NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT

JOHN K. HIRASAKI
INTERVIEWED BY SANDRA JOHNSON
HOUSTON, TEXAS – MARCH 6, 2009

JOHNSON: Today is March 6, 2009. This interview with John Hirasaki is being conducted in Houston, Texas, for the NASA Johnson Space Center Oral History Project. The interviewer is Sandra Johnson, assisted by Jennifer Ross-Nazzal. I want to thank you again for joining us today, and I will start out by asking you about your background and how you first became interested in working for NASA.

HIRASAKI: That's very interesting, and it all depends on how far you want to go back. Probably just to say why did I even get interested in space program goes back to my childhood. I grew up on a farm. My parents ran a rice farm here in south Texas, and out on a farm, if you want adventure, you have to use the imagination a lot. But I was always fascinated with what could happen in the future, and especially during my high school, college years, I read a lot of science fiction. Both of my parents went to college, so they had encouraged all of us to go to college. I think it's the encouragement of your parents to be all you can, allowed me to get into the situation where I came to work for NASA.

Coming out of college, I went into private industry for about a year and a half, and during one visit back to see my friends, the subject came up, "Hey, you realize that they've got job openings over at NASA?" That piqued my interested because at that time, you realize that going into space was really a very big thing. It's like taking part in an adventure that you just had only imagined you could have become a part of this. It availed itself to me at that point.

Obviously I applied and was accepted. I applied to the Landing and Recovery Division. That's where the jobs were being offered at the time. To me, and I think to a lot of people of that same era, it represented a chance to take part in this great exploration that our whole nation had undertaken. Matter of fact, I took a cut in pay to come here. At that time, if you were working in the space program, you would sort of wonder, "You realize they're paying us to do all of these neat things? They're actually paying us to do this!" Because people loved to do it if they had the opportunity. They would even pay to do it. Well, you take space tourists these days, twenty million a pop to go into space. You would pay to do it. Well, we were being paid to work in the program, so that's the type of feeling and excitement that was generated in the country at the time I joined NASA.

JOHNSON: You said you applied to Landing and Recovery because that's where the jobs were being offered at the time?

HIRASAKI: Right, yes.

JOHNSON: Did you have any idea—what were your thoughts about what you would be doing, or what did you know about your job when you first started?

HIRASAKI: I had one interview with the person who hired me. It was Wayne [E.] Koons who was my ultimate supervisor. I didn't know what was really involved, so I came over to visit one day, just to sit down with him and had a chat. Matter of fact, he invited me to his house. The

interview was held at his house. He explained what the division did and what was involved with the job, and I was just glad to be in any part of the program, because to me it was an adventure.

JOHNSON: Let's talk about those first days, when you first started working here. What type of training did you receive, and what were some of the first positions or assignments?

HIRASAKI: That's very interesting because at that time, when I first started, one of the first tasks I had to do was to do a failure modes and effects analysis for the recovery systems that were aboard the Apollo Spacecraft. In other words, you had to go through a system and say, "What are the probable causes of any component in this system failing, and what is the result of that failure?" So it allowed me to learn a couple of systems that I worked on early in my career. Since the Landing and Recovery Division was responsible for those type systems, after the Apollo Spacecraft landed, they had the post-landing environmental control system and they had all the recovery systems, the systems associated with being able to recover the spacecraft. I was working on two of the systems, the post-landing environmental control system as well as the deactivation of the reaction control system. They are somewhat disparate systems, but since the Landing and Recovery Division was responsible for that, they had engineers that were looking after each system and performing tests as well as review procedures, and things of that nature.

With respect to the post-landing environmental control system, one of the things that the Landing and Recovery Division was doing at that time was going through a series of tests to qualify the equipment and operation of that to support the survival of the crew for forty-eight hours. If they landed, say, in a remote area, this system had to be able to support the crew for forty-eight hours before they would have access to recovery. We set that time to give us a buffer

or to cover what we would consider the worst-case scenario. Associated with that—and I may be stepping ahead of myself—was the hardware that was physically aboard Apollo 6. Apollo 6 was the last unmanned flight prior to manned spacecraft, so we were actually flying hardware and we were certifying the hardware for flight using that last unmanned flight.

A problem that they were concerned about was after the valves were launched into space and exposed to space environment and the spacecraft landed, would the [post-landing ventilation] valves—because they were electrically motor-driven valves—there was concern that the seals that prevented air from leaking out would stick to the surface to the point where they could not open after seeing this environment. To make sure that we didn't have a problem on there, they actually sent me down to the Cape [Canaveral, Florida] with a test setup, which was a recorder and a power supply to connect to the valves to make the valves open and close, and measure the current requiring these valves to operate. Interesting enough, here I am, an engineer just a couple years out of college, "Here, go take care of this." So I get travel instructions, they sent me down to the Cape by myself, "Go see these people and they'll give you access to the spacecraft."

So I drive into KSC [Kennedy Space Center, Florida], get cleared in, go up to the Vertical Assembly Building where the Apollo was stacked up, and show them my papers. He says, "You want to go up in the Command Module." So he says, "Okay, first you've got to take your personal effects out, put on a bunny suit [clean room attire], sign these releases, and once you do that then you can go on up to the Command Module." So you go through all this, and it's sort of interesting the first time you do something like that. So I said, "Well, how do you get to the Command Module." He said, "Well, just go through those double doors there and take the elevator on up." So I'm in my bunny suit, walk through a set of double doors, and all I see is a

white wall in front of me. The wall is slightly curved. I say, "Where's the elevator?" So I went one way and it just seemed like it stopped, so I went the other way. I started walking around this curved wall, and I spotted an elevator. Then I realized, the curved wall isn't a wall. It is the Saturn 5 rocket. It was so huge, and since I did not see the vehicle coming in, I just came in through the side and went in, I didn't realize what it was that I was actually seeing in front of me.

So now comes this interesting ride all the way up to the top to get into the Command Module. So you go up, you show them your papers. "Yeah, you're clear to go inside the spacecraft." Pull my electrical connectors, run my test, hook everything back up, and come home. Well, the reason that we did that is they also tasked me to go out on the recovery ship for Apollo 6. "Now, run that same test post-landing." So that was the tie-in I had as far as the post-landing environmental control system. Because as a part of the recovery team, I was performing the same test on the vehicle after it had gone through the flight environment and had landed and been recovered, back aboard the recovery ship. Because the valves would not have been opened because it was just an unmanned flight, so we simulated after we got the spacecraft onboard, connected the power and saw how much power it took to drive these valves open and closed.

But that's just an interesting aside for a young engineer that's just fairly fresh out of college, to be given that sort of responsibility. It also explains what was so neat about the program. You were part of something that had never been done before. You were part of a program that the President [John F. Kennedy] said, "Our nation will undertake this, to send a man to the Moon and return him safely back to Earth." Not because it is easy; because it is hard. It pressed everybody. You might say it's a very challenging set of goals, to be able to accomplish all those things. And I think that's why everybody who was involved in the program

at that time had this, "I'm doing something important. I'm part of something that's much bigger than myself." It was just a great feeling.

JOHNSON: As you mentioned, you were fresh, just a year or two out of college and you were young, and everyone that was coming in that time, you weren't young compared to other people because everyone was young and fresh out of college. But there were some engineers that had been there for a while.

HIRASAKI: Yes.

JOHNSON: What was that relationship like for you coming in as this young engineer, and working with some of the older engineers and getting that autonomy to go out and just do something?

HIRASAKI: It was very interesting because, like you said, they were the original core group that had worked from the Mercury/Gemini Programs and were now in the, you might say, the supervisory or the management ranks. They really enabled the engineers to do what was necessary, gave them the guidance yet allowed them the autonomy to take it upon themselves to make sure everything was done correctly. How you did it, you were given quite a bit of time to do that.

It was an excellent mentoring experience, and I think one of the things that we had in the Landing and Recovery Division as compared to a lot of other divisions at NASA at the time, we built hardware in house, we tested it, we developed procedures, and then we executed operations.

So you got to do all the various pieces—and I'm just giving you one example for one piece of hardware. Then you understand the relative importance of something working or not working, and the consequences if it doesn't work. You have a much more tangible—how would you say it? Experience is a great teacher. People can tell you all these things. Until you've done it for yourself, it's hard to appreciate how critical one little step is, or the design of one piece of hardware is, and you realize how many pieces of hardware it took to get a man to the Moon and back. So it just emphasized that.

JOHNSON: There were other areas of Landing and Recovery. If you can just describe some of the areas that Landing and Recovery was responsible for, and maybe the area that you ended up working within. I know that they had the deck force, like on the aircraft carriers. Then you had a lot of the testing and everything that went on. If you can just describe the department and a little bit about the department, how it was organized?

HIRASAKI: Well, like I said, the Landing and Recovery Division was an excellent opportunity for engineers, because I could do a little bit of all of the things I described. I could participate in operations. I could participate in the development of the design. I had done each one of those. I described test criteria to certify pieces of hardware. Then we went out and then built the procedures, and then we implemented.

Before the Apollo Program, it was very shortly after I came to NASA, we were still at the very tail end of the Gemini Program. On the Gemini Program, we were at Gemini 12 when I was deployed. The Landing and Recovery had their own internal training programs to teach each one of the engineers, on various recovery ships, how to explain what had to be done to

safely recover the crew and the spacecraft. You had the primary recovery ships, but you had multiple secondary, contingency recovery ships. So we had deployed the personnel out of our division to multiple locations, and I was assigned to a destroyer in the mid-Pacific. I was the only NASA rep [representative], and I had one photographer with me. But it just goes to emphasize the amount of responsibility NASA provided engineers of my age to assist the infrastructure, the DoD [Department of Defense] infrastructure, to enable the safe recovery and return of the crew and the spacecraft.

There had been other cases where a spacecraft had come down in contingency areas, unplanned landing areas. So you had to have that covered and someone had to be there who knew what should be done, how to go about it, and explain to the personnel—in our case which was DoD—how to properly handle the equipment, how to safely recover the spacecraft, and how to avoid the hazards. There are a lot of hazards aboard the spacecraft. There are unexploded pyrotechnics, there are propellants which are extremely, extremely toxic and flammable—and for good reason, because in space, you have to resort to some very complex systems in order to be able to control the spacecraft in a vacuum. Those solutions end up with extremely toxic propellants for [spacecraft] attitude control.

That was another one of my responsibilities, is after I had worked on the Gemini recovery, on that last one, fortunately the spacecraft did not land in my site so I was just there as a standby, had it landed. But on the Apollo, they asked me to take part in the deactivation of the spacecraft, which started after we got the spacecraft on deck, there is a minimum set of deactivation to do just powering down the spacecraft. Once it returned to the first land base, we had to remove all of the propellant and safe all the pyrotechnics before we could ship that spacecraft back to the manufacturer site.

So the propellants that were used on the spacecraft at the time, I think Mercury had monopropellant, whereas both Gemini and Apollo had bipropellants for the attitude control system. They used chemicals like nitrogen tetroxide for the oxidizer, monomethylhydrazine for the fuel. And these particular propellants are what they call hypergolic, they ignite upon contact. So you don't have to put a spark to get them lit. All they had to do is physically come in contact; they immediately combust. The other factor is we called them Earth storables. In their separate states, if you store them in a container, they'll stay liquid at room temperature. So under normal atmosphere, normal temperatures, they just stay in liquid form. But if you combine the two, they immediately combust. So that made them extremely flammable. At the same time, the chemical characteristics made them very, very toxic. So, before we can ship these spacecrafts back to the manufacturer, you have to purge or neutralize the system, so you make sure that if you had any problems, you don't have any leakage aboard the aircraft or over the public, right-of-way transportation, you're not emitting toxic, flammable elements. So that was my involvement in the post-flight deactivation of the early Apollo Spacecrafts.

JOHNSON: You mentioned on the Gemini 12, and if we can go back to that just for a second. You were on the ship that didn't have anything to do with the splash down because you were in a contingency area. Can you just walk us through, or if you have any anecdotes about that specific assignment or some of the things that you experienced while you were on the ship? Talk about that relationship a little bit—since you were the only NASA rep—and the DoD that was on the ship.

HIRASAKI: All right. Imagine yourself a young engineer, telling a captain of a ship what to do.

(all laugh)

HIRASAKI: So you can have an idea. This was the ship I was aboard [shows card from wallet]. The reason I keep these things around, it's just sort of interesting to have participated in something like that. As the NASA representative aboard a recovery ship, you've got to explain to the captain as well as the crew exactly what techniques should be used to safely recover the spacecraft as well as rescue the crew. It gets into a lot of—even though we had standard procedures that were sent out and developed for all recovery ships, there're always questions that come up. "Well, what do you mean, you have to thread a line to this point here?" So aboard each one of the recovery ships, you need a representative for NASA to walk through, you might say these intricacies of what you had thought to be [standard recovery] procedures.

Now, having performed these stateside and having developed procedures, we understand—we in Landing and Recovery—understood what had to be done. Matter of fact, each one of us, everybody who was deployed, would go through a training session prior to deployment. It says, "Here's the things you need to watch out for. Here's the points you need to make sure that the crew very well understand, so we have a safe recovery and don't hurt anybody." So it's interesting, because I think I was a GS-7 [general schedule pay scale] at the time trying to explain to the captain of a guided missile destroyer, "Here, you need to do it this way." It's a lot of responsibility. If things go wrong, it's on your head too, by the way. You never quite thought of it that way, but to us, you might say it was quite an honor to be able to take part in it.

JOHNSON: How did you receive that card?

HIRASAKI: I think it's complimentary as the representative, as the NASA representative for the ships. They would usually do that, a complimentary card for the guest, because you're the guest on the ship. Aboard that particular ship in the North Pacific, I don't know if you've been aboard a destroyer before.

JOHNSON: No, I can't say I have.

HIRASAKI: Well, the north Pacific is not exactly what you would say a tranquil sea; matter of fact, it gets quite rough. We ran into some storms, and they had berthed me all the way in the officers' quarters, near the bow of the ship. Well, it's okay while you're sailing around in smooth water, but when you run into a storm—and a destroyer's not what you would say the most stable of cruise ships. Matter of fact, they pitch and roll a lot. The seas got so high that as the ship would go over a swell, it would drop in, it would bury the bow below the next wave, and the water of that next swell would come up and cover the bridge. So you can imagine, you're diving under this next wave and you get green water. Also, you see, they have a meter which tells you how much list you have, and you watch it and you say, "How far can this ship roll over before it won't right itself?"

So it was an interesting experience. But we were riding these seas at night, and being berthed all the way forward, the ship is pivoting by the midpoint, so as the ship went down, you felt very light. As the bow buried, you hear water rush over you, and then you hear the screws, the propellers of the ship, actually come out of the water and shake the whole ship. It's sort of

like the tale of a fish flapping in the air after it's exposed. Then as the buoyancy carries you back up, you feel like you're about twice as heavy as you normally are, laying in the bunk, until it pitches is all the way up, and all of a sudden you start getting light again. So after a while you start getting used to it, so all you do is just wedge yourself in a bunk and just ride it out. It's an interesting ride for anybody who's not been at sea aboard something like this.

JOHNSON: Had you ever been on a ship or anything before?

HIRASAKI: Not before I went to Landing and Recovery Division, and I have a tendency towards seasickness, so it takes you a few days to get acclimated. But once you get acclimated, it's okay.

JOHNSON: Yes, that's quite an introduction, I think, the North Pacific. Well, it was also during that time period there was a lot happening in the country, the Vietnam War and that sort of thing. Did you receive a deferment to come to NASA because of your age?

HIRASAKI: Yes, I did. Because of my age and because they needed engineers to support that activity, NASA submitted my name for deferment.

JOHNSON: There was also a lot of other activity, and especially toward the late sixties, things that were happening in the country. How aware do you remember being of what was going on? We've talked to so many people that were so focused on the mission and focused on what you were trying to accomplish with Apollo, and that they were somewhat unaware of what was going on outside of this circle of work.

HIRASAKI: Right. Well, you became very focused. That's an interesting point that you bring up. We had racial strife at that time period, and one of the things that NASA did is they assigned me to be a member of this forum which looked into racial intolerance. Except, they didn't call it that. It's only after I came to this meeting, I realized, "Hey, I'm representing an Asian. Somebody else is representing Hispanic, somebody else is representing African American. Oh! That's what this is!" Because essentially, NASA was quite colorblind. If you could do the job, that was what mattered.

You go back to growing up on a farm and then getting to work in a space program, they were looking for good, hard-working people. And if you had the education to where you could get a degree, where you had some expertise, NASA was a great place to work because, like I said, you were promoted on merit. It doesn't matter what ethnic group, religion, or whatever. It was just are you capable of doing the job? The job is very challenging. So I've talked to different school groups that have asked, and I've always emphasized that that is one great opportunity you have in this country. If you get a good education, the whole world is opened up to you, because too many people just try to skate by and just get the minimum education. But that's your ticket out if you're underprivileged in some way, or you feel oppressed. Just get an education, because that is your ticket out.

JOHNSON: With that group that you were involved in, what type of issues did you work on?

HIRASAKI: I just vaguely recall, it was an EEO [Equal Employment Opportunity] type of thing, so you know the typical topics that come up. It's just, "Oh, well, now I've been reverse-discriminated against by y'all sticking me on this particular forum!"

JOHNSON: That's funny. You mentioned some of the work you did with the post-landing, the life support systems and the reaction control system, when you were working with that. If you can just kind of describe some of that testing that you were doing, like on the post-landing, the life support [systems].

HIRASAKI: That's very interesting because, like I said, one of the very first jobs was doing the failure modes and effects analysis. The next thing they said is, "All right, John, why don't you define the radiation test environment, because we're trying to qualify this spacecraft. Figure out what we need to design to simulate the spacecraft being out in the Pacific for forty-eight hours." We had to simulate inside Building 260 a test of the Apollo Spacecraft. We had to simulate the sea state, we had to simulate the humidity, we had to simulate the temperature. So they asked me, "What sort of solar radiation can we expect the spacecraft to see, and how can we simulate it inside of Building 260?"

So once again, they send you back to the books. Do your research, do your calculations. Okay, I need this amount of radiating heat over the surface, and then you need to program it like the solar cycle so it comes up, you know, like say you had a cloudless day, what would the solar cycle look like? It ended up being a very complex set of conditions to simulate what a spacecraft would see in open seas, and to get the heat load that would represent, once again, the worst-case environment. We were actually stacking worst on worst because we were having worst-case

thermal plus worst-case humidity, which it probably would never get, but if you can survive these under normal conditions, the spacecraft was qualified up to this. So that was another activity which was strictly a design requirements activity that they had me do very shortly after I joined NASA.

In addition, the other thing is because we were a fairly small division, we did not just simply write up a test and turn it over to the test division to do. We ended up writing up the test and being test subjects of the procedures that we wrote. So you end up having to volunteer, "Well, you be a test subject for this test. I want to run this one," but you ended up being a test subject for somebody else's test. So that's why I'm saying you got to experience what it takes to design systems very intimately, so you got to see various aspects. Not only the calculations, not only procedure. You participate, so we were actual participants. We were the guinea pigs in a lot of cases.

JOHNSON: Do you recall any of the ones where you were the test subject?

HIRASAKI: Yes. There were several. One was in a contingency egress test where you had three incapacitated crew people in the water. We ran that inside of Building 260 in a water tank we had built for the post-landing qualification for ECLS [Environmental Control and Life Support]. They suited us up in the crew suits because what they were trying to do is develop procedures for the swimmers or the rescue team to open the spacecraft, extract the crew, and secure the spacecraft so we could have written procedures and know that they worked and you didn't have any gaps and you didn't drown somebody in the process. So doing it inside of a pool, you could go through the steps very methodically. For that particular test, I was just simply a test subject.

JOHNSON: What were some of the others?

HIRASAKI: That gets a little farther downstream. After I had worked a couple of the Apollo recovery missions themselves, I got assigned another duty, which was to be the project engineer for the Mobile Quarantine Facility. You're aware that we had imposed conditions that we had to quarantine the crew after coming back from a mission. So we now have the situation, you've got to develop hardware, qualify it, develop procedures, and execute the quarantine of the crew that's been exposed to lunar surface.

The hardware was designed by the time I got to NASA. It was being actually manufactured, I think, in the mid-1960s. I don't remember whether it was in 1967 or '68 I was asked to take over the project for the final test and qualification, to prepare for operations. But there, Melpar [Incorporated] was the design company. They subcontracted to Airstream to build the shell. The quarantine facility was a fairly complex—it looks like an Airstream trailer from the outside, but on the inside it was very, very different because we had to maintain biological isolation of the crew once we got them inside.

Now, in addition to making sure that the equipment would maintain the biological isolation, there were multiple tests that we ran on that. One, after the crew was brought inside the quarantine facility, they were transferred from the ship to land to go over to the airport and to be transported by aircraft back to JSC, and then transported by land to the Lunar Receiving Lab. So we had to qualify the whole unit for operations shipboard, we had to qualify it for operations airborne, and we had to qualify it for all the immediate transport activities, all while maintaining quarantine and biological isolation of the inside from the outside.

To do the shipboard qualification after we had the first unit built, we put the Mobile Quarantine Facility aboard a destroyer in Norfolk, Virginia, and took it out for sea trials. What we were trying to do at that time is actually having the hardware aboard a ship in actual sea-state environments. So you're operating aboard, shipboard, using shipboard power. You're dependent upon the crew to provide you all your external systems. You were exposing it to the sea environment. All this time, you want to make sure everything operates and nothing leaked, because that's the conditions that you had to do. So we did that particular test to qualify it for the shipboard environment.

To qualify it for the aircraft environment—now, once again, I was a test subject inside of that one. To qualify it for aircraft environment, we had this unusual situation. The Mobile Quarantine Facility is designed to be transported by C-133 or C-141 aircraft, and your cruising altitude was around 35,000 to 40,000 feet. If you had rapid decompression aboard the aircraft, you wanted to make sure that the structure of the quarantine facility would not destructively fail. We had oxygen onboard the quarantine facility because if you had loss of cabin pressure, you had to make sure everybody's got oxygen onboard. So that's why it's not quite your standard Airstream trailer.

Aboard the aircraft, also you have different power supplies than what you have shipboard or land-based. So to simulate the case of being aboard an aircraft and going through rapid depressurization, we used the vacuum chamber here on site. We put the whole unit in it with test subjects inside, dropped the pressure to be equivalent to 35,000 feet, and depressurized the chamber. Is everything going to work? Obviously you've got backup safety equipment, because you are putting yourself at risk anytime you do any of these things.

In doing any test, you have to be very conscious of safety of personnel. So not only are you testing systems to ensure that you have the failure tolerance of any, you might say reasonable contingency, you actually test the hardware under those same conditions. So that was to qualify the equipment aboard rapid depressurization of aircraft. Obviously, we didn't go up on the aircraft and depressurize because you're putting too many people at risk to try to do something like that.

Now, what we finally did to get the final qualification of the Mobile Quarantine Facility and its associated equipment was to do a parallel mission on the Apollo 9 mission. We loaded the quarantine facility aboard the prime recovery ship for Apollo 9, went out to sea, picked up the crew and the spacecraft, and we simulated all of the steps that we would have to go through from the time we recovered the crew to the time we got to the Lunar Receiving Lab. So we did, literally, a full dry run of everything we would have to do for the lunar mission on Apollo 9. So that is to give you the idea of the extensiveness of the test activities that we went through.

JOHNSON: I know you worked with Apollo 6 on the ship, and Apollo 9. What other missions prior to Apollo 11, the Apollo missions, were you covering?

HIRASAKI: I worked Apollo 7 and Apollo 8, but only for the deactivation part, for the deactivation of the spacecraft. On those missions—and at that time, I was heading up the deactivation team, the land-based deactivation team, so I did not go aboard the ship. I waited until the ship came into port, and then after they off-loaded the spacecraft and brought it to the hangar where we could start our activities, then we had a crew go in and safe the pyrotechnics,

and they flushed out all the propellant. So on those two missions, my recovery operation was just limited to the post-flight deactivation of the spacecraft.

JOHNSON: Did you ever go to Florida as part of the recovery work that they were doing out there for the launch?

HIRASAKI: No, I did not cover any of the launch abort activities.

JOHNSON: In 1967, though, you went to UCLA [University of California, Los Angeles] for a technical course in advanced propulsions systems. How did that come about?

HIRASAKI: That was a filler. The reason I say it's a filler, we had the Apollo fire [Apollo 1] earlier that year, as you recall. Now we had to have an investigation. What caused the fire? What are we going to do to correct it? So we ended up with a stand-down of flights. So NASA offered, since we weren't doing real-time missions, do you want to take some of these courses which will give you some insight, to develop your career is basically what it was. So there was an assortment of courses being offered to NASA employees at the time, because we finished the Gemini. Apollo is on hold. So what are you going to do with the people? So that really was a filler activity that allowed me some experience for later in my career, to understand technologically what are involved with all these different propulsion systems.

JOHNSON: During that time, as you mentioned, the Apollo 1 fire. Can you talk just for a moment about the atmosphere onsite and at the Center, and how the fire affected any of your testing that

was being done for the MQF [Mobile Quarantine Facility] or for the fireproofing and that sort of thing?

HIRASAKI: Very interesting you should ask that, because there was a direct relationship. Because of the Apollo fire, we were asked to reexamine everything inside the Mobile Quarantine Facility, because we could potentially be in an oxygen-rich environment, which is the depressurization case where you're dumping pure oxygen inside the system. So we had the design team go through the materials that were contained in the Mobile Quarantine Facility and say, "Are any of these susceptible to an oxygen-rich atmosphere?" The answer came up yes. There was fabric material that could be potentially flammable in an oxygen-rich environment, and a lot of the inner structure panels were made out of wood, because we did not—it's just, "Hey, we'll use what's existing, you know, don't redesign everything." But since we'd already accepted the design and we had it built, we said, "Well, what can we do?"

One activity was, well, how do you reduce the flammability of the wood panel? They came up with a fluorocarbon paint that you could apply on both sides of all of the wooden panels, and that's what we did for the mobile quarantine. The fluorocarbon paint, you could put a blowtorch on it, it would char but it would never openly combust. It would never go into self-sustained combustion. So that was another outcome of that wariness of the potential hazards to the crew and personnel under these oxygen-rich environments.

JOHNSON: Along with the Mobile Quarantine Facility, and because of the concern over possible contamination from the astronauts bringing back from the Moon, the Interagency Committee on Back Contamination—

HIRASAKI: ICBC?

JOHNSON: —was formed. One of those projects that NASA developed to comply with their requirements was the Biological Isolation Garment, or the BIG. There was a lot of controversy about that because of the bulkiness and the heat, and it was difficult to put on, when they were first developing it. If you could discuss some of the work that you did with that, and some of the—I think you did some work investigating complaints—and some of the work on how the tests were conducting with that.

HIRASAKI: I was not directly involved in the development of the BIG. My colleague, Frank Janes, led that activity; matter of fact, this is once again getting a little ahead. To support the lunar missions, since we didn't want the same person to work every mission and we wanted some backups in every case, the Landing and Recovery Division asked for volunteers to act as the recovery engineer that would be quarantined with the crew. There were four of us that said, "I'll do it." I guess before they did that, they put constraints that said they would prefer you not to have a lot of family commitments and stuff like that. (laughter) Because they didn't want to put people unnecessarily at risk that had a lot of responsibility. So young engineers are the usual suspects. But those that volunteered besides myself were [Brock] Randy Stone, Ralph [H.] Culbertson, and Frank Janes. So there were four of us that volunteered, and we elected to rotate who was on the inside and who was on the outside for each one of those missions.

But Frank, who has since passed away, was responsible for the development and qualification of the Biological Isolation Garment. Since that was an ancillary piece of quarantine

equipment that occurred in the segment between the spacecraft recovery and the [Mobile] Quarantine Facility, other than how it interacted with the quarantine facility, I did not really take part in the qualification tests or the development.

JOHNSON: But you were aware of some of the issues that they were having.

HIRASAKI: I'm well aware of that, and as you can read in historical documents, that there was a lot of controversy over the use of that equipment. But as you say, the ICBC wanted to take whatever measures they felt appropriate without compromising the safety of the crew to protect the other personnel from potential contamination from lunar surface materials. So that was one of the measures that we took. Because when you put yourself in a garment that doesn't leak and you're operating in elevated, humid conditions, you run into this heat problem. So after we did Apollo 12, I think that was the last time we used that suit. Since Apollo 13 was an abort, we didn't use it. But by the time Apollo 14 came around, with the evidence of potential contamination of lunar material being evaluated from two previous flights, the ICBC agreed to relinquish the requirement to wear the BIG between the time the crew was moved from the spacecraft and put into the quarantine facility.

JOHNSON: We talked about Apollo 6 briefly, but can we go back to that for a minute and just talk about what was involved, maybe in a little more detail, on making sure that the Command Module was safe once it came onboard? What type of hardware was developed for any contingencies or emergency situations? Like you were talking about the hypergolic materials

and that sort of thing. Was there anything that was specifically developed to take care of any kind of emergency situations if anything spilled and that sort of thing once it was onboard?

HIRASAKI: We did not build any special equipment; what we did was develop procedures to address that particular contingency, because we were not actively interfacing with the propulsion system, attitude control system, while it was physically aboard the recovery ship. The system was put into a safe mode while it was still on parachute. The Apollo Spacecraft was designed where it would dump the propellants, any excess propellants, while you were on main chutes. So most of the propellants would have been dissipated to the atmosphere even before it touched down. At touchdown, the systems were turned off so there was no power. The valves would turn off so you got electrical and pressure isolation to keep the valves from opening or any propellants from being expelled. So it stayed in this particular configuration until we offloaded the spacecraft at the land base, where then we hooked up specialized equipment which would handle toxic and flammable propellants so we could then actually flush those propellants outside of the spacecraft, and then put neutralizing solutions to neutralize any residual that remained in it.

What we did aboard the shipboard, and aware that if there was, say, a broken pipe or there was a leak that occurred, is we had developed procedures cautioning people that one, you always had the people upwind. So any fumes or flames were downwind, and you had the sufficient fire extinguishers and hoses already laid out to cover that contingency. By anticipating the problem, we developed procedures or counter-measures to minimize the hazard. So aboard the ship, we just used procedures and available equipment, versus specialized equipment.

JOHNSON: When you were preparing for the Apollo missions and doing the testing—and this may go back to some of the life support work that you did after they landed—how much involvement did the Apollo astronauts have in any of the testing, or how much interaction did you have as an engineer working on those systems that were going to be supporting them?

HIRASAKI: We did not usually interact directly with the crew. We usually had a [Astronaut] Crew Office representative that would work with us. So there were people who, like, on a lot of our dry runs, some of the test subjects would come out of Crew Office. So we had those people who were our direct participants in each one of the tests. Why put the astronauts at extra risk doing these qualification tests? So they had a representative who represented the Astronaut Office and who looked after their interests and gave feedback to the crew. So that's who we interacted with the Crew Office and not directly with the astronauts themselves. Now, the astronauts themselves did get training aboard each one of the spacecrafts so they would be familiar with what to expect and what were the procedures to go through. But since I was more in systems side of the house and not the training side, I did not interact directly.

JOHNSON: Did you ever have anything to do with the Aircraft Deployed Drift Reduction System, and the work that they were doing on that at that time?

HIRASAKI: No. I'm aware of it. I realize how it works. Once again, when you're a representative aboard a ship, you have to know how it works, what to do about it, what are the intricacies of how it does operate, because the recovery crews may not be familiar with it.

JOHNSON: Let's move on to Apollo 11. As you mentioned, there were four of you that volunteered to be part of the possible quarantine with the crews in those Apollo missions. Of course, for Apollo 11, you were chosen as the first one to go in with the crew. How did that come about that you got picked out of the four volunteers?

HIRASAKI: Well, it wasn't a matter of getting picked. You might say it's the luck of the draw. We actually drew straws, and the short straw went in first. I just happened to draw the short straw. Literally, it's, "Hey, how do we do this?" You know, everybody wanted to do it, because to be a part of an event like that, it's just really great. But at the same time, I didn't feel it would be appropriate to say, "Well, I'm going to be first," because why should I be first? So we did that, we just drew straws.

JOHNSON: Were you concerned before that? I know, as you mentioned, to be apart of this history, but were you concerned at all? I think I read that you had been married just prior to that.

HIRASAKI: Right.

JOHNSON: Were you concerned about the possibilities of contamination, or did your group really take that seriously as a true concern?

HIRASAKI: It's interesting you ask that. The ICBC, National Academy of Science, was very concerned. That's why we had all these constraints placed upon us, and that's why we took what we thought were all possible measures without impacting the safety of the crew to ensure that we

minimize the hazards. As ICBC stated, there is a potential back contamination from the lunar surface. Because of problems of importing pathogens from another environment, you had to take that concern seriously; therefore, we did everything we thought prudent to satisfy those concerns. About that time, there was a book out by Michael Crichton, and I read that book.

JOHNSON: I was going to ask you if you read it. (laughter)

HIRASAKI: I read that book before the mission. *Andromeda Strain*. Have you read it?

JOHNSON: Yes.

HIRASAKI: Okay, so you know the scenario. So you can imagine, there were mixed feelings floating around about is this real or is this imagined or what are the possibilities? At the same time, another side of your brain says, "Well, what are the chances really?" I'd say that really, if you want to sterilize an environment, what do you do? You heat it up. You freeze it. Or you expose it to hard radiation. Right? So you stop and think, "What does the lunar surface see?" They see these extreme cycles of heat and cold. It's in a hard vacuum. It's been bombarded by harsh radiation all the time. There's no atmosphere to filter it. So the chances are that the lunar surface is very, very sterile under those conditions.

Had there been an atmosphere, say like in Mars—Mars is a different case because Mars has an atmosphere. I don't know if you've been watching the recent photos back from the [Mars Exploration] Rovers. Is there moisture? That was the other thing. In a hard vacuum, it's hard for life to exist that we know of that would affect biological processes. You literally have to

have moisture, otherwise now we're talking about—life without moisture, you're talking a completely different realm than what would directly affect us biologically. So under those conditions, I felt the risks were very, very minimal.

JOHNSON: As you mentioned, when they wanted you to have as few as possible family connections, but then you married just prior to that. Was your wife concerned at all, or was she worried about it?

HIRASAKI: I don't know how much she was concerned. It was a situation I had already agreed to do it, so it's a little late to back out on deals like that. So I think you go in there with knowledge, there is some risk involved, but you agreed to sign up because you think the risk is minimal. The astronauts, on every flight they go on, they go over a much higher degree of risk than I was exposed to for back contamination. You think about the crew going up on any Shuttle flight, any of the Mercury, Gemini, Apollo flights, and think about the dangers they expose themselves to. To them, the risk is acceptable for what you achieve.

JOHNSON: Let's talk about your experience on Apollo 11, and if you could, just walk us through when you went to the ship and when you actually entered the Mobile Quarantine Facility. If you will, just walk us through that experience and what your duties were, from once they came down to when the astronauts were put in, and then when you were moved here to Houston.

HIRASAKI: Okay. That's going to take awhile.

JOHNSON: Well, that's okay. Do you want to take a break first?

HIRASAKI: Yes, why don't we take a break?

JOHNSON: Okay, okay.

HIRASAKI: Because that gets quite involved.

JOHNSON: All right.

(pause)

JOHNSON: When we stopped we were going to start with your experiences on Apollo 11, so if you want to walk us through those?

HIRASAKI: All right. I guess, just like on other missions, we had to deploy all of our hardware to be prepared aboard ship. The port that we sailed out was Pearl Harbor [Hawaii]. So we went out ahead of the missions, delivered the hardware, made sure everything was onboard, and checked everything before we parted dock to make sure we had everything we needed. Typically, they run recovery exercises with the ship as they're going to their recovery point. So you had all of their trial runs of actually recovering the crew and going through those exercises. To avoid any problem with the doctor and I being contaminated by a person aboard the ship, they put us into the [Mobile] Quarantine Facility and isolated us from outside direct contact, and I don't know

exactly how many days before the lunar landing. It was just about that same time, because I recall that Dr. [William R.] Carpentier and I were sitting inside the Mobile Quarantine Facility listening to the voice down of the lunar landing. So we could follow along, we could follow along and keep track of how things were going.

Now, the way we maintained biological isolation of the crew from the recovery personnel after we got the crew inside the Mobile Quarantine Facility was the Mobile Quarantine Facility was at a slightly lower pressure than outside, so we had fans that always kept the air coming into the quarantine facility—if you have any cracks, air would tend to go in. But all air that was being expelled went through a very fine porosity biological filter—and speaking of tests, I had a test over here onsite where personnel from Fort Detrick [Frederick, Maryland] came by and they actually put spore samples inside the quarantine on the surfaces. They dusted atmosphere, they put it into liquid systems, and they then checked for any spores getting out or any spores surviving a decontamination process.

We did have what was called a decontamination lock built into the quarantine facility so we could bring things into the quarantine facility and send things out. The way that the decontamination lock worked was before anything was sent out of the quarantine facility, the object was double vacuum packed and sealed in polyethylene containers. It was then placed in the lock. The lock was then flooded with a sodium hypochlorite solution and remained in that state for some period of time, and then the lock was drained down to empty the sodium hypochlorite. Then, once that cycle was complete, the outer lock door could be opened so they could remove the item from the lock that was built on the side of the quarantine facility. That way we didn't have to store all of our food onboard, and we could get the samples, the lunar

samples and things, outside the quarantine facility. So that's how we operated preceding the crew coming onboard.

Now, as you recall, after the crew were taken out of the spacecraft, they had their Biological Isolation Garments on. They were then scrubbed down, I believe, with Betadine [topical antiseptic], with a rescue swimmer who was also in a suit. The hatch area was also scrubbed down, and then the crew were picked up by helicopter and then transported by helicopter while they were in the Biological Isolation Garments to the deck of the ship. The helicopter was brought down into the hangar deck and moved over close to the Mobile Quarantine Facility, and the crew exited there along with Dr. Carpentier. Dr. Carpentier was aboard the helicopter at that point, and he came in with the crew. Once we got the crew inside, [we closed the door to the MQF].

I should mention that we had a tunnel that was partially erected but sealed off on the end. This tunnel was made out of a polyvinyl type of material, translucent material, and its shape was kept and supported by metal poles, so it would retain its shape. So it was restrained to stay open against the negative pressure. It was set up so the end was sealed off, so when the spacecraft came onboard, the spacecraft would be brought from the flight deck, lowered down to the hangar deck, and then towed on a trailer in the hangar deck up to a position where we could connect the tunnel to the spacecraft.

What they did is then they restrained the tunnel against the spacecraft, strapped it in place, and now, since the inside of the tunnel was connected to the Mobile Quarantine Facility, I could go inside the tunnel, and open up the inner flap. That allowed me to open the spacecraft door. Once I opened the door, one of the first things that you do with a spacecraft is you do a photo documentation of what the configuration is. So here is the as-recovered condition. That's

the very first thing you do. Then there is a switch configuration check to make sure exactly what position are all of the switches, so you do that sort of recording. After those two things were done, then I proceeded to go ahead and remove—the first thing they really wanted was the lunar samples.

There is a little aside here, that when I opened up that spacecraft—and people have asked me this. I noticed an unusual smell of this spacecraft as compared to the other spacecraft I opened, and the smell was like Fourth of July after fireworks, there's that scent that you smell of black powder after firecrackers explode. It's also the scent—and this is the country boy speaking—if you strike two pieces of flint together, you get that same scent. Do you know what I talking about? I suspect what it was is the lunar surface has been constantly bombarded by micrometeorites and meteors and things like that, so it's churned up. But, like I said, it's exposed to a vacuum environment so nothing reacts, because there is no moisture, there's no atmosphere, there's no oxygen to react the broken rock surface. So I suspect what I was smelling was some slow oxidation or reaction of the lunar surface material with our atmosphere and humidity in our atmosphere. Because scents require a carrier for them to occur, and the nose is quite sensitive to that sort of thing. I've read excerpts from other crew that they've also noticed this somewhat unique scent, the lunar surface material.

Anyhow, first things they wanted out was the lunar samples. The lunar samples were contained in an aluminum container that was machined out of two blocks of aluminum, and they had an iridium knife edge seal. So anything that they picked up on the lunar surface and placed in that, once the container was closed, inside the container would remain in a hard vacuum so you'd have no atmosphere actually contaminating the sample, so to speak. By the way, those boxes were actually built here, onsite. They just had machines and machined those boxes

straight out of chunks of raw aluminum. That's the other thing about NASA. At that time, you had to build things uniquely for spaceflight because there was no need nor anything built to deal with things like this, because you'd never done it before. Anyhow, having removed the lunar sample turn container from the spacecraft, I brought it in, double vacuum-packed it, put it through the lock, and sent it outside. Then Randy [Stone] would tell you what happened with it after it got outside. I cannot because that's the last I saw of it.

In the meantime, I proceeded to go ahead and get the other items out of there, the film canisters and things like that nature. There was also a contingency lunar sample bag that I don't know if you're aware of. One of the first things that the crew were supposed to do is—and this is not a sterile sample—but was to put into a beta cloth bag some rocks and dirt from the lunar sample, because if they aborted the mission, they didn't want to go home empty-handed. So there's this little bag of rocks and dirt that we brought inside and kept with us in the Mobile Quarantine Facility because we didn't want to lock that out. So it came back to us, all the way to JSC, inside with us. During that time, you see all the media of the President [Richard M. Nixon] coming aboard, talking to crew, so there was a lot of press exposure and excitement. Meantime, the doctor and I just kept to the background because it's the crew's show, because they're the one that took the adventure. But it was interesting talking with the crew just on the off-times, because we're just all sitting around chatting about, "What was it like to go to the Moon and back?"

JOHNSON: Were they ready to talk about it at that point?

HIRASAKI: Yes, they were. Matter of fact, they were very enthused and quite excited about it. I really think they wanted to share it with the world, the experience, the uniqueness of the adventure. I don't know how you would characterize it. I guess any exploration that mankind has done is an adventure. Just you stop and think of the old world exploring out and discovery, or looking for a route to China and you think you're going there, then you find something else that you never expected. The explorers that come back from this, carrying the news, "You won't believe what we saw, you can't imagine these things." That all out there, that's beyond our shores. So the crew were very much like that. They wanted to express, "Hey, it really was a new and unique experience," and everybody was very up, as you can well imagine.

Meanwhile, we did have these nice little off-the-book conversations. When we got back to Pearl Harbor, we were off-loaded amongst pomp and ceremony and put aboard a mobile transporter and brought over to Hickam Air Force Base [Hawaii], where they loaded us aboard a [C] 141 Aircraft, which was the standard aircraft that transported the Mobile Quarantine Facility. On the way, I guess the word is out, so the local residents just lined [the roads], so the crew is watching through the windows.

JOHNSON: So they didn't have it covered? They could see?

HIRASAKI: No, no, no, they could see the people on the route. They were enjoying the situation as much as the people that were observing and standing by to see them come by. At that time, this is the first time humans have set foot on another body other than the Earth. The enormity of that accomplishment, it's amazing. You could tell they were very happy to be home too, because I think there was, that's a very big undertaking and you don't know what all can get you, and

there are many things that can get you, like I said, that you had to watch out for. But we were put aboard the aircraft and flew into Ellington [Air Force Base, Houston, Texas], where we once again off-loaded in Ellington and put aboard another mobile transporter and brought back to JSC. Also from the time we landing at Ellington to the time we went to JSC, the route was lined by spectators and well-wishers. So I guess at Ellington, they were greeted by their family on the outside, so they did get to chat with them for a short period.

Once we got to the Lunar Receiving Lab, we backed the quarantine facility up to one door, where we sealed the aft section of the Mobile Quarantine Facility with the Lunar Receiving Lab. Once again, the Lunar Receiving Lab is also under delta P relative to atmosphere, so any leakage would have gone in, so we're not leaking anything out. So we egress the Mobile Quarantine Facility, went into the Lunar Receiving Lab, and then I closed up the quarantine facility. We kept the equipment running so for the time period of the quarantine, the delta P fans were always maintained at a constant lower pressure, and just like we do, we made sure we had redundancy both in power supply as well as equipment. So you do hold the quarantine, so a single failure would not have breached quarantine while you tried to keep the crew quarantined. We stored the quarantine facilities—well, I didn't, but the quarantine facility was stored onsite under lock, until the time the quarantine period was lifted.

Inside the Lunar Receiving Lab, we had a little bit more room. To the crew, the Mobile Quarantine Facility was big compared to the Apollo Spacecraft, so they really didn't worry about being cramped in there because we weren't in there that long. But in the Lunar Lab, now you've got separate quarters and everything. The crew went about their debriefs as well as their PAO [Public Affairs Office] events.

Meanwhile, a couple of days later, first they had to deactivate the Apollo Spacecraft at Hickam Air Force Base, and then it was shipped by a C-133 to Ellington, and it was also transported to another bay at the Lunar Receiving Lab, where they closed the whole bay off with the spacecraft in it.

After the spacecraft was sealed inside the lunar receiving lab, one of my other jobs was to finish the equipment removal and decontamination of the interior of the spacecraft. Because before we released it—the interior of the spacecraft had a lot of lunar dust and stuff like that, so it's considered contaminated. Also, by the flight time back, your systems, your ECLS systems, your air circulation fluid systems, were seeing exposure to the lunar surface material. So I had to go inside the Command Module once it got back to the Lunar Receiving Lab, remove any other—and at this point, I can't remember what else I removed. I thought I had removed a flight recorder aboard the spacecraft, but I may have removed it inside the Lunar Receiving Lab. It's been too [long ago;] procedures will tell you where it got removed.

But after everything that they wanted out of the spacecraft was taken out, I had to then go in and use decontaminants for the atmosphere of the spacecraft as well as the fluid systems inside there, where I had to put decontaminants inside the fluid system and put para-formaldehyde inside the Command Module just for atmospheric decontamination. So it kept me quite busy, so there's enough work that I did not get bored while I was inside the Lunar Receiving Lab.

While I was there, I think the crew did take one of them. I do recall them coming into the spacecraft area, and [Michael] Collins had signed the spacecraft because he was in Command Module Pilot. He did put his signature on it while it was inside the Lunar Receiving Lab. While we were there, we did get to have visitors. My wife did come visit me occasionally, and it's nice, but you've got this nice little barrier between you. (laughter) And being newlyweds, you

sort of hated to be separated, but we all endured. So everybody was glad when the quarantine was over and they let us out.

JOHNSON: How long were you in there?

HIRASAKI: Well, they were counting twenty-one days from the time of departure from the lunar surface to the time that the quarantine was over. I think that's how they counted it. I may be off, from the first exposure versus departure from the lunar surface, but basically we had twenty-one days of required quarantine. That included the exposure time, flight time, and all the travel time.

JOHNSON: Describe the MQF and the interior and how it was designed, and maybe some of the things you did while you were still in that on the ship.

HIRASAKI: Okay. As I said, Melpar designed the MQF uniquely for this mission. We used the exterior shell structure and a lot of the interior paneling that was available. We did not redesign drawers. They already had drawers, they already had sinks, they already had mirrors, they already had a shower and a tub. So why go design that? So we used what equipment we could use that already existed. But even though it may look like an Airstream trailer from the outside, the entire substructure was made out of extruded aluminum, and the reason it was built that way was for structural rigidity, because it had to withstand the landing loads of the aircraft. So it had rails that were specifically designed to lock into the cargo rails that are built in the bottom of the C-141 and C-133 aircraft. Of that mass of trailer, they had to withstand landing loads, so it was much, much stronger than what you would have in a typical travel trailer.

In addition, we had to put in the decontamination lock. We had to have aircraft quality seats because we were going to be flying in an aircraft. We had to have oxygen, emergency oxygen. We had to have a communication patch panel so we could get signals in and out. So that's how we had communication inside and out, for the press and whatever. We had an interface, we built in a patch panel. The filters and their fans and the electrical systems that support them were unique because you don't run negative delta pressure inside of travel trailers. We had our onboard power supply, so while we're being lifted between the ship and the transporter—matter of fact, the transporter does not provide us power—so we had to have a system which was compatible with the shipboard power, which was one type of power; with the aircraft power, which is another type of power; with ground facilities power, which is three types. So the system had to be able to work with any one of those different power sources. In addition, it had to operate on its own, so we had diesel generators onboard plus battery backups. So you had multiple power systems that were built in there, both for redundancy as well as compatibility for the means of transport or connection to power source.

The tankage it had for holding the wastewater and stuff like that was conventional materials, but we had to make sure we had the isolation, sufficient isolation or decontamination. If the case we had to vent atmosphere, you always vented it through a filter. We had built on the sides of the quarantine facility two blowout panels, so if you did suffer rapid decompression, if the decompression was rapid enough, the panels would fracture rather than the structure failing. But we utilized things like the air conditioning, we used conventional air conditioners. We used the existing bunks other than the fireproofing. We used the existing lavatory and conventional water supply. So we used available equipment where it suited the purpose, and we designed

unique equipment where the situation demanded it. So even though it has the shape, it's not the same thing. Just because it looks like it.

JOHNSON: Was there anything, any special requests or any type of food that the astronauts had requested to have once they came back, and were you the chef while you were inside?

HIRASAKI: Well, that goes back to the sea trials. Remember the first sea trials I told you about where we put it aboard a destroyer? At that time, the food was provided to us. On those sea trials, I forget who provided the food, but they had lobster thermidor, they had eggs benedict, they had all these exotic meals. They don't mix well with shipboard operations, especially if you're feeling a little queasy, so we asked for quite a bit blander food when we went to the dry run, for instance. So once again, that's why you do these tests. In a real environment, is the food compatible with what you're doing? The answer was no. So you change it to suit the situation. But the crew did not specifically—if they did, they didn't tell me.

One other thing we had aboard the quarantine facility was a Litton microwave oven. Stop and think, in 1969, microwaves were not very common; matter of fact, they had just come out. In the sea trials, there was an interesting meal. Because all you did was just put the meal in, you just turn the dial, and you nuked it. But interesting thing happened on the eggs benedict, for instance. You put it in. It says how long you're supposed to cook it. You cook it so many minutes. Take it out. It's sitting on a plate, and the egg explodes. So now they tell you about it, "Don't ever microwave an egg!" Because it will explode on you.

JOHNSON: That's funny. During the time once you got back to Houston, you were in the LRL [Lunar Receiving Laboratory]. You were joined by some people that were inadvertently exposed.

HIRASAKI: Right. In the LRL, we did have additional people accompany us. We had a PAO rep. I think we had some LRL support people already were preplanned to be on the side with the crew, just to facilitate food preparation and things like that. However, the rules that the ICBC put down were that if any person handling lunar sample became directly exposed to the lunar surface materials, they would have to be required to go in quarantine with the crew at the time of exposure. There were, I think, two incidents I recall. One was a glove tear. I forget what the other one was. But in each case, because they were working with lunar samples, quarantine was compromised with that individual. That individual had to go through a double-lock to the quarantine side, to the crew side of the quarantine facility, LRL. Once again, those were the conditions that we set procedurally up ahead of time.

JOHNSON: So you'd already made arrangements in case something happened?

HIRASAKI: That's right. So those procedures were already in place, and that was the protocol that you had to follow if there was a violation of quarantine or exposure to lunar surface material.

JOHNSON: The bag that you brought in that had the rocks and the dirt and everything, you had that with you as well once you got to the LRL?

HIRASAKI: Yes. I forget how we turned that over, but we carried it back with us in the quarantine facility.

JOHNSON: Had it been opened up while you were in the MQF?

HIRASAKI: Took a peek.

JOHNSON: So you did look a little. Well, if you want, it's almost three o'clock and we talked about stopping about three. We can stop here and make arrangements for you to come back and we can talk about your experiences starting with Apollo 12, and if there's anything we haven't talked about Apollo 11 then we can talk about that then, if that'd be okay.

HIRASAKI: That'd be fine.

[End of interview]