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

Interview with Robert Hahn

October 29, 2004
Las Vegas, Nevada

Interview Conducted By
Mary Palevsky

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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

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

Robert Hahn: I graduated from the University of Colorado in 1950 and was working in Denver and Arvada and Pueblo, Colorado. Once I got out of the university, I was looking around for a job. And so I, believe it or not, ended up as a manager of a dime store. And this was in 1957 when I finished my work there. When I was working at the dime store one evening, why, we noticed an ad in the paper. Dr. Lewis Fussell and Bruce Carter—actually it was Bruce Carter—were having interviews for people to join EG&G [Edgerton, Germeshausen, and Grier]. And 1957 was a year that was sort of the starting of the big buildup in the resumption of testing and actual testing—and actually not resumption but continuation of testing. And so I met with Bruce Carter at the Brown Palace Hotel and we had a discussion. My background at the university was in mathematics, so they were interested in someone with that background. So they invited me for an interview to come to Las Vegas. So my wife and I and two children came to Las Vegas for a brief interview, and within about a month, then, we came back and started my career on June 10, 1957.

Mary Palevsky: *You mentioned Carter, and what was the other fellow's name?*

Bruce Carter and Dr. Lewis Fussell. He was one of the early physicists that had worked in Los Alamos [National Laboratory], and so he was working with Herb Grier and [Kennth J.] Germeshausen and [Harold E.] Edgerton. For a while he was working in Boston, but then eventually they moved from Boston to set up here near the [Nevada] test site because the testing was done during the summer and spring, and so they needed people to do work here and primarily in analysis of test data.

I have one other question. When you interviewed, how much did they tell you about—did you know about the test site at that point in time and how much did you learn just sort of in the preliminary—?

I did not know much about the test site at that time. But they essentially explained how EG&G was involved with both Los Alamos laboratory and the Livermore laboratory [Lawrence Livermore National Laboratory] and what their responsibilities are in term of timing and firing, recording data, and then actually analyzing data for the two laboratories.

And so we ended up coming to Las Vegas and got established. In the meantime, testing in 1957 in the spring got going, but the leading group for all of this analysis and information was done by an analysis group from Boston. EG&G, of course that was the headquarters, and so there was a contingent of people that came from Boston that set up shop at 1622 A Street. And at that point, we started the analysis work for the various information that needed to be extracted from the information that was recorded. It was primarily of two phases. One was so-called fireball information and then the other was actually the alpha data information which sort of corroborated the two ways of what the yield of the particular device was.

The alpha data.

Yes.

So you're analyzing certain qualities of the fireball.

Well, actually what we were doing was determining the growth of the fireball, and that in turn was related to the actual energy involved in the device. And we did this through—they recorded **[00:05:00]** the fireball with very high speed cameras and this information then was related atmospherically and all those things so that we can eventually determine a rate of growth of the

fireball, which then in turn helped determine what the energy of the device was. We then did the alpha information which sort of corroborated the information a different way.

And so that was the early work that I was involved with. I was recruited out of Denver. Another friend of mine, Larry Wegkamp was recruited actually out of Montana. He had worked for Anaconda Copper Mines. And so he came down and we started to assemble an analysis group in Las Vegas.

Spell his name. Larry—?

Wegkamp.

Oh. OK, thank you for that. So you were sort of the initial analysis group on the ground here in Las Vegas?

Actually we were in support of the people from Boston. They were the leaders of the information—they had done it before. But they actually moved their entire families out here and spent the summer here.

But during the first two months that I was with EG&G I did not have a Q-clearance, so I was working with the engineers and technicians over in the lab facility, which was sort of where the Holsum Bread factory is located and near the Charleston underpass. And it was a pretty large sort of warehouse, and so that worked very well for the things that they were putting together. Primarily they were either setting up oscilloscopes for recording information and checking them out, and then moving this high speed recording electronics equipment to the test site, and eventually setting it up in a bunker—connecting those pieces of equipment to detectors that were placed near the device, and that information then was recorded and we analyzed it.

When you're there, do you have to wait till you have your clearance to actually go out to the site?

Yes. I never went to the test site until I actually had the Q-clearance, which took two months in those days, and actually that was pretty fast in comparison to what some other people experienced. But once I had the Q-clearance, I can remember the first day driving to the test site and experiencing everything that was going on. The purpose of our going to the test site was acquaintance, but also to determine some preliminary information because there the test directors wanted information as soon as possible as to how things went. And so the leader developing that information, a guy named Don Barnes from Boston, and he led the analysis group here in Las Vegas.

What was it like? So this is 1957. I've been to the test site three times now and even though there are some activities sort of ramping up, it's very desolate.

Right.

And I tried to imagine, the last time I was there—in the fifties, and then in the sixties there were lots *of people up there and lots of activity, and maybe you could just describe what it was like when you first went.*

Well, when I first went, why, I went to control point and of course there was just lots of activity. That's where the device's control information was located. All the timing signals were sent out and all the other information to actually detonate the device—and of course that was usually seven, eight miles away or whatever distance from ground zero. And in those days most of the events were balloon-type events, or tower, but everybody was at the control point when this thing actually was detonated.

Which was the first detonation you saw, do you remember?

I don't remember the name of the one.

[00:10:00] *Yes, but it was '57.*

But it was in 1957, right. Right. But by the same token, while living here in Las Vegas, the events occurred early in the morning, so many's the time you could be—if for some reason or other you were up, why, you could actually see the sky light up from the detonation. And you know that's sixty, almost a hundred miles away, and yet we did see the sky change for a little bit.

So those were the early days in 1957. Then we did our preparation, and then in 1958 we went overseas to Enewetak. And in Enewetak we were working with Los Alamos laboratory particularly in analyzing their data and giving that information to the laboratory for their own physicists' interpretation, but we essentially provided them with the raw data as we developed it.

Then in '57, in the early days in Las Vegas, to analyze the information we had a very simplified computer system. It was a Burroughs 101 something-or-other and it was a pegboard-type of computer, but it really ground out the information, rather than us sitting there by a calculator—just a National Cash Register calculator—calculating each individual piece of information. But when we went overseas in 1958, the IBM 704 computer came out. And so Los Alamos developed a very large facility in Enewetak, and that was then our processing tool. It had very limited memory compared to what we have in computers today. Its capability was probably less than a PC [personal computer] that you have on your desk, but it did the job. And again there was a lot of information that we put together from fireball information and health information.

And that was my early work with EG&G.

When you went to Enewetak, how long did you stay out there?

I was there for one three-month stretch, and then I went back a second time for another five weeks. And on Enewetak, it was a fully-contained effort because there were barracks there, and Holmes and Narver provided all the meals, all the logistics that went on. And every Saturday

night was big steak night, and that was a favorite time of course [for] everyone there. And one time I saw one man eat six steaks one night. I just *couldn't* believe what he was doing. But the camaraderie and the spirit and morale of the people that were doing all that work was just tremendous. And that was [Operation] Hardtack, phase I and II. Once we came back from that, then they did—let's see, [Operation] Hardtack, phase II, was at the test site, a very short period of time, and then we went into the moratorium.

Right. Back to Enewetak for a second, or I guess in general, you're providing this data but it guess it comes to mind more at Enewetak, I guess, because it's more isolated. Do you have interaction with all sorts of, quote unquote, "levels of people?" Are you interacting with the physicists and the engineers and the people that are doing support work pretty much, or is it stratified, or what's the sense there?

[00:15:00] No, you know there were certain people that were responsible for different activities. As far as our work [was] concerned in analysis, we had to get with the engineers and physicists because there were calibrations and so on that needed to be determined and equipment certified, so to speak, so that the data would be recorded properly. And we knew a lot of the physics involved as it was being recorded. And so there was the interaction that people were down island, so to speak, because they were in the bunkers and recording information, but their calibration, and so on, had to come back and we had to check that out. So there was a lot of interaction with a lot of people, and the computer facility was a great boon for bringing people together.

And were the leaders of EG&G, Herb Grier and those folks, would they be out there?

I don't recall seeing Herb out there. But within each organization there was essentially a test leader—and I don't think that was the exact name of them—but they essentially represented that

company in doing things, whether it was Holmes and Narver or EG&G, and we got all the other groups that were involved. And then the laboratories of course had their own test directors and so on that controlled information.

Right. One person I had the opportunity to speak to who just died was Bob Campbell. I know he was an early test director out at Los Alamos.

Yes.

Did you know him?

I don't recall seeing him in the testing program overseas, but when I came back and we were in the moratorium and the Rover program was underway at the test site, Bob of course was the test director up there for a long time and so he directed that. And he was a great guy.

Yes. Yes, I'm very happy that I was able to meet him.

So your family stays here while you're in—

Our families stayed here while we were in Enewetak, but there were times when—through shortwave radio—we were able to contact them, usually maybe once a week or something like that. But the local EG&G contingent always was aware of what the families were doing. If there were any problems, whatever, those would be immediately relayed overseas and if there was something that needed to be done, why, people could deal with that. But the contact between Las Vegas and, say, Enewetak was just pretty good.

Now do you have children? Did you have children at this point?

We have two children, two sons, and one now presently works for Los Alamos laboratory at the test site.

Oh really? At the test site?

At the test site, yes.

So he lives here still.

Yes. He went to school in Reno and finished his work there, and then he eventually came back down and started to work for REECo [Reynolds Electrical and Engineering Company]. And then from REECo he moved into the Los Alamos laboratory effort and has been here since, golly, I don't know when.

Help me understand—one hears about EG&G, your timing and firing, and diagnostics. I also understand from reading, this diagnostics is related intimately—correct me if I'm wrong—with the photographic aspect and this high speed photography that then allows you to diagnose, but explain how that works. The timing and firing pieces—they do that work for the labs who are developing the actual physics of the device—?

That's correct.

OK. So what does that mean, in sort of layperson's terms, to understand what that phrase "timing and firing" means?

Timing and firing means essentially—there is much checkout of various signals, electronic signals, in a hard cable, hard wired signals, that need to be sent to the device to eventually **[00:20:00]** get the detonation. But all this has to be put on monitors. People have to essentially go through a countdown system, so that eventually when the system is *really* ready to be fired, that control panel at the control point has everything in line. And they know that everything is set and going so that the information, once the device is fired, *then* that information has got to be recorded on the electronics equipment that's recording that particular information. Now in a typical bunker system, there would be as high as three dozen cameras and oscilloscopes with open lens cameras attached to them that would record this information. And of course all this information is being recorded in a very short period of time—a couple of microseconds—so you

can imagine what has to be done to establish all that equipment so that it's going to do its job when it comes.

Now that's in terms of getting the alpha information. Fireball information is of course involved with above ground devices that are in atmospheric testing. Essentially we're looking at trying to understand the growth of the fireball as it goes, and eventually it ends up with a mushroom cloud. But in terms of our diagnostic information, that's doesn't mean anything, you see. It's the fireball itself that we are concerned with. And we had developed a special set of diagnostics—equipment, microscope equipment—that we used to put that information together. Most of that was recorded on sixteen-millimeter film, eight-millimeter film, and so we would run this through the microscopes and make measurements a frame at a time.

Right. Right. That's interesting, because I just recalled—I hadn't recalled it when I was mentioning Bob Campbell, but that's one of the things he told me was that people don't appreciate the importance of the photographic equipment in this *day and age, how key that was, the images.*

Oh, that's correct. Yes.

And I guess as things developed electronically, that became less and less important.

Well, but as time went on, we went from atmospheric testing to down the holes, and so the devices were put well underground so that you didn't have that information to look at. And so then you needed to just rely on the so-called alpha information.

Interesting. So you come back from the Pacific for Hardtack II, and I've spoken to several people from sort of different perspectives about that test series. What was your involvement with that?

Well, Hardtack II, you know, that was before the moratorium. And again we were involved with preliminary analysis of information that the directors needed. We'd bring that information back

down to Las Vegas and analyze it, and then provide that information to Los Alamos or Livermore. And I can remember the last day, as I recall, I think there were four tests on the last day. That was really a hectic day because it was done in Frenchman Flats up in the forward areas, and what a schedule that was. It was almost a twenty-four-hour day as far as things getting set up and handled and, oh, it was just amazing how that went about.

[00:25:00] *How early did you have wind that the moratorium was in the works, you know, at the test site itself?*

I don't recall how far ahead we had that information, but we knew it was coming. And the laboratories were controlling how that was going to be handled and what sequence of events would occur as we were getting up into the moratorium. And of course those two laboratories were the real—along with Sandia Laboratories—controlling entities that put that all together. And then once the moratorium went into effect, and that was until 1961, during that period of time, why, eventually the size of the EG&G organization decreased here in Las Vegas. Once the testing started to get going again in '61, then EG&G—I guess eventually there were like ten thousand people at the test site at one time.

A couple of questions come to mind. So the moratorium goes into effect and it's hectic. It sounds like what you're saying is, if I'm understanding you correctly, that the labs are directing what you all need to be doing and that makes it very hectic on the ground to try to complete all those tests.

That's correct. Well, they were essentially coordinating all that and saying what the requirements are. They're eventually responsible back to the Atomic Energy Commission [AEC] and all the other activities that are going, so the laboratories are responsible for putting together all the technical data.

One of the people I also interviewed was Louis Wouters up at Livermore who had this, what's it called, Reaction History Group.

That's correct.

So would this kind of data possibly that you're doing be supplied to someone like him?

It was actually supplied to him directly, yes.

Oh, interesting.

And his group was one of the groups that we provided information that we had determined.

So he would take that raw data—

He would take what we put together and then he would get with other physicists and other groups within the laboratory and then they'd eventually use that to analyze how that information and that particular device and set parameters for future tests.

So they're actually, I guess, they're learning about these reactions at that time as it happens.

That's correct.

[00:28:18] End Track 2, Disc 1.

[00:00:00] Begin Track 3, Disc 1.

OK, so the work at the test site and the information that we gathered really ended up with Louis Wouters' group. And then at Los Alamos there was a group similar to that, and we provided them information.

There's much discussion, especially I think at the labs when I go there, of the differences between the two models of how they're doing their science and how they're doing their tests. Was that something that you were ever aware of? Were there different styles, or would that impact you in any way?

There were different styles but it wasn't too apparent in terms of the work and information that we were putting together. We realized that, you know, Los Alamos was much more conservative in terms of doing their thing *versus* Livermore, and so that was sort of apparent, but it didn't really create any difficulty or what have you with—

Yes, because you're just supplying them with the data.

We're supplying the information. We're doing the work for them, and doing it according to how *they* wanted it, and they set a lot of the parameters of what we needed to do.

So by "conservative," Los Alamos versus—*what would that mean to a layperson? Conservative in what sense?*

Well, how should I say that? They were doing things more based on the information that had been developed in the past and didn't develop new techniques and so on. They developed new techniques, but they were slower at doing this in terms of what Livermore was doing. Livermore was really just sort of moving way ahead in terms of those things that *they* wanted to do, so it was a different style of operation. But in both cases it worked out well for EG&G.

Did you tend to do an equal amount of work, EG&G, or you in your position for both of them, or—?

Initially that was true, but eventually Los Alamos started to pull back some of the work that they wanted to have done. EG&G responded to that because, you know, that's just the way they wanted to do it. And so we said, Hey, whatever we need to do for you, let us know and we'll support you. But EG&G always was involved in the timing and firing and the initial setup of all the equipment and running the various tests.

Yes. That's really interesting because I'm trying to sort of get a sense in my mind of the organizational structure, and you've got the labs and the AEC and the contractors for all these various functions, specialties, I guess you'd say.

Right. But it eventually came down to each test director for each laboratory for the test site that pulled things together—assembled meetings and got, whether it was the weather data that the Weather Bureau had to put together, which Phil Allen and his group were involved with—but the director particularly was responsible for getting it put together.

Yes. So what kinds of stuff did you do during the moratorium?

Well, during the moratorium we were analyzing some additional information for the two labs. And then as time went on we were developing techniques—well, we then got involved with the Rover program and the effort that was going on there, and that lasted for two, three years almost. And so here in Las Vegas the analysis group then did some information in terms of keeping up with what was going on the weapons side. We assembled a group of information people and we did analysis work for the Rover program, and that was for Los Alamos. The Rover **[00:05:00]** program provided essentially a means of keeping—many of the physicists and engineers that were involved within the weapons side ended up working on the Rover program. It was a place for them to work and to continue to have their expertise and their knowledge.

And what about that for yourself? I would imagine you—what was your degree from Colorado? What's it in?

My degree from Colorado was in mathematics in 1950 with a minor in accounting and some physics work. And during the moratorium one of the things that we were doing was putting together some computer information. After the moratorium, EG&G started to buy computer equipment for the laboratory and using computer equipment for our own work. And so as time

went on I eventually got involved in helping to establish guidelines and procedures and controls for acquiring computer equipment and relating it to the various activities at the test site. And in one of the early—let's see, it was 1964, I guess—we purchased a used Control Data 1604 computer system, thirty-two thousand words of memory. It was a giant computer in terms of how much room and space it needed, and cooling. And to get information into it we used punch card equipment, which of course is no longer available or needed today. So as time went on, that's where I migrated into, starting to help with the development of computer equipment and its use.

Oh great. I want to talk about that some more, but before that, what kind of experience is it for you as a mathematician and a thinker? Are you learning things as you go? Is this a job where you're learning new information that you didn't have before, or pretty much doing the same things?

No, certainly there was new information that we were all getting and had to deal with. And there was some training that went along with that, primarily interacting with the physicists and engineers and trying to figure out just precisely how are we going to record this new information, or record the information, and what equipment is available at the time. And eventually there was a lot of—in terms of analysis of information and getting information early, the Livermore group developed some very special equipment to record that. And eventually some of it was adopted by Los Alamos.

OK, so let's talk a little bit about the end of the moratorium and then this shift, basically, with the treaty to underground testing, because I think there's not a general—at least on the public's part, maybe not even on the scholars' part—understanding of this complete change, or radical change, in the way you all were doing your work. Or is it?

Well, in some sense of the word it was a change because we no longer relied on fireball and had to do that particular work. But we still had the diagnostic information with the oscilloscopes and the various detectors and so on, and the laying of cables, in order to gather that information. So there was a lot of work involved in getting that information, because it was down hole now, **[00:10:00]** that is where it was developed. So all this cabling information, cable system, had to be established and connected to the bunker systems where all these large array of oscilloscopes were located. That information was displayed on those oscilloscopes and with the cameras collected, recorded on film, and film processed, and then we analyzed that information from there.

But you're no longer, or are you any longer, able to look at the explosion itself directly underground? I mean not directly. Photographically, I'm trying to say.

Photographically—in terms of the sense of like a fireball gathering—we did not do that at that time, because the cameras would be destroyed. It just was not feasible to do that. But with the detectors, specific kinds of detectors that recorded the information various distances from the device, that information could be relayed out through the cables before they were destroyed. So that information, then, was recorded on the oscilloscopes and recorded on film and then we analyzed it from there. So the diagnostics underground, or the above ground in terms of the alpha information, that was pretty much the same.

And it's this whole problem of staying ahead of the explosion in a certain sense, getting that data out fast enough or—it moves fast enough, I guess—capturing it?

Well, it moves up the cable before the cable actually gets destroyed, so that always worked OK. But we needed it all—the cable information, then also the detector information in the device that

was being used—to detect the energy out of the device. [This system was calibrated before the event happened.]

We know when a layperson reads the report that the DOE [Department of Energy] put out of all the tests and it says what it is, weapons related or something like this, do you all, when you're doing the work, have a sense of what the purpose of a particular test is, say, from the lab's point of view or the military's point of view or the Department's point of view or anything?

As far as our analyzing it, we didn't know that and it wasn't important to us. Whatever the design criteria that they developed for the device, we were not privy to any of that information. We were just responsible for analyzing that information and whatever we received and putting it together based on previous procedures that we had and then they would relate that to whatever they wanted to determine in terms of the device, and then set parameters for future tests.

Another question that always comes up, I think for people in general, is you're working in this highly specialized weapons world and it's the Cold War now if we're in the sixties; it's a pretty hot and intense period of the Cold War. In your day-to-day work, are you connecting what you're doing with the larger political landscape? Because it's technical work and sometimes technical work can be so focused.

No, although we just sometimes in general knew that we were sort of, you know, we were maybe six months or a year ahead in terms of *our* development *versus* what the Russians were doing. But as far as we were concerned, we didn't really understand all of that at where we were, providing support for the tests. We just knew that this is what we needed to do and somebody **[00:15:00]** else needed to determine how this fits in to their overall development process. And whether this [was] involved with a tactical device or whatever, we didn't really need to know that information. It was not important for us.

Right. Because sometimes people will say—now, in retrospect, it's said in some of the literature that you read that the test site was really the battleground of the Cold War. And so looking back on it, one is curious to know, did you think of it that way at the time or is that something you realize in retrospect with the fall of the Soviet Union [USSR]? You know, you make judgments about what kind of contributions the test site made to the Cold War.

I don't think many of us thought of it that way at all. We just knew that we were supporting this work and knew it was important. We, to some extent, possibly knew how it fitted the overall international situation, but it really didn't come home to us, I think, until eventually when we started doing—there was coordination and effort, talking back and forth, and eventually almost comparing information, and their scientists coming up to the test site and observing tests there, and then we sending our scientists over there and observing things that they were doing.

Right, through the JVE [Joint Verification Experiment].

Right.

So were you involved in that?

I was not involved with that.

OK. And another sort of non-technical, more cultural question, I guess, is this whole situation of doing work that's secret. And it's unusual when you look at the whole population of the fifties, there were a small bunch of you that were doing work that you probably couldn't talk about with your families and your neighbors, I imagine.

That's correct.

What was that like?

Well, never really—as far as I was concerned, whatever I did at the office I did at the office. Once I was home, you know, we didn't talk about what we were doing other than coordinating

our schedules—where we were traveling and things that we were doing and whether we had to go to the test site for a particular situation or whatever. I suspect our families knew a little bit about what was going on but certainly they didn't understand the scientific aspects of it, that's for sure, because none of us talked about it. We just didn't do that.

But they know you work at the test site. They knew you were—

But they knew we were working at the test site, they knew that it was very classified information and classified work. Actually when I started working on the Rover program, that was a different change because that was *not* classified, and so that was a very different kind of environment. It was interesting to work in that change for a while. The physicists and engineers that we were working with up there who had been on the weapons program, you know, it was a certainly a big change on how that was coming about, how that was put together and what the goals were in the Rover program.

So it was interesting in what ways? I'm just curious what that would be. You could talk to your family more or you could—?

We could talk to our families more. We could discuss a little bit what we was doing and how we were gathering information there as compared to how we would on the weapons testing side. Although everyone was processed for a Q-clearance, still it was unclassified work that we could just talk about.

I hadn't realized that.

But in getting the Rover program together, it was sort of the birth of using buses to drive people to the test site.

[00:20:00] *Was it?*

Oh yes, because prior to that time [Interstate] 93 going to the test site was just a two-lane road. People driving up there early in the morning were traveling at high speeds, and there were wrecks and several fatalities along the way. And so EG&G got talking with people, and they said, Why don't we rent a bus and rather than having seventeen, eighteen, twenty cars traveling to the test site, we could do that with one bus and carry all those people to the test site and do it safely and not have to worry about all the bad things that could occur from accidents. So at first there were a couple of buses, I think just actually one bus, involved and then eventually there were three buses at that time that took people to the Rover program.

Wow! And that was before the highway got widened.

That was before the highway got widened. That's correct.

So someone had said to me if you got up early in the morning in—I guess the late fifties before this—in Las Vegas, you could see a line of headlights out to the test site.

You bet. Yes.

Really?

Yes. Because that was where the work was located and there were limited living facilities at the test site, so people drove back and forth every day. And in those days it was an eight-hour day, five-day-a-week job. Actually in some cases people worked six days and particularly in the early days of the Rover program when it was getting put together. But we were paid *per diem.* With the buses, why, that really relieved—if we could catch the bus over on Rancho someplace and go to the test site and do our work and come back on the bus. And families would meet people getting off the bus, and so it was a daily routine up and back.

So during Rover you're going to the test site every day?

So with Rover, all the work was at the test site. That's right. And so that was in Jackass Flats—and that's where, in the early days, they were developing the control point and the testing stand—and so that involved establishing information as much as we could.

Now what eventually happened with Rover?

Well, as I recall, the prime purpose of that was to develop a motor so that we could travel to Jupiter and come back. But eventually it lost that goal, and so the Rover program was disbanded. But primarily it was an effort to keep scientists on board so that if the testing ever came back, that these scientists would be still available, still within the laboratory and there, ready to take up their work. So it gave work for people to do that was challenging but then also kept them there at the laboratory. Eventually when the moratorium went off, why, they were readily available again to do their work.

So do you remember when the moratorium ended, when the Russians tested, what that was like or—?

Well, as I recall, we had ninety days once they said the moratorium was off. Prior to that we were under a constraint that we had to get information and record information, be able to detonate a device within ninety days after the moratorium was declared null and void. And **[00:25:00]** essentially during that period of time prior to that, we were involved in the readiness program to be sure that in fact we knew what we needed to do if in fact they're going to say we got to do it again.

So you had to have a readiness program in place.

We had to have a readiness program. That's right. And in fact because of that we were able to detonate a device on time. As I recall we didn't get all the information that we wanted but we got what we felt was acceptable information and able to determine what we were looking for.

Was that an underground or an atmospheric test?

That was an atmospheric test, and then eventually—well, let's see, now that I think of it, I don't recall the first test after the [moratorium]. Yes. I think it was an atmospheric test. [The Antler test from Operation Nougat on September 15, 1961 was underground.]

But there were certainly some number of atmospheric tests after the moratorium. [Post-moratorium atmospheric tests took place in the Pacific only.]

Yes.

And before the treaty [Limited Test Ban Treaty, 1963].

And before the treaty, Yes.

OK. So you said you moved into more of a—would that be more of a management—?

I moved into more of a management role in helping to determine where we needed computer systems, types of computers, and then eventually involved with the security of those computer systems.

Security? You're talking about technical security.

Technical security and procedures of how to control this information, and where the computers were going to be located, and how we would deal with the information that was handled through those computers.

Well, that's interesting to think about because up until that point you're basically worrying about control of secret documents?

That's correct, and handwritten documents—not handwritten—well, in many of the cases, at least it started out handwritten, typed up, and put together into professional reports. But the computer systems essentially just assisted us in getting the information and putting the information together faster and more precisely and be able to handle more information at the

same time, whatever we needed to do. So as the computer industry developed, we just—and both Livermore and Los Alamos were prime movers in getting computer systems throughout the country developed to larger and better systems and faster systems and so on and so forth. Not only was the laboratory involved in technical programs in developing the information and getting that scientific information put together, but also involved in how do we do a better job. They played a big role, I think, in putting the computer industry ahead and doing the research and development to make better and faster computer systems.

That's interesting because that really now is entering that era of that really amazing computer development.

That's right. That's right. And so if there was a large computer system needed, the two laboratories were right in line to get those pieces of equipment and put them to use to do laboratory work.

Now were you around when the Baneberry accident occurred, or event occurred?

I was around. I don't recall precisely all of the details of it. Several of our people were involved with that and had received exposures during that test. I don't recall anyone having specific problems from that test, but it was a concern that stopped our whole process for a while.

[00:30:00] *I read some of the interviews that Jim Carothers did up at Livermore with various of the scientists and it seems to be a question that he was asking, How do we understand what exactly happened there and why it happened? I didn't know if you had any—a diagnostic piece of that or not.*

I don't recall what diagnostics we put together on that. I think we did, but at the time it didn't play a significant role in what we were doing, other than the fact that, Hey, we've got to

find out what went wrong here first before we proceed. Because safety was a major concern all the time. What do we need to do to keep people safe? That was a big role.

Did EG&G have particular, what's the word I'm looking for, functions in that area? I know that REECo had RADSAFE [radiological safety]. Did EG&G have programs?

No, I think we deferred to REECo and essentially they were responsible for doing the radiation monitoring and testing and keeping that information and putting it together. We all wore dosimeters, and we turned them in once a month and if they were getting overexposed, then changes were made and people made reassignments for a while.

Did that ever happen to you?

No. No, it never did.

And let's see, during the moratorium Livermore was involved in another program which was in Area 400 [Project Pluto]. They were developing a motor also, but in a different way. Los Alamos was developing a reactor so that it stood upright and was vented upright, whereas Livermore was doing it the other way in the sense they were running it along the track.

What was that program that Livermore was doing?

I'm trying to think. I don't remember.

Again, we can look it up, but just so I can understand it, what was the purpose of it?

The purpose again was for them to develop a motor for propelling a ship or whatever.

In space?

Into space, yes, right. But again, the two different philosophies on how the two laboratories were thinking—one did it one way and the other one just don't even think of it. What's another way to do it? And so the other laboratory would do it accordingly.

But I guess that was also a discontinued program, I would imagine.

That's correct, yes. Right.

So according to the documents, after the moratorium, the next two years, it seems like an incredible amount of testing was going on. So you all got real busy again or—?

Yes, once the moratorium was taken off, then the program really accelerated and eventually everything went underground—either in the areas below or on the—let's see, what was the mountain up off the—?

Rainier Mesa?

Rainier Mesa, yes. But again that information was brought back and analyzed and put together.

But you're saying you sort of moved out of that analysis?

I had moved out of that analysis and people that worked for me eventually took that over and **[00:35:00]** continued that work. And so I was off in the management side, trying to get equipment and procedures and things that would further accelerate their work.

And what was your position at this point?

I was the manager of the computer system for EG&G.

Oh, OK. OK. So how long did that go on?

Probably from about 1965 until in the early eighties. Then in 1989 we moved to Dallas, Texas to work on the collider program [Superconducting Super Collider, SSC], and I was down there for three years. And so [I] went to work for two people that were with EG&G, and of course we again tried to do some similar roles at the collider that we had here at the test site. And much of it was, but it was not as large a group of people working at the collider program, of course, as it was here at the testing program, at the weapons testing side.

So I retired in 1992 and we came back to Las Vegas.

So that was your last position there, was working on the collider?

That's correct.

Whatever happened with that?

Well, in 1990 and '91 the work phase was moving from Berkeley and Livermore and so on—from Berkeley primarily—from a theoretical development phase into an actual trying to put together the actual thing down there. And so EG&G was involved with that, supporting again technical people there because we had people who really were skilled in putting things together and making it, whether it was a drafting program or other effort. And so eventually, as time went on and we started to get into the development phase at the facility there, that was going to be developed, which was going to be the largest piece of equipment for high energy physicists to use. Congress asked us to—in fact, here are a couple of things, replicas of that.

Oh great!

But as time went on, Congress said, you know, Hey, this is taking a lot of money and how much money is it really going to cost? And so in the initial phase of it our people, I think, put together information that said, you know, Maybe four or five billion dollars. But they said, OK, go back and really analyze and put together what you really need to do and over what period of time. And so once that information was developed, it was determined that maybe the project can cost as much as thirteen billion dollars, and Senator [Dale] Bumpers from Arkansas said, Hey, that's way too much money for what we're doing and we just can't do that. So the AEC had to develop certain other priorities, and so the upshot of it was that eventually the collider program was put on hold, and then eventually it was going to be shut down. And by the time they got through, why, I think they spent about the four billion dollars initially invested or estimated, and there was a large contingent of people and very highly skilled people [who] were helping to put that together. And because it was going to

be a fifty-four-mile track with a tunnel underground, a twelve-foot tunnel, and all of the—and this is a typical—the magnet system that was going to be put together, that was a slice of the magnets that were put together or were going to be put together. And so that thirteen billion became much **[00:40:00]** too much, so eventually the program was shut down and dispersed. And of course Texas had spent a lot of money. They spent four hundred million dollars to acquire the land. The track was going to be underground, but they needed control of all the land above that, so they were relocating a lot of people and buying out their ranches and so on. And one of the interesting parts of it as it was going along, there was one lady there that—she was eighty-nine years old and her family had lived on that ranch for years and years and years—and she decided that she just wasn't going to sell. And so she was the last holdout, and it was a very significant piece of land that they needed to get. I think she eventually did sell. So I don't know what has happened to all of the land that they have acquired, but Texas sold bonds to acquire that land and it was going to be a boom for Texas.

We're right close to the end of this CD.

[00:41:31] End Track 3, Disc 1.

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

I wanted to ask you about that. When you're working on the collider—so you're able to talk about your work at that point.

We were able to talk about our work and of course the work that EG&G again was of a support nature. We provided a very large drafting group, designing all the equipment that was going to be involved in putting the collider together, and the logistics of moving information, and then moving equipment and the parts that eventually would be involved in assembling the collider, and control of equipment, and where all this would be located, and how the whole procedure

would be put together, so that eventually the collision could be made and all the information analyzed. And so EG&G played a similar role there as they did at the test side. We did more in terms of logistics and so on because there was no REECo there and so that was one of the things that we ended up helping to do.

So that expertise, I guess, that has developed from the fifties is—

Fifties, is being now transported, if you will, to help put the collider program together in physically assembling that instrument and getting it to a working phase. And as I recall—when it was going down and they stopped, figured that they were going to quit—of the fifty-four-mile track, fifteen miles of tunnel had already been developed. They were developing a mile a week, I guess it was, and they were tunneling out, getting the—

A mile a week?

Let's see. Yes. Within a year-and-a-half or so they were going to have that tunnel put together, or at least dug out and ready for installation of all the equipment. But in getting those fifteen miles of tunnel put together, they figured out a lot of things. And they were ready to go. They were going to push it. And then the word came, Hey, this is it, we're not going to do it.

This is interesting. But this is close then to your retirement in any case?

It was close to my retirement and then—actually I had retired and I was going back down and helping them on some consulting work that I was doing with them. So during that time, eventually Congress decided to shut it down and said, you know, Do what you need to do to get rid of equipment, close it down, and we're not going to do it anymore. So I think that initially in the neighborhood of two billion dollars had been spent but by that time it took another two billion dollars to phase out all the equipment and all the people and just get things shut down. And I have no idea what's going on with all that was left. But it was an interesting way that people approached that task, and in some cases—well, the Russians were

involved with some of the things that we were doing, people from Japan, scientists from Japan. One of the things that we did do was—and the Internet was starting to come around at that time, the early phases of it, from ARPA [Advanced Research Projects Agency].

From ARPA?

Well, that's where much of the initial information was put together to start the Internet. But all **[00:05:00]** the laboratories were conversing with people in ARPA and trying to use the information, and so that eventually put some—there were some not very high speed links, but links put together so that the laboratories could talk. And then the collider program in Dallas started to use that information. So we eventually put together a large computer system for about six million dollars, and it was assembled from pieces of equipment from a lot of different companies.

I was going to ask you if it was one company or—

No, it was several. Sun Microsystems, I forget who all was involved, but we put this equipment together. In fact, this is the group of people that sort of coordinated that [referring to photograph]. And so we had a system, a link, put together that controlled equipment in Dallas, the processing equipment in the Dallas area. But scientists from all over the world were coming in and using that equipment, running their analyses or doing their work on those computer systems, but doing it from Russia, from Japan, from wherever else they were located. And that was a very significant piece of work that we did that was a lot of fun to put together. Spent a lot of money at it but less than what we would if we'd have just went out and bid a computer system.

Oh, interesting. And what's interesting as you tell that story is really the interesting contrast between the openness, the networking of all these different places, and the sort of inner networking that you were having to do at the test site.

Yes. The outside world didn't know what we were doing, and there was no way of connecting to information that we were putting together or processing or moving back and forth. But that was an open world and so it was sort of easier to work in, that's for sure.

Was it? Oh, in what ways?

Well, I shouldn't say "easier" but it—

It was different.

It was different and we didn't have to go through gates, we didn't have to show badges, we didn't have to do this and do that all the time, and so the movement back and forth was easier.

Yes, you bring a couple things to mind. One thing that I have found interesting in this work, hearing what people have to say about the JVE, is the excitement that people felt, being able to actually communicate with a former enemy, or still enemy, but other scientists who are working on the same kinds of problems that were so specialized.

That's correct. Right. And specialized in the sense that once that work was done, well, scientists and engineers and that could transfer that information to other areas of work but not in the exact same way that they were doing it at the test site. So it was a unique effort, that's for sure.

Which was? Which—now you're referring to the JVE or the—?

Well, to the testing as a whole but then—

Testing as a whole.

Yes, but as JVE came on it was, you know—that allowed people to communicate and get to know each other better. And it was a way of getting out of the Cold War and actually reducing that conflict.

Yes. And I think the other thing that's interesting listening to you is that since I was raised on Long Island [New York] near Brookhaven National Laboratory–and that was an open facility—many **[00:10:00]** *people, when I say my father worked at a national lab, they assume sort of the Los Alamos/Livermore/test site model.*

That's correct.

And it's just so interesting when you're talking about the collider, that sounds a lot more like what—

What Brookhaven was to you.

—a laboratory was to me in my consciousness. But many people have that notion of the high level of secrecy. Of course there were certainly areas that were, I imagine, but you know the gates and all this kind of business that you experience at a place like Los Alamos or at the test site.

Right. Yes, at the collider program we didn't have to go through gates, and when we went into a building we didn't have to show a badge to someone. Security was much laxer there, although it was a government program so we needed to keep it under control. And we used the local telephone system, eventually trying to communicate back and forth, because there were several different locations in the Dallas area. So we needed to get these all coordinated and put together, to tie them together so that people could pass information back and forth.

Well, what kind of telephone system was at the test site?

Well, it was a controlled telephone system, and although we could call the test site, there were controlled links that people communicated on. But also there was a radio communication system, and that was a controlled environment as far as communication. So if things needed to—for instance, coordinating between the control point and the forward area, radio communications was the way of doing it.

So that was the work that EG&G did for a number of years of supporting the testing program. It started in EG&G and Edgerton, Germeshausen, and Grier, particularly Edgerton in timing and firing, and then Grier in terms of overall and photography, and Edgerton in terms of photography. Those were all key elements in the work that EG&G did for the Atomic Energy Commission.

You mention these names. Are there any other—anything you can tell me about certain personalities that stand out or that come to mind?

No. In terms of people working with—everyone knew that the laboratories were in charge of the technical program, and had always deferred to them as to setting the guidelines, the direction, telling us what needed to be done. And so once that was laid out, then it was up to EG&G, Holmes and Narver, REECo, all the support contractors, to put that together and to achieve the goal that the laboratories established.

That's interesting because when you think of organizational structure, a certain management style must have developed within each of those entities, and yet it had to be directly connected with a smooth relationship, I guess I would say, with the laboratories.

That's right. That's right, because, well, much of the funding and so to speak was done by the AEC in the group here—from Albuquerque initially, but then eventually established here in town. **[00:15:00]** And then once that annual funding level got established and controlled, then it

was up to the laboratories to develop the technical programs and the goals that were being put together. It was up to those two laboratories, Sandia, to determine what each phase was going to be, because they then in turn were talking with their scientists in the various laboratories to determine what they want to do from the various device developments. But again, the management skills, you're right, it was a melding of all that put together. EG&G had to talk not only to AEC here in town, but talk to the program directors at Los Alamos and at Livermore, and then peddle that down to eventually the engineers and the technicians and so on that were putting that equipment together. So that's sort of where we fit in. And it seemed like it was going on forever almost at times, because we didn't really understand what the scientists at the laboratories were working towards. We just, you know, `Hey, we're there and this is what we're going to do this week, this month, this year in terms of supporting their program.`

That's interesting. And it's interesting that EG&G's success clearly must have been understanding, from an organizational point of view, how to negotiate these different relationships.

That's right, and saying we're the best of the group that can put that information together and do that both in terms of technical skills, design equipment at times, or acquiring equipment that was available on the market, bringing it to the test site and getting it put together so that the information could be acquired. And the high speeds that were involved in those days were just, you know, it was really sort of thought of as an amazing program. Today, yes, there are a lot of things better today to do that same thing.

Right. But that's where it really is interesting to see how the test site as one place where technology is needed and develops reflects sort of the history of technology, the history of science.

That's right, that's right.

When you're talking about calculators and then very simple computers to do scientific—

Right. Right. Going from a little keyboard peg computer system to eventually the large computer systems and the high speed computer systems available today. But again the laboratories, I think, played a key role in getting that technology to move ahead and to become a real development throughout the country.

Well, great.

So that's sort of where we are.

OK. Let me see this picture. Yes.

This is a picture of a group of scientists and engineers and buyers and so on that helped put all this together. And this was at the time of my retirement from the lab.

Is this you here?

That's me right there.

OK, you have different glasses on.

I had different glasses on, right. Didn't have cataracts at that time, or I didn't have cataract *surgery* at that time.

Yes. So this is in Texas.

This is in Texas, right.

[00:20:00] *Great.*

This was the man that I worked for, Phil Leibold, and—

Say the name again.

Phil Leibold.

Leibold. OK.

I don't know whether you've had a chance to talk to him or not—

No.

—but Phil might be an interesting person to talk to because he was involved with timing and firing at the test site, and so he could relate to you some good experiences.

Oh really? Phil Leibold. OK. Is he here in town?

He's here in town, yes, right. And he worked on the collider program down there for a while. Went from Las Vegas to the program down there.

OK. That's a good lead because obviously the EG&G part of the story is really essential.

Right. Right. The other phase of it, I don't know. Yes, Phil would be a good contact.

OK. And you were saying the other phase?

Well, the radiation monitoring put together by aerial measurements. I don't know whether you've had a chance to talk with anyone in that area.

Aerial measurements of radiation.

Yes. EG&G helped to support—in other words, for instance, when the Russian satellite broke up and they had some plutonium and other radiation-type equipment on board, EG&G was involved in trying to locate and recover those pieces. And so aerial measurements was a phase of work that EG&G did, and Jack Doyle and Jack Storey were two people involved in that.

I know Troy Wade has talked about that from the, I guess, the DOE standpoint.

Yes. Right.

But was this technology that EG&G was developing for other reasons as well?

Well, it was just supporting that work.

That particular work.

That particular work, for instance. And that came to light in the early phases where this device was lost in Kansas City, or I forget where, and so they used aerial—there was an initial survey with airplanes and detectors to locate this device, and eventually they did. That helped to develop that work and say, `Hey, this is pretty important, pretty interesting. Maybe we need to proceed with that`. And so that was one phase of work that was quite interesting for EG&G.

Well, can you tell me more about that because I've just heard mention of this thing in Kansas City, or is that still—is that allowed to be talked about or—?

I don't know. Yes, it was in the papers, but Jack Doyle could enumerate on that greatly because he is involved in handling both personnel and equipment and people involved in doing that work. He was involved from the management standpoint of it.

And these are also people that are here in Las Vegas?

Jack Doyle is here in Las Vegas, yes, and he works for Bechtel [Nevada] still.

Oh, he still works for Bechtel. OK. Great.

And Phil Leibold is retired but he lives here in town. And Jack Storey is still here in town and he's retired from EG&G.

OK. Oh, excellent. So is there anything else you can think of that I need to know today?

Gad. [laughter]

[Laughter] You told me a lot of stuff.

No, I guess that's all. But it was a lot of fun over the years.

[00:25:00] *Yes. Well, great. Thank you very much.*

[00:25:06] End Track 2, Disc 2.

[End of interview]