NASA GLENN HISTORY OFFICE
ORAL HISTORY TRANSCRIPT

Eugene Krawczonek

Interview by Virginia Dawson
with Dennis Brown
January 23, 2003

One of a series of filmed interviews conducted on January 23, 2003 with former Rocket Engine Test Facility employees for the documentary video "Fueling Space Exploration." Dennis Brown is the videographer.

BROWN: I want you to say and spell your name and give your title and we'll go from there.

DAWSON: Okay, you guys have to be quiet.

BROWN: We're taping. Okay, your name and spell it, please.

GENE KRAWCZONEK: My name is Eugene Krawczonek, K-R-A-W-C-Z-O-N-E-K. I was an operations engineer at the Rocket Engine Test Facility, South 40.

DAWSON: When did you come to the Lewis Laboratory?

GENE KRAWCZONEK: I came to Lewis in about 1955, and I worked at some of the small rocket test cells. And learning about hydrogen and some of the other propellants and knowing how to design facilities and equipment to handle propellants. And I think in 1957 we started the, actually run South 40. So at that time, then during that time, we were building it, we were checking it out. And originally the rocket, the South 40 was not hydrogen -- didn't have hydrogen equipment. So we ran with RP1, JP-type fuels, kerosene type fuels.

DAWSON: Yeah, could you say that again? Because that's important. Say originally in the South 40 we ran traditional kerosene type of fuels, you know? Because then people would know what that means. I don't know if they know RP1.

BROWN: Hang on a second.

DAWSON: Yeah, he's got to adjust it anyway.

BROWN: Don't look at him.

GENE KRAWCZONEK: Okay, originally South 40 was not capable of running liquid hydrogen. At that point in time we were designing tanks and having tanks built to do that. But we

started out using kerosene-type fuels with liquid oxygen. And so we were designing the facility and also to handle to fluorine. The fluorine we could handle, so the scrubber had to be capable to remove the fluorides from the exhaust products and to dispose of them and neutralize them and get them out of the system so we could put it in the sewer systems.

DAWSON: I see. Could you tell us a little bit about the design and sort of thinking through the South 40 before it was actually built? Were you involved in some of the design and construction?

GENE KRAWCZONEK: I was not involved in design at this time.

DAWSON: Oh, okay, okay.

GENE KRAWCZONEK: I was just -- on the side I was, but not really in the design of it.

DAWSON: So, did you watch it -- you watched it go up, though, right?

GENE KRAWCZONEK: Watched it go up and actually --

DAWSON: Well, say I watched it --

BROWN: Get him [inaudible].

DAWSON: Yeah, yeah. Yeah, I watched the construction of it. And then maybe you can describe a little of what you saw when it was being constructed, if you can remember back then.

GENE KRAWCZONEK: All right. I was involved in the installation of the test facility. And I saw the design as it was going along. And originally it was done with, for the JP-type fuels and liquid oxygen. And South 40 facility is a rocket test stand, and it had two propellant pits--a liquid oxygen pit and a fuel pit. A fuel pit at that time and all the kerosene-type fuels. When we went to hydrogen, actually the hydrogen tank was put outside. And so it was on the outside. The hydrogen tank was something like 175 cubic feet. We actually had a smaller one, 75 cubic feet, too. But they were outside of the test facility because we were a little worried about the escaping of the hydrogen into our building would cause a problem, that it would detonate or something. And so we kept those tanks outside. And the fuel tanks had, like I say, a kerosene-type fuel. And the oxygen tanks handled liquid oxygen, but they'd also handle liquid fluorine. And later on when we started using liquid fluorine, after we checked out the facility. And then we had a -- the scrubber had to be capable of exhausting and covering the exhaust. So condensing the exhaust products and capturing them with the hydrogen and oxygen, which was kind of simple to do. But the fluorine was a little harder because of the fluorine products. And the facility had a large water tank at the top of the hill, like 750,000 gallons, I believe, or maybe more, that was used for the scrubber. It was gravity fed to spray into the scrubber, which neutralized the exhaust products of a rocket burning.

DAWSON: Great, that's good. Can you -- do you have any fluorine stories, about, you know? I heard that not all the tests worked the way they were expected to work. And do you have -- maybe you could give us some of those.

GENE KRAWCZONEK: Yes, fluorine --

DAWSON: No, don't say yes. Just say fluorine blah, blah, blah.

GENE KRAWCZONEK: Just say what?

[Laughter]

DAWSON: Say -- just start with fluorine was a--

GENE KRAWCZONEK: Well, fluorine was a propellant we wanted to use. And we actually set up a system to condense fluorine, because fluorine at that time only came in gaseous bottles. We had to condense the fluorine so we could have a liquid to put into the tank. Later on in time, we actually -- some -- Allied Chemical, I believe, was the company that actually supplied us with liquid fluorine so we didn't have to condense the fluorine. So Allied gave us the fluorine. We had a few minor problems with fluorine. One of the problems was when you have a leak, what does it smell like? And what is it that's leaking? Because fluorine being very reactive would combine with hydrogen in the air. You might hydrogen fluorine, or it would be elemental fluorine out in the exhaust. So we -- we had a little fun. We were trying to see what would happen. And we set up some tests where we spilled some fluorine into a tray, and we squirted it with like the JP-type propellant to hope to neutralize the fluorine. Or then we ran around smelling it with our noses, of course. And my nose is sort of -- but that's another -- and trying to determine whether it's fluorine or hydrogen fluoride. And we never could tell. The instrumentation wasn't that well known how to handle the stuff to find out about fluorine.

But, another good fluorine story is one we time we were running a fluorine test. And one of the tanks, the outlet line of it, the part of the piping a big valve kind of disappeared. And we dumped a lot of the fluorine out into the atmosphere. And what actually happened, I don't know. But we went into the propellant pit. And it was winter time, and I know I had a large car coat, and it was wool. And I went in there, and we're wearing a gas mask so we could work in the pit and evaluate the problem. And my coat turned very sticky. And I got rid of the coat that night.

DAWSON: That's a good story. What about your relationship with the research engineers? How did that work? I mean, did they -- they dreamed up the tests and you figured out how to carry them out? I mean, could you kind of talk about the relationship and --

GENE KRAWCZONEK: Yeah, the research engineering was --

DAWSON No, it's --

GENE KRAWCZONEK: Oh, okay. We're starting on a test engine, the research engineer would think of what they would want to do, check performance and try different hardware like an injector, the injector propellants. And they would talk with the operations people, and we would help them design the hardware and have it built. And then we put it on the stand and the research people then would get the data and analyze the data. And we worked -- we worked very

closely as a team. You had to work that way, close. And we became good friends with the research engineers as much as we didn't want to be. But -- sorry, Bill.

[Laughter]

DAWSON: How -- did you -- can you talk a little bit about working with liquid hydrogen. Did you -- did you find it very dangerous? Were you worried? I mean, was it -- I mean, I know it's a very -- can be a volatile chemical. So if you could talk a little bit about how you could do that safely and, you know, relaxed, I don't know. Anyway, just kind of talk about that.

GENE KRAWCZONEK: Okay, liquid hydrogen, because like, as Bill pointed out, is a very reactive chemical. And it's very cold. And you didn't deal with propellants of this type at minus 425 degrees. And instrumentation to measure things weren't that well known. So, to check the liquid in the tank, we -- the only way we could find out how much hydrogen was in it -- the first time we loaded hydrogen, we didn't know what we had in there, how much we had in there. So, what we did was we stuck a tube down an opening in the top of the tank and dropped the tube into the tank. And when it got -- touched the liquid, it kind of percolated. And so it shot up a smoke. And then we knew that that was our level, then. So we measurements, we could tell how much hydrogen we loaded. Because at that point in time we didn't know what to do. We didn't have the instruments that we had in the tank to measure the level of the propellant.

DAWSON: Oh, that's fascinating. That's a very interesting story.

GENE KRAWCZONEK: It was a fascinating job.

>> Can we do that again? I mean, that's fascinating. What would make you from getting that syndrome they talk about, you know, where you don't have enough light because it's winter? Sad or something?

BROWN: Okay, go ahead.

DAWSON: Okay, so you can? Go?

BROWN: Mm-hmm, go ahead.

DAWSON: Okay, if you could talk a little bit about hydrogen and how you came to respect it.

GENE KRAWCZONEK: Yeah, hydrogen is a propellant, and it's very cold. And it's -- when you do have a leak with hydrogen, hydrogen, it's so light it actually disperses quite quickly. And like Bill pointed out, the JP fuels were a little different, but then tougher to handle because when they got out, they hung around the building, like they were heavier. And they might go down to the bottom of a propellant pit. But the hydrogen was, being a very light gas, which flowed out of the building. Sort of this -- in a way it was kind of safer to work with. You knew more about it. You respected it more and you took -- you took care working with it.

DAWSON: Maybe you could -- could you say that one more time. You could say I knew --

GENE KRAWCZONEK: I don’t know what I said.

DAWWSON: Yeah. Say, I knew about hydrogen from working with it and I respected it. Just, you know, say it that way just so -- great sound bite is what we're looking for.

GENE KRAWCZONEK: Yeah, I knew what hydrogen was like and I respected it, because as a liquid, it's very cold. But if any hydrogen got out, it immediately gasified, and you could see it from the water condensing around it. But I respected it. I was more cautioned, worried about the JP-type fuels, which were heavier and would hang around longer and could cause you a problem later on during a test period, where hydrogen was nice that it got out.

DAWSON: Good, good. That's great. I think that's it. [inaudible] down and that was because at the time you didn't have those instruments to actually figure that out, you know, from a distance. If you could talk about that one more time, that would be good.

GENE KRAWCZONEK: Okay, when we started to work with hydrogen, and the first time we loaded it into a propellant tank, we didn't know how to measure how much hydrogen we had. We knew the guy came with a trailer full of liquid hydrogen, and we were putting it into a tank that's never used hydrogen before. And we didn't have any instruments in it to measure where the - what level the hydrogen was at. So we were filling it for I don't know what period. I'd say a half hour. And we decided to try to find out how much hydrogen we had. So we uncovered a port in the top of the tank and took a hollow -- like a tube, and put the tube down the hole until it touched the surface of the liquid. And then it kind of percolated up the tube. And we could tell that's -- what level the hydrogen was. And from using measurements, we can of determine how much was in the tank.

DAWSON: Excellent, excellent. Okay, thank you.

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My name is Eugene Krawczonek. I was an operations engineer at the Rocket Engine Test Facility, South 40.

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Originally, South 40 didn't have hydrogen equipment so we ran with kerosene JP-type fuels. At that point in time, we were designing tanks, and having tanks built to do that. But we started out using kerosene-type fuels with liquid oxygen. And so we were designing the facility and also to handle fluorine. With fluorine we could handle. So the scrubber had to be capable to remove the fluorides from the exhaust products and to dispose of them and neutralize them to get them out of the system so we could put it in the sewage systems.

I was not involved in the design at the start up. On the side, I was.

I was involved in the installation of the test facility and I saw the design as it was going along. And originally it was done for the JP-type fuels and liquid oxygen. And the South 40 facility is a rocket test stand that had two propellant pits. A liquid oxygen pit and a fuel pit. A fuel pit at that time handled the kerosene type fuels. When we went to hydrogen, actually the hydrogen tank was put outside, and so it was on the outside. The hydrogen tank was something like 175 cubic feet. We actually had a smaller one – 75 cubic feet too. But they were outside the test facility because we were a little worried about the escaping of the hydrogen into the building would cause a problem, detonate or something. And so we kept those tanks outside. And the fuel tanks handle like I said kerosene type fuels, and the oxygen tanks handled liquid oxygen, but they also handled liquid fluorine. And later on when we started using liquid fluorine, after we checked out the facility. The scrubber had to be capable of covering the exhaust. So condensing the exhaust products and capturing them with the hydrogen and oxygen, which was kind of simple to do, but the fluorine was a little harder because of the fluorine products. And the facility had a large water tank at the top of the hill – 750,000 gallons I believe or maybe more. It was used for the scrubber. It was gravity-

fed to spray into the scrubber which neutralized the exhaust products of a rocket burning.

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But, another good fluorine story is one time we were running a fluorine test, and one of the tanks, the outlet line of it, the part of the piping and a big valve kind of disappeared, and we, it dumped a lot of the fluorine out into the atmosphere. And what actually happened, I don't know, but we went into the propellant pit, and it was wintertime, and I know I had a large car coat. It was wool. And I went in there. We were wearing gas masks, so we could work in the pit, and evaluate the problem. And my coat turned very sticky. I got rid of the coat that night.

Starting on the testing, the research engineer would think of what they would want to do to check performance, and try different hardware, like injector propellants. And they would talk with the operations people, and we would help them design the hardware and have it built. And then you would put it on the stand, and the research people then would get the data and analyze the data. We worked very closely as a team. You had to work that way closely. You became good friends with the research engineers, as much as we didn't want to be. [Laughter]

Liquid hydrogen, because as Bill pointed out, is a very reactive chemical and it's very cold. You didn't deal with propellants of this type at minus 425 degrees, and instrumentation to measure things weren't that well known. So to check the liquid in the tank, the only way we could find out how much hydrogen was in there…the first time we loaded hydrogen, we didn't know what we had in there, how much we had in there. So what we did was we stuck a tube down an opening in the top of the tank, and dropped a tube into the tank, and when it got to touch the liquid, it kind of percolated. And so it shot up a puff of smoke, and we know that was the level then, so the measurements we could tell how much hydrogen we loaded. Because at that point in time we didn't know what to do. We didn't have the instruments that we had in the tank to measure the level of the propellant.

Hydrogen is a propellant and it's very cold, and when you do have a leak with hydrogen, hydrogen gets so light, it actually disperses quite quickly, and like Bill pointed out, the JP fuels were a little different but tougher to handle because when they got out they hung around the building, like they were heavier, and they might go down to the bottom of the propellant pit. But the hydrogen was a very light gas which flowed out of the building, so in a way, it was kind of safer to work with. You knew more about it. You respected it more. And you took care when you worked with it.

I knew what hydrogen was like and I respected it, because as a liquid it is very cold. And any hydrogen got out, it immediately gassified, and you could see it from the water condensing around it, but I respected it. I was more cautious, worried about JP-type fuels which were heavier and would hang around longer, and it could cause you a problem later on, like during a test period, where with hydrogen, it was nice that it got out.

Again, when we started to work with hydrogen, and the first time we loaded it into a propellant tank, we didn't know how to measure how much hydrogen we had. We knew the guy came with a trailer full of liquid hydrogen, and we were putting it into a tank that has never used hydrogen before, and we didn't have any instruments in it to measure the hydrogen, what level the hydrogen was at. So we were filling it for I don't know what time period, let's say a half hour, and we decided to try to find out how much hydrogen we had. So we uncovered a port in the top of the tank, and took a hollow, like a tube, and put the tube down the hole until it touched the surface of the liquid, and then it kind of percolated up the tube, and we could tell that's what level the hydrogen was, and from using measurements, we could kind of determine how much is in the tank.