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

Interview with Edward B. Giller, Jr.

April 5, 2005
Albuquerque, New Mexico

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.

Mary Palevsky: *General Giller, let's begin by having you tell me your place of birth, your full name, your date of birth, and a little bit about your family background leading up to your service in World War II.*

Edward Giller: My name is Edward, full name is Bonfoy Giller, Junior. I was born July 8, 1918 in a little town in west-central Illinois, White Hall, to a family that was doing farming, and my father was also a vet[erinarian]. Therefore I grew up in a small village of three thousand people. Worked on the farm. In those days, all kids worked when they weren't in school. In fact, my first year, we lived out in the country and I rode a horse to first grade, where we had eight grades in one room. That building still stands on the old farm. And then we moved to the village of White Hall and [I] rode my bicycle to school.

In about 1936, I seemed to have gotten myself into a little tiff with my family over some of the things I did, so they sent me to military school because—

What kind of tiffs?

Oh, they felt I—nothing serious, just a little exuberance and all sorts of things. And I guess they felt I wasn't studying enough, and my father having a degree in vet[erinary medicine] and my mother also a degree, they wanted me to go to college. I think they were worried that I wasn't doing as well in the first couple years of high school. So they sent me to Kemper Military School and that really changed my future. Turned out I enjoyed military school. A lot of the guys didn't. They really fussed about it. But I went three years and then went to the University of Illinois in 1936, I guess it is, as a sophomore. Then I found out that the military school, good as it was, was

not a good freshman class for Illinois. I struggled the sophomore year. Finally got over the hump from that and went on and got my bachelor's degree.

In…?

Nineteen forty, in chemical engineering, from the University of Illinois.

My mother's family comes from Galveston and Houston [Texas], and they had a friend who was in the Sinclair Oil Refinery there. Jobs in those days were beginning to show up, but not exactly everywhere, and so he got me a job in the Sinclair Refinery in Houston, Texas where my grandmother and her family lived.

So the summer of '40 to the summer of '41, I worked in the refinery, and decided that wasn't for me. And a friend of mine said, `Why don't we learn to fly? Why not?` There was a program called the—I've skipped so many of them, but it had a program where they were trying to get young folks to learn to fly with a commitment; in case they had to be called up, they would be [committed]. And so for forty bucks, you got forty hours of flying, forty hours of ground school. And that was fun. We flew at the old original, no runway, Houston main airport. And then they said, `Well, we have a second class. You do acrobatics. Forty bucks, forty hours ground, forty hours of air work.` And so we, "we" being several of us that ran around together, took that course.

Now, we found out, they pay you to fly in the Army and the Navy. So we said, well, what about the Navy? Well, that runway's pretty short and it goes up and down all the time. How about the Air Force? Army in those days, Army Air Corps. OK. So we went to Ellington Field, which is in Houston—it'd just opened up, it'd just barely opened, in fact there weren't any airplanes there yet—to take our physical. I had an eye balance problem, so I went to an ophthalmologist and she gave me exercises and lenses to get my eyes to balance. It's a muscle

balance problem which is correctable. So I got that straightened out. My best friend had a slight color problem with colorblindness. He could really tell red and green. But they have something which they use today called the Ishihara charts in which you see a bunch of dots. If you see one number, that's good; if you see another number, that's not so good. So he went to the same ophthalmologist, memorized the chart, so when he saw 23 he said 67. Ah, you're right. And he **[00:05:00]** went on through the war, flew B-17s, came home and flew for TWA [Trans World Airlines]. There was another program they used at other places. Instead of having the charts, they had you match colored yarns. He would've flunked that one. Anyway, those are some of the vicissitudes, I guess, of life.

Anyway, this is now the fall of '41 and they sent us off to Stamford, Texas, which is way out in west Texas in the cow country, for primary school. We were flying Stearmans. It's a biplane. Well, with eighty hours, I didn't need to learn too much about flying. I just needed to know that airplane. So my instructor and I had fun doing acrobatics for forty hours. He liked to do it, I liked to do it, and so it wasn't a question of my learning to fly.

Now just for my understanding, you are now enlisted. You are in the Army.

I'm now an enlisted man legally.

In the Army.

In the Army Air Corps. In order to go in, you have to be sworn in and take the oath and then you start wearing the uniform and you're an enlisted person until you graduate from flying school.

So it was six weeks at Stamford. Then they sent us to Randolph [Air Force Base] which is in San Antonio. And there we flew a bigger airplane, the BT-14, Basic Trainer 14, and again we had ground school, air school, formation flying, night flying, and all sorts of things like that. And because of my past history—on the farm we fed lots of hogs in the summer, we grew corn

and fattened hogs in the summer, cows in the winter—I had learned to holler hogs and they could hear me across a quarter-mile field. I can still do it. So when they tried out for the officers at Randolph, I bellered—well, also at Kemper, I'd learned how to beller out the military commands squad right, squad left, things like that. So I bellered them out, and I ended up in San Antonio as the battalion adjutant, along with two or three other guys. It takes three people to be the battalion staff. So this background came from the past, and I don't know if it was useful. Anyway, that's what happened.

Then they transferred us to Lubbock, Texas in the early spring of '42. And there we flew two airplanes, one a twin-engine, the AT-9; then we flew the AT-6, a single-engine similar to the one at Randolph but bigger, more horsepower. Night flying, formation flying, things of that nature. And we graduated from there May 29, 1942 and we got our second lieutenant bars, became a commissioned officer in the Reserve, and got our wings. My mother and everybody came.

Then they sent all of the unmarried people, which were most of them, in the class to Paine Field, which is north of Seattle, Washington. The married people were sent to the southeast airfields to be training instructors. So we went to Paine Field, arrived there to discover that the field had just barely opened, two or three airplanes sitting around. What had been a skeleton group of senior officers—"senior" being first lieutenants, captains, majors—were waiting for the bulk of the folks to show up, and here we come, some thirty of us from this class and some twenty from another advanced school. And now we have a full-fledged, not very well trained, full-fledged fighter group, the 55th Fighter Group. It was actually spun out of the 20th Fighter Group down at Hamilton Field in San Francisco six months before we showed up. The Air Force was just expanding.

And our airplanes begin to show up, the P-38. We then started flying. The P-38 didn't have any electronic instrumentation for weather flying, and Seattle is an area with a lot of **[00:10:00]** weather, so we did a lot of flying, trying to figure out how to fly without getting in the clouds too often. Unfortunately, we had an accident rate that was kind of high.

In the fall of '42, several interesting things happened to me and in some cases didn't. There was a call for a young man to go to England, spend six weeks learning how to fly in England, and come back. So they pick me, I get on a train headed for the New York City area to get on a boat to go to Europe. And I got about ten hours or eight hours to some place in Stryker, Montana. The conductor comes through the train. Lieutenant Giller. Lieutenant Giller. I have a telegram for you. Thank you. "Return immediately. All orders cancelled. Return immediately." Now in those days, "immediately," and the war's going on, meant "immediately." The conductor looks at it and says, What can I do? He says, Ah, the westbound train'll go by in a half hour. We'll stop it. So in Stryker, Montana, they put torpedoes on the track. This thing goes bang. Well, these two trains go side by side [and] stop. This lieutenant gets off of one, gets on the other. And I am back in my barracks in Paine Field, [in] about another six hours. The orders were wrong. I would have been a replacement pilot in North Africa. And I'd left my car with my roommate and the keys and everything on the naïve assumption I would be back in six weeks. So I got saved from that one.

Also that fall, they needed a squadron in Amchitka, Alaska because the Japanese had now attacked Alaska. And so they picked one of our squadrons, not mine, and sent that squadron to Alaska. They took the other two squadrons that were left and spread them out and made a new third one, and we got new pilots. Pretty soon comes the call for a squadron to North Africa. Not my squadron. And so again we went through the same process. We sent one squadron of the

original three. Now we're down to one original and two expanded ones. I'm still there in the Northwest. We stayed there, protecting the Pacific Northwest from the Japanese, which never showed up, as far as we were concerned. Doing a lot of flying and buzzing the natives and trying to blow sailboats over on Puget Sound and other nonsense. Because in those days, there were almost no rules for flying control.

Anyway, it was in the spring of '43 when I went on a blind date—and just met her [wife, Mildred F. Schmidt]. Somebody stuck his head out and said, Got two stews [stewardesses]. Anybody want to go on a blind date? So I hold my hand up, and I met my wife. And I had a car, so that made me a little more popular. And so we got acquainted and more acquainted. And in the summer of '43, after having been stationed all around the Pacific Northwest there, at Pendleton Field, Oregon; Burns, Oregon; Klamath Falls [Oregon]; Hoquiam, Washington; Olympia [Washington]; Paine Field; McChord [Air Force Base, Washington]—they moved us around quite a bit. There were three squadrons, so they moved around. In the summer of '43, against the advice I gave everybody else, and fortunately, I got married. I kept saying, We're going overseas. Don't get married now. And so what happens? I get married in July 3rd, and a month later, six weeks later, we shipped out. My wife was a stewardess on United. United didn't take married stewardesses. So she went to Pan Am and started flying from the Pacific Northwest to Alaska and back. She spent more time in the air than I did, I think, because in those days they flew the little C-47s, DC-3s, and seven, eight hours to Anchorage.

Anyway, so the group, all three squadrons in the group, had orders. The whole outfit, lock, stock, and barrel, was sent to McGuire Field in New Jersey, which was the staging place to catch the boat to England. And then they moved us onto the boat, the *Orion*, a British boat made

for fifteen hundred guests. We had seven thousand guests, all the GIs and everybody else, stacked all over the boat.

[00:15:00] *So it was made for fifteen hundred and there were seven thousand?*

It was a British ship in commercial traffic and it was hauled into drafting people to Europe. So it was a convoy and kind of slow. The poor enlisted people were down in the hold and they didn't get much relief from anything.

But anyway, we finally made it to England and docked. We went to our airfield at a place called Nuthampstead, a brand new airport just carved out of the countryside from some farmers' places.

What area is this in the UK [United Kingdom], you're saying?

It's not far from Cambridge. It's about twenty-five miles as the crow flies from Cambridge. East Anglia is the area of England in which the Eighth Air Force built an *enormous* number of fields. They must've built a hundred. They're all *over* the place.

So we ended up in the field. It was kind of muddy everywhere, so we called it "Mudhampstead." And there in September of '43, we became what's called "operational." We were ready to go to war. We had P-38s, had bullets in the guns, everything like that. We'd practiced a couple of times. And then we took off to be escort for the long-range bombers, the B-17, B-24s. Now the P-38 was the first long-range escort in operations in England. Prior to our arrival, they'd used Spitfires and P-47s, which had only enough gas to go to the edge of the German border and then had to go back. The Germans just waited on the other side of the border, so to speak, and as soon as the fighters left, why then the bombers were on their own. And the losses were kind of high. Well, high. When we showed up, our job was to appear to fly directly to the border, meet the bombers when the others went home, and then our job was to continue on

into Germany. Well, the first month or two, we had the whole German fighter force to ourself. That's thirty of us and six hundred of them. We had as much trouble as the bombers did. Almost, not quite. But anyway, every month a new fighter group, long-range one, would show up. So as time went on, the odds became completely in our favor.

In the summer of '44, D-Day, our group was assigned cover over the beach. I was over D-Day at four o'clock in the morning at ten thousand feet and you could see the whole show. The idea for the P-38, because it has twin engines and twin booms so it looks different than the German airplanes, was that the sailors would recognize us and would feel comforted and not fire. Well, it turned out a couple of us went down to take a look at the beach. Every boat in the harbor lit up at us, so we went back up. The poor gunners were so nervous, they'd just as soon shoot anything, which I can understand.

What was it like to see that unfold at that time?

It's amazing. I mean it's incredible to see six thousand boats, all sizes of course, some of them burning, some of them sinking, fires on the beach. But at ten thousand feet, which is two miles, it becomes blurred, certainly in the sense that you cannot get the personal interactions taking place—like in *Saving Private Ryan*, where that's probably a reasonably good reproduction of the landing problem. You don't get that in the Air Corps, "we live in fame or go down in flame," and that's about the way it is. Sleep in cold sheets at night or in a grave that same night.

So our job was to patrol the beach, and the Germans never showed up. There were so many American fighters around there that they just didn't risk losing all their air force at once.

After D-Day, that's June, in July I had finished the required number of missions and I volunteered to take a second tour, they called it, but I get thirty days R&R [rest and recreation]. So we flew home, sitting in a DC-4 at that time instead of the boat, and went out to Oregon and

found Mildred, and I think we went back to visit my mother and everything in Illinois, and then I went back to McGuire again, got on another boat, and went back to England.

[00:20:00] September of ’44, [I] joined my group, and at that time we changed airplanes from the [P]-38 to the P-51, which we liked better because the 38, the cockpit was a *very* cold cockpit. Because the designer had not provided enough heat into the cockpit, and the engines are not in front, they’re off to the side. The P-51, the engine was right out in front of you, sort of like a fireplace, so to speak, and that we liked. Furthermore, the flying characteristics of the 51 were better suited to Europe. The 38 was better suited to the South Pacific by quite a difference.

And explain a little bit why that would be. What’s the difference?

Well, in the South Pacific, they didn’t fly very high. They weren’t very cold. They had *long* hauls over water where one engine would get you home. If you got on one engine in Germany and ran into a German fighter, you’re in more trouble than it’s worth. And the fighting tactics; the Japanese airplane tactics, and the 38 tactics. The 38 guys were able to really utilize their one strength, which was a lot of power inertia, in a fighting tactic, but they would never get in a turning with a Zero. The Germans would never get in a turning with a P-38 because we could pull it so tight and they’d spin out and we wouldn’t. So it’s tactics. Furthermore, the high altitude we flew at, we left contrails all the time. We left two contrails, not one, so the Germans said ah, P-38, *further* than we could *see* them. So the playing field wasn’t quite even. When we got the 51, why, everything looked alike till it was too late.

The 51 has a better turning or the 38 has a better turning?

Well, the P-38 is capable of going around in a very tight turn and never stalling. It stalls but it never drops the wing. A 51, a 109, any of those single-engine ones, if you stall it in a tight turn, it’ll flip on you, and if you’re at five hundred feet or a thousand feet, you go straight in. That’s

what happens around here in small airplanes, when people turn to final, the last turn, if they're overshooting and pull it too tight, they'll stall and it's too late. And that happens once a month in the United States, in small private airplanes. The big boys don't do that very often, fortunately.

So you fight with what you have. So the 51 turned out to be—and that picture up there is a picture of me flying my 51 in England in 1944. I'm in the cockpit. And it's named the *Millie G.*

After your wife.

Yes. That's right.

That's a great picture.

And I'm flying formation with a British guy that wanted to take pictures of P-51s for recognition purposes, so he gave me a courtesy copy.

I'll take a closer look at that before I leave.

OK. I'll give you a card. I had it laser-colored, the black-and-white, in the real colors that it should be, and then I took that and made negatives, and I made little calling cards out of them.

I'd like to have that.

So I'll give you one if you remind me.

Anyway, we went on through the fall of '44, into the spring of '45. Sometime in April of '45, I'm strafing south of Munich and a shell explodes in the cockpit. A German 20-millimeter shell exploded right off my left shoulder, which hit my shoulder harness—which is my parachute and everything, which is a lot of nylon—with the feeling like somebody hit me with a hammer, a big hammer. I was down about three or four hundred feet. Just in reflex, I pushed the throttle forward, which meant my hand was still working, and pulled the stick back and just went up, and told my wingman, `I'm hit. We're leaving.` I then stuck my hand in my shirt and it went all the way in and it went into my chest. Well, it turned out it later wouldn't quite go into my chest,

but anyway out comes blood. Well, what do I do? I'll pass out. I'll fly for the lines, which weren't too far away at that time, maybe fifty, a hundred miles, and I'll belly in before I pass out of blood. But as time went on, I really didn't get a lot of blood, though the hole was still there, and I go a little further, and two hours **[00:25:00]** later I'm back in England. And this hand has gotten stiff, so I land with one hand and everything, and they take me off to the hospital and sew me up. And that's when I first ran into penicillin. Penicillin in those days was given every four hours with a needle. And so after two days of that, a nurse [said], `Where you want it this time?` So I recovered relatively—or quite well. And it turned out that the parachute harness had absorbed 90 percent of the energy in the fragment, and what was left just skidded along the top of my ribcage underneath the skin. That's what I actually—my finger was going this way, not this way.

Not down but just sort of across—

And it came out and went in there and came out and was laying in my shirt, a piece of metal.

But the war ended. It's now the late spring or early summer of '45. Then our group got orders, not to go to the Pacific like we thought we might, but to go to the occupation of Germany. So we were sent to Kaufbeuren, which was a German training field south of Munich, oh, about fifty miles. Had never been bombed, had no runways, permanent buildings built in the thirties, beautiful permanent buildings. All the roofs had trees and bushes and things growing on it for camouflage. The Corps of Engineers put down a steel track for us. They still use them today. And we took our airplanes over there. But there wasn't much to do, obviously, keep flying a little bit, so some of us scooted off to Nice [France] one day. They'd go down there and spend a couple of nights at Nice. The thing about it, we'd go flying right across Switzerland. Well, they don't like that, so here show up two white ME-109s. They weren't going to shoot us, but they

just wanted to inform us, you know, we'd trespassed. By opening the throttle, we actually ran off and left them.

So we spent a couple of nights at Nice. We did things like that. Or we would go to Munich and drive around. And I have a lot of movies of all of this—16-millimeter movie of Munich when the streets are only one car wide, literally, and people are wandering around looking for things to pick up in the rubble of the bombing and everything.

Otherwise, we did what Americans do best. We scrounged for souvenirs. Now on the air base was a nice woodworking shop and big stacks of plywood, all sorts. So we told the shop, anybody wants a box made, he'll give you the size and you just go make it. I still have some of the boxes they made, good German boxes with the countersunk screws and the whole works. And as long as you could meet the post office requirements—it was so many inches and so many pounds—you could mail it home. So they were very busy mailing all sorts of things home.

There's a German BMW called the 328 which is a little two-seater sport model built in the late thirties. [It] became very famous. It won the thousand, not mile, but a thousand-kilometer Mille Miglia race. And one day on the air base, I saw this beautiful white car running around with some major in it. And the next time I saw it, it was all painted Army green with stars and a big number. I said, What'd you do all that for? [And he said], Well, now I can drive up to any gas pump and fill it up, Army gas pump, put my number down and drive off, and everybody's happy. It wasn't the only car like that. The Americans were very busy picking up automobiles, fixing them, and motorcycles and things like that. People cannot understand the philosophy of the time: if it's German, I own it. You don't. If I want it, I'll take it, whether it walks, talks, or drives. Which is war, especially in a country as technologically advanced as Germany was. So we had a lot of cars running around.

When you say "souvenirs," what other kinds of things were you sending home or were others sending home?

Well you can send home guns—not pistols but long guns—swords, crystal, any jewelry you could find, military souvenirs of one kind or another, whatever struck the GI's **[00:30:00]** fancy. There were almost no constraints on it. You can't do it now, but in those days, fine.

Now the story with the BMW is, I was talking to the major one day and he says, I'm going home. What'll I do with this car? [And I said], Well, I'll trade you my Eisenhower jacket for it. Now an Eisenhower jacket was one that Eisenhower designed as a semiformal, not formal but a dress jacket which was pulled here [indicating]. It didn't have the side flaps. And he says, All right, it's a deal. So then I got a car and he's gone. Now I try to figure out, how do I get this home? And I remembered I had an uncle in the Lykes Brothers Steamship Company, which still is a big shipping company. So I called Antwerp [Belgium] from the field in Kaufbeirun. In those days, the telephone lines were down, but the Army lines were up, but the Army lines would lose power as you went from one switch to the next. The telephone in this office I had in Kaufbeuren had an amplifier built into it, first I'd ever seen, so every time I'd go through a switch, I'd turn the volume up. So I got this guy in Antwerp, the Lykes Brothers, and he said, Yeah, we're going home empty. Bring it up here and we'll take it back to New York for you at not too much. [And I said] OK.

So then I went to see some friends of mine who were interrogating German generals, and they were assigned to our air base for support. I said, How about you guys going up with me and bringing me back? They said, Well, OK, we've got this big command car that used to belong to [Benito] Mussolini and we've got this German general's driver that drives it like they're still full of generals, and full throttle and full horn, right through Germany. So I put on all my winter flying gear because this

thing hadn't any heat in it and it's winter. And we drove it to Antwerp. I found the guy, I gave him the battery, and he's happy because batteries are almost nonexistent. The gas he liked.

And then he says, Well, let's see, no problem. Where's the bill of sale?

[And I said], What bill of sale?

[And he said], Well, you've got to have a bill of sale.

I said, You got a blank one?

[And he said], Yeah.

So I turned to Hans, the driver, and said, Hans, sign.

Hans signs, I give him a carton of cigarettes, he's happy, the Belgians are happy, the steamship company's happy, and for a hundred and fifty bucks it'll be in New York City when I get there later on.

So we went back to Kaufbeuren, and then two or three months later I went home the normal way. [I] went to one of the personnel handling depots on the French coast where they processed people, put them on boats, sent them back to the United States. And then I went all the way back to Oregon where Mildred was still flying for Pan Am, and of course she quit. And they asked me did I want to get out of the Army Air Corps. So I didn't know what I wanted to do. I did know that I didn't want to continue to be a fighter pilot because everybody's doing that. I did know that if I wanted to, which I thought I did, continue in science, I had to go do something about making up for the four years of absolute loss in my memory bank of things technical.

And while I'm trying to make up my mind, why, we got orders to go down to March Field. Now March Field is down east of Los Angeles [California]. And so we went down there. Now I'm driving two cars, the BMW, which we drove out from New York City to Oregon, and Mildred had our car, my original Chevy convertible, so I had two cars. So we drove those down

to March Field. And finding a house was something else. We found a little house somewhere. And on the way down, we'd stopped in the Presidio, which is an Army field in San Francisco. And the commanding general turned out to be a second cousin of mine, so he invited us to dinner and asked us what we wanted to do and I said, Well, I don't want to go fighters but, you know, Wright Field, that's the technical center of the Air Force, would be nice.

So I'm down there with nothing to do because there was all kinds of people sitting around trying to find a spot in this one fighter group in the Air Force at that time on March. And I got **[00:35:00]** orders to go to Wright Field. So we pack up the two cars. And in the meantime, on the way out, we stopped in Boise, Idaho on the way out to Oregon, and Mildred was feeling somewhat queasy, and our friend who lived there, his doc said, Yeah, you're pregnant.

So it was obvious she was pregnant, and we head for Wright Field. Well, that's in Dayton, Ohio. My mother, my family is in Illinois three hours away. There's no housing in Wright Field whatsoever. We stopped and she stayed with Mom and I went on to Wright Field, lived in the barracks. Then came this notice that the Army Air Corps was sending officers back to graduate school in science, all forms of science, everything, including lawyers and everything else. And you had to have certain skill identifiers in your record. Mine was fighter pilot, and that was not one of the ones they were looking for to send to graduate school. But I was assigned to the Materials Lab, which is a technical organization, so I went around to the boss and said, Let's change my number. [And he said], Oh, OK, no problem. [They] changed my number. I go over and tell the Air Force I've got this number now and I want to go to graduate school. I want to go to Illinois. And they get a letter back saying Illinois accepts me. Now I go back home in Illinois and we take the two cars and go from my home not far from St. Louis up to Champaign.

Right. Let me ask you about what was behind this push for more science.

Oh, the Chief of Staff of the Air Force at that time, [Henry Harley] Hap Arnold, and the technical advisory people who had seen the German science that the Germans had done during the war, which was really something else. Having learned that science, engineering, the same word, it's a major impact on equipment, tactics, and everything else, he was going to raise the educational level of the Air Force, period, lock, stock, and barrel. So they sent hundreds of people to *all* universities. We had forty at Illinois. I didn't know but one or two of them. But that was behind it.

We arrived at Illinois, let's see, now we're September of '46, and I go into the chem[ical] engineering department with this letter, and the head of the department is the same guy that was the head when I left.

And he says, Giller, what the hell are you doing here?

[And I said], Well, I've come to go to graduate school.

[And he says], What? I didn't—my grades weren't that good and Illinois is kind of fussy in chem. engineering—[so he said] I didn't approve it.

[And I said], Well, here's the letter, signed by the dean.

[And he said], Well, huff, huff, huff.

See, still the returning people from the war had a certain amount of generosity extended to them, a certain amount of forbearance for whatever.

He says, OK, you've got to redo some of your last courses, your senior year courses.

And I said, I know that. I've got to get wound up again.

So we start. And so I do the first year of graduate work, and I have to do a master's degree. I find a young man who's about a year older than I am, Ph.D. from Michigan, and we

sort of hit it off. And so I started working on my master's thesis with him. And I looked around, I looked at these Ph.D. guys. Hell, they don't know any more than I do. They do a lot of work and everything. So finally I went to him and I said, You know, if I can get a couple more years, and then I do my research, and at least I don't have to find somebody, as long as I do it right, don't screw it up, will you let me out at the end of the time and not hold me on for one more paper? The head of the department was well known for—you never got out from under him. He said, Yeah, I think so.

Well, how do I get two more years out of this year-and-a-half they gave me? So I get in the B-25. See, we had to fly every month for four hours to get our flying pay, so two of us flew **[00:40:00]** over to Washington, went into the Pentagon, went to the Personnel Department, and here's my old friend from the war in the Personnel Department.

I said, I want to stay in graduate school for a couple more years.

[And he said], Well, you know, that's not exactly how we run things. Why don't you get out and then after a couple of years, go back again?

I said, I did that once. That won't work. That period just does not work.

[And he said], Well, we'll see on it.

So I go back to the University of Illinois and I get a cable from Maxwell [Air Force Base], which is down at Montgomery, Alabama, which is the organization that was handling all these folks out at all the universities; all of the extracurricular educational activities went through this headquarters, to report to Wright Field in about a month, *et cetera*.

So I get on the phone and call up my friend and I said, They're ordering me to Wright Field. What about this two more years of graduate school?

He said, Wait a minute, the general's going by.

Muffled tones.

He picks up the phone again and says, General says you can stay.

See what I mean about the vicissitudes of life? Or whatever, a better word than that.

But anyway I said, You going to tell Maxwell?

[And he said], Yeah, we'll tell Maxwell.

So about two days later, I get a huffy telegram from Maxwell: Previous orders cancelled. Two more years. Period. That's all it said. The next newsletter from Maxwell said, Students will not, repeat not, approach Washington directly without going through this headquarters. So I guess I got through before the gate was closed.

But anyway, I stayed two more years, graduated, it must be, well, the winter of '50. And I got orders. I said I wanted to go to Wright Field, so I got orders to the Armed Forces Special Weapons Project [AFSWP] in the Pentagon. I didn't fight that one because I didn't know what the hell it was particularly.

Did you know at all what it was or—?

No, not—well, I'd been interviewed by who later became a very good friend of mine, [Herbert] Pete Scoville, who was the head of the—sort of the technical director for Armed Forces Special Weapons Project I guess that's what his title was. And so I had gone to interview [with] him and I said, I don't want to come to the Pentagon. I thought maybe I wanted to do hands-on science again.

But anyway, the orders came, and so we packed up again. Now when we were at Illinois, we were able to get housing. Meanwhile, our first child, Susan, the girl, had been born in Illinois while I was still at Wright Field. I wasn't even there when she was born. The second child was born in Champaign, the university there. And so the dog, two kids, two cars, and a trailer, we head off to Washington, D.C.

What's your second child's name?

Carol. And Mildred was pregnant again. So we rented a little house. Well, we looked, and then we bought a house. And in the meantime, the third child, first boy, Bruce , showed up. So we bought a house and lived there until we came here [Albuquerque]. Let's see, I went there in '50, so we came here about '55, I guess, '54 or '55. I'd have to go read my orders. And so again, two cars, three kids now—four kids, because Penny was born later while we were still in AFSWP—four kids, and drove out to Albuquerque, because we were assigned to the Air Force Special Weapons Center.

Tell me a little bit about what's happening at the Pentagon during those years.

Well, I will. And we can stop there on that, if you want to. But anyway, we're back to here. Well, when I arrived in the Pentagon, the Armed Forces Special Weapons Project [AFSWP], spun out of the Atomic Energy Act of '47. With it came all of the mystique of the nuclear weapons business, so we had our own private section down on the third wing, first floor, with our own guard and everything, and everything seemed to be secret or top secret. I got **[00:45:00]** my first Q-clearance, which was required. And it turned out that my friend Dr. Scoville was the scientific director. Also, he was the head of a technical part of it. And under that we had a unit for blasts, for overpressure and a unit for radiation. I had the radiation branch, which was both thermal radiation and nuclear radiation—then we had one in blast. I'd have to go find the organizational [chart]. And then we began to—when I first got there, the tests were out in the Pacific. I didn't go out, but a lot of the test experiments and everything were coming back through AFSWP. And it turned out that our job became to consolidate the requests for effects tests of the Army, Navy, and Air Force, and the Marines. So they would propose this test, that test, and this test, and we'd try to consolidate. We tried in some cases to talk them out of the

tests. We didn't think that—one, we knew the answer to. It wouldn't get the answer they wanted anyway. And finally it was decided that the turnaround time for the Pacific was too long. The time between a test, what do I do, the results change things, and test again, you know, it was two years almost. They wanted a lot faster turnaround. The pressure to develop smaller, more versatile weapons besides the big old Fat Man and Small Boy, and to fit them on different airplanes, including the 280-millimeter cannon and one for the infantry line. So there was just an incredible amount of ideas running around for how a nuclear weapon might be used, and the development people at Los Alamos [National Laboratory] and [Lawrence] Livermore [National Laboratory] were always proposing new ideas, somewhat in competition with the other lab; I'm not going into that part of the [story]—

No, don't. You don't have to.

We watched it, but that was another part of the [story]—. So our job was to consolidate and then we would attend the test series for the various tests. So the first problem was, where is the test site going to be? And everybody had an idea. There was a suggestion that we—the first choice, at least the one that seemed to be the first one that comes up, would be the Air Force Bombing Range in Nevada. But then people looked around. They were worried about fallout and other things. And they were doing atmospheric testing, so seismic wasn't really part of it at that time. And somebody suggested that we could go to Alaska, to Amchitka. So we sent a couple of people up there. The guy's name, I could never [remember]—I would always forget but I can't ever forget him. They went up there and came back with a report that said don't ever go near Amchitka. The logistics will kill you, the weather will kill you, and everything. It was just impossible to conceive of these technical tests that we'd been doing in the Pacific where everything is set up real nice and everything. Then they went to the shoreline of North Carolina.

Well, it turns out the wind blows offshore all the time. But that one came back and said, ah, fine for radioactivity but everything else is terrible; there's too many people and it's too close and it just—So that one was merely a passing idea, and Amchitka was, I think, rejected mostly on the logistics of it. And therefore out of that spun the Nevada Test Site. Then there was a problem—we didn't get involved in it so much—of the land transfer and responsibilities and rights and everything. That was not an AFSWP responsibility, at least the part I was in, I never saw AFSWP involved in that very much. That was between the Air Force and the AEC [Atomic Energy Commission] as much as anything.

I have a question to go back a little bit and then maybe when you answer it, I can hit my stop button. In those early days, help me understand what kinds of effects the armed forces were **[00:50:00]** *interested in doing experiments to look at. I know the scientists are trying to think about advances in the device itself, but what are they looking for and what is the scenario in their minds about use that would cause them to look at these kinds of things?*

Well, the background of some of that is, *The Effects of Atomic Weapons* was written—that book which I'm sure you read—by Glasstone really dealt with the output of the bomb, thermonuclear blasts and all the technology that goes with it [see, Samuel Glasstone, 1950 AEC/AFSWP. Later editions titled, *The Effects of Nuclear Weapons* (DSWA 1991:7)]. The services were interested in the response of service stuff, equipment, people, whatever, to those outputs. So whenever we had a test, we had to make arrangements for the output, which becomes an input to our test, to be done. Sandia [National Laboratories] often did the blast measurements for us. Sometimes we hired private guys. NRL [Naval Research Laboratory] did radiation measurements. But then the services would propose exposing, what it really amounted to, various and sundry equipment. In the case of people—people not directly but people things—under various conditions to find how

much overpressure it takes to blow down this, that, or the other; how much thermal damage will result from, or radiation will be received. And I don't know if you've seen a list of the experiments, but they go on and on, and some of them are weird. And then Los Alamos mainly, at that point, was the prime outputter, we'll put it that way. They built the bomb and would tell us what the radiation was going to be and things like that. [They] thought that a lot of the stuff we did was amateurish and they knew the answer; it was all the folks grumbling about all these odd ideas that the military had, with *some* justification from their standpoint, but from the military standpoint; here's this weird and wonderful thing. Is it wonderful? What will it do? I need to know. So AFSWP undertook to write *The Capabilities of Atomic Weapons*, which is a military publication. I don't know if you've seen it or not. [Defense Special Weapons Agency, (DSWA), 1957]

I have not.

I probably have a copy. And two of us wrote the radiation [chapters]—we all wrote different chapters—which has to do mostly with, from the military standpoint: What can this do to me? To my stuff? To my equipment? To whatever I have?

And I'm sure you must've heard a lot of the experiments.

I have.

Of course, Desert Rock was a demonstration, not really an experiment, a demonstration in itself, educational process, and so Desert Rock became an entity into itself on the test site. I went out one morning and the worst part was riding out there in that Jeep with the windshield down because the general required it— it's colder than hell in the morning. We drove out to the test site and crawled into these foxholes or trenches for one shot. I only went on one.

You did that?

Oh, I did it, yeah. Sure, I went along to see.

Oh, well, tell me about that. What was that like? I haven't talked to someone who actually was in the trenches yet.

Well, I'm not like a GI who's scared to death or heard rumors. I have been in this business long enough not to worry about it. And so when Desert Rock came along I said well, I'll go out with them and see how it goes. They had trenches set out, let's say a mile or two, further than that, from where the bomb would be on a tower. I don't remember them doing free drops. The Desert Rock guys lived in tents, had their own mess hall and everything. And they had all the briefings: we're going to go out at four in the morning. They usually fired often in the dark because the optics measurements were pretty good then, the bomb optic measurements. So they said, We're going to go out there and we'll get in these trenches and the loudspeaker system will tell you when to duck down in the, in this case, trenches. Do not look at it until the [loud]speaker says it's OK. And so we went out there and crawled in a trench with everybody else. Since I'd already seen some through dark glasses previously, I wasn't going to look at it. Well, I knew that. Anyway, we all knelt down and the bomb goes off, and you have this sensation of **[00:55:00]** intense light coming down in the trench and everything, and it's shortly gone, and then the voice said OK, and you can look, and what you see is the boiling colors. It's not the flash or the intense light, but the colors are—I don't know how you describe them. Wicked. They are an incredible mixture of colors and movement. Fluid movement. They don't last very long. Apparently sometime during some of these tests, two or three guys decided they wanted to see it, and that would result in a permanent burn on the retina, and they've probably seen the fireball the rest of their life. I mean

you can't do anything about it, especially if it's on the fovea centralis, the main part. That's not good.

I didn't do this, but on one of the exercises they then drove forward and marched to the ground zero and things of that nature, measuring the radiation. I can't recall if I did that or not. I don't recall that I did, but it doesn't mean I didn't, because I don't even remember which one of the exercises I went forward with.

So the military reason for doing this, you said part of it was training. I think I've read things about one of the exercises, the scenario was an actual invasion by the Soviets, so you actually had to be in atomic combat to a certain degree. Was this what you're training for or—?

Well, they had several of these exercises. The written record on it is better than my memory, I'm sure, but my impression is part of it was to demonstrate to the troops it was safe to go into an area where this thing had gone off. Another one was to find out the reverse of that, how would troops react, having had one of these happen? So that has to do with the people part of it. Whether they created a scenario, a made-up scenario or a scenario, which is quite possible because that would probably give a little bit more meaning to the GI that this is in the context of something other than my going and watching a bomb go off and go home again. Now that's pretty ethereal, I'll agree, ephemeral, but I would not be surprised. I really do not remember what scenario they created in order to explain to the GI, this is the context in which you're doing it. We can order you to do it, but that's not the point.

No, but you've answered my question. I didn't mean to say did you remember that as much as to say I did read that, but to get your views on the kinds of reasons that you would do that for the troops, and you've answered that question.

It was for troops. Well, and for the command structure of the troops. See, they have to know how the troops are going to react and what their reactions are and anything they can learn. This is so mysterious. Now Hiroshima's pretty much in their minds. And it's all new, and especially to the military. Is it going to change the fundamental kind of war work we're going to do? It probably did. We never used it to find out. But for instance, one of the tests, not Desert Rock, was what protection do foxholes give in a forest? As you know, we planted Yucca National Forest. Hauled all the goddamn trees down, planted them in concrete, dug foxholes, put in measurements. The birds came, and the workmen came and left paper and we had to haul it out. And finally you've seen the movie of the trees going back and forth, back and forth. That's an example of a very down-to-earth-type practical demonstration or experiment, which Los Alamos thought was a waste of time.

But you've said something important for my understanding, which is the military is grappling—it's obvious when you say it—is grappling with an unknown factor now and a possible future—but it's mysterious to you.

It was, yeah. Not only mysterious, it had an aura of secrecy, an aura of—mystery is only part of **[01:00:00]** the aura. It's awe-inspiring. And there were so many rumors and so many wise owls popping off about all this. And a lot of analysts who were saying warfare's going to do this or that, and of course they didn't agree at that point. And you've got a lot of young folks that—well, you've got young officers. Well, even the senior officers hadn't the foggiest idea what this was about. And so a number of the Desert Rock-type things were for that purpose, whereas some of the other experiments were just straightforward ones: what is the damage radius for blowing a Jeep over? We blew so many Jeeps over, somebody claimed we had a Jeep calibration for overpressure.

Yes, I've heard that from one of the test guys.

You heard that one?

And when he said it to me, I said what? He said Jeep over-something some formula, which I didn't get the joke. So one other question about these effects. Are you also thinking about if this is a defensive use, what would this do to our stuff? Are you also doing offensive—?

Oh, yeah. I mean that's the same telescope turned around. That goes with it. How can you use it and what can you count on and what of the lethal radius. I mean if you go the other side of it, what is the lethal radius of overpressure on people? Radiation, and how fast does it set in? What's the mean lethal dose? And a number of things. But it's the same scenario except viewed differently, offensive and defensive. Like the neutron bomb which was to save buildings and kill people.

Right. I'm just going to—

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

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

[Recording resumes mid-sentence]

[I have a] Ph.D. in chem. engineering. And my tour is up in AFSWP, the Armed Forces Special Weapons Project, tour being four years, four to five.

And what is your rank at this point, then?

I'm now a colonel. I advanced very fast in rank during the war because the people in front of me got shot down. That's the way it often happens. I was at AFSWP when they made me a colonel. Then the Air Forces Special Weapons Center [AFSWC] was the Air Force version, namely that was where the nuclear weapons business was done here in Albuquerque. How do you put bombs on airplanes and drop them so they hit the target? What bombs should be developed? What

should be the development part of the bomb side, the hardware side? And then what is the background and technology that supports this? So when it came time to find somebody to come to the Special Weapons Center, actually the personnel system just looked and says, Giller, nuclear, Kirtland [Air Force Base], nuclear, they need a colonel, send him. I mean that's sort of like it went.

So I arrive out here and told them I'm the deputy of the 4925th Flying Squadron, which are the airplane guys dropping bombs. These are test bombs. I don't want to do that, since I'm still in science. I go to the boss man and plead my case, Don't put me in there, you're wasting me and them and everybody else. You have this little Research Directorate whose boss is leaving, which are made of technical people, how about sending me there? So he did. So now I'm the director of the Research Directorate.

This is here.

At Kirtland, in the Air Force Special Weapons Center. Now it turned out the Research Directorate job—until Mike shot in the Pacific, which showed you didn't need liquid hydrogen and deuterium, until that point, the B-36s were going to have a cryogenic system in the B-36. Now that's a plumbing nightmare. So they had a lot of contracts to develop all the parts of the plumbing system for the 36, and the Research Directorate ran those. It wasn't two weeks after the bomb went off that they cancelled all the contracts.

After Mike.

After Mike, after that, here's these guys sitting around, guys with physics and engineering and all sorts had been contract monitors, and what the hell, I show up. Well, I come out of the effects world. I said, We'll worry about Air Force effects, things on flash blindness in airplanes, decontamination if somebody's flown through a cloud, radiation

rates—that's your cloud—how do you measure these? And I also had a determination we were going to have as many blue suit scientists as I could get my hands on instead of—

What does that mean? Oh, you mean service—

People—active duty.

Active duty scientists.

Military people with doctorates and master's degrees. I wasn't looking for civilians. Not that I was against them.

Why?

Well, I'm a military scientist. I wanted more military scientists doing science. Well, it's a consequence of going to graduate school and the reason for it and my four years in the Pentagon. So we set out to find as many graduates. Now at that time, the Air Forces services had postponed people's Ph.D.s till they finished them, then they had a three-year commitment. So I would go back to Wright Field AFIT, the Air Force Institute of Technology—it's an education system. What the hell does that mean? Anyway, they had a lot of the responsibility for assignments. So we would fly back there and say, Give us all you've got, all you've got, all these second lieutenants. And a lot of the other labs says, Well, they only stay three years, we don't want them. Our reaction was they're young, they're full of energy, they'll do things. A few will stay. I don't know if you know Art [Arthur H.] Guenther. He came and is still here. Became Chief Scientist and everything else. He earned it for everybody else.

Anyway, so we gathered a lot and I turned them loose. My idea was to get out of the way and let them go. So they came up with more ideas of doing things. We got a project to do Orion, which was the bomb-propelled spaceship to Mars. There is a book called *Orion*, which still floats around the system. It was in *Scientific American* not too long ago. We went to Washington and

got them to give us the money for the contract, and then we went to General Atomics **[00:05:00]** and started monitoring it, and that was one fun game. Another one was what happens if a bomb goes off in the Van Allen Belts? So now we got to learn about Van Allen Belts. And so we came up with a concept for an experiment in the Van Allen Belts, shooting the bomb. We went to Washington and tried to sell it. We'd run it. Well, that didn't go over too well with AFSWP, my old outfit. Now it has a new name, Defense Threat Reduction Agency, DTRA. And they said, `We run those things.` I said, `All right, give us a part of the action`. So we developed electron counters to put on three-stage rockets which we had developed. We didn't do any of the—most of this is contract. But we did put together a program, and when the bomb was fired in the South Atlantic off of a ship, we sent up sounding rockets from Cape Canaveral [Florida], Puerto Rico, and Wallops Island [Virginia]. [We] sent them up there to count the weapons, count the electrons, and the idea was proposed that they would create so much radio noise that God knows what it would do. Well, it didn't. So we solved that one.

So do you recall which test that was in the Pacific [Atlantic] that you did that on?

[Operation] Argus. We tried to take over and run the whole damn thing. That gives you some idea of our philosophy. Whatever it is, we'll do it.

Now explain to me how the—

Well, they went through four names. [In 1959 the AFSWP was renamed the Defense Atomic Support Agency (DASA) which became the Defense Nuclear Agency (DNA) in 1971 and later the Defense Special Weapons Agency (DSWA) in 1995; in 1998, DSWA became DTRA.]

But how is that interfacing with the actual physics that the labs are doing? That's my question.

You mean Los Alamos?

Yes.

Well, the technical people working here, the scientists, even though in uniform, spent a lot of time in the labs. The Air Force had—maybe they still have—active duty Air Force people in two-and-three-year residencies at Los Alamos and Livermore. A whole *bunch* of them went through there, and some of them came down here. One of them came down here as a captain, worked for me, and became Chief of the United States Air Force, Lew Allen. He did the experiments on one nuclear test. Jasper Welch went on to two stars, and he came out of Livermore. He got his doctorate out there while he was out there. And on and on and on. So we had a lot of folks who had been at the labs two or three years. It turns out when they left here after the two years were up, they went to the labs, so there's guys scattered all through the system that were here for two or three years. So there was a lot of technical discussion on science because of these particular individuals, as well as the subject matter. Especially the Van Allen Belt one. That was when the Van Allen Belts were discovered by Van Allen. That was a big deal, you know, the excitement. And then the idea you could screw them up by using a bomb, and that's not something we did in a vacuum. And we had contracts with a number of scientific—well; I mean commercial organizations of which people in there, they either come from the labs or were going to the labs, so it's a whole flux of people that just go round and round and round. They did in those days.

One sort of general overarching question about world view. Are you, when doing this kind of work, envisioning really that these things will happen? You know we're standing here at the end of the Cold War and none of these scenarios came true as far as nuclear war, to date. So the question is when you're developing all these kinds of things, are you in a position where you're thinking about war plans and what would we do or how this could happen? You're purely technical.

Well, some of the guys went into war planning from here, and some came from war planning, so it's not as if we weren't aware of it. But primarily we viewed it as a technical question to be answered one way or another, experimentally, *et cetera, et cetera*.

You're really as military scientists is what you're describing.

Yes. Now the war planners is what they call the guys in the Pentagon. A lot of them are graduates from here, but when they got there, they were doing something—their technical background was useful in keeping some of the other guys from getting too carried away. So the idea was to infuse into as much of the Air Force as possible a science knowledge, the people with science knowledge. Now unfortunately, as the years have gone by, the Air Force has **[00:10:00]** reduced the number of scientists in uniform. That's a consequence of just time and change. The Special Weapons Center became the Phillips Lab, now it's called Section Something-or-other of the Air Force [Research] Laboratory, has mostly civilians. And it was probably inevitable. I was just a blip in the system, I think, like at that time. But the Research Directorate was forty people. It is now a thousand here. Now they're in space, and they went into directed energy weapons. The airborne laser airplane was developed and pushed primarily with fellow[s]—Art Guenther came to me as a second lieutenant from New Jersey and he was only going to stay two years and he's still here. Still busy as he can be. Optical physicist.

And now you're saying the lab's name changed, this lab's name changed, over time, or—?

Oh, yes. It was the Special Weapons Center, then it was—the Research Directorate was part of it—then it became the Phillips Lab, and then the Air Force consolidated all its individual labs into one thing and called it Air Force [Research] Laboratory. And there are two [of ten] sections here [at Kirtland AFB], one is Space and one is Directed Energy. But real early on, there's another one. I'm missing one someplace in the very beginning.

I can look that up.

Yes, that's got to be around. [*Special Weapons Command* was created in1949. In 1952 it was re-designated the *Air Force Special Weapons Center* assigned to Air Research and Development Command].

Now when you come here, you've talked to me a little bit about Nevada, but is there anything more you can tell me about the work you did and going to the test site or—?

Well, have you read the list of the experiments we did?

Well, I have—

It's amazing how many.

I have the list of all the experiments that were done at the test site.

Let me tell you some funny ones.

Go ahead and tell me.

I'll do that one. I think it's one more humorous one. Whether it's stupid or not is another matter. The Army wanted to know what protection Army uniforms gave to thermal burns. And so what animal is closest to the human? The pig. In sweat and everything. OK, good, we'll put pigs out. Now you had to do everything at three ranges in order to get—too close, middle, further away—so that you can find out the gradation of effects from the obvious: it's going to blow them up to I don't think anything will happen. And so you get three points in your curve, if you like, of not distance so much, damage *versus* flux, and flux depends on distance, depends on the bomb size. If the bomb is twice as big as it's supposed to be, the whole experiment goes up in—. So we tried to get bombs that we thought the output would be somewhat predictable.

So the Army wanted to do that, and they brought it to AFSWP; I think we said well, why not? Well, how do you do it? Well, OK, we get uniforms for the pigs. So the quartermaster

makes those. So they buy shoats, forty-pound pigs, and I'm out at the test site and they appear out there in a pen. They've got their uniforms. Now they have to be put out in the desert, as I say, three distances, the night before the bomb. We can't just run out and put them out—And since you put cameras on them and put all sorts of things to take pictures when the bomb goes off, the cameras were everywhere in that test site, triggered to go off one millisecond, one second, before the bomb. They had a big timing system. OK, so you're going to put them here and here and here. Then they discovered that there are bobcats and wild cats out there, and the pig has to be anesthetized. So then they come and can chew them up. OK, now you've got to put an electric fence around them. But they're anesthetized; they're going to get into hypothermia. So you put heat lamps on them. So the heat lamps have to go off before the bomb goes, so now you have this concept that finally the pig is sitting there, everything's all right, and the bomb goes off. Well, they kept postponing it, and the pigs outgrew the uniforms. So, well, the test was postponed till the next series.

We had two Hawaiian guys [who say], `Let's have a luau`. Fine, we've got all these damn pigs. Well, they wanted us to fly in all of the stuff you'd use in Hawaii—palm leaves and bananas and all that stuff. And we said `now wait a minute, if we get caught doing that,` **[00:15:00]** `no way.` OK, we'll wrap them in burlap. So they dig the hole in the rocks, build the fire, wrap the pigs in burlap, stuff the pigs with rocks, cover them up, and everybody goes off and waits till they're cooked, open up the beer tent and everything, dig them up. Well, two things. The rocks they used were sandstone. Now all the meat has sand in it. And burlap is cured with—oh, damn it. A chemical which is—it makes the eating impossible. How can I forget it?

You mean formaldehyde or something?

No, no, it's a black tar-like thing. Anyway, so much for that. So we threw the pigs away and had the beer. Creosote.

Creosote. Right. Tar.

So I tell you, a sandy creosoted pig ain't for eating. Anyway, the next series, I wasn't there, they tell me they wrapped them in aluminum foil and it worked OK. That was one of them.

But eventually that test did take place.

Yes, it did take place.

It's just that it had been postponed.

Yeah, it had to be postponed. So it did take place later.

But now you said something that I must ask you about. As you said, whether it was stupid or not is another question. Do you think that those kinds of tests were worthwhile in any real way as far as the military was concerned?

You're asking me to answer for a lot of other people.

No, I'm asking for you.

No, I understand, but the answer is what *I* think is probably not really germane. It's what the guys who want to do it, why do they want to do it. I'm in no position to tell them and you don't need to know why you aren't going to get the answer.

Now another one was M.A.S.H. [Mobile Army Surgical Hospital] systems. The Army put out three M.A.S.H. units, there and here and here. Laid out every scalpel, numbered one to a hundred, all just exactly—X-ray machines and everything. Here, here, and here. We said this is what's going to happen. Well, well, you know. The first one blew away. The second one caught on fire and some damage. Nothing happened to the third one. Every one of those scalpels had a number on it. So that was another experiment.

The Corps of Engineers wanted to know what one of the little shuttle locomotives—you know, the little ones they used to run back and forth to move boxcars around. [They said], `Don't you hurt it`. So the Yucca National Railroad sits out there on a hundred feet of rail in which there was a locomotive on it, so far away that I don't even think the window cracked. They didn't want to hurt the locomotive. It was running. That one was obviously, even in my view, not worth it.

The [F]CDA [Federal Civil Defense Administration], the people who worried about the effects of atomic weapons on civilian life—

Oh, the Civil Defense—[F]CDA

Civil Defense, that's [F]CDA, Civil Defense, yes. Anyway, so we put together a bunch of experiments for them. So we built nice standard Middle West houses.

I've seen them.

With all of the hardware on it. Doors. I mean it's a house. Everything. And then some of them would have trash in the yards and some of them wouldn't and things like that. So we'd all place bets on how long before the trash would catch fire and the house would catch fire. That was just a private. And so a lot of those movies were made for that purpose. Then there was a series of apartments which are all different structures, bigger bricks, smaller bricks, what have you, all with pictures. And then the underground parking lot. And if you have been to all of those, you know those are what's left over from some of them. So there's a *whole* series of those.

The biggest problem we had was getting people to write the final reports. They'd all go home and we'd have to *fuss* at them because they'd all go back to their labs in Army, Navy, and Air Force. Where's the report? It's due! It's due! We were forever bugging them on that. Finally

we told them we're not letting you leave the test site till you write the draft one. That speeded things up.

And those reports were written and they are somewhere.

Oh, they're over at AFSWP. Over here at wherever the hell it is. Over at DTRA.

At DTRA. Well, I'm glad you said that because last time I was out at the test site and we were looking at all those things, I said to myself, I wonder where those final reports are? And the DOE [Department of Energy] guys that were touring us, no one could answer that question.

They should be over under Byron Ristvet. He'll be glad to—have you got a clearance?

I don't have a clearance. But he can let me know what I can see. But spell his name for me, then.

Let me get you a card.

[00:20:00] *That's a good thing to know because I was wondering about that. Because for the very issue that so much effort has gone in. You could tell just by seeing the ruins how much effort must've gone into creating them.*

Those are a whole series of tests, of course. They shot the cannon off and things like that [Grable test]. One of my perhaps misguided studies when I first got to AFSWP, second year, I wrote a paper supporting the development of the eight-inch, the 280-millimeter cannon, in favor of it. That turned out to be misguided. It turned out they couldn't drive the damn cannons through the streets of Europe. They can't get it around the corners of the towns. It's such an *enormous* machine. It is an *enormous* machine.

And the test itself [Grable], what was the result of that? You see pictures—

The bomb went off like it was supposed to and everything went as it was supposed to.

It went as far as it was supposed to.

Yes. Well, they wanted it to go over ground zero with an airburst, not a surface burst. No, they demonstrated the blooming cannon would work and that the shell, I guess Los Alamos built that one, I'm not sure, you know, it worked. Things like that.

Were you there for that one?

Yes. It was just like any other one, in the sense of the cloud.

Yes, the pictures look like all the other pictures of the mushroom cloud.

You will see some pictures in which there are little rocket trails that go up on the outside. Those are smoke rockets put there for the purpose of measuring the shock wave when it goes through it. See, the camera is taking a picture. You can see the shock wave go through, time it and everything. That's why those are in there. Some of them are close enough so you get a base surge, that thing they get off the bottom. Others are higher. You don't get that. Then of course there's the surface shot and the subsurface shots. Then we went underground and started doing other things.

Speaking of underground, are you here when the moratorium comes into place, that whole issue in the—?

What year is that?

Late fifties is that, I think '58. [Operation] Hardtack II was the last series of tests they did at Nevada. And then there was the Soviet sort of unilateral—

I was here in the Research Directorate. I left here in '60 and went to CIA [Central Intelligence Agency].

What takes you to CIA? What kind of—?

My friend Pete Scoville.

That's right, you said.

I became Deputy to Pete. Well actually, when I first went there, I went into the James Bond equipment department to help them, the idea was that it would bring some science into this do-it-yourself shop. It was fascinating. But then the Bay of Pigs came and all sorts of things and the CIA went through a big change. You know the boss man changed, then they reorganized and they created a Deputy Director for Science and Technology. And my friend Scoville took that over and called me out of the James Bond department and put me as his Deputy to put some science. And so I formed a Division of Research Development to try to do longer-term aspects on CIA problems, not how to give something to an agent tomorrow but rather how do we solve a tougher problem in a longer term? And then he [Scoville] left and Albert Wheelon, Dr. Wheelon, , took over, and I worked for him for a year, and then I went back to the Air Force.

OK, so let's go back to CIA. Explain to me in layperson's terms, when you're saying "bigger problems," are you talking about agents themselves being able to recognize important scientific issues that they're seeing, or what does that mean, "bigger problems"?

Well, the activity you're talking about, namely what does this mean that we see and how do people understand what they see, is in the analytical side of CIA. That's not in the technical side. However, the interactions are such that the technical side says look for these things, so they give guidance. In fact, there are collection priorities of all kinds, for cameras as well as people's ears. And they come from the analysts who would like an answer to A, B, or C to help them with a **[00:25:00]** problem they're trying to put together. In the terms of a scientific organization, for instance, a simpleminded one but still a tough one in those years is automatic translation from Russian into English that meant something. That's pattern recognition. That's an example of what you could—. Now today we're beginning to have it, but in those days they had none. Another one was—let's see, I got to find another—well, the idea of how do you get listening

devices into impenetrable places? Not the usual way, but what are some screwball ways? And some of them are screwball. They don't work, but that's not—

So you're talking about actual technological development of things that CIA can use.

Yes.

I understand that now. And this is not necessarily related anymore to nuclear issues, then?

No, no. I had very little to do with nuclear things. The only thing doing in nuclear things is the Cuban missile crisis. I was there during the Cuban missile crisis. That was pretty intense.

What was the deal in your part there?

Well, they wanted clandestine measurements devices to find out if these Russian boats really had fissionable material on them. So we would send these fishing boats out to try to sell the Russians fish. But they were supposed to measure things. So they [said], `Get us some instruments`. We just picked up the phone and called Los Alamos and Livermore [and said], we need instruments tomorrow. And so in a sense, all we did was act as a way of pulling the string or pushing the buttons to get [them]. And it did happen, if I remember right, and they did confirm that there were nuclear material[s] on the ships. Not that anybody had any doubt, but nevertheless.

This is a real laywoman's question. Would these fishing boats have to be—they couldn't be American fishing boats.

Oh, no, no, they'd be the locals. The Agency would have locals do it. Yes. Well, that goes on all the time, always trying to sell you a fish off the back of the fantail.

So that's CIA. And then—

And then I went to the Air Staff. So when they asked me if I wanted to stay in CIA, I said no, I like the Air Force, thanks. Probably just as well anyway, in hindsight. So I went to the Air Staff for three years as Deputy Director of Science and Technology. That's *all* science and technology.

My job primarily was budgets for the Air Force, for the engine developments and the weapon developments and airplane developments, endless. And Vietnam was really getting cranked up, so people were looking for all kinds of things to help in Vietnam, specialized to that particular piece of warfare. So the Director of Science and Technology is probably still in the Air Force. But their job is to put the budgets together. The various parts of the service, Air Force, come in with they want money for this and this. Then the Secretary's office has the technology people and they'll say no, we're not going to do that, so we get in the middle of that. And finally there's a budget that the Air Force puts in with the rest of the military budget and it goes to Congress, then you go over and testify. And so I had just the Science and Technology end of it. Other people had airplanes, had development, and all kinds of—.

So I stayed there three years. The Atomic Energy Act still requires a flag officer to run the weapons program, and so I was nominated and accepted by the AEC commission at that time. And so I moved over to Germantown, AEC, to run the weapons program.

This was seventy—

This'll be '67. And in '72, they retired me from the Air Force, in place. [James] Schlesinger just kept me and pushed me up a notch, and I stayed until '75. Then ERDA [Energy Research and Development Agency] came along. AEC disappeared. For two years, I was in ERDA.

Yes, AEC disappeared, then ERDA.

And then Energy Research and Development Administration, which is a kluge. And then—

What did you just say?

A kluge. You know, a hodgepodge, a collection of stuff—Bureau of Mines and all **[00:30:00]** sorts of things were added in. And it only lasted two years, and in '77 Congress got rid of the

Committee on Atomic Energy, they created the NRC [U.S. Nuclear Regulatory Commission] as a stand-alone, and DOE, which is a bigger outfit. And I left the day before DOE existed.

Really.

Well, mainly because I was getting tired of the whole business, and secondly is I had some stock in a portfolio that if taken literally I'd have to get rid of and I didn't want to do that. So that's when I went to work for a Beltway Bandit in Arlington [Virginia], a little outfit called Pacific Sierra Research, Incorporated, run by an old friend of mine, an old Sandian, actually. And tried that till 1990, and I said that's enough of Washington, so we moved here.

So you were doing sort of a consulting—?

You mean when I worked for Pacific?

Yes.

Well, there we competed with other organizations, like BDM [Braddock Dunn & Moore] and SAIC [Science Applications International Corporation] and all of those for study contracts in arms control, primarily. Since I'd been in arms control now for—actually, when I left ERDA, the day before DOE, I became a representative for the JCS [Joint Chiefs of Staff] to the test ban talks in Geneva during the Carter years, '77 to '80. So my wife and I went to Geneva twelve times in three years.

Well, was that the era when Herb [Herbert F.] York was—?

Yes, he was the second ambassador. The first ambassador was Paul [Warnke]—what the hell was his last name?

Was it Nitze? Was it—?

No, Nitze was in the SALT [Strategic Arms Limitation Treaty] business. Anyway, Herb, who I knew quite well, was our ambassador for the last part of our—

Yes, I know Herb very well, so—

He's a hell of a nice guy, yeah.

So you were there for the Joint Chiefs—

Well, yes. Delegations are made up of representatives of OSD [Office of the Secretary of Defense], Joint Chiefs, [Department of] State, CIA's buried in State, and ACDA [Arms Control and Disarmament Agency], and then the ambassador, and staff. And we had guys from Los Alamos and Sandia and Livermore as technical consultants. A lot of it had to do with seismology. We spent more damn time on seismology. But we didn't go anywhere. I mean when [Ronald] Reagan came in, he said knock it off and that was the end of that. It was trilateral.

And at the time, what were your views on the arms control question? Did you think it was workable? Were treaties possible?

Well, my views at that time were that the detection limit was such that I would have preferred to see a very low threshold. I didn't mind a low threshold, like five kilotons or two or something. But once you get down there, the evasion scenarios were fairly persuasive that they would work. The complications of inspections were incredible. We argued about location systems. Before GPS [Global Positioning System] became ubiquitous, we tried to describe we'll make Omega-3, which is a navigation system for locating a shot. And it's amazing to watch the process, in those days, of negotiating with the Soviet Union. So it was an education process. It didn't go anywhere, except I discovered that Geneva is a popular town with diplomats. It was very good for living conditions. The bigger the car, the smaller the country. We had old beat-up Army cars and little guys ran around in big white Mercedes. So Geneva, that whole world, is a world unto itself in which sometimes you think the only end is to keep going, not to solve anything. I mean

some people take it more seriously than others. But eventually they did get a test ban treaty. I don't know if we ever ratified it. Did we?

We didn't.

That's what I thought.

We haven't ever ratified it.

That's right, yes.

So did you have any thoughts on that, when that finally was negotiated, having been in the business for so—?

You mean years later?

Yes, sort of whether it's a good idea, neutral—?

I'd lost my—whatever it was—I'd lost my, not enthusiasm, my involvement in it and my concern about it: **[00:35:00]** Let the next bunch screw it up. Do what they want. Yes. Subjects that are very exciting to you and very important and you're into it up to your eyeballs, some years later when you look back, all you can do is shake your head. In hindsight, that wasn't actually perhaps the wisest course. You do a lot of thrashing around in the federal government, especially when about six departments get involved. Well, after thirty years in Washington, '60 to '90, it was enough. Then we threw everything overboard and moved here. We were here in the fifties; that's why we liked it here. I still consult for Sandia a little bit, but not very much.

When you first came, did you, or—?

Yes. I just consulted.

Right. Did you move to this house?

Yes, we bought the house, moved out of Washington into this house. It happened to be for sale by a Sandian who was going to Washington. Well, the whole area is full of folks like that that come and go. Some work for Sandia, and some military folks are here.

Well, that's great. We're just about at 11:30. Then let me think if there's anything else I want to ask you about. You say that the archive here is available for non-cleared people, as well, you were telling me—

I think so. I can call it.

No, you don't have to do that. I'll call you when I get back to Nevada.

Well, I leave here in three weeks for the summer. I live six months in Durango, Colorado.

Bayfield, Colorado.

You lucky man. That's nice.

Yeah, we have a spot up there, a cabin, and we close that in the winter and we leave this place open. My daughter who lives in Corrales comes up once a week, checks everything, does this, that, and the other. And so we usually move up there the first of May. We're leaving the last week of April.

OK, I'm going to turn this off.

[00:37:29] End Track 2, Disc 2.

[End of interview]