

# ORAL HISTORY TRANSCRIPT

S. JEAN ALEXANDER  
INTERVIEWED BY KEVIN RUSNAK  
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[This oral history with S. Jean Alexander was conducted at the Johnson Space Center in Houston, Texas on June 23, 1998. This oral history was conducted by Kevin Rusnak for the Johnson Space Center Oral History Project.]

RUSNAK: We were talking about what you do on the day of the mission and that type of thing, in terms of fitting the astronauts into their suits, walking around with the pads up to the white room and everything. What specifically goes on in there?

ALEXANDER: About six or seven hours before launch, the lead suit tech and then what we call the ASP, an Astronaut Support Person—it's one of the astronauts that is assigned for that mission—go out to the pad with the rest of the close-out crew. There's four technicians and a NASA QC [Quality Controller] that make up the team when we go out to the pad early after tanking. We go ahead and prepare the vehicle, get it ready for the crew to arrive. The ASP goes in, does a lot of switch verifications, making sure everything's set up and everything. The suit tech goes in, we make sure that headrests are installed, parachutes are in the right seats, TE units, the little liquid cooling units are securely mounted. Just anything that's associated with the crew [unclear], the suit and double-check and make sure everything's okay. The rest of the close-out crew, of course, they're doing a water drain. We install the LiOH [Lithium Hydroxide] canisters right before the crew comes out and stuff like that.

Then back in the suit room, in the O&C Building, there's a set of Boeing suit technicians that are back there. They actually suit up the crew, put them in their suits, do a little man-testing right before they leave to make sure that the suit's not leaking or anything.

Then there's a Lockheed suit tech that's part of the close-out crew. He rides out to the pad in the Astro van with the crew and brings them up the elevator. Then the lead suit tech does the ingress for the flight deck and Lockheed, the number-seven guy, does the strap-in on the mid-deck for the three crewmen down there.

RUSNAK: So the group of technicians works with all the astronauts as opposed to having one specific technician for each?

ALEXANDER: Right.

RUSNAK: Are you assigned to a particular crew and you train with that crew before the mission, or how do your assignments work?

ALEXANDER: Until just recently, there were three NASA suit technicians and we had three or four contractor suit technicians. Every third flight, a NASA suit technician was considered the lead. Then we had a Lockheed tech, and they rotated, too, so that we would have a different one each time. We would be a team from this side of the group. Then Boeing, likewise, would assign, depending on the size of the crew, anywhere from four to five technicians to work with that crew. Those technicians would try to work with the same crewman each time. Of course, sometimes that worked out and sometimes it didn't, so they'd see familiar faces at all the training exercises and know who to go to with questions and stuff. So that's basically how it's always worked in the past.

We're kind of in the middle of a transition right now. They're turning all the suit tech jobs over to USA [United Space Alliance], of course, because the Shuttle Program is going to be run by the contractors. Two of our NASA suit techs retired in December, so now we're bringing the Lockheed people up to be lead suit techs in charge of the overall mission now.

RUSNAK: So it was [Alan M.] Rochford and [Troy M.] Stewart that retired?

ALEXANDER: Rochford and Stewart, yes.

RUSNAK: Right now they use the launch entry suits, right?

ALEXANDER: Yes.

RUSNAK: How long have you been with NASA?

ALEXANDER: I've been with NASA since like 1965. I've been in this area working with crew escape since 1980.

RUSNAK: Prior to *Challenger*, and actually in the first five missions where the crews actually wore suits, did you participate in that?

ALEXANDER: Yes. Yes, I was lucky, I came on just at the right time. I got to support with Al Rochford, the STS-1 landing at Edwards [Air Force Base, California]. That's been the most exciting thing that I have done. I love what I do, doing the strap-ins and stuff, but STS-1 landing was the most exciting thing that I've ever been in, and Al Rochford was the lead for the land portion of that. Joe [Joseph W.] Schmitt was the lead for the strap-in portion. He strapped in [Robert L.] Crippen and [John W.] Young on STS-1. Then Al and I were out at Edwards to recover them when they landed.

RUSNAK: So you had a chance to work with John Young and Crippen?

ALEXANDER: Yes.

RUSNAK: How would you characterize either of them? Did you have any kind of interaction there?

ALEXANDER: Everyone that I have ever worked with are just remarkable people, the dedication and willingness to do whatever. Our equipment isn't the most comfortable stuff in the world, and until the last few years we didn't have liquid cooling or anything, and it was hot, not only was it heavy and hot and uncomfortable. They're just really great about working with it.

RUSNAK: You mentioned that you participated in the landing. What goes on there?

ALEXANDER: Basically, right now the way we have it set up, there's a crew transfer vehicle called the CTV [Crew Transfer Vehicle], that actually pulls up to the orbiter and makes a little walkway over to the orbiter hatch area. We open the hatch, the crew comes out, they walk across this walkway and they're right inside this big room. It's a mobile platform-type and they come in there and just a big room. It's like a big trailer house on high that can be jacked up.

They come inside the CTV and then they take the suits off and kind of get their land legs back and the doctors check them out. If there's any medical experiments that have to be done after landing, there's gurneys and stuff in there. They do blood draws, whatever they require for that specific mission.

RUSNAK: Once the mission's completed, what do you do with the suits? Do you break them down, analyze them?

ALEXANDER: In the beginning, before we had the CTV, what happened is, most of the crews would come off—well, when they just wore coveralls, the light blue coveralls, they would come out in their coveralls and just walk around. Then we had to recover the harnesses and the helmets and stuff. They would just leave them on board the orbiter, usually, and we had to go in and recover that type of stuff.

Once we went to the launch and entry suits, before we had liquid cooling, they would be so hot at landing that they would actually doff the suits right inside the orbiter, take off everything and just leave it in the floor and whatever. We would have to go in and get all that gear, bundle it up, and get it out.

Now that we have liquid cooling and the CTV, they are a little more comfortable at landing. It still gets hot after wheel stop and the heat starts to build up some in there. But most of the time, they come out suited and onto the CTV, and then they doff the suits there. We bag all of that equipment up, try to recover everything that we can that's covered on our crew-worn drawing and take it back to the suit room. Of course, everything's cleaned. We put stericide inside the suits to kill germs and stuff like that, clean everything up, then bag it and ship it back to Houston. Then it's tested again post-landing and turned around and put back into the system to be used again.

There's only like forty pressure suits, and all crews use them and train in them and fly in them. There's not a suit for each crewman like there used to be back in Mercury, Gemini, and stuff; everybody had their own suit. That's not the way it is anymore.

RUSNAK: Are you also responsible for preparing the EMUs [Extra-Vehicular Mobility Units]?

ALEXANDER: No, we don't work with the EMUs at all. There's a whole separate group of people that do that.

RUSNAK: So you just work on the launch and entry suits and that type of thing. What can you tell me about Al or Troy?

ALEXANDER: I was very lucky to get to train with Joe Schmitt and Al Rochford and Troy. Troy became a NASA suit tech just a few months before I came over to this area, so we kind of became NASA at the same time. Before that he had worked for the military and he had been doing this for a while, though. Then he had retired from the military and was working for the contractor ILC [International Latex Corporation] and then he became NASA, I think, after that.

RUSNAK: What year was that?

ALEXANDER: 1980 is when I came. Then Al was in the Navy, and he came right out of the Navy into NASA and became part of the NASA group. So he was already here. He had worked Gemini flights and Mercury and Gemini Program with Joe Schmitt. Joe Schmitt was like the leader of everybody [all suit technicians]. He's just the most patient, understanding person in the whole wide world. He's perfect to be trained by.

Al Rochford was wonderful about details. He would tell you ten times more than you ever wanted to know about anything, but once you had been through training with him, I mean, you knew what you needed to know. You didn't walk away uncertain about anything. He's just famous for his checklist and checking and double-checking. That's kind of what he left with the group.

Troy is the more laid-back of the three of them. He did an excellent job in everything that he did, but he approached it with more of a sense of humor and "Let's have a good time while we do it, too."

RUSNAK: Speaking of sense of humor, I know some of the other, particularly the pad technicians were somewhat famous for their jokes with the astronauts and their kind of kidding around, that type of thing. Does the same thing go on between the suit techs and the astronauts?

ALEXANDER: Yes. You try to do some things. We have a real good working relationship with them, day-to-day conversations and stuff, when you're suiting up and stuff. It's a friendly atmosphere. At launch time, things start getting a little more tense sometimes, so you try to do some things.

STS-1, one of the things is that John Young, I believe, made a big deal about the size of the American flag on his suit. It came in with kind of a small version and they got several sizes before he was satisfied with how big it was. They had to change it out two or three times, if I remember right, and it was kind of a joke. So, launch morning there was a motel that we stayed out in Cocoa Beach and they had this huge flag that flew on a pole right out by—well, it was actually a real estate office right next door. One of the suit techs that was down there for launch talked the real estate people into letting him take that flag down and he took it to the suit room for suit-up morning and had it actually covered one whole wall. When John Young walked in, he said, "John, is that flag big enough?" [Laughter] It just kind of lightened things up.

Same thing, like with STS-2, it was [Joe H.] Engle and [Richard H.] Truly. Both of them wore glasses. Back then the glasses had to mount into the helmet. They were attached to the helmet. Trying to get lenses and their current glasses at every training exercise, putting them in and getting the right glasses, it seemed like they change glasses a lot during that time. Every time we turned around, we were having to get new glasses or redo something.

So launch morning for one that one, I was at the Cape for that, for that launch. Al Rochford was down there. He put on a trench coat and he had like fifty pair of glasses on

each side. When they came in, he opened it up, he said, "This is your last chance," you know, to try for glasses. Big funny sunglasses, every type of glasses. Just things like that.

We do different things. Like the last flight, [STS] 91, they carried a canister of roaches for some type of experiment that they had. One of the techs had brought in an ad from home that was from an exterminator company that had a big roach on it. So we made a bunch of copies of these roaches. When we were down at the Cape, we like put them in their dresser drawer. They each have their own room where they live while they're at the Cape, in the crew quarters there. So we taped them to the wall in the bathroom, to the light fixtures, on their pillows, so that every time they opened a drawer or something, there was a little paper roach somewhere. Just things like that. Like they would stick them on their door outside their room, keeping count of how many roach kills they had, I guess, or whatever. But it was just stuff like that.

RUSNAK: That certainly would lighten up the tension, I think, before a mission. How long before the mission would you go down to the Cape? Just the day of?

ALEXANDER: No, we traveled down anywhere from five to six days, depending if there's a weekend in there. Of course, they try not to work any more weekends than they have to because of overtime and stuff. But it depends on when the launch falls and the flow. But we have to go down several days, first of all, to receive all the gear in. It's a lot of equipment. If you've got a seven-man crew, it's just a lot of equipment. It's tested here in Houston and then as soon as we get it there we test it all again, just to make sure nothing was damaged during shipment or anything.

Then we also do end-to-end com checks with all of the com gear, the lines and stuff that go into the orbiter with the helmets and stuff. All the O<sub>2</sub> hoses, the oxygen hoses and stuff, we test all of those once we get to the Cape. We do a checkout of all the parachutes



before they're installed on the seats and stuff like that. We charge the liquid cooling units or do a pre-flight testing on them once we're at the Cape. So that takes several days to get all of that.

Then the crew usually arrives anywhere from three to four days before the launch at the Cape. Then we start, we have meetings and briefings with them. Then at L minus 2, they come in and they do a fit check. They put on all of their gear, everything they're going to wear, and we do a man-testing with it to make sure everything's okay. They get to actually see their flight gear. Some of the flight gear that they actually fly with, they don't really see that much of in training, because they're just too expensive to provide for everyday training. They can't take the wear and tear.

There's a thing called a personal digital assist. It's like a small laptop computer that they use. There's one that they can use in Building Five, but for the rest of the training it's not here. So that's down there then. So it's the first time they really get to see a lot of that gear.

The survival equipment in their packs, for all their training, is dummy equipment, just for bulk. When they get down there they actually can pull the live flares out and see them and look at them again and review one more time. So that's kind of what the fit check is for.

Then suit-up morning they come in and they have about forty, forty-five minutes to do the suit-up. Then they head out to the pad.

RUSNAK: Do you use a whole separate suit for training, or do you have them use the actual ones that they might use for the launch?

ALEXANDER: We try to have them use the actual one that they're going to use for launch. Sometimes it just depends. If you have two crews back to back that have big people, big guys on them, there's only so many extra large suits, so you may have to have the second crew that's not prime, one of those guys may have to fall back to the next smaller size for

some of his training and then actually wait until that suit lands before it can be assigned to him. But we try to provide, at least the size suit adjusted to what that guy requires for every flight. It happens most of the time, for every training exercise. It happens most of the time and they always fly the size that they need. That's what we actually do at the Cape. We can take the cover layers off and do adjustments right down there, if we need to.

RUSNAK: How does that work out for durability purposes and how long will the suit last?

ALEXANDER: It's really amazing, with what they go through. We've just recently in the last couple of years changed from what we call the launch and entry suit, the LES, to the ACES, the Advanced Crew Escape Suit. One is a partial-pressure suit and one is a full-pressure suit. The LES is the partial pressure suit. Considering the number of time they've been worn and the number of bodies that have been in and out, and just a strenuous training, they have to climb up the top of the orbiter, go out the side of the orbiter, crawl in and out. They've taken quite a beating, and they've held up really, really, really well, considering. It takes a lot of maintenance. Boeing has about fifteen to twenty suit techs on board at any time, just to process and to maintain the equipment.

RUSNAK: Are you responsible for any maintenance here?

ALEXANDER: Right now over here in our building the only thing that we have responsibility for is the liquid cooling. We do take care of the liquid-cooling garments. We check them, make repairs to them, purge them, purge the air bubbles and stuff like that and in the liquid-cooling units. Right now we have a two-man liquid-cooling unit that we fly. Two people share one cooling unit. The next version of that is an individual cooling unit, the ICU,

individual cooling unit. That has not flown yet, but we've been testing it and doing some evaluations of it. It will be flying shortly.

RUSNAK: What's your role in development? You mentioned a couple of these changes that they're going through.

ALEXANDER: We do a lot of the things. The crew wanted a different knee board several years ago. They had metal knee boards and they wanted one that would do a few more things. Their T-38 knee board had like a clamp on it, top and bottom, or something. We designed what we call a fabric knee board for them to use. We make a prototype and we go over there with them and they try it in training, make suggestions. Then we finalize things like that.

When they have a problem with the suit, like their shoulders will hurt or something, we develop shoulder pads, some type of shoulder pad to put inside the cooling garment for them to use. When we started flying the parachutes after a couple of flights, we realized we didn't want the risers just floating around on orbit, because if it gets a hold of the D-ring and it gets pulled, you could have a problem. So we made a cover for the parachute that flies. We do things like that.

The crew had a lot of problems, on entry, the commander and pilot, especially, with the helmet riding on the back of their head during entry, because the shuttle comes in at such an angle, and with the vibration they were constantly feeling like they wanted to push the helmet back to get it off. Of course, any head movement at that time is critical, because it sets them to spinning. So you don't want to move it around any more than they have to. We developed a neck ring pad to put underneath the neck ring to support the helmet, to keep them from having to do that. That was a spinoff of—we heard one of the crewmen say that for entry he takes his helmet pads out of his helmet and puts them under his neck ring. We're

like, "Okay." [Laughter] So we made a piece of equipment to do that for him so he didn't have to do that.

The laptop computer on their knee board, we worked with the people, with one of the astronauts. Rick Mastrakio [phonetic] was in charge of that project. We had to develop a metal knee board for that thing to mount to and then strap to the leg and do that. We worked with them on that. We have access to machine shops and stuff like that, so it's easier for NASA to do that type of stuff, the development, anyway, than it is for probably the contractors to do.

RUSNAK: So there's obviously a high degree of astronaut input. Do they assign anyone to work specifically with development of the suits?

ALEXANDER: Yes, there's always someone assigned as the crew escape representative from the astronaut office. Right now it's K. C. Chawla. It rotates. They're here for six months to a year, and then a different person will take over and work it. Any issues that come up during the time that they're there, that's who we call if we have a problem or want to do something.

When we were down at the Cape, one of the crewmen wanted to wear their class patch on their shoulder. Well, you know, that had to be approved. So we called the crew rep and say, "Is it okay?" They give their blessings, or if it takes a higher authority than them, then they take it up the chain for us, so that we don't have to do it. So they do that type of stuff.

RUSNAK: So you said you've been working here since 1980, correct?

ALEXANDER: Yes.

RUSNAK: That's really a long time at this job. How do you think the role of the suit technician has changed?

ALEXANDER: Well, it's been pretty consistent. That's one of the things that's been so valuable, I think, in the program, because we have the history. Fortunately, the three of us that were here, four counting Joe Schmitt, this is what we wanted to do for a career. We stayed with it. We didn't come here and work for three or four years and then go off and do something else. That's been really valuable, because you get new astronauts all the time, new classes of astronauts. They come in, and the first thing, it's kind of funny, we always laugh when you get a new crew and you go over and you do training with them, they're wanting to reinvent everything. "Why can't we do this? Why can't we do that?" And since you have that history, you can explain to them why. "Why do we have to do this like this?" You can say, well, "Because," and so you can tell them why.

Like in the Boeing suit tech, in the contractor world, they have a high turnover of suit techs. If they stay three or four years, that's a pretty long time for their turnover rate over there. Engineers, too. So you lose a lot of that history. You're constantly in training. Whereas we selected our support contractors, our Lockheed people, we were looking for people that were young and that were looking for a career, because we had hoped that they would be the ones that would replace us, because we knew that eventually the NASA techs would start retiring, because we're reaching that age.

At that point we were told that we would be replaced with a NASA person. But then the program made the decision to turn the Shuttle Program over to the contractor. So they kind of thought, well, we really don't need probably three NASA suit techs if we're not going to be doing this anymore. So now we're just totally training the contractors to take over and do our jobs.

RUSNAK: So eventually there won't be any NASA suit techs?

ALEXANDER: Right now I am the last NASA suit tech that NASA has. I was told, with the ceiling and the no-hiring policy and stuff that we have, it will just depend. I would think that the division would probably always want to have at least one suit tech because we can do things easier, like advanced development and stuff like that. So I hope that when I retire, that they will have the space available that they can replace me with another NASA person.

RUSNAK: You would think for the purposes of retention of knowledge. You mentioned the high turnover rate in contractors and such, and simply for continuation of NASA's role in this particular fashion.

ALEXANDER: Yes.

RUSNAK: That would be unfortunate.

ALEXANDER: Then space station will be working with some of the things. The space station in our group right now are subsystems managers working on the portable breathing apparatus that's used on space station, so they kind of need technicians. We'll be keeping at least one contractor technician and then maybe a contractor engineer to work projects like that, too.

RUSNAK: With the space station personnel, is there going to be any expanded role here, in terms of any different type of suit, or are they just going to go up on the shuttle with the regular crew in that format? Or is there going to be something special that they will need actually while they're on the station?

ALEXANDER: Space station-type suits, other than the EMU, our suit, nothing has been said yet about changing the suit that they would wear up and back. I guess there's different ways. I guess they can launch in a Soyuz vehicle and go up and then probably come back in the shuttle, so they still get training in both areas. But right now there's no new developments in our suit that I know of for space station.

RUSNAK: You mentioned going up on the Russian Soyuz. Have you had any interaction with your Russian counterparts or any dealing with the suits that they use?

ALEXANDER: Not really. We had Shannon's [Lucid] suit here for a while, so we have seen the suit, but that's about all. I've never really even seen anyone in it. We've heard their comments of comparing the suits with our suits and everything.

I was most impressed, I went and saw the movie at the IMAX, *Mission to Mir*, and that the most that I've learned about how they do things over there. I thought it was amazing. Their landings, where the capsule lands out in the middle of this field, and all these people troop out there and get the guys out, and wheel them off in something that looks like a rocking chair or something, and wheel them across this bumpy ground, it was just funny compared to our operations. Like the launch morning with us, everything is so controlled and so set and only certain people are allowed. When I saw their film of their vehicle going out to the pad and all these people are just walking along beside it, it seems much more relaxed than our program is.

RUSNAK: If I can get back to the three gentlemen that we were talking about before, do you know specifically what Mercury, Gemini, or Apollo missions that they were assigned to, or ones that they spoke about in any great length?

ALEXANDER: Right off the top of my head, I can't tell you that, but they've talked a lot about it. They have lots of pictures and lots of good memories. You definitely need to talk to them, Joe Schmitt and Al Rochford, both, have a lot of history, just between those two people right there.

RUSNAK: Right. Yes, that's certainly why we want to interview them in some depth for our purposes, anyway. I was just wondering if there was anything specifically with regard to those issues. Is there anything else about the job of the suit tech that you think is important, that we haven't covered?

ALEXANDER: The main thing, in the way that the system works right now, and I hope that it will carry over when the contractor takes over, is that the two people from our side of the team that make up the suit tech team, we kind of act as checks and balances for the others. When they show up at the exercise with the equipment, we go in and double-check everything, make sure the suit is prepped right, has the counterbalance springs on and off, whatever the configuration for that crewman is, that it is the right size, that the right harness is there, that it's configured properly and stuff.

That's an important operation, I think. That's one of the most important operations that we have in our setup, I think, is the checks and balances. Like I say, the contractor, the Boeing contractors prep all the gear here and send it to the Cape. Then when we get to the Cape, we do a lot of the check-out and overseeing of the testing there. It's amazing, the little things that we catch, you know, just a second pair of eyes.

It's good to have a QC in the room with you when you do stuff and everything. But unless you've actually worked with the hardware yourself and you've seen it, just daily, that you see it and work with it, there's a lot of things that get by you that you really don't see. So a second pair of eyes, I think, that's just the most important thing that we do.



Then like I say, our history with doing the job. The ASP that goes out to the pad with us on each flight, they change. They do one or two flights and then they're gone. A whole new group comes in and trains again. So they depend upon us to say, "Okay. Now what do we do this morning?" Launch morning, we have a dry count. Then, of course, we do launch. At dry count they're all a little, "Okay. I know we meet at the roadblock, but what all do we take? What time do we need to be there? Who do we see when we get there?" Things like this.

Then once we get out to the vehicle, they're dependent on you to take care of all the small stuff. Like I say, they're out there looking at switches, switch configurations and stuff. As far as the vehicle being ready for the crewmen, they're depending on you to make sure that the seats are ready and harnesses are laid out, and everything's ready for them to go. It's important, because it's a stressful time for them. They want to make sure that there's somebody there.

If you have a problem at the pad, you know that you know what to do about it, the troubleshooting that you can do. We take spares of just about everything that we can out there with us—helmets, com caps and everything, so that if something happens we can swap something out at the last minute. Of course, time is of importance there. Especially like *Mir* flights and stuff, where you have a five-, six-minute launch window, you can't spend thirty minutes troubleshooting something. You've got to be able to react quickly and make the changes and do whatever, or just to get the strap-in done. Strapping seven men in, we're allowed fifty minutes. It takes fifty minutes to do it, and sometimes it takes longer. If you run into a problem with a crewman, his com's not working right or something, so you have to troubleshoot. Is it the helmet or is it the orbiter side com? Just all of a sudden they have a hot spot that's hurting. Well, you've got to work that out, because you don't want them out there for two hours on their back, or three hours on their back, with that's all they can think

about is this pain in the middle of their back. They have other things to be worrying about at that point and you don't want them to have to do that.

RUSNAK: Have there been any serious launch-related issues with your responsibilities?

ALEXANDER: I guess the worst that I've had is on STS-26, our first flight when we returned to flight. I worked that flight. Back then we had what we called a personal suit ventilation system. It was just a fan that drew in cabin air and blew it into the suit. That was the only means of cooling that they had. It wasn't very effective at all.

The first round of suits that we had were sized military-style. The military people just basically sit in the cockpit and fly the plane, so their gear was much tighter on them than we have. You have to be able to climb out of the top of the orbiter and stuff. But when they ordered the suits for the first crew, they ordered them based on military sizing. So all of the suits were a little bit smaller than what they would wear today. Like if a guy wore a medium/regular then, he would be in at least a large/regular now.

On STS-26, the gear was arriving daily as we were supporting events. When we went down for dry count, their suits had just come in. In fact, I think at dry count we actually only had two flight suits and the other three flight suits came in after TCDT. We have pictures where three of them are in blue suits and two of them are in orange suits. It was things like that.

But while we're out the pad launch morning, these ventilators had fuses, and the fuses started blowing. We had the commander strapped in. We were working on the pilot. The fuse went out. At first we didn't know what it was, you know, just the fan went off. Then they were real noisy, so you noticed right away when it went off. So we started trying to see what we could do.

Well, this crew, I mean, they wanted to get this flight off the ground right away. So I just continued with strapping and the ASP was trying to troubleshoot the fan problem, see what was the matter there. I remember, like the second one that went down, we had like two that blew the fuses that morning. The commander kind of turned around and looked at the ASP, and he said, "If you touch another fan, I'm going to be seriously upset." [Laughter] He was just to that point of like, "We will launch without cooling. Just leave the things alone. Don't touch another one." [Laughter] It was kind of funny. It was like, I don't know, like something he was doing was causing them to go out. But we had to get fuses sent out to the pad, last-minute change fuses and do that kind of stuff. They did launch with "cooling." It's not very effective cooling, but it was cooling. But it was kind of hectic. I guess that's the most pressure that I've been under.

We all have com problems, you know, where you've had to change out helmets and com caps. But like I say, we have learned to take as many spares as we can. It's just a matter of time then to get out there and do it. But that's the first really hectic morning that I've had in a long time.

RUSNAK: I can understand that. After the first five missions, they would just go up in their blue flight suits, right?

ALEXANDER: Yes.

RUSNAK: So that obviously maybe had some effect on your pre-launch responsibilities.

ALEXANDER: We still had to go out there. In some ways, it was easier. Back in those days, you have to remember, we had a much smaller group. There were like about seven people. There were four NASA suit techs and then we had maybe four or five contractors that worked

with us. So we were a group of ten people total, with our engineer. We did all of that. I mean, we covered the coveralls, the helmets, the harnesses. They had breathing systems, a portable breathing system that they could use to do an egress out of the orbiter and type stuff. So we handled all of that equipment.

It was not as hard in some ways, because you didn't have a suit to deal with, but, still, just the coveralls and stuff, the coveralls were treated cotton, so they couldn't be just washed or anything; they had to be dry-cleaned. Just like at dry count at the Cape, you'd have to worry about taking them to a cleaners and making sure they got back from the cleaners. You'd never know who was going to want to take a souvenir or something. So you always worried about things like that.

Fitting them, you'd be surprised at how hard it was to fit coveralls. I mean, when you're dressing like that, they want to look good. So they would want them fitted. It was almost as much trouble doing that as it is fitting them in a launch and entry suit, in some ways. The maintenance wasn't quite as bad.

Then we had the launch entry helmets that they wore. We were in charge of testing those and keeping those up and everything. So it was still quite a bit. With fewer people, like I said, we had a lot fewer people.

RUSNAK: Were you responsible for any development on the launch and entry suits?

ALEXANDER: When they decided to go to the launch and entry suit, they kind of handled it in a strange fashion. Our subsystems manager, at the time, Jim Slesher [phonetic], was kind of detailed over to the Manned Systems Division and he went to work in actually another building. He took some of the contractor people in our group that's here now and worked most of the development with just four or five people over there. I'm not for sure why it was

handled that way. We weren't very happy about it, because there were three of us sitting over here with not much to do at that time.

Then the equipment started hitting the doors. From our standpoint of how we work with the crewmen, we saw obvious things right off the bat. For one thing, the parachutes came in with nine-inch risers. I mean, nine inches isn't very long. The crewman's on his back. This riser has to come over and attach to a frost-bitting that's level with their armpits.

I remember Al and I went out to California to support a test of a jump for the parachute, doing the qualification jumps on the parachute in the suit. It was one of our first experiences with the equipment. We're attaching this parachute to the jumper, and you had to actually hold the parachute up over his shoulders to do this connection. Then it came down and connected to the lower portion. Al and I kind of looked at each other, like, "Yeah, right. I can see this, you know, a guy laying on his back and us being able to do this." We went back and told them, and they were like, "Well, it'll work."

I can remember the first training exercises over in Building Nine with the 26 crew and trying to get those parachutes attached. I mean, it was murder for both sides. It was really, really, really hard to do. And it really, really, really hurt them, so we ended up going to longer risers. We ended up going to twelve-inch risers and ten-inch risers. Small people, the smaller females wear the ten-inch and then everybody else has a twelve-inch. But things like that, that I think we could have helped with a little bit more, just because you had Al and Troy, especially their background, to fall on. I had been doing it for a while at that point, but not nearly as much as they had. So some things like that that might have made a little bit of difference. But the group of people were a really good group of people. Jim Slesher was probably the best in the business at that time. So they did a really good job, considering the time that they had to work with. There were several astronauts that were assigned, that worked really close with them in the development of the suits.

RUSNAK: What type of responsibilities do you have when you're not preparing for a specific mission?

ALEXANDER: Well, just maintenance of the hardware; the crew [unclear], keeping it up to date; the lab itself. We do other kinds of testing and stuff in here. People use the lab for different things. We don't have much down time. This is really strange, between 91 and 95, having these months here, three or four months in between. This is like, we're all still kind of coming in each day kind of dazed, look at the schedule and don't see just back-to-back training and stuff. So we'll use it. We have like a lot of underwear, our liquid-cooling underwear, that the elastic is stretched out in. It's been like that for a long time. We've been needing to replace it, but we just haven't had the people or the time to do it. So we'll take the time to do repairs like that, the more time-consuming repairs.

Like I say, we've got the individual cooling units that we've had in-house for quite a while now, but they're not totally certified yet. So hopefully we'll try to finish up and get whatever testing and documentation that's needed for that, help Stephanie get that done so we can start flying those.

On liquid cooling, part of the problem is, (a), people are either too cold when you first turn it on, so they want to shut some of the flow down. But with like the individual cooling units, if you throttle them back and then you get hot, it's hard for the unit to make it up. So you want to kind of keep that water as cold as you can and then just be able to use it when you need it. So Max has been working on a little flow valve that will—instead of right now what they have to do is actually just do a pincher valve that pinches off the flow and shuts it down. Max is working on a little throttle valve that will actually let them do a mix of cool water and circulate. Some developments like that, some advanced developments that we'll spend some time looking at stuff like that.

RUSNAK: Are you assigned to the next shuttle flight? Are you working on that?

ALEXANDER: Yes, I'm on STS-95.

RUSNAK: So have you had a chance to meet or work with Senator [John H.] Glenn [Jr.]?

ALEXANDER: Yes. It's been really fun. I was kind of worried about it, didn't know, really, what to expect. I worked with [Senator E.] Jake Garn when he flew, too. I did that flight. He gave out caps called "Garn's ground crew." So I was kind of interested to see if John Glenn was going to do anything. So far he hasn't done that. But he has been just super to work with. He is so nice. I mean, people just approach him constantly when you're at training exercises. "Can I have my picture [taken with you]?" He is just so nice. I mean, he just stops and, "Where do you work?" Has a few words with them, poses for the picture. He's just really super.

He's brought his wife, Annie, to several of the training events. I had heard about her and how nice she was, too, and she is. She sent me a set of pictures, in fact. She brought her little camera and took pictures with him. I got a note one day and said, "Jean, I thought you might enjoy seeing these. I just enjoyed so much watching the strapping and stuff." But I've done strap-ins with a lot of crewmen and had their families there and I've never received photos from any of them, and John Glenn's wife sent me photos. I thought that was really nice. They've just been really good.

RUSNAK: Yes, we did an interview with him last year when he was here for his annual physical. We talked to him a little bit. That's when he was still lobbying to get on a flight. So he had a few words to say about that. Now he's obviously on the next mission.

ALEXANDER: We were kind of worried, you know, about the responsibility of—whether he was going to be able to do everything that he needed to be able to do. But right after the first few events, it was very obvious that he was going to be able to do anything that he needed to do. He's really good about asking questions and understanding everything. Some people kind of look it over and you're trying to explain it. It's like, "Yes, yes, yes, okay, I got that." Then they go out to do it and they really can't do it, because they really didn't get all the instruction. But he's real good about listening and has a lot of patience. He does really well in training, therefore, because of that.

RUSNAK: Does he ever bring up any stories of his previous flight or anything?

ALEXANDER: He's made mention. He does talk about it. He's real willing to sit down if you ask him any questions. I'm trying to think right off the top of my head some of the stories.

RUSNAK: For comparative purposes, because the suits between then and now are obviously quite different.

ALEXANDER: Yes. I think he was pleased with our suit and the fit and everything that we were able to do for him and all, considering that it wasn't custom-made to him, like he had had in the past and everything. So he's been just really good about it.

RUSNAK: That's terrific then, you have a chance to work with him.

ALEXANDER: Yes.

RUSNAK: In your official capacity, right?



ALEXANDER: Yes. It's been really interesting. I got to do quite a few of the *Mir* flights, too. I was either there for the launch or for the landings. That was real interesting. I got to the launch, the flight that launched Shannon Lucid, and then I was there when she came home, too. So things like that are real special, I think. I like doing that.

RUSNAK: So have any of you had a chance to work with some of the cosmonauts?

ALEXANDER: I did STS-[6]0, wasn't it? Which one did Sergei Krikalev and [Vladimir] Titov worked on? I worked on that flight. That was real interesting. Of course, on the last flight, I just did 91 with Valeri Ryumin. It was interesting. Krikalev spoke English real well, so training was real easy. Ryumin didn't speak English and it's definitely much harder. It's frustrating on his side, especially when you're trying to operate all these different equipment and attachments and stuff that you have to do. I think he kind of came in with the attitude of, "Well, somebody's going to be there to strap me in and somebody will get me out," which may be how they do it over there, so he wasn't really too worried about it. We don't operate that way. You know how to do everything in case you have to do it. It took a couple of sessions before he kind of got with it that, "Okay, I'm going to have to learn to do this." But once he put his mind to it, he was real good. Like I say, communication was still kind of funny.

Like at TCDT, even launch, I was telling them—Dave Brant [phonetic] from Lockheed is the one that strapped him in on the mid-deck. When they get in on their back, there's a strap above them that they have to lift up on to position themselves, or we'll tell them to get a hold of the bottom of the seat and pull themselves down. Well, Dave would be trying to tell him to pull down in the seat and he would reach up and pull up on the strap, and it just undoes everything that you just did and you'd have to start over. I was coming out of

the flight deck going out to get my next crewman and I see Dave over there going, "No! No!" [Laughter] Slashing his finger across his neck trying to tell him, "No, not that!"

I told him in the debrief, I said, "I couldn't tell if Dave was threatening to kill him or was trying to get him to stop what he was doing." [Laughter] Things like that make it a little more interesting and harder to work sometimes with them. But it was fun.

RUSNAK: Do you have any of your pictures or anything here that I could take a look at?

ALEXANDER: Yes, I have a whole cabinet full of pictures in there. I don't know what all they are. I have a lot of the collages. After each of the flight, the crew puts out a collage and they give it out to several people. I've got quite a few of those in my office. Then I have some other pictures, too, if you want to come look. I'll be glad to let you look at them.

RUSNAK: Sure. I'd love to take a look at anything you've got there.

ALEXANDER: All right.

[End of Interview]