

NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

ORAL HISTORY TRANSCRIPT 4

WILLIAM S. MCARTHUR, JR.
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is March 31, 2017. This interview with Bill McArthur is being conducted at the Johnson Space Center for the JSC Oral History Project. The interviewer is Jennifer Ross-Nazzal, assisted by Sandra Johnson. Thanks again for taking some time this morning.

MCARTHUR: I've really enjoyed the time we've been able to spend together. You're delightful people. I was just talking to Jim [James A.] Rostohar this week. I wish we had been able to steal you years ago.

ROSS-NAZZAL: We wish so too. When we left last time, I noticed as we were exiting, you have this drawing of the STS-58 crew. I thought that might be a fun place to start.

MCARTHUR: Sure, it was done by Mike Sanni. I have a poster of his somewhere, I think he did this. [Pulls a poster out.] This was the serious one. The mission was Space[lab] and Life Sciences 2. It was the second Spacelab flight that was dedicated to physiological research. We had forty-eight rats in the lab that we gathered data on; of course they were going to get data once they came back, and there were control animals on the ground. Then they used us as test subjects. I was MS-2 [mission specialist-2], the flight engineer, which I thought was a good thing, because the pilot, the commander, and MS-2—the experiments they could do on us were less invasive.

ROSS-NAZZAL: That's a good thing.

MCARTHUR: Although I did do blood glucometry every day, just to see how your blood sugar changed. I think I had to do it over a period of ten days. You have ten fingers, so ultimately I had to prick each of my fingers. Once or twice I made a mistake. I would go one side of the tip of the finger, and if I made a mistake I'd have to then go to the other side of the tip of the finger. Eventually my fingertips were all tender.

This was my first flight, STS-58. It was on board *Columbia*, and we flew in fall of 1993. Generally, especially if you were a first-time flier, you would get assigned to a mission about a year out. In 1992, I'd been in the Astronaut Office for two years. I was a year out of completing AsCan [astronaut candidate] training, and several of my astronaut classmates had been assigned to missions. Of course, it's a real thrill when you do that. I'm going, "Oh gosh, I hope I get assigned to a mission soon."

The chief of the office was Dan [Daniel C.] Brandenstein. I was actually doing a PR [public relations] somewhere, and I got a call from Dan. He didn't say, "This is what I want you to do," but he asked if I'd be willing to be on a mission that involved medical research. I thought, "Okay, yes. Army aviator, medical research, that ought to be fun." I said, "I'll be happy to do anything." Of course I was just desperate to get assigned to a flight.

He's saying, "No, wait, wait, wait, don't volunteer for everything or anything." Of course the implication there was that the research community sometimes asked you to do things that if you weren't desperate to fly you might think twice about agreeing to. "Don't sell your soul to the devil quite yet."

Then I got assigned to STS-58. It was interesting. Several of us were rookies. If you see here [demonstrates], here's the patch on the outside. John [E.] Blaha was commander, Rick [Richard A.] Searfoss was the pilot, [M.] Rhea Seddon was the payload commander, Dave [David A.] Wolf was, I think, mission specialist number 3. As payload commander, Rhea was also MS-1. Shannon [W.] Lucid was MS-4. Here I am, MS-2. As you can see, I'm holding a pig on my shoulder with a cord and microphone coming from the pig because I was the prime amateur radio operator, or ham radio operator, on the flight.

ROSS-NAZZAL: I was trying to figure that one out.

MCARTHUR: This is Marty [Martin J.] Fettman, who was one of our payload specialist candidates at the time. Marty ultimately was the one that flew with us. Marty is a doctor of veterinary medicine. Jay [C.] Buckey [Jr.] was one of the other two. This is Jay Buckey, who is a medical doctor, and he was one of the other payload specialist candidates. This is Larry [Lawrence R.] Young. Larry Young was from MIT [Massachusetts Institute of Technology, Cambridge]. I don't remember [where] Jay had come from. Larry Young is a PhD. Larry was a lot into neurovestibular research at MIT. Jay was really [into] cardiovascular-type stuff. Of course Marty is a veterinarian, and Marty actually flew. Jay ultimately did fly. I think he flew STS-90, which also had a lot of biological research on it. Larry, unfortunately, never had the opportunity to fly.

If you notice, Rhea has her ankle in a cast. I would say within three months of flying, we were doing emergency evacuation training over in Building 9, in probably the Full Fuselage Trainer or else one of the Crew Compartment Trainers. We had the emergency slide deployed, and Rhea came down. When she got to the bottom, her foot turned under and she injured her

ankle. We were a little bit worried. Of course, close to flight that was a little bit of a worry, but obviously she recovered.

There was an interesting thing that happened. We were going to the Cape [Canaveral, Florida] for our crew equipment interface test. That's where you get to climb all over your vehicle when it's getting close to the flight configuration, and you can put hands on some of the equipment. With her foot in a cast, Rhea obviously couldn't fly in a T-38. For one year, from '92 to '93, NASA leased a small business jet and six mission specialists got qualified to fly the airplane. I was qualified to be the pilot—I could fly it as long as I had a qualified copilot to fly—and Shannon checked out as a copilot.

We flew the airplane with probably all three of the payload specialists, because I don't think they could fly in T-38s. When "Hoot" [Robert L. Gibson] brought Rhea out to Ellington [Field, Houston, Texas] and let her get on the airplane with us flying, I thought that was a tremendous—either she had laid down the law and told him she was going to do that regardless of what he said, or he had confidence that we weren't going to kill his wife, kill the mother of his children. We enjoyed that.

ROSS-NAZZAL: Was that the Mission Specialist Training Aircraft?

MCARTHUR: Mission Specialist Training Aircraft. I think that's part of the reason I got the shell. She and I really bonded over that.

I may have mentioned—there were so many of us, because there were nine of us in the crew plus two backup payload specialists. John really wanted the two backups not to feel like they weren't a full part of the team, so they participated fully in all our training. But there were no

offices large enough to hold nine people, so we had two offices. We had a corner office in Building 4, and then right by that we had a smaller office.

Six of the members of the crew were in the big office, to include the alternate payload specialists. Shannon, Marty, and I shared one office, and the other four who were actually going to fly plus the two alternate payload specialists had the office right beside ours. I thought that was a real smart thing on John's part to do that, to just make sure that they didn't feel that they were isolated or that they were outsiders.

It was fun. Shannon was great to have as an officemate and to fly with because NASA does a really good job of teaching you what you know to do your work in space. Shannon shared a lot with us about how to live and enjoy being in space. We really grew close. I have two what I call "space siblings," I have a space sister and a space brother. Shannon is my space sister and Valery [I.] Tokarev is my space brother.

ROSS-NAZZAL: There were a couple things here in the portrait. What's the duct tape for that Shannon is holding onto with Marty? You know what that symbolizes?

MCARTHUR: I don't think it's duct tape, I think it's actually, I would assume, practicing bandaging. I don't really remember. That particular part of the image doesn't resonate with me particularly. Of course you can see Jay was quite the snacker.

ROSS-NAZZAL: Wondering about those Oreos.

MCARTHUR: Larry is quite the cerebral, quite the intellect. Then Dave Wolf—his undergraduate degree is, I think, electrical engineering. Then he's got his MD [Doctor of Medicine]. I wouldn't call him a mad scientist, but he has an extraordinary talent and insight into things not just mechanical but into machines. I remember there was one piece of equipment that we were using on orbit, and it had a hose that fluid would flow through. They used it, deconfigured it, and then tried to reconnect the hose later.

They had, of course, quick disconnects because those minimize leakage and things like that. The two fittings would no longer mate; you just couldn't put the female connector over the male end. The ground is trying to figure out what to do, and we don't know. Dave very quickly realized that trapped pressure in the line wouldn't allow the quick disconnect to open to mate. So he just partially disassembled it, got a little bit of water to leak out of it, a drop or two is all it takes, and then tightened it back up, and it remated just fine. He's maybe the mad scientist.

ROSS-NAZZAL: Boy, I can't do anything like that. I would have broken it. I wonder if you would talk to us about training. You said you were the flight engineer, so you probably spent a lot of time in the simulator.

MCARTHUR: That was a lot of fun. I got to do all the—got to—I had to do all the ascent/entry sims. That was a really good experience. Then I flew with John a lot in T-38s. I think it was because he wanted to maintain that close relationship, since I would be looking over his and Rick's shoulder. That real close relationship of the crew that we would work together in that environment every chance we got.

John was also really good at preparing you to do things that would help him. On many occasions he would basically say, "I would like for you to do X." It could be something really really simple. In the bags I had on my seat I think he must have had a half a dozen different [eye]glasses on orbit. I actually learned this technique from him, but there were glasses that he used for ascent, glasses that he used for being on orbit, I think he even had separate entry glasses. He would have the prescription in different areas of the lens depending on what he needed.

By that time, I wore bifocals. Being the flight engineer, I would have to look straight ahead and see the panel. I would have to look down to either see my checklist or any of the switches that were right there. I would have to look overhead at circuit breakers and overhead switches. So I had a pair of glasses that had my reading prescription at the bottom, distance prescription in the middle, and the third segment at the top with the reading prescription again so that when I looked up I would be able to read things more clearly right over my head.

It was a great experience. There were four of us; it was our first flight. So we had three very experienced veterans and they taught us a lot. They really did.

ROSS-NAZZAL: Did you get a chance to fly in the STA [Shuttle Training Aircraft], being the flight engineer?

MCARTHUR: Oh, absolutely.

ROSS-NAZZAL: Did you spend much time going out to [NASA] Marshall [Space Flight Center, Huntsville, Alabama] doing payload work?

MCARTHUR: No. Most of the Spacelab missions were managed out of Marshall, but the Spacelab Life Sciences missions were managed here. We didn't spend very much time at Marshall, which for a Spacelab mission was atypical, but again for SLS [Spacelab Life Sciences]-1 and SLS-2 they were both managed here at JSC.

ROSS-NAZZAL: Did you practice any of the experiments? Did you have an idea of what you might be asked to do?

MCARTHUR: Absolutely. I was the operator on a number of experiments, and I was the subject on a few. I was the subject on ones that were self-initiated.

There was one—it was called “drop.” It was interesting. You'd put on a harness—maybe it was just a belt—and be held on the deck with bungees. Overhead you'd have a T-bar, and you would suspend yourself from this T-bar and lift your feet off the deck. There would be sensors on your calf. You would then push a button on the T-handle and at some random time interval it would release and pull you toward the deck. It was to measure your reaction time to get your feet underneath you, to land on your feet versus landing on your knees. I think it was designed probably so you weren't supposed to ever actually land on your knees.

I found it interesting. That was the first time I discovered that the bottoms of my feet would get very sensitive from not walking around. We didn't have a treadmill. We had a cycle ergometer, but there was no foot impact. There was nothing on orbit that we did where your feet would actually give you the sensation of walking on the bottom of your feet. I noticed that when I would land on my feet they were pretty sensitive. It was a little bit uncomfortable, and that was a surprise.

ROSS-NAZZAL: That's interesting. Rhea mentions in her book [*Go For Orbit: One of America's First Women Astronauts Finds Her Space*—of course you also mentioned the rats—how a lot of animal activists were very opposed to parts of the mission. You had to go to briefings and be aware of these things. Can you talk about that?

MCARTHUR: Sure. There was a lot of sensitivity. I mean that in a positive way, I think we appreciated the passion that the animal rights community had. There were a couple things. One is we embraced, without any reservation whatsoever, our obligation to treat the animals humanely. As research animals, six of them were partially dissected on orbit, and all the rest were going to be shortly after landing. That's the reality of using animal analogues in research. The animals are euthanized.

There's quite broad diversity in how people view that type of research. I think we respected the animal rights groups who objected very strongly to what was going on. I think there were even demonstrators outside the gates at KSC [Kennedy Space Center, Florida]. One of the things we were actually briefed on and given—I don't want to say instruction, but made sure we understood what were, for example, the trigger words that could trigger a very negative reaction, such as saying the animal is sacrificed. They didn't really do that voluntarily, so [we had] to be very professional in how we talked about it.

One of the downsides was that we really couldn't talk about the animals. We were discouraged to talk about the animals on the radio traffic, and we weren't allowed to do any photo or video documentation, which I thought was a shame, because that meant there was some research value that was lost.

Let's go back to launch. Our first launch attempt was on a Thursday. I think we had an equipment failure which, if I remember correctly, the transponder is what failed. There was some debate on whether or not we could fly without it. Said, "No, you can't." Then they discussed whether or not they would just come put a spare on board, and then I would get to try to replace it on orbit. They decided not to do that, and they scrubbed the launch. My memory is that the weather was bad anyway, so we were grateful that we probably didn't stay on the pad as long as we would have otherwise. I don't remember why, but the next day we scrubbed as well, which was Friday.

Then we ran into this requirement that the protocols for research animals required that they be checked every day for their conditions and their health. Under certain circumstances you could waive that for one day, but now we had already gone through two days without someone having checked on the condition of the animals, so we had to stand down for two days to replace all the animals. I think there was also a concern that there was an optimum age for the animals, and now they were progressing outside that optimum age.

We stood down for two days, and we just had a ball because we went to the beach house every day. We were ready to fly, so there really wasn't anything we had to do for the next two days other than kill time.

ROSS-NAZZAL: Were you watching *Groundhog Day* then?

MCARTHUR: We did, we watched *Groundhog Day* several times. That became the signature movie for the STS-58 crew.

We finally launched. One of my responsibilities was to go check on the animals. There were two things we looked at. They were in two racks; they were called Research Animal Holding Facilities, or RAHFs. The ground could determine whether or not the animals were consuming water. They couldn't tell if they were eating, though. There was a food tape that was part of each one of the cage sets, and you'd pull the tape out and see how much further out it came. I remember doing that a few times.

If I remember correctly, I think there were two animals per insert, or else there were two inserts per slot. That was so each animal would have another animal. There was mesh between the two of them, a screen in between the two of them. They couldn't actually physically make contact, but they at least would be aware that there was another animal there.

The ground noticed that one animal did not appear to be drinking water. This is when I regret we missed the opportunity to capture some neat at least anecdotal information, if not controlled research. They asked Marty to take the animal out, put it in the glove box, and assess its health. He transferred it into the glove box, and he was holding it in his hand by its back, so it was laying back in his hand. He had prepositioned a bag of water in the glove box. He then took the bag and squeezed out a little bubble of water and presented it to the rat. The rat just grabbed it, pulled it to its face, drank it. Marty offered another one, rat did the same thing with that one. He offered a third. The rat drank about half of that, and then used the rest to wash its face.

I've often wondered what animal would do well in space. Sounds like something like a rat. These animals seemed to adjust to microgravity just fine. Clearly this animal very quickly figured out that it could actually take a little bubble of water and drink it. I thought that was pretty cool. I think probably the absolute worst animal you could ever take into space would be a cat.

ROSS-NAZZAL: Why is that?

MCARTHUR: First, there is a video—it's really bad—there may be a couple about taking a cat on the zero-g [gravity] plane.

ROSS-NAZZAL: That sounds dangerous.

MCARTHUR: Cats, in my opinion, have a very keen sense of up and down. I don't recommend doing this, but you've seen people hold a cat upside down and drop it. There are slow-motion videos showing how a cat is able to get its feet underneath, and they're very very agile. My belief is that they have a well-developed ability to sense up and down, and in microgravity that goes away, so I just suspect that some cats would find that very stressful. When cats freak out, you don't exactly want to be cuddling them.

ROSS-NAZZAL: Especially if they have claws.

MCARTHUR: Although I think my wife and I are about to adopt two kittens.

ROSS-NAZZAL: Oh, they're so cute.

MCARTHUR: One of our grandcats just had two kittens. It was a surprise. Since there are only two of them—I'm thinking they're a few weeks old now—they're playing with each other. When

I retire I'll need to have some animal at the house, and I was thinking it was going to be a dog, but I guess it's going to be a cat.

ROSS-NAZZAL: The grandkids will like that.

MCARTHUR: Talking about the ham radio, we did a lot of amateur radio contacts to quite a number of schools. That was called the SAREX, the Shuttle Amateur Radio Experiment. When it moved to the Space Station Program it became ARISS, Amateur Radio on the ISS [International Space Station]. First, you had to have an amateur radio operator's license, so Marty and I and maybe Rick all got our amateur radio operators' licenses. One of the rules is that at least one crewmember had to be a licensed radio operator.

One of the deals was that if you had young children, crewmembers could pick a school to make contact with, so I was able to talk to the school my daughters went to. Of course, when she was able to get on the radio I think my younger daughter asked if I would finally buy them a dog. They had wanted a dog for years. My wife and I told them, "You can't have a dog because we move so much, this, that, and the other."

I think Rhea's boys went to Ed White Elementary [El Lago, Texas], so we did a contact with them a little bit later. One of the things we did for all the contacts—I had a little microcassette recorder, so I would record the conversation with the school contacts. After Rhea finished talking to Ed White, she said, "I thought I heard"—I can't remember which son it was—"I thought I heard him say, 'Mommy, I love you.'" I rewound the tape, let her listen to it again, and in fact you could hear that's what he said. It was obviously something that was very touching, really meant a lot to her.

ROSS-NAZZAL: You were prime on the SAREX, and you were also prime on the Orbiter itself. How did the vehicle perform during that flight?

MCARTHUR: Funny you should ask. One of the experiments we had was to collect urine samples, so there was extra equipment that was placed into the toilet system in the Shuttle to allow us to, for the most part, use the toilet the way we would nominally. Then there were some additional hoses put in-line and some additional equipment that would capture a urine sample, so we weren't having to run the risk of touching any body waste. Talk about training. Almost every time we had a simulation that wasn't an ascent/entry simulation, the UMS, the urine monitoring system, would break. I was lead for in-flight maintenance, so I would have to go fix the urine monitoring system.

We got on orbit and very quickly we noticed—I think this was the first day—if you ever go look at the toilet as you face it, facing aft in the Shuttle, over in the left corner, left deck behind where the seat is, there's a round object, which is the odor/bacteria filter. The air, as it travels through the system, goes through the odor/bacteria filter, then it eventually returns into the cabin. We noticed this dark green liquid starting to accumulate around the rim of the odor/bacteria filter. “That's not good.” It turned out that when the Cape was servicing the galley, when they were loading the hot water tank, air had been introduced.

One of the things they asked me to do, and I think it was the first day, was dump a lot of water from the galley through the toilet into the wastewater collection system, which eventually is dumped overboard. They were hoping to get as much air as possible out of the galley. The concern is without gravity the air doesn't rise to the top of a body of liquid, it just stays pretty well mixed in. Historically, what we had seen is if there is air entrained in the water, then as you drink your

beverages you swallow a lot of air. Now you have air in your digestive system, and that can cause discomfort.

It turned out I had actually flooded the toilet. So now, the gas-liquid separator had been overwhelmed, and there was a lot of liquid that we needed to get rid of. Things weren't too bad yet, we were just concerned about it. They sent up a modification to a standard procedure, and I misread the change to the procedure.

So as I'm connecting all these hoses to try to get rid of some of this excess water, as soon as I connected one of them thinking it was going to pull water in, I noticed liquid starting to run through the hose. The first thing I did is took the nozzle, stuck the nozzle to my chest so it wouldn't spray all over the middeck, and reached over to disconnect it. This happened so fast. Like a gallon of wastewater came out, and the cabin now really smelled.

The little town I grew up in [Wakulla, North Carolina], some of the school buildings were built by the Civilian Conservation Corps coming out of the [Great] Depression, so these were pretty old buildings. The boys' bathroom had old hot water radiators in them, so there was always the little boy who decided that urinating on the radiator was more fun than in the urinal. That's how those bathrooms smelled. But I never did that. At least not that I'll admit.

Anyhow, the vehicle smelled like that. I'm just mortified, I have created this awful environment that my crewmates and I are going to have to live in for the next two weeks. We all pitch in together; we go through this massive cleanup campaign. I'm feeling pretty low, and I think this is flight day two. The ground knows that the odor/bacteria filter is saturated. They didn't share that with us, which might have been helpful, but it wouldn't have made any difference in the long run.

We've left the toilet fan running to try to use the Shuttle's ability to dehumidify the air, use that in order to dry everything out. It's time to go to bed. They say, "Okay, go ahead and shut the fan off in the toilet. Shut the toilet off so the fan won't run and bother you while you're sleeping." When I woke up the next morning, I was a little optimistic because it smelled significantly better. Then they said to turn the toilet back on to get the fan running to keep drying things out, and shortly after doing that the odor came back pretty noticeably.

I finally realized the odor was not from the wastewater that escaped. The odor was from the saturated odor/bacteria filter. After about a day of running it, maybe a little less, the odor/bacteria filter dried out, and everything was just fine. Of course by now the press knows. It was interesting.

ROSS-NAZZAL: Did you get a number of questions on that when you got back?

MCARTHUR: We got questions from the press in one of our press conferences. They said, "Hey, how about taking a deep breath? How's it smell up there?"

"It smells just fine, thank you very much."

ROSS-NAZZAL: I understand that Blaha managed to make communication with the Mir.

MCARTHUR: With the Mir station. I can't remember who was on Mir. He was very interested in doing that, and the Russians have always been very, very supportive of having amateur radio in their vehicles, particularly their space stations, both Mir and the International Space Station.

They're actually more supportive of that than we are, which I think is unfortunate. It's a community that reaches out and gets young people interested in science and technology.

John had asked the amateur radio community to see what they could do. These were pretty low-powered radios, and they got us the information where we knew we would be most likely to be able to make contact. When we got to that point, I had the equipment set up. I initiated the call and then handed the microphone to John. The Mir commander was a Russian I think John had met previously.

ROSS-NAZZAL: Can you tell us about the conversation? Or was it just something really basic?

MCARTHUR: It was so brief. John calls him, and I remember the reply from the Russian back was, "Ha ha ha, is that you, John Blaha?" It was a matter of seconds. It's one of those things. They wanted to hear each other's voices, and they did.

That was an epiphany for me in this whole phase. We generally made two types of contacts. We made the prearranged school contacts, and for those I would generally know ahead of time what the questions were. That was helpful, because if the question was garbled or the student had a little trouble with the radio you could very quickly give them an answer. The key was to give them very concise answers so as many students as possible could ask a question.

Then we had the CQs—"seek you." That's where you just call out, and you want to talk to anyone who can reply to you. What I found interesting is the vast majority of operators who tried to contact the spacecraft—they may have been interested in having a conversation, but what they wanted was to document they had talked to a spacecraft with people on board, that they had talked to someone in space.

Generally, I would call out with my call sign. I had to use my personal call sign on the Shuttle, but the Station has its own call sign. It would be like “CQ CQ CQ KC5ACR Space Shuttle *Columbia*.”

And then there would be somebody coming back, it'd be “N1 ABC.” What they really wanted to hear was me respond back with their call sign, then they acknowledge that I responded back. I'd write down their call sign and bring it back here and give it to the amateur radio community. They would then send out cards confirming that this operator had talked with the Space Shuttle.

It was interesting. I remember once I found myself without a piece of paper, so I started writing all the call signs on my arm, I was writing them on my leg. I have to look; I've got those pictures somewhere. Then I heard about one farmer somewhere was out plowing his field in his tractor and he heard us coming overhead so he very quickly got on the radio. In the toolbox on his tractor—he didn't have a pencil and paper—so he scratched in the information about the contact. That was pretty funny.

When I was on board ISS I did thirty-some schools, but also did over one hundred what are called entities. A country is an entity, but if you have geographically isolated parts—like Hawaii is an entity separate from the United States just because it's geographically separated. I talked to someone in the Vatican. I talked to [Guglielmo] Marconi's granddaughter, some relationship to Marconi, the inventor of the radio, pretty cool. Nikola Tesla was from some Eastern European country and I remember talking to some people at some conference or something there commemorating his birthday. There were a few interesting events.

ROSS-NAZZAL: Did you talk with everyone on every continent in the world?

MCARTHUR: I did. I don't think I got a certificate for that, but I got credit for an honorary Worked All States [amateur radio award]. I talked to someone in all fifty states. Oh, and I talked to someone on all seven continents on both of the two-frequency bands that we use. The Antarctic is the challenge. It was called the DX-pedition. It was a group that went to some island right on the edge—it's part of the Antarctic but it was not in the very South Pole, because we only go between 51.6 [degrees latitude] south and 51.6 north. We never pass over the Antarctic, so this was an island that would put us close enough so that part of the Antarctic was still above the horizon for us. I talked to them.

There was a group, here they are [demonstrates]. In 2006, I can't remember what the name of the expedition was. It was an expedition that was searching for Amelia Earhart's airplane. It was very very hush-hush, very very secret. I talked to them. They sent me several of these things. What do you think that is?

JOHNSON: Looks like a bandage.

ROSS-NAZZAL: That's what I was thinking it was.

MCARTHUR: It's a Styrofoam coffee cup. They were sending remotely piloted submersibles down thirty thousand feet in the ocean, maybe not thirty thousand feet. They would include these little Styrofoam cups. Because the pressure was so high, it would take a regular Styrofoam cup and crush it to that size. [Points to cup.]

ROSS-NAZZAL: Oh my gosh, wow.

JOHNSON: That's amazing.

ROSS-NAZZAL: That's why I thought it was a bandage too, because there wasn't a bottom. There is a bottom, it didn't look like it.

JOHNSON: There's a bottom. It's sunk in.

ROSS-NAZZAL: I guess they were drinking a lot of espresso.

JOHNSON: That's pretty cool.

ROSS-NAZZAL: That's cool. You've got a lot of treasures here.

JOHNSON: You have a lot to pack up.

MCARTHUR: Here's one that's even smaller. Maybe this was a small Styrofoam cup, and this was a large Styrofoam cup.

ROSS-NAZZAL: Oh my gosh, look at that. Wow.

JOHNSON: It's like a thimble.

MCARTHUR: The pressure at depth was eight thousand pounds per square inch. Of course here at sea level it's 14.7 pounds per square inch.

ROSS-NAZZAL: Going through all your mementos?

MCARTHUR: Ocean Explorer, the [R/V] *Mt. Mitchell*. Ocean Explorer 6000 I guess is the name of the expedition [trademark of Oceaneering International, Inc.], the *Mt. Mitchell* was the vessel.

JOHNSON: That's interesting.

ROSS-NAZZAL: I had read that you were backup on TV and video for the flight and Earth obs [observation] as well. Did you get a chance to take any photos or video while you were on board?

MCARTHUR: I did.

ROSS-NAZZAL: Any favorite image that you took?

MCARTHUR: West Point [United States Military Academy, West Point, New York]. I've got it somewhere.

ROSS-NAZZAL: We'll get to see it on TV.

MCARTHUR: That's a picture of West Point that captures the fall colors.

ROSS-NAZZAL: Oh yes, I can see the red there.

MCARTHUR: West Point itself is right here. [Demonstrates] This is a little place called Constitution Island which is across the Hudson River from there. That's where two sisters [Anna B. Warner and Susan Warner] used to teach Sunday school to cadets. They also might be known as the people who wrote the little children's song "Jesus Loves Me."

ROSS-NAZZAL: Oh, really? I had no idea.

MCARTHUR: Not the best picture though that I ever took of West Point. See if I can find my favorite picture, not sure.

... There's Rhea. This is a neurovestibular experiment. There's Marty in the chair, and there's Rhea spinning him around. All these extra hoses here and hoses here were for the urine monitoring system experiment. [Flipping through photos] West Point picture I told you that I liked. Pulmonary function thing. I don't know why I have multiples of the same picture but I do. Grits. Matter of fact, I had grits for breakfast this morning.

ROSS-NAZZAL: It's an STS-58 kind of day.

MCARTHUR: Showing that I grew about an inch and a half. Here's Shannon on board Mir.

Anyhow, it was a good mission, the crew got along well. We supported each other well. We landed. We were the longest U.S. human spaceflight since Skylab. As a matter of fact, we were longer than any flight other than the three Skylab missions. We were up for just a shade over fourteen days.

We landed at Edwards [Air Force Base, California] because of the long runways and the better weather and the option to land on the lake bed if you needed to. There was some concern, because landing the Shuttle is a manual piloting task, that there might be some cliff that you would go over where the commander and pilot would suddenly not be able to—their deconditioning would result in a loss of good enough piloting skills to land *Columbia*. We landed. Kind of cool, family was there.

I felt pretty good after landing. It was interesting, Shannon's husband Mike [Michael F. Lucid] had told [my wife] Cindy [Cynthia L. McArthur] that when I see her I'm going to try to give her a hug and bend over and kiss her. He said, "Watch out; he'll lose his balance when he does that." Sure enough when I did that, people are grabbing me, because you lean forward and you can't stop. We came back to Houston the next day.

ROSS-NAZZAL: You were taken off [in] stretchers.

MCARTHUR: Some of the crewmembers were. John, Rick, and I were not. The crewmembers who were the real subjects of the neurovestibular experiments, they didn't want them to reacclimate to gravity as quickly.

ROSS-NAZZAL: So you didn't get to stay at Silver Saddle [Ranch and Club, California City] for that week?

MCARTHUR: We did. We did one night, then we came back the next day. I think we did; I don't remember. It was a long time ago. Cindy will remember better than I would.

Then, as a segue, of course it's really nice—you know at that point if you never fly in space again, you flew in space once. There's a good news, bad news situation there. The good news is you've achieved a pretty significant life goal at what might be arguably described as a young age. I was 42. Part of the question is how do you ever top that? You can make the argument you don't need to, but that doesn't address whether or not you want to.

On the one hand it's a, "Whew, got it done." On the other hand, you come back, and there's a certain sense of euphoria that you went and it turned out well. Yes, you really are at least good. Are you great at living and working in space? Who knows? Are you good enough living and working in space? It appears so.

Going back to the problems with the toilet, I talked about training. Part of the training was reconfiguring this urine monitoring system. Bang, as soon as we started having trouble with the toilet, I had to reconfigure the urine monitoring system. It's this thrilling epiphany that yes indeed, the training is good. I have work to do; I have the skills to do it. You get a very strong sense of satisfaction.

On the other hand if you go, "Wow, that turned out really, really well"—if something turns out really, really well, you generally want to do it again. One of the questions is do the people who make those decisions and do your contemporaries think that you ought to do it again? Maybe

as sort of a segue into the next mission [STS-74] is when you get assigned to the next mission, it's a case of, "Yes, I guess I was put to the test and not found wanting."

ROSS-NAZZAL: It was a very different mission from your first flight and a different crew as well.

MCARTHUR: Absolutely. Eventually I'll try to paint a picture that all these missions came together in my final flight. This mission and STS-74 were absolutely very, very different, but the things I did on this mission were very relevant to being on ISS. The things I did on STS-74 were very relevant to ISS; the things I did on STS-92 were very relevant to being on ISS. Each mission provided experiences and arguably skills that were needed on ISS.

There were things I did on this mission that I didn't do on the other missions that I really needed for ISS. There were things on STS-74 that I didn't do on 58, and that weren't as important for 92, that were important for ISS. There were just a lot of things on STS-92 that provided the experience that was important for being on Station for six months.

ROSS-NAZZAL: Can you give some examples from your first flight? What was important that you ended up using?

MCARTHUR: Doing research. This day in which you are working inside a lab and you're going methodically through a procedure, doing things like determining your body mass. Just using yourself, being the subject of an experiment or conducting an experiment for which you are the subject. That was a significant feature of STS-58 and a significant portion of every day on ISS involved that.

ROSS-NAZZAL: Were there any lessons learned that you applied to your next mission or to ISS from this first flight?

MCARTHUR: One is really trying to understand or, if you will, making a mental list, “What are the things I absolutely want to do on this mission in case I never get the chance to do them again?” For example, you really don’t want to go up on a mission and not have a picture of you seeing how tall you are. It’s not in the planning; it’s not in the timeline. That is not a mission objective for the Agency. If it’s not on your personal list, you can get home and say, “I wish I’d done X,” and there’s not going to be an opportunity ever again to do X.

ROSS-NAZZAL: That’s true. Not an opportunity again to fly on the Shuttle either.

MCARTHUR: There’s that.

ROSS-NAZZAL: I wonder if you would talk a little bit about the postflight PRs [Public Relations events]. You mentioned you went to West Point, and I assume you went to your hometown.

MCARTHUR: I did. I’d actually had a hometown PR before the flight, it was actually Bill McArthur Day. I did go home after this flight and was the grand marshal for the Christmas parade for the little town that’s the county seat, so that was fun.

It actually began a pretty fun tradition of going back to West Point and talking to the cadets there. A former roommate of mine was one of the permanent professors in the math department.

One of the courses for which he was responsible was probability and statistics for the sophomores. We call them “yearlings.” Every year he would invite me back to give them a lecture. I really fold into the lecture, from a probability standpoint, the likelihood of losing a Shuttle. Those were a lot of fun.

I did one to a science museum there in the local area. One time I went back—don’t remember how long ago that was—there’s a branch of the University of North Carolina that’s in the county I grew up in, a city called Pembroke. I went back and got an honorary doctorate from the University of North Carolina at Pembroke.

ROSS-NAZZAL: Did you get a chance to go to the White House?

MCARTHUR: Let’s see. Where did we go? We did not. We went and met Al [Albert A.] Gore [Jr.]. We went to the vice president’s—I guess it was his office. Of course Rhea is from Tennessee and Al had been the senator from Tennessee, so that’s what we did. After STS-74 we met with the president’s Science Adviser [John H. Gibbons] and got a box of M&M’s with [President] Bill Clinton’s picture on it. STS-71 crew told us that when they went to Washington they got to meet Socks the cat.

You may find it interesting—the first president that I ever actually had some personal contact with after a mission was on April 12, 2006, in which we had a video conference with [Russian President Vladimir V.] Putin. April 12 in Russia is Cosmonautics Day. It’s the anniversary of when [Soviet Cosmonaut Yuri A.] Gagarin flew. Valery and I returned from ISS on April 8], and so Putin—I don’t know if he wanted to. Certainly agreed to it, but whether someone said, “Hey, crew just came back. It’s Cosmonautics Day, PR opportunity.”

ROSS-NAZZAL: What'd you talk about?

MCARTHUR: Oh, he just congratulated us on the mission. Then a couple years later, it must have been the next year, so it's probably in 2007, did get to go to the White House. George W. Bush had his administration set up so that, probably twice a year, they would bring all astronauts who had flown the previous year to the White House, along with their immediate family. It's an assembly-line production, but he was really quite charming.

My older daughter had actually worked as a poll watcher for his campaign. She was an avid Young Republican. It thrilled her to no end to get to meet the president.

ROSS-NAZZAL: That's got to be exciting.

MCARTHUR: It is; it's interesting. Of course, none of the pictures have me standing beside the president. They have my daughters. That was as it should be. I will say he was extremely gracious.

ROSS-NAZZAL: This might be a good place for us to stop. We can pick up with your next mission next time.

[End of interview]