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

Interview with Elmer Sowder

July 29, 2005
Las Vegas, Nevada

Interview Conducted By
Mary Palevsky

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Table of Contents

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

Mary Palevsky: *OK, so that's the story I remember when I first came over to your house and I went and looked in your museum and I saw the bayonet and the—*

Elmer Sowder: The rifle.

—the rifle, excuse me, and the samurai sword. We have a part of that story, but if you could give it all to me, that would be really useful.

Well, as had been previously indicated, a bunch of us were on patrol and this buddy of mine, we're pretty much together. He was a little bit ahead of me and I looked up. We were going through what I called a forest there on Okinawa, and I looked up saw this figure up in the tree with a rifle. I had an American M-1 carbine, and I raised it to take a shot first, but it was jammed. The last shot I'd fired out of it, the shell didn't release and the mechanism was jammed so I couldn't fire. Well, in the meantime, my buddy got shot. By the time I realized what was going on and what had happened, I got the rifle cleared, so I took aim and I knocked the guy out of the tree and he and the rifle came down together. His sword was leaning up against the tree, at the base of the tree, but the rifle and the soldier came out of the tree, and that was the end of that, except I picked up the rifle. It was damaged, I mean it had damaged the mechanism, so I brought it back and I had it boxed up there on Okinawa; had it boxed up and sent back home. And eventually, when I eventually moved, well, it went back to Amarillo in the first place. I'm dragging too much, I think.

No, that's OK.

And it ended up in Amarillo, Texas where my parents lived and my first wife was living at the time. But I moved it over to Los Alamos when we moved to Los Alamos. So it was in Los Alamos for quite a while. And then when I came out here, I brought the sword and the rifle out here. I took the rifle down to a gun shop down here off of Decatur and Lake Mead and showed them the bolt action didn't work right. And they said, `We can fix that,` and they did. So it's in working order right now. But if I hadn't have been—well, I think I indicated in that interview somewhere that if I hadn't been so careless in taking care of my rifle, the incident as far as my friend was concerned probably would not have happened. But I was too slow because I had let my rifle get in trouble. And of course that's the first basic rule: you live with your rifle, that's your livelihood. But I didn't realize that it had jammed up.

And you were a young guy then, too.

Twenty years old. Twenty-something. Twenty or twenty-one.

That's a lot of responsibility for such a young person.

We were all like that.

Yes, that's true.

All young. But I am—well, I am extremely proud of my service in the Marine Corps. I see all of these, you know, you see all these news reports about the people fighting in Iraq. Yes, I can sympathize with a lot of that, but then I get to thinking about the hundreds of thousands that were either over in Europe or were in the Pacific during the war, and sympathy is about as far as I can go. I went through a lot of the same things they're going through. Maybe it's different but anyway, I'm proud and very honored to be around *anybody* that served in the military. Of course, **[00:05:00]** my laboratory career—well, I don't think I could've had a better career anywhere.

You were saying before we turned on that there's things that wake you up at night that you think about and you told me a couple of those things. Can you tell those stories again now?

Well, I think about the time that I got cut with a bayonet. I think about that. In fact, I probably mentioned that to you once before.

You did.

About how I would wake Jeanie [deceased wife] up in the middle of the night with a nightmare. And I think about some of the—are we recording?

Yes.

You really want all this nonsense on there?

Yes, I do. Unless you don't want to tell me, then I'll turn it off.

No, no. But I think about—I haven't done it in, well, at least in the last two or three years; I haven't had any what I call really bad dreams. My dreams nowadays are about her [Jeanie].

Sure.

Anyway. Well, as I indicated in the interview, and it's in there, I was a twenty-year-old kid when I went into the Marine Corps and they made a man out of me. I consider they made a man out of me, and I wouldn't change that for anything. Sure, I learned some bad habits, like I drank too much. But right now, I have a bad habit in my depression and the doctor tells me that I have a depression that seems to come and go a little bit. But I get depressed, but mostly nowadays it doesn't have much to do with the war [WW II]. I don't think about that much anymore. It's just Jeanie. I miss her so much.

Yes. I can pause this if you want, Elmer.

Well, whatever.

[short pause in recording]

OK, I'm going back on. So it's after the war.

Yes, and I discovered that the wife was pregnant and the doctor told her, he says, `You're going to have more than one.` They didn't have ultrasound or things like that at that time. He says, `You're going to have more than one.` So the time came, August the 13th, and it was a Friday, but where was I? I was off 300 miles away in Oklahoma on the day that she actually went to the hospital.

Because you were working for the railroad, is that what you said?

Yes. And the only way I could get back in time—because the words I was getting were you'd better get back here as soon as you can—so I managed to hitch a ride on a Santa Fe freight train coming from Oklahoma to Amarillo. I rode in the caboose of the freight train, and got in I guess about 10:30 to eleven o'clock at night; finally got to Amarillo. And my dad came and picked me up when I called him. Got to the hospital, and of course the word at that time was it's going to be any time. So at 11:50—and my daughters corrected me on this because I had the times a little bit wrong—at 11:54 on August the 13th, the first baby was born. I heard the first baby cry. This was 11:54. Well, the other one didn't come till actually like 12:04 on the 14th. But the doctor, when he came out he said, `Everything's fine.` He said, `Two beautiful girls,` or something to that effect. And the nurse said, `Well, here's the times we have,` and they had it on two different dates. The doctor said, `No, twins are not going to have different birthdays,` so he set the 13th as their birthday. I don't know, he set one of them, I think, at 11:54 and one of them at 11:59 or some such thing so they'd have the same birthday.

Right. What a great story. Now, are they identical or are they fraternal?

They were identical. Now, they've lived apart—well, they've lived apart since the sixties or **[00:10:00]** seventies. The oldest one, Carol lived back in Long Island, New York for a while and

then her husband was a professor—what is that New York university at—I can't even remember the name.

Well, on Long Island, there's [SUNY] Stony Brook—

No, no, it's not—it wasn't on—it was inland, the university he was at. But anyway, someday I'll think of the name.

One of the state universities? I'm from Long Island. Was the school on Long Island or was it upstate?

No, it was upstate.

OK, there's several of them. Yes, State University of New York. There's a bunch—

Stony Brook? Is there a Stony Brook?

Stony Brook is one.

Maybe that was it. But he was there. But he couldn't get—they were there for a few years after they had left Long Island, but he couldn't get tenure, so they came back west. And then the second set of twins—of course, the girls were born in Amarillo—the second set was born here in Las Vegas. Kerry and Kay. First two were C and C and the second two were K and K. But Mary, I have been so blessed in my life.

OK, here's a picture. Oh, how cute! So this is—Kerry's the boy.

Yes. Oh, I can remember—of course, we moved to Los Alamos not long after—well, we moved to Los Alamos in '59. And when they were little, we put them in the bathtub and gave them a bath, and I couldn't tell them apart, but neither could my wife. They'd be sitting there in the tub and I'd say, `Which one is that?` [And she would say], `I don't know.`

Now, when were the little ones born, the younger ones? Forty-eight and—

Fifty-three.

Fifty-three. And what was your first wife's name, again?

Virginia.

That's right, you told me that. Wow, that a cute picture.

And I found this. This was in storage over here. Somebody broke into the storage and trashed it, and this was one of the pictures that survived. Because we went back over there after they had just taken boxes—Jeanie had thirteen or fourteen boxes of Christmas decorations over there—they just took the boxes, dumped them in the middle of the floor, with all the mess. Of course, the ornaments, a lot of them, were broken. Some of them are still around. Some of them we still—but I found some of these pictures that didn't get broken. And here was—[Pause]

So we're recording again and I want you to tell me the two stories you told me before we started recording, but tell me what—you were saying this was the first time you were the test director?

I was a rookie.

And which test was it, Elmer, and what was the year, do you recall?

Eighty-four.

Oh, that's right, you told me.

Eighty-four.

And which test was that?

It was called Villita. That was the first one that I had on my own. I had been following other directors around on some of the other events, but this was the first one that I ever had on my own.

What was the purpose of that test?

It was just a weapons test.

OK. So you had to coordinate with the lab guys, is that how it works?

Yes, the scientists come in with the experiments that they want to do, the data that they want to get out of the test. Of course, in the atmospheric testing days when they were testing in the atmosphere, they could get it directly from the fireball. But when you went underground, it was a different story. Had to do things different. So they'd come up with their various experiments that they wanted to do. Sometimes they were a little bit beyond engineering **[00:15:00]** feasibility, but as engineers we tried to go along with them and do the best we could. So they had this quick look at the data that afternoon after the test, and then that night I had understood that the quick-look data looked OK; looked like it was OK. Then we went to the Steakhouse, I walked in the door, and I'll be damned if I didn't get a standing ovation.

Yes. That's so great.

Oh, there's all kinds of stories from the [Nevada] test site. Of course, then the other one was when Andy—who brought that in.

Right. Now, Ledoux was that one—because there's a thing on the certificate, it's like "Ledoux and Redoux" and—what was the deal with that? You've talked to me a little bit about it before but—

Ledoux was originally—I don't remember the original schedule date, but it was in early 1990, as I recall. And we had some difficulty; it was all underground and buried. It was down in a mine drift off of the shaft. After they got everything assembled and all the experiments and everything were in place—and this one had a gas system in it, I mean there was compressed gas involved in the test—and after we had sealed off the tunnel where the device was and where the experiments were, they discovered that a valve had been left open on one of the gas systems, so the gas was escaping into the tunnel. The entire test would've been a complete failure without that gas system. So it was decided that they would abandon that area and go back and mine another drift

around the original one, which is what they did and on that certificate there's reference to that.

The miners say, We don't need mining practice.

That's right. We wondered what that meant, too.

But they mined another drift around the original one—of course, the original one had been sealed off with concrete. So they mined a new drift and we went in, and then they went in and installed everything again. And the test, it went off in late—when was it? I don't even remember the date, but it was late '90, I think [09/27/1990].

We can look on your certificate.

Sure. But when we first had the delay, when we were going to have to mine a new drift around, we started calling it "Ledoux in '92" or "Ledoux Neverdoux," or something. But then things went better. We had great cooperation from the construction people. The miners and all, they got the drift done much faster than some of the people thought they would and got things installed again; got it ready to go. So it ended up that it was in the same year that it was originally planned, but it was "Ledoux in 92" there for a while.

You showed me this gold-plated, it looks like a cone. Was this a diagnostic piece or—?

Yes, a diagnostic piece. A series of different-sized cones to obtain some kind of data from the event.

Were they spaced apart or—?

Yes, they were installed in a series—

On a pipe or—?

Oh, I don't—it was inside of a pipe, I think.

Inside the pipe, OK. And so then the story with that is that, again, after the test you go to the Steakhouse?

Yes. And the scientist that had that particular experiment, he came in the Steakhouse, walked over to the table where Jeanie and I were, and he says, I think you ought to have this, Elmer.

That's great. Andy Obst, you said his name was?

[00:20:00] Yes. He was a—if you'll turn off the recorder, I'll say something—

Sure. I will.

[00:20:04] [At this point, the recording is paused, and then restarted.]

So tell me a story about what you were going to say about [Harold] Agnew.

Well, when he was director [of LANL], and he knew me only by name, I'm sure, because I was a peon in the Engineering Department, or the J-6. But the parking lot—you know the parking lot in front of the administration building there at Los Alamos [National Laboratory]?

Yes.

One winter—of course, every winter it got covered in snow, and people parked in every—nobody made a real effort to do any decent parking in that parking lot because they couldn't see the markings. One morning I had parked—I guess way in the front, closer to the street, in the lot, found a place—and was walking back in through the snow, and Agnew comes along, and we were walking in together. And we came by one of these areas where two cars had parked nose-to-nose, and then some car had come in behind them so that the guy in the middle had no way in the world of getting out. And we walked through there, and Agnew made a comment about that. He said, That must've been some of my physicists that did that. He was the director at the time.

OK, I'm going to pause this, then.

[00:22:04] [Recording is paused, and restarted.]

He [Robert Brownlee] really was the group leader of the group that started the containment program at Los Alamos.

Brownlee was?

Yes. J-9 became the containment group and Brownlee was group leader.

But he was also around in atmospheric days, no?

Oh, yes. He was around for the underground, above, before the containment the business. He was on the underground testing, too.

Because when I spoke to John Hopkins about it, I said I'm interested in understanding containment, now Cliff Olsen is writing a book on containment, and then John Hopkins said to me, But it's Brownlee that you want to talk to from Los Alamos about containment. And either he'll come down here or I have to get myself up to where he lives.

Understood. Brownlee was the guest speaker at one of these annual [Nevada Test Site] historical foundation meetings, I don't know, two or three years ago.

Before I came.

Yes, I'm sure it must've been.

Because John was at the one the first year I was here.

Yes. Right. But Brownlee gave the talk.

Yes. I wonder if they have a copy of that talk at the museum.

Well, the current director of the Los Alamos laboratory, Bob Kuckuck, he made one of the guest speeches at the annual meeting. I thought it was the best speech I had ever heard as far as testing was concerned. But I don't know whether they recorded it. I suggested to Troy Wade after he left, after I heard this talk, I said, You ought to get a recording of that talk. Of course, I don't know where Kuckuck could give the same talk twice. But I thought it was

magnificent. Jeanie and I went to that annual meeting and I thought that Kuckuck gave a magnificent talk. Of course, Hopkins did, too. And Brownlee did, too.

Well, John talked about World War II, but Kuckuck, you're saying, talked about Cold War testing.

Mostly Cold War business, yes. He is now director of the Los Alamos laboratory.

I heard, yes.

Of course, I got reminded of that. Joe Behne—at the last trustees' meeting of the historical foundation that I attended, Behne was there and that's when the first words were coming out about the new director of the laboratory—old Behne had to remind me, he said, **[00:25:00]** `Well, looks like Los Alamos was saved by Livermore again.` Of course, he and I used to—we had friendly confrontations, Joe and I did. Great experience. I had a fabulous career. Well, I think I had the best—there at one time—well, when I became group leader of the engineering and construction group, I thought that was the best job in the laboratory. You're not recording, are you?

I can turn it off.

[Recording is paused, and then restarted.]

The first—Bob Newman was a major part of this exercise. They were trying to figure out some kind of a formula for burying nuclear weapons; what size they could bury at what depth and keep them in the ground. And Newman came up with an idea out there, a relatively shallow hole—I don't remember how, but he came up with the idea. They put a steel dome on top of the hole, fired the shot, and they never found the dome; the dome went off.

Oh, right! Oh, God. So that didn't work.

But it was part of the study. It was part of the learning process of learning how deep, what it took to actually contain nuclear fission products in the hole. That was all a part of it. At the time that happened, let's see, I don't remember where I was at the time. Oh, and something else. You're not recording.

I'll turn it off again [Off the record comments]

[Recording resumed mid-sentence [00:30:38]

—with him [James Carothers], was in these CEP [Containment Evaluation Panel] meetings. I generally wasn't an active participant in very many, but he was so biased—

Jim [James] Carothers was biased in what sense?

Livermore [Lawrence Livermore National Laboratory]. At these meetings—

The meetings were joint with both labs?

Oh, yes, it was a DOE [Department of Energy] meeting—Containment Evaluation Panel—one of the reviews that had to be done before you could even schedule a test out there. Bob Brownlee was on the CEP at one time. But I didn't have much use for Jim Carothers just because of *my* opinion of him. He's was a scientist. I mean he was a smart guy, there wasn't any question about that. But his bias showed too much, as far as I was concerned.

Now, this is an interesting point, and I'm going to record this if it's OK with you.

OK.

Because people talk a lot about, and you joke about it yourself, about the competition, et cetera, but in what sense was someone like Carothers to the point where you would say biased? How would that manifest itself?

Well, in some of the speakers that would get up to make a presentation, and they had to—see, if Livermore was going to do a test out there, their containment people, which included Olsen, they

would have to make a presentation at the CEP as to what they intended to do or what the containment involved. And there was a few of those meetings that I sat in when it seemed to me—oh, again, it just seemed to me that Carothers was being unnecessarily harsh with the Los Alamos presenters—

I got it. OK. Now, what was his role? He was at the top of the triangle above everybody?

He was the chairman of the Containment Evaluation Panel.

Appointed by the DOE to be the chairman or—?

Yes, he was selected in some fashion. And then, of course, after the meeting, the minutes of the Containment Evaluation Panel meeting, of course, then went to the DOE manager here, for approval before they could actually schedule a test.

OK. One of the things I have from—Carothers did all these oral histories up at Livermore, and he seemed, when I read the stuff about Baneberry, to have been really concerned and baffled and all these kinds of things about why Baneberry happened. Now, because that was a Livermore test, were Los Alamos people ever involved in trying to figure out what the deal with Baneberry was?

Oh, I'm sure people like Brownlee and the containment people in Los Alamos spent a lot of time evaluating. There was a lot of joint effort, but there was a lot of competition, too. For instance, the stemming plan, how they stemmed the hole after they put the device in it, the two labs did it a completely different way. Of course, Livermore thought Los Alamos was doing it the wrong way, and Los Alamos thought the same thing about Livermore. But both of them seemed to work about as well. But Baneberry was a little bit different. See, I think—my vague memory of Baneberry is that it wasn't the containment in the hole; it was that the nuclear blast opened up some fissures in the natural ground, and that's where the—but that had to be **[00:35:00]**

considered as far as containment was concerned, and it was apparently not considered in enough detail for that one. Los Alamos blew a few out, too, but they were in the early days; very small. Of course, it's all listed in that book that came out, "release on site only" or "no release on site" or some such thing.

Right. Of course, it's hard for the layperson. "Some release," you don't know what that means relative to some other release on site, off site. But explain in a layperson's terms, what was the different sort of stemming philosophies, I mean for between Los Alamos and Livermore. Could a layperson understand what the difference was?

Well, I don't think I can even theorize or remember what Livermore's was.

OK. Tell me what yours was, then.

Los Alamos? They lowered the package in the hole, which may've been a 50-to-150-foot rack with the bomb in the bottom, and then they filled the hole starting at the bottom with magnetite sand, then they'd come up with coarse gravel and then they'd have some more sand, not necessarily magnetite, just fine sand, and go alternating layers up the hole until they got—at one point we were doing coal tar plugs.

Coal tar.

Coal tar. Because there had been some evidence that maybe some of the release that might be seeping out of the ground was coming around cables. So somebody came up with the idea that OK, at one point in there, we put in a layer of coal tar around there, around the cables, so that the gas won't be able to seep up around the cables. And then—I think Livermore was more to using concrete in layers in there than we were; of course, that was another learning exercise—we'd stem a hole. We had one out there—I forgot, I have to look back in the book to even remember its name—but we, Los Alamos and I think Livermore, had the same problem but we didn't hear

it about it much. They'd get a hole almost filled up, ready to seal it off at the top, and the stemming do would what they call a stemming slump: for some reason, it would fall. We had one, one night—and I'll have to go back and remind myself of the name of this—but one evening we had stemmed the hole almost to the surface and we came back the next morning, or somebody found the next day and the stemming had slumped. Well, I know what happened. EG&G [Edgerton, Germeshausen, and Grier] went for their cable check to check the timing and firing cable to see if they still had continuity in their timing and firing cable, and found that they didn't. The stemming, when it fell, had broken the timing and firing cable. So at that point, there was really no way to fire the device. Well, we had experimented from time to time out there, mostly as an engineering activity, of removing the stemming from the hole. You know after we'd fill it up with sand and gravel, was there a feasible way to get that out of the hole if you needed to? So REECo had a big vacuum cleaner, if you will. I mean it was a—I've forgotten what they called the thing, but it actually was just a vacuum cleaner. They'd lower a pipe down the hole, put a vacuum on it, and suck that sand and gravel out of the hole. And so after the T&F cables were broken and we knew that they were separated, we went to the vacuum system to try to—the break, I guess, had occurred some two or three hundred feet down in the hole—so we vacuumed it out, and then was running TV cameras down to find out really what it looked like down there **[00:40:00]** after the stemming had been taken out. And they found with the TV camera, they found where the cable was broken. So Tom Scolman—you've heard the name, you may not know him but you've heard the name—was a test director at that time, and of course the only thing that could be done was to go down and repair those cables. Well, Tom was an ex-timing-and-firing engineer before he became a test director, so he set it up with the AEC [Atomic Energy Commission] and REECo, they built a cage that they could lower in the hole that would

hold two people. And so they set it up, rigged it up with a crane, to lower this down in the hole with two men in it to see if they could repair those cables, and Tom Scolman was one of them. I don't remember who the other T&F engineer was that went down, but two of them went down, and they patched up the cable and EGG [EG&G] checked it and got continuity on it. So they got the men out of the hole, stemmed it up again, and fired the shot. But it took some work.

OK, two questions. When it slumps, is it like settling? Is that what—?

Yes, but it's a sudden settle. See, sometimes what it was doing—we discovered that what it was doing was it might bridge; you might drop a bunch of sand or gravel down in there and it might just bridge itself off—

And not really go all the way?

—and not really go all the way down. So then you got a little bridge in there and you keep stemming on top of it and eventually that bridge gives way. That happened to us more than once, but this was the only time that it really damaged the cables.

I have to check because I've had a couple of stories from the miners' end. I know of one case where one guy who was a safety engineer had to go down with another guy and fix something, but I'm wondering if it's this, because you're saying you think it was two T&F engineers—

No, this did not have a safety engineer.

OK. So this was two—I'll find—we can find out. If you look at the list, will you be able to remember the name, or we can research it?

Oh, yes, I can look at the list, I think. I used to remember the—there was two particular events out there that I was involved in, that for a long time I remembered the names of them, but then suddenly, well, as I got older, it left.

It's that name memory that starts to go, that's the problem. But about what era are we talking about here? The eighties, would you say, or—?

Let's see. I think this was in the seventies. Let me go get the book.

*OK. I'll pause it. You go get the book [*DOE/NV—209-Rev 15 December 2000].

[Brief pause]

You heard about that one, didn't you?

No, you'd better tell me. What's a transom test?

That was just one of the underground tests that we had out there.

Oh, was its name Transom?

Yes.

OK.

Oh, we were talking about Peninsula.

Oh, it is on the list. OK.

Well, no, this is Azul, A-Z-U-L. "Detonation destroyed Peninsula device that was damaged during emplacement."

Oh, great.

"Peninsula device was not tested." So we found the answer to that one, anyway.

We did. Thanks for that, Elmer. That's good.

But Transom was similar. Transom was one of ours that we had buried in a hole, and when it **[00:45:00]** counted down to zero, it didn't fire. There was no way to get to it, so the big decision was made to drill a hole down alongside the hole that Transom was in.

Hey, there's Ledoux. 9/27/90.

I was looking—I saw Transom a minute ago and then I promptly lost it. But I wish I could find that one we were talking about—I was talking about, about the stemming slump.

Right. That's very interesting.

I haven't found that one yet.

[00:46:14] [Recording is paused and restarted.]

Oh, OK.

Umber.

Umber.

That doesn't sound right, particularly. I mean the year it was done doesn't sound quite right, but I think that was the name of it.

And that's the one with the stemming slump, you think.

Right.

Well, you know, that's something, if I have a name to start with, I can probably get some more information about it.

Well, I'll keep looking, and if I find something better, I'll let you know.

Now, so what was the deal with Transom? Oh, that was the one where you had to send the other one down?

Yes, I found it a while ago and I managed to lose it.

Here. Take a look. If you look at the alpha[betical listing], then maybe you can find the year? Does that book have an alphabetical listing?

Yes. That's where I found it, found Transom. But I'm looking to find the one—oh, oh, here it is. Transom. "No nuclear yield. Device was destroyed by Hearts detonation on 09/06/1979." That's

where we drilled a hole down alongside, put a new device, another device in it, and blew the old one away.

But when you're doing that, are you making a nuclear reaction, or you're just blowing the other guy up?

Just blowing the other guy up. Yes. It's just destroying it.

Just destroying it. OK.

Yes. It gets caught in the fireball and destroys it.

Oh, I see. I see. Was it ever figured out what was wrong with that one?

Oh, I think the T&F people may have figured it out sometime, but I don't remember. I'll keep looking.

[00:48:40] [Recording is paused and restarted.]

One of the questions that arises—I'll record my question, then you can tell me whether you want to answer it—one of the questions that arises for a layperson, when you're hearing about all these underground shots, is you begin to think about the kind of residue or stuff that's left over in the soil from all the underground shots out at the test site. Do you have any knowledge about that, or were you ever concerned about that as far as future safety?

I was never concerned about it. See, the debris—give me a pad and pencil, I'll draw a crude picture on it. See, in the atmosphere—well, we'll go at it this way. When a shot was fired in the atmosphere, whether it was on top of a tower or not, it creates a big fireball. It may've been on a tower. Of course the scientists could point their instruments at that fireball and do everything that they wanted to do. Underground everything's underground, buried, but when the device goes **[00:50:00]** off, it creates a big cavity and that of course is what causes these craters at the surface; as this cools off, it gradually slumps in until it gets to the surface and then you end up

with a crater at the surface which is why you see a bunch of craters. Somebody drew a—I can't draw but somebody drew one time—you know, underground is just the opposite of atmospheric. In one case, you're doing the bomb or the device on top of a tower, so you just turn that over and it becomes an underground test. And of course, the post-shot drilling, when we'd come in with a drill rig and we'd drill down, of course the debris puddle down here. Down at the bottom of this big cavity, there's a debris puddle, which theoretically the nuclear debris collects in that cavity, and when we drill down—we would drill down into that area, pull samples out of the ground, pull them to the surface and we'd have a sample of the bomb debris. And then they'd analyze that and determine what the yield of the device was from doing that. But the technique of directional drilling from the surface down into a particular spot was developed at the test site.

So that was not a simple thing to do.

Well, it took a little extreme effort to do it. [In the] first place, you had to keep track of where you were going. And of course there are tools that are made that you can lower down in the hole—either as it's being drilled or after it's been drilled—and lower it down in the hole and it tells you direction; it tells you where you are with relation to a reference point so that you know when you're getting close to the—. Of course, this is theory, where that actual debris is, but it became pretty strong theory the more we did it. Sometimes we'd go out there and drill for hours and hours or days and days and figure, fine, well, we aren't in the right place, so we'd have to go back and maybe run some more directional tools down there to try to discover where we were and where we had to go to get to it. But again, that is a science in itself, directional drilling. We had two of the best engineers out there that were good at that. But I got to the point—this was before I was test director, this was when I was strictly J-6 and J-6 had the responsibility of doing the post-shot drilling, which meant it was our responsibility to be sure they got samples of the

debris back at the laboratory as quickly as possible. So if we screwed up in the drilling operation, somebody like [Robert] Campbell was on our back immediately.

You've heard this, I'm sure, but Campbell never did give up completely being J-6 group leader, he never did give that up. Even when he was test director, he was still J-6 group leader. Some people liked him, some people hated him. Me, I thought he was the greatest guy I'd ever been around. He was good; he was strict. Don't fool with him, don't lie to him, because if you lied to him, then you're in *deep* trouble. But he was straightforward. I enjoyed very much working for him. Some people didn't like him at all because he was too harsh, too critical. One of the physicists—and even if I remembered his name, I wouldn't tell it—but he was one of the top **[00:55:00]** physicists and he got stopped on the test site for speeding, I mean he got a ticket from the sheriff. Of course, that was reported to the Los Alamos test director after it happened and Campbell suspended his driving privileges on the test site for three months and told him, `If you do it again, it'll be for a year, and after that it'll be forever.` And this was one of the top physicists or one of the well-known physicists, but Campbell didn't fool around. Now, he was just as strict with peons like me or others, but as far as I was concerned, he was always fair.

So let me ask you a question back to this because this is very interesting, this post-shot drilling. How long would you wait till after the test was done to do that? Generally, let's say.

Well, sometimes they set up to drill the same day of the test, after the test. They generally waited till it cratered at the surface, because that was an event in itself. I remember one time they fired a shot—I had nothing to do with it, I was just on the sidelines—but they fired a shot. And jointly we got to the point where we could estimate pretty well how long it would take before the crater would get the surface, depending on the size of the device and the type of soil it was in, and then

we'd estimate about when it might crater. It might be an hour, might be three hours, might be four days. Sometimes they set out there—in fact, I'm not sure there's not at least one or two out there somewhere that haven't *ever* cratered—but we got pretty good at estimating. And I went out there, and Los Alamos—I think Livermore did about the same—but after we'd fire an underground shot, nobody could get near the area until it had cratered, supposedly, and nobody at any time could get closer than the perimeter fence which we had put around ahead of time because we figured we could predict well enough the size of the crater that we could put the fence around ahead of time. So the general plan was they'd fire the shot and they'd send a team of security and health physics people into the perimeter fence to wait for it to crater. And I went in there one time, it was not my event and I was in J-6, but I went out with them to the perimeter fence and was standing there by my pickup and the perimeter fence was probably 300 feet away from the ground zero. And it cratered. When it cratered, I thought that pickup truck was going to come off the ground. You know it was quite a shock. So it was an event in itself.

Was there noise with it?

Oh, yes.

Was it a rumble like a—?

Oh, you bet. I guess you could—I've never really been through an earthquake, but I guess I would correlate it with maybe like an earthquake.

So you feel the earth moving.

Oh, you feel a lot of earth movement because when that pile of—when all that dirt that's been laying there for ages, when it suddenly decides to fall in.

[00:59:30] End Track 2, Disc 1.

[End of interview]