's great.

But anyway, I get off the track once in a while.

That's fine.

But anyway, after a year, [the] biggest problem I had, two biggest problems in California: one is we were living in Anaheim. This [North American Aviation] was in Downey. Driving, I don't know, fifteen miles, but it took hours, depending on the traffic. And I'd get home and come the weekend my wife would say, `Well, where are we going this weekend?` And I'd say, `I'm going to stay home. I drove all week.` She was ready to go on weekends; I was ready to stay home. The older boy was coming down with asthma almost constantly, spending nights in hospitals, and I think in all the time we were there, September was nice and hot and that was the only month that he really didn't have any problem.

Got a call after Christmastime. I had written some Christmas cards to people that I'd known in Los Alamos. But after Christmas I got a call from a man whose name was Tom

Scolman. And Tom asked if I was interested in coming back to work *at* the test site because he really needed somebody permanent. And I went and took the interview and was back. I spent exactly a year—I think it was a year and a day at North American, which was enough.

Made it a year.

Well, I figured I had to. But anyway, that was the beginning of my permanent party. I was living in Las Vegas, riding a bus out to the site. I was hired into a group which was J-8. (That's just the letter J, not the word Jay.) J-Division was the testing division and J-8's main responsibility was the timing and firing [T&F], the electronics for the timing and firing. And so I got involved with the timing and firing. I was the only permanent party from J-8 at that time. There was only a total of—Los Alamos permanent party[s] on the weapons site was probably never, ever greater than twenty or so.

So you worked with about twenty people here?

Well, there were twenty Los Alamos people. Most of the people I worked with were EG&G. All the technicians that I worked with were EG&G.

Now this was the mid-sixties that you—?

This was starting in '64.

OK. And so you moved from California to—?

To Las Vegas.

Now that must've been a little bit of a switch. Well, actually you'd been used to the desert, being in New Mexico.

Well, Los Alamos is not the desert. It's seven thousand feet or so. But it really didn't bother me. I'd been out often enough, of course, to at least realize what I was getting into there. It's not like

some of the people who come here now and don't realize what they're getting into. I don't know, where did you come from?

Well, oddly I did go to the University of Wisconsin also, so Wisconsin—

Oh, you did? In Madison?

Yes. Via Colorado.

Oh, OK. But anyway.

Yes, it can be a switch if you're not used to it.

It was, and at that time, of course, the population of Las Vegas, if I remember right, was sixty thousand. The last paved street going west was Jones [Boulevard]. And we lived a block from Jones. That's where we bought a house. So it was still a nice, pleasant town. And no matter what you say, the Mafia running the Strip was an improvement over what we have these days.

I tend to agree. So you've seen some pretty significant changes happen in the city, in Las Vegas, since you've been here.

In the city, yes. I was never unhappy that my sons went to high school here. I felt that they got as good a high school training in Las Vegas as they could have probably anyplace. Maybe **[00:25:00]** not Los Alamos because it had high ratings, but over the overall schools. And both of them went on to college, of course. None of them at UNLV [University of Nevada, Las Vegas]. Probably a little bit due to my influence. The older boy went to Humboldt State in northern California because it was one of the only undergraduate schools that had a degree in oceanography, which is what he wanted.

And that's what he—[he's in] the Coast Guard?

No. That's the other one. The other went to the Merchant Marine Academy and when he graduated from there, there weren't any jobs available because the union had shut down the books on officers, so that's when he joined the Coast Guard.

And what are their names?

The older one is Kevin and the younger one is Brian.

OK, let's see, where do you want to start now?

Well, you're out here at the test site and you're now in the timing and firing, and so what—well, why don't you, just for the record, explain a little bit about what that means.

Well, all of the timing signals went through the Red Shack, which was not a very big shack; about two racks of electronics, maybe three in some cases. The main thing in there was a zero rack, which the signals from the CP [control point] would go through and then be transmitted down to the device to go off. That was mostly signals that were involved with firing the weapon. We did not take much data at that point. The data was in the alpha skid and the trailers.

So you were sort of on the front end of the test, so to speak.

Yes, and on shot days the T&F man, which is what we were called, the T&F person would be down there before the test director, getting the last cables ready to go. And generally speaking, the test director would show up—he would wait until almost everybody else was out, and we'd do the final cabling. And we were the last people to leave, with the security guards that had been on the hole following us out. So that was the group that did that.

And doing this kind of work, what was a typical day for you guys? Now you said you were at this point living in Las Vegas and taking the bus out?

Taking the bus. A lot of people drove and I didn't like to drive that sixty miles. At that time, the highway was called the Widowmaker because it wasn't like it is now. It was two lanes all the way, up and down hills and all sorts of things. It was pretty bad. So I was taking the bus.

A typical day, you're always trying to get ready for the next event, and back in the sixties the next events were fairly close between, time-wise. And so you would get together with your EG&G technicians and do preliminary—basically check out of that zero rack in particular, and point-to-point checks, all the electronics, that it would work properly and it didn't have any bad components in it, et cetera. And then finally set it up in the Red Shack, along with the other equipment that was in there that was more or less what I would call incidental to the event; there were sensors that went on the bottom of the canister to be able to tell when you got to the bottom, I mean without banging it.

That makes sense.

And then another one is that this was Los Alamos's, and the little rack that's in there, in the [Atomic Testing] museum, is a Los Alamos rack. That lower canister was supposedly airtight and there would be a temperature-humidity instrumentation in there that we could keep track of that. Most events were well above the water level. There was one up in Area 19 that [they] didn't realize it was really quite that much water, and it went down into it and that canister leaked and we had to pull that back out again and redo everything.

What shot was that?

One of the first ones in [Area] 19 is the best I can tell you. I can't remember the name. I have real difficulty trying to remember many names because they've all blended together. **[00:30:00]** Because actually with the mass spectrometer, I worked on essentially every event Los Alamos

had. From ’55 through ’63. Getting in timing and firing, again, almost every event. There were a couple—

That’s a lot.

And that’s why I can say that yeah, I never sat down to count them but almost every Los Alamos event from ’55 to ’92, I had something to do with.

I can see how they would just all kind of turn into one big event.

But anyway, so the day was mainly spent checking out, getting ready, getting things ready. At that time, you probably were working as many as three different events at some different stage at one time, where you’d go from one to the other. The EGG technicians, EG&G technician—I keep calling it “EGG,” which was the normal nomenclature—we’d have usually two technicians assigned to each Red Shack. And [we] got along fine. There was never really any problems. They were good workers. You could trust them. Are we doing OK?

Oh, we’re doing fine. I just wanted to check our time.

But anyway, I’m sure you’ve heard it before, that the biggest thing at the test site was the camaraderieship between the various peoples: the Los Alamos, the EG&G, the REECo [Reynolds Electrical and Engineering Company] people.

Yeah, people talk about that a lot.

At that time, Sandia actually did one thing on our devices, which in later years they stopped doing and we’d just go ahead and—Los Alamos said to go ahead and do it themselves. But, the same guy would show up every time from Albuquerque and sit and talk and have a beer after hours out in Mercury. So it was just that kind of place. And as I say, even the crafts, in general—there was a dividing line between the crafts and the technicians and the lab, but the people still—

the technicians would help you if you had a problem, the crafts would help you, although sometimes their union got upset with you. With me, maybe, too.

How so?

Oh, the main one that almost caused a strike was when we first started using fiber optics for bringing signals back, and I insisted that was not an electrician's job because fiber optics were not an electrician's work, they never saw one before. That was EG&G work. And they just about went out on strike over that, but they lost. But that was much later on.

Anyway, I lasted at that, and I don't really know the dates anymore, or even the time, but say about mid-seventies. I got tired with T&F. My statement was that once you learned Ohm's Law, you knew everything about timing and firing that you could possibly know.

So at that time the laboratory in particular was just beginning to attempt to put vacuum systems down hole for the experiments, to pump out the lines of sight, and again, going back to that little rack in there, all those lines of sight, a number of those would've been pumped with a vacuum pump to make sure that as much air as possible was out of there so that the particles would have less collisions getting to the detectors. Basically, that's what the system—and so I got started in pumping vacuum systems down hole. No one really had tried to run a vacuum pump down a two-thousand-foot hole, and there was a learning curve. The type of cabling, everything else, was the learning curve. And in general they were successful. The biggest problem in particular up in Area 19 was the temperature of the holes were so high that you couldn't run the pump for any length of time, just because of the heat out there.

That makes sense, because it gets so hot.

So we built timers that would turn them on for fifteen minutes out of every three hours and things like that.

But anyway, that was the vacuum system business.

And so you did that for a while?

Oh, probably until the late eighties. And call it "special instrumentation." It's probably a better **[00:35:00]** word because it did get involved. J-8 still was the group. There was timing and firing, but there was also an instrumentation section. They had big trailers doing—if you look at the skids and things like that, that was the high-speed photography like EG&G, Edgerton's pictures, et cetera, but the J-8 portion was the low-speed information things. It was like ground motion. We would put seismic stations, actually, all around the hole, and they all read out into this one trailer. But as I say, it was what I called the slow-speed, more incidental, and most of it had nothing to do with telling you anything about how the device went off. It was more for safety. There was a little bit, probably, if you looked at it close enough, yield versus seismic wave. Not the best in the world. The cloud sampling was the best in the world because that was the live particles. And actually, again, it no longer became cloud sampling, of course, when it went underground, but the post-shot drilling came down to drill into where that puddle of radioactive material [was], and that was brought out and probably still analyzed the same way, mass spectrometers, although I understand they did get moved out of that building that I was in and went into a chemistry group like they should have been.

If only they'd listened earlier.

Yes. But anyway, again, extremely good technicians. EG&G completely; willing to do anything. The one that I had working on vacuums was a whiz. Most people didn't like him, but he was a whiz. If you said, Dick, put this together and this is what we want to do, it might look like hell but it sure would run right.

Right. Well, that's all that matters, I guess.

Yes, that's all that mattered.

So this is something that you ran, that you oversaw, this process?

Keeping the vacuum systems running, et cetera.

And how many people were involved in this aspect of it? I mean how many people would work on something like this?

On the vacuum systems themselves?

Yes.

Well, usually there was the one, a man from J-7, which was mechanical engineers. He would be worrying about getting the system put together on the rack or whatever it might be. I would worry about the instrumentation to it, and then I would have at least—usually it was only the one EG&G technician. Between us, that was just about it. I mean the work was being done by REECo plumbers, or pipe fitters actually, but the electronics was EG&G and myself.

Interesting. So you did that through the eighties.

Yes, through the late eighties. Then one night in the dormitory, knock on the door, and this man who had—and I can't remember his name, which is probably the best also, knocked on the door. He had been working on one of the tunnel shots, and he said, `I just can't take this anymore. I'm going to tell them that you're the new test director and I'm going to catch the plane home in the morning.`

Really.

That's about right. Now usually the test directors went through a long series of learning things. Of course, what I had been doing for twenty years already was a long series of doing things.

Yes. You had hands-on.

So they, I guess, submitted my name that night to DOE [Department of Energy] and I was the test director in the morning.

Overnight.

Overnight. And the event, again, Diamond Fortune, it was the last Los Alamos tunnel event. We're up into the nineties, '92, say.

I can look that up.

I've got a hat at home that says it, too. You know, I knew what the test directors did. I knew how the—oh, I'm sorry. I'm sorry. Prior to that, probably in the '89 period, I had transferred *to* the test director's office as the resident—now they call it the "resident manager." But at that time it was called the resident test director. And you were the person that was sort of in the main office of **[00:40:00]** the laboratory because the rest of the people traveled out from Los Alamos and weren't necessarily here on weekends; definitely not on weekends but even during the week sometimes. So you were the Los Alamos representative for the test site.

And you were on the test site.

On a permanent basis.

OK. So you were the test director from Los Alamos.

No, not yet. They might call it the assistant test director, but I wasn't doing test director duty. I would do a lot of the paperwork for him and get it all set up for him—but I was not the test director as such—and on call every night. I would get calls from Security about this and about that. I would say it would average about two a week. Most times you could calm them down by talking over the phone.

And what were they calling about? What types of things were happening?

Power outages, alarm systems going off. I drove every day almost, a government car, because maybe 20 percent required driving back out again to find out what was going on or trying to solve their problems.

That's got to be hard.

Yes. it was. I mean even going out at night to eat, I'd carry a—at that time it was not cell phones, but it was a pager that would tell me to call such-and-such a number.

So that's how I got into the division office. And then this, what I was talking about, coming up on the tunnel where the guy—I think just mentally he just couldn't really—he hadn't been working this sort of thing. He'd been working back in Los Alamos all the time, and he hadn't been exposed to this testing. He shouldn't have been put on that shot, probably, from the very beginning. He should've been gradually taken in, and he got put in a bad situation.

So just the stress of having to deal with issues like that and—

Yes, right, I think that got to him. And then the other thing the assistant test director did was on post-shot, they had to have a Los Alamos authority person on site day and night. And so when they were post-shot drilling, I just stayed in Mercury at night. I'd get calls from them saying where they were and what they were doing, and it was sort of a—maybe once a night they'd call in the middle of the night just to keep you up to date. It was mainly just everything came through that person, and that person talked to Los Alamos in the morning of where we were, because that was probably one of the more hazardous things; as opposed to shooting off weapons, the post-shot drilling was much more hazardous.

For different reasons.

For different reasons, yeah, because once they were contained underground, they were no hazard to anybody, and especially if it collapsed, it was no hazard to anybody. Some of them did not collapse. But the post-shot drilling, they would drill in, as I say, on an angle and pull out very hot radioactive samples which would then be packed up and sent to Los Alamos for, again, the same types of analysis that they did on cloud samples.

So basically they've been doing the same sort of analysis for—

I'm sure that the mass spectrometers were still running. I don't know who were running them.

A long time.

But anyway, so then the final shot that Los Alamos had was Divider on September 23, 1992. I was the test director.

I was going to ask you about that because that was the final shot.

That was the final test for anybody, right. It was the final Los Alamos one. Livermore had one between that tunnel shot and Divider, and again, you can check on what that one was, but there was a Livermore event between the tunnel shot and Divider.

And so what—I mean that's quite a—

I've got quite a history, right?

History from basically the very early shots to the very last shot. Can you talk a little bit about working on that last shot and—

The test director was sort of an overseer. Maybe that's the right word. I was the first test director **[00:45:00]** that the lab had that actually lived in Las Vegas. All the rest of them came from Los Alamos on Monday morning, went home on Friday night.

But you're here permanently.

And I was the first one in that position that was here permanently. So, to me, other than not taking the bus anymore it was really not much of a change. I would come out and I would go out and wander around the area to see if anybody had any horrible problems or there was arguments going on or whatever. And it was sort of like the responsible person on site. Actually the assistant test director was that, too, in a sense because you were the only one there 100 percent of the time. So it really was no great big change. My experience in timing and firing and et cetera

made it so nothing was magic to me anyway because I'd probably seen it all sometime or another.

No kidding.

So falling into the job was nothing, I was in it. And I thought a pat on the back to get the last one. The man who was my boss at the time, he took a trip on one of these sail-type vessels, and that's when they said this is going to be the last shot, and he was out on the boat.

Now did you know before that—because I'm trying—I can't—

It was indicated. You mean if Divider would be the last one?

Yes, I'm trying to remember the timing of the—

It was pretty—at least amongst us it was pretty well-known, yes.

You knew. OK. And so what were you thinking about that? I mean how was that experience?

My own thought was it was right. It was the right time.

The right time for it?

The USSR [Union of Soviet Socialist Republics] had disappeared, as such. Russia was there. There was no more reason to have what would be called the Cold War, and I thought it was the right time. Now I'm maybe one of the few that will say that. I think most people think, boy, we'd better start testing again, and I don't agree. I think that other than trying to make sure that your weapons in stockpile are operable—and by having those small [subcritical] experiments that they have in U1a [NTS underground complex], indicates an awful lot of it. I'm not sure that maybe, in time to come, that they will have to have another shot just to prove that indeed they are operable. That would not surprise me. But I think it would be politically a bad thing to do. Russia would jump up and down, et cetera. I think countries like Iran may or may not be working on weapons, but gee, what's the difference? I mean if you go into that museum right now and see twenty

bombs lined up, that's more than Iran will ever have. So I feel that [of] the countries that have them now, the only one you wouldn't trust is Pakistan, in my mind. Of course there's background there that I did not cover. My wife grew up in India. She's a British citizen, or was a British citizen, but grew up in India. I promised her when we retire, we're going to go home. We went for a month in Nepal and India. She grew up in South India. If you go to a travel consultant, they'll tell you about flying to Bombay and to New Delhi and going to the Taj Mahal. That's all northern India. That's not southern India at all, and southern India is beautiful.

Yes. Southern India, what's—?

It's Bangalore, Madras, Cochin. We went to all of them. She grew up in Coonoor, a girls' school called Mountain Home School for Girls. At that time it was Coonoor and Hill Station**,** what were called British summer—where the officers would go in the summer to get out of the heat, because Coonoor is at seven thousand feet.

Oh, so it's a little cooler than—

Like Los Alamos. It's like Los Alamos. This was during the war [World War II]. Her father was in northern India and she said maybe a couple of years would go by and she didn't see him. Her mother was **[00:50:00]** dead, her brothers went to another school close by, and she figured she had a great education. The school at that time was like forty students, a girls' school for all—not only British subjects like herself but the higher-class Indians also. We went to the school when we were—took her back to India, and we went into the principal, and the principal sent this person out, and I think the person went around to the classes to tell them that they had a visitor and that they should be ready for some people to come. There were now eight hundred students. The school had changed to taking the kids off the streets of India and getting them into education.

Very different scene.

Yes. And as we walked around, they sang the songs of welcome to the visiting Americans.

How neat.

It was. She was almost crying.

What an experience.

Yes.

What is your wife's name?

Marjorie.

Now this is interesting, you said you met in Los Alamos. So how did she get from there to there? How did you guys end up meeting?

Well, she left India in '47 when India became an independent country. Went back to England and went to nursing school in England and graduated from nursing school. Worked for a while there and then decided she was going to work her way around the world. She went to New York and then wound up in Louisville, Kentucky. Worked at a couple of hospitals in Kentucky. Saw this advertisement of "we need nurses in the Atomic City." She thought that might be interesting, so she came to Los Alamos. And she came right—let's see, I have to think. It must've been New Year's Eve of '58, just before that. Like I said, Los Alamos at that time had a *lot* of single people, and the nurses and the schoolteachers were fair game. And she walked in and I said, ah, I got to dance with her. Danced with her and the first night I told her, I said, `I'm going to marry you.` And that was not a line. I never had said that before. She didn't believe that but—

That's amazing. I guess sometimes you just know these things.

And the trick that all the single fellows did with the all the girls they took out was, one of the first nights they said, `You want to go to eat?` You'd go down to Española to a little place called the Rio Grande Restaurant. They served Mexican food that was so hot that you could start a fire by breathing. But it was fun to see these schoolteachers from Iowa, you know, trying. Took her down there. Next day she said, `Can we go back down there again?` That Indian in her, Indian food, that wasn't hot to her.

But anyway, she worked in the Los Alamos hospital until we got married in Los Alamos, and we got married in mid- '59. She worked until the kids were born and then did not work in California. Came out here. She worked off and on for a doctor at first, in a doctor's office, and then she wound up retiring from UNLV in the Student Health Center.

Oh, really. So you've got your connections with UNLV, too. Neat. Wow, what a great full-circle experience.

What else you want?

Well, I guess I'm—

Covered everything?

We covered a lot. Well, I mean I'm just—

Yes, you've got—go ahead.

Well, having been involved now for the span of time, I mean, that you were in the test site, I guess I have a couple of questions, or maybe not so many questions but wondering what your experiences are in that from the time that you got involved till the time that you worked on the last shot that was out there, I'm just wondering if your perspective or your perceptions changed, because you basically went through the whole program and I think it's—

I would say no. I would say that when I first started in Los Alamos I thought that they were doing the right thing. Testing was important and probably much more important then than it was **[00:55:00]** in 1992, to be honest, but it was important. It was still in a small stage compared to modern-day. The weapons you see in those pictures there are nowhere near what was being built back in the fifties, because you can see the pictures of Small [Little] Boy and Fat Man, and it took a while to get to a different stage. So yes, I thought all along that testing was important. Now after the demise of the USSR, maybe already I was saying gee, why are we doing this? And as I said, I still think it was good. It was the proper time to stop. And Russia stopped and we stopped, and the only one, [the People's Republic of] China, has continued. And I guess China is the third country or the third-largest and one would expect that they would've continued, or that they would've developed, I think, at first.

Yes. I guess that makes sense. I mean when something runs its course—

Yes. And it did.

And I guess the other thing that I'm always kind of curious about is there's definitely a certain—different levels of secrecy that go along with the types of jobs that you guys did, some more so with others, and I'm just wondering what your clearance was and how many—

Everybody at that time, everybody from the laboratory, from Los Alamos and probably Livermore too, that had anything to do with weapons was a Q-clearance. There was no question. Now I believe that's no longer true, and people are coming out here with—what is the—L-clearance? There's one step below a Q—

I'm not sure what that is.

Yeah, I think that more and more people are going that way, probably expense-wise to the laboratory itself because of the investigation necessary between the two. It never bothered me to

have, you know. I think that back in those days we were less likely to tell people where we worked, in Las Vegas.

How come?

Just I guess the security. Because if you start telling people they say, well, what do you do, and where does it end?

Right. So just best not to get into it.

Yes. You didn't really—only people you knew fairly well after a while, like say a church. After a while you got to know certain people better, although as I remember it, the ones I had the most dealings with, with church, worked out there, too, so.

Yeah, there were quite a few people from Las Vegas that worked out there, so I would imagine—

Oh, yes.

I mean was it a strange thing to not—I don't know how much you were able to discuss with your family or with your wife at all. I mean was that—?

She never questioned, really. She of course knew when shots were going to come off because she could tell by the schedule, if nothing else, of my staying out. But she never questioned it, and I think she tended not to necessarily tell where her husband worked either, just because of questions and some people putting you on the spot, well, why are you doing such a thing?

Right. Did you encounter much of that?

Not directly, but I think there were times when I felt that people that I met in Las Vegas had a feeling that that shouldn't be going on, but never drastic.

Right. Now that seems like maybe there was a shift in that from when you first got out here or maybe, you know, in the fifties and sixties when the test site opened to—

Oh, yeah, very definitely because—

You know, a shift in public perception, I guess.

Yes. Well, because when it was atmospheric, it was almost like fair game to go up to Mount Charleston and watch the shot go off, and what then was AEC [Atomic Energy Commission], now DOE, they had an office on Main Street and they would put a red light up on the night before the shot. So people would drive around, you could—

So you always knew when it was going to happen.

Yes, people that knew about the red light could.

Interesting.

[01:00:00] But there was an indicator and when I remember it, it was on Main Street. And then later on they were up—they moved around a number of times.

There was a significant amount of protest that happened up there by antinuclear activists, particularly throughout the eighties.

That's right. Well, even yet. I mean they were out there on the fiftieth anniversary of Hiroshima.

Oh, yeah, and it definitely still goes on out there.

Not to the extent that it did then.

Right. Do you remember any of those?

Usually my only connection with them in general was I had to drive through their line to get in the gate at Mercury. And usually they were smart enough not to be sitting out in the middle of the highway and standing along the side. You slowed down, and as you got to the gate there—well, not the gate. They didn't come that far. It was just off the highway.

By the cattle guard?

By the cattle guard, yeah. I was going to say, did you know the cattle guard? Yes, that was sort of the security line that they kept. They were large groups. They would shout and scream, but the

buses came right through or you drove right through. They never really stopped the individuals, I'm saying the individuals going to work. They didn't. They may have held them up a little bit as far as the speed that—

Like the buses and things.

Yes, and to a degree, for sure, made them slow down. Maybe that was good on their part anyway.

Coming off the Widowmaker.

Well, most of those were much later.

That's true.

The Widowmaker no longer existed because that was only until probably the early sixties or so, then it disappeared.

OK.

I didn't see it but it's an incident that supposedly there were some people on the site, and one of the J-7 engineers said that he found French coins on his doorstep of the building that he worked in out in the forward area.

Interesting.

Yes. You know, I don't know what that really meant. And French?

Maybe somebody had been traveling.

Yes, that could be, maybe.

That's interesting.

You know, we never made anything big about it.

I've never heard that one before.

No, I'm sure you didn't. I'm sure you didn't because he and I might've been the only ones that knew about it.

That's interesting. French coins.

I think he still has them.

I would've kept them. I was just curious. I mean there were a lot of—

There were cases where they actually got all the way to the forward areas. I thought at Divider that there were people [that] got in and that they didn't know they were in, and they went to the wrong hole, and so as a result the helicopters never saw them. Again, that may be hearsay, but I vaguely remember—maybe it wasn't Divider, it might've been another shot, too, but that they just went to the wrong place and so the security sweeps with the helicopters never knew that they were there. They were lucky.

I'm sure that would've been highly frowned upon.

Well, and also the ground motion on some of those was pretty ferocious, on some of the events, and you might get a leg broken or so from—

Really. That strong.

It could throw you to the ground if they—because you'd come back out on some of the bigger shots and those buildings would be half-cocked and—Los Alamos put them on shock pads, and they'd actually go up and come down again.

Yes, somebody else was mentioning that, and then talked about one even just tipping over.

Oh, yes. They did a pretty good job of it. I don't think they ever lost any trailers or buildings, but they did take a good shock wave. Now when I was still working with the instrumentation, one of the other jobs, seeing that I was the only one on site, is I got the chance to walk back in on every hole, if it didn't collapse, to dig up our sampling devices that were at ground zero. There was a

routine. Now I would call Sandia and Sandia would come **[01:05:00]** out and their people would put a portable geophone, seismic instrument, and sit there and watch it while I went in with a loudspeaker if I—they said to start running. Never happened. It never happened.

I just want to pause for a minute because I need to make a break in the track.

OK.

I think we're just about done, too.

Well, it depends how you're feeling and how you're doing on time.

Just your questions. Your questions.

[01:05:50] End Track 2, Disc 1.

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

And I guess maybe we touched on this a little bit, but obviously throughout your career there have always been various politics and political views surrounding the program, the testing, the test site itself, even.

I think on a federal level, there never was anything too much. I mean I wasn't into budgets. When the money was there, I spent it, sort of thing. We knew what we had to do, but people never really reminded us that you're spending too much on this. That was not a case. For most of that time the state government and the city, county was, I think, very tolerant of what was going on. Nye County— which the test site of course is in, was much more so. It was actually probably their bread and butter in a lot of respects because there wasn't a lot in Nye County, one mine in Tonopah but that shut down sometime too. I think that politically it was very acceptable. People learned to live with it. I would think you'd have difficulty today if you said we're going to start testing out there. Now, maybe 70 percent of our population never lived through it in the first place. Because some of the big tests would crack swimming pools and what have you. I mean

they did damage. I never suffered anything. But I'm sure that if you started today, there would be a *lot* of hue and cry about why are you doing this.

Do you foresee the site becoming active again?

Well, as I said, my own opinion is that it's not necessary. I guess my feeling is it could happen. It would be hopefully not a series to develop new weapons, which I think is unnecessary.

Are not. New weapons are necessary?

Are not necessary. I think it would be a test of ability after sitting in stockpile for fifteen years. Is this a usable weapon? I think that is important.

And our stockpiles are still—

They're still there. Maybe not as big because there are some agreements with Russia that they'll be down to such-and-such by such-and-such a year. And the tests going on at U1a are tests to try to prove that without using a full-scale device, to prove that they're still working, would work properly. Our present president [George W. Bush] seems to be on the road of blocker, a bunker [buster] which would dig its own hole and go off and et cetera. I think that would be a difficult one to test, for one thing. You can test the device itself, but whether it's going to dig the hole or not is something else. And so it's a difficult one to say what would happen. I would think that the device itself would be something just what it is right now, except in a different-type casing that is ground-penetrating of some sort.

I mean it seems to me that they are still testing various types of weapons out there, maybe not nuclear—

No, even at the site they're not. Nellis [Air Force Base] might—

I guess Nellis.

Nellis might be testing still, bombing. The big thing at Nellis now is the Predator. But what Nellis was in years past was—Sandia used to have a group of people up in Tonopah.

Right. They had a site up there [Tonopah Test Range, TTR].

Yes, they had a site up there, and I don't know if it still exists or not. I obviously don't know. But it had nothing to do with Area 51.

Where we tested the Stealth was—

Well, 51 was Stealth, mainly, but Tonopah was special instrumentation of some sort. I've known people that worked up there and one of them was a [Boy] Scout leader from when the **[00:05:00]** boys were in Scouts. In fact he lives up in Sun City with me now. I've seen him once in a while. But there was secret things that you never knew. I never had anything to do with Area 51, other than to go over to Rachel and have a beer in the A'Le'Inn [Takeoff on "Alien"].

Well, it's not a bad thing.

You've not been over there, I would guess.

No, but I would like to, actually.

It's not much of a place.

I guess my one other question that I have, because you'd mentioned that you weren't concerned so much about exposure or radiation, there's been so much that surrounds the test site that has to deal with the debate whether people have been exposed, whether they're not, whether there was, whether there wasn't.

Remember my statements. The only atmospheric shots I saw were in Enewetak. The fallout did not fall on Utah. All of the above-ground shots at the test site, indeed there was fallout, mainly to Utah, some in northern Nevada. They would not fire if it was aimed at Las Vegas or Los Angeles. So there was a definite window with the way the wind was blowing of what would be a

good day to shoot or not. At first, no one knew, I don't think. They knew that there were hazards, but how deep those hazards might be, I don't think they did know. The iodine in particular, because of thyroid, it wasn't the most radioactive because its half-life wasn't very long but it still was probably the most dangerous health-wise, obviously health-wise I should say. Some things are probably twenty years later that maybe somebody that had been exposed comes down with some rare form of cancer. I never was worried about it. I didn't partake of that many—only the atmospheric shots out there, and some of them raised a little dust out here when we first were getting underground, but nothing like the events that most people are referring to.

Right. The shots through the fifties, basically.

Yes. And as far as working with it, there were times that you handled radioactive material. There was—ah, this—it's a good story. In Enewetak one of the shipments was a canister full of radioactive gas. We opened the outer, and the inner canister had leaked. Another fellow and I opened it up. And as we ran—this was a long, narrow building and there were radiation alarms—as we ran we'd set off each one.

So I guess there was—

Yes, there was quite a bit following us. I went to Health Physics. And the gas was tritium [T], tritium gas. And the cure, they gave me a case of beer and said go home and drink it, or go to the dormitory and drink it. And that was it.

And that seemed to—

Well, tritium is just a form of hydrogen and the body doesn't know if it's tritiated water or water, and so your urine takes care of tritium just the same as it does hydrogen.

That's a great cure.

There's other people that tell stories like that, too, that happened.

That's great.

That was really the only gross exposure I might've had. There was a minor one in Los Alamos with the mass spectrometer business, but it was essentially a loss of a pair of shoes because somebody had spilled something on the floor, but it wasn't volatile. And also you had places to check in and out of that area that you had to check your feet and your hands.

[00:10:00] *Yeah, I would imagine you would have to do something before you came and went.*

But, you know, I didn't really worry about it.

Just curious.

And health-wise over the years nothing has indicated that that's been a problem.

It's interesting, depending on who you talk to.

Yes, that's true. I'm sure if you talk to the Downwinders, their stories would be drastically different. And of course some of the ranchers around Las Vegas, although—around the test site, not Las Vegas.

Right. Up in the area.

EPA was worried about radiation off site, the Environmental Projection Agency, and there was one time that I took *a* trip around the test site with the EPA and spent the night; it was in Ely, I think. They'd stop at different ranches and talk to the people. They knew every one of those ranchers, knew them and knew everything about them, their kids. The relationship between those ranchers and the EPA radiation monitors was tremendous, and very impressive. None of those that we stopped at, of course, because they could choose which ones they stop at, but none of them had bad things to say.

I think it was Ken Giles. I don't know if you know—

Is he the one in the—?

He's with the EPA and he does that, has the interaction with—had and still has, I guess, still monitoring out there for certain things.

Oh, OK.

So that is interesting, though, that the relationship that they do have seems very close. And I guess they've been monitoring for a long time?

Well, I think they do. Now I got a notice, again, four years ago from Johns Hopkins [University] that certain people that had worked for the laboratory would be, if they wanted to, have an examination. It was a cover-your-ass-type thing. I mean the laboratory probably started it and Johns Hopkins was doing it. So I'd gone back to New Mexico. It was mainly lungs, hearing—mainly the lungs because of people who had worked with beryllium [Be], which out here was rare. I mean no one really worked with beryllium out here. But I had worked in tunnels and so I said no beryllium but let's check for silicosis, because I had worked a lot in the tunnels. On mine they specifically said silicosis not beryllium. And then it was—I can't remember—it was heart, prostate, probably blood work, ears, eyes, basically six things that they were worried of ex-employees probably suing them and this is a baseline. And I've got copies of it at home.

And everything's good?

Yes, everything was fine. And so the laboratory, as I say, some of it's maybe protecting them.

Sure. I'm sure it is, for liability and things.

From future lawsuits. But it's also worthwhile to the individual.

Absolutely. That's interesting. I think it's always going to be, not a controversy but a topic of discussion.

You happy?

Sure. Yes. Is there anything else that maybe we didn't cover that you—?

I think nothing that I'd really want to.

OK, if you change your mind—the last shot, you know, through the eighties and into the nineties, the work population at the test site, was that starting to downsize?

Quite a bit. Back in the sixties, between the two labs, I would guess you were **[00:15:00]** having a shot about every two weeks, two to three weeks. In the nineties, every three months, one or the other laboratory. So each laboratory maybe had a total of four shots for a year, something on that. Again, you can look at your book and see how that decreases with time. Of course, the other thing is, that they became much more complicated, too. *Much* more. Back in the early days of sticking down a hole with cables to fire it, cables to operate a few detectors, maybe a total of fifty or sixty cables going down hole. You get to those later ones and you're up to two hundred, three hundred cables, mainly because of the advancements in instrumentation, not the weapon, but the instrumentation to *measure* what that weapon is doing.

Now I'm curious because before you talked about sort of the camaraderie and the community that the test site was and that sort of was formed around that. As the tests changed and became less frequent and fewer and fewer people were, you know, the worker population was going down, did that change at all?

I think the camaraderieship probably got better. It would be the obvious thing.

Uh-huh. I'm just wondering if it changed the dynamics or the way things—

Just because you had less people.

Right. So you became a tighter-knit group.

But of course the good thing was, is the less people were also the best educated in what had been going on, and so they were really the best trained. You always get rid of the ones that aren't as well trained.

Just weed them out. That's what we strive for. Well gosh, I definitely appreciate you taking the time to talk to us.

OK. I guess if there's something comes up, you can call.

Definitely. Well, thank you so much. I appreciate it.

OK.

[00:17:25] End Track 2, Disc 2.

[End of interview]