

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

Interview with
L. Joe Deal

September 27, 2005
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.

L. Joe Deal: My name is Joe Deal. I was born in Hickory, North Carolina. I had a goal of being an electrical engineer, but the war [World War II] came along and we had some family problems. My father died early. And so I didn't quite get to electrical engineering school at North Carolina State except for one short period.

Mary Palevsky: *Let me ask you what year you were born.*

Oh, in 1924.

OK, so when the war comes along you're—

Sixteen.

OK.

Maybe I should've just said that.

Well, it's OK, you've said it now.

Yeah, I was sixteen. And my dad had died just before that and we had the usual problems families had during the Depression. There was a small college in town called Lenoir-Rhyne. It was two words. It was a Lutheran school. And my mother insisted that I go to college, so I went on to Lenoir-Rhyne and entered there; I was taking math and science so that I could hopefully transfer and did transfer once to North Carolina State to the engineering school.

I spent my years there at Lenoir-Rhyne. Our physics professor was a young man whose father was the—the school was a Lutheran school, belonged to the Lutheran Church, and his father was a Lutheran minister. He had been designated to be a Lutheran minister but he didn't

like it, so he went off to school at the University of North Carolina and on to Duke [University] and had become very much interested in cosmic ray research. Dr. Karl [Z.] Morgan was his name. In my second year in the school, I worked in the laboratory helping the students in the health physics lab. I was a first-year student and the junior people came in and we showed them how to do the lab work and so forth. And I got to know Dr. Morgan quite well. He knew my family, too, from my grandparents particularly. He was an excellent teacher and, as I said, had a lot of cosmic ray instrumentation and research and we fiddled with it and knew what it was all about.

Now just let me interrupt you for a second. This is now during the war that you're there or when?

I guess I should've told you, I graduated when I was twenty; I started, I think I was sixteen or seventeen. But in those days you went straight through your college. You went summer and winter. There wasn't any break. So I finished in three years, so I would've been, what, seventeen—yes.

Dr. Morgan gave excellent lectures on modern physics and things like that—which were just coming in, but that was the cosmic ray stuff and things—and we fiddled with his instruments and learned a lot about them.

I went off a second year. I finally transferred for summer quarter to North Carolina State. This was at the end of my second year in Lenoir-Rhyne. And I realized when I got to North Carolina State that with the war on and my being sixteen or seventeen, I was draft material. I did have one call-up but I don't think it had come that time because they usually gave the students in particularly science time to finish up. I didn't realize that electrical engineering would be a five-year course; in any event, I figured I'd never make that one through, so I went back to [00:05:00]

Lenoir-Rhyne to finish. And when I got back, Dr. Morgan had disappeared. He was no longer the professor there and he was gone and nobody quite knew where he was. They said he was doing war work somewhere.

During that period he contacted me once. We found out later and he told me he was in Oak Ridge, Tennessee [Clinton Laboratories]. We knew Oak Ridge was a big processing facility but we didn't know anything else. If you are familiar with the Manhattan District Project, the Oak Ridge Lab had the big reactor, the only big reactor, and they were the training point for the Hanford [Works, Washington, Manhattan Project site] crews.

Right. So you knew something was happening there but did you have any inkling about—?

No, not at the time, but there was one kind of interesting story. Because when he called me he just says, I want you to go on and send me some of my instrumentation. He told me what it was. He says, Don't tell anybody what you're doing. And he says, It's mine. It doesn't belong to the school. And that's when he gave me the Oak Ridge address and I took it down. I did it. I took it down and mailed it to him, put it in the mail.

And I found out later, after he wrote his book, why he wanted this equipment. I didn't know at the time, and this is kind of an interesting story. They were concerned about radiation in the reactor and this was the first one that had been built, the big reactor, this one, the first big reactor. And so they were concerned about possible leakage of high-energy gamma rays and so forth. So he was talking to Fermi one day and Fermi says, Why don't you get some of your old cosmic ray equipment and make some measurements about it and see what it was? Now I didn't find out about that until I read Dr. Morgan's book later. [*The Angry Genie: One Man's Walk Through the Nuclear Age*, with Ken M. Peter, University of Oklahoma Press]. He told the story but I didn't know what it was—kind of an interesting thing.

That is interesting.

But I finished in August of '44 and immediately went to Oak Ridge. I think I left the next day. We were on the rail line to Knoxville, Tennessee, from Washington [D.C.] to Knoxville, the Southern Railway, so I got on the train the next day and went to Oak Ridge to work for Dr. Morgan.

So he told you to come?

Yes, he had called me and asked me to come over and work. That was the second phone call I got from him. So I went over and we were told right away what was going on. Ninety-five percent or more of the people in Oak Ridge had no idea what they were doing. They had these huge cyclotrons and things but people didn't know what they were. They knew they were handling some yellow cake or whatever you call it, I don't know what they called the product, and they had no idea what it was. But he told us. They had to tell us. We knew what they were working on because radiation was what we were doing.

Dr. Morgan had just taken over the Health Physics Division at Oak Ridge from Herbert [M.] Parker if you've ever heard of Herbert Parker. Herbert Parker was brought into the Manhattan District and he was a hospital physicist. He was an expert in handling radium samples and doing radium stuff. Actually he was an Englishman. He came over from England and he worked and he headed—moved from Oak Ridge to Hanford. And Dr. Morgan's job had been during that period basically to train the young engineers that DuPont was bringing in to work in the Health Physics Division. They were mostly chemical engineers. There were a few electrical and so forth. And K.Z. [Morgan] had a regular training program for them. He had a course thing. One day I was pawing around in some of the cases and found a whole training program written out. And we looked at it from time to time. It was very good.

*Let me ask you a question here. Do you recall when he explained to you what was happening?
What kind of words did he use?*

Well, he didn't talk to us. This crazy security guy did. And he started out and he was kind of, I shouldn't say crazy but he was a kind of an oddball, and he started out about all this secrecy and [00:10:00] You can't tell anybody anything, particularly in Oak Ridge, and so forth and so on. And we had a little disadvantage. We couldn't even mention radiation. Radiation instruments and the stuff about them was essentially classified. But around the lab, everybody was cleared at least to know all this, so the workmen and everybody knew there was something, they didn't know what it was, and we had to be careful how we dealt with it.

Dr. Morgan had a job for me to help maintain the instrumentation that they were using to protect the people. They had a group of military noncoms [noncommissioned officers], what do you call them, sergeants, and he had trained them and they kept instruments in the various locations around the lab. The chemistry group were always spilling something and spreading radiation around, and the noncoms would be there with them to find out what had spilled and arrange for cleanup; also to help them when they were working with something that was really more radioactive than you like to have around and they would help and say, Hey, you can't stay but ten minutes in here and so forth.

My job was to keep those instruments working and calibrated. We didn't do the repair. The instruments we maintained were ion chambers. The electronic instruments were just being developed. We had a good engineering instrument group starting up but they didn't have them then in those days.

I guess what I'm curious about is did they say you're making this weapons-grade uranium for a bomb? Did you know that much specificity there?

I don't remember whether they mentioned "bomb" or not. They talked about uranium and of course we knew that was what it was. And we knew about Los Alamos and we knew about Hanford.

And as I say, my job was to keep the instruments working and available to the military noncoms. Actually it was a pretty simple thing. We had a young lady—actually she'd been a schoolteacher in Tennessee—and she drove the car around and every day she'd go to where these guys were located, take their instruments down, and calibrate them, and I would come along. If something didn't work right, then my job was to get her the right instruments and see what was happening. It was a very simple arrangement but it was effective. We used radium sources calibrated by the National Bureau of Standards [NBS] in order to provide the calibrations for the instruments.

Dr. Morgan had been known because of his work in cosmic ray research and he had known Arthur Compton for example who was the head of the Manhattan plutonium project program at the time. And they knew about Dr. Morgan's cosmic ray work, so that's why they drafted him into [University of] Chicago. That's how the whole thing started. He started out in Chicago, moved his family there first, and then they moved to Oak Ridge when Oak Ridge was completed.

When the war ended, nobody was sure what was going to happen. They were talking about the lab closing down.

What do you remember about when the war ended?

What do I remember? You mean the day?

Yes.

I remember that there was a huge party in Oak Ridge because the people there learned what they were working on. Most of them didn't know, you see. And they had some tennis courts in the back of the dorms and somebody brought music out there and they had dancing, they had the biggest time you've ever seen. It was a real blowout for, oh, I guess a day [00:15:00] or so they had this thing going. It was kind of that simple. We heard, I guess, the surrender and heard the drop of the bomb and heard all that stuff like everybody else did. And I think a lot of it was coming from the *New York Times* reporter [William L. Laurence] who did the write-up.

Well, we continued on. At first they weren't sure they were even going to keep the lab working, and they had a couple of contractors run it. Initially the lab was run by a joint venture between the DuPont Company who was building Hanford and the University of Chicago. And the University of Chicago people weren't interested in running the facility in Oak Ridge for a long time because they were getting ready to build their own reactors in Chicago. And so the question as to whether the lab would stay in business and all that finally was settled some way. The lab was kept in business and they brought in a couple of contractors. The one I remember was Monsanto Chemical Company came in towards the end, and I don't know who else they had in there. Eventually Union Carbide took it over because they were running everything else in Oak Ridge. They were running the production facilities. But it started out with Monsanto Chemical Company. And then they made Karl the head of the Health Physics Division at that time when they were doing all this switching around.

By that time everybody and their daddy wanted to come down and see the place and see how it worked and of course see the reactor and how you did your work and so forth, so we spent a lot of time entertaining visitors. And there was also a lot of good work going on. People were coming up with good development, particularly in instruments and so forth.

Early after the war there was a controversy between the [U.S.] Air Force and the [U.S.] Navy. The Air Force said we did not need the Navy. I don't know whether you recall this or not but, well, the Air Force generals were out talking about how there wasn't any Navy needed anymore. It was all a battle, you know, all battling for money—and so that's why they held the [Operation] Crossroads experiment, by the way—to allow the Air Force to drop a couple of bombs on some of the ships. Well, they dropped one, I guess, one was underwater and they dropped one, and that was all set up to see where it was really that bad or what it was, of course, and they needed to learn information. They got a great deal of information out of it.

Karl came in and said—well, they had set a date for the Crossroads experiment and that they had moved the date up. The president moved it up for some reason, I don't know what. And we knew by then he wanted us to go out for it. He took a team of six of us out to fit into this already big health physics program they had to protect against radiation. So I got to go see the Crossroads underwater shot. We were really treated royally because we got first-class accommodations on the airplanes and General [Leslie R.] Groves had the place well organized. Everywhere we went one of his officers, usually a colonel, would meet us and see that we got through the red tape and onto the next plane we were going on. It was a military plane. And we didn't have anything remarkable happen to us at Crossroads. We had a lot of freedom and we looked around and saw a lot of the damage and so forth. You know what they did. They assembled a whole bunch of U.S., Japanese, and German ships and fighters and all and put them in the little Bikini lagoon. The bomb missed its point on the air drop. Somebody screwed around [00:20:00] with the, what do you call it, the bombardier's equipment. He had it all set up and somebody screwed around with it the night before, reset it. He didn't know it. He claimed he didn't know it anyway. And so when he dropped they were several hundred feet off. The target ship was the *USS Arkansas*. And

so then we got there in time for the underwater burst. And that for me was an experience. I was a young kid here almost. And we got word that this thing had been moved up and we were going to have to leave. Originally we were going to fly to the West Coast from Oak Ridge and pick up military transportation from there, but we didn't have time for all that, so they put us on the trains, which was the way people traveled. We got an overnight train from Knoxville to Washington and some Navy officer met us the next morning and took us down and checked us in the Willard Hotel, then he took us over to the Navy's—were you ever in Washington? The Navy building was down there. It's no longer there. It was one of the World War I temporary buildings. It was down about where the Wall [Vietnam Memorial] is now, but on Constitution Avenue, and they had some medics there who gave us a bunch of shots and talked to us a little bit and checked us over to see that we didn't have something wrong with us. And then they took us over, put us on an airplane at National Airport, and we flew to the West Coast. It was a military plane, one of their big four-engines. They were just beginning to fly them nonstop. But ours, we had engine trouble, so they had to land first in Kansas. And then we started going from there to—and in Kansas they changed planes and put us on another one, and they took us to San Francisco. And the Manhattan District, General Groves, that was a takeoff point for all of the shipping and everything that went there. We left all our clothes over at a military base there and got Army uniform types. We didn't have any insignia but we just had uniform types. And took the next plane, I guess, overnight to Hawaii, and then from Hawaii over. And unfortunately the plane that was supposed to pick us up was delayed and so we actually sat up all night in the terminal waiting until they finally brought another plane in to go to Hawaii. And that was sixteen hours. I don't know, it was a long flight, and when we got there, of course, we thought, well, they're going to let us go to bed. And they said, you've got time enough to go down and take a

shower if you want to but we're going to leave so-and-so, so we didn't have much time in Hawaii that time.

And I was on the USS *Haven* [AH-12] which is a hospital ship and that's where the Manhattan District had all of its safety and radiation stuff under the medical director. Of course he had been a professor at the University of Rochester in radiology, Dr. Stafford Warren, and Dr. Warren had brought a lot of his friends who had worked with the thing and we were all living in various quarters around the ship. It was the best ship to be on. They also had members of Congress, some of the VIPs up there, so they took the nurses' quarters over. And we were there part-time, and the other time I was out on a destroyer. And we were assigned to different ships. But they were concerned about the water contamination, as they knew they would have some from the underwater shot particularly, so we'd follow the way the path was supposed to go and check it out, and we had some oceanographers with them. I [00:25:00] don't know where they were from but they had some instruments and they would make measurements and we'd check what they brought up to see if there was any radiation in it and radio the information back to the *Haven* and they kept track of it. We never saw anything out there particularly. We were out there for several days floating around. But it was an interesting experience. You can just imagine, a young kid out here on an adventure.

Yes! I don't know that much about Crossroads, so with the underwater shot, what do you see?

Where were you?

Well, have you seen—in some of that material it shows a picture in the shot of it [indicating personal documents and photographs]. It shows a ship. It was completely upended. A big ship. It was, not a tanker but something like a tanker. It was a merchant ship type thing. And they had a lot of contamination on the ships because of the water. The neutrons from the bombs activated

the sea water, the elements in the sea, so there was all kind of radioactivity. One experience was it turned out that some of the guys sleeping on the top bunks, we had to move them because the water lines went under the floor board on top of the bunks; and they pumped salt water throughout the ship because they used salt water for everything, so they were bringing in contaminated water. They had evaporators to make clean water, and they were very effective. In fact one of the jobs we had was to go down—one day they were repairing one of the evaporators—our job was to go down and follow the health physics side of it and be sure the guys didn't get too much radiation and all; they had to take all this contaminated salt and all the other stuff out of the water and get rid of it and keep the evaporator working. We found out one thing that was kind of interesting. They were using salt water to clean the tables in the kitchen and so they had to stop that kind of stuff. But that's the kind of thing you ran into. There wasn't any real harm by it because they had enough guys running around with instruments to see, and you could get fair instrument readings almost anywhere on the ship, certainly on the outside, but it didn't last long, a couple of days maybe, two or three.

When I came back from Crossroads, I spent some time with—Dr. Morgan had put me in—one of the military guys had to be transferred to another job and so I took over what was then the personnel monitoring program. Personnel monitoring was the film badges and the pocket chambers. Everybody that entered the lab had to have a pocket chamber and a film badge, which was part of the identification system. And they had a little gatehouse-type thing and that was the clock alley. Everybody had to go through the clock alley and pick up their instruments, and if they were going into the forward area where the reactors and everything was, that was separate. You still had to go through another guard check and that's where they really checked them to see that they had their instruments and their badges. And we had some trained people.

This guy did a marvelous job of setting it up. He had some young ladies, yeah, they were all young ladies who would come in on the afternoon shift and they would read the pocket chambers and the film dosimeters. If there was anyone that showed up more than they should, we would go out the next day and say hey, what'd you do yesterday? and how'd you do this? and so forth and so on.

What's the difference between a pocket chamber and regular dosimeter?

A pocket chamber was a small—they looked about the size of that pen you got, a black little chamber, graphite-coated. The pen was made out of plastic coated inside with graphite, and they [00:30:00] put a charged wire down the middle of that and that was electrostatic and it would hold, and whenever radiation would hit it, it would cause it to discharge and you had an instrument that you put that into and it would measure the discharge over the—and that was kind of the early instrumentation was based on that because that's the way they did it. And the chambers weren't so reliable, so we usually had to have everybody had to wear two instead of one. And then if the pocket chambers, if both of them showed doses, then we would process the film that night. Otherwise we'd do the film once a week because that was a much more reliable method of what the radiation dose was.

So I was working on that program and we spent a lot of time—we began to look into how—what long-term, was there enough exposure, people getting enough exposure to cause any troubles. We had some statisticians and they had what they called a tolerance dose of so much, I think it was 100 millirem [mrem] a day, at first, and then it was reduced. I don't know what it is now but it's gotten much lower. But we actually didn't have many people who got much radiation. Every once in a while there'd be a big surge, somebody'd do something they shouldn't do, a lot of them also would hang up their instruments before they'd go into the hot cells, there

was some of that went on. And sometimes you'd catch it; sometimes you didn't. But I never heard of anybody on the staff really having a serious problem. In other places they did but we didn't really have them there.

And we got concerned about how good our calibrations were and how the instruments performed in different situations because they were energy dependent. If they were working with radium, they had one energy, basically, they're working on. If they're working on others, it'd be a mixture and the instruments would actually respond more to one than the other because of the energy dependence of the radiation that was coming off. So we decided we really didn't know a lot about that and we didn't have a good system for it. So Dr. Morgan took some of us to Washington—and it was right after the war and I'm sorry, I don't remember the date—but Washington and the National Bureau of Standards were where the radiation safety had begun. And they had equipment and sources and all that stuff, so we made arrangements with the head of the X-ray Section, Dr. Lauritson Taylor, who I'll tell you more about later, to come up and use his equipment and they did the measurements and all. I made several trips to Washington with suitcases full of instruments, we'd take them up there and expose them and take them back to Oak Ridge and process them and so forth. So it was just a way of being sure our instrumentation was—well, we were doing the best we could with the state of the art.

And I did that, and then the boss came in one day and said that they wanted somebody to help them get started at this new laboratory in New York. They had set up the Brookhaven lab [National Laboratory]. New England universities had all gotten together. You know the history of Brookhaven. So he wanted to know if I wanted to go up there and I said, Well, I don't want to move out of the South. My home was only a few hours away from Oak Ridge and I could go home even on weekends and things if I had to. So I said, No, I don't want to go

up there part-time. I'll go up for a while. He said, Well, why don't you go up for six months?

So that was in 1946, I guess, '47, and I went up that summer and spent six months in [00:35:00] Brookhaven and came back to Oak Ridge. And of course the job I had, somebody else was working on. And I stayed there a while and then I got an opportunity. The Manhattan District had been dissolved and the AEC [Atomic Energy Commission] was taking over at that time, and they had followed the organizational structure of the—in the beginning, you know, the field offices—you know what the field offices do. The field offices, they administer the contracts. And the field office had a medical director, and then he kept in touch with the medical people and all. He wanted somebody to help him in the health physics area. So I decided I'd leave the lab. I wasn't really set up to be a lab researcher, which if you want to continue you'd have to go back to school and all that. At this time I was sure I didn't want to do that. So I took the job with him and I was there for a few months.

This is the field office in Oak Ridge?

Yes, Oak Ridge Operations Office [OROO]. And then Dr. Taylor showed up. He was brought in by Dr. Shields Warren, if you know the two Warrens, who was the director of the AEC Biomedical Program. And they talked Dr. Taylor into leaving the Bureau of Standards on a leave of absence for a year or so and to come over and work for the AEC and help get the program started. And he's well known in X-rays and radiation safety work and standards. So somehow out of the course of his [work]—he was sent down to Oak Ridge to look into something and I of course was escorting him because I was the one that knew the place and I knew around everything. So somehow the idea got planted and I helped plant it to some extent that maybe I should go to Washington and work with him. And so soon after that the boss came in one day and he says, Hey, I got a request from headquarters to transfer you to

Washington. So on October 22, 1948 I got transferred to Washington and was there for the rest of my career in Washington, AEC, various places in Washington.

And it was a very fascinating period. They were doing—the AEC was—first they started out that anything the Manhattan District had done was wrong. Then they kind of changed their mind and there was a little bit if that, not too much, because too many of the key Manhattan District people were also taken into the AEC—all the management, most of the guys, the colonels and all, the engineering colonels who had been in the operations offices became executives of the AEC. But it was an interesting period there.

When you first go to the AEC headquarters, what are you?

They called me an applied biophysicist, and they didn't have the term "health physics" in those days. They had it in the lab but they didn't have it much anywhere else. And they had formed what they called a Biophysics Branch in the Biomedical Division, and so Dr. Taylor was the Biophysics Branch and actually I think I was the only one there at the time but we had some others in there before it was over. So I was in the Biophysics Branch in Washington.

Now I have a question here about the organizational structure. If you're in Washington, are you setting policy and standards for all the operations offices?

Yes. Mostly—well, if you knew, all of them were pretty independent and it was you were hopefully keeping track of what they were doing in some respects, but theoretically yes, and the big policy, yeah, the AEC was great on that. They were doing all the big policy stuff, and they were doing a great job on it.

[00:40:00] I might mention a little bit about Dr. Shields Warren. Dr. Warren was a Navy captain in the war and he was on a ship in the Pacific somewhere fairly close to Japan. And as soon as the bombs were dropped, he was among some of the first people who went into the cities of

Hiroshima and Nagasaki. And of course it left a terrible impression because it was a mess. And he came back, he was a professor at Harvard University, he was a pathologist and one of the leading pathologists in the country. And the AEC, of course, Dr. Stafford Warren who had been the Manhattan District colonel who ran the biomedical program and all, he was looking for a job, too, but for some reason he didn't get it, and this was the politics that was going on. And I didn't have anything to do with that, but the AEC formed a committee of high-level medical people from around the country. There were several people from the Rockefeller Foundation and all those things. And they recommended that Dr. Shields Warren get the job. Of course Stafford Warren, his home was in California initially, and he went on and built the UCLA [University of California, Los Angeles] Medical School, so he made his mark in medicine in two areas and he had that, but he built the school. But anyway, I think he was a little, I don't know, he probably was a little disappointed at the time. Of course he knew everybody and knew what was going on.

But Shields Warren was an extremely kind individual and the AEC had a program, the government did at the time, in what they call it when you're actually employed, and for people like Dr. Warren, he worked three days a week in Washington and two days a week in Boston [Massachusetts] or four or whatever it was. He'd ride the train. He rode the train back and forth. It was an overnight trip to Boston and so he did a lot of traveling. And he kept up with both his Harvard job and the AEC. And he was a very well-known, as I said, man.

Let's take a pause, then. That's just fine.

Right, you were talking about the Warrens.

Well, I didn't really know Dr. Shields Warren but through Dr. Taylor I met him, and he was just a prince of a fellow. He was very soft-spoken and everything else but you didn't want to cross

him, I found out. If he says don't do this again, he meant it. But Dr. Warren, as I mentioned, he came back and forth to Washington.

And they were building a biomedical research program. That was the whole thing. Each of the labs—Richland, Oak Ridge, Chicago, Berkeley they had very fine and state-of-the-art radiation labs, doing all kind of stuff, and they were building a group to look after vegetation problems if you had fallout and things and what would happen. And so they were bringing a lot of outside people in, university people. They'd bring them in for two or three years at a time, long enough to get some piece of the program started and then they'd go back. But they were basically using the AEC labs as the starting point of this. They also used some university groups, and in fact they had a big offsite university lab program which I think eventually went to the National Science Foundation, but I'm not sure, but for a long time it was *the* thing in the government. And Dr. Warren had such a reputation both medically and politically, he was pretty well connected with the Boston people because when [00:45:00] he'd have a problem that would require a little political touch, he would go up the hill and spend a day and come back and amazingly this problem had gone.

I had one question about him as far as what you said, how he was impacted by what he saw in Japan.

Yes, they were extremely impacted. They all were. And they came back—there were a number of military medical people, and they formed the Atomic Bomb Casualty Commission. And that was the big thing they formed and it was military and I think Japanese people were members of it. At least they were closely allied with the Japanese. I'm not sure about that. And as they call it, the ABCC. Dr. Warren [and] they were impressed with the terrible damage that was done and they weren't prepared for any of this, the medical people. So they started working with the

Japanese very early on to follow the medical history of the Japanese, and amazingly the Japanese people, medical people and all were very, very cooperative. They were a big part of this ABCC. They were separate but they all worked together. And Dr. Warren was one of the principals in this ABCC work. It's kind of a side issue but when they started doing this, somebody, Jim [James V.] Forrestal who was the Secretary of Defense, wrote a letter to the president and said they ought to set that thing up, but he didn't talk about funding it. And so it turns out that Dr. Shields Warren and President Truman's physician were close friends from their military days, so they wrote a letter to the AEC and the [National] Academy of Sciences [NAS] and said, we want the Academy of Sciences to run this program, but the AEC will pay for it. And I'm pretty sure Shields wrote that letter. I did have a copy a long time ago but I can't put my hands on it now.

Was there a sense that his concern from Japan in any way influenced how he set stuff up that you all were working on?

Not really. The strictly medical stuff they were all of course interested in but there wasn't any—no, it was all done in Japan. They had medical people, they had military medical guys, and AEC. I don't know who the head of the ABCC was at that time.

No, I meant just as far as concern for future—concern here about radiation effects.

Oh, well, yes. You know, I think that will come better to talk about that when we talk a little bit about civil defense.

Great, because I want to talk to you about that, about the civil defense stuff.

Yeah, I've got some stuff on that. But the ABCC as it was set up, they met frequently both here and in Japan and they worked hard to get lists of people. Now, there was an interesting thing about [that]. The Japanese were meticulous after the war in writing down and recording where people were when the bomb was exploded. There were a large number of these people and they

had a record of them, whether they were in a structure, whether they were in the front room or the back room or where they were, they had a very meticulous record of this. And when they got going down the line and they began to see radiation effects of one kind or another, they had some situations that didn't just fit right. In fact they had a lot of them. They'd have guys who were up here somewhere closer to where the bomb was supposed to have been dropped and others back here somewhere, and the ones back here were having the big medical problems and the ones close up weren't. So it dawned on everybody that they needed to have a program for dosimetry [00:50:00] in working with the Japanese. And at the time we were involved in this. This is called *Ichiban [Radiation Dosimetry for the Survivors of the Bombings of Hiroshima and Nagasaki]*, John A. Auxier, DOE 1977]. They've got these books here. That's my only copy.

I can get this.

And we put the program in Oak Ridge because one, they had a fine radiation measuring group with Dr. Morgan's group. I had been there and I was part of helping getting them into it. And they had people in Japan, and still do, working with the shielding people, but they began to make a lot of sense out of what was otherwise a fuzzy situation that they couldn't, you know, it just looked crazy. They knew enough about radiation to know that first, there was a difference between the two bombs, a big difference, and that showed up.

One of the interesting things was that one of the physicists who was involved on the periphery of this suggested that they might look for cataracts in the people in Hiroshima because that's where they had more neutrons than in Nagasaki. And the Fat Man was huge and it absorbed those neutrons and they didn't get out into the atmosphere. Well, there's a big difference between the characteristics of radiation between the two cities, too, and that's part of what we talk about here. Anyway, they did look around and sure enough, they found cataracts in

people. That was one of the first radiation effects that they saw and they were in the Hiroshima people and not the Nagasaki people. Now the reason the physicists came up with this, by the way, was that they had been playing around with cyclotrons for years and they used to get down and line up their beams and everything and they overexposed their eyes and a lot of them got cataracts because of this. So that was a known radiation effect that they saw right away. There were others but I think they expected more leukemias and things like that than they saw. But they were also seeing a little bit of difference, as I said, between Hiroshima and Nagasaki in the medical programs. And that's what we faced when we came out here and I'll talk about that if you want when we get here.

One of the other things that Dr. Warren and the biomedical people instituted was a training program. They didn't have a formal health physics operation. So they decided to go to the Academy of Sciences and have them set up a program of fellowships. And they went out and wrote a nice brochure about this and got fellowships, and then they wanted to set up the fellowship program. They set it up, but they wanted it to be specific to the AEC needs and not just some university group getting on and teaching. So they had picked Vanderbilt [University] as one of the major schools because it was close to Oak Ridge. That's why Dr. Taylor, by the way, was in Oak Ridge that time when I first met him. He came down because they didn't understand something about the fellowship program. Of course, Dr. Morgan jumped on this big time because he had been a teacher and he loved it and he did some of the work; but most of the students would go to Vanderbilt and spend a lot of time, then they would bring them into the labs and give them experience in the labs. And just as a side issue, I don't know whether you want to—you may not want to use this.

I want to hear it for sure.

[00:55:00] We had a situation that came up because they had two problems. One, the Academy of Sciences had given these fellowships out and they got a hold of one guy who was a homosexual. So that was a no-no because they couldn't get a clearance in those days. We had to find a way to talk him out of this. I didn't have anything to do with this. He was in California. And Dr. Warren had a young physician who was his deputy. Dr. John Bowers was his name. And Bowers, he was very clever at handling these things. He just picked up the phone and called one of the medics that they had worked with in the lab down in UCLA and they'd been in the Army and all this and said, you know, See what you can do. So a couple days later, he called him back and he says, well, it's all right, he says, I told him he couldn't have that fellowship for the same reason he couldn't go in the service.

But the other part was the segregation. Now Oak Ridge was a segregated city. Tennessee was segregated by law. And one of Vanderbilt's medical schools was Meharry [Medical] College, I can't pronounce it correctly but they had a medical school there and one of their principal people was a Negro. And so the way they worked with him was when he'd come to Oak Ridge, they'd arrange to have a room for him in the Oak Ridge Hospital. He couldn't stay in any of the places with the other people. Now I grew up in North Carolina so I know, but it's unbelievable in a way today. But they had also given a fellowship to some black students. Well, we couldn't house them at Oak Ridge without segregating them and that would've been a no-no all over the place. So I was in talking to Dr. Bowers, Shields's assistant, and I said, you know. He says, I'll fix it. So he picked up the phone and called the [University of] Rochester people and said, You guys are going to get a fellowship program up there. He gave them a number, half of them or something, and that way they then worked a deal to send them to Brookhaven where there wasn't any segregation problems.

Right. To Brookhaven or to Rochester?

No, took them to Rochester for their coursework, and Brookhaven where they had to have their experience, and they got all that from Brookhaven.

Wow! We're going to pause if that's the end of that story.

Sure. Sure.

We'll pause to change our tapes.

[00:57:55] End Track 2, Disc 1.

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

One of the things that people have to understand, and I'm not sure they always did, you know they used to talk about the AEC not being very careful with radiation safety and the Commission didn't care. Well, that was actually a bum rap because they were extremely concerned about these things. And I'll tell you, I'll mention some more about it when we get to the Nevada Test Site, but there was a movie out and I've forgotten the name of it but it dealt with getting rid of the population on the Earth because of a nuclear holocaust. It made big headlines and it was the kind of thing that was supposedly science fiction. I can't remember the name of it.

Was it On the Beach?

You've got it. It was *On the Beach*. And one day I was in the office and Dr. Warren came in. Now Dr. Taylor had already decided he was going back to the Bureau of Standards and they hadn't found anybody they wanted to bring in to take his place. And Dr. Warren came into the office and says, What did Lauri [Lauritson] do about those calculations I asked him to make?

And I said, I don't know anything about it.

Now unfortunately at that time Dr. Taylor was over at Georgetown Hospital flat on his back with a back problem, and in those days, you know, they hung a weight on your neck and a

weight on your feet and you stayed flat for a period of time. He had strained his back carrying a bag in traveling.

So he says, Go over and talk to him. See what's happened.

So I went over and I said, Dr. Warren wanted to know what you've done about those calculations.

He says, I told Shields, I can't do that. He says, that's a big job. That's an operations analysis job. Dr. Warren wanted to verify whether *On the Beach* was possible. The Commission asked him to look into it. And he said, I only know one guy who could do this and he's down in Oak Ridge. He had worked with Dr. Taylor during the war.

And so I went back and told Dr. Warren and he said, Well, I got to have something on this. He says, You follow up on it.

Because it was a top secret matter, I went down to Oak Ridge and discussed it with him. We couldn't talk to anybody. I told a made-up story to my Oak Ridge friends. They knew there was something up but I couldn't tell them what was going on. And this particular guy [Nicholas Smith] was working in the aircraft nuclear program, at one time they were going to fly a plane and he was working in it. A very brilliant guy. And so I talked to him a little bit and he said, yeah, he knew what they wanted, he'd look into it.

So Nicholas came back up and we visited with the military applications people who controlled all that kind of stuff. We had a big meeting with them and had to get a whole bunch of highly classified information, and you couldn't just walk down to the library and sign your name. They had to approve it. So we were sitting there and the guy that was supposed to be sure that you had the need to know to get this material was kind of stalling around because it involved a lot of intelligence stuff. And finally the deputy director said, Paul, we're not going to

have anything to do with this. Get them whatever they want because otherwise we'll get the job and, he says, we don't want it. I used to tell that because that was an interest the Commission had, you see. They wanted a decent story and they wanted it with somebody that would carry some weight with it.

So we started going around and Nick did some studying and we finally came up with a draft report of what we wanted. First we went to Los Alamos and we had one of the most fascinating meetings I was ever in. They had Hans Bethe, they had Edward Teller, Eugene Wigner, they had the guy who was head of the Los Alamos Theoretical Division and a couple of other people in the room and we spent a whole day talking about this.

Carson Mark was head of [Theoretical Division] —

Carson was—yes, he was there. And I can't remember who else. Freddy [Frederic] de Hoffman who was kind of Teller's right, he was Teller's kind of secretary or something. Teller [00:05:00] would dream up something and Freddy would have to follow up on the math and see that it was working and so forth. And of course out of that meeting the main thing that came out was that there had been, from the Pacific tests that had been performed by us and by the Russians, enough fallout that it was possible that everyone had a chance of getting a little bit, a particle or two around the country.

So Nick went back and put the operations analysis touch to this and we went out and we had to show it to some people at Berkeley and I can't recall who they were but they were of equal stature of the people in Los Alamos. And he came to the conclusion that it wasn't possible to do this. There wasn't that much uranium to begin with to make that much material to have a complete wipeout of populations.

And so he brought the report back. Now I had to carry it because I had to be a courier. And I went out and here I was one day, over in the Department of Agriculture learning to shoot a

gun because I had to be armed when I carried this stuff around in my briefcase. I had to follow Nick. I followed him around the country and I would carry the material.

So I took his report up to Dr. Warren to review. Dr. Warren was in Boston and he was not going to be back that weekend, so he had me bring it up to him, so I took it up to him. Dr. Warren summarized a very lengthy report to two and a half pages. We named it Project Gabriel. And when I showed it to Smith, he couldn't believe it because he said, I thought Dr. Warren is a M.D. He said, This is the best. He says, I couldn't write a better summary than this of any kind. And it was pretty good. Eventually that thing got declassified somewhere along the line. I never saw it after that. But it stopped people worrying about whether we were going down the wrong road in development and so forth. But I tell you that because of the way the Commission felt about a lot of things.

Let me ask you two things just to clarify. So they had to train you to shoot a gun so you could carry this thing around?

Yes, I had to become a courier. They just made me a courier.

And where did they actually teach you this stuff?

Actually, well, there was nothing to it; just you go to the gun range. The Department of Agriculture, in the basement, had a huge gun range down there for government use, all kinds of government people. And the AEC had a half-a-dozen guys—some of my best friends were couriers. They were always running around, carrying documents from one city to another. But the nice thing about it was whenever you traveled you got closed space in the train. You couldn't let the briefcase get out of your sight, and so you carried it around. Some of them lock it to their arm but I didn't do that. That was a little too obvious.

That's what you see in movies.

Yeah, that was a little too obvious.

Well, let me ask you another question about that whole project. This physicist's name from Oak Ridge was Nick—

Nicholas Smith.

Nick Smith. Nicholas Smith. And when you're actually working on this, as a technician, as a scientist, you standing back from the data, but were you at all worried about the implications of this? No?

No, because the reason they were trying to find as much uranium as they could, and they knew they didn't have enough. So they had the raw materials people, *the* top people in the AEC with money and flexibility, to do anything they needed to help find uranium, and you know they got most of the uranium from Canada anyway. They were getting the uranium from Canada and they got the uranium for the first bombs from Africa.

[00:10:00] But the report was, as I say, it has been declassified, I think. I don't know where you can find it.

We can ask the woman here [Nuclear Testing Archive archivist]. She'll know if it's available..

It should be available. It was downgraded a great deal. And I never heard much about it after that. Some of the other guys picked up and followed it.

That's an interesting story, though.

Yeah, it was. What the interest was, I told this because I wanted to point out the Commission's concern about safety which you know they were taking a bum rap by everybody about safety.

Why do you think that happened? Do you have some theories about that?

Oh, antis and other people. No, I don't know. Well, there's a lot of people who were opposed to nuclear energy, nuclear power and I just don't agree with them. I think they're wrong. They use

safety in the wrong way and everything else, at least I think they do. But you can't. But there was a lot of people who didn't like the Commission one way or another and they would say, it's the politics.

Let's see, let me have a minute here and see what I [referring to papers and documents]—
Yes, take your time.

Well, the biomedical group became pretty much a research support group. The AEC actually formed a safety organization. They called it Operational Safety and so eventually through a period of transfers around I ended up in that group when I retired.

But my first move from there was to—they had a group of people in Oak Ridge who were set up by the Manhattan District, the Army group, at a very high level to help bring on the development of a nuclear instrument industry and what have you. And they had these guys there. They were also selling radioisotopes. Now one of the things about the isotope program was the fact that that did get in the hands of lots of people. Usually it was small amounts of radioactive materials. And we were always getting a lost source or something like that. Now when I talk about the airplane program, I'll bring that up because that's where it fitted in best.

We always got a what? I didn't hear what you said. "A lost source?"

Oh, somebody would misplace one every so often. They'd say it was in the garbage. The [U.S.] Public Health Service was claiming a lot of jurisdiction in this area. We didn't particularly want to get into it but they claimed that it was their job to help the states and everybody else. The trouble was, they didn't have any money or any capabilities. And so—well, I'll go into that now. It probably fits as well here. The Public Health Service people were—it was a friendly but they were—now the first thing I remembered about it where we had problems was somebody would lose a source or they couldn't find it and they'd go looking around all over the place. Well, when

the Commission started selling radioisotopes, the biomedical people, Dr. Warren's staff, prepared a staff paper for the Commission. Now if you don't know what a staff paper is, they had a formalized system of papers that had to be written and then everybody had to approve them. And what it did was set up a program where anybody in the country could call the nearest AEC phone number and say, I've got a problem with radiation, and a team would come out and check it. And the contractors were—they just told [00:15:00] them all, designate a certain number of your health physicists, give them proper instrumentation, set them up so they can travel, and you'll do this job. Now they never had a budget for it. It was one of these things where the budget didn't count. This came from up at the top levels. And we ran that program in the AEC, I did, in the safety program when I got into the safety. And we would get all kind of crazy calls, but the biggest ones would come out of Chicago where some group was shipping a lot of isotopes on the airplanes and they'd leave a source on a plane or somebody would drop a source. It's all in the baggage, this would be the baggage stuff. And they had one thing where they got a bunch of sources in the baggage or somebody would find a box leaking. Minor. For the lab people this was nothing, you just go in and clean it up and forget about it, but if you didn't have this capability, it was a major problem. The labs had equipment and people, and we used them. I had one guy who did nothing but follow this up. And they had literature and this literature included a little pamphlet [that] was sent to all the fire inspectors, all the police places and things like that in the country. So they knew if anybody mentioned radiation, they had somebody that could come in and help them out. And when I talk about the airplane program, there's a lot of interesting things that we did in that.

But as a result of all this, as I say, Dr. Taylor went back to the Bureau of Standards. They moved this instrument group they had set up originally to follow industry's development. It was

a government organization—it was not a contractor—to follow industry’s development of radiation instruments but to create the safety stuff. And they moved this group to Washington. Well, it didn’t fit in with the AEC’s headquarters operations too well, so they physically located it out at the National Bureau of Standards, and Dr. Taylor’s lab, they had set aside space, and I was delegated to that group. Soon after this I started working with them full time. And our job was to follow what was coming on and we’d purchase any new instruments, pick them up, or we’d do them free if they wanted to give them to us, then we’d give them to the Bureau of Standards people and they would calibrate them and prepare a report. And so it was a liaison. It was a way to quality-control the stuff that was coming out on the thing. And it worked very well. But we were located right there in the high-voltage area of the Bureau of Standards. And we spent a lot of time back and forth downtown. I was involved with some other things but that was my biggest thing at that time.

Following up on what the plants were doing with their programs, they’d pretty much been fitted into the—they hadn’t been fitted into the safety program but it was fitted into kind of the research of the biomedical stuff. They kept track and we didn’t have too much trouble with it then. They left it to the field offices to do that kind of thing. The managers of the field offices were responsible for that. They had a safety group that would collect the statistics of how many accidents had happened and this kind of stuff, but beyond that there wasn’t much done. There wasn’t need to because the research was being done if there was any being done. The instrument thing was coming along very well.

I guess it’s about time to talk about nuclear tests.

That’d be great. You’ve given us some really great background both on your career and the state of the industry and the state of the whole organization.

[00:20:00] Well, yeah. Of course I had had the experience at Operation Crossroads. And one day Dr. Warren called me in and they had a young officer from the Military Applications program and he informed us that they were getting ready to set up a Nevada Test Site. Now they had been testing overseas and we hadn't been involved much in the overseas work because that was pretty much isolated and they didn't have a lot of biomedical studies and things going on at the time. And we knew and one of the things that I was working with at the time was the Bureau of Standards part, another part of Dr. Taylor's group had been contacted and actually had a contract—I guess they called it a contract, but an agreement—to make a lot of measurements at Operation Greenhouse which was overseas. And one of the things they were using was a lot of our little meters to do certain dose—where you wanted to find out what was going on in a place, you put one of those dose meters out and somebody would bring it in. And Dr. Taylor knew I had been fooling with that when I was at the lab. And I got involved with working with his people to help see that the lab part, the processing of these and all would work out. And so I was actually slated to go out to Greenhouse with his people. And this young officer that came in to talk to Dr. Warren told us that they were getting ready to have tests in Nevada and they were going to do it right away and they gave us a briefing on what it was. Well, that triggered a lot of concerns, and Dr. Warren told me he wanted me to get Dr. Stafford Warren in from UCLA and they were going to give him a briefing on what was going on. And he was the spokesman at UCLA and they didn't want him coming in saying, hey, these guys are putting fallout over Los Angeles and I know, you know, and so forth. Then they gave him a complete briefing of everything that was going on. But it was just fortuitous that we were involved with that.

So the NBS stuff was moving along and we were scheduled to go to Greenhouse. I've forgotten the dates. I thought I had them here but I don't.

Well, when you review the transcript we can insert them.

If I can find them.

We can figure that out.

OK, do you want to pause a minute?

Sure.

Let me show you—[maybe you] saw that piece of paper but if you didn't you might want to get it.

No. That would be great.

I guess I didn't tell you this part of my story which is probably not worth recording but recently my wife and I had to downsize and now we can't find anything.

All right. There were a couple of things that happened to get the Civil Effects program going. You've heard of the Joint Committee on Atomic Energy. The Joint Committee on Atomic Energy was very safety-conscious and they didn't hesitate to call the chairman of the Commission and chew him out if something was going on that didn't look like it was safe. We had some interface with them and Dr. Warren had a lot of interface with them from time to time. And they were always interested in what was going on. Now are we going to talk about the testing?

Yes.

[00:25:00] Testing. All right. And so when this program started out here in Nevada, what was the date, 1951, yeah, because in '52 we went to Greenhouse. In fact it was about ten days after we left here that we went to Greenhouse. But the Commission insisted that Dr. Warren come to be in Las Vegas during the shots. So somehow I ended up coming with him, driving the car for him and for the commissioner Smythe. Smythe was a commissioner. He came out and I ended up

driving them around. General Cooney who was the head of the last military— Manhattan District doctor, was still attached to the Military Applications program and he was helping make the transfer, so General Cooney was with us. And I think Dr Klaus, one of the men that had come into Dr. Warren's group. So anyway I had the advantage on them. I had seen a test and nobody else had.

But we came out and followed all the buildups and all the other stuff, went to all the weather briefings and everything. And Dr. Alvin Graves was the test director for Los Alamos at the time and he was a prince of a fellow. He was one of the nicest guys I ever ran into. And we saw a lot of things and did a lot of running around looking at things going on. But somebody decided that they needed to do some other things; they were concerned about the fact that so many people had automobiles and that automobiles might be a good place for people to go if they had a bomb blast somewhere and the metal would protect them. So they bought four or five of these damn clinkers and we placed them in different places around the shots. And that was what we kind of laughingly called our first "civil effects study." And of course Graves insisted we write a report on it, so there is a report on it. I've forgotten what the name of the project was but I think we can pick it out of here. But anyway, we placed these damn cars—

So you did that.

Yeah, we did it. We placed them out and put instruments on them. We used Los Alamos instrumentation. The Los Alamos guys had film badges and stuff and we put them in them and checked them out. It was not the most successful thing but it showed you what a car could do. We had a couple that were kind of half-buried and we checked them, and they had others that we had them just put them out and checked them both to see if they'd still run, and many of them did run. There was a little damage here and there, you could see them. But they're in the

[Samuel] Glasstone book, I think. I'm not sure. I think Glasstone has some pictures of those. *The Effects of Nuclear Weapons*. You're familiar with that. And then as I say, ten days later after this, I got back to Washington and we took off for the Pacific for Greenhouse.

Now Greenhouse was the first major thing where the medical people had lots of animals. They had a lot of pigs. They were studying rats and all kind of things for medical effects. And we were doing, as I say, just the general work, Dr. Taylor's group was. We were there for three months, I guess, several months. We didn't stay through all the Greenhouse shots because they finished up their studies, but we were kind of tied in with the medical people in addition to that one little project where we measured the doses in places where somebody wanted [00:30:00] to know what the dose was. And we did that and that was pretty much the start of our testing-type thing in the Greenhouse thing.

Now I told you I'd gone and joined the instrument branch. There was a program going on earlier when they first started the Nevada tests—I can't remember the shot and I can't find it offhand—where there was a concern with the Russians having a large fleet of planes and weapons that could drop on the U.S. by flying over the [North] Pole, and of course Hanford was the prime target. And so the Joint Committee insisted that Dr. Warren, and it was given to him; I don't know why, it may have been nobody else in the Commission wanted it, that we have a group that would be liaison with the civil defense groups. And that's how the civil effects program started. Dr. Shields Warren had set this up and had hired or brought into the program a Professor Harry [L.] Bowman. Professor Bowman was in the Civil Engineering Department at MIT [Massachusetts Institute of Technology] for many years. And after World War II the military had a group that went out and did—they call it the United States Strategic Bombing Survey, called USSBS. Are you familiar with USSBS? You know about that.

Something. I've heard of it.

Well, Professor Bowman was involved with the physical damage for the structural damage part of that. And of course Dr. Warren knew that and he got him in to help decide what kind of stuff civil defense needed and get the information to them so that nobody was hiding anything from them as stuff came out because there wasn't any formal way to do it. Well, Professor Bowman, when they were doing the surveys for the USSBS in Japan, had met a fellow named Robert L. Corsbie. And Corsbie was an architect-engineer. He was a Navy lieutenant or something at the time, working with the Seabees [Construction Battalions]. And he had come back to this country and was working for an architect firm in New York. So Professor Bowman recommended and they talked Bob Corsbie into coming down and working with Bowman in what we call the Civil Effects Group. I think they call it the Civil Defense Liaison Group.

So that's how we got into this. But at the same time there was a lot of concern about the safety of the Richland [Washington] reactor people, if Russia did bomb Hanford or something. So Bowman and Corsbie and some other guys got together and designed a couple of shelters that were going to be made out of concrete pipes and metal pipes, cheap things, but so that the guys at the front like the reactor guys, if the whistles blow they had shelters available, and you could bury them cheap. So they started testing those things. And Bowman and Corsbie and I don't know who else, they had some other engineers working with them, made a couple of these shelters and tested them out and they had some problems with them.

Well, Dr. Warren was leaving the division at the time and he had a fellow named John Bugher coming in, and John was interested in the stuff we were doing, too, so he insisted that we get some radiation measurements in these shelters. We were in the instrument branch at the time. So I went down to Oak Ridge and got my Oak Ridge friends that I'd worked with in the health

physics group and they came up with a system to check what was going on in the shelters with radiation. The medical people had dogs in them and they also had mice in these things and everything.

Now these are out here in Nevada?

Yes, they were out on the test site. I don't know whether those pipe shelters are still there or [00:35:00] not. But they had three or four in several miles, and that's how we started in the civil effects group. And then that moved into the Japanese program, too, after that.

Corsbie was quite a character. He was a pretty hard, high-living guy. He loved his drinks at night and stuff like this, but he was a very energetic and sincere worker and he did a great job on this thing. And Bowman stayed around for years and then finally—but they would go through all the engineering studies that were done in the AEC system and put a rubber band around them and send them over to the civil defense people. Now whether they were reading them and what they were doing with them was different but at least they were getting the information. They couldn't blame the Commission for not filling them in on what was going on.

What you've said is very interesting because it answers a question of mine and I see that I have to go elsewhere for the answer. But I've always been curious how much that information that was gotten at the test site about civil effects filtered out to the general public, but you're saying it left the AEC and went to civil defense and then it was their job—

We didn't do the public. And of course when we got in the Japanese program and the other stuff, then that was—but we were collaborating with the civil defense people all over the place. The houses that are still standing up in Nevada were houses that we—some of them were put up by them. I don't think we built any houses. We fiddled with some shelters but we didn't do many

houses. And they had one series and I can't remember, I didn't get a chance to look back and find it, but where they had a kind of a street and they had like—do you know which test?

Right. I'd have to look. I have the reference book on it, so we can look [Annie, 1953, Apple II, 1955].

Yes, well, that was one of them, and we supplied them the instrumentation for the radiation measurements. We were doing this with EG&G [Edgerton, Germeshausen, and Grier] at that time. We had gotten them into the business. But that was the main stuff they got started in and we kept following up on the Japanese thing. Of course we had a big garage down on Frenchman Flat. You know about that. And that was designed for—Corsbie and Bowman kept talking about having dual-use-type shelters and they had the feeling that if you could get enough information out into the engineering community, you could eventually harden enough stuff so there was plenty of places for people to go if they had an attack, and this was kind of moving in that direction. They had some pretty good architect-engineering firms working with them on some of this stuff.

I've talked to one guy from Holmes and Narver who worked on some of those shelters. So the dual-use concept is you have a parking garage but it's hardened to also be a shelter, is that what you're saying?

Sure. Yeah, you got to put concrete around it and if you could put it underground it was even better. And this was a big underground [garage]. Now there was another use for it but I don't know that we should have it on the record. [This is because of classification concerns.]

Well, people are always alluding to that. Why don't I pause and then you can tell me.

All right, let me tell you what that was.

OK, I'm going to pause it. [Can I] turn it back on again or—?

Yeah, you can. They tested a lot of things other than garages. Well, they did a lot of work looking at fallout shelters, and they were telling people to go to the basement of their house and build a—go under the stairs and so forth and that you could get good protection there. And I don't know whether you want to talk about the fallout shelter studies we did.

Sure.

Well, the question of course was then how good was all this work we were doing or how good was the protection? And that meant finding out the shielding factors that associated with radiation and going into a structure. And one of the people was Willard [F.] Libby who [00:40:00] was a Nobel Prize-winning member of the Commission at the time was very interested in this kind of stuff. He invented a lot of almost impossible things for us to do from time to time but we always had good support since one of the commissioners wanted it and nobody wanted to tell him no, we couldn't do it.

But Libby got the idea of doing a lot of testing and one of the things we did was that Oak Ridge developed a program of—well, they first made kind of some strings of sources, big long—on the end of trains, and we came out here to the structures in Nevada and laid them out and then measured the radiation inside and integrated all that and it simulated fallout. Later a group from Boston developed a way to run a big radium source around a hose, so you could put the hose in the ground and run water through it and you could move this thing around and simulate a fallout field.

So Libby decided we should check the AEC building, which is up in Germantown, Maryland, and we proceeded to do this. We got the Boston group down with their resources and the EG&G guys instrumented the buildings for us. We did it on the weekends and whenever we could. We put it on the roof of the building, on the second floor, first floor and all this business,

just to see how good the relocation site for the DOE [Department of Energy] was, or the AEC at that time. And it was with that source thing. Actually we did Herb [Herbert] Grier's house out here in Nevada with the same thing. Herb let them use his home and they brought it out and put it out in the ground and around. I think that got a lot of publicity. I don't remember. But that was the kind of stuff we were doing. Now there was a group of theoretical people at the Bureau of Standards who were making theoretical calculations and following up on that stuff and they were feeding back into civil defense too. So that was one of our big contributions in that respect.

The biggest civil defense program we got into was at Oak Ridge National Laboratory. Alvin Weinberg was director of Oak Ridge lab then. Alvin wanted to talk Eugene Wigner into coming back down. Are you familiar with this?

No, not the story, but just the names.

Wigner had gotten the Nobel Prize and he [Alvin Weinberg] wanted him to come back to the lab. They were personal friends. So Wigner says, well, I'll come down but I'm interested in civil defense. I want to study civil defense. The Commission would've bought him an accelerator if he said he wanted to go down and do accelerator work, but nobody wanted to pay for this, so of course it ended up in the biomedical because we were the civil defense people. And we finally went over and persuaded the Department of Defense [DoD] to pay half the cost. It was very small, it was just a small staff, really, it wasn't very big, but we went over and persuaded them to pay half the cost of it. By that time was part of the Defense Department. And they did a number of interesting studies. I brought a couple of their reports which I was going to give you. Let me get them. Let's see where did I put them?

OK. Can I help you?

No, I just got to find them. I put them somewhere here.

Yeah, here they are. The first thing they did was to decide they should take a look at the state of the art, what they were doing and so forth, so they did a summer study with the Academy of Sciences. They got the Academy of Sciences mixed up into this. You can keep those. I got a bunch of them. [*Civil Defense: Project Harbor Summary Report*, 1964, NAS, National Research Council #1237; *Civil Defense: Little Harbor Report*, 1969, AEC, #TID-24690]

Oh, thank you. Great.

And then they did a second one later. (That's the white one.) But those were the kind of studies that they came up with.

Oh, great!

And they put those out in a number of places. But then they also did a lot of other work at the [00:45:00] labs. They decided to try to find out what would happen if a nuclear bomb hit a reactor. And Oak Ridge had a very able engineer who had done engineering work, you know, blast stuff, so he made scale models of nuclear power plants, and of course the plants were very hardened, most of them were hardened for aircraft thing. And he had them out and they studied this thing. I remember I went down there to a meeting they were having, and Teller of course was in and out of this meeting because he was a friend of Wigner's. Anywhere Wigner went, a lot of times Teller would show up. And so Teller did some work and had some guys do some calculations, and they came up with the final scheme that to do any damage in a reactor you'd have to use—the bigger the damage would be, the megaton types or have big ones, and that there'd be so much radiation associated with the bomb itself that you wouldn't have a special problem associated with the reactor. So that kind of put that program to rest.

But they did another study—and I know it got published but I don't know where—on what you could do about evacuating or protecting the population in New York City. Holmes and

Narver did the study for them. They directed it from Oak Ridge. And they came up with a scheme that you've got the two tunnels, the Holland and the Midtown Tunnel, and if you go down deeply and then mine up under the highways, you could put escalators in there. You could also make parking down there. They were looking for dual use, that this would be parking areas, but with even one-way escalators they could fill them in a hurry and probably save a hell of a lot of the population of New York in case of a surprise attack. Now of course I don't who would've paid for all that. That was another question. But it showed the feasibility. But this was the kind of studies they were doing at the lab.

And Wigner had gotten upset because [Robert F.] McNamara had a group of guys who thought they knew everything and they had come up with the idea that you didn't want. What you wanted to do was build more bombs because you could build bombs cheaper than shelters and forget about the shelters. Well, that didn't go over very well. That was what Wigner and them were—and they were every once in a while getting one of these high-powered research groups in Washington to do calculations to support them, they'd have all these big thick reports. I went over to the Pentagon one day with Wigner to review on of their reports. At any rate, Wigner was coming up and he called me and told me he was going over there and wanted to know if I wanted to go with him, so I of course did. So we were coming out of there and I said, You know, Gene, I don't understand all that stuff. I don't understand the math and all but, I said, something just didn't sound right in that shelter thing. And he said, Yeah, that's right, he says, the math was wrong, too. So he went back and wrote a scathing report and just took them apart, and they got off of that after his report on the math, but they had messed that thing up royally.

But one of my big jobs was to keep track of Wigner because he was so well known and if he would get into something, one of the commissioners would want to know and it could be

reported. They wanted to know what was going on. So I found out later on, he was a prince of a guy. We got to know him personally very well and entertained him when he came in. But he was very good about telling what was going on. If he was going somewhere, he'd call me and tell me, and half the time I'd join him and half the time I wouldn't. It depended on what it was. Jim [James] Ramey who was one of the commissioners that worried about this more than anyone else would call and want to know what Wigner was up to and I'd have to come up and if I didn't know I'd have to find out pretty quick. But they did some very good work in that shelter program in Oak Ridge. I think they closed it out.

What was the worry about what he was up to? Why were they concerned about that?

[00:50:00] Just because of his notoriety and civil defense was a big publicity thing and all that business. It was mostly that. They didn't want some congressman from the Joint Committee calling up and saying, what's going on over there? They wanted to be able to answer it. And we had pretty good luck with that but they didn't surprise us at all. Wigner was good. We got to know Teller pretty well, too. Teller was a character. And that was one of my fun times. But they did a lot of reports down there.

These are interesting. I'm so glad you can—

Those are the first reports, but there's some that they did a lot of lab work and calculations on and so forth. Another one that came to mind which I don't know how it ever played out but they had a scheme to use Spartan missiles to go up in the upper atmosphere and explode in case a Russian armada was coming over; above the atmosphere the blast would travel further and the radiation, so they figured the blast and the radiation together would kill the pilots. And maybe they couldn't do this but one of the things—have you ever heard of the electromagnetic pulse? The EMP effect on a heavy side layer when it would come from that high a burst could affect the

whole country. And one of the engineers that Wigner had on his project, a young guy, just happened to find out that in Hawaii they knocked the streetlights out one time with one of the high-altitude shots out in the Pacific. And so they got a hold of that one and they called the TVA [Tennessee Valley Authority] and all these others and the TVA guy said, God, he said, that's like hitting our whole system with lightning. He says, we couldn't possibly keep the power up after that. We never heard a whole lot more about that fancy system. I think they exploded up in Alaska, I think there was one of those Spartans tested, the bomb. We never heard anymore about that thing. It was kind of fun. But as I say, those guys did a lot of good stuff.

So these are dated '64 and '67 so this is now into the sixties and that's how that connects over, so McNamara was the Secretary of Defense then.

Yeah, I don't remember when—but he had these guys in there. He got out of that.

Let's see where we are. I'm going to pause for a second.

All right, the Japanese dose studies, we were doing a lot of things in Japanese houses [at the NTS], as you know. And the question came up when testing was beginning to stop in Nevada how we could continue in the air, atmospheric testing, but they had decided that they wouldn't built any more towers for the bomb but they were going to use balloons to suspend the bombs in the air. Well, of course, that messed up our plans for a lot of the shielding studies that we wanted to do with our Japanese houses and so forth. And so one of the things we had planned to do was to take a fast-burst reactor and suspend it in the air close to the height of the bomb, where the bomb went off, and make a lot of ground measurements in shelters and whatever we could do. Well, when we first started doing that, the people got worried because they didn't want to see a balloon get loose with a reactor hanging on the bottom of it. So we kind of lost out on that. And

Corsbie and I were out here at the time together and we were pretty down about the thing, and we were on our way back to Washington and we went in to see Herb Grier. We sat down with Herb and talked to him a while. We always had a lot of connections with EG&G. And we're telling him about this thing and Herb says, Oh, let me see, maybe we can help you find a way to suspend [00:55:00] this thing. So he called Johnny Elmgren who was the EG&G head, had been at REECo [Reynolds Electrical and Engineering Company] Operations. Johnny says, Well, I've seen something about a tall television tower, and he said, these reactors aren't that big. Herb says, Why don't you see what you can do to help these guys? So Johnny made some inquiries and found that there were a couple of these towers in Texas. In fact he went down and looked at them and said they were in that ballpark as far as altitude. So they found out they were an item that was made by a group called Dresser-IDECO [International Derrick and Equipment] Company somewhere in the Midwest. I think, I don't know for sure, but I think Ohio or somewhere in that part of the [country]—and so he got a hold of them and talked about it and could they do it. And first thing you know we had a plan to erect one of those towers and have a special elevator on the outside to lift the reactor, and of course it had an elevator inside for the personnel [Operation BREN, Bare Reactor Experiment, Nevada]. And the price turned out to be right. The price was only—I think I told Troy [Wade] and them, yes, it was \$480,000, I think is what it was. It was somewhere in that neighborhood, but it was very reasonable. So the weapons guys were wanting us to move—well, we erected it first in Area 3 because they had bunkers and a photographic place and so we could save all that cost. And they put the tower up. We called Dresser Group and they bought it as a procurement item out of Albuquerque for us. Of course the biomedical people paid for the tower.

Then the testing guys decided they were going to do more underground. They were going to do things that they might damage—that the tower would come down was their thing. So we were really down this time because we were out here and we had gotten the British interested and we had the Defense Nuclear [Agency, DNA] people and we had a big program planned to use that thing at that time. And in fact we had also gotten an accelerator. The Defense Nuclear people had helped us buy a specially-built accelerator from Oak Ridge Y-12 where they were doing the thermonuclear work for the power development and all that. They built a special accelerator to go on there for us. And we got it moved. There was quite an argument internally but the general manager in Washington called the manager of Nevada Operations [Office, NVOO] and says, You're going to move the tower and pay for it. And they did. And so within a few months they got the Dresser people back out. They moved the tower and moved it over where it was and we had a very successful series of tests. And I'm sure that they probably would've done more things. I don't think they used the reactor over where it is now. I think it was only down in Frenchman [Flat] but I'm not sure. But they had the accelerator, I know, because we built it.

Great. We're going to stop to change tapes.

[00:58:43] End Track 2, Disc 2.

[00:00:00] Begin Track 2, Disc 3.

OK. So my question basically is to give me sort of a layperson's lesson about how those experiments that you did with the tower—

That was, of course, to follow up on the shielding studies of the Japanese situation, and you know the Japanese had the houses made of mud. They used transite to get rid of the mud. They instrumented them and they also used helicopters to get the dose distance at various heights

above the ground from the radiation from the tower, which was just part of defining what the radiation environment was. And they did a lot of that kind of study, and they had used a big source, a cobalt source, too. They had a huge cobalt source that they could do straight gamma rays. Now the accelerator gave them 14 MEV [10^6 electron volts] neutrons which can come with thermonuclear weapons and so they were able to get some good data. The military guys and the British guys built some shelters underneath and measured the radiation inside the shelters. I don't think the Oak Ridge guys were doing much. They were doing mostly with their houses because they could move them around. You could put them on a truck or something and move them around.

One interesting story about houses—I think it may fit in—did I tell you how we got the first houses, the Japanese houses?

No.

All right, it was one of the earlier test series, one of the very beginning, and Bob Corsbie had been in Japan with the ABCC director who was a military guy, a colonel. And they were worried about how to—this was the first study of a Japanese structure to see what the dose information was and the Oak Ridge guys were ginned up pretty much to move and do the instrumentation once they had the structure. So they got I think it was CIA [Central Intelligence Agency], I'm not sure, but somebody flew all the material over to make two Japanese-style houses, and we put them up in Frenchman Flat at one of the shots early on. And we had to hide them because, well, the public information people didn't want stories coming out in the press about U.S. testing Japanese houses for nuclear radiation. And so we had a battle with them to even get to use the houses.

Really?

Oh, yeah, they called me in Washington. Bob was out and they called me and said, You can't do that to us. I said, Well, I don't think you're the one that can tell me that anyway but I'll pass it on. So I got the boss and he went up to see Admiral [Lewis L.] Strauss who was the chairman of the Commission at the time and Strauss says, Tell him to go ahead and do the test but, he says, if I read anything about it in the *New York Times* or any of the papers there, they're dead. And Los Alamos had a very good public information guy named Dick Elliot. Dick was with us from the beginning and he kept the testing from the public.

Now help me understand the political atmosphere. What was the concern that it got out?

Well, newspaper stories about the U.S. testing atomic bombs on Japanese structures, that they didn't want to see.

Because of what had happened in Japan or because of what might happen?

What might happen. I think this was what the public information people were worried about. Oh, they didn't care what happened in Japan. They were probably worried about what might happen in term of publicity and they were trying to protect the test program and so forth.

Right. Did you say that that material was actually flown from Japan?

Yes. There was a little bit of that kind of stuff went on from time to time. There was another phase of it that was—but anyway, we had then camouflaged, we put a lot of small buildings, all kinds of structures around these—between where News Nob was, where the news people were, so they couldn't actually make them out with their cameras and stuff, and that's how they kept [00:05:00] them away from knowing what was going on. But they told them they were doing light structures, testing the effects of radiation on lightweight structures. Oh, they picked up every—spare johns [outhouses] and anything else they could find out here and put down there

and put them around the houses, and they couldn't catch it with their cameras, I guess. We managed to pull it off anyway. But it was kind of fun at the time, once we got going on it. And they learned a lot of information about that. What they learned was that, one of the things, the wall structure in the Japanese houses was mud and seaweed and all this stuff, and they found that transite could be a substitute as far as radiation protection, if you checked the thickness. Oak Ridge checked the houses in Japan and so forth.

What is transite?

It's this white plastic material you use for building purposes. It's like wallboard you see, it's a foam—and the only place you could buy it was New England—so we had another series going and we were buying and this time we had a large number—this was ours and this time we had built—and there wasn't any publicity problems. We were going to build a dozen or so of these Japanese structures with two-story and different things and all, and the engineer who was assigned to our civil effects group from Holmes and Narver came in one day and my boss Bob was back in Washington, D.C. He says, You're not going to get those structures, he says, you don't have time.

I said, What do you mean, time?

He said, Well, they bought the material transite in Limestone, Maine and there's a truck strike. And he says, Those things will never get out here in time.

I said, Well, aren't they going to put continuous drivers on them and all?

He said, Yeah but, he says, even so you probably won't get it.

So I said, Well, let's fly it in.

And he said, Do you know how much that would cost?

You've got to remember, I was still kind of green behind the ears and this was a senior engineer I was talking to. I said, No, do you?

And he said, No, he said, plenty.

So anyway, I went to Jim [James] Reeves. Jim was the test manager. And I told him what I was trying to do. So he sent me over to the military deputy. Jim says, Oh, they used to do this all the time in the Pacific, fly all kind of stuff. He says, I don't know why they'd worry about flying building material. But the upshot was that that weekend, United Airlines had five flights of freight planes land at Indian Springs [Nevada] and we got our houses. But that was one of our little victories that didn't cost anybody anything, because when we figured it out, we had figured about \$20,000 to ship the material, and I think the flights only cost us maybe twice that, which the way test money went, that was a bargain.

That's right. That's right. OK, let's take a stop and—

[00:08:25] End Track 2, Disc 3.

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

March 26. I've got that book [referring to DOE-NV—209], yeah, I had it.

March 26, '57. I've got it. [Looking at Civil Effects Group organizational chart dated March 26, 1957, revised May 24 and August 19, 1957]

I got one of those yesterday. I had one and lost it somewhere.

Yeah, they're hard to come by sometimes anymore. Do they have them here? [asking if

DOE/NV—209 is available in Atomic Testing Museum bookstore]

Well, they gave me one.

They were out for a while. They're sort of precious, I think.

I know they were. And they gave me one because I gave them a lot of stuff.

So March '57 was—[referring to organizational chart]

The test series, was it [Operation] Upshot-Knothole?

I'm looking..

I don't remember.

Well, Plumbbob comes in May, so perhaps it was—and there was something called a “plutonium dispersal” project.

No.

The closest to March '57 is Plumbbob, which comes in May '57.

Yeah, that was probably it.

Yeah. Because otherwise we're out in the Pacific.

Well anyway, the way we did this, see, this [referring to chart] for instance, he was a civil defense employee.

[E. R.] Saunders [FCDA Assistant to Director on chart].

Yes. We were all different organizations. This was kind of a group that we used when we needed some expert advice or something. And then each of these were representative of—there was a lot of biomedical work went along.

So you headed the radiological and operational criteria group.

Right, and then I was Corsbie's assistant here.

Right, I saw that.

And we had—well, these were staff up here. This guy handled our automobiles. You know automobiles out here were a big thing in those days. And each of these was different things. One of the things we were doing a lot of was running around keeping track of fallout around the test site, on the site, and we brought in a lot of the guys from UCLA. In fact one of the guys was a

fellow named Kermit Larson, and Kermit had been in the Army and worked at Los Alamos and helped track the fallout from Trinity. So he knew what fallout tracking was all about. But they'd bring guys up there. We'd put them out in the desert and then they'd stay out there and try to be in the fallout if they could to get readings on it and so forth. They had all-wheel-drive vehicles and stuff like that. We'd bring in health physics guys from other labs to work with them, too, so we'd have a pretty good sized group. All of them got identification in the thing.

So talk to me about the airplane program because I need to understand that better.

All right. After the war, the Richland people began to have to worry about what was going on from their work out there, and they began to see radioiodine on the ground, and they knew it wasn't coming from them because they had a good handle on it. And they finally figured out it was coming from the Russian tests. That's the first time they saw it. And they hooked up with the air intelligence, I don't know who all, a lot of people, and the Air Force went to Oak Ridge and got a group down there to instrument a DC-3, in those days that was one of the big ones. And they put instruments in it, early cosmic ray-type instruments because that's what they had down at the lab for that kind of stuff, and they [00:05:00] tried to track the fallout from the Russian tests. But then on the sidelines the U.S. Geological Survey [USGS] got interested in it and the AEC people hooked up with them and they were prospecting for uranium and were looking around and these planes were finding enough identifications of the radiation that they could distinguish background; and so some of the big uranium finds in this country came from work that was done by the U.S. Geological Survey with the Oak Ridge guys backing them up on the instruments.

So some of the finds here in this country, you're saying.

Came, yeah. That's what I understand. But anyway, after they started shooting tests, they screwed up the background out here, so they couldn't do any more of this. And the U.S. Geological Survey had also begun a program of flying magnetometers, doing magnetic field studies, on the back of the planes while they were doing this, so they were interested in continuing some of that. So we got the idea when testing was on that one of the things we could use those planes for, because they couldn't do anything else, we used them with two purposes. The first one was when a shot went off, like this morning, you want to know where the hotline was, the major fallout, and it was perfect for this. The plane was perfect. You could guide it and it would trace it down as far as they could follow it. And we were using them for that during the test series. And they also turned out to be very useful in keeping contact with our field crews because they had radios and they were up over the site and you could line-of-sight radios without any trouble with them. But the Geological Survey was really losing interest in them and the planes were costing a small fortune to fly. We also entered into a program of when they would have long periods between tests, of going to one of the AEC sites that had been operating for a while and do a background map. They used to fly I think it was one mile or half-mile grids over the whole site. So we got a lot of information about our external fallout from our facilities. Frequently we would point out stuff that the local people either didn't want to know about or they didn't know about. We don't know which. It was a little of both.

But we were looking for a way to get the USGS to continue, they let it be known they wanted out and we wanted to get to a smaller plane, and there had been a lot of discussion about instrument improvement and stuff like that, so it was possible to get away from the big, massive things. Also to get radar altimeters and positioning systems built in, which were already available, which weren't available originally. So Bob and I made a visit one afternoon to Herb

Grier on our way back to Washington and talked to him about what they could do and they assigned one of their engineers, Jack Storey to look at compacting the instrumentation and finding out whether it would be as good as the other. And of course it turned out it was much better than the other. So they did a study for us which we paid dearly for but we paid them.

Then came the question of what kind of planes we could get, and it turned out we didn't want a big plane, which the Air Force had, we wanted something smaller than a DC-3, which is a Beechcraft. And it turned out that the AEC couldn't own airplanes at that time, of their own. The Joint Committee had put this thing in effect. So Herb says, Oh well, we'll lease it, he says, we've got a big contract so we can lease it for you, and he did. And so they [EG&G] ran the program for a long time and they would go out and we went to all [00:10:00] the sites, and all the nuclear power plants. Before the plant was sited or any radiation was put in, we have a background map of them. You want a good story, go over and look at their library of maps and all this stuff. They still have it here, the EG&G guys do, of all over the country.

And it's fascinating. We did a lot of one-time things. I started talking to Troy about some of this last night, but the Public Health Service, every once in a while they had a problem and they lost a source on a train somewhere. Somebody had it on a railroad train and they—they never did find it. They did an extensive search. But we had a similar experience in that a mining company or a drilling company for petroleum drilling got out somewhere on the West Coast and realized that their big—it's a fairly large—cobalt source had—they used them for mapping the well inside [and] a thing had turned over and that source was not there. So we got the plane out. In fact Troy was on it this time; he flew with them on this thing. And they flew the map and flew the route, because it was a big source; they could see that thing. And somewhere in Missouri they got the big blob, so they landed the plane and got some equipment so that they could find it

and went out and found the place where this was and found this big source lying down there, picked it up, put it in a makeshift pig—they didn't have any lead pigs but they used a sand bucket which works just as well—and they took it back and turned it over to the state police or somebody and I guess they came home. It was unbelievable. That was one of the best ones they did.

But they did a number of those. It was when the Air Force was flying missiles; they were checking the oblation of nose cone. They had a small, low energy but gamma source that would seed and would lose its radiation as the missile came in. They were checking out the safety of the nose cone and all that. And it got lost. It didn't land in White Sands [Missile Range, New Mexico]. It went to Mexico. And so I got a call from somebody in the Pentagon, and by this time the plane's characteristics were well known and we had done some work with the military, wanted to know if we could go to Mexico. And I said, well, I guess they can. I don't know. Let me go up and talk. So I went up and talked to the general manager and he said, Yeah, he says, go help them out but make them take care of all the passports and all the State Department stuff. He says, We don't want to fool with that. So one Thursday afternoon, I think it was, or Friday, they left the country and went down to this place in Mexico where it had landed and then the next day they went over in the desert where they knew the missile had come in, they thought it had. And they kept fooling around and fooling around and finally they found it. And then they went back to the hotel where they were staying and told the people how they had found the source and all this. So they took the plane and took a window out and put five-pound flour sacks in it and they had them follow the plane and they'd throw a flour sack out to show the ground people where to go because it was just desert country. And they had driven maybe within a mile or so of it but they couldn't find it because it was a little

crater and the source was down in there. And they got the thing and I think they came back to work Monday morning here; at least they came back into the U.S. That was quite a story.

That is a story! Now let me ask you because you mentioned Troy, because he's talked about the NEST [Nuclear Emergency Search Team] program. Was this part of this?

[00:15:00] Well, we had more or less integrated the operations with the airplanes. We paid for the airplane part and they paid for the other part. But it was all operated through Nevada and it was known as NEST.

And that's what you're talking about.

Yeah, AMS [Aerial Measurement System] NEST. You could use the same word but they hyphenated it [AMS-NEST]. That included a lot of specialized people and equipment coming in. AMS was essentially just the plane and the people making surveys.

So this is detecting radiation sources, it's for finding them, whereas a lot of your measurements before had been for safety issues.

Well, this is safety, too.

I guess you're right, yeah.

Because if there was something straggling around, you wanted to find it. But the EG&G guys had that thing down. Jack Doyle was one of the principals in it, and Jack Storey, and I don't remember who else. I can't remember all the names but there was a whole bunch of them. I guess they're still located out—what we did then was we worked with the military people in Washington, the Military Applications people of the AEC, and worked out a deal because we wanted two sites. We wanted a West Coast site and an East Coast site in case something happened. And by this time the guys here had also figured out how to make the instrumentation smaller so they could put it in a helicopter in a hurry. And we had integrated it with the military

system in that respect because they knew if they had a problem in Europe, the fleet was always nearby and there were always helicopters there and they could get in in a hurry and they could install the instruments and fly over the area, so they had worked that program out. But they had a lot of things like that that was set up so it was a dual-purpose thing. And then we found this Mexican—this was very interesting because it was a very low energy gamma ray coming and I can't remember but it was low. It was very close to the gamma rays that are associated with plutonium, which are very low. So we were at a meeting one day and we asked the guy and he says, Well, you guys were so smart down in Mexico, why don't you go see what you can do with all that plutonium that's spread around the test site? And up until then, nobody had a way to really keep track of any plutonium in the environment. And they did and they made it work, but they wanted helicopters. This is where the military guys, they arranged for us to go out to San Diego and we briefed the guy out there, some admiral that ran—I don't think he was [U.S.] Coast Guard, I'm pretty sure he was Navy—who ran the helicopter in San Diego, and when they wanted to do some testing or check their instruments, they'd call these guys and they'd come up to Las Vegas for a few days; and they loved it because they all liked to come to Vegas, you see, and they'd load the plane up with instruments and fly up and do the flying that needed to be done and go back. That was one of the things.

But then we arranged to build an East Coast base at Andrews Air Force Base [Maryland] and they keep people there, I guess they still do, and they have two planes. They have a twin Beech and I think they have two helicopters. But they have them there because if you look at the map, the nuclear power plants, which this would be the big kind of thing you'd use this for, were all within a shorter distance to Andrews than to out here, and so that's what the thing was set up. I don't know, I haven't been out there in years, but they had a place right out there. In fact it was

right next to the hangar for U.S. One. And that program still is very active, as far as I know. I haven't heard. They don't seem to have as many things going on.

When Three Mile Island [TMI] came up, our Radiological Assistance Plan which I told [00:20:00] you about was called and asked for help, Brookhaven people got a call that there was a problem in Pennsylvania, the RAP program we call it, and so of course they notified our headquarters control center. By this time we had a control room. The phones were at least monitored all night long, twenty-four hours. And so they were kind of asking for Brookhaven to send their team down to help them out. And then we got in touch with the NRC [U.S. Nuclear Regulatory Commission] and we did a lot of things and opened up the thing. And we decided we'd send somebody up there, and so there was a fellow who was the Nevada representative at Andrews. Herb Hahn was his name. Maybe you've heard the name. Herb went over and talked Andrews out of a helicopter to fly the guys up in advance to see what was going on and get them located and a place to operate from and so forth. And then they brought the plane up loaded with instrumentation right after that. But they operated out of the National Guard airport which is not the Harrisburg airport which is down on the river but it was up on the hill. In fact they actually used the hangar that the governor's plane was in and he had security built around it where the local police kept people out and they had a huge operation. And the thing was that with NRC and with all these things, the same thing like with the states, the resources to do these jobs they don't maintain because they'd just sit there and people would be doing other things. They'd be reading the books and doing all kind of things. But here you have the resources and a group of people who maintain them but use them and they're ready to be used; when the time comes, they can move hurriedly. And nobody was interested and nobody asked us about a penny [of] money, you know, the stuff got moved. The Military Applications people were flying Air Force planes all

over the country. They brought a load of lead bricks from Long Island down there for some reason. And then somebody got worried about the cost of it because the Air Force was billing the AEC Military Applications guys for the cost but they worked it out some way. And all of our stuff I guess. And we finally went— after everything died down, we had a hearing before the Joint Committee and the assistant secretary went and I went along with her and talked to them about it. She was a very, very nice lady, at the time. And they said kind of, how much do you need? And they kind of said, well, here's a check, and we got reimbursed just like that. Nobody asked a question. Of course we didn't use it. It all came out here.

It all came—?

Well, it came to EG&G. It was EG&G. They had the biggest participation. And we had ground crews and we would set up to do—in fact we were doing what we call a public health hazard-type thing. We were monitoring the whole area.

And what were your conclusions about the dangers there after Three Mile Island?

Not much, if any. But it was an interesting period. And the big thing is, I don't know what the NRC people—in fact there's a new book out. *Crisis Contained* [was about] EG&G's and our [DOE's] participation in Three Mile Island [Cantelon & Williams, Southern Illinois University Press, 1982]. And there's a new one out and I don't have the name of it, unfortunately, or the guy's name but he's the historian for NRC. And he has written about the political chunk that was going on between the NRC and the White House and all these people who thought they had some responsibilities in this but no way to discharge them at all. [J. Samuel Walker, *Three Mile Island: A Nuclear Crisis in Historical Perspective*, University of California Press, 2004.]

[00:25:00] But AMS has resources that can be used anywhere and they've taken it anywhere.

Some years ago there was a Russian submarine, oh, out in the Pacific. They overflowed that before

it got into Russia where there was Russian air cover and provided that information to the Navy reactors people. In fact we flew over a couple of those for the Navy reactors people. I don't know what they're doing now but I know they still have the program pretty well under control. They have people that can move in and do the job.

Great. That's really good information.

Well, we had a lot of fun with the AMS program. We went down to Savannah River [National Laboratory, SC] one time. And the DuPont people prided themselves in not having any problems and so forth. Well, first thing the guys did flying over this marsh area and it was all junked up with fission products and other stuff. So they went back in and they didn't use this "gotcha" thing. They would work with the local people. When they find something, they work with them first, sometimes even before they would tell us, but we never tried to use that as a club to beat them with because then they wouldn't use the plane. And so sure enough, they went out in the boats and there it was. And then they said, Oh, yeah, we had a little spill up there some time or other at one of the plants and we thought everything was under control. And not only that, the property wasn't theirs; it was owned by the newspaper publisher down there. So about two days after all this got out, the manager from Savannah River was sitting before the Commission, discussing all of this, and apparently the newspaper guys didn't care, so they got by without any—it's wasteland. Nobody would go in there, and apparently this guy didn't do it. I don't know whether they bought the property from them or what. They might've before it was over. But that's the kind of thing that we solved.

I understand. That's a good example.

It's just an example. They have a lot of them. I don't have too many of them.

No, that gives me a sense of what it was about. Well, it's getting to be close to 12:30, so we should think about winding up, but is there any other thing that you had on your list there that you think we really should talk about? It's been a long morning so I don't—

Well, we talked about TMI and accident response.

We covered that.

No, I think that's—

Let me ask you a question. So when did you retire and what was your position when you retired?

I think it was '86; don't hold me to that. But I was the assistant director of the Operational Safety Division. It's kind of divided into two parts. There was one which was the engineering part; they would be sure that the right things were used in the plants. On our side, we were public health.

We had the environmental studies. AMS was our big program and we had health physics and the medical program. We had an M.D. with us; his job was to keep track of like the local physicians, I guess they all have, I don't know, they used to have in the big plants, all have a medical department, and those physicians, this guy was kind of their leader. He didn't fund them or anything but he'd get them together every six months and find out what the problems were and if something came up in the plant, they'd keep him plugged in.

So this is DOE that you retired from then.

Yes.

And so health physics, it sounds like, really grows up in this era.

Oh, it did. It did. You know how the Health Physics [Society] [HPS] was formed? They had a big meeting. Karl Morgan was behind it and a lot of the people who had worked in the plants at Ohio State, I think it was. It was in Ohio anyway. I think it was Ohio [00:30:00] State. And they got together and formed the Health Physics Society. That's the way it came about. And it was

pretty active in Washington. I got this thing just before I left. I stuck it in the bag. I haven't finished reading it but—

Oh, "The Birth of the HPS: A Look Back." This would be an interesting one. This is the June 2005 volume. I'll get this. I've been up on their website. I haven't ever looked at the—OK.

Oh, it's a monthly newsletter, I think. It's a newsletter anyway and it's pretty good.

Yes, June 2005 [HPS] newsletter. Great.

I found this. I don't know. This was Maryland put this out. It's just an example of what they got out.

Oh, I see. "What to do in a nuclear power plant—"

And you know, the interesting thing, there are two power plants in Maryland. I've forgotten the name of the plant, the location. They're on the water anyway. They use the bay for cooling water. And they supply most of the electricity for Washington and Baltimore and other places around there. Baltimore Gas and Electric Company owns them, and this they put out. They were well built and they're good plants and they haven't had any real trouble with them at all. But that's the kind of stuff that's coming out.

This is interesting. For public education. Baltimore Gas and Electric. Great. OK.

I collected a lot of stuff about the nuclear bombing. This is one. You can get this off of Google or somewhere. And this one was another one that I had.

Right, for the sixtieth anniversary [of atomic bombings of Japan] that we just passed. Right. And then what's this?

Well, that was a federal civil defense—I don't know. Bob had something to do with that. It was a meeting. The president—Jack [John F.] Kennedy was the one that pushed the fallout shelter thing to start off with, and they would have these meetings with the vice-president and so forth

and so on, and Corsbie would a lot of times go over as our director, as the AEC representative, and this is one of the places where he was over there.

This is an interesting document. Well, this has been just so educational for me, so I thank you very much. We can look at some of these documents without recording, so I think we'll turn off.

OK, I'll show you some of these things. So this is all you need now.

This is so much information. If we have a chance to get together again, we can talk some more.

But what I like about this information is that it gives me a good overview from the early days all the way over.

Yeah, well, that's what I was trying to do.

You succeeded.

[00:34:11] End Track 3, Disc 3.

[00:00:00] Begin Track 4, Disc 3.

Go ahead and tell this story.

The British had just had their Windscale accident. Now if you know about Windscale—

No.

Well, Windscale was where the graphite in the reactor caught on fire and it spread activity all over the place. And the British did a very fine job of bringing it under control and checking it out and everything. And we had some meetings with the Brits later on a number of things and one of the things they told us was that keeping track of how far away from the plant the impact was was the one that caused them the most trouble. And they just had an aerial system. So this is kind of the report on what they found at Windscale. And I was at a meeting in Chicago. We talked about that then. That's when we were getting heavily into AMS. We were still working getting it started going and everything. It was there all along, you know. But there's two of these reports.

Oh, that's why they have the British seal on them. I see. Atomic Energy Office.

Oh, yeah. Yeah, they had pretty bad accidents there. And you can get all you need to know about

TMI from—

From the book.

Yes, and from the guys out here.

Yes. All right. Good.

[00:01:43] End Track 4, Disc 3.

[End of interview]